CHIEFTAIN
PA-31-350

PILOT'S OPERATING HANDBOOK

AND

FAA APPROVED AIRPLANE FLIGHT MANUAL

AIRPLANE SERIAL NO. 31-8452001

AIRPLANE REGIST. NO. VH-LGX

PA-31-350
REPORT: LK-1208 FAA APPROVED BY:

D. H. TROMPLER
D.O.A. NO. SO-2
PIPER AIRCRAFT CORPORATION
LAKELAND, FLORIDA

DATE OF APPROVAL:
SEPTEMBER 14, 1979

FAA APPROVED IN NORMAL CATEGORY BASED ON CAR 3 AND FAR PART 21, SUBPART J. THIS DOCUMENT INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY CAR 3 AND FAR PART 21, SUBPART J AND CONSTITUTES THE APPROVED AIRPLANE FLIGHT MANUAL AND MUST BE CARRIED IN THE AIRPLANE AT ALL TIMES.

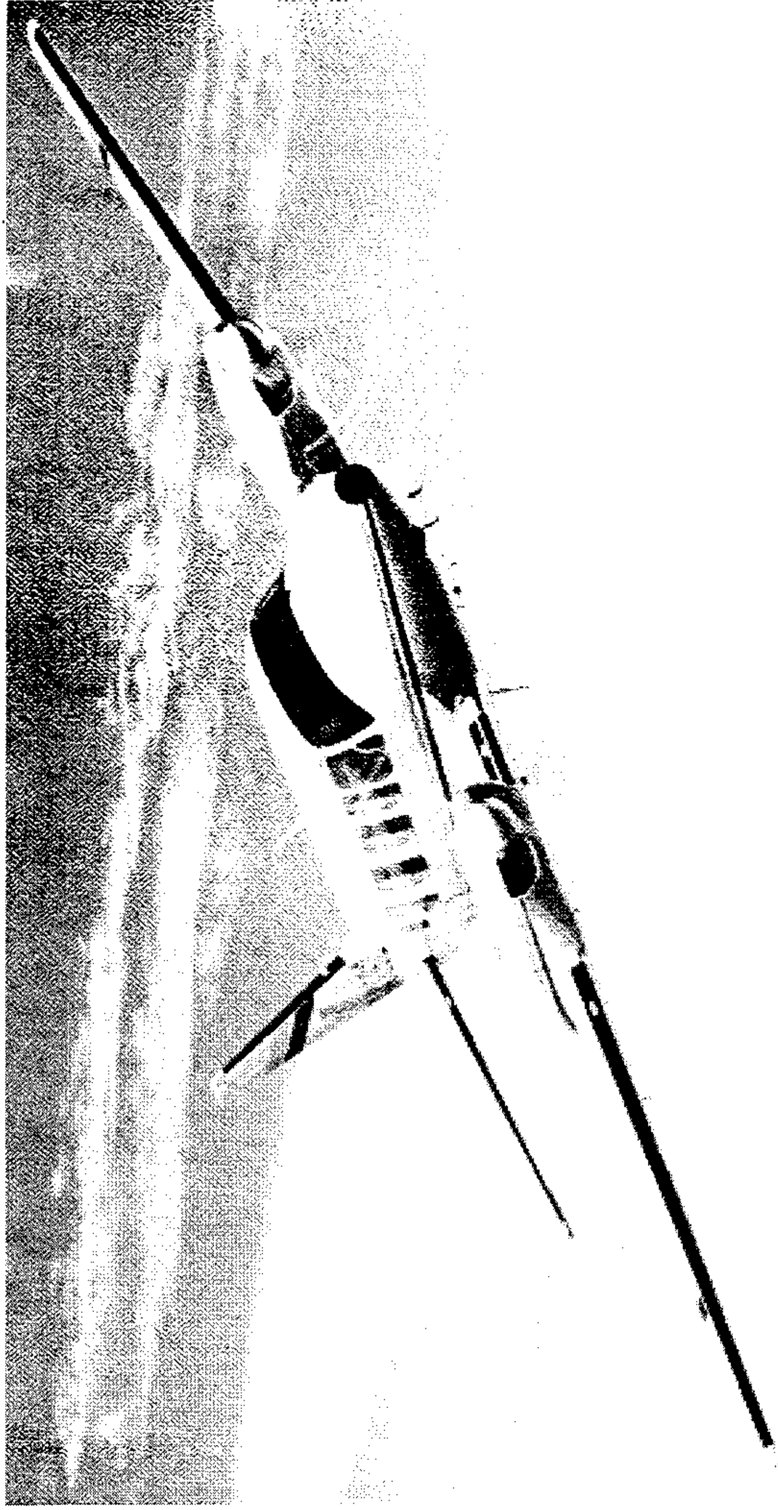
N 102
in 201
out 144

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 AIRCRAFT CORPORATION MUST BE PROPERLY INSERTED.

Published by
PUBLICATIONS DEPARTMENT
Piper Aircraft Corporation
Issued: September 14, 1979



BLANK PAGE

APPLICABILITY

Application of this handbook is limited to the specific Piper PA-31-350 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 or 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 by symbols.

ORIGINAL PAGES ISSUED

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

Title, ii through vii, 1-1 through 1-22, 2-1 through 2-18, 3-1 through 3-28, 4-1 through 4-27, 5-1 through 5-39, 6-1 through 6-88, 7-1 through 7-69, 8-1 through 8-26, 9-1 through 9-135, and 10-1 through 10-3.

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS

Current Revisions to the PA-31-350 Chieftain Pilot's Operating Handbook, REPORT: LK-1208 issued September 14, 1979.

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 1 (PR800129)	1-4	Added fuel additive info.	
	4-8	Added 2400 RPM.	
	4-19	Removed info.	
	5-5	Revised cruise figures.	
	5-6	Revised fuel required figure.	
	5-25	Corrected spelling.	
	5-30	Removed 2500 RPM column.	
	5-31	Revised MP column.	
	5-33	Corrected spelling.	
	6-12	Revised rear baggage arm.	
	6-42	Added item 189.	
	6-52	Revised item 321.	
	6-53	Revised item 327.	
	6-59	Revised item 393.	
	6-61	Revised item 415.	
	6-65	Revised item 463.	
	6-72	Revised item 535.	
	6-74	Revised item 561.	
	7-21	Corrected para. reference.	
	7-32	Revised wording.	
	7-35, 7-36	Revised paragraph structure and wording.	
	8-10	Corrected spelling.	
	8-14	Added fuel additive info.	
	8-15 thru 8-18	Relocated info.	D.H. Trompler Jan. 29, 1980
Rev. 2 (PR800404)	2-i, 2-7	Removed flap indicator markings & revised para. nos.	
	2-12, 2-14	Revised para. no.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 2 (PR800404) (cont)	3-i	Revised engine failure during takeoff index.	
	3-3	Removed engine failure during takeoff info.	
	3-4	Revised engine failure during takeoff info.	
	3-5	Relocated material & added warning.	
	3-15, 3-16	Revised engine failure during takeoff info.	
	3-17, 3-18, 3-19	Relocated material.	
	4-i	Revised para. 4.23. Added para. 4.24.	
	4-2	Revised items (d), (g) & (h).	
	4-8	Revised Before Takeoff, Takeoff & Climb info.	
	4-9	Revised Before Landing & Balked Landing info.	
	4-18	Revised para. 4.21 & 4.23.	
	4-19	Revised material. Added para. 4.24. Relocated para. 4.25.	
	4-21	Revised para. 4.29.	
	4-25	Revised para. 4.41.	
	5-4	Revised takeoff distances.	
	5-6	Revised # to +.	
	5-7	Revised figure no.	
	5-9	Revised index.	
	5 11	Added temperature conversion chart.	
	5-12 thru 5-17	Relocated charts.	
	5-18, 5-19	Revised charts.	

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 2 (PR800404) (cont)	6-37	Revised item 119.	
	7-8	Revised para. 7.9.	
	9-24, 9-34	Revised item (f).	
	9-44, 9-60	Revised item (b).	D.H. Trompler April 4, 1980
Rev. 3 (PR800612)	2-17	Revised Windshield Wiper placard; deleted Synchro-phaser placard.	
	2-18	Revised Cargo Loading placard.	D.H. Trompler June 12, 1980
Rev. 4 (PR800916)	1-4	Revised * note.	
	2-1	Revised para. 2.1.	
	3-1	Revised para. 3.1.	
	4 1	Revised para. 4.1.	
	4-2	Revised para. 4.3.	
	4-7	Relocated material.	
	5-4	Revised Figure no.	
	5-5	Revised Cruise Fuel & Average Cruise Weight nos.	
	5-19	Added Goodyear 9544482 Brake Assemblies to chart.	
	5-22	Corrected example.	
	5-24	Corrected note.	
	5-34	Corrected engine no.	
	5-37	Corrected note.	
	6-11	Revised 8th seat arm.	
	6-35	Revised item 99.	
	6-42	Revised item 187.	
	6-43	Revised items 211 & 213.	
	6-44	Added item 229.	
	6-49	Removed item 291.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 4 (PR800916) (cont)	6-50	Removed items 293, 295, 297 & 299. Added items 290 and 291.	
	6-50a	Added pg. Added items 293, 295, 297 & 299.	
	6-50b	Added pg.	
	6-52	Revised item 321 to 317. Removed item 323.	
	6-52a, 6-52b, 6-52c	Added pg. Added item 319.	
	6-52d	Added pg. Added items 319 & 321.	
	6-52e, 6-52f	Added pg. Added item 321.	
	6-52g	Added pg. Added item 321 and item 323.	
	6-52h	Added pg.	
	6-53	Removed items 329 & 331.	
	6-53a	Added pg. Added items 328, 329 & 331.	
	6-53b	Added pg.	
	6-57	Revised item 371.	
	6-59	Added item 394. Removed item 395.	
	6-60	Added items 395 & 406.	
	6-62	Added item 422.	
	6-64	Revised item 447 to 446. Added new item 447. Removed material.	
	6-64a	Added pg. Added item 448.	
	6-64b	Added pg. Added new item 449. Added renumbered items.	
	6-79	Revised item 661.	
	6-88	Added item 691.	
	7-24	Added 3 amp flap control breaker.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 4 (PR800916) (cont)	7-26	Corrected switch location statement.	
	7-28	Removed radio light switch & renumbered items.	
	7-29	Revised callouts.	
	7-32	Revised PA system & ground clearance energy saver info.	
	7-42	Revised para. 7.35.	
	7-43	Added optional chimes info.	
	7-52	Revised wording.	
	7-61	Revised para. 7.63 & 7.67.	
	7-62	Added fire extinguisher info. & relocated material.	
	7-63	Relocated material.	
	8-5	Revised wording.	
	8-7	Revised item (c) (3).	
	8-14	Revised para. 8.25.	
	8-16	Revised para. 8.27.	
	9-i	Revised Table of Contents.	
	9-4	Revised item (f) (3).	
	9-13	Revised item (b).	
	9-16	Added overhead switch.	
	9-17	Revised item (d).	
	9-82	Revised item (e).	
	9-123 thru	Revised Supplement 11.	
	9-137 thru 9-218	Added Supplements 12 through 17.	D.H. Trompler Sept. 16, 1980
Rev. 5 (PR810130)	ii	Revised Warning.	
	2-10	Deleted item (a) (14).	
	2-15	Deleted placard; revised spelling.	
	2-16	Revised placard locations.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 5 (PR810130) (cont)	3-i	Revised Engine Inoperative Procedures; relocated info. to pg. 3-ii	
	3-ii	Added info. from pg. 3-i.	
	3-4	Revised procedure headings.	
	3-4a, 3-4b, 3-4c, 3-4d	Added Engine Failure During Short Field Takeoff procedures.	
	3-5	Deleted Warning.	
	3-15	Revised procedure heading	
	3-16	Revised procedure heading and Warning.	
	3-16a, 3-16b, 3-16c, 3-16d	Added Engine Failure During Short Field Takeoff procedures.	
	4-1	Revised pg. no.	
	4-8	Revised procedure heading, added Short Field Takeoff procedure, relocated info. to pg. 4-9.	
	4-9	Added Short Field info.; added info. from pg. 4-8; relocated info. to pg. 4-10.	
	4-10	Added info. from pg. 4-9; relocated info. to pg. 4-10a.	
	4-10a, 4-10b	Added pgs. (added info. from Pg. 4-10).	
	4-18	Revised para. 4.21; relocated para. 4.23 to pg. 4-18a.	
	4-18a, 4-18b	Added pgs. (added info. from pg. 4- 18; added Short Field Takeoff procedures; added info. from pg. 4-19).	
	4-19	Relocated info. to pg. 4-18a; added info. from pg. 4-20.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 5 (PR810130) (cont)	4-20	Relocated info. to pg. 4-19; added info. from pg. 4-21.	
	4-21	Relocated info. to pg. 4-20; added info. from pg. 4-22.	
	4-22	Relocated info. to pg. 4-21.	
	5-9	Revised Figures 5-15 and 5-17; added Figures 5-18 and 5-18a.	
	5-13	Revised Figure 5-5.	
	5-18	Revised Figure 5-15.	
	5-19	Revised Figure 5-17.	
	5-19a, 5-19b	Added pgs. (added Figures 5-18 and 5-18a).	
	6-31	Added item 50; relocated item 53 to pg. 6-32.	
	6-32	Added item 53 from pg. 6-31; relocated item 67 to pg. 6-33.	
	6-33	Added item 67 from pg. 6-32.	
	6-34	Added item 94.	
	6-37	Revised item 119.	
	6-42	Revised item 189.	
	6-64a	Revised item 448.	
	6-66	Added item 474.	
	6-72	Revised item 537.	D.H. Trompler
	6-83	Revised item 673 i and j.	Jan. 30, 1981
Rev. 6 (PR810824)	2-i	Added new para. no.	
	2-5	Added new para. 2.12.	
	4-19	Revised para. 4.25.	
	5-19	Revised Figure 5-17.	
	6-30	Revised item 29.	
	6-38	Removed item 129.	
	6-45	Added new item 242.	
	6-47	Added new item 266.	
	6-48	Added new items 275 thru 279.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 6 (PR810824) (cont)	6-50	Revised equipment list heading.	
	6-52b	Revised item 319.	
	6-52c	Revised item 319.	
	6-52d	Revised item 319.	
	6-68	Added new item 490.	
	6-80	Revised item 663; added new item 664.	
	6-82	Revised item 673 (a) thru (e).	
	6-83	Revised item 673 (f) thru (i) and (k).	
	6-84	Revised item 673 (1) thru (p).	
	7-1	Revised para. 7.3.	
	7-2	Revised para. 7.3; moved info. to pg. 7-4.	
	7-4	Relocated info. from pg. 7-2; moved info. to pg. 7-5.	
	7-5	Relocated info. from pg. 7-4.	
	7-6	Revised para. 7.7.	
	7-17	Revised para. 7.17.	
	7-39	Revised para. 7.33; added Note; moved info. to pg. 7-40.	
	7-46	Revised para. 7.43.	
	7-62	Revised para. 7.73; moved info. to pg. 7-63.	
	7-63	Relocated info. from pg. 7-62; revised para. 7.75; moved info. to pg. 7-64.	
	7-66	Relocated info. from pg. 7-63.	
	8-i	Changed pg. nos.	
	8-7	Revised para. 8.9.	
	8-15	Revised para. 8.25; moved Note to pg. 8-16.	
	8-16	Relocated Note from pg. 8-15; moved para. 8.27 to pg. 8-17.	

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 6 (PR810824) (cont)	8-17	Relocated para. 8.27 from pg. 8-16; moved para. 8.31 to pg. 8-18.	
	8-18	Relocated para. 8.31 from pg. 8-17.	
	9-140	Revised Section 1 (d) (2).	
	9-157	Revised Section 1, step 9.	
	9-213	Revised Appch. Button Function.	D. H. Trompler D. H . Trompler Aug. 20, 1981
Rev. 7 (PR820917)	iii	Revised para.	
	1-i	Revised Table of Contents.	
	1 9	Corrected spelling.	
	1-13 thru 1-22	Deleted pgs.; deleted para. 1.21.	
	2-8, 2-9	Revised para. 2.25 info.	
	3-i	Relocated info. to pg. 3-ii; revised Table of Contents.	
	3-ii	Added info. from pg. 3-i.	
	3-27	Revised para. 3.33 info.	
	4-i	Relocated info. to new pg. 4-ii; revised Table of Contents.	
	4-ii	Added pg.; added info. from pg. 4-i.	
	5-3	Revised para. 5.5 (b) info.	
	5-20, 5-23	Revised fig. no.	
	5-25, 5-26	Added Note.	
	6-i	Revised Table of Contents.	
	6-1	Revised para. 6.1.	
	6-2	Revised para. 6.3.	
	6-5	Revised para. 6.5.	
	6-6	Revised fig. 6-7.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 7 (PR820917) (cont)	6-7	Revised fig. 6-9.	
	6-19	Corrected spelling.	
	6-22	Revised para. 6.15.	
	6-23	Revised para. 6.15 info.	
	6-25	Revised example.	
	7-i, 7-ii	Revised Table of Contents.	
	7-1	Revised para. 7.3.	
	7-2	Relocated info. to pg. 7-4; revised para. 7.3 info.	
	7-3	Revised fig. 7-1.	
	7-4	Relocated para. 7.5 info. to pg. 7-5; added info. from pg. 7-2.	
	7-5	Relocated info. to pg. 7-6; added para. 7.5 info. from pg. 7-4.	
	7-6	Added info. from pg. 7-5.	
	7-10	Revised para. 7.9 info.	
	7-21	Relocated para. 7.19 to pg. 7-22.	
	7-22	Relocated info. to pg. 7-23; added para. 7.19 from pg. 7-21.	
	7-23	Relocated fig. 7-19 to pg. 7-24; added para. 7.19 info. from pg. 7-22 and pg. 7-26.	
	7-24	Relocated fig. 7-21 to pg. 7-25; added fig. 7-19 from pg. 7-23.	
	7-25	Relocated fig. 7-23 to pg. 7-26; added fig. 7-21 from pg. 7-24.	
	7-26	Relocated info. to pg. 7-23 and new pg. 7-26b; added fig. 7-23 from pg. 7-25.	
	7-26a	Added pg.; added new fig. 7-24.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 7 (PR820917) (cont)	7-26b	Added pg.; added info. from pgs. 7-26 and 7-27; revised info.	
	7-27	Relocated info. to pg. 7-26b; corrected typo.	
	7-33	Revised para. 7.27.	
	7-45	Revised para. 7.37 info.; revised para, 7.39.	
	7-46	Deleted fig. 7-37 (Oxygen Duration Chart); added para. 7.45 from pg. 7-47.	
	7-47	Relocated para. 7.45 to pg. 7-46 and pg. 7-48; added new fig. 7-37 (Oxygen Duration Table).	
	7-48	Revised size of fig. 7-39 (Oxygen System); added para. 7.45 info. from pg. 7-47.	
	7-52	Revised para. 7.49.	
	7-53	Revised para. 7.49 info.	
	7-60	Revised para. 7.61.	
	7-61	Revised para. 7.63.	
	7-64	Revised fig. 7-43.	
	8-2	Revised para. 8.3.	
	8-3	Revised para. 8.3 info.; revised para. 8.5.	
	8-4	Revised para. 8.5 info.; added para. 8.7 info. from pg. 8-5.	
	8-5	Relocated para. 8.7 info. to pg. 8-4.	
	8-10	Revised para. 8.17.	
	8-11	Added Note.	
	8-25	Corrected spelling.	
	9-i	Revised Table of Contents; relocated Supplement 17 to new pg. 9-ii.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 7 (PR820917) (cont)	9-ii	Added pg.; added Supplement 17 from pg. 9-i; added new Supplements 18 and 19 to Table of Contents.	
	9-3	Revised Section 1.	
	9-4	Relocated Section 4 items (g) and (h) to pg. 9-5; revised Section 4 items (a) and (b).	
	9-5	Relocated Section 5 to pg. 9-6; added Section 4 items (g) and (h) from pg. 9-4; revised in-flight oxygen table.	
	9-6	Added Section 5 from pg. 9-5.	
	9-12	Revised Section 6.	
	9-15	Revised Section 7 (c).	
	9-21	Revised Section 7 (h).	
	9-23	Revised Section 1.	
	9-28	Corrected typo.	
	9-33	Revised Section 1.	
	9-35	Revised Format.	
	9-37	Corrected typo.	
	9-43, 9-55	Revised Section 1.	
	9-59, 9-75, 9-93, 9-109, 9-123, 9-137, 9-149	Revised Section 1.	
	9-155	Revised supplement title; revised Section 1.	
	9-156	Revised info. and illust.	
	9-157	Revised item 9.	
	9-159	Revised Section 5.	
	9-161	Revised supplement title; revised Section 1.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev, 7 (PR820917) (cont)	9-162	Revised info.	
	9-163	Revised illust.	
	9-167	Revised Section 5.	
	9-169	Revised Section 1.	
	9-183	Revised Section 6.5.	
	9-184	Revised Section 6.5 info.	
	9-191	Revised Section 1.	
	9-207	Revised Section 6.	
	9-219 thru 9-254	Added pgs.; added new Supplement 18 (Edo-Aire Mitchell Century 41 Autopilot Model AK847 or Century 41 Flight Director Autopilot Model AK847/FD).	
	9-255 thru 9-260	Added pgs.; added new Supplement 19 (Bendix RDR-160XD and RDR-230HP Color Weather Radar).	D.H. Trompler Oct. 12, 1982
Rev. 8 (PR831118)	vii	Revised Table of Contents.	
	1-2	Revised Turn Radius and Towing Turn Radius.	
	1-5	Revised para. 1.13.	
	1-7	Corrected spelling.	
	3-20	Revised Single Engine Go-Around procedure.	
	3-22	Revised para. 3.19.	
	4-i	Revised Table of Contents.	
	4-7	Revised Engine Run-Up procedure.	
	4-11	Revised para. 4.9; added info. from pg. 4-12.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 8 (PR831118) (cont)	4-12	Relocated info. to pg. 4-11; revised info.	
	4-18	Revised para. 4.21.	
	5-14	Revised Fig. 5-7.	
	5-15	Revised Fig. 5-9.	
	7-5	Revised info.	
	7-26b	Revised info.	
	7-27	Revised para. 7.21.	
	7-62	Revised para. 7.69 title; added note.	
	7-64	Revised Fig. 7-43.	
	8-i	Revised Table of Contents.	
	8-2	Revised para. 8.3.	
	8-11	Deleted info.; revised info.; added para. 8.19 and para. 8.21 from pg. 8-12; revised para. 8.21.	
	8-12	Deleted info.; relocated para. 8.19 and para. 8.21 to pg. 8-11; added para. 8.21 info. and para. 8.23 from pg. 8-13.	
	8-13	Relocated para. 8.21 and para. 8.23 info. to pg.8-12; added para. 8.23 info. from pg. 8-14.	
	8-14	Relocated para. 8.23 info. to pg. 8-13; added para. 8.25 (b) from pg. 8-15.	
	8-15	Relocated para. 8.25 (b) to pg. 8-14; added Note from pg. 8-16.	
	8-16	Relocated Note to pg. 8-15.	
	8-26	Revised para. (h).	
	9-44	Revised Section 2 (a).	
	9-46	Relocated items (e) (5) thru (e) (7) to pg. 9-47; revised item (b)	
	9-47	Added item (e) (5) thru (e) (7) from pg. 9-46.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 8 (PR831118) (cont)	9-60	Revised Section 2 (a).	
	9-61	Revised items (b) (2) and (c) (2) and (c) (3).	
	9-66	Revised item (k).	
	9-73	Revised para. 4.7.	
	9-74	Revised Section 5.	
	9-77	Revised Abbreviations.	
	9-90	Corrected typo.	
	9-95, 9-100	Revised Abbreviations.	
	9-132	Revised item (d) (1).	
	9-133	Revised item (a).	
	9-163	Revised item (1) (a).	
	9-164	Revised item (2).	
	9-220	Revised Abbreviations.	
	9-221	Revised Section 2 (h).	
	9-225	Revised item (e) (2).	
	9-229	Revised Note.	
	9-259	Corrected spelling.	
	10-i	Revised Table of Contents.	
	10-1	Revised Title; para. 10.1, 10.3 and 10.3 (a).	D.H. Trompler
	10-2, 10-3	Revised Title.	D.H. Trompler Nov. 18, 1983
Rev. 9 (PR840504)	1-4	Revised para. 1.7.	
	1-9	Relocated para. 1.19 (b) info. to pg. 1-10; revised para. 1.19 (b) info.	
	1-10	Relocated para. 1.19 (e) info. to pg. 1-11; deleted MEA; added para. 1.19 (b) info. from pg. 1-9.	

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 9 (PR840504) (cont)	1-11	Relocated para. 1.19 (f) info. to pg. 1-12; added para. 1.19 (e) info. from pg. 1-10; added new terminology.	
	1-12	Added para. 1.19 (f) from pg. 1-11.	
	2-4	Revised para. 2.7 (g).	
	2-9	Revised para. 2.25 info.	
	2-15	Revised para. 2.29 info.; relocated para. 2.29 info. to pg. 2-16; added placard.	
	2-16	Added para. 2.29 info. from pg. 2-15; added placard.	
	2-17	Added placard.	
	4-i	Revised Table of Contents.	
	4-4	Revised para. 4.5 info.	
	4-5	Relocated para. 4.5 info. to pg. 4-6; revised para. 4.5 info.	
	4-6	Relocated para. 4.5 info. to pg. 4-7; added para. 4.5 info. from pg. 4-5.	
	4-7	Relocated para. 4.5 info. to pg. 4-8; added para. 4.5 info. from pg. 4-6; revised para. 4.5 info.	
	4-8	Relocated para. 4.5 info. to pg. 4-9; added para. 4.5 info. from pg. 4-7.	
	4-9	Relocated para. 4.5 info. to pg. 4-10; added para. 4.5 info. from pg. 4-8; revised para. 4.5 info.	
	4-10	Relocated para. 4.5 info. to pg. 4-10a: added para. 4.5 info. from pg. 4-9.	

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 9 (PR840323) (cont)	4-10a	Added para. 4.5 info. from pg. 4-10.	
	4-12, 4-13	Revised para. 4.9 info.	
	4-14	Revised para. 4.11.	
	4-15	Relocated para 4.13 info. to pg. 4-16; revised para. 4.11 info.	
	4-16	Relocated para. 4.15 info. to pg. 4-17; added para. 4.13 info. from pg. 4-15.	
	4-17	Relocated para. 4.19 info. to pg. 4-18; revised para. 4.19; added para. 4.15 from pg. 4-16.	
	4-18	Added para. 4.19 info. from pg. 4-17.	
	5-19	Revised Fig. 5-17.	
	5-38	Revised Fig. 5-55.	
	7-i	Revised Table of Contents.	
	7-3	Revised Fig. 7-3.	
	7-12	Relocated para. 7.15 to pg. 7-13; revised para. 7.13.	
	7-13	Added para. 7.15 from pg. 7-12.	
	7-54	Revised para. 7.51.	
	8-3	Revised para. 8.5.	
	8-5	Added para. 8.9 (b) (3), (4) from pg. 8-6.	
	8-6	Relocated para. 8.9 (b) (3), (4) to pg. 8-5; revised para. 8.9 (c) (2).	
	8-14	Revised para. 8.25 (a).	
	9-14	Revised Supplement 2 (Ice Protection System).	D.H. Trompler May 4, 1984
Rev.10 (PR900427)	1-9	Revised para. 1.19 (b).	
	2-15	Placard added. Moved info. to page 2-16.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 10 (PR900427) (cont)	2-16	Relocated info. from page 2-15. Added S/N effectivity. Moved info. to page 2-17.	
	2-17	Moved info. from page 2-16. Added placard. Moved info. to page 2-18.	
	2-18	Relocated info. from page 2-17. Moved info. to page 2-19.	
	2-19	Page added. Relocated info. from page 2-18.	
	2-20	Page added.	
	3-9	Revised Engine Fire In Flight para.	
	3-22	Revised para. 3.19.	
	4-10a, 4-10b	Added items to Shutdown checklist.	
	7-10	Revised para. 7.9.	
	7-31	Revised para. 7.23.	
	8-1	Revised para. 8.1.	
	8-2	Revised para's. 8.1 and 8.3.	
	8-3	Revised para. 8.3.	
	8-12, 8-13	Revised para. 8-12.	
	8-22	Added Caution. Moved info. to page 8-23.	
	8-23	Relocated info. from page 8-22. Moved info. to page 8-24.	
	8-24	Relocated info. from page 8-23. Moved info. to page 8-25.	D H Trompler D. H. Trompler
	8-25	Relocated info. from page 8-24	August 8, 1990

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS

Revision Number and Code	Revised Pages	Description of Revisions	FAA Approved Signature and Date
Rev.11 (PR940317)	vi-q	Added Log of Rev. Page.	Wm. R. Moreu
	vi-r	Added Log of Rev. Page.	W. R. Moreu
	4-4	Revised para. 4.5 by adding caution and warning.	FAA/DOA Coordinator
	4-4	Relocated para. 4.5 info. to pg. 4-5.	3-18-94 Date

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

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

TABLE OF CONTENTS

BLANK PAGE

TABLE OF CONTENTS

SECTION 1

GENERAL

BLANK PAGE

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.

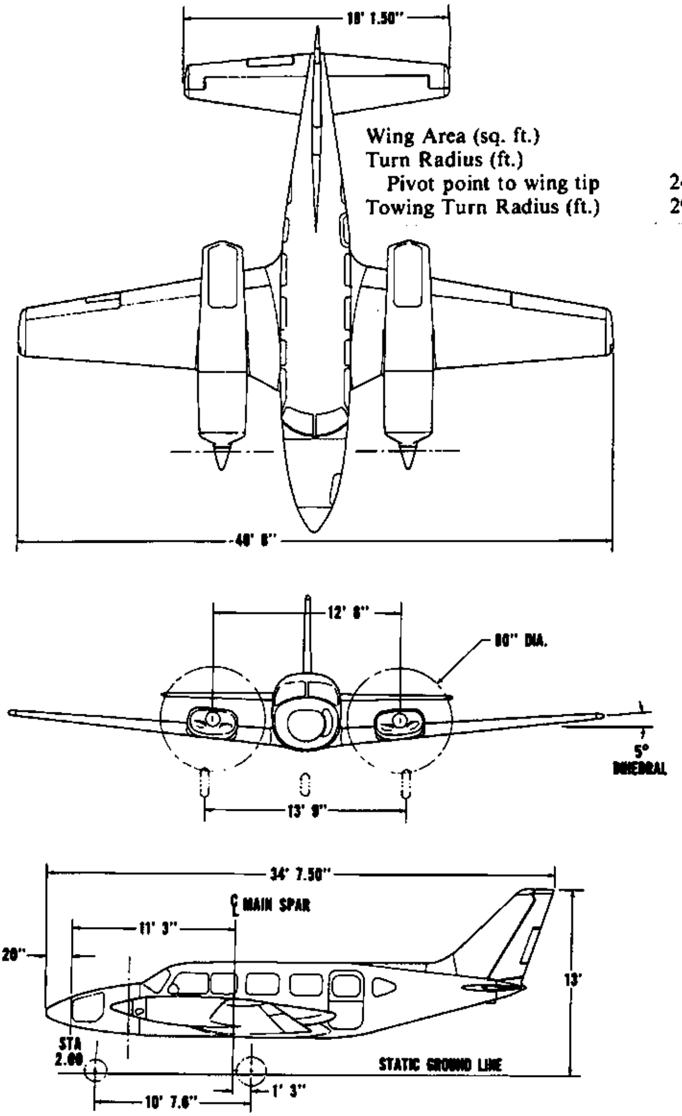
This handbook is not designed as a substitute for adequate and competent flight instruction, knowledge of current airworthiness directives, applicable federal air regulations or advisory circulars. It is not intended to be a guide for basic flight instruction or a training manual and should not be used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

Wing Area (sq. ft.)	229
Turn Radius (ft.)	
Pivot point to wing tip	24.20
Towing Turn Radius (ft.)	29.25



THREE VIEW
Figure 1-1

1.3 ENGINES

(a) Number of Engines	2
(b) Engine Manufacturer	Lycoming
(c) Engine Model Number	
(1) Left	TIO-540-J2BD
(2) Right	LTIO-540-J2BD
(d) Rated Horsepower	350
(e) Rated Speed (rpm)	2575
(f) Bore (inches)	5.125
(g) Stroke (inches)	4.375
(h) Displacement (cubic inches)	541.5
(i) Compression Ratio	7.3:1
(j) Engine Type	Six Cylinder, Direct Drive, Fuel Inj., Turbocharged, Horizontally Opposed, Air Cooled

1.5 PROPELLERS

(a) Number of Propellers	2
(b) Propeller Manufacturer	Hartzell
(c) Blade Model	
(1) Left	FC8468-6R
(2) Right	FJC8468-6R
(d) Number of Blades	3
(e) Hub Model	
(1) Left	HC-E3YR-2ATF
(2) Right	HC-E3YR-2ALTF
(f) Propeller Diameter (inches)	
(1) Maximum	80
(2) Minimum	78
(g) Propeller Type	Feathering Constant Speed, Hydraulically Actuated

1.7 FUEL

AVGAS ONLY

(a) Fuel Capacity (U.S. gal) (total)	192
(b) Usable Fuel (U.S. gal) (total)	182
(c) Fuel Grade Aviation*	
(1) Minimum Octane	100/130 - Green
(2) Specified Octane	100/130 - Green 100 - Green 100 LL - Blue
(3) Alternate Fuels**	115/145 - Purple Refer to Lycoming Service Instruction 1070, Revision J or later.

1.9 OIL

(a) Oil Capacity (U.S. quarts) (each engine)	12
(b) Oil Specification	Refer to latest issue of Avco-Lycoming Service Instruction 1014.
(c) Oil Viscosity per Average Ambient Temp. for Starting	Refer to Section 8, Paragraph 8.23.

1.11 MAXIMUM WEIGHTS

(a) Maximum Ramp Weight (lbs)	7045
(b) Maximum Takeoff Weight (lbs)	7000
(c) Maximum Landing Weight (lbs)	7000
(d) Maximum Weights in Baggage Compartments (lbs)	
(1) Forward (Nose)	200
(2) Aft	200
(3) Nacelle Compartment (each)	150

* Anti-icing additive per MIL-I-27686 is approved for use in the above fuels in the amount by volume of 0.15% maximum. (See Section 8 for blending and handling procedures.)

** Alternate fuels refers to military grade with 4.6 ml of TEL. See Section 8.25 concerning use of alternate fuel grades.

1.13 STANDARD AIRPLANE WEIGHT*

(a) Standard Empty Weight (lbs): Weight of a standard airplane including unusable fuel, full operating fluids and full oil.	4319
(b) Maximum Useful Load (lbs): The difference between the Maximum Ramp Weight and the Standard Empty Weight.	2726

1.15 BAGGAGE SPACE

	FORWARD	AFT	NACELLE
(a) Compartment Volume (cubic feet)	14	22	13.25 (ea.)
(b) Entry Width (inches)	26.5	27.5**	20
(c) Entry Height (inches)	20	47	40

1.17 SPECIFIC LOADINGS

(a) Wing Loading (lbs per sq ft)	30.6
(b) Power Loading (lbs per hp)	10.0

* These values are approximate and vary from one aircraft to another. Refer to Figure 6-7 for the Basic Empty Weight value and the Useful Load value to be used for C.G. calculations for the aircraft specified.

** Aft cargo entry width is increased to 45 inches when optional cargo door is installed.

THIS PAGE INTENTIONALLY LEFT BLANK

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.
M	Mach number is the ratio of true airspeed to the speed of sound.
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.

V_{LE}	Maximum Landing Gear Extended Speed is the maximum speed at which an aircraft can be safely flown with the landing gear extended.
V_{LO}	Maximum Landing Gear Operating Speed is the maximum speed at which the landing gear can be safely extended or retracted.
V_{MCA}	Air Minimum Control Speed is the minimum flight speed at which the airplane is directionally controllable as determined in accordance with Federal Aviation Regulations. Airplane certification conditions include one engine becoming inoperative and windmilling; not more than a 5° bank towards the operative engine; takeoff power on operative engine; landing gear up; flaps in takeoff position; and most rearward C.G.
V_{NE}/M_{NE}	Never Exceed Speed or Mach Number is the speed limit that may not be exceeded at any time.
V_{NO}	Maximum Structural Cruising Speed is the speed that should not be exceeded except in smooth air and then only with caution.
V_S	Stalling Speed or the minimum steady flight speed at which the airplane is controllable.
V_{SO}	Stalling Speed or the minimum steady flight speed at which the airplane is controllable in the landing configuration.
V_{SSE}	Intentional One Engine Inoperative Speed is a minimum speed selected by the manufacturer for intentionally rendering one engine inoperative in flight for pilot training.

V_X	Best Angle-of-Climb Speed is the airspeed which delivers the greatest gain of altitude in the shortest possible horizontal distance.
V_Y	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: (1) The air is a dry perfect gas; (2) The temperature at sea level is 15° Celsius (59° Fahrenheit); (3) The pressure at sea level is 29.92 inches Hg (1013.2 mb); (4) The temperature gradient from sea level to the altitude at which the temperature is -56.5°C (-69.7°F) is -0.00198°C (-0.003566°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 component of the reported winds.

(c) Power Terminology (Specific)

Maximum Continuous Power	Maximum power permissible continuously during takeoff, one engine inoperative, and emergency operations only.
Maximum Normal Operating Power	Maximum power permissible continuously during all normal operations.

(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	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.
BSFC	Brake Specific Fuel Consumption (BSFC) is the number of pounds of fuel burned per hour to produce one horsepower.

(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 if 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

BLANK PAGE

SECTION 2

LIMITATIONS

2.1 GENERAL

This section provides the "FAA Approved" operating limitations, instrument markings, color coding and basic placards necessary for the operation of the PA-31-350 Chieftain and its systems.

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

2.3 AIRSPEED LIMITATIONS

SPEED	KCAS	KIAS
Never Exceed Speed (V_{NE}) - Do not exceed this speed in any operation.	236	236
Maximum Structural Cruising Speed (V_{NO}) - Do not exceed this speed except in smooth air and then only with caution.	187	185
Design Maneuvering Speed (V_A) - Do not make full or abrupt control movements above this speed.	162	160
Maximum Flaps Extended Speed (V_{FE}) - Do not exceed this speed with a given flap setting.		
Flaps extended speeds		
15° flap	160	162
25° flap	160	162
40° flap	130	132

	KCAS	KIAS
Maximum Gear Extended Speed (V_{LE}) - Do not exceed this speed with landing gear extended.	156	153
Maximum Landing Gear Operating Speed (V_{LO}) - Do not extend or retract landing gear above this speed.		
Extend	156	153
Retract	130	128
Air Minimum Control Speed (V_{MCA}) - Lowest airspeed at which airplane is controllable with one engine operating and takeoff flaps.	78	76
Stall Speed (full flaps, gear down, power off, 7000 lbs.) (See Section 5, Performance, for stall speeds at reduced weights.)	74	74

NOTE

The maximum altitude loss during a single-engine stall, gear and flaps retracted is 600 feet. For a symmetrical power-off stall, gear and flaps retracted, maximum altitude loss is 500 feet. Altitude loss is less for other aircraft configurations.

Demonstrated Crosswind Velocity 20 KTS

2.5 AIRSPEED INDICATOR MARKINGS

MARKING	KIAS
Green Arc (Normal Operating Range)	77 to 185
Yellow Arc (Caution Range - Smooth Air)	185 to 236
White Arc (Flaps Extended Range)	74 to 132
Radial Red Line (Never Exceed - Smooth Air)	236
Radial Red Line (Minimum Control Speed - Single Engine)	76
Radial Blue Line (Best Rate of Climb Speed - Single Engine)	106

2.7 POWER PLANT LIMITATIONS

(a) Number of Engines — 2
(b) Engine Manufacturer — Lycoming
(c) Engine Model Number
  (1) Left — TIO-540-J2BD
  (2) Right — LTIO-540-J2BD
(d) Engine Operating Limits
  (1) Maximum Continuous Power
    (a) Maximum Horsepower — 350
    (b) Maximum Rotational Speed (RPM) — 2575
    (c) Maximum Manifold Pressure (Inches of Mercury)
      To 15,000 feet — 49.0
      15,000 to 22,300 feet — 49.0 minus .64 per 1000 feet increase
      22,300 to 24,000 feet — 44.3 minus 2.2 per 1000 feet increase
    (d) Maximum Cylinder Head Temperature — 500°F
  (2) Maximum Normal Operating Power (Top of Tachometer and Manifold Pressure Gauge Green Arc)
    (a) Maximum Horsepower — 315
    (b) Maximum Rotational Speed — 2400
    (c) Maximum Manifold Pressure (Inches of Mercury)
      To 18,700 feet — 40.0
      18,700 to 24,000 feet — 40.0 minus 1.7 per 1000 feet increase
    (d) Maximum Cylinder Head Temperature — 475°F
  (3) Maximum Oil Temperature — 245°F
  (4) Maximum Exhaust Gas Temperature — 1650°F

(e) Oil Pressure	
Minimum (red line)	25 PSI
Maximum (red line)	100 PSI
(f) Fuel Pressure	
Normal Operating Range (green arc)	34 PSI to 55 PSI
Minimum (red line)	34 PSI
Maximum (red line)	55 PSI
(g) Fuel Grade (AVGAS ONLY)	
(minimum octane)	100/130 - Green
(h) Number of Propellers	2
(i) Propeller Manufacturer	Hartzell
(j) Propeller Hub Model	
(1) Left	HC-E3YR-2ATF
(2) Right	HC-E3YR-2ALTF
(k) Propeller Blade Model	
(1) Left	FC8468-6R
(2) Right	FJC8468-6R
(l) Propeller Diameter	
Maximum	80 IN.
Minimum	78 IN.
(m) Propeller Pitch Settings at 30 Inch Station	
Low Pitch Stop	13.4° ± 0.1°
High Pitch Stop (Feathered)	82° ± 1.0°

2.9 POWER PLANT INSTRUMENT MARKINGS

(a) Tachometer	
Green Arc (Normal Operating Range	500 RPM to 2400 RPM
Radial Red Line (Maximum)	2575 RPM
(b) Fuel Pressure	
Green Arc (Normal Operating Range)	34 PSI to 55 PSI
Radial Red Line	
Minimum	34 PSI
Maximum	55 PSI
(c) Cylinder Head Temperature	
Green Arc (Normal Range)	100°F to 475°F
Yellow Arc (Caution)	475°F to 500°F
Radial Red Line (Never Exceed)	500°F
(d) Oil Temperature	
Green Arc (Normal Operating Range)	120°F to 245°F
Yellow Arc (Caution)	50° to 120°F
Radial Red Line (Maximum)	245°F

(e) Oil Pressure	
Green Arc (Normal Operating Range)	60 PSI to 90 PSI
Yellow Arc (Caution)	25 PSI to 60 PSI and 90 PSI to 100 PSI
Radial Red Line (Minimum)	25 PSI
Radial Red Line (Maximum)	100 PSI
(f) Exhaust Gas Temperature	
Green Arc (Normal Operating Range)	Zero or lower scale limit to 1650°F
Radial Red Line (Never Exceed)	1650°F
(g) Manifold Pressure	
Radial Red Line (Never Exceed)	49 IN. HG.
Green Arc (Normal Operating Range)	18 IN. HG. to 40 IN. HG.

2.11 WEIGHT LIMITS

(a) Maximum Ramp Weight	7045 LBS
(b) Maximum Takeoff Weight	7000 LBS
(c) Maximum Landing Weight	7000 LBS
(d) Maximum Weights in Baggage Compartments	
Forward (Nose)	200 LBS
Aft	200 LBS
Nacelle (per side)	150 LBS

NOTE

It is the responsibility of the airplane owner and the pilot to insure that the airplane is properly loaded. Maximum allowable takeoff and landing weight is 7000 lbs. Maximum allowable ramp weight is 7045 lbs. See Section 6 (Weight and Balance) for proper loading instructions.

2.12 FUEL LIMITATIONS

(a) Fuel Capacity (U.S. gal.) (total)	192
(b) Usable Fuel (U.S. gal.) (total)	182

2.13 CENTER OF GRAVITY LIMITS (GEAR EXTENDED)

Weight Pounds	Forward Limit Inches Aft of Datum	Rearward Limit Inches Aft of Datum
7045 (Max. Ramp Weight)	126	135
7000 (Max. Takeoff Weight)	126	135
6200	122	135
5200 or less	120	135

NOTES

Straight line variation between the points given.

Datum line is located 137 inches ahead of the wing main spar centerline.

2.15 MANEUVER LIMITS

This is a normal category airplane. All intentional acrobatic maneuvers (including spins) are prohibited.

2.17 FLIGHT LOAD FACTOR LIMITS (MANEUVERS)

(a) Positive Load Factor (Maximum) at 7000 Lbs 3.51 G
(b) Negative Load Factor (Maximum) at 7000 Lbs -1.4 G

No Inverted Maneuvers Approved

2.19 COWL FLAPS LIMITATIONS

Cowl flaps are provided to allow control of engine temperatures. The cowl flaps should be open during ground operations and in climbs. In no case should the cylinder head temperature be allowed to exceed 500°F or the oil temperature to exceed 245°F.

2.21 MINIMUM CREW

The minimum crew for operating this airplane is one pilot unless the type of operation (air taxi, for example - see FAR's) requires a copilot.

2.23 MAXIMUM OPERATING ALTITUDE

24,000 feet

2.25 TYPES OF OPERATION LIMITS

The Federal Aviation Regulations make the operator of an aircraft responsible for insuring that sufficient and proper instruments and equipment are installed, operating, and calibrated for the type of flight being undertaken. These regulations (for example, see FAR 91.3(a), 91.25, 91.33, 91.97 and 91.170) also specify the minimum instruments and equipment which must be available for the various types of flight such as VFR, IFR, night, commercial, air taxi, high altitude, icing and so on. It is recommended that pilots of this aircraft make themselves familiar with these regulations in order to avoid violating them. While the regulations list minimum instruments and equipment, experienced pilots realize that the minimum practical instruments and equipment depends on the pilot's capability, weather, terrain, the flight plan, facilities to be used, whether flight is during daylight or night, at high or low altitude, for hire or not, in icing conditions or not, and so on. Pilots are cautioned to consider all factors in determining whether they have all the required equipment for making a particular flight.

When properly equipped this airplane may be flown day or night, VFR or IFR, and in known icing.

The certificating regulations of the FAA for this airplane require the manufacturer to specify in the Pilot's Operating Handbook the types of operation for which the airplane is equipped.

The equipment installed in this aircraft has been substantiated to 24,000 feet.

When this airplane was licensed it contained the properly installed equipment listed in the Equipment List and, therefore, was satisfactory for the types of operation indicated below by an asterisk.

(a)_____ Day VFR

(b)_____ Night VFR

(c)_____ Day and night IFR after adequate communication and navigation radio has been installed in an FAA approved manner.

(d)_____ Day and night IFR

(e)_____ Known icing after deicing and icing equipment listed on a following page for operation in known icing conditions has been installed in accordance with Piper drawings or in an FAA approved manner.

(f)_____ Known icing.

Operators are warned that if any of the equipment listed as having been installed at time of licensing is changed, not operating, or not properly maintained and calibrated, the airplane may not be properly equipped for all the conditions noted above. It is the responsibility of the pilot to determine whether the lack of a piece of equipment limits the conditions under which he may fly the airplane.

AIRCRAFT

_______________ REGISTRATION NO. _______________ SERIAL NO.

Owners desiring to make changes or additions to the equipment must have these modifications done in an FAA-approved manner. All PA-31-350 aircraft are licensed equipped for day and night VFR flight, and for IFR flight except when there may be insufficient communications or navigation radio equipment installed.

The performance, handling qualities and structure of the airplane are approved for instrument flight.

If an owner of an airplane which is approved for VFR flight only desires to extend his operations to IFR, he should have radio equipment installed in accordance with Piper-approved drawings or other FAA-approved data (or data approved by the aviation agency of the country of registration). The owner should insure that the radio equipment is adequate for the ground facilities to be used, is of sufficiently high quality and reliability, is properly functioning, adjusted and calibrated, and that it is compatible with previously installed equipment before authorizing it to be flown under instrument conditions.

This airplane is approved for day and night VFR and IFR flight when all of the following conditions have been met: the required equipment or FAA-approved equivalent is installed either originally by Piper or in an FAA-approved manner, is functioning properly, and is calibrated in accordance with Federal Aviation Regulations; and adequate radio communications and navigation equipment is installed in the same manner as indicated above.

If the airplane is approved for night IFR, but is not approved for flight in icing conditions when licensed, it will be necessary for an owner to add all the equipment listed in this section as required for flight in icing conditions if he desires to operate in icing conditions. If this equipment is properly installed in accordance with Piper-approved drawings and all the other equipment required for night IFR flight is installed in an FAA-approved manner, is adequate for the ground facilities to be used, is of sufficient quality, is functioning properly, and is calibrated in accordance with the FAR's, the airplane is approved for IFR flight in known icing conditions. If anti-icing and deicing equipment is not installed in accordance with Piper drawings, FAA approval or approval of the aviation agency of the country of registry must be obtained in order to legally conduct flight in icing conditions.

Flight through any icing conditions is prohibited if any of the anti-icing or deicing equipment is missing or not functioning.

Pilots are reminded that oxygen must be available to passengers and crew during high altitude flight and that special electronic equipment is required for flight above specified altitude.

FAR 135 places special requirements on air taxi and commercial operators.

In accordance with the FAR's, this airplane is not properly equipped for the condition of flight indicated if any of the equipment listed below is not properly installed, functioning, properly maintained and calibrated according to the FAR's. The pilot is responsible for assuring compliance with the latest amendments to FAR 91 concerning required equipment.

(a) Day VFR
- (1) Airspeed indicator
- (2) Altimeter
- (3) Magnetic direction indicator
- (4) Tachometer - each engine
- (5) Oil pressure gauge - each engine
- (6) Stall warning indicator
- (7) Oil temperature gauge - each engine
- (8) Manifold pressure gauge - each engine
- (9) Fuel gauges
- (10) Fuel pressure indicator - each engine
- (11) Exhaust gas temperature gauge - each engine
- (12) Landing gear position indicator
- (13) Seat belts - each occupant
- (14) Emergency locator transmitter
- (15) Above 12,500 feet - transponder with automatic altitude reporting capability.
- (16) Starter - each engine

(b) Night VFR
- (1) All equipment required for Day VFR
- (2) Position lights
- (3) Strobe lights or rotating beacon
- (4) Alternator - each engine
- (5) Instrument lights
- (6) Landing light, if for hire

(c) Day IFR
- (1) All equipment required for Day VFR
- (2) Two-way radio for communication
- (3) Suitable and adequate navigation radio equipment
- (4) Gyroscopic rate of turn indicator
- (5) Bank indicator
- (6) Clock with sweep second hand
- (7) Sensitive altimeter adjustable for barometric pressure
- (8) Alternators - each engine
- (9) Gyroscopic bank and pitch indicator
- (10) Gyroscopic direction indicator
- (11) Free air temperature indicator

(d) Night IFR
- (1) All equipment required for Day and Night VFR
- (2) All equipment required for Day IFR

(e) Flight in Positive Control Areas
- (1) Transponder

(f) Known Icing

For flight in known icing conditions the following equipment must be installed in accordance with Piper drawings or in a FAA approved manner:
- (1) All equipment required for Night IFR
- (2) Pneumatic wing and empennage boots (including inboard wing boots)
- (3) Electrothermal propeller boots
- (4) Pilot side heated windshield
- (5) Heated pitot
- (6) Ice detection light
- (7) Heated stall warning transmitter
- (8) Non-icing heater air inlet
- (9) Heater combustion air alternate source
- (10) Forward heater
- (11) Ice shields
- (12) Prop control deicer boot
- (13) 'A' - 'B' pneumatic system

The following equipment is required and is normally part of the standard airplane:

(1) Alternate static system
(2) Elevator balance boot
(3) Direct vision window

(g) Flight with Third and/or Fourth Seats in the Aft Facing Position

(1) When the third and/or fourth seats are installed in the aft facing position, 10 inch minimum height headrests must be installed.

2.27 NOISE LEVEL

The corrected noise level of this aircraft is 78.9 dB(A) determined at the Maximum Normal Operating Power of 2400 RPM and 40.0 inches of manifold pressure.

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." The aircraft noise is in compliance with all FAR 36 noise standards applicable to this type.

THIS PAGE INTENTIONALLY LEFT BLANK

2.29 PLACARDS

On top right side of instrument panel:

THIS AIRCRAFT MUST BE OPERATED AS A NORMAL CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS AND MANUALS. NO ACROBATIC MANEUVERS (INCLUDING SPINS) APPROVED.

FOR TYPES OF OPERATION SEE PILOT'S OPERATING HANDBOOK.

On top left side of instrument panel:

MINIMUM CONTROL SPEED	76 KIAS
MAXIMUM SP. LG. - RET. 128 KIAS	EXTEND 153 KIAS
DESIGN MANEUVERING SPEED	160 KIAS

SEE PILOT'S OPERATING HANDBOOK
FOR ADDITIONAL SPEEDS.

On floor between pilot and copilot seats:

EMERGENCY GEAR EXTENSION
REMOVE COVER
EXTENSION INSTRUCTIONS ON REVERSE SIDE

On underside of emergency gear extension door:

EMERGENCY GEAR EXTENSION

1. PLACE GEAR SELECTOR HANDLE IN DOWN POSITION.
2. PULL EMERGENCY PUMP HANDLE OUT AS FAR AS POSSIBLE.
3. PUMP HANDLE UP AND DOWN UNTIL ALL 3 GREEN LIGHTS COME ON. CONTINUE PUMPING UNTIL PRESSURE BUILDS UP AND SELECTOR HANDLE RETURNS TO NEUTRAL.

On fuel system console:

(a) On top of fuel system control console:

FIREWALL FUEL SHUT OFF
LEFT ENGINE RIGHT ENGINE
PUSH ON-PULL OFF PUSH ON-PULL OFF

(b) On center of fuel system control console:

CROSS FEED
ON
OFF

(c) On bottom of fuel system control console:

LEFT ENGINE RIGHT ENGINE

FUEL
SELECT

38 GAL		53 GAL	53 GAL		38 GAL
OUTBD	OFF	INBD	INBD	OFF	OUTBD

OUTBD TANKS - LEVEL FLIGHT ONLY

On pilot's door window moulding:

LATCH
◀CLOSE

On window post between the second and third window on the right side of cabin (S/N 31-8052001 thru 31-8352042):

EMERGENCY EXIT RELEASE
REMOVE COVER
PULL HANDLE DOWN
PUSH EMERGENCY
EXIT OUT

On window post between the second and third window on the right side of cabin (S/N 31-8452001 & up):

EMERGENCY EXIT RELEASE
REMOVE COVER
PULL HANDLE DOWN
PUSH EMERGENCY
EXIT OUT
AT BOTTOM

At top of emergency exit window on moulding:

EMERGENCY EXIT

At bottom of emergency exit window on moulding (S/N 31-8452001 & up):

PUSH HERE FOR EXIT

On rear bulkhead in rear baggage compartment and on forward baggage compartment door:

MAXIMUM BAGGAGE 200 LBS
SEE LOADING SCHEDULE

On the pilot's window moulding (when supplementary white anti-collision strobe lights are installed):

WARNING

TURN OFF ANTI-COLLISION LIGHTS WHEN TAXIING IN VICINITY OF OTHER AIRCRAFT OR DURING FLIGHT THROUGH CLOUD, FOG OR HAZE. STANDARD POSITION LIGHTS TO BE TURNED ON FOR ALL NIGHT OPERATIONS.

On side trim panel adjacent to third and fourth passenger seats (S/ N 31-8052001 thru 31-8352042):

FOR OCCUPANCY OF AFT FACING SEAT
10" MIN. HT. HEADREST IS REQUIRED

On trim side panel adjacent to third and fourth passenger seats (S/N 31-8452001 and up):

REQUIREMENT FOR OCCUPANCY OF AFT FACING SEAT
1. SEAT HEADREST INSTALLED
2. SEAT BACK BOLTED IN UPRIGHT POSITION

On pilot's door window moulding (when pilot's door is installed):

OPEN DOOR CLOSED
CLOSE DOOR PRIOR TO STARTING ENGINES

THEFT LOCK
PULL TO UNLOCK
PRIOR TO FLIGHT

On left center of instrument panel (when windshield wiper is installed):

WINDSHIELD WIPER
DO NOT OPERATE
ABOVE 127 KIAS
OR ON DRY WINDSHIELD

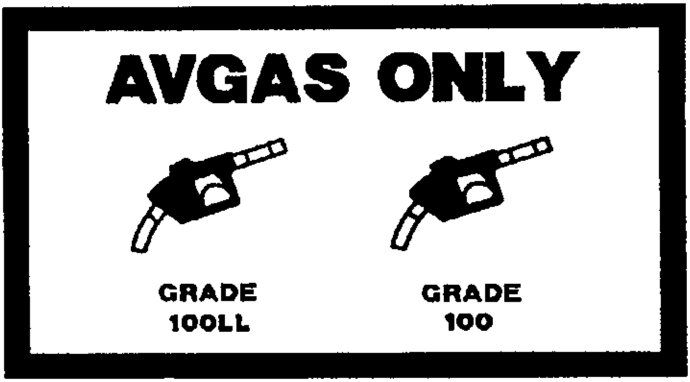
On inside of nacelle locker doors:

BAGGAGE CAPACITY
150 LBS. MAX.
SEE LOADING SCHEDULE
DO NOT EXCEED
10 LBS./SQ. FT. FLOOR LOADING
OR 100 LBS. DIFF. BETWEEN LOCKERS

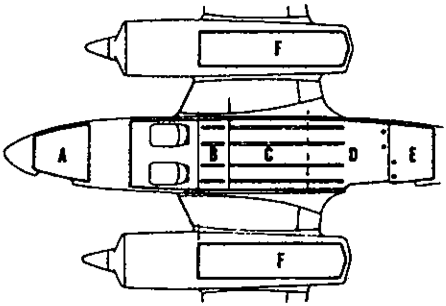
On pedestal adjacent engine controls (when air conditioning is installed):

AIR CONDITIONING OFF
FOR SINGLE ENGINE OPERATION

On each wing near fuel fillers (S/N 31-8352006 and up):



On top center of aft cabin panel (cargo loading placard):



MAXIMUM CAPACITY

AREA	FLOOR LOAD LBS/SQ FT	ALLOWABLE LBS	
A	100	200	
B	200	400	2000 TOTAL
C	200	1800	
D	200	900	
E	100	200	
F	10	150 EACH	

MAXIMUM TIEDOWN CAPACITY

PER FOOT OF TRACK	200 LBS
PER TRACK	900 LBS
PER TIE DOWN RING	200 LBS

CARGO MUST BE LOADED WITHIN THE WEIGHT AND BALANCE LIMITS OF THIS AIRCRAFT

THIS PAGE INTENTIONALLY LEFT BLANK

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 in this section. All of the 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 checklist which supplies an action sequence for critical situations with little emphasis on the operation of systems.

The remainder of the section presents 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 CHECK LIST

SPEEDS

Air Minimum Control .... 76 KIAS
Best Single Engine Angle of Climb .... 104 KIAS
Best Single Engine Rate of Climb .... 106 KIAS
Maneuvering .... 160 KIAS
Never Exceed .... 236 KIAS

ENGINE INOPERATIVE PROCEDURES

ENGINE SECURING PROCEDURE
(FEATHERING PROCEDURE)

Throttle .... close
Propeller .... FEATHER (1000 RPM min.)
Mixture .... IDLE CUT-OFF
Cowl flaps .... close
Air conditioner .... OFF
Magneto switch .... OFF
Emergency fuel pump .... OFF
Fuel selector .... OFF (detent)
Fuel boost pump CB .... pulled
Alternator CB switch .... OFF
Prop. Sync. .... OFF
Electrical load .... reduced
Crossfeed .... if required

ENGINE FAILURE DURING NORMAL TAKEOFF (85 KIAS or below)

If sufficient runway remains for a safe stop:

Throttles .... immediately close
Brakes .... As required
Stop straight ahead

If insufficient runway remains for a safe stop:

Throttles .... immediately close
Mixtures .... Idle cutoff
Master switch .... OFF
Fuel selectors .... OFF
Magneto switches .... OFF

NOTE

Maintain directional control and maneuver to avoid obstacles.

ENGINE FAILURE DURING NORMAL TAKEOFF (Above 85 KIAS)

Directional control .... Maintain
Power (operating engine) .... Max. continuous
Propeller control (inoperative engine) .... Feather
Landing gear (in level or climbing flight) .... Retract
Bank .... 5° into operating engine
Airspeed .... 95 KIAS to 50 ft. then accelerate to 104 KIAS
Cowl flaps (inoperative engine) .... close
Airspeed .... 106 KIAS, after all obstacles have been cleared
Engine securing procedures .... Complete

NOTE

Land as soon as practical at the nearest suitable airport.

ENGINE FAILURE DURING SHORT FIELD TAKEOFF
(92 KIAS or below)

If sufficient runway remains for a safe stop:

Throttles .... immediately close
Land (if airborne) .... on remaining runway
Brakes .... as required

If insufficient runway remains for a safe stop:

Throttles .... immediately close
Mixtures .... IDLE CUT-OFF
Master switch .... OFF
Fuel selectors .... OFF
Magneto switches .... OFF
Land (if airborne) avoiding obstacles

ENGINE FAILURE DURING SHORT FIELD TAKEOFF
(Above 92 KIAS but below 104 KIAS)

If sufficient runway remains for a safe stop:

Throttles .... immediately close
Land .... on remaining runway
Brakes .... as required

If insufficient runway remains and the decision is made to abort the takeoff:

Throttles .... immediately close
Landing gear .... Extend

NOTE

Depending on terrain, it may be advisable to land with the gear retracted.

Flaps .... Extend
Airspeed .... 87 KIAS min.
Mixtures .... IDLE CUT-OFF
Master switch .... OFF

Fuel selectors .... OFF
Magneto switches .... OFF
Land avoiding obstacles

If insufficient runway remains, the terrain ahead is unsuitable for a safe landing and the decision is made to continue the takeoff:

Directional control .... Maintain
Power (operating engine) .... Max. Continuous
Propeller control (inoperative engine) .... FEATHER
Landing gear (in level or climbing flight) .... Retract
Bank .... 5° into operating engine
Flaps .... Retract in increments
Airspeed .... Accelerate to 104 KIAS until all obstacles have been cleared then accelerate to 106 KIAS
Engine securing procedures .... accomplish

WARNING

Negative climb performance may result from an engine failure occurring after lift-off and before the gear and flaps have been retracted, the failed engine propeller has been feathered, the cowl flap on the failed engine is closed and a speed of 106 KIAS has been attained. Refer to "Single Engine Climb" chart, Figure 5-21, for clean configuration positive climb performance.

ENGINE FAILURE DURING SHORT FIELD TAKEOFF (Above 104 KIAS)

Directional control .... Maintain
Power (operating engine) .... Max. Continuous
Propeller control (inoperative engine) .... FEATHER
Bank .... 5° into operating engine
Airspeed .... Maintain 104 KIAS until clear of obstacles then accelerate to 106 KIAS

If sufficient runway remains for a safe stop:

Throttles .... immediately close
Land .... on remaining runway
Brakes .... as required

If insufficient runway remains and the decision is made to abort the takeoff:

Throttles .... immediately close
Landing gear .... Extend

NOTE

Depending on terrain, it may be advisable to land with the gear retracted.

Flaps .... Extend
Airspeed .... 87 KIAS min.
Mixtures .... IDLE CUT-OFF
Master switch .... OFF
Fuel selectors .... OFF
Magneto switches .... OFF
Land avoiding obstacles

WARNING

Certain combinations of aircraft weight, configuration, ambient conditions and airspeeds will result in negative climb performance. (Refer to specific chart in Performance Section.)

THIS PAGE INTENTIONALLY LEFT BLANK

ENGINE FAILURE DURING CLIMB

Airspeed....maintain 106 KIAS
Directional control....maintain
Inop. engine....identify and verify
Inop. engine....complete Engine Securing Procedure

Land as soon as practical at nearest suitable airport.

ENGINE FAILURE DURING FLIGHT
(Below 76 KIAS)

Rudder....apply towards operative engine
Throttles (both engines)....retard to stop turn
Pitch attitude....lower nose to accelerate above 76 KIAS
Operative eng.....increase power as airspeed increases above 76 KIAS

If altitude permits, a restart may be attempted.

If restart fails or altitude does not permit:

Inop. eng. prop....FEATHER
Trim....adjusted (5° bank into operative eng.)
Inop. eng.....complete Engine Securing Procedure
Cowl flap (operative eng.)....as required

ENGINE FAILURE DURING FLIGHT
(Above 76 KIAS)

Inop eng....identify
Operative eng.....adjust as required
Airspeed....attain and maintain at least 106 KIAS

Before securing inop. engine:
Fuel flow ....check (if deficient - emergency fuel pump ON)
Fuel quantity ....check
Fuel selector (inop. eng.) ....switch to other tank containing fuel
Oil pressure and temp ....check
Magneto switches ....check
Air start ....attempt

If engine does not start, complete Engine Securing Procedure.

Power (operative eng.) ....as required
Mixture (operative eng.) ....full rich
Fuel quantity (operative eng. tank) ....sufficient
Emergency fuel pump
(operative eng.) ....as required
Cowl flap (operative eng.) ....as required
Trim ....adjusted (5° bank into operative eng.)
Electrical load ....decrease to min. required

Land as soon as practical at nearest suitable airport.

SINGLE ENGINE LANDING

Inop engine ....Engine Securing Procedure complete
Hydraulic pump ....check
Seat belts/harnesses ....secure
Heater ....FAN position
Emergency fuel pump (operative eng.) ....ON
Mixture (operative eng.) ....RICH
Propeller (operative eng.) ....full FORWARD
Fuel selector on
operative engine side ON INBOARD tank
Crossfeed ....OFF
Cowl flap (operative eng.) ....as required
Airspeed ....maintain 116 KIAS min. until landing is assured
Altitude ....higher than normal until landing is assured

When landing is assured:
Gear .... DOWN
Flaps .... DOWN
Power .... retard slowly and flare airplane
Trim .... as power is reduced (airplane will yaw in direction of operative engine)

SINGLE ENGINE GO-AROUND

(Not possible from a full flap position unless sufficient altitude is available to raise flaps in a descent.)

Avoid, if possible, if necessary:
Airspeed .... hold 106 KIAS
Power .... max. on operating engine
Flaps .... retract
Landing gear .... retract
Cowl flaps on operative engine .... as required
Trim .... as required

AIR START (UNFEATHERING PROCEDURE)

Fuel selector .... ON
Fuel boost pump CB .... IN
Magnetos .... ON
Throttle .... open 1/2 inch
Propellers .... 1/2 forward
Mixture .... forward
Starter .... engage until prop unfeathers
Propeller .... pull back to low RPM position as propeller speed accelerates through 1000 RPM
Throttle .... reduced power until warm; 2000 RPM max.
Alternator .... ON
Engine instruments .... check
Air conditioner .... (as desired) ON
Propeller .... manual sync with operating engine
Throttle .... set as desired
Prop Sync .... (as desired) ON

ENGINE ROUGHNESS

Emergency fuel pumps .... ON
Engine instruments .... scan for cause
Mixture .... adjust as required
Alternate air .... OPEN
Cowl flaps .... adjust for proper CHT
Fuel .... switch tanks if fuel in second tank
Magnetos .... check

ENGINE OVERHEAT

Cowl flaps .... OPEN
Mixture .... richen
Power .... reduce
Airspeed .... increase (if altitude permits)

LOSS OF OIL PRESSURE

Engine .... secure per Engine Securing Procedure

ROUGH AIR OPERATION

Slow to manuevering speed or slightly less (7000 lbs. 160 KIAS)
Fly attitude and avoid abrupt maneuvers.
Seat belt and shoulder harness - tighten.

ENGINE FIRE ON GROUND (Engine start, taxi and takeoff with sufficient distance remaining to stop)

Firewall fuel shutoff .... OFF
Emergency fuel pump .... OFF
Boost pump CB .... pulled
Brakes .... as required
Throttle (affected engine) .... OPEN
Radio .... call for assistance
Mixture (if fire persists) .... IDLE CUT-OFF
External fire extinguisher .... use

NOTES

If fire continues, shut down both engines and evacuate.
If fire is on the ground, it may be possible to taxi away.

ENGINE FIRE IN FLIGHT

Fire wall fuel shutoff .... OFF
Throttle .... idle
Propeller .... FEATHER
Mixture .... idle cut-off
Inoperative Engine .... Secure

If fire persists:
Airspeed .... increase in attempt to blow out fire

Land at nearest suitable airport.

ELECTRICAL FIRE

Flashlight (at night) .... located
Master switch .... OFF
Circuit breakers .... checked & pulled
All electrical switches .... OFF
Master switch .... ON
CB and switch for each unit (one at a time) .... ON
CB and switch for failed unit .... OFF

CROSSFEED

Fuel selector (inop. eng.) level flight .... either tank
Boost pump CB (inop. eng.) .... IN
Emergency fuel pump (inop. eng.) .... ON
Crossfeed .... ON
Fuel selector (op. eng.) .... OFF
Boost pump CB (op. eng.) .... pulled
Emergency fuel pump (op. eng.) .... OFF

COMING OUT OF CROSSFEED (PRIOR TO LANDING)

Fuel selector (op. eng.) .... INBOARD tank
Boost pump CB (op. eng.) .... in
Emergency fuel pump (op. eng.) .... ON
Crossfeed .... OFF
Boost pump CB (inop. eng.) .... pulled
Emergency fuel pump (inop. eng.) .... OFF
Fuel selector (inop. eng.) .... OFF

ONE ALTERNATOR INOP. LIGHT ON

Electrical load .... reduced
Approp. side of master switch .... OFF
Tripped CBs .... reset
Approp. side of master switch .... ON
Elec. Load (if light goes out) .... reinstated
If light remains lit or alt. CB has tripped:
Approp. side of master switch .... OFF
Electrical load .... reduction continued

TWO ALTERNATOR INOP. LIGHTS ON

Repeat above procedure for each side.
If both lights stay on:
Master switch (both sides) .... ON
Alternator CB switches .... OFF
Electrical load .... minimum
Land as soon as practical.

PROPELLER/GOVERNOR MALFUNCTIONS

RPM UNDERSPEED

Power .... reduced
Mixture .... RICH
If prop. moves to feather;
Mixture .... IDLE CUT-OFF
Prop control .... FEATHER
Engine .... Engine Securing Procedures complete

NOTE

Propeller will move to feather if engine oil pressure is lost.

RPM OVERSPEED

Power .... reduced
Airspeed .... reduced
Prop control (if prop speed cannot be kept below 2575 RPM) .... FEATHERED

NOTE

If prop will not feather, do not shut down engine.

Engine .... Engine Securing Procedures complete if prop will feather

EMERGENCY GEAR EXTENSION

Airspeed .... 153 KIAS max.
Gear selector .... DOWN
Emerg. gear extender cover .... opened
Emerg. gear extender .... extended
Extender handle (till 3 green lights and selector returns to neutral) .... pumped

EMERGENCY EXIT

Exit (third window from
front on right side)........locate
Plexiglas cover........remove
Handle........pull down
Emergency exit window........push out

GEAR UP LANDING

Ground personnel........inform (if possible)
Fuel........burn off (if time allows)
Passengers........briefed
Normal landing check list........complete
Gear selector........UP
Autopilot........OFF
Master switch (daytime)........OFF
Make a normal approach
When runway is made and landing assured:
Mixtures........IDLE CUT-OFF
Prop controls........FEATHER
Firewall fuel shutoffs........OFF
Fuel selectors........OFF
Touchdown at minimum airspeed and level attitude
Master switch (night)........OFF
Evacuate

NOTE

If nose gear is not extended, the landing light will not be functioning.

FLAP SYSTEM MALFUNCTION

ANNUNCIATOR LIGHT ON

Flap selector .... reposition slightly
If flaps move .... replace amplifier prior to next flight
If flaps do not move .... check for split flaps
If flaps are split .... pull flap motor CB and land in this condition
If flaps are not split .... pull and reset flap motor CB
If flaps still do not operate .... pull flap motor CB and land in this condition

FLAPS FAIL TO RESPOND TO FLAP SELECTOR (WITH FLAP INDICATOR POINTING TO OFF)

Flap control CB .... pull and reset
If indicator remains "OFF" .... the flap control is inoperative and flaps cannot be repositioned for landing or go-around
If indicator shows flap position .... use following checklist

FLAPS FAIL TO RESPOND TO FLAP SELECTOR (WITH FLAP INDICATOR POINTING TO FLAP POSITION)

Flap test switch .... push
If annunciator fails to light .... follow ANNUNICATOR LIGHT on checklist
If annunciator lights .... pull and reset flap motor CB
If flaps fail to respond .... a flap drive fault may exist and further effort to reposition flaps may cause damage

THIS PAGE INTENTIONALLY LEFT BLANK

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 INOPERATIVE PROCEDURES

ENGINE SECURING PROCEDURE (FEATHERING PROCEDURE)

The engine securing procedure should always be accomplished in a sequential order according to the nature of the engine failure (ie., practice, engine failure during takeoff, engine failure during climb, etc.).

Begin the securing procedure by closing the throttle of the inoperative engine and moving its propeller control to FEATHER (fully aft) before the propeller speed drops below 1000 rpm. The inoperative engine mixture control should be moved fully aft to the IDLE CUT-OFF position. CLOSE its cowl flaps to reduce drag and turn OFF the air conditioner (if installed). Turn OFF the magneto switch, the emergency fuel pump switch and the fuel selector. Pull out the fuel boost pump circuit breaker and turn OFF the alternator circuit breaker switch of the inoperative engine. The propeller synchrophaser (if installed) should be OFF. Complete the procedure by reducing the electrical load and considering the use of the fuel crossfeed if the fuel quantity dictates.

ENGINE FAILURE DURING NORMAL TAKEOFF (85 KIAS or below)

Determination of runway length, single engine climb rate, and accelerate/stop distance will aid in determining the best course of action in the event of an engine failure during takeoff. If engine failure occurs while sufficient runway remains for a deceleration and a safe stop, cut power immediately and stop straight ahead.

If an engine failure occurs before an airspeed of 85 KIAS is attained, and there is not adequate runway remaining for deceleration and stop, immediately retard the throttle and mixture levers fully aft. Turn OFF the master switch, the fuel selectors, and the magneto switches. During these procedures, maintain directional control and maneuver to avoid obstacles if necessary.

ENGINE FAILURE DURING NORMAL TAKEOFF (Above 85 KIAS)

If an engine fails during takeoff at an airspeed above 85 KIAS the pilot must decide whether to abort following the preceding procedures or to continue the takeoff and climb on a single engine. The pilot's decision must be based on a personal judgment, taking into consideration such factors as remaining runway, obstacles, the type of terrain beyond the runway, density altitude, weight and loading, weather, airplane condition, and the pilot's own proficiency and capability.

WARNING

Certain combinations of aircraft weight, configuration, ambient conditions and airspeeds will result in negative climb performance. (Refer to specific chart in performance section.)

If takeoff is continued the airplane will tend to turn in the direction of the inoperative engine, since one engine will be inoperative and the other at maximum power. Rudder pedal force on the side of the operating engine will be necessary to maintain directional control. If rotation for takeoff has begun or the aircraft is just airborne, maintain the takeoff attitude of approximately 10°. The aircraft may skip along the runway or settle back to the runway, if airborne. Do not force the aircraft off the ground or raise the gear, but continue to maintain maximum power on the operating engine and the aircraft directionally aligned with the runway. Once the faulty engine is identified and its power loss verified, feather its propeller. The drag reduction resulting from feathering the windmilling propeller will provide a rate of climb increment which will allow the aircraft to accelerate to and remain airborne at the 50 foot barrier airspeed (95 KIAS). If the aircraft will maintain level flight or a positive rate of climb, retract the landing gear. Maintain 95 KIAS to the 50 foot barrier, then accelerate to 104 KIAS (best single engine angle of climb speed) until clear of obstacles and close the cowl flap on the inoperative engine. When above all obstacles accelerate to the best single engine rate of climb speed (106 KIAS), trim as necessary and CLOSE the cowl flaps on the operating engine as much as possible without exceeding engine temperature limits. After a climb has been established complete the "Engine Securing Procedure" on the inoperative engine.

ENGINE FAILURE DURING SHORT FIELD TAKEOFF
(Below 92 KIAS)

Should an engine failure occur prior to reaching the barrier speed (92 KIAS), the takeoff should be aborted. If the failure occurs while the aircraft is still on the ground and sufficient runway or suitable overrun remains, retard the throttles and apply braking as necessary. If insufficient runway or suitable overrun exists, retard the throttles, apply braking as required, pull the mixtures to idle cut-off, turn the master switch, fuel selectors, magneto switches off and steer the aircraft to avoid obstacles.

Should the engine failure occur after the aircraft is airborne, lower the nose to maintain airspeed, retard the throttles and land on the remaining runway, the runway overrun or the most suitable area straight ahead avoiding obstacles. If the landing cannot be accomplished on the remaining runway or overrun prior to touchdown, pull mixtures to idle cut-off, turn the master switch, fuel selectors and magneto switches to the off position.

ENGINE FAILURE DURING SHORT FIELD TAKEOFF
(Above 92 KIAS but below 104 KIAS)

Should an engine failure occur above the barrier speed (92 KIAS), but below the best single engine angle of climb speed (104 KIAS), the decision to abort or continue the takeoff will be based on several factors including altitude, aircraft weight, suitable landing areas, pilot proficiency and ambient conditions. The two most important considerations; however, are the altitude gained prior to the engine failure and the availability of suitable landing areas ahead of the aircraft at the time of the failure.

Should a suitable landing area (remaining runway, overrun or an area relatively free of obstructions) be accessible from the point where the engine failure occurs, the takeoff should be immediately aborted and a power-off landing should be accomplished within that area.

If a suitable landing area is not available and sufficient altitude has been obtained, the pilot may elect to continue the takeoff. Should the decision be made to continue the takeoff, it is of the utmost importance to realize that the aircraft will have negative single engine climb performance until the gear and flaps have been retracted and an airspeed of 104 KIAS has been reached. As altitude may be lost during gear and flap retraction and the subsequent transition to 104 KIAS, the decision to continue the takeoff should primarily be based on the altitude gained prior to the failure. Flight tests have indicated that as much as 100 feet may be lost during gear and flap retraction and the transition to the best single engine angle of climb speed (104 KIAS). The altitude loss is a difficult variable to quantify and is primarily predicted on pilot proficiency; however aircraft weight and ambient conditions must also be considered. Prior to takeoff, the pilot should always review the performance section to determine that adequate single engine climb performance exists for the takeoff weight and associated ambient conditions.

Should the decision be made to abort the takeoff, the throttles should be closed, the landing gear extended (terrain permitting), the flaps extended and a minimum airspeed of 87 KIAS should be maintained. If possible, plan to land in an area free of obstructions. Prior to touchdown, position the mixture controls to idle cut-off and turn the master switch, fuel selectors and magneto switches off.

Should the decision be made to continue the takeoff, maintain directional control, identify and then feather the inoperative engine. In level or climbing flight, retract the landing gear. Apply 5° of bank into the operating engine. As the aircraft starts to accelerate, retract the flaps incrementally (recommend 3-5° increments). After attaining 104 KIAS, maintain 104 KIAS until all obstacles have been cleared and then accelerate to 106 KIAS. Complete the engine securing procedures and land at the nearest suitable airport.

WARNING

Negative climb performance may result from an engine failure occurring after lift off and before the gear and flaps have been retracted, the failed engine propeller has been feathered, the cowl flap on the failed engine is closed and a speed of 106 KIAS has been attained. Refer to "Single Engine Climb" chart, Figure 5-21, for clean configuration positive climb performance.

ENGINE FAILURE DURING SHORT FIELD TAKEOFF
(Above 104 KIAS)

If a suitable landing area exists at the point where the engine failure occurs, accomplish the aforementioned takeoff abort procedures.

If the decision is made to continue the takeoff, maintain directional control, apply maximum continuous power to the operating engine and feather the inoperative engine. Bank 5° into the operating engine and accelerate to 104 KIAS. Maintain 104 KIAS until all obstacles have been cleared, then accelerate to 106 KIAS. Complete the engine securing procedures and land at the nearest suitable airport.

THIS PAGE INTENTIONALLY LEFT BLANK

ENGINE FAILURE DURING CLIMB

If engine failure occurs during climb, a minimum airspeed of 106 KIAS should be maintained. Since one engine will be inoperative and the other will be at maximum power, the airplane will want to turn in the direction of the inoperative engine. Rudder pedal force on the side of the operating engine will be necessary to maintain directional control. After the faulty engine has been identified and power loss verified, complete the "Engine Securing Procedures." Continue a straight ahead climb until sufficient altitude (minimum of 1000 feet above ground elevation) is reached to execute the normal "Single Engine Landing" procedure at the nearest suitable airport.

Multi engine aircraft are required to climb at a given rate with one engine inoperative at 5000 feet. During this climb engine temperatures must remain at or below specific limits set by the engine manufacturer. Further, the established temperature limitations may not be exceeded on a 100°F day.

Cooling depends to a large extent upon airspeed and the outside air temperature.

This aircraft has a single engine Best Rate of Climb Speed of 106 KIAS. This speed yields a rate of climb in excess of the minimum required climb rate.

Should an engine failure occur on a cold day it may be possible to maintain engine temperatures below maximum allowable limits at 106 KIAS. When the outside air temperature is higher, a higher airspeed must be used until on a 100°F day the aircraft must be flown at 110 KIAS. At these speeds the aircraft will climb at the minimum required rate and still maintain temperatures at or below the temperature limitations of the engine. Normally, cylinder head temperatures can be maintained within limits through cowl flap adjustments. Climb rate will be reduced by approximately 50 FPM.

ENGINE FAILURE DURING FLIGHT (Below 76 KIAS)

Should an engine fail during flight at an airspeed below 76 KIAS, apply rudder towards the operative engine to maintain directional control. The throttles should be retarded to stop the yaw force produced by the inoperative engine. Lower the nose of the aircraft to accelerate above 76 KIAS and increase the power on the operative engine as the airspeed exceeds 76 KIAS.

After an airspeed above 76 KIAS has been established, an engine restart attempt may be made if altitude permits. if the restart has failed, or altitude does not permit, the engine should be secured. Move the propeller control of the inoperative engine to FEATHER and complete the "Engine Securing Procedure," Adjust the trim to a 5° bank into the operating engine. The cowl flaps on the operative engine should be adjusted as required to maintain engine temperatures within allowable limits.

ENGINE FAILURE DURING FLIGHT (Above 76 KIAS)

If an engine fails at an airspeed above 76 KIAS during flight, begin corrective response by identifying the inoperative engine. The operative engine should be adjusted as required after the loss of power has been verified. Attain and maintain an airspeed of 106 KIAS. Once the inoperative engine has been identified and the operating engine adjusted properly, an engine restart may be attempted if altitude permits.

Prior to securing the inoperative engine, check to make sure the fuel flow to the engine is sufficient. If the fuel flow is deficient, turn ON the emergency fuel pump. Check the fuel quantity on the inoperative engine side and switch the fuel selector to the other tank if a sufficient supply is indicated. Check the oil pressure and oil temperature and insure that the magneto switches are ON.

If the engine fails to start it should be secured using the "Engine Securing Procedure".

After the inoperative engine has been secured, the operative engine can be adjusted. Power should be maintained as required and the mixture control should be adjusted for power. Check the fuel supply and turn ON the emergency fuel pump if necessary. The cowl flaps on the operative engine should be adjusted as required to maintain engine temperatures within allowable limits. Adjust the trim to a 5° bank into the operating engine. The electrical load should be decreased to a required minimum. Land as soon as practical at the nearest suitable airport.

SINGLE ENGINE LANDING

If a single-engine landing is necessary, a check should be performed to determine whether or not the hydraulic pump is functioning for normal gear extension. This check is accomplished by placing the landing gear control in the UP position with the gear retracted. If the hydraulic pump is functioning, pressure will return the control to the neutral position. This check should be performed before entering the traffic pattern so that there will be time to pump the gear down with the hand pump if necessary.

The "Engine Securing Procedure" should be complete on the inoperative engine. Fasten the seat belts and shoulder harness and select the FAN position of the heater switch. The operative engine emergency pump should be ON and the mixture RICH. Advance the propeller control (operative engine) full forward. Check to ensure that the fuel selector is ON the main (inboard) tank on the same side as the operating engine. The fuel crossfeed valve should be OFF. The cowl flaps on the operative engine should be adjusted as required.

Maintain an airspeed of 116 KIAS or above and an altitude higher than normal until a landing is assured. When a landing is assured, extend the gear and flaps. Slowly retard the power on the operative engine and flare out the airplane for a normal landing. Trim as necessary as power is reduced. The airplane will tend to yaw toward the operative engine.

SINGLE ENGINE GO-AROUND

A single engine go-around should be avoided if at all possible. A go-around from a full flap position is not possible unless sufficient altitude is available to raise flaps in a descent. A final approach speed above 106 KIAS will place the airplane in the best configuration should a go-around be necessary.

To execute a single engine go-around, advance mixture, propeller, and throttle controls fully forward for maximum power on the operating engine. Retract flaps and landing gear. Maintain the airspeed at or above 106 KIAS. Set the trim and cowl flaps as required.

WARNING

A go-around should not be attempted after the airspeed is decreased below the best single-engine angle of climb speed (104 KIAS).

During climbs, the best single engine rate of climb speed of 106 KIAS is recommended; however, in high ambient temperatures, airspeed must be increased to 110 KIAS as required for improved cooling. Normally, cylinder head temperatures can be maintained within limits through cowl flap adjustments. Climb rate will be reduced by approximately 50 FPM.

AIR START (UNFEATHERING PROCEDURE)

Turn ON the fuel selector of the inoperative engine side and push in the fuel boost pump circuit breaker. Turn on the magnetos. Open the throttle 1/2 inch. Move the propeller control one half forward, and the mixture control, full forward. Engage the starter until the propeller is unfeathered. As the RPM passes 1000 coming out of feather, pull the propeller control back to the low RPM position to prevent excessive engine speed. Maintain the engine speed between 1800 and 2000 RPM, not exceeding 2000 RPM. This low power setting must be held until the engine is warmed up and oil pressure and temperature are stabilized within limits. Turn the alternator ON and check the engine instruments. The air conditioner and propeller synchrophaser (if installed) can then be turned ON.

3.9 ENGINE ROUGHNESS

If an engine falters or runs erratically, the cause may be fuel flow interruption, fuel contamination, icing or air starvation, or ignition problems. If roughness occurs, turn the emergency fuel pumps ON. Scan the engine instruments to see if the cause can be determined. Adjust the mixture controls for maximum smoothness; if the mixture is too rich or too lean, engine roughness may result. Open the alternate air control; a blocked induction system can cause roughness. If cylinder head temperatures are too high or too low, adjust the cowl flaps as required.

If the problem is in the fuel system, selecting another tank containing fuel may remedy the situation. A check of the magnetos will determine if they are operating properly.

3.11 ENGINE OVERHEAT

If engine temperatures become excessive, open the cowl flaps. Enriching the mixture and reducing power will also reduce engine temperature. If a more rapid reduction of engine temperature is desired, increase the airspeed by establishing a shallow dive.

3.13 LOSS OF OIL PRESSURE

Loss of oil pressure could be caused by a faulty pump, oil exhaustion, or a leak. A loss of oil pressure indication could be the result of a faulty gauge. In any event, continued operation of the engine could result in a serious emergency situation or severe engine damage.

Complete the "Engine Securing Procedure" (paragraph 3.7) on the faulty engine.

If engine oil is depleted, the engine will seize and if feathering is not initiated before 1000 RPM is reached, propeller will not feather.

3.15 ROUGH AIR OPERATION

In conditions of extreme turbulence, slow the airplane to maneuvering speed or slightly less. Maneuvering speed will decrease with the weight of the airplane - e.g., 160 KIAS at 7000 lbs., 156 KIAS at 6200 lbs. A reduction in speed will ease the stress to which the airplane is subjected by turbulence. Fly attitude and avoid abrupt maneuvers. Fasten seat belts and shoulder harnesses as a precaution against buffeting and lurching. When flying in extreme turbulence or strong vertical currents and using the autopilot, the altitude-hold should not be used.

3.17 ENGINE FIRE ON GROUND (Engine start, taxi and takeoff with sufficient distance remaining to stop)

The first step to extinguish the fire is to move the fire wall fuel shutoff valve to OFF. Next, turn OFF the emergency fuel pump and pull out on the fuel boost pump circuit breaker. This will stop the flow of fuel to the burning engine. The brakes should be used as required. OPEN the throttle. Use the radio to call for assistance.

If the fire persists, move the mixture control to IDLE CUT-OFF, shut down the engines and evacuate; the fire should be extinguished by an external means.

If the fire is on the ground near the airplane, it may be possible to taxi to safety.

3.19 ENGINE FIRE IN FLIGHT

Should an engine fire occur in flight, first move the firewall shutoff valve of the affected engine to the OFF position. Next, close the throttle, feather the propeller, and place the mixture control in the idle cut-off position. Then, complete shutdown of the affected engine using the Engine Securing Procedure in paragraph 3.7. If the fire persists, attempt to blow it out by increasing airspeed as much as possible. Land at the nearest suitable airport.

3.21 ELECTRICAL FIRE

The presence of smoke in the cabin or the distinctive odor of smouldering insulation are indications of an electrical fire. The first step in coping with an electrical fire is to turn the master switch OFF. During night flight, be sure that a flashlight is in hand before turning off the master switch. Check for open circuit breakers; then pull all circuit breakers and turn OFF all electrical switches and avionics switches.

Return the master switch to ON and, one unit at a time, turn ON the electrical switches and press in the circuit breakers for the individual units required for flight. When the faulty unit is located, pull its circuit breaker and turn its switch OFF. The failed unit should be left OFF for the remainder of the flight.

3.23 CROSSFEED

Crossfeed should be employed only when it is necessary to extend range during single-engine operation. Crossfeed must be OFF for takeoffs and landings.

To activate the crossfeed system, place the fuel selector valve of the inoperative engine side on either of the tanks on that side containing sufficient fuel quantity. Press in the fuel boost pump circuit breaker for the inoperative engine side, and turn ON the emergency fuel pump of the inoperative engine.

Turn ON the crossfeed valve located at the base of the control pedestal. Then, on the side of the operating engine, turn OFF the fuel selector, pull the fuel boost pump circuit breaker, and turn OFF the emergency fuel pump.

3.25 COMING OUT OF CROSSFEED (PRIOR TO LANDING)

To return to normal operation during a single-engine landing when the crossfeed system has been in use, first place the fuel selector on the operating engine side in the INBOARD tank position. Press in the fuel boost pump circuit breaker for the operating engine and turn ON its emergency fuel pumps. Then turn OFF the crossfeed valve, and on the inoperative side, pull the fuel boost pump circuit breaker and turn OFF the emergency fuel pump and the fuel selector. It is recommended that the fuel system be returned to normal in sufficient time to determine normal operation prior to entering the landing pattern.

3.27 ONE ALTERNATOR INOPERATIVE LIGHT ON

In the event one of the alternator inoperative warning lights on the instrument panel illuminates, indicating an alternator failure, reduce the electrical load to the minimum necessary to sustain a safe flight. Turn OFF the side of the master switch corresponding to the side of the inoperative alternator. This will open the field circuit of the inoperative alternator. Reset any circuit breakers which may have popped. Return the appropriate side of the master switch to the ON position, and, if the alternator inoperative light has extinguished, reinstate the electrical load. If the warning light remains lit or if the alternator circuit breaker has tripped, return the corresponding side of the master switch to the OFF position, and continue the flight with a reduced electrical load.

3.29 TWO ALTERNATOR INOPERATIVE LIGHTS ON

If both alternator inoperative lights come on, repeat the above procedure individually for each side. Should both warning lights remain lit even after corrective action, turn ON both sides of the master switch and turn OFF both alternator circuit breaker switches. Reduce electrical load to an absolute minimum and terminate the flight as soon as possible, since all electrical power is being supplied by the airplane battery.

CAUTION

The alternator circuit breaker switches should not be opened manually when the alternators are functioning properly.

In case of the loss of both alternators, reduce electrical load by disconnecting the following equipment, as appropriate to the airplane:

(a) Turn OFF switches for the following:
- (1) Right pitot heat
- (2) Cabin heater
- (3) Heated windshield
- (4) Autopilot
- (5) All unnecessary avionic equipment
- (6) Prop deicing
- (7) Alternator field switches

(b) Open the following circuit breakers:
  (1) Right turn indicator
  (2) Trim indicating system
  (3) Instrument panel lighting (use flashlight)
  (4) Map lights
  (5) Cabin reading lights

CAUTION

If load shedding procedures have been carried out, the battery will provide electric power for approximately 35 minutes to complete a landing under IFR conditions including only a single flap extension and use of landing lights for a limited time. The above time depends upon the condition of the battery, temperature, and the time elapsed between alternator failure and load shedding.

3.31 PROPELLER/GOVERNOR MALFUNCTIONS

An internal malfunction of the propeller or governor could cause loss of RPM control and uncommanded movement of the propeller blades into high pitch or feather, or against the low pitch blade stop. A proper preflight check of the propeller governing and feather functions should indicate such malfunctions before takeoff. Should such a failure occur while airborne, the following actions are recommended:

PROPELLER RPM UNDERSPEED

If an uncommanded RPM decrease occurs while operating at high power settings, immediately retard the throttle to a low cruise power setting and advance the mixture control to full RICH. If the propeller moves to feather, as indicated by a very low RPM and attendant vibration, shut down the engine with the mixture control (idle cut-off) and move the propeller control to FEATHER. (Refer to Engine Securing Procedures.)

NOTE

The propeller will move to feather if engine oil pressure is lost.

PROPELLER RPM OVERSPEED

An uncommanded RPM increase could indicate an internal failure that has caused the propeller to move to full low pitch. Initiate corrective action by immediately reducing the throttle setting and decreasing the airspeed with a nose-up attitude. If the propeller has moved to the low pitch stop, it is effectively a very low pitch fixed-pitch propeller and will exceed the 2575 RPM limit until both airspeed and manifold pressure have been reduced.

At idle throttle, airspeed must be reduced below 127 KIAS to maintain the propeller speed below 2575 RPM. Once airspeed has been reduced, usable power for low-speed cruise (near single engine best rate of climb speed) and approach will be available without exceeding 2575 RPM.

Once the propeller speed has been reduced to 2575 RPM by airspeed and power reductions, the pilot can test for regained RPM control with the propeller lever.

The engine should not be shut down if the propeller cannot be feathered since high drag would result from a windmilling propeller in low pitch. If engine shut down is desired, the pilot should first test for feathering ability with the engine running at idle throttle. (Refer to Engine Securing Procedures if propeller will feather.)

NOTE

Do not secure the engine if the propeller cannot be feathered.

3.33 EMERGENCY GEAR EXTENSION

If the landing gear fails to extend when the gear selector is placed in the DOWN position, the hand-operated emergency gear extender should be employed. The emergency gear extender is located beneath the access plate on the cabin floor, between the crew seats.

Before the gear is extended, the airspeed must be reduced below a maximum of 153 KIAS. To extend the gear by use of the emergency extender, the gear selector must be in the DOWN position.

When the emergency gear extender cover if lifted, note that instructions are printed inside. Extend the emergency gear handle completely, and pump the handle until the three green lights on the instrument panel indicate that all three gears are locked down (approximately 50 full strokes will be required to complete this operation). The master switch must be ON for the gear lights to illuminate. Continue pumping until hydraulic pressure builds and the gear selector returns to the neutral position.

3.35 EMERGENCY EXIT

An emergency exit is located on the right side of the fuselage, and is the third window from the front. With the cockpit-cabin divider installed, the emergency window will appear as the second window from the front on the right side of the cabin.

To use the emergency exit, remove the plexiglas cover over the handle; then pull the handle and push out on the window.

3.37 GEAR UP LANDING

If all normal and emergency gear extension procedures have failed, a gear up landing will be necessary. Select a suitable landing area. If possible, inform ground personnel of the emergency situation. If time allows, burn off excess fuel. Brief passengers on the use of the emergency exit and be sure that all occupants have seat belts and shoulder harnesses secured properly.

When ready to land, complete the landing checklist as for a normal landing, except that the gear selector should be in the UP position. Turn OFF the autopilot, and, in daylight, turn OFF the master switch. During a night landing when the master switch is left ON, the gear warning horn may sound when the throttles are retarded.

Make a normal approach, and when the runway is "made" and landing is assured, place mixtures in IDLE CUT-OFF, FEATHER the propellers, and turn OFF the fire wall fuel shutoffs and fuel selectors. Land smoothly, touching down in a level attitude. At night, turn OFF the master switch after touchdown. All occupants should evacuate as soon as the airplane has stopped.

NOTE

The landing light is attached to the nose gear. Therefore, if the nose gear is not extended, the landing light will not be functioning.

3.39 FLAP SYSTEM MALFUNCTION

In the event of a flap system failure which causes asymmetric ("Split") flaps, the flap drive stops automatically and the "flap" annunciator lights when the difference between the flaps reaches five degrees. If this occurs, no further control of the flaps is provided and the remainder of the flight including the landing and go-around if necessary, must be planned without repositioning the flaps. Asymmetric flaps may usually be identified by a rolling tendency, depending on the lift characteristics of the flaps at the positions where they fail.

A "FLAP" annunciator warning without asymmetric flaps can be caused by a failed amplifier. In this case, the flight may be continued with the, knowledge that, in the event of asymmetric flaps, no further annunciator warning will exist. The amplifier should be replaced prior to the next flight.

Failure of the flaps to move without an asymmetric condition can be caused by a tripped flap control circuit breaker or flap motor circuit breaker at the circuit breaker panel on the left wall of the cockpit. If neither circuit breaker is tripped, a fault exists in the flap drive and further effort to reposition the flaps should be carefully considered so as not to compound the problem.

If a flap malfunction should occur and the flap control circuit breaker or the flap motor circuit breaker is not tripped, proceed accordingly to the Emergency Procedure Checklist on page 3-13.

CAUTION

Do not reset a tripped flap motor circuit breaker if a split flap condition exists.

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 PA-31-350 Chieftain airplane. All of the required (FAA regulations) procedures and those necessary for the 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 presented in Section 9 (Supplements).

These procedures are provided as 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 is a short form check list which supplies an action sequence for normal procedures 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 lengthy explanations. The short form check list should be used in flight.

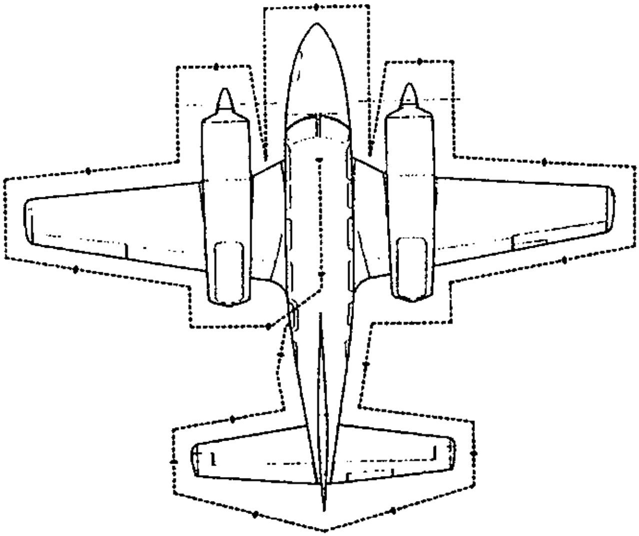
The pilot should use the full Maximum Continuous Power rating of the engine when safety considerations so dictate.

4.3 AIRSPEEDS FOR SAFE OPERATION

The following airspeeds are those which are significant to the operation of the airplane. These figures are for standard airplanes flown at gross weight under normal conditions at sea level. For additional airspeed information see Section 2.

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

(a) Never Exceed Speed	236 KIAS
(b) Maximum Structural Cruising Speed	185 KIAS
(c) Design Maneuvering Speed	160 KIAS
(d) Maximum Flaps Extended Speed	
25° Flaps	162 KIAS
Full Flaps (40°)	132 KIAS
(e) Maximum Gear Extended Speed	153 KIAS
(f) Maximum Gear Operating Speed	
Extend	153 KIAS
Retract	128 KIAS
(g) Best Rate of Climb Speed	
0° Flaps	101 KIAS
(h) Best Angle of Climb Speed	
0° Flaps	84 KIAS
(i) Final Approach Speed	95 KIAS
(j) Intentional One Engine Inoperative Speed	92 KIAS
(k) Maximum Demonstrated Crosswind	20 KTS



WALK-AROUND
Figure 4-1

4.5 NORMAL PROCEDURES CHECK LIST

PREFLIGHT CHECK

COCKPIT

Controls ....release
Magneto switches ....OFF
Electrical switches ....OFF
Flap switch ....OFF
Mixtures ....IDLE CUT-OFF
Master switch ....ON
Gear lights ....3 green
Fuel quantity ....sufficient
Trim ....neutral
Cowl flaps...OPEN
Master switch ....OFF
Airplane papers ....checked
Emergency window...secure

Oxygen pressure .... sufficient
Oxygen masks .... in place

LEFT WING

Surface condition .... checked
Nacelle locker door .... Locked
Flap and flap tracks .... checked
Aileron .... checked
Fuel tanks and filler caps .... checked
Fuel tank vent~ .... clear
Tie down .... removed
Fuel drains (4) .... drain and check for water sediment and proper fuel
Landing gear .... checked
Chock .... removed
Nacelle .... checked

> **CAUTION:** Check that the four screws securing the nose bowl are present and secure. A screw driver may be needed to do this. Check that the six (three per side) side cowling fasteners are present and secure. Check for both the proper alignment of the paint stripes on the cowling and fastener and for the extension of the locking pin indicator in the fastener slot.
>
> **WARNING:** Failure to insure the presence and security of nose bowl and cowl side fasteners may result in inflight cowl separation and loss of aircraft control.

Oil .... checked
Cowl flap area .... checked
Propeller .... checked
Accessory section (engine) .... checked
Gear mirror .... checked

NOSE SECTION

General condition .... checked
Baggage .... secure
Baggage door .... Locked
Battery vents .... clear
Nose gear .... checked
Chock .... removed
Pitot tubes .... clear
Landing lights .... checked

RIGHT WING

Check as for left wing (3 fuel drains).

FUSELAGE (RIGHT SIDE)

General condition .... checked
Static openings .... clear
Antennas .... checked

EMPENNAGE

Surface condition .... checked
Tie down .... removed
Trim tabs .... neutral and checked for play
Hinges and push rods .... checked

FUSELAGE (LEFT SIDE)

General condition .... checked
Static openings .... clear
Doors .... checked

BEFORE STARTING ENGINES

Preflight inspection .... completed
Cabin doors .... secure
Passenger briefing .... completed
Seats .... adjusted
Belts and harness .... secure
Parking brake .... set

WARNING: Braking may not occur if parking brake handle is pulled and held prior to brake pedal application.

Controls .... checked
Fuel selectors .... INBOARD
Crossfeed .... OFF
Fuel fire wall shutoffs .... ON
Alternate air .... OFF (in)
Circuit breakers .... checked
Electrical switches .... OFF
Alternator CB switches .... ON
Avionics switches .... OFF
Alternate static source .... OFF
Mixtures .... IDLE CUT-OFF

Master switch ....ON
Cowl flaps ....OPEN
Gear lights ....3 green
Annunciator panel ....press-to-test
Alternator inop. lights ....ON
Pneumatic source malf. lights ....ON
Door ajar lights ....OUT
Boost pump and fuel flow lights ....checked
Emergency fuel pumps ....OFF
Prop sync ....OFF
AP/FD switch ....OFF
Seat belts and no smoking sign ....ON

ENGINE START

NORMAL START

(Master switch off when using APU.)
Throttle ....open 1/2 inch
Prop control ....forward
Mag switches ....ON
Mixture ....RICH (6 sec) then IDLE CUT-OFF
Prop ....clear
Starter ....engaged
Mixture (when eng. starts) ....advance
Oil and fuel pressure ....checked
Alternator inop. light ....OUT
Pneumatic malf. light ....OUT
Gear handle (hydraulic check) ....DOWN then returns to neutral
Second engine ....repeat first 10 steps thru "pneumatic malf. light - OUT"

HOT START

Throttle ....open 1/2 inch
Prop control ....forward
Mag switches ....ON

Prop .... clear
Starter .... engaged
Mixture (when eng. starts) .... advance
Normal start procedure .... complete

FLOODED START

Mixture .... IDLE CUT-OFF
Mag switches .... ON
Throttle .... full OPEN
Prop .... clear
Starter .... engaged
When engine starts:
Mixture .... advance
Throttle .... 1000 RPM

BEFORE TAXIING

APU .... removed
Master switch .... ON
Lights .... as required
Heater/Air cond. .... as required
Avionics switches .... ON
Gyros .... set
Altimeter and clock .... set
Electric trim .... ON and checked
Autopilot .... checked and OFF
Fuel valves (all positions) .... checked
Radios .... checked
Parking brake .... release

TAXIING

Brakes .... checked
Flight instruments .... checked

ENGINE RUN-UP

Parking brake ....set
Mixtures ....RICH
Prop controls ....forward
Cowl flaps..OPEN
Engine instruments...checked
Throttles..1500 RPM
Prop controls (max. drop 500 RPM).................................feather checked
Gyro pressure (4-6 in. Hg.) ....checked
Alternator output..checked
Alternator inop. lights ....OUT
Annunciator panel lights ....OUT
Throttles..2300 RPM
Mags (max. drop 175 RPM;
max. diff. 50 RPM) ....checked
Prop controls (max. drop 300 RPM)...exercised
Throttles (600-650 RPM) ....idle checked
Throttles..1000 RPM
Friction lock ....set

BEFORE TAKEOFF

Seat belts and no smoking sign ....ON
Fuel selectors ....INBOARD
Fuel quantity ....sufficient
Mixtures and props ....forward
Flaps ....checked and set 0° for normal takeoff
checked and set 15° for short field takeoff
Autopilot ....OFF
Trim...set
Surface deice ....OFF
Pitot and prop heat...as required
Windshield heat ....as required
Avionics ....as required
Direction indicator...set
Radar...as desired
Transponder...as required

Controls .... checked
Emergency fuel pumps .... ON
Air conditioner .... OFF
Prop sync .... OFF
Parking brake .... release

NORMAL TAKEOFF

Brakes .... apply and hold
Mixtures .... full forward
Propellers .... full forward
Throttles .... full forward
Manifold pressure (43" normal-static
sea level std. temp.) checked
Prop speed .... 2575 RPM
Brakes .... release
Rotate .... 85 KIAS min.
Gear .... UP
Accelerate to .... barrier speed (95 KIAS)

SHORT FIELD TAKEOFF

Brakes .... apply and hold
Mixtures .... full forward
Propellers .... full forward
Throttles .... full forward
Manifold pressure (43" normal-static
sea level, std. temp.) .... checked
Prop speed .... 2575 RPM
Brakes .... release
Rotate .... 76 KIAS
Accelerate to .... barrier speed (92 KIAS)

After the barrier has been cleared:

Gear .... retract
Flaps .... retract
Accelerate to .... Best Single Engine
Angle of Climb Speed
(104 KIAS)

CLIMB

Maximum Normal Operating Power (when
safely clear of obstacles or terrain) ....40" MP/2400 RPM
Mixture (30 GPH min. 475° CHT max.
1500° EGT max)..LEAN
Cowl flaps ....as required
Emergency fuel pumps ....OFF
Air conditioner ....as desired
Seat belts and no smoking sign ....ON
Oxygen ....as required

CRUISE

Fuel selectors..OUTBOARD OR INBOARD
Power ....set
Cowl flaps ....as required
Mixture ....leaned

DESCENT

Mixtures...min. 1350° EGT
Fuel selectors ....INBOARD
Power ....as required
Oxygen (below 10,000 ft.) ....OFF
Pitot and windshield heat..as required

BEFORE LANDING

Seat belts and no smoking sign ....ON
Emergency fuel pumps...ON
Air conditioner ....OFF
Mixtures ....RICH
Prop sync ....OFF
Prop controls..2400 RPM
Gear (below 153 KIAS) ....DOWN
Gear lights..3 green

Gear mirror .... checked
Brake pressure .... checked
Autopilot .... OFF
Wing flaps .... as required
(162 KIAS max. to 25°)
(132 KIAS max. to 40°)

Landing lights .... as required
Radar .... OFF

BALKED LANDING

Props .... full forward
Power .... as required
Wing flaps .... 15°
Gear .... UP
Wing flaps .... UP
Airspeed .... 98 KIAS min.

AFTER LANDING (CLEAR OF RUNWAY)

Cowl flaps .... OPEN
Wing flaps .... UP
Emerg. fuel pumps .... OFF
Heater switch (if used) .... FAN
Prop controls .... forward
Strobes .... OFF

SHUTDOWN

Parking brake .... set
Avionics .... OFF
AP/FD .... OFF
Throttles .... IDLE
Mag grounding .... checked
Throttles .... 1000 RPM
Lights .... OFF
Heater switch .... OFF
Electrical equipment .... OFF
Mixture (1st eng. started) .... IDLE CUT-OFF

Gear handle .... DOWN
Gear handle (hydraulic check) .... returned to neutral
Mixture (2nd eng.) .... IDLE CUT-OFF
Mags .... OFF
Master switch .... OFF

4.7 AMPLIFIED NORMAL PROCEDURES (GENERAL)

The following paragraphs are provided to supply detailed information and explanations of the normal procedures necessary for 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 determination of the airplane's operational status, a check that necessary papers are onboard and in order. and a computation of weight and C.G. limits, takeoff distance, and in-flight performance. Baggage should be weighed, stowed, and tied down. A weather briefing for the intended flight path should be obtained, and other factors relating to a safe flight should be checked before takeoff.

COCKPIT

Upon entering the cockpit, release the controls if they have been secured. After insuring that magneto switches, electrical switches and flap switch are OFF and that mixture levers are in IDLE CUT-OFF, turn the master switch ON. Check that the fuel quantity gauges are operating and that there is sufficient fuel for the flight. Fuel quantity gauges indicate the amount of fuel in the tanks selected on the fuel selector valves. Check that the three green gear position lights illuminate. Set all trim controls to neutral and fully open the cowl flaps. Turn OFF the master switch.

While still inside the airplane, check that the emergency window is secure and that an oxygen mask is present and operational and properly stowed if installed. Check the oxygen pressure gauge on the lower right instrument panel to ascertain that the oxygen supply is sufficient. Check that the oxygen control knob is pushed into the OFF position.

A complete walk-around check should be routinely performed during each preflight. A set pattern should be established, starting at the cabin door and proceeding forward, completely around the airplane, and terminating upon return to the cabin door.

LEFT WING

Proceed first along the trailing edge of the left wing, checking the wings, control surfaces, and hinges for damage and operational interference. The wings and control surfaces should be free of ice, snow, frost, or other extraneous substances. Static wicks should be in place and in good condition. Nacelle baggage doors should be closed and locked. The fuel supply should be checked visually, and fuel caps securely in place. Fuel vents should be clear of obstructions. If surface deicing is installed, the boots should be free from defects and flat against the wing surface. If tie-downs and chocks have been employed, they should be removed before flight. The wing tip and lights should show no signs of damage.

On the underside of the left wing are four fuel drains which should be briefly drained and checked for any possible accumulation of moisture or sediment in the duct system, and to verify fuel octane by checking the color. Opening each fuel drain valve for a few seconds should allow sufficient fuel flow to allow the removal of contaminants. Collecting drained fuel in a clear container and examining it visually is recommended.

The landing gear should be examined. The strut should be inflated to expose about 3.25 inches of piston tube when supporting an empty airplane with full fuel tanks and full oil and operating fluids. The condition of components of the strut, the gear doors, the brakes, the gear micro switch. etc., should appear sound, and fittings, attachments, screws, hinges. etc. should be secure. The tire should be inflated to 66 psi. and should be examined for breaks, cuts, bruises, cracks, and excessive wear.

At the engine nacelle, access panels should be secure. The engine cowl flap area, wheel wells, and nacelle intakes should be clear of debris, bird nests. etc. Oil quantity can be checked through the access door on the top of the nacelle. The oil filler must be replaced securely.

The propeller blades and spinner should be checked for nicks, cracks, dents, or other defects. There should be no indication of leakage of oil, fuel, or other fluids in the area of the wing or on or about the nacelle and landing gear. Inboard of the nacelle, the gear mirror should be clean and intact, and the wing root fillet should show no signs of stress.

NOSE SECTION

Continue from the left wing forward around the nose section of the airplane. All access plates should be secure, and the general condition of the nose section should appear sound. Baggage should be securely stowed and the baggage compartment door completely closed and locked. Battery vents and heater inlets and outlets should be open and clear. The nose gear should be checked in the same manner as the main gear, with a proper strut piston tube exposure of about 3.25 inches, and a proper tire inflation of 42 psi. No leakage of hydraulic or brake fluid should be present. If a chock has been employed, it should be removed. Landing and taxi lights should be clean and intact.

If pitot tube covers have been installed, they must be removed, and the pitot head opening checked and ensured clear of insects, dirt, or other obstructions. When pitot heat operation is to be checked, the master switch and pitot heat switch must be turned on, and the pitot head found hot to touch. Be careful, as the pitot tube gets extremely hot.

The windshield and pilot and copilot side windows should be clean and the windshield wipers in good condition.

RIGHT WING

Continuing aft and around the right wing, the same checks and procedures as performed on the left wing should be completed in reverse order. There are three fuel valves which must be drained and checked for any possible accumulation of moisture or sediment in the fuel system, and to verify octane by checking the color. The right aileron includes a trim tab which must be checked.

FUSELAGE (RIGHT SIDE)

Check the general condition of the right side of the fuselage. The emergency exit window should be secure and flush with the fuselage skin. and all side windows should be clean and without defects. Antennas and cables should be in place and securely attached. The openings in the static pads should be clean and unobstructed.

EMPENNAGE

All surfaces of the empennage should be examined for damage and operational interference. Fairings and access covers should be attached and in good condition. Deicer boots should be in good condition and flat against the surface. The elevator and rudder should be free and in good condition. With the trim controls set neutral, all trim tabs should be neutral. Check the condition of the tabs, and ensure that all hinges and push rods are secure and in good condition. If the tail has been tied down, remove the tie-down rope.

FUSELAGE (LEFT SIDE)

On the left side of the fuselage, the static openings should be clear, side windows clean and sound, and cabin door attachments and hinges operational. If night flight is anticipated, before completing the walk-around ensure that all exterior lights are operational; the master switch must be ON for this check.

When all occupants are boarded, the pilot should check that all cabin doors are properly closed and latched. The door support cables should be held in position, if necessary, so that they will not interfere with the closing of the door.

4.11 BEFORE STARTING ENGINES

After preflight interior and exterior checks have been completed and the airplane has been determined ready for flight, the cabin door should be secured, and all occupants seated. Check that the aft baggage compartment and the cabin cargo area if it is loaded are secure and that tie-downs are used where necessary. Passengers should be briefed on the use of seat belts and shoulder harnesses, the emergency exit, supplementary oxygen, ventilation controls, seat adjustment, comfort facilities, etc. The pilot should advise the passengers when smoking is prohibited and caution them against handling controls, equipment, door handles, and the emergency exit. It may be advisable to inform passengers of sounds or sensations which may not be familiar to them, but which are associated with normal flight. All seats should be adjusted and secured in position and seat belts and shoulder harnesses properly fastened.

To set the parking brake, first depress and hold the toe brake pedals and then pull out the parking brake handle.

WARNING

Braking may not occur if parking brake handle is pulled and held prior to brake pedal application.

Check that control levers move smoothly, and adjust the friction control as desired. Fuel selectors should be set on the inboard tank position, the crossfeed turned OFF, and the fuel fire wall shutoffs checked open.

Check that the manual alternate air controls on the lower instrument panel are pushed in and OFF. All circuit breakers should be IN and alternator circuit breaker switches ON. All other electrical switches and all avionics switches should be OFF. Check that all radio switches, light switches, and the pitot heat switch are OFF to avoid an electrical overload when the starter is engaged. The alternate static source control under the left side of the instrument panel should be OFF, and the mixture controls should be in the IDLE CUT-OFF position.

Turn ON the master switch. Three green gear lights should illuminate. The alternator inoperative lights and pneumatic source malfunction lights should come on and remain on until the engines are started The door ajar lights on the overhead panel should both be out. Check that both cowl flaps are open. Check the function of the boost pump and fuel flow warning lights by using the press-to-test feature. Check the annunciator panel by using the press-to-test switch. Before starting the engines, turn ON the seat belt and no smoking signs, and check that passengers comply.

4.13 ENGINE START

NORMAL START

If an external auxiliary power unit (APU) is used for starting; the master switch and all avionics switches should be OFF until both engines are running and the power unit is removed. When an APU is used, it is recommended that the right engine be started first. Open the throttle of the first engine to be started about 1/2 inch, advance the propeller control forward, and turn the magneto switches ON. Advance the mixture control to RICH for about six seconds to prime the engine, then pull the mixture control aft to IDLE CUT-OFF. Visually confirm that the propeller area is clear, and engage the starter. When the engine starts, advance the mixture control slowly toward the RICH position. Adjust the throttle as necessary to maintain a speed below 1000 RPM. Check the oil pressure gauge for an indication. Normally there should be an indication of oil pressure within 30 seconds. In cold weather it may take a few seconds longer. If after allowing sufficient time there is no oil pressure, shut down the engine until the cause is determined and remedied. Check the fuel pressure gauge.

Check to see that the alternator inoperative light and the pneumatic malfunction light for the running engine are extinguished. To check the function of the hydraulic pump of the first engine started, place the gear selector lever in the DOWN position. If the pump is functioning properly, the gear lever will automatically return to neutral.

Start the second engine following the same procedure. The hydraulic pump check should be eliminated from the starting procedures for the second engine. When both engines are running, all warning lights should be extinguished.

HOT START

If the engines are still warm from previous operation, the mixture control should remain in IDLE CUT-OFF and the priming steps eliminated. Open the throttle 1/2 inch, and advance the propeller control. Turn ON the magneto switches and engage the starter. When the engine starts, advance the mixture control, and proceed as in a Normal Start (see above).

FLOOD START

If an engine is flooded (by overpriming, for example) the mixture should be pulled to IDLE CUT-OFF. After turning ON the magneto switches, advance the throttle to the fully OPEN position and engage the starter. Advance the mixture control only after the engine has started, and retard the throttle lever to 1000 RPM.

4.15 BEFORE TAXIING

If an APU has been used for start, it should be disconnected and the master switch turned ON.

Lights and heater or air conditioner may be turned on as desired. Set gyros and clocks as required. Set the altimeter to field elevation. Turn ON and check electric trim. Turn ON the avionics master switch. Check the autopilot (see Section 9), then turn it OFF. Check the fuel selectors in all positions, at the same time observing that fuel warning lights should not illuminate. Check the radios, and set them as desired.

Release the parking brake by first depressing and holding the toe brake pedals and then pushing in on the parking brake handle.

4.17 TAXIING

While taxiing, apply the brakes to determine their effectiveness. Check the flight instruments to see that they are functioning.

4.19 ENGINE RUN-UP

Set the parking brake. Advance mixture and propeller controls, and open the cowl flaps. Check engine instrument to see that they are functional and that readings are within limitations. (See Section 2.)

The engines are equipped with a dynamic counterweight system and must be operated accordingly. Use smooth steady movements of the throttle controls, and avoid rapid opening and closing. Set the throttles to an engine speed of 1500 RPM. Retard the propeller controls aft to check feathering; however, do not allow a drop of more than 500 RPM. Check that the gyro pressure gauge is reading within the green arc.

Check alternator output by pressing first one and then the other momentary push button located on either side of the ammeter. Alternator output readings should be approximately equal.

Advance the throttles until engine speed reaches 2300 RPM. Check the magnetos on each engine by turning OFF, then ON, each of the four magneto switches in turn. The normal drop when a magneto is turned off is about 90 RPM. The maximum allowable drop is 175 RPM. The maximum differential between the magnetos on one engine is 50 RPM. After checking one magneto, do not check the next until the engine speed returns to 2300 RPM. Operation of an engine on one magneto should be kept to a minimum.

Exercise the propeller levers through their range to check their operation. Response should be normal. Do not allow speed to drop more than 300 RPM.

Retard the throttles to 600-650 RPM to check idling. Set the throttles at 1000 RPM; recheck the flight instruments, and reset them if necessary. Set the desired amount of friction on the engine control levers.

4.21 BEFORE TAKEOFF

Seat belts and no smoking signs should be ON for takeoff. Inboard fuel tanks must be used for takeoff; therefore ensure that both fuel selectors are on the inboard tank positions and that the fuel quantity is sufficient. Check crossfeed is in OFF position.

Check that the mixture and propeller controls are full forward. Check the wing flaps for proper operation. Extend wing flaps 15°. Visually confirm that right and left wing flaps are equally extended. Retract the flaps. After the flaps begin to move, press and hold the flap test switch. The flaps should stop and the FLAP annunciator should illuminate. Release the flap test switch; the annunciator should extinguish and the flaps retract to 0°. Confirm flaps are at 0° for normal takeoff or actuate to 15° for a short field takeoff. Check to be sure that the propeller synchrophaser, autopilot, air conditioner, and surface deicers are OFF if installed. Set trim for takeoff.

Recheck alternator output. Turn pitot, propeller, and windshield heat on if necessary. Set avionics as required. Set the direction indicator if necessary and set the transponder as required. Make certain that controls are free and that all engine instruments are reading within limits. Turn emergency fuel pumps ON for takeoff. Check that no warning lights are illuminated. Do not take off if a fuel flow warning light is illuminated. Release the parking brake.

4.23 TAKEOFF

NORMAL

While holding the brakes with the mixture and propeller levers full forward, advance the throttles slowly to a manifold pressure of 30 inches of mercury; then continue to advance the throttles at a normal rate and release brakes, but do not allow manifold pressure to exceed 49 inches. Use smooth, steady throttle movements, and avoid rapid opening and closing. Propeller speed for takeoff should be 2575 RPM.

The engines are adjusted to provide 43 inches Hg. manifold pressure at full throttle in standard temperature at sea level. Depending upon an altitude and temperature it is possible to reach higher (up to 49 inches) or lower manifold pressures.

Each engine density controller is set to produce rated takeoff power for the engine. The takeoff power manifold pressure for each engine will not necessarily be the same. However, if the spread in manifold pressure exceeds three inches during a full throttle climb, the density controller settings should be checked and serviced.

At 85 KIAS, rotate to a 10° pitch attitude and allow the aircraft to fly off. Maintain a pitch attitude which will result in acceleration of the aircraft to 95 KIAS at 50 feet. Before airspeed reaches 128 KIAS, retract the landing gear. Continue acceleration to the desired climb airspeed.

SHORT FIELD

The initial segment of the short field takeoff procedure is identical to the normal procedure except that the brakes shall be held until it has been determined that each engine is operating normally at maximum continuous power. After it has been determined that each engine is operating normally at maximum continuous power, release the brakes, neutralize the elevator control and initiate the takeoff roll. Maintain directional control with the nose wheel steering system only. Avoid making steering inputs with the brakes as this may result in increasing the takeoff ground roll distance.

At 76 KIAS, rotate the aircraft to achieve an attitude that will result in an initial climb airspeed of 92 KIAS. Maintain 92 KIAS until the barrier has been cleared. After the barrier has been cleared, retract the landing gear, the flaps and accelerate to 104 KIAS (best single engine angle of climb).

THIS PAGE INTENTIONALLY LEFT BLANK

4.24 CLIMB

When clearance above obstacles and terrain permits, reduce to Maximum Normal Operating Power by setting the throttles to 40 inches Hg. manifold pressure and the propellers to 2400 RPM. Turn air conditioner on as desired. Lean the mixture to a minimum fuel flow of 30 gallons per hour at a maximum exhaust gas temperature of 1500°F and maximum cylinder head temperature of 475°F. Adjust cowl flaps and mixture as necessary to maintain engine temperatures within limits.

Turn the emergency fuel pumps OFF one at a time, and check fuel gauges and warning lights. At power settings above 75%, maintain the mixture controls in the full RICH position except with Maximum Normal Operating Power setting when the mixture may be leaned as stated in the preceding paragraph.

Although the maximum approved operating altitude for this airplane is 24,000 feet, under standard atmospheric conditions and at maximum gross weight the multi-engine service ceiling and absolute ceiling are 27,200 feet and 28,300 feet, respectively.

4.25 CRUISE

During cruise, fuel selectors may be on either inboard or outboard tanks. When the airplane is loaded with a rearward C.G., it is recommended that outboard tanks be used first. This will tend to move the C.G. forward with fuel burn-off. Outboard tanks should be used during coordinated level flight only. If outboard tanks are used during climbs, descents or prolonged uncoordinated level flight, power loss may result even if there is appreciable fuel remaining.

Throttle levers should be set as required. During power changes, move the throttles slowly to the desired setting, wait a few seconds for the system to stabilize, and then make adjustments, if necessary, after leaning the engines. Always return the mixtures to full rich before increasing power. To increase power, always increase propeller RPM prior to manifold pressure. To decrease power, always decrease manifold pressure prior to propeller RPM.

For "best power" during cruise, lean to 125°F rich of peak EGT. For best economy, lean to peak EGT. Never exceed 1650°F EGT. Refer to Paragraph 4.37 for Leaning Procedures.

Adjust cowl flaps as necessary to maintain engine temperatures within limits. The maximum continuous cylinder head temperature is 475°F during normal operation. At high altitudes, cylinder head temperatures can be maintained within limits through careful leaning and proper use of cowl flaps. When cruise conditions permit, it is desirable to maintain cylinder head temperatures below 435°F to provide maximum engine life.

Fuel flow warning lights indicate an impending fuel flow interruption which could result in power loss. Use of the emergency fuel pumps will not normally be required for climbs or cruise at any altitude; however, high power climbs to high altitude under conditions of elevated ambient temperature, high climb rate, and extremely volatile fuel may cause a fuel boost pressure warning light to illuminate and/or the engine fuel pressure gauge to indicate fluctuation of 2-5 psi. The emergency fuel pump should be turned ON to provide stable engine operation during such high power operations, but should be turned OFF after leveling off if reduction to cruise power extinguishes the boost pump warning light and if engine fuel pressure remains steady with the emergency fuel pump off. Any time fuel pressure falls below 34 psi the emergency fuel pump should be turned ON.

NOTE

Heater operation will cause the right fuel pressure gauge to fluctuate during heater cycling.

Since inboard tanks must be used for landing, be sure to retain sufficient fuel in the inboard tanks for normal descent and landing in addition to reserve fuel for a possible go-around.

NOTE

Fuel remaining in the tanks when the fuel gauge indicates zero fuel cannot be used safely in flight.

During cruise, propellers should be synchronized as close as possible. The control levers can be secured in their settings by use of the friction knob on the right side of the control pedestal. During flight, monitor fuel gauges and engine gauges.

4.27 DESCENT

During power reduction for descent, be sure EGT is maintained at minimum of 1350°F. Throttling back at high altitudes (above 15,000 feet) without first checking that the mixture has been so leaned could result in engine power loss.

Set fuel selectors on INBOARD tanks and set power as required for descent. Adjust cowl flaps as necessary to maintain engine temperatures within limits.

At altitudes below 10,000 feet, turn OFF the oxygen system. The pitot heat and windshield heat may be used as required.

4.29 BEFORE LANDING

When preparing for landing, turn ON seat belt and no smoking signs and ensure that all occupants comply. Turn ON emergency fuel pumps, turn OFF air conditioner and set mixture controls to full RICH. If a propeller synchrophaser system is installed, turn it OFF.

Set the propeller controls to 2400 RPM. Landing gear may be lowered at airspeeds below 153 KIAS. Determine landing gear extension by checking the gear position lights. Secondary indications of gear extension are the return of the selector lever to a neutral position and the appearance of the nose gear in the gear mirror on the inboard side of the left nacelle.

Operate the toe brakes to determine if there is sufficient pressure for normal braking and make sure that the parking brake is not set. Should brake freeze-up (caused by icing of the brake assembly during flight) be suspected, it is recommended that maximum brake pressure be applied several times to "break-up" possible ice accumulation. The autopilot and propeller synchrophaser should be OFF for landing.

Extend the wing flaps as required. The maximum speed for up to 25° of flap extension is 162 KIAS; the maximum speed for 40° flap extension is 132 KIAS.

Landing lights should be turned on as required. Radar should be OFF for landing.

4.31 BALKED LANDING

In a balked landing situation, set props full forward and apply power as required, set the flaps to 15° and retract the landing gear. Flaps should be set at 15° until obstacles are cleared. A minimum airspeed of 98 KIAS should be attained.

The Before Landing checklist should be completed before all landings; landing after go-arounds or balked landings are no exception.

4.33 AFTER LANDING (CLEAR OF RUNWAY)

When the airplane is taxied clear of the active runway, cowl flaps should be fully opened, wing flaps should be fully retracted, and trim set to neutral. The emergency fuel pumps and strobe lights should be turned OFF.

If the heater is in use, place the heater switch in the FAN position for a few minutes to allow the heater to cool down before turning it off. This cooling down period is only necessary during ground operation, not when the heater is turned off in flight.

Taxi with the propeller controls full forward. Unnecessary radio and electrical equipment may be shut down.

4.35 SHUTDOWN

After the airplane is taxied to a stop, set the parking brake. If the temperature is below freezing and the brakes are wet, they should not be set if there is a possibility of the brakes being frozen. Turn OFF avionics and the autopilot AP/FD master switch. The heater switch may be turned OFF after it has cooled down. Turn OFF all other electrical equipment.

Retard the throttle levers to idle power before checking magneto grounding. Turn both magnetos on one engine OFF, then immediately back ON. An engine will stop briefly if magnetos are grounded. During this check, do not allow engines to come to a complete stop.

Advance the throttles to 1000 RPM to check the battery. With both engines turning 1000 RPM and all electrical equipment off, if the ammeter shows a battery charge rate in excess of 25 amps, the battery has a low charge. In this case, do not stop engines until current drops below 25 amps or there may not be sufficient battery current for starting.

Leave throttles at 1000 RPM. Since one engine's hydraulic pump was tested at start, the other should be tested at shutdown. Place the mixture control of the first engine started in IDLE CUT-OFF. When the engine has stopped, place the gear selector handle DOWN. If the hydraulic pump on the running engine is functioning, the selector will return to neutral. After this check, place the mixture control of the second engine in IDLE CUT-OFF. Switch magnetos OFF, and, lastly, turn the airplane master switch OFF.

For mooring instructions refer to Paragraph 8.9.

4.37 LEANING PROCEDURES

When leaning below best power is permitted (refer to Maximum Manifold Pressure Vs. Altitude graph in Section 5 - Performance), the engines may be operated at peak EGT or on the lean side of peak EGT as long as stable engine operation results without exceeding any engine limitations during steady state or transient conditions.

BEST POWER

To lean the mixture to best power, proceed as follows:

(a) Lean the mixture slowly until EGT has stabilized at peak.

NOTE

Do not exceed 1650°F EGT.

(b) Enrich the mixture 125°F.
(c) At high power setting if 1650° F is reached before peak EGT, refer to Lycoming Operator's Manual for correct procedure.

BEST ECONOMY

To lean the mixture to best economy, proceed as follows:
(a) Lean the mixture slowly until EGT has stabilized at peak.

NOTE

Do not exceed 1650°F EGT.

LEAN SIDE OF PEAK

To lean the mixture on the lean side of peak, proceed as follows:
(a) At the desired power setting, lean the mixture slowly until EGT has stabilized at peak.

NOTE

Do not exceed 1650°F EGT.

(b) If peak EGT is 1650° F or less, continue to lean until a maximum of 50° reduction in EGT is obtained. Readjust manifold pressure as necessary to maintain the desired power setting.

(c) If 1650°F EGT is reached before peak EGT is obtained, lean according to the following procedure:
    (1) With the mixture leaned to 1650°F, reduce manifold pressure until EGT is reduced approximately 75°.
    (2) Lean the mixture slowly until peak EGT is obtained.
    (3) Lean the mixture additionally until 50°-100° on the lean side of peak is obtained. Do not lean into engine roughness.
    (4) Slowly increase manifold pressure to the desired power setting without permitting EGT to exceed 1650°F.
    (5) Carefully adjust the mixture until EGT is 1625° to 1650°F.

NOTE

Enriching the mixture will increase the EGT when operating on the lean side of peak EGT.

(6) Before enriching the mixture, reduce the manifold pressure as in step (1) to prevent exceeding 1650°F EGT.

4.39 V_{SSE} - INTENTIONAL ONE ENGINE INOPERATIVE SPEED

V_{SSE} is a speed selected by the aircraft manufacturer as a training aid for pilots in the handling of multi-engine aircraft. it is the minimum speed for intentionally rendering one engine inoperative in flight. This minimum speed provides the margin the manufacturer recommends for use when intentionally performing engine inoperative maneuvers during training in the particular airplane.

The intentional one engine inoperative speed, V_{SSE}, for the PA-31-350 is 92 KIAS.

4.41 V_{MCA} - AIR MINIMUM CONTROL SPEED

V_{MCA} is the minimum flight speed at which a twin-engine airplane is directionally controllable as determined in accordance with Federal Aviation Regulations. Airplane certification conditions include one engine becoming inoperative and windmilling; not more than a 5° bank toward the operative engine; landing gear up; flaps UP and most rearward center of gravity.

V_{MCA} for the PA-31-350 has been determined to be 76 KIAS.

The V_{MCA} demonstration, which may be required for the FAA flight test for the multi-engine rating, approaches an uncontrolled night condition with power reduced on one engine. The demonstration and all intentional one engine operations should not be performed at an altitude of less than 5000 feet above the ground. The recommended procedure for V_{MCA} demonstration is to reduce the power to idle on the simulated inoperative engine at or above the intentional one engine inoperative speed, V_{SSE}, and slow down at approximately one knot per second until the FAA Required Demonstration Speed, V_{MCA}, or stall warning is obtained.

V_{SSE} is a minimum speed selected by the manufacturer for intentionally rendering one engine inoperative in flight for pilot training.

V_{SSE} for the PA-31-350 is 92 KIAS.

V_{MCA} DEMONSTRATION

(a) Landing Gear	UP
(b) Flaps	UP
(c) Airspeed	at or above 92 KIAS (V_{SSE})
(d) Propeller Controls	HIGH RPM
(e) Throttle (Simulated Inoperative Engine)	IDLE
(f) Throttle (Other Engine)	MAX ALLOWABLE
(g) Airspeed	reduce approximately 1 knot per second until either V_{MCA} or STALL WARNING is obtained

CAUTIONS

Use rudder to maintain directional control (heading) and ailerons to maintain 5° bank towards the operative engine (lateral attitude). At the first sign of either V_{MCA} or stall warning (which may be evidenced by: Inability to maintain heading or lateral attitude, aerodynamic stall buffet, or stall warning horn) immediately initiate recovery; reduce power to idle on the operative engine, and immediately lower the nose to regain V_{SSE}.

One engine inoperative stalls are not recommended.

Under no circumstances should an attempt be made to fly at a speed below V_{MCA} with only one engine operating.

4.43 SIMULATED SINGLE ENGINE ZERO THRUST

To approximate single engine flight conditions without intentionally rendering an engine inoperative, use the following power settings to simulate zero thrust (feathered) conditions.

Mixture control (inop. engine) ....full rich
Propeller control (inop. engine) ....high RPM
Throttle (inop. engine)...............................adjust to achieve RPM listed below

ZERO THRUST

KTAS	RPM
80	1600
90	1800
100	2000
110	2200
120	2400
125	2500

Straight line variation between points.

BLANK PAGE

TABLE OF CONTENTS

SECTION 5

PERFORMANCE

BLANK PAGE

SECTION 5

PERFORMANCE

5.1 GENERAL

All of the required (FAA regulations) and complementary performance information applicable to the Chieftain is provided in this section.

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

The pilot should use the full Maximum Continuous Power rating of the engine when safety considerations so dictate.

5.3 INTRODUCTION - PERFORMANCE AND FLIGHT PLANNING

The performance information 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 airplane. This performance can, however, be duplicated by following the stated procedures in a properly maintained airplane.

Effects of conditions not considered on the charts, such as the effect of a soft or grass runway surface on takeoff and landing performance, or the effect of winds aloft on cruise and range performance, must be evaluated by the pilot. 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 in item 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.

5.5 FLIGHT PLANNING EXAMPLE

The following Flight Planning Example illustrates the correct utilization of pertinent data presented in this section of the manual.

(a) Associated Conditions

Certain basic information must be gathered when planning a flight. This information includes departure and destination airport conditions, en route conditions, and basic aircraft conditions. Such factors as weather, the status of the runway, the distance of the flight, the number of passengers, etc., must be determined. Assume, for example, the following conditions:

(1) Departure Airport Conditions	
Outside Air Temperature	17°C
Pressure Altitude	2000 ft.
Wind and Direction	15 kts at 360°
Runway Direction	300°
(2) Cruise Conditions	
Outside Air Temperature	-5°C
Pressure Altitude	10,000 ft.
En route Distance	800 naut. mi.
Power Setting	230 BHP (2300 RPM)
Mixture Setting	Best Economy
(3) Destination Airport Conditions	
Outside Air Temperature	20°C
Pressure Altitude	2000 ft.
Wind and Direction	10 kts at 330°
Runway Direction	270°
(4) Aircraft Configuration	
Basic Weight (assumed for example)	4200 lbs.
Fuel Tanks (total capacity)	192 gal.
Occupants	8 at 170 lbs. each
Baggage	240 lbs.

(b) Aircraft Loading

The airplane weight and center of gravity may be determined by utilizing the information given in 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 6-7. If any alterations to the airplane affecting weight and balance have been made, reference to the aircraft logbook, Weight and Balance Record (Figure 6-9) or latest FAA Major Repair or Alteration Form should be made to determine the current basic empty weight of the airplane.

Use the Weight and Balance Loading Chart (Figure 6-17) and the Weight, Moment and C.G. Limit graph (Figure 6-19) to determine the total weight of the airplane and the center of gravity position.

After proper utilization of the information provided, assume that the following weights have been determined for consideration in the Flight Planning Example:

(1)	Basic Weight (assumed for example)	4200 lbs.
(2)	Occupants (8 at 170 lbs. each)	1360 lbs.
(3)	Baggage	240 lbs.
(4)	Fuel (182 gal. at 6 lbs./gal.)	1092 lbs.
(5)	Ramp Weight (total of above)	6892 lbs.
(6)	Landing Weight (takeoff weight minus item (h), Total Fuel Required)	6030 lbs.

The landing weight cannot be determined until the weight of the fuel to be used has been established.

Ramp weight is below the approved maximum of 7045 lbs. Determine that weight and balance calculations have shown the C.G. position to be within the approved limits.

(c) Takeoff Distance

After determining the aircraft loading, all aspects of takeoff must be considered. Conditions of the departure airport and takeoff weight should be applied to the appropriate Takeoff Distance graph to determine the length of runway necessary. Takeoff conditions for the Flight Planning Example are listed below:

(1) Wind	15 kts at 360°
(2) Angle between Flight Path and Wind	360° -300° = 60°
(3) Head Wind Component (from Wind Component Graph, Figure 5-13)	8 kts
(4) Outside Air Temperature	17°C
(5) Pressure Altitude	2000 ft.

Using the Normal Takeoff over 50 Feet graph (Figure 5-15) the takeoff distances are as follows:

Total Distance	2740 ft.
Ground Run	1820 ft.

(d) Climb

Entering the example conditions of the departure airport and the cruise altitude into the Time, Fuel and Distance to Climb graph (Figure 5-25) yields the following:

(1) Time to Climb	9.0 - 1.5	= 7.5 minutes
(2) Fuel to Climb	55 - 10	= 45 lbs.
(3) Distance to Climb	20 - 3	= 17 naut. miles

NOTE

The effect of winds aloft must be considered by the pilot when computing climb, cruise and descent performances

(e) Descent

Entering the cruise and destination airport conditions into the Time, Distance and Fuel to Descend graph (Figure 5-51) yields the following:

(1) Time to Descend	20 - 4	= 16 minutes
(2) Distance to Descend	51 - 10	= 41 naut. miles
(3) Fuel to Descend	33 - 6	= 27 lbs.

(f) Cruise

Subtracting the previously calculated distance to climb and distance to descend figures from the total en route distance yields the total cruise distance. For example:

Cruise Distance
= En route Distance - Climb Distance - Descent Distance
= 800 - 17 - 41
= 742 naut. miles

The average cruise weight is estimated as:

Average Cruise Weight

$$= \text{Takeoff Wt.} - \frac{\text{En route Distance x Cruise Fuel Flow}}{\text{Cruise Airspeed at 7000 lbs. x 2}}$$

= 6492 lbs.

From the Cruise Performance Table (Figure 5-35) for 230 BHP (2300 RPM) Best Economy Mixture, the cruise airspeed is 184 kts at 6400 lbs.

From the same table, Fuel Flow is 30.8 gallons/hour (184.8 lbs./hr.).

Cruise time and fuel may be calculated by the following formula:

Cruise Time
= Cruise Distance/Cruise Speed
= 742/184
= 4.03 hours or 241.9 minutes

Cruise Fuel
= Fuel Flow x Cruise Time
= 184.8 x 4.03
= 745 lbs.

The above data can be used to calculate an average cruise weight in the following manner:

Average Cruise Weight

$$= \text{Takeoff Wt.} - \text{Ramp Fuel} - \text{Climb Fuel} - \frac{\text{Cruise Fuel}}{2}$$

$$= 6892-45-\frac{745}{2}$$

= 6430 lbs.

If the average cruise weight was found to be significantly different from the estimated cruise weight, the cruise airspeed would be changed to coincide with this weight by interpolating between the appropriate two aircraft weights. For example, had the average cruise weight been found to be 6600 lbs., then the cruise speed would be corrected to 183 kts.

(g) Total Flight Time

The total flight time is determined by adding the time to climb, cruise time, and time to descend. The following flight time is required for this Flight Planning Example:

Total Flight Time
= Time to Climb + Cruise Time + Time to Descend
= 7.5 + 241.9 + 16
= 265.4 minutes

(h) Total Fuel Required

Determine the total fuel required by adding fuel for taxi and takeoff, fuel to climb, cruise fuel, and fuel to descend. When the total fuel (in pounds) is determined, dividing this value by 6 lbs./gal. will give the total fuel in gallons to be used for the flight. Total fuel calculations for the Flight Planning Example are shown below:

Total Fuel Required
= Fuel for taxi and takeoff + Fuel to Climb + Cruise Fuel + Fuel to Descend
= 45 + 45 + 745 + 27
= 862 lbs. (143.6 gallons)

(i) Landing Distance

Subtracting the total fuel required from the takeoff weight of the airplane gives the landing weight:

Landing Weight
= Takeoff Weight - Total Fuel Required
= 6892 - 862
= 6030 lbs.

Destination airport conditions applied to the Wind Component graph (Figure 5-13) gives the following headwind component for the Flight Planning Example:

The angle between the flight path and wind is 330° -270° or 60°
Therefore, the Head Wind Component is 5 kts.

From the Landing Distance over 50 Feet graph (Figure 5-55), with the destination airport conditions, the distances required for landing for the Flight Planning Example are as follows:

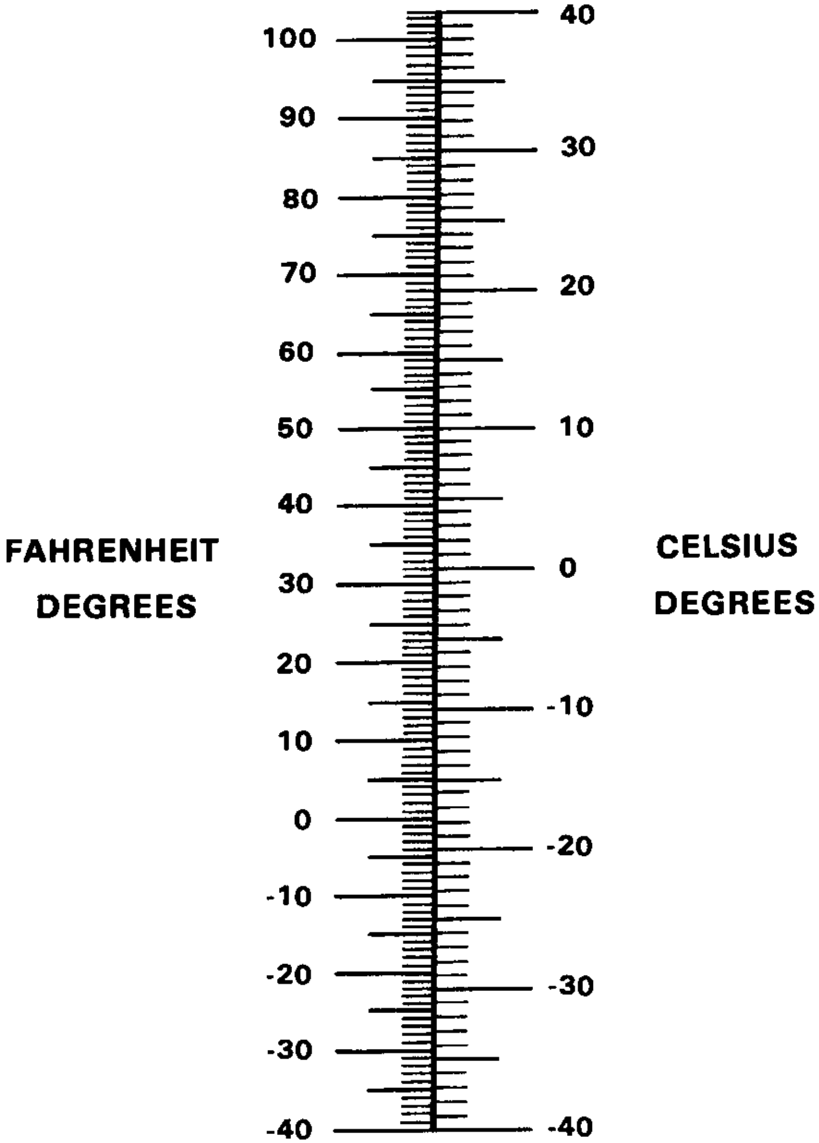
(1)	Total Distance	1600 ft.
(2)	Ground Roll	750 ft.

THIS PAGE INTENTIONALLY LEFT BLANK

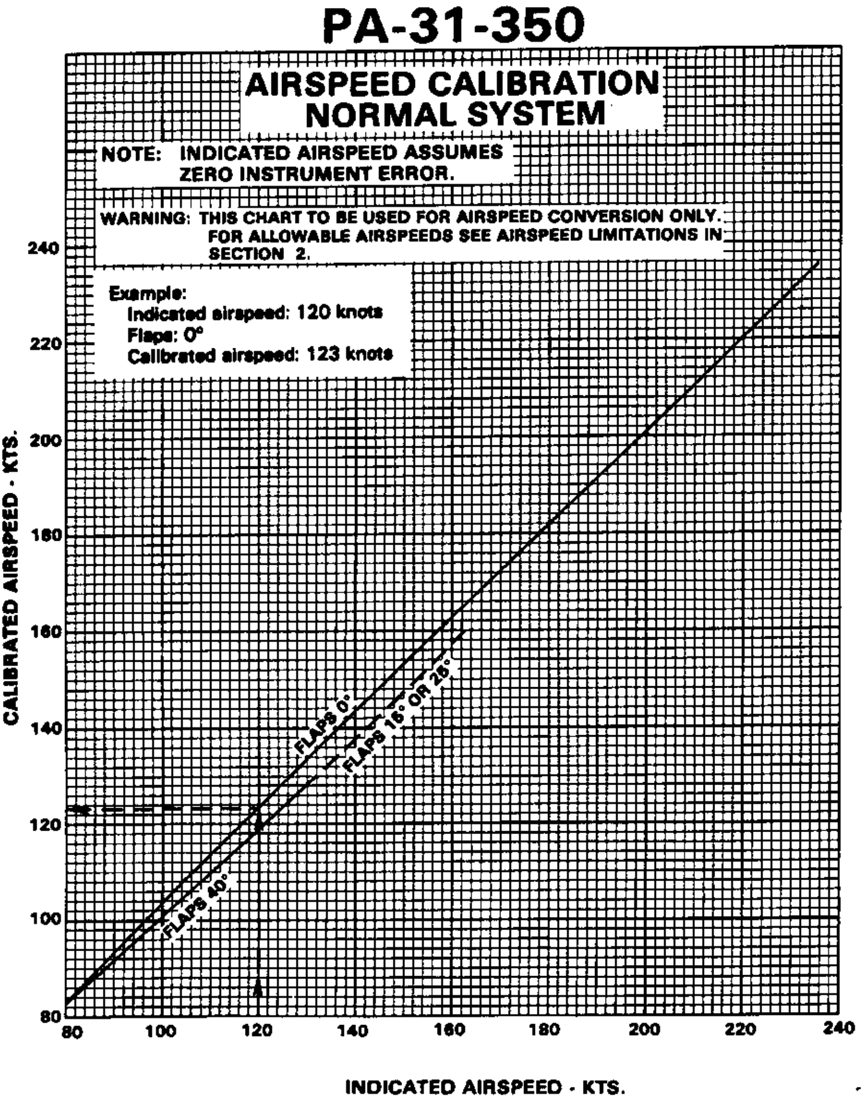
5.7 PERFORMANCE GRAPHS

LIST OF FIGURES

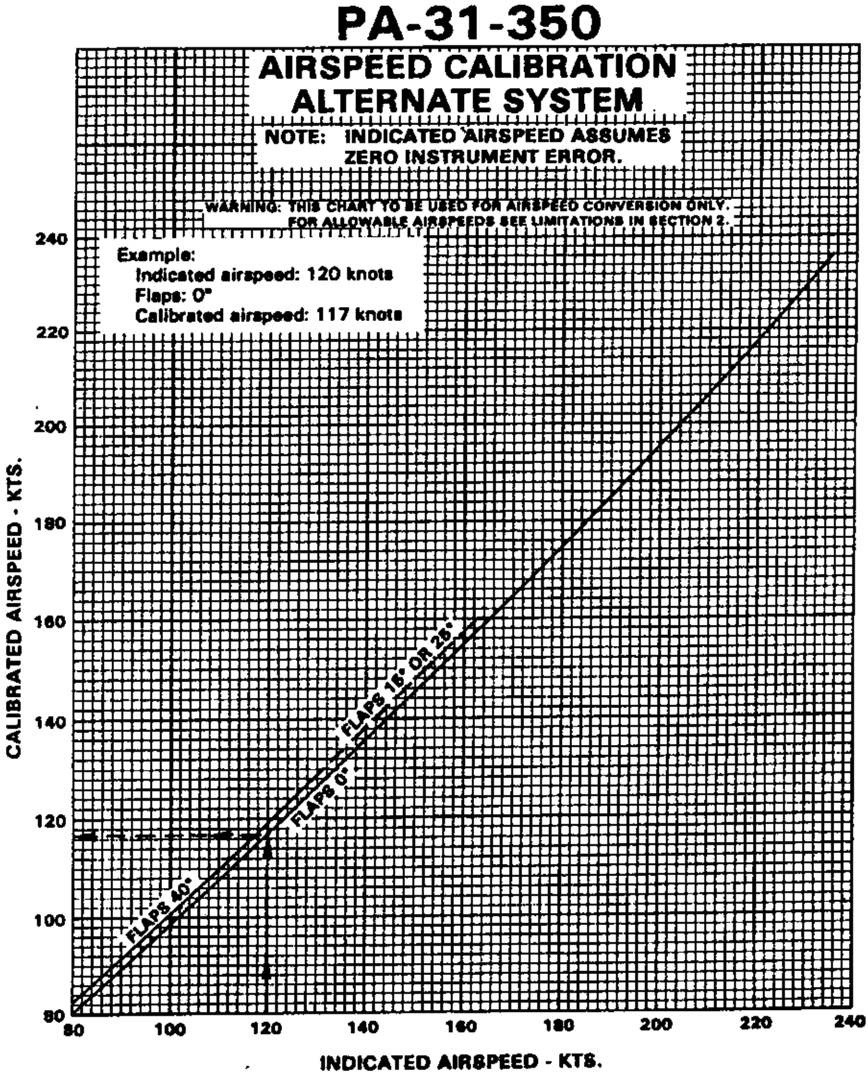
THIS PAGE INTENTIONALLY LEFT BLANK



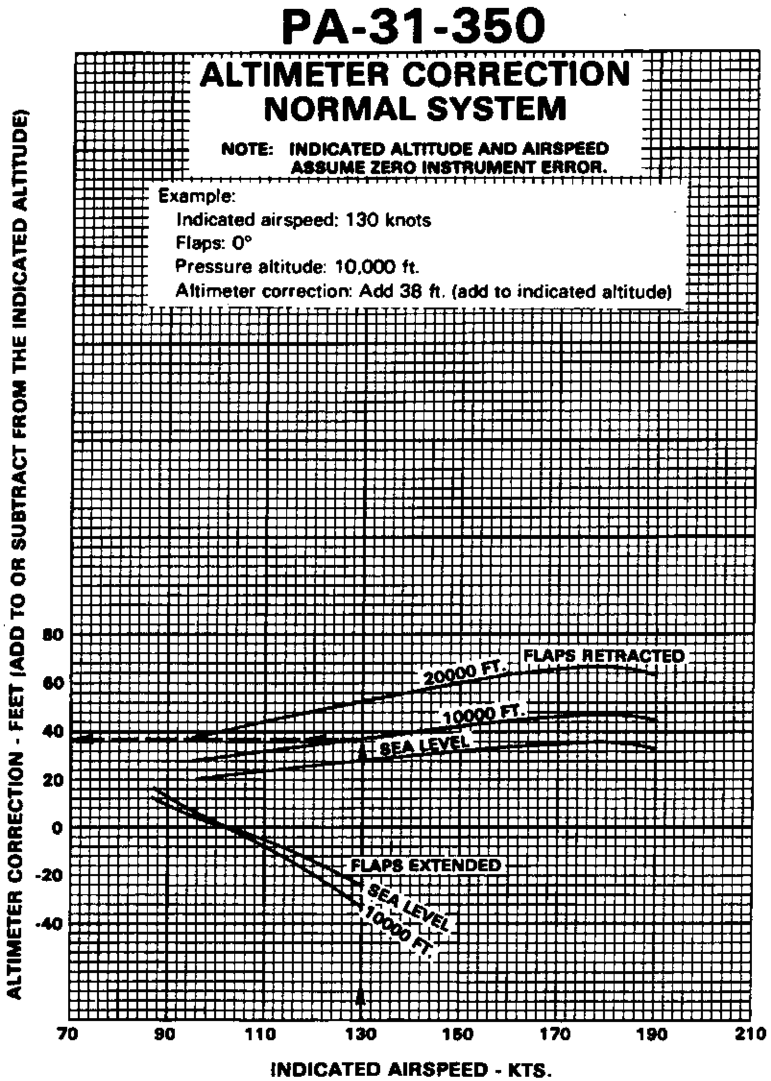
TEMPERATURE CONVERSION
Figure 5-1



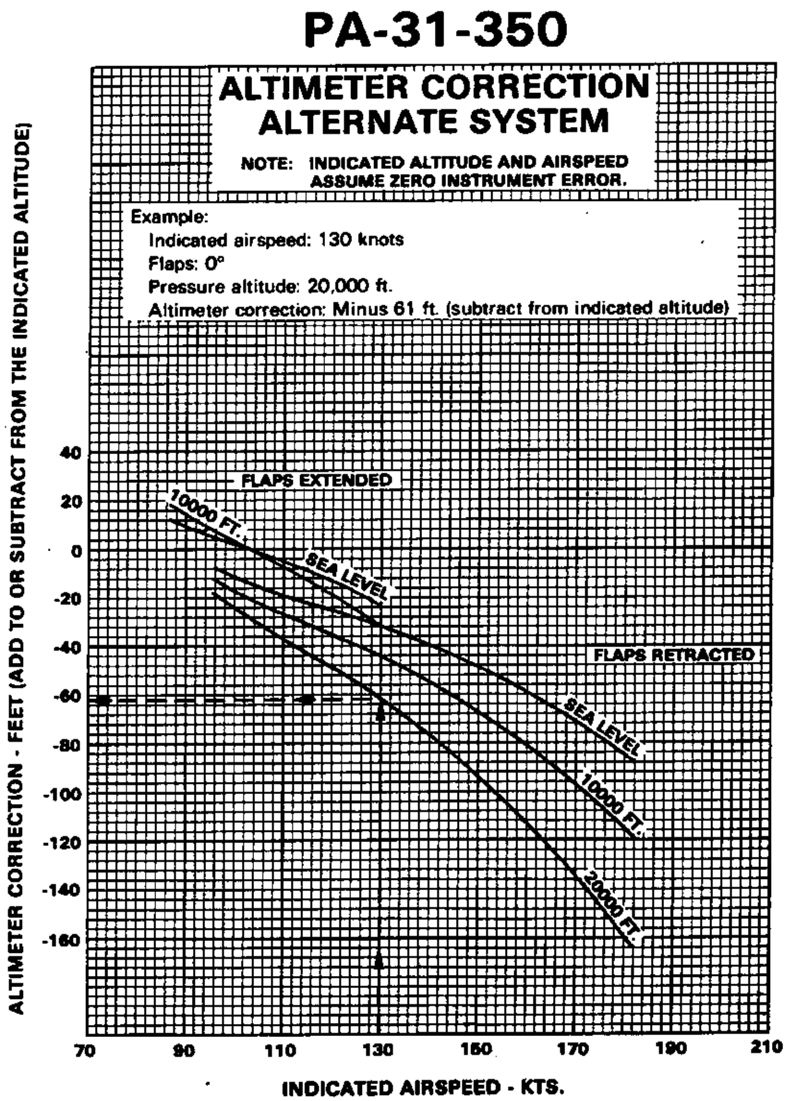
AIRSPEED CALIBRATION - NORMAL SYSTEM
Figure 5-3



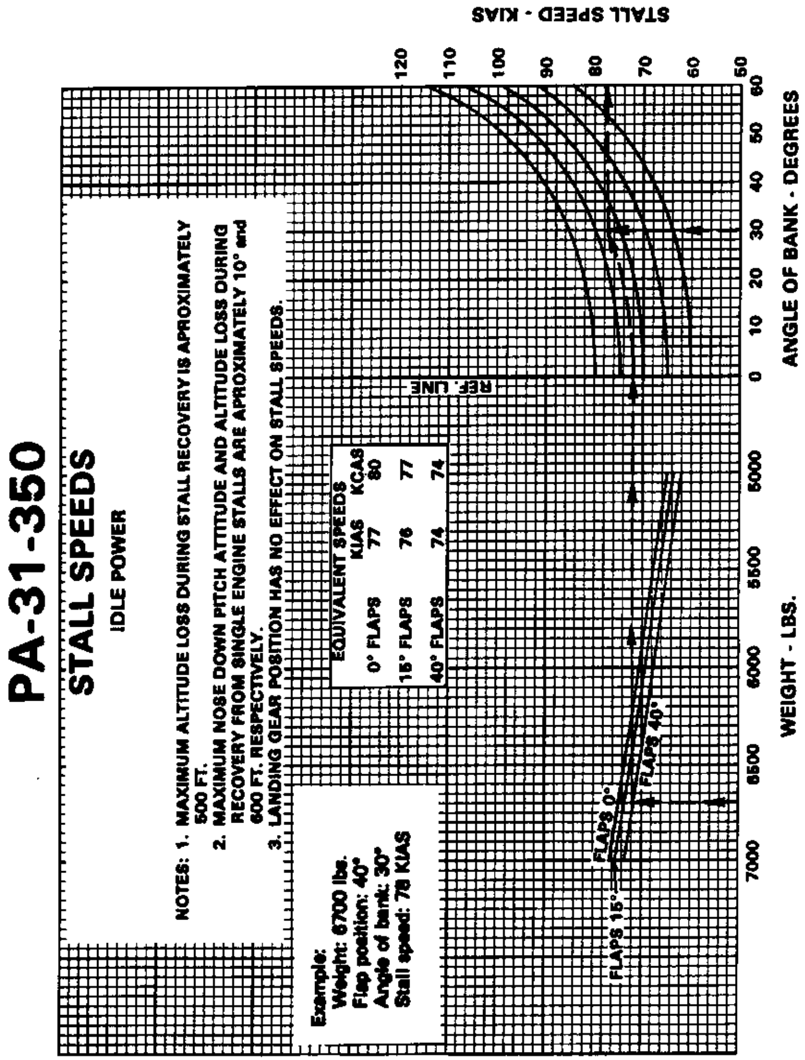
AIRSPEED CALIBRATION - ALTERNATE SYSTEM
Figure 5-5



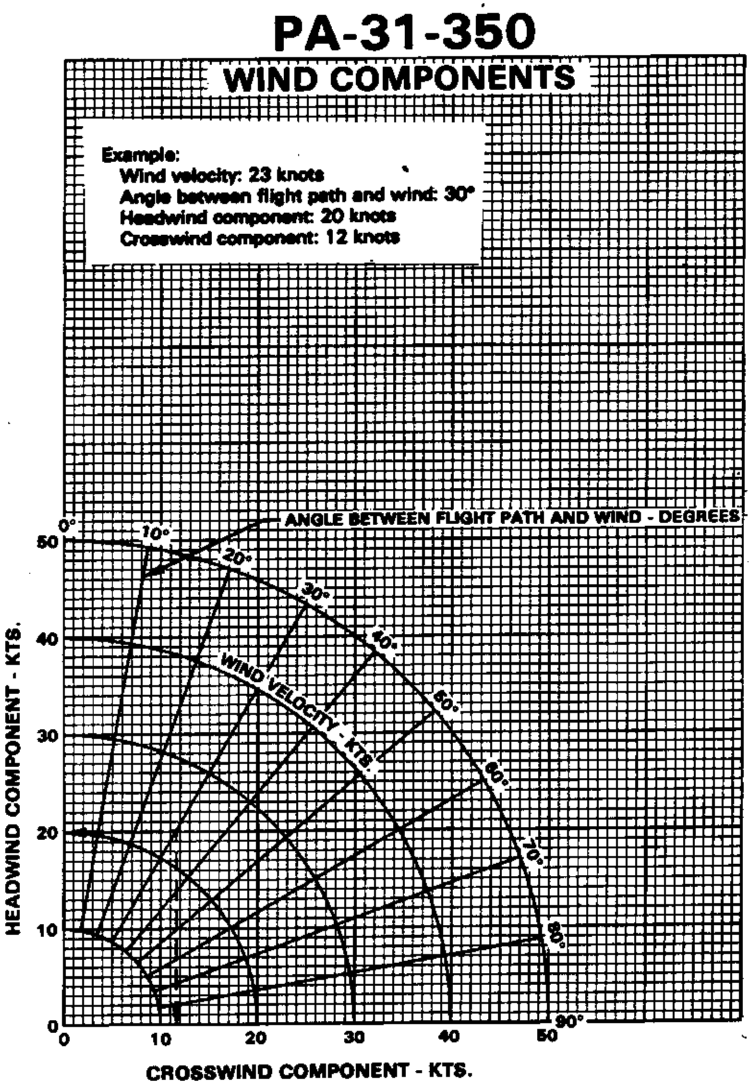
ALTIMETER CORRECTION - NORMAL SYSTEM
Figure 5-7



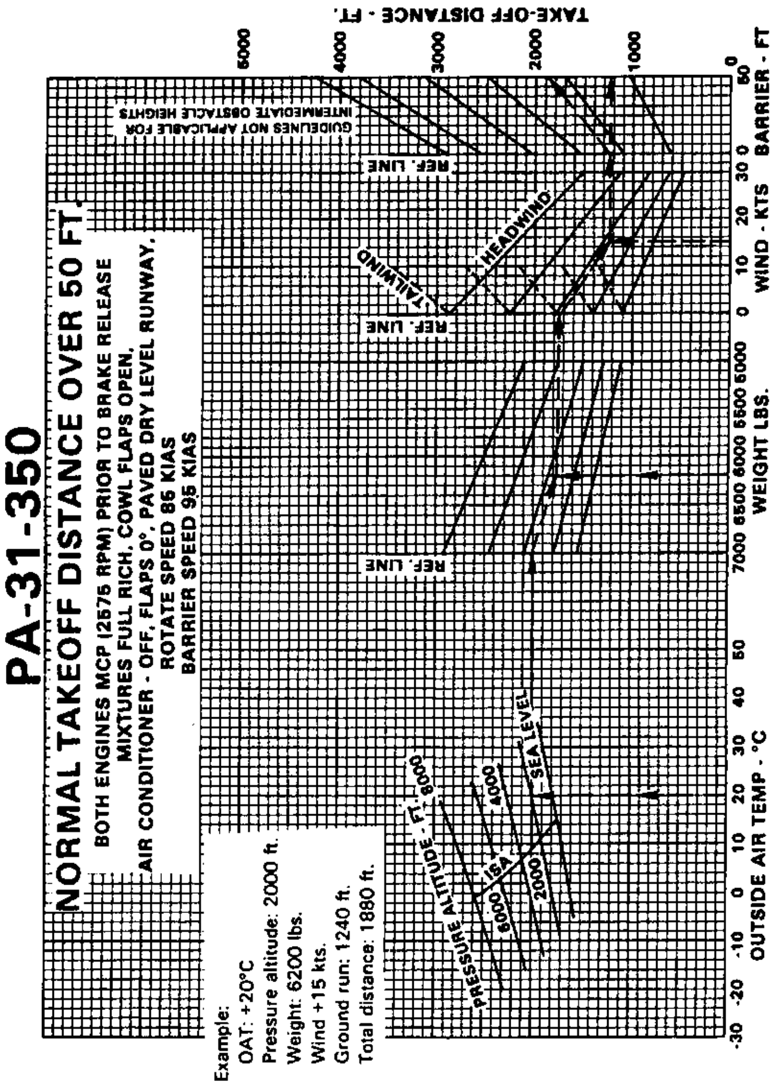
ALTIMETER CORRECTION - ALTERNATE SYSTEM
Figure 5-9



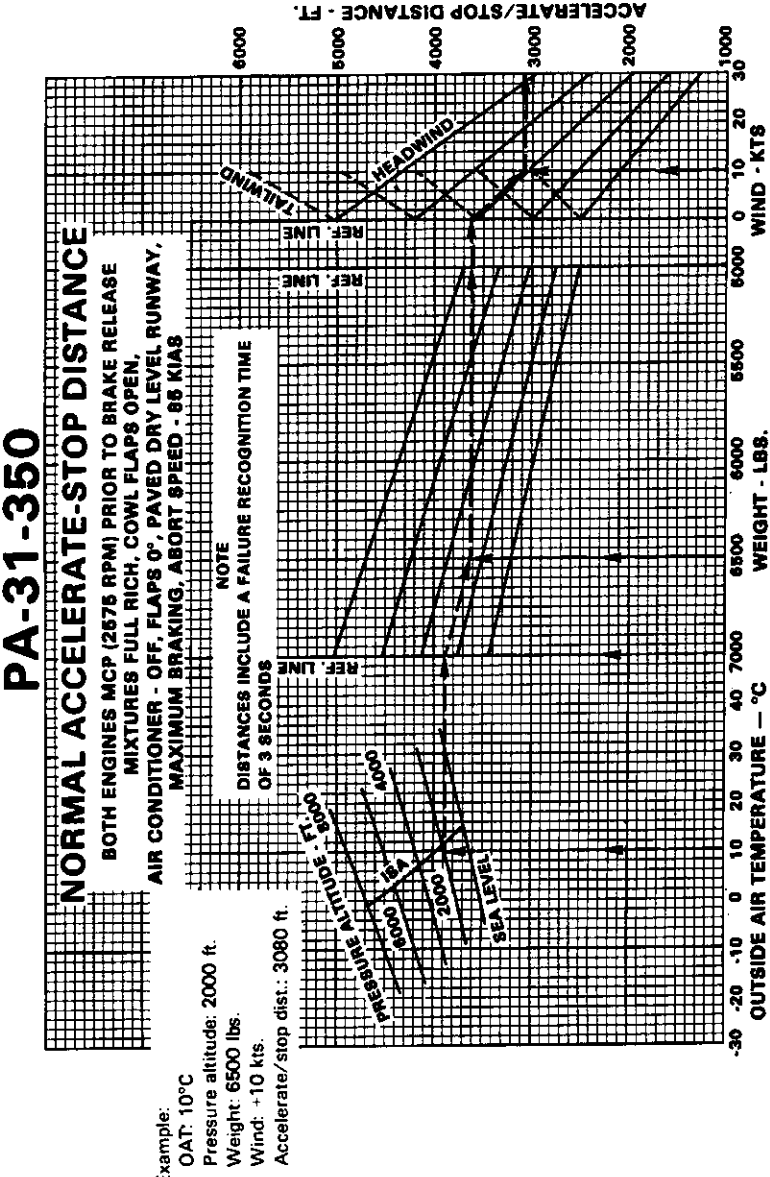
STALL SPEEDS
Figure 5-11



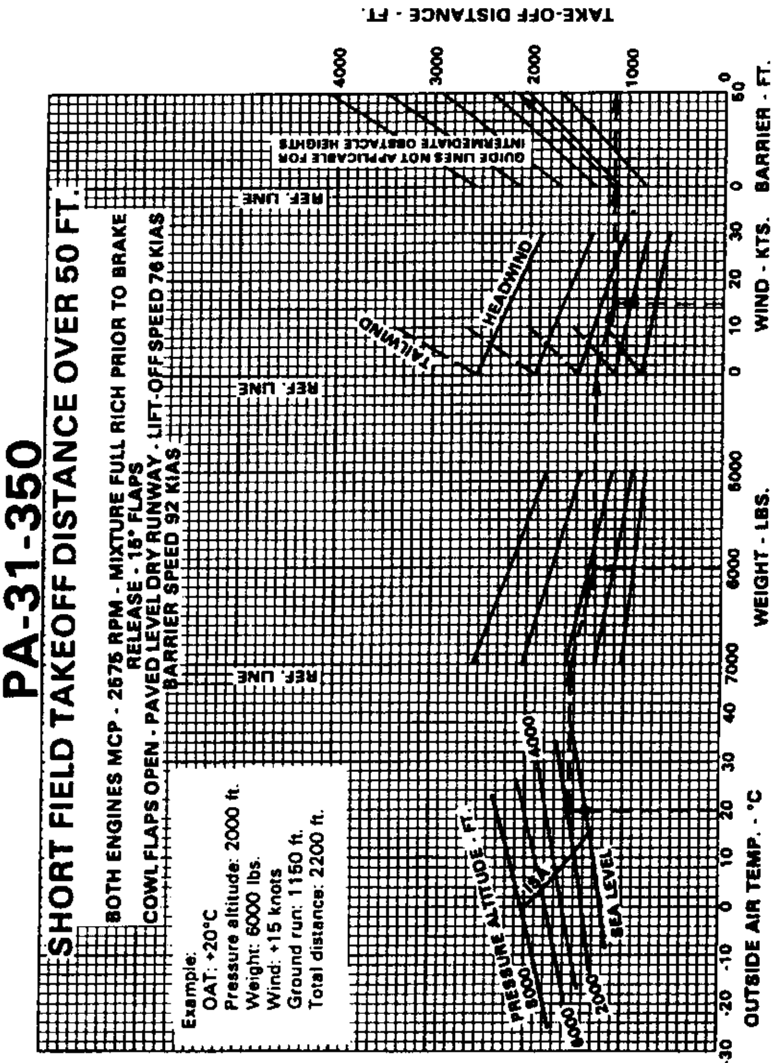
WIND COMPONENTS
Figure 5-13



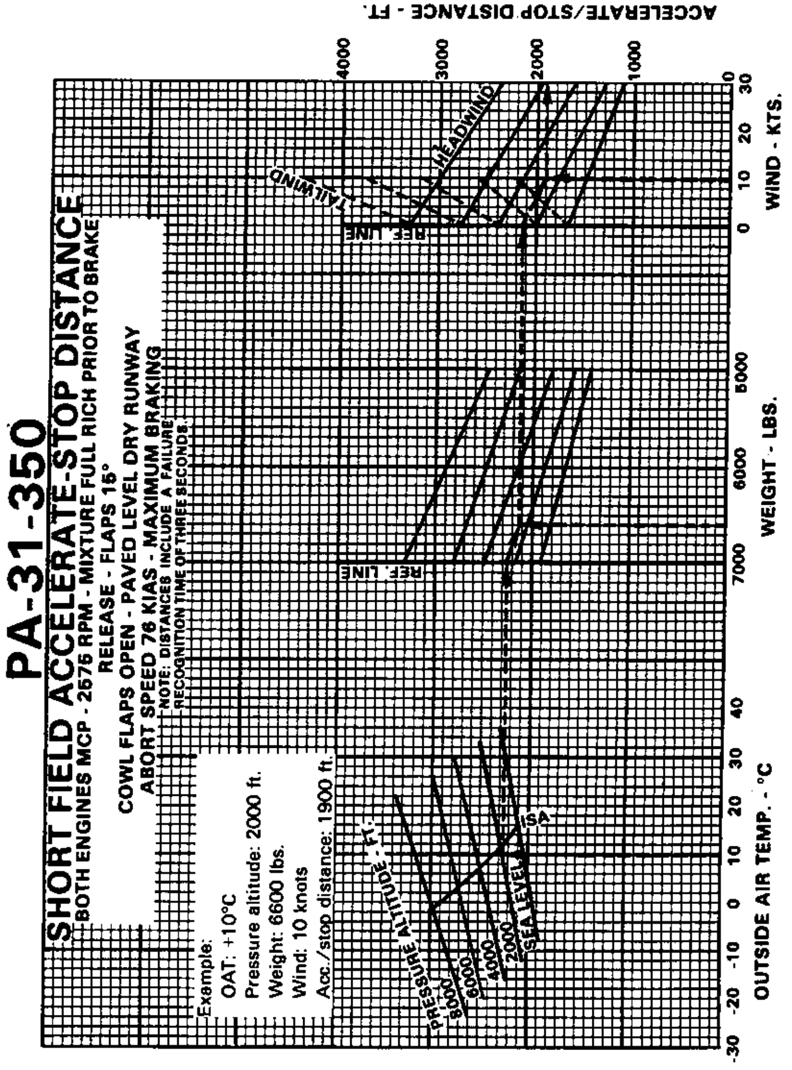
NORMAL TAKEOFF DISTANCE OVER 50 FEET
Figure 5-15



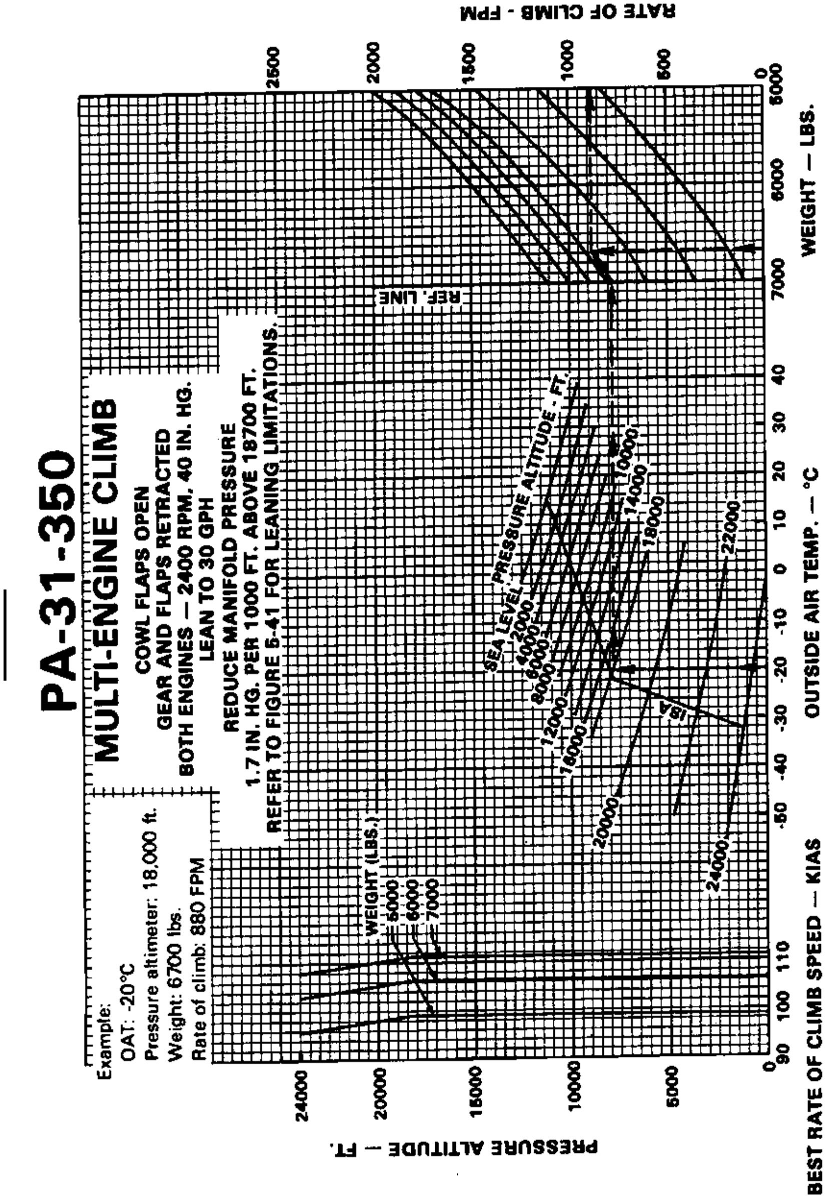
NORMAL ACCELERATE-STOP DISTANCE
Figure 5-17



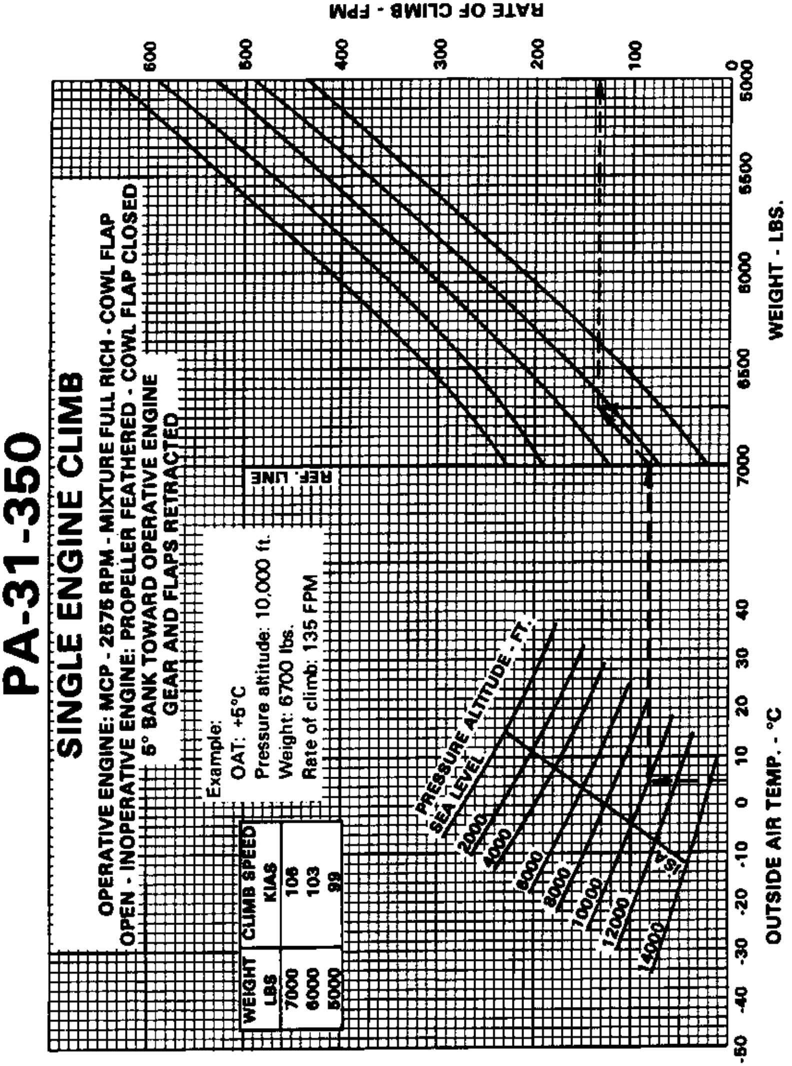
SHORT FIELD TAKEOFF DISTANCE OVER 50 FEET
Figure 5-18



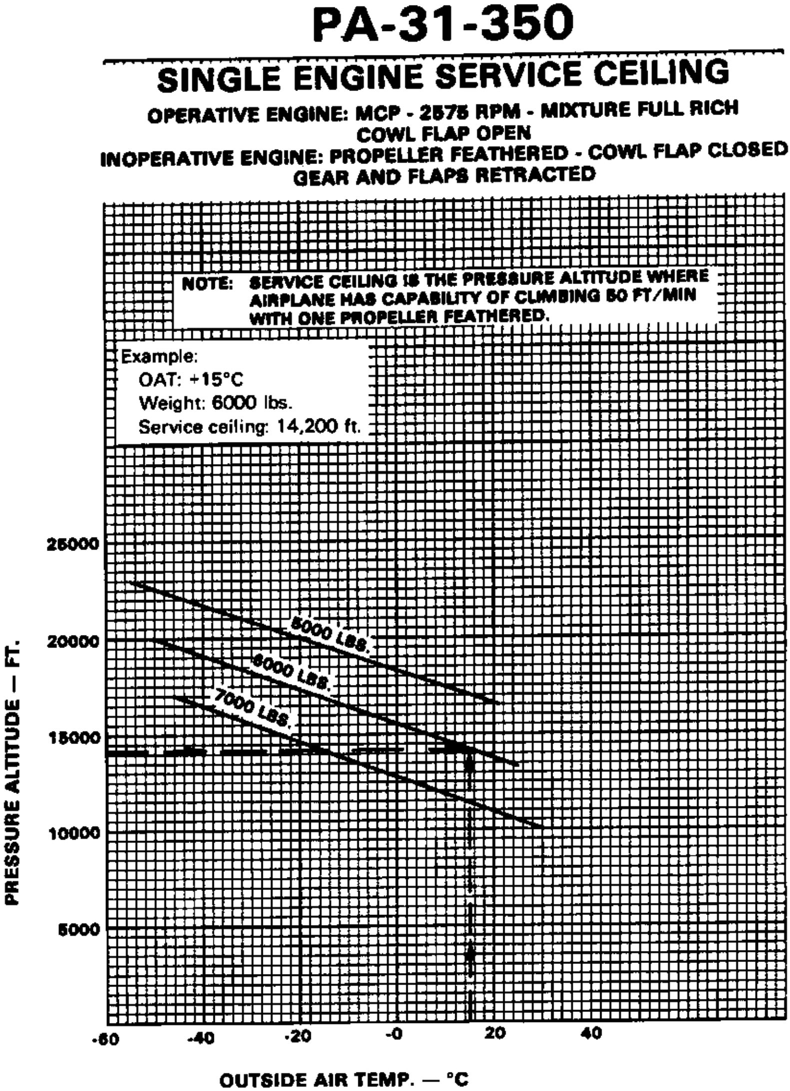
SHORT FIELD ACCELERATE-STOP DISTANCE
Figure 5-18a



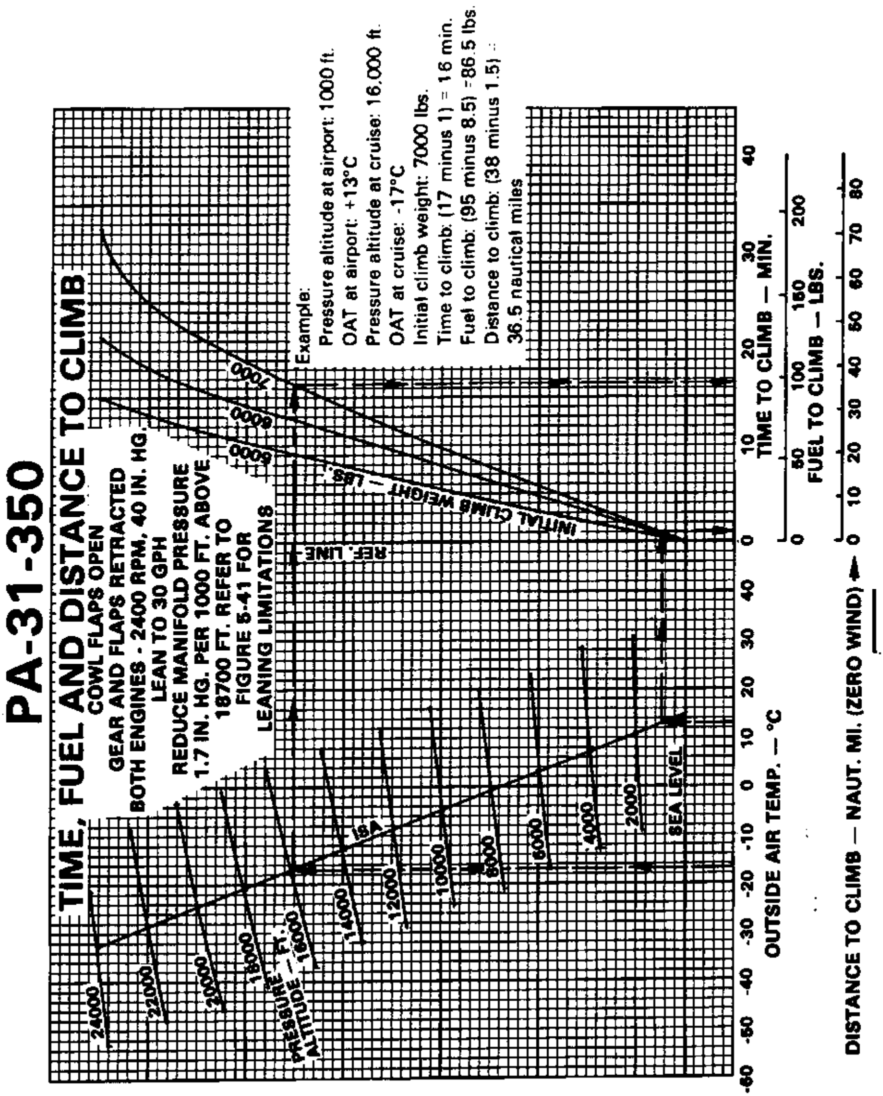
MULTI-ENGINE CLIMB
(Maximum Normal Operating Power)
Figure 5-19



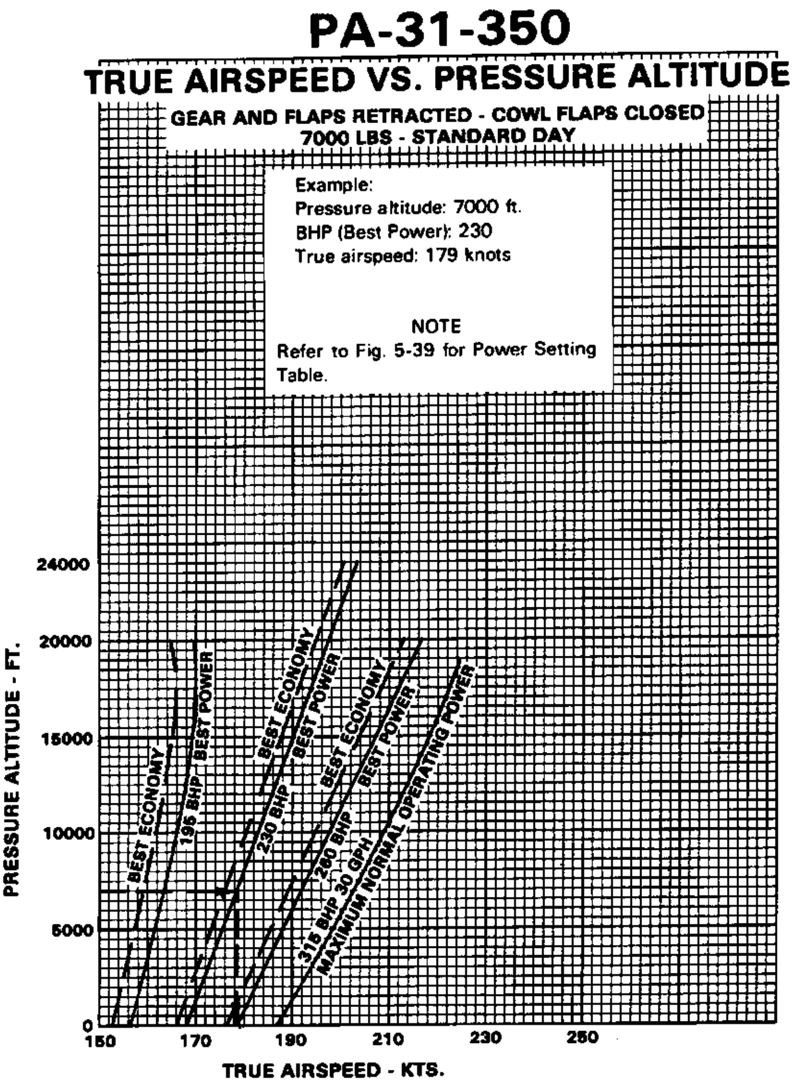
SINGLE-ENGINE CLIMB
Figure 5-21



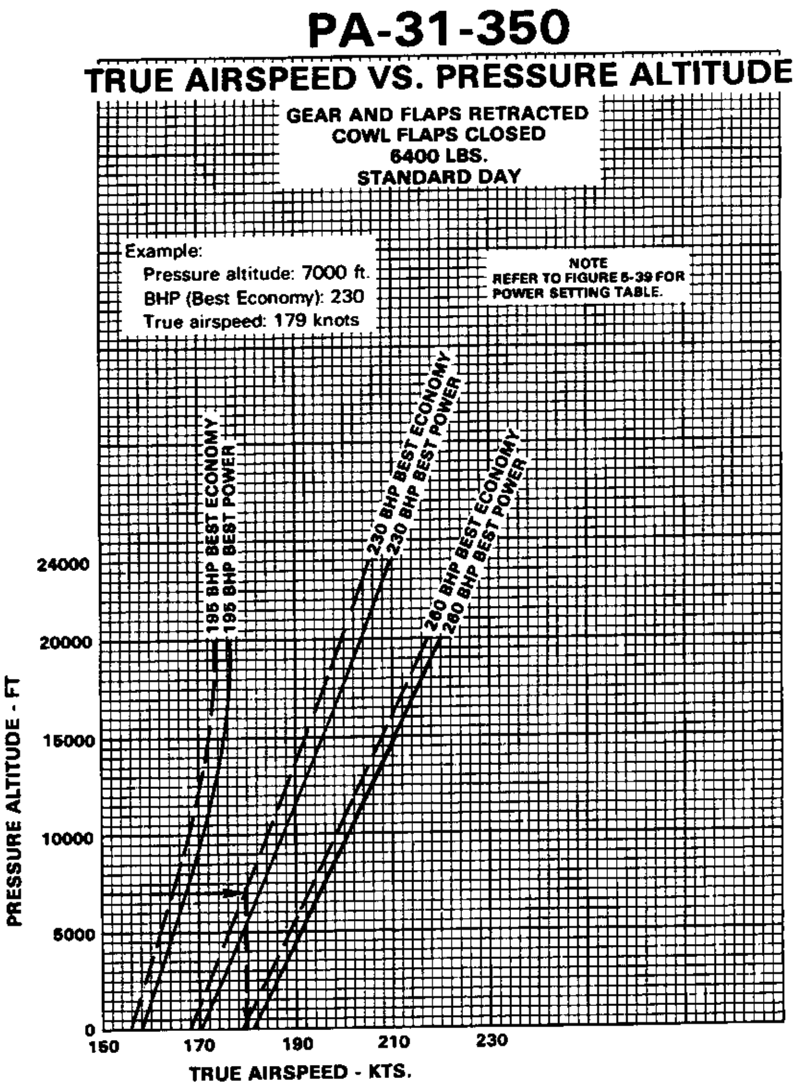
SINGLE-ENGINE SERVICE CEILING
Figure 5-23



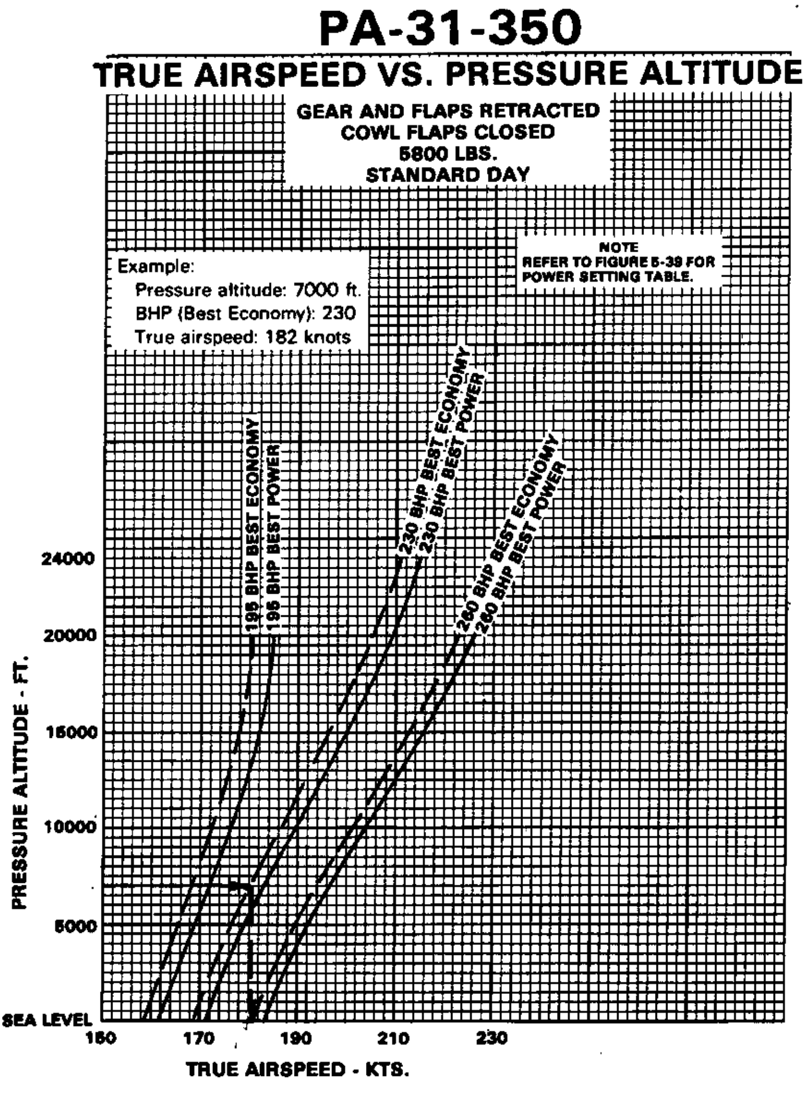
TIME, FUEL, AND DISTANCE TO CLIMB
(Maximum Normal Operating Power)
Figure 5-25



TRUE AIRSPEED VS. PRESSURE ALTITUDE (7000 LBS.)
Figure 5-27



TRUE AIRSPEED VS. PRESSURE ALTITUDE (6400 LBS.)
Figure 5-29



TRUE AIRSPEED VS. PRESSURE ALTITUDE (5800 LBS.)
Figure 5-31

	Pressure Altitude Feet	OAT °C	Fuel Flow GPH Total B.P./B.E.	Cruise True Airspeed - Kts. 7000 Lbs. Best Power	7000 Lbs. Best Economy	6400 Lbs. Best Power	6400 Lbs. Best Economy	5800 Lbs. Best Power	5800 Lbs. Best Economy
ISA + 20° C	SL	35.0	32.6/26.3	158	155	162	159	165	162
	5000	25.1	32.6/26.3	162	159	167	164	172	169
	10000	15.2	32.6/26.3	167	163	172	170	177	175
	15000	5.3	32.6/26.3	171	167	176	173	182	179
ISA	SL	15.0	32.6/26.3	156	153	159	156	162	159
	5000	5.1	32.6/26.3	161	158	165	163	169	166
	10000	-4.8	32.6/26.3	165	162	170	168	175	172
	15000	-14.7	32.6/26.3	169	166	175	172	181	178
	20000	-24.6	32.6/26.3	169	165	177	173	184	181
ISA - 20° C	SL	-5.0	32.6/26.3	153	151	156	154	159	157
	5000	-14.9	32.6/26.3	158	155	162	159	166	163
	10000	-24.8	32.6/26.3	163	160	168	165	172	169
	15000	-34.7	32.6/26.3	167	164	173	170	178	175
	20000	-44.6	32.6/26.3	171	166	176	173	182	179

CRUISE PERFORMANCE - 195 BHP - 2200 RPM (Approx. 55%)

Figure 5-33

	Pressure Altitude Feet	OAT °C	Fuel Flow GPH Total B.P./B.E.	Cruise True Airspeed - Kts.					
				7000 Lbs.		6400 Lbs.		5800 Lbs.	
				Best Power	Best Economy	Best Power	Best Economy	Best Power	Best Economy
ISA + 20° C	SL	35.0	38.2/30.8	171	169	174	171	176	174
	5000	25.1	38.2/30.8	179	177	182	179	185	183
	10000	15.2	38.2/30.8	187	184	191	188	195	191
	15000	5.3	38.2/30.8	195	191	199	196	204	200
	20000	-4.6	38.2/30.8	202	198	207	204	213	208
	24000	-12.6	38.2/30.8	206	202	213	210	219	215
ISA	SL	15.0	38.2/30.8	168	166	170	168	172	170
	5000	5.1	38.2/30.8	176	173	179	176	181	178
	10000	-4.8	38.2/30.8	184	181	187	184	190	187
	15000	-14.7	38.2/30.8	192	188	196	192	200	196
	20000	-24.6	38.2/30.8	199	195	204	200	209	205
	24000	-32.5	38.2/30.8	204	201	210	206	215	211
ISA - 20° C	SL	-5.0	38.2/30.8	163	161	165	163	167	165
	5000	-14.9	38.2/30.8	172	170	175	173	177	175
	10000	-24.8	38.2/30.8	180	177	183	180	186	183
	15000	-34.7	38.2/30.8	187	184	192	189	195	192
	20000	-44.6	38.2/30.8	195	192	200	197	205	201
	24000	-52.5	38.2/30.8	201	197	206	203	211	208

CRUISE PERFORMANCE - 230 BHP - 2300 RPM (Approx. 65%)
Figure 5-35

	Pressure Altitude Feet	OAT °C	Fuel Flow GPH Total B.P./B.E.	Cruise True Airspeed - Kts. 7000 Lbs. Best Power	7000 Lbs. Best Economy	6400 Lbs. Best Power	6400 Lbs. Best Economy	5800 Lbs. Best Power	5800 Lbs. Best Economy
ISA + 20° C	SL	35.0	43.6/35.3	183	181	185	183	188	186
	5000	25.1	43.6/35.3	193	191	195	193	198	196
	10000	15.2	43.6/35.3	202	200	205	203	208	206
	15000	5.3	43.6/35.3	212	209	215	213	219	217
ISA	SL	15.0	43.6/35.3	179	177	181	179	183	181
	5000	5.1	43.6/35.3	188	186	191	188	193	191
	10000	-4.8	43.6/35.3	198	196	201	199	204	202
	15000	-14.7	43.6/35.3	208	205	211	208	215	212
	20000	-24.6	43.6/35.3	217	214	221	218	225	223
ISA - 20° C	SL	-5.0	43.6/35.3	174	172	176	174	178	176
	5000	-14.9	43.6/35.3	184	182	186	184	189	186
	10000	-24.8	43.6/35.3	193	191	196	194	199	197
	15000	-34.7	43.6/35.3	203	201	206	203	210	207
	20000	-44.6	43.6/35.3	212	210	216	213	220	217

CRUISE PERFORMANCE - 260 BHP - 2400 RPM (Approx. 75%)
Figure 5-37

POWER SETTING TABLE

LYCOMING MODEL LTIO AND TIO-540-J2BD ENGINES

P.A. Alt. Ft.	Std. Temp. ° F	195 BHP (Approx. 55%) RPM & M.P.			230 BHP (Approx. 65%) RPM & M.P.			260 BHP (Approx. 75%) RPM & M.P	P.A. Alt. Ft.
		2200	2300	2400	2200	2300	2400	2400	
S.L.	59	27.2	26.6	26.0	31.5	30.7	29.9	33.7	S.L.
5000	41	26.6	25.7	24.8	31.2	30.1	29.0	33.3	5000
10000	23	26.0	25.0	24.0	31.1	29.8	28.5	33.0	10000
15000	5	25.9	24.8	23.8	31.2	29.7	28.3	33.2	15000
18000	- 5	25.9	24.6	23.8	31.4	29.8	28.2	33.3	18000
20000	-13	25.8	24.7	23.6	31.5	29.9	28.3	33.8	20000
22000	-20	—	—	—	31.6	30.2	28.7	—	22000
24000	-27	—	—	—	—	30.5	29.0	—	24000

1. To maintain constant power, correct manifold pressure approximately 1% MAP for each 10°F variation in induction air temperature from standard altitude temperature. Add manifold pressure for air temperatures above standard; subtract for temperatures below standard. Observe maximum allowable manifold pressure limitations, see maximum manifold pressure limitation chart.
2. Maximum Normal Operating Power 2400 RPM at 40.0 IN. HG. to 18,700 feet (permissible to lean to 1500° EGT or 30 GPH fuel flow, whichever occurs first, provided cylinder head temperatures (475°) and oil temperatures (245°) remain within limits). Above 18,700 feet maintain maximum allowable manifold pressure (turbine speed limit).

POWER SETTING TABLE
Figure 5-39

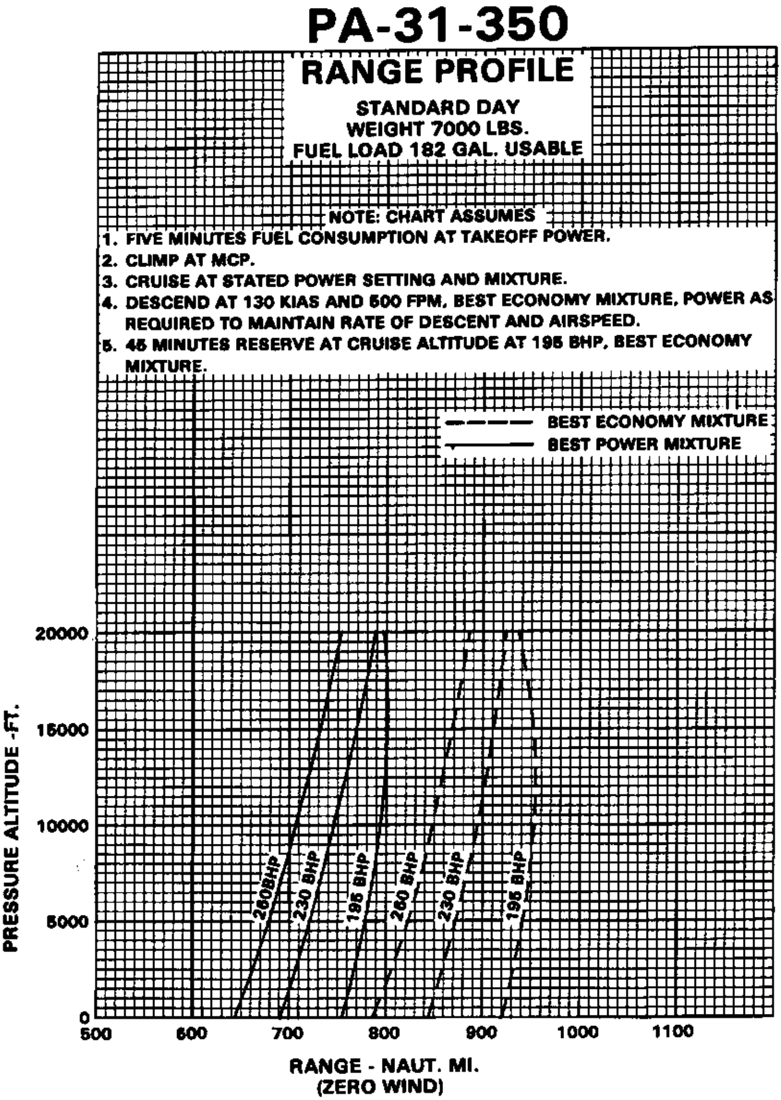
LEANING - MAXIMUM NORMAL OPERATING POWER -2400 RPM

LIMITS - DO NOT EXCEED

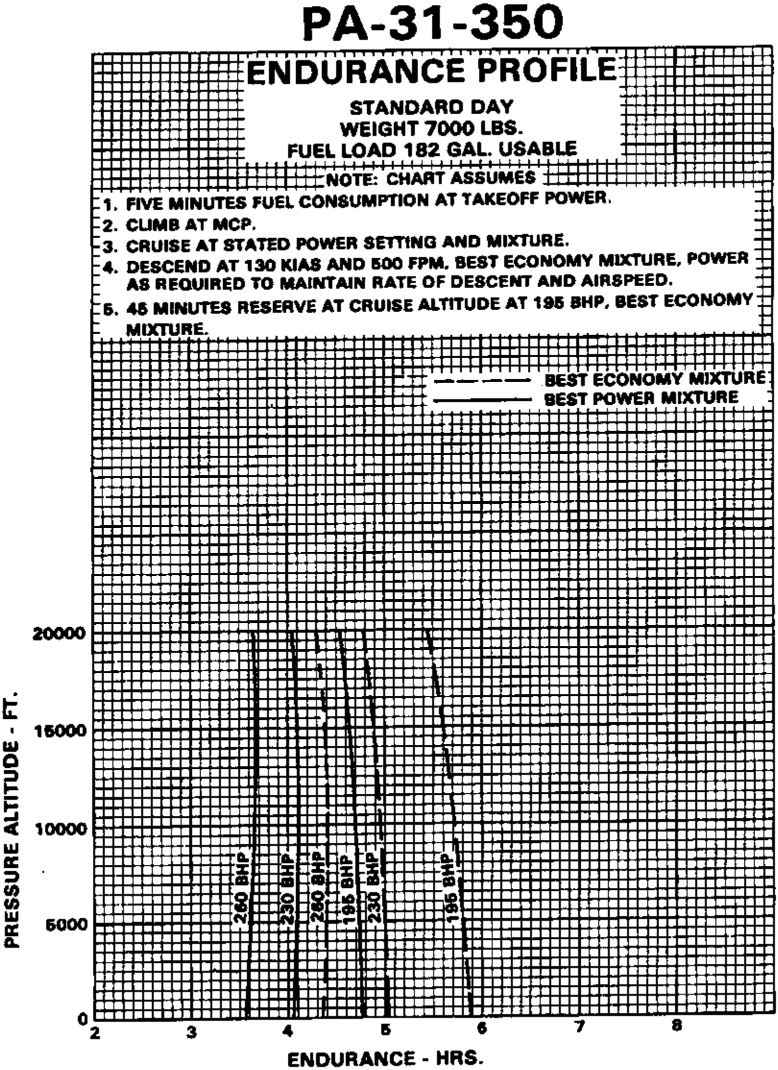
Alt.	MP	FF	EGT	CHT
SL	40.0	30	1500	475
8,000	40.0	30	1500	475
10,000	40.0	30	1500	475
12,000	40.0	30	1500	475
14,000	40.0	30	1500	475
16,000	40.0	30	1500	475
18,000	40.0	30	1500	475
18,700	40.0	30	1500	475
20,000	37.7		1500	475
22,000	34.3		1500	475
24,000	31.0		1500	475

Note that a minimum fuel flow of 30 GPH must be maintained through 18,700 feet, then EGT limit can be used as a guide for leaning which should result in less than 30 GPH fuel flow.

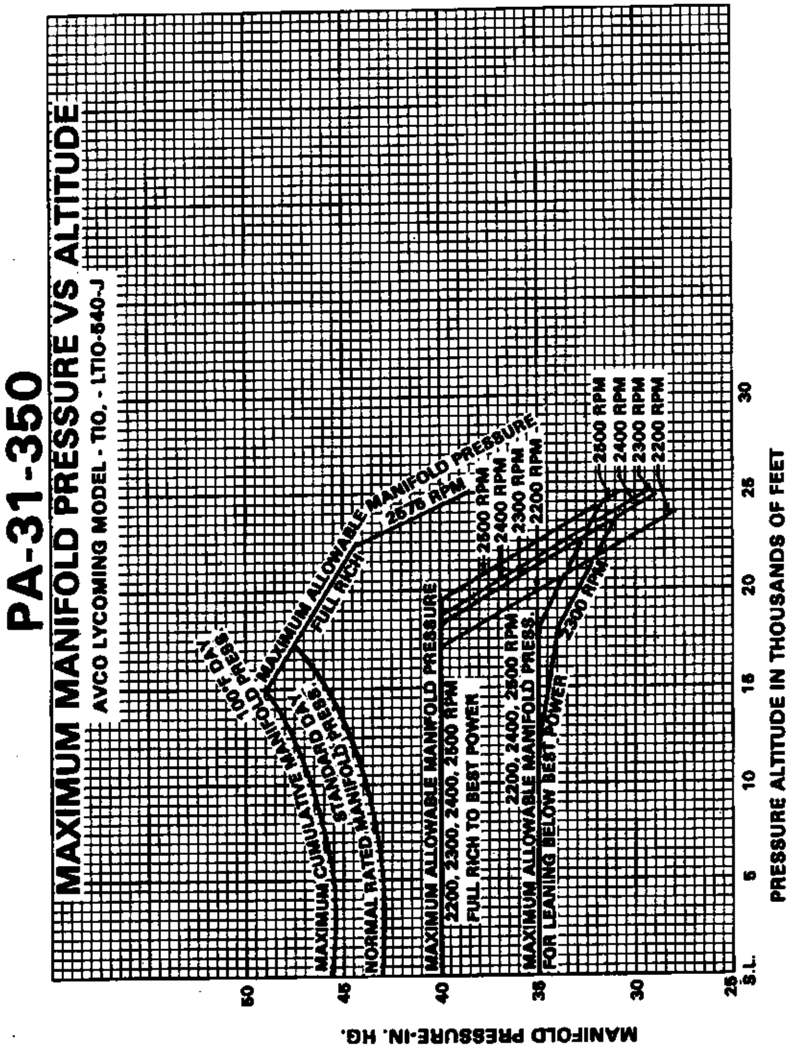
LEANING - MAXIMUM NORMAL OPERATING POWER - 2400 RPM
Figure 5-41



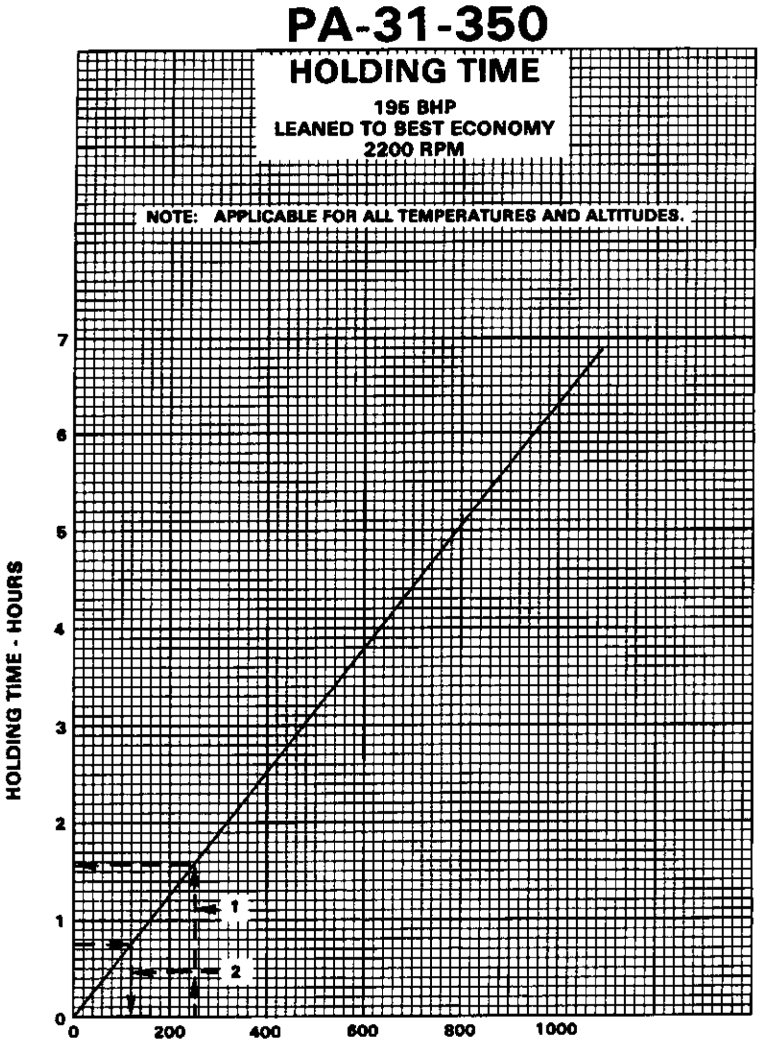
RANGE PROFILE
Figure 5-43



ENDURANCE PROFILE
Figure 5-45



MAXIMUM MANIFOLD PRESSURE VS. ALTITUDE
Figure 5-47

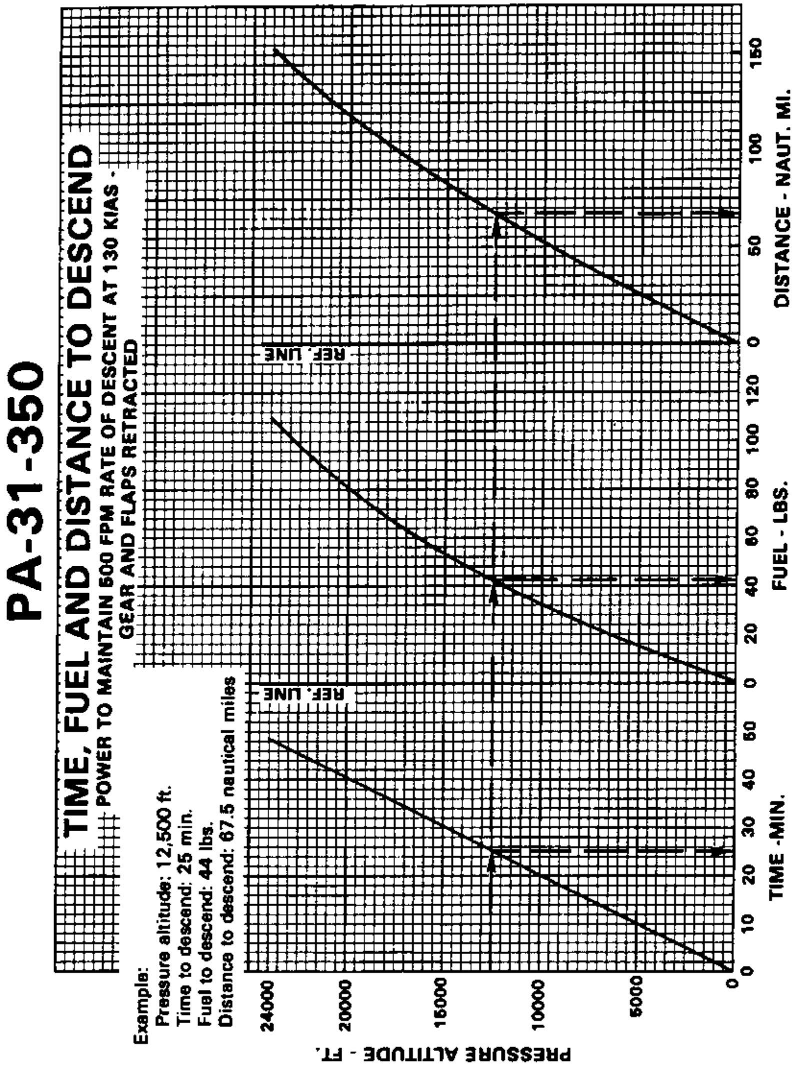


Examples:

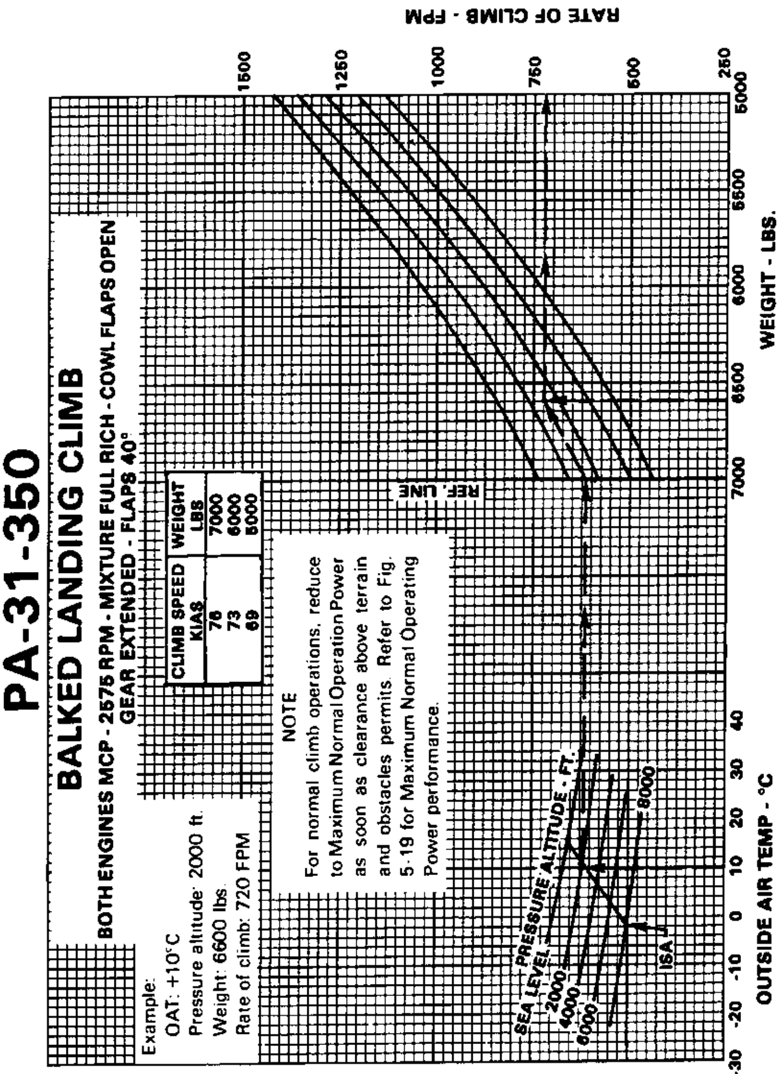
1. Fuel available for holding: 250 lbs.
   Holding time: 1:33 hours

2. Required holding time: 45 min.
   Fuel required: 120 lbs.

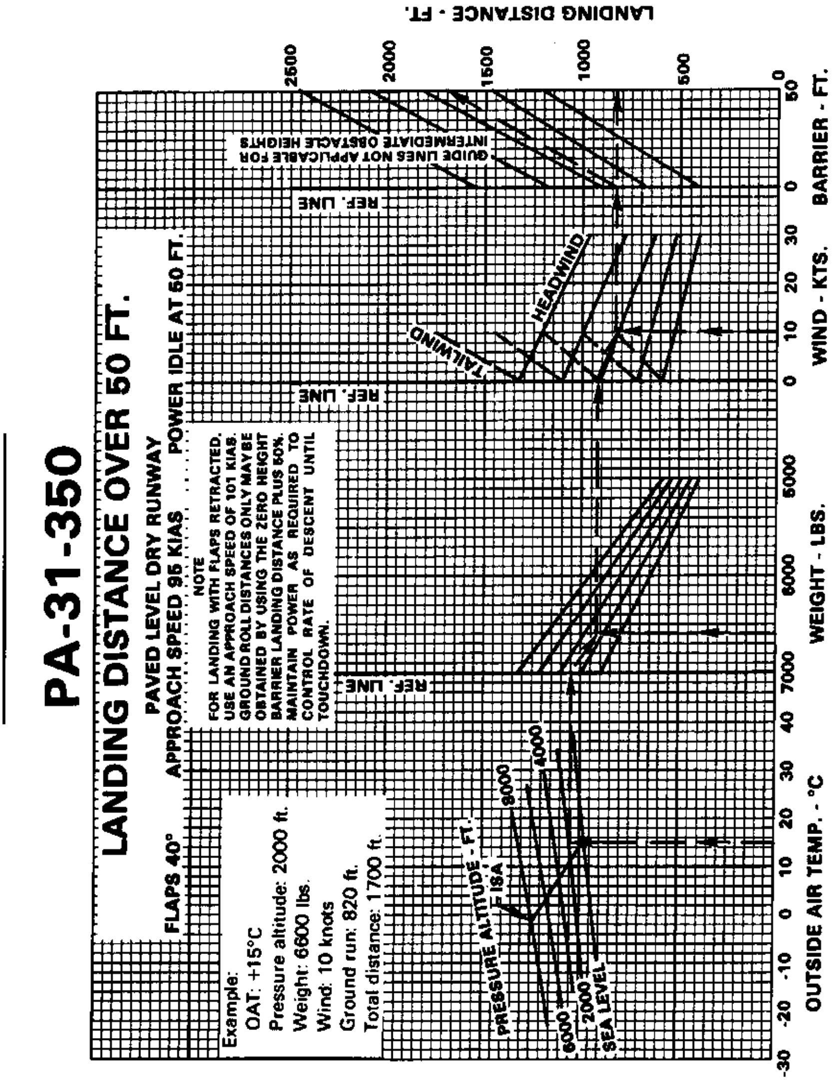
HOLDING TIME
Figure 5-49



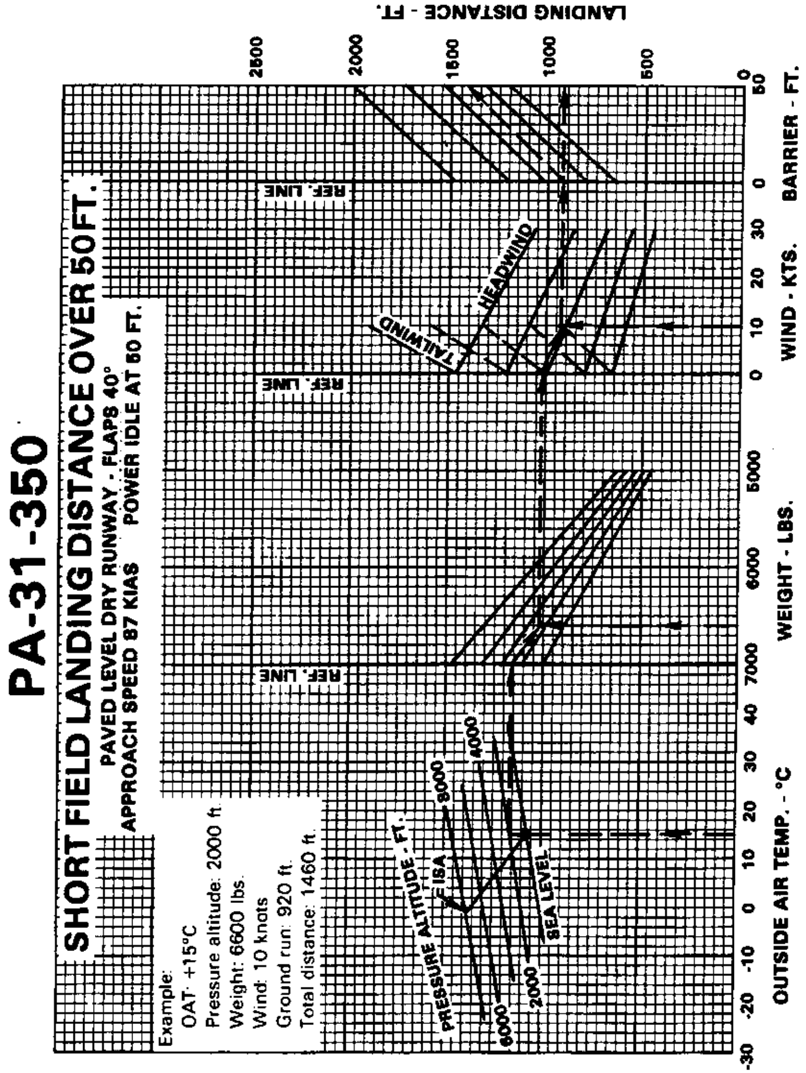
TIME, FUEL AND DISTANCE TO DESCEND
Figure 5-51



BALKED LANDING CLIMB
(Maximum Continuous Power)
Figure 5-53



LANDING DISTANCE OVER 50 FEET
Figure 5-55



SHORT FIELD LANDING DISTANCE OVER 50 FEET
Figure 5-57

BLANK PAGE

TABLE OF CONTENTS

SECTION 6

WEIGHT AND BALANCE

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

BLANK PAGE

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 a flexibility of loading, it cannot be flown with the maximum number of adult passengers, full fuel tanks and maximum baggage. With this loading flexibility comes responsibility. The pilot must insure that the airplane is loaded within the loading envelope before 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, it is weighed, and 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 6-7) and the Weight and Balance Record (Figure 6-9). 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 loaded 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 PROCEDURES

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 6-7.

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.

(4) Fill to full capacity with oil and operating fluids.

(5) Place pilot and copilot seats in a center position on the seat tracks. 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

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

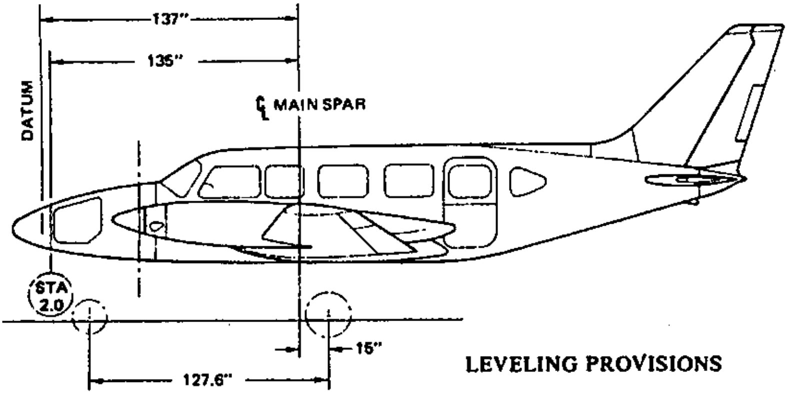
AIRPLANE AS WEIGHED
(Including full oil and operating fluids but no fuel)

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

WEIGHING FORM
Figure 6-1

(d) Center of Gravity

(1) The following geometry applies to the PA-31-350 airplane when it is level. Refer to Leveling paragraph 6.3 (b).



LEVELING DIAGRAM
Figure 6-3

(2) C.G. Arm of airplane as weighed =

$$(137 + 15) - \frac{(127.6)\,(N)}{T} =$$

Inches Aft of Datum

(e) Basic Empty Weight

Item	Weight (Lbs)	x Arm (Inches Aft of Datum)	= Moment (In-Lbs)
Weight (as Weighed)			
Unusable Fuel (Inbd.) (6 gal.)	36	126.8	4565
Unusable Fuel (Outbd.) (4 gal.)	24	148	3552
Basic Empty Weight			

BASIC EMPTY WEIGHT
Figure 6-5

6.5 WEIGHT AND BALANCE DATA RECORD

The Basic Empty Weight, Center of Gravity Location and Useful Load listed in Figure 6-7 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 6-9). 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 and Equipment List.

MODEL PA-31-350, CHIEFTAIN

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*			
Optional Equipment (if applicable)			
Basic Empty Weight			

*The standard empty weight includes full oil capacity, full operating fluids and 10 gallons of unusable fuel.

AIRPLANE USEFUL LOAD — NORMAL CATEGORY OPERATION

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

(7045 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 6-7

PA-31-350	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
		As licensed						

WEIGHT AND BALANCE RECORD
Figure 6-9

PA-31-350		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 6-9 (cont)

6.7 GENERAL LOADING RECOMMENDATIONS

EXECUTIVE CONFIGURATION (8 SEAT)

(a) Load occupants from front to rear progressively.

(b) When carrying from 1 to 6 occupants, load rear baggage compartment first.

(c) When carrying more than 6 occupants, fuel and/or baggage may have to be reduced.

(d) When carrying 7 occupants, load front and rear baggage compartments equally.

(e) When carrying 8 occupants, load front baggage compartments first and locate heaviest occupants forward. Forward baggage may be required to bring the loaded airplane's C.G. within allowable limits.

NOTE

These general loading recommendations suggest normal proper loading procedures. The charts, graphs, instructions, and plotter should be checked to assure that the airplane is within the allowable weight vs. center of gravity envelope.

COMMUTER CONFIGURATION (10 SEAT)

(a) Load occupants from front to rear progressively.

(b) When carrying from 1 to 7 occupants, load rear baggage compartment first.

(c) When carrying more than 6 occupants, fuel and/or baggage may have to be reduced.

(d) When carrying 8 or 9 occupants, load front and rear baggage compartments equally.

(e) When carrying 10 occupants, load front baggage compartment first and locate heaviest occupants forward. Forward baggage may be required to bring the loaded airplane's C.G. within allowable limits.

NOTE

These general loading recommendations suggest normal proper loading procedures. The charts, graphs, instructions, and plotter should be checked to assure that the airplane is within the allowable weight vs. center of gravity envelope.

6.9 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 Chart (Figure 6-17) 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 Weight, Moment and C.G. Limits graph (Figure 6-19). If the point falls within the C.G. envelope, the loading meets the weight and balance requirements.

(f) Location of the point on the Weight, Moment, and C.G. Limits graph indicates whether the airplane is slightly nose heavy or slightly tail heavy and can assist in setting pitch trim for takeoff.

IT IS THE RESPONSIBILITY OF THE PILOT AND AIRCRAFT OWNER TO INSURE THAT THE AIRPLANE IS LOADED PROPERLY. THE CHARTS, GRAPHS, INSTRUCTIONS, AND PLOTTER SHOULD BE CHECKED TO ASSURE THAT THE AIRPLANE IS WITHIN THE ALLOWABLE WEIGHT VS. CENTER OF GRAVITY ENVELOPE.

ITEM	WT. LBS.	ARM-IN.	MOMENT
Basic Airplane	4836		600326
Revised Airplane			
Pilot's Seat	175	95.0	16625
Copilot's Seat	160	95.0	15200
Seat No. 3	140	132/137 (Reversed)	18480
Seat No. 4	160	132/137 (Reversed)	21120
Seat No. 5		195.0	
Seat No. 6		195.0	
Seat No. 7		229 0	
Seat No. 8		242.0	
Fwd. Baggage	50	19.0	950
Rear Baggage	150	255.0	38250
Rt. Nac. Baggage Forward Half	50	145.0	7250
Rt. Nac. Baggage Rear Half	50	192.0	9600
Lt. Nac. Baggage Forward Half	50	145.0	7250
Lt. Nac. Baggage Rear Half	50	192.0	9600
Inbd. Fuel	636	126.8	80645
Outbd. Fuel	456	148.0	67488
Other			
Total Wt.	6963	Total Moment	892784

C.G. Location for Take-off 128.2 from Figure 6-19

SAMPLE LOADING PROBLEM
Figure 6-11

ITEM	WT. LBS.	ARM-IN.	MOMENT
Basic Airplane			
Revised Airplane			
Pilot's Seat		95.0	
Copilot's Seat		95.0	
Seat No. 3		132/137 (Reversed)	
Seat No. 4		132/137 (Reversed)	
Seat No. 5		195.0	
Seat No. 6		195.0	
Seat No. 7		229 0	
Seat No. 8		242.0	
Fwd. Baggage		19.0	
Rear Baggage		255.0	
Rt. Nac. Baggage Forward Half		145.0	
Rt. Nac. Baggage Rear Half		192.0	
Lt. Nac. Baggage Forward Half		145.0	
Lt. Nac. Baggage Rear Half		192.0	
Inbd. Fuel		126.8	
Outbd. Fuel		148.0	
Other			
Total Wt.		Total Moment	

C.G. Location for Take-off

WORK SHEET - EXECUTIVE LOADING
Figure 6-13

ITEM	WT. LBS.	ARM-IN.	MOMENT
Basic Airplane			
Revised Airplane			
Pilot's Seat		95.0	
Copilot's Seat		95.0	
Seat No. 3		132	
Seat No. 4		132	
Seat No. 5		163.5	
Seat No. 6		163.5	
Seat No. 7		195.0	
Seat No. 8		195.0	
Seat No. 9		229.0	
Seat No. 10		247.0	
Fwd. Baggage		19.0	
Rear Baggage		255.0	
Rt. Nac. Baggage Forward Half		145.0	
Rt. Nac. Baggage Rear Half		192.0	
Lt. Nac. Baggage Forward Half		145.0	
Lt. Nac. Baggage Rear Half		192.0	
Inbd. Fuel		126.8	
Outbd. Fuel		148.0	
Other			
Total Wt.		Total Moment	

C.G. Location for Take-off

WORK SHEET - EXECUTIVE LOADING
Figure 6-15

OCCUPANTS
EXECUTIVE SEATING

Weight	Pilot, Copilot Arm 95.0	Seats 3 & 4 Fwd Facing Arm 132.0	Seats 3 & 4 Aft Facing Arm 137.0	Seats 5 & 6 Arm 195.0	Seat 7 Arm 229	Seat 8 Arm 242
	Moment / 100					
120	114	158	164	234	275	290
130	124	172	178	254	298	315
140	133	185	192	273	321	339
150	143	198	206	293	344	363
160	152	211	219	312	366	387
170	162	224	233	332	389	411
180	171	238	247	351	412	436
190	181	251	260	371	435	460
200	190	264	274	390	458	484

LOADING CHART
Figure 6-17

OCCUPANTS
EXECUTIVE SEATING

Weight	Pilot, Copilot Arm 95.0	Seats 3 & 4 Arm 132.0	Seats 5 & 6 Arm 163.5	Seats 7 & 8 Arm 195	Seat 9 Arm 229.0	Seat 10 Arm 247.0
	Moment / 100					
120	114	158	196	234	275	296
130	124	172	213	254	298	321
140	133	185	229	273	321	345
150	143	198	245	293	344	370
160	152	211	262	312	366	395
170	162	224	278	332	389	420
180	171	238	294	351	412	445
190	181	251	311	371	435	469
200	190	264	327	390	458	494

LOADING CHART (cont)
Figure 6-17 (cont)

BAGGAGE

	Fwd Baggage Arm 19	Rear Baggage Arm 255	Nacelle Bag. Fwd Half Arm 145	Nacelle Bag. Rear Half Arm 192
Weight	Moment / 100			
10	2	26	15	19
20	4	51	29	38
30	6	77	44	58
40	8	102	58	77
50	10	128	73	96
60	11	153	87	115
70	13	179	102	134
80	15	204	116	154
90	17	230	131	173
100	19	255	145	192
110	21	281	160	211
120	23	306	174	230
130	25	332	189	250
140	27	357	203	269
150	29	383	218	288
160	30	408	—	—
170	32	434	—	—
180	34	459	—	—
190	36	485	—	—
200	38	510	—	—

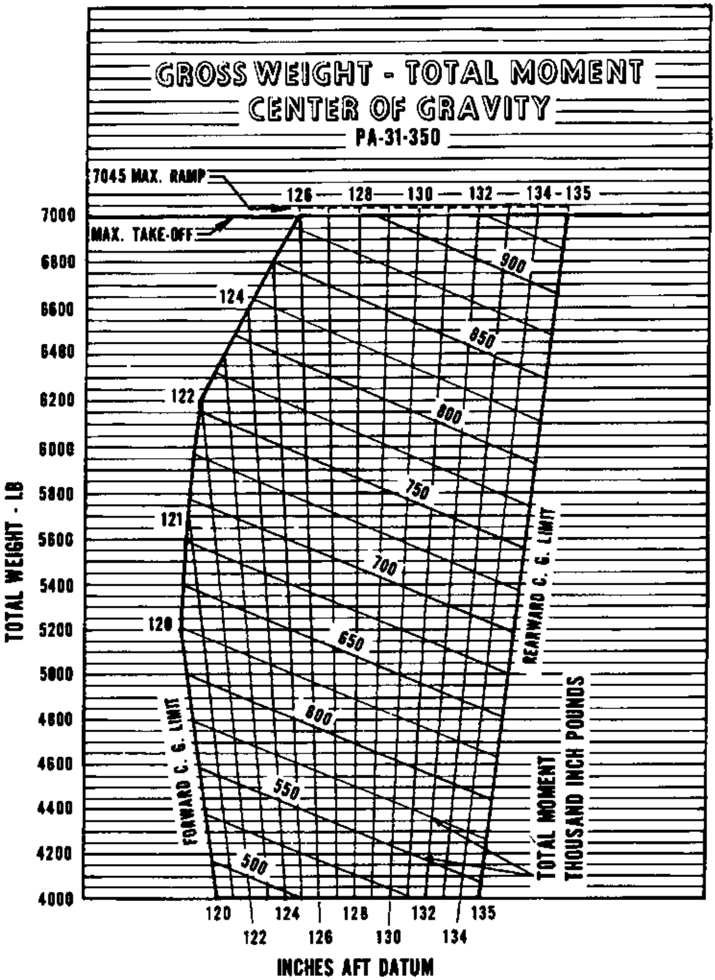
LOADING CHART (cont)
Figure 6-17 (cont)

FUEL

Gallons	Weight Lbs.	Inboard Tanks Arm = 126.8	Outboard Tanks Arm - 148.0
		Moment / 100	
5	30	38	44
10	60	76	89
15	90	114	133
20	120	152	178
25	150	190	222
30	180	228	266
35	210	266	311
40	240	304	355
45	270	342	400
50	300	380	444
55	330	418	488
60	360	456	533
65	390	495	577
70	420	533	622
75	450	571	666
76	456	—	675
80	480	609	—
85	510	647	—
90	540	685	—
95	570	723	—
100	600	761	—
105	630	799	—
106	636	806	—

3 gals. unusable fuel in each inboard tank and 2.0 gals. unusable fuel in each outboard tank included in basic weight (60.0 lbs., 8117 in. lbs. total)

LOADING CHART (cont)
Figure 6-17 (cont)



WEIGHT, MOMENT AND C.G. LIMITS
Figure 6-19

6.11 WEIGHT AND BALANCE VISUAL PLOTTER

The Weight and Balance Visual Plotter furnished with this airplane is a weight and center of gravity computing device.

The face of the plotter displays the slots used for plotting and the graphic center of gravity envelope. On the back of the plotter are printed instructions for use and general loading recommendations. The center of gravity envelope on the face shows all allowable moment conditions between 4000 and 7000 pounds, with the limits outlined in red.

The "Basic Empty Weight and Center of Gravity" location is taken from the Weight and Balance Form (Figure 6-7), the Weight and Balance Record (Figure 6-9) or the latest FAA major repair or alteration form.

CAUTION

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

6.13 INSTRUCTION FOR USING PLOTTER

(a) Locate point on plotter face corresponding to the "Basic Empty Weight" and "C.G." location.

(b) Zero the "OCCUPANTS, 1ST & 2ND" slot over the "Basic Empty Weight" point; establish new point at weight corresponding to occupants weight.

(c) For 3RD & 4TH SEATS, repeat step (b) from point 2 (NOTE: Use correct plotter side for EXECUTIVE or COMMUTER seating configuration).

(d) For 5TH & 6TH SEATS, repeat (c) from point 3.

(e) For 7TH SEAT, repeat step (d) from point 4.

(f) For 8TH SEAT, repeat step (e) from point 5.

(g) Zero the "FRONT BAGGAGE" slot over point 6; establish new point at weight corresponding to front baggage weight.

(h) For "REAR BAGGAGE" repeat step (g) from point 7.

(i) For "NACELLE LOCKER BAGGAGE" zero "NAC LOCKER REAR" slot over point 8; establish new point "R" corresponding to the total baggage weight in the rear half of both lockers.

Zero "NAC LOCKER FWD" slot over point "R"; establish new point "F" corresponding to the total baggage weight in the forward half of both lockers.

(j) Zero the "INBOARD FUEL" slot over point "F"; establish new point at fuel quantity desired.

(k) For "OUTBOARD FUEL" repeat step (j) from point 10.

NOTES

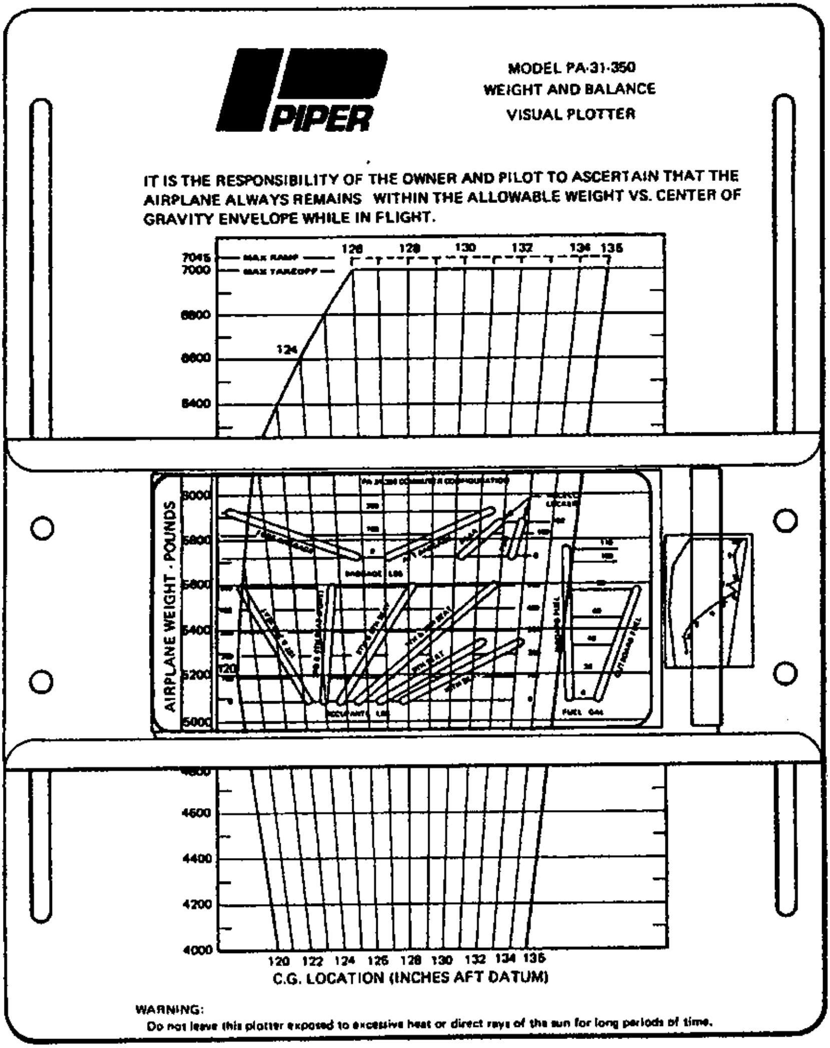
Should the fuel slot leave the "C.G. Envelope" (outlined in red) between 126 and 135 inches, the fuel indicated at the exit point is maximum allowable.

Should the fuel slot leave the "C.G. Envelope" other than between 126 and 135 inches, the baggage or passenger load should be redistributed forward or aft as required, to allow a higher load.

SEATING CONFIGURATION:

(1) EXECUTIVE configuration:
1ST & 2ND SEATS forward facing
3RD & 4TH SEATS aft facing
5TH thru 8TH SEATS forward facing

(2) COMMUTER configuration:
1ST thru 10TH SEATS forward facing



WEIGHT AND BALANCE VISUAL PLOTTER
Figure 6-21

6.15 CARGO LOADING

An optional cargo door facilitates loading by providing an opening 45 inches in width and a minimum 31 inches in height. To aid loading computations a cargo loading chart and a cargo loading placard are provided. The loading chart is located in the Weight and Balance Section of this manual and the cargo placard is located on the aft baggage compartment bulkhead interior panel. The chart has station line references which define the cargo areas and also aid in measuring the arm of the load.

Usually the C.G. of an object is at the center of the object except with unusually shaped objects, in which case the C.G. is near its greatest mass. If you are loading a number of items, which weigh the same, the C.G. of all the items can be measured at the center of the load. Items of unequal weight should be figured separately. Weight and C.G. computations should be calculated before actual loading. Also compute load weight and C.G.; then compute fuel weight and total C.G. because it is possible in certain instances to have the C.G. move aft of the allowable aft C.G. while burning off fuel.

The procedure for computing total weight and c.g. location is the same as that for passenger occupancy. If the airplane is licensed with the cargo barriers and restraining equipment installed, the basic airplane will include the weights and arms of these items. If this equipment is installed later, the basic airplane shall be revised to take into account the equipment removed and added. Weights and arms of these items are listed in the Equipment List.

The Cargo Loading Work Sheet is used in a similar manner as in the previous example. It is the pilot's responsibility to determine the actual arms of items loaded in a given area.

The aircraft has a placard installed on the aft bulkhead interior panel. The cargo loading placard states the maximum weight and floor loadings permissible. In addition the barriers and restraining equipment are limited as follows:

(a) Cargo barriers - Maximum restraining capacity of 2,000 lbs. at 19 in c.g. height of cargo.

(b) Cargo net - Maximum restraining capacity of 1,600 lbs. at 24 in c.g. height of cargo. This capacity is increased to 2,000 lbs. at 19 in c.g. height when used with cargo barriers.

(c) Cargo straps - Maximum restraining capacity of 150 lbs. at 12 in. c.g. height of cargo.

(d) Baggage tic down rings attached to seat tracks - maximum restraining capacity of 200 lbs. each.

(e) Baggage tie down rings attached to Wedjit plates - maximum tie down capacity of 200 lbs. each.

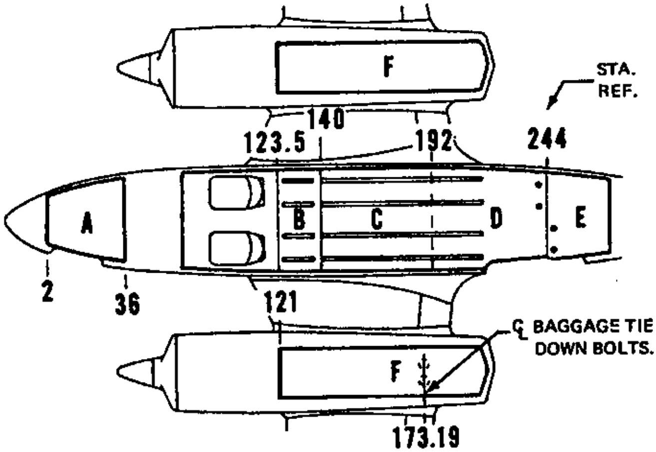
If the airplane is licensed with passenger seats installed, some or all of them may be removed for cargo usage.

When seats are removed for cargo stowage, the Basic Empty Weight and corresponding C.G. must be corrected prior to determination of the loading schedule. The weights and arms for these seats are listed in the Equipment List.

Generally when loading, the heavier items should be loaded in sections B & C first and the lighter items in sections D & E.

NOTE

When loading heavy items it is recommended to install a post under the tail skid to prevent the tail from settling while loading. The parking brakes should also be set.



MAXIMUM CAPACITY

<table>
<tr><th>AREA</th><th>FLOOR LOAD
LBS/SQ FT</th><th colspan="2">ALLOWABLE
LBS</th></tr>
<tr><td>A</td><td>100</td><td colspan="2">200</td></tr>
<tr><td>B</td><td>200</td><td>400</td><td rowspan="4">2000
TOTAL</td></tr>
<tr><td>C</td><td>200</td><td>1800</td></tr>
<tr><td>D</td><td>200</td><td>900</td></tr>
<tr><td>E</td><td>100</td><td>200</td></tr>
<tr><td>F</td><td>10</td><td colspan="2">150 EACH</td></tr>
</table>

MAXIMUM TIEDOWN CAPACITY

PER FOOT OF TRACK	200 LBS
PER TRACK	900 LBS
PER TIE DOWN RING	200 LBS

CARGO MUST BE LOADED WITHIN THE WEIGHT
AND BALANCE LIMITS OF THIS AIRCRAFT

CARGO LOADING CHART
Figure 6-23

The forward baggage compartment will probably have to be loaded in order to utilize sections D & E. The empty weight of the aircraft does not include the cargo barriers, pads, tie-down rings and straps and cargo nets. However, the above items were included in the empty aircraft weight and C.G. in the following example.

EXAMPLE:

	Weight	x	Arm	=	Moment
A/C Empty Weight	4316		122.5		528,710
Pilot	175		95		16,625
Load Section A	200		19		3,800
Load Section B	400		131.5		52,600
Load Section C	400		164.0		65,600
Load Section C	200		174.0		34,800
Load Section D	400		218.0		87,200
TOTAL	6091				789,335

Moment ÷ Weight = C.G.
789,335 ÷ 6091 = 129.6"

	Weight				Moment
Inboard Fuel 106 gal	636				80,600
Outboard Fuel 45.5 gal	273				40,404
	7000				910,339

910,339 ÷ 7000 = 130.0"

In the above example the aircraft C.G. falls within the limits (both C.G. and weight).

NOTE

Cargo Barriers & Restraining Equipment is included in basic or revised airplane weight and arm.

ITEM	WT. LBS.	ARM-IN.	MOMENT
Basic Airplane			
Revised Airplane			
Pilot's Seat		95.0	
Copilot's Seat		95.0	
Area A		2.0 to 35.0*	
Area B		123.0 to 140.0*	
Area C		140.0 to 192.0*	
Area D		192.0 to 244.0*	
Area E		244.0 to 274.0*	
Area F Rt. Locker Fwd.		121.0 (135 w/air cond) to 174.0*	
Area F Rt. Locker Rear		174.0 to 210.0*	
Area F Left Locker Fwd.		121.0 to 174.0*	
Area F Left Locker Rear		174.0 to 210.0*	
Inbd. Fuel		126.8	
Outbd. Fuel		148.0	
Other			
Total Wt.		Total Moment	

C.G. Location for Take-off

*Pilot's responsibility to determine actual arm of item loaded. See Figure 6-23 for locations of loading areas.

WORK SHEET - CARGO LOADING

Figure 6-25

6.17 EQUIPMENT LIST

The following is a list of equipment which may be installed in the PA-31-350. It consists of those items used for defining the configuration of an airplane when the basic empty weight is established at the time of delivery. Items marked with an "X" are those items which were installed on the airplane described below as delivered by the manufacturer.

Unless otherwise indicated, the installation certification number (Cert. Basis) for the equipment included in this list is TC A8EA.

PIPER AIRCRAFT CORPORATION — PA-31-350, CHIEFTAIN

SERIAL NO. ____________ REGISTRATION NO. ____________ DATE: ____________

(a) Propeller and Propeller Accessories

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
1	Two Propeller Installations Per Piper PS50071-12, Hartzell Model HC-E3YR-2ALTF/FJC8468-6R (Right) and Piper PS50071-11, Hartzell Model HC-E3YR-2ATF/ FC8468-6R (Left) Cert. Basis - TC P33EA	____	91.9 ea.	48.2	4430

(a) Propeller and Propeller Accessories (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
3	Two Hydraulic Propeller Governors Per PAC Dwg. 24622-24, Hartzell Model F-6-24Z or F-6-24 (Left) and PAC Dwg. 24622-23, Hartzell Model F-6-24LZ or F-6-24L (Right)		5.5 ea.	64.0	352
5	Two Propeller Spinners Per PAC Dwg. 43940-8 (Left) and PAC Dwg. 43940-9 (Right)		3.1 ea.	46.2	143
7	Two Propeller Spinner Caps Per PAC Dwg. 43929-2 (3 Bld)		.6 ea.	36.0	22
9	Propeller Spinner Bulkheads Per PAC Dwg. 439334 (Left), 43933-7 (Right)		1.1 ea.	49.8	55

(b) Engine and Engine Accessories

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
17	Two Engines Per PAC Dwg. 41741-4 (Left) and 41741-3 (Right), Lycoming Model TIO-540-J2BD (Left) and LTIO-540-J2BD (Right) Cert. Basis - TC E14EA	______	558.0 ea.	79.2	44194
19	Two Oil Coolers, Harrison Model AP16AN08-01, Part No. 8535311, Per PAC Dwg. 41635	______	4.5 ea.	97.0	437
21	Fuel Pumps (Engine Driven) Lear Siegler Model RG9080-J4A (Right) and RG9080-J7A (Left) or Titan Fuel Pump Equivalent	______	1.3 ea.	91.0	118
23	Two Emergency Fuel Pumps (Electric) Weldon Model A10014C-40, Per PAC Dwg. 54364-6 and -7 (one ea.)	______	2.8 ea.	122.7	344

(b) Engine and Engine Accessories (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
25	One each Fuel Boost Pumps (Electric) Airborne Model 2B6-33 or 64 Piper PS50109-2 or 4 or -6 (Left) and Airborne Model 2B6-32 or -50 or -63, Piper PS50109-3 or -5 or -7, (Right)	______	3.2 ea.	122.7	393
27	Starter 24 Volt Prestolite MHB-4013 or MHB-4018 (Left), MHB-4014 (Right)	______	18.0 ea.	65.8	1184
29	Two Hydraulic Pumps Per PAC Dwg. 26802-8, or -10, or -11 Eastern Industries Model 1213-HBG Type 310	______	3.6 ea.	92.0	331
31	Two Induction Air Filters Donaldson Model P10-6590	______	1.0 ea.	88.0	88
33	Two Oil Filters, Lycoming Model LW-10660	______	2.5 ea.	92.0	230
35	Two Air Pumps Per PAC Dwg. 26749-7, Airborne Model 211CC (Left) and PAC Dwg. 26749-8 Airborne Model 212CW (Right)	______	4.0 ea.	90.0	360

(c) Landing Gear and Brakes

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
45	Two Main Wheel and Brake Assy., Cleveland Aircraft Products, Wheel No. 40-130 Brake No. 30-95 Cert. Basis - TSO C26a	______	22.4 ea.	152.0	3405
47	Two Main Tires, 6.50 x 10, 8-Ply Rating, Type III with Regular Tubes	______	13.0 ea.	152.0	1976
49	One Nose Wheel Assembly, Cleveland Aircraft Products No. 40-76B Cert. Basis - TSO C26a	______	3.8	24.0	91
50	Nose Wheel Assembly Piper PS50144-2-2 Cert. Basis - TSO C26b	______	5.3	24.0	127
51	One Nose Tire, 6.00 x 6, 6-Ply Rating, Type III with Regular Tube	______	9.3	24.0	223

(c) Landing Gear and Brakes (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
53	Two Main Wheel and Brake Assy., Cleveland Aircraft Products, Wheel No. 40-130, Brake No. 30-95A Cert. Basis - TSO C26a	______	22.4 ea.	152.0	3405

(d) Electrical Equipment

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
61	Two Alternators, 70 Amp ea. Prestolite No. ALU-8421 (Left) ALU-8421-LS (Right)	______	12.6 ea.	62.8	791
63	One Battery, 24 Volt 17 Ampere-Hour Gill No. 12-GCAB-9	______	28.0	-2.0	-56
65	Two Landing Lights, 28 Volt, 250-Watt GE No. 4596	______	2.0 ea.	26.5	53

(d) Electrical Equipment (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
67	Position/Strobe Lights Tail, Whelen #A500-HDM-28/ A490-HT-M-28; Left Wing, Whelen #A429-PR-D-M-28/ A490-HT-M-28; Right Wing, Whelen #A429-PG-D-M-28/ A490-HT-M-28	______	4.6	183.0	842
69	Two Fuel Flow Warning Lights Per PAC Dwg. 54338-3	______	Neglect Weight Change		
71	Two Boost Pump Inop. Warning Lights Per PAC Dwg. 54338-3	______	Neglect Weight Change		
73	Two Fuel Boost Warnings Pressure Switches Per PAC Dwg. 54300-2	______	0.2 ea.	122.7	25
75	Annunciator Display Per PAC Dwg. 55930-3	______	0.5	740	37
77	Annunciator Control Per PAC Dwg. 49353-2	______	1.0	39.0	39

(e) Instruments

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
87	Airspeed Indicator Per PAC Dwg. 41507-15		.6	72.0	43
89	Magnetic Compass Per PAC Dwg. 42580		.7	72.0	50
91	Sensitive Altimeter Per Piper PS50008-4 or PS50008-5		1.3	72.0	94
93	Electric Turn Rate Indicator Per PAC Dwg. 43220 or 32737-6 or 44378		2.3	72.0	166
94	Turn Coordinator TC-120-1B Aviation instrument Corp. 507-0020-902		2.0	95.5	191
95	Rate of Climb Per PAC Dwg. 41706 or 41706-2		1.0	72.0	72

(e) Instruments (cont.)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
97	Eight-Day Clock - Wakmann W-33-7510ET or Longines ALL-90P-ET	______	.4	72.0	29
99	Outside Air Temp Per PAC Dwg. 41707, 54507-2 or 54507-3	______	.3	79.0	24
101	Ammeter Per PAC Dwg. 41505	______	.2	72.0	14
103	Dual Manifold Pressure Gauge Per PAC Dwg. 19697-10	______	1.0	72.0	72
105	Dual Tachometer Per Piper PS50048-13-1	______	.7	72.0	50

(e) Instruments (cont.)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
107	Engine Hour Recorder Per PAC Dwg. 51006		.3	72.0	22
109	Dual Fuel Pressure Guage Per PAC Dwg. PS50116-3		1.0	72.0	72
111	Two Fuel Quan. Guages Per PAC Dwg. 43242-2		.4 ea.	72.0	29
113	Dual Fuel Flow Guage Per Piper PS50031-51		1.1	72.0	79
115	Dual Exhaust Gas Temp Guage Per Piper PS50101-33L		1.2	72.0	86

(e) Instruments (cont.)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
117	Cowl Flap Position Indicator Per PAC Dwg. 43145	______	.2	72.0	14
119	Wing Flap Position Indicator Per PAC Dwg. 71128-8 or -11	______	.2	72.0	14
121	Rudder Trim Position Indicator Per PAC Dwg. 41510	______	.2	72.0	14
123	Elevator Trim Position Indicator Per PAC Dwg. 53444	______	.2	72.0	14
125	Aileron Trim Position Indicator Per PAC Dwg. 41510	______	.2	72.0	14
127	Two Combination Gauges Per PAC Dwg. 41506-2, Oil Pressure, Oil Temperature, Cylinder Head Temperature	______	2.4	72.0	173

(e) Instruments (cont.)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
131	Gyro Horizon Per PAC Dwg. 99002-2, -3, -4, -7	______	2.3	72.0	166
133	Directional Gryo Per PAC Dwg. 99003-2, -3, -4, -6	______	3.4	72.0	245

(f) Miscellaneous

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
141	D.O.A. SO-2 Approved Pilot's Operating Handbook Report: LK-1208		—	—	—
143	Cabin Heater, 24 Volt Janitrol No. 65079-2 Cert. Basis - TSO C20		25.5	41.0	1046
145	Cabin Exhaust Vent. Instl. Per PAC Dwg. 43827-2		3.0	252.0	756
147	Stall Warning Lift Detector, Safe Flight Instr. Corp. #C-52207-4		Neglect Weight Change		
149	Stall Warning Horn, Safe Flight Instr. Corp. #02054-3		2.0	66.0	132
151	Heated Pitot Tube AN5812-1 (24 Volt)		1.0	40.3	40

(g) Engine and Engine Accessories (Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
161	Two Air Pumps Per PAC Dwg. 26749-9, Airborne Model 441CC-7 (Left) and PAC Dwg. 26479-10, Airborne Model 442CW-6 (Right)	____	3.0 ea.	90.0	270

(h) Propeller and Propeller Accessories (Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
171	Propeller Synchrophaser Per PAC Dwg. 49694-4		8.0	75.8	606
173	One Hydraulic Propeller Governor Per PAC Dwg. 24622-26, Hartzell Model F-8-48LZ (Right)		5.5	64.0	352

(i) Landing Gear and Brakes (Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
185	Dual Toe Brakes Per PAC Dwg. 42386	______	1.8	62.9	113
187	Two Main Wheel and Brake Assy., Goodyear Wheel No. 9544171-1, Brake No. 9544482 Cert. Basis - TSO C26a	______	24.9 ea.	152.0	3785
189	Two Main Wheel and Brake Assy., Cleveland Aircraft Products, Wheel 40-141, Brake 31-123 Cert. Basis - STC SA295GL	______	32.5 ea.	152.0	4940

(j) Electrical Equipment (Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
211	One Battery, 24 Volt 25 Ampere-Hour Gill No. PS12-24	______	38.1	-2.0	-76
213	Electric Windshield Wiper Instl. Per PAC Dwg. 44115	______	5.5	57.1	314
215	Electrically Heated Windshield, Per PAC Dwg. 42637-2	______	13.8	70.0	966
217	Wing Ice Inspection Light Per PAC Dwg. 52661	______	.5 ea.	94.5	47
219	Electrical Propeller Anti-Icing, Per PAC Dwg. 43947-4	______	14.0	40.9	573

(j) Electrical Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
221	Emergency Locator Transmitter Per PAC Dwg. 55675-3 Cert. Basis - TSO C91	_____	2.0	309.5	619
223	Emergency Locator Transmitter Per PAC Dwg. 49736-3	_____	4.2	307.7	1292
225	Two Recognition Lights Per PAC Dwg. 55802-3	_____	1.3	134.0	174
227	Ground Recognition Beacon Instl. Per PAC Dwg. 49512-2	_____	.7	307.7	215
229	Chimes Instl. Per PAC Dwg. 71619-2	_____	.5	51.0	26

(k) Instruments (Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
233	Airspeed Indicator Per PAC Dwg. 41507-15		.6	72.0	43
235	Sensitive Altimeter Per Piper PS50008-4 or PS50008-5		1.3	72.0	94
237	Electric Turn Rate Indicator Per PAC Dwg. 43220 or 32737-6 or 44378		2.3	72.0	166
239	Rate of Climb Per PAC Dwg. 41706 or 41706-2		1.0	72.0	72
241	Eight-Day Clock - Wakmann W-33-751OET or Longines ALL-9OP-ET		.4	72.0	29
243	Digital Clock - Astrotech Per PAC Dwg. 74062-2		.3	72.0	22

(k) Instruments
(Optional equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
243	Dual Gyro Pressure Gauge Per PAC Dwg. 46320	______	.5	72.0	36
245	Gyro Horizon Per PAC Dwg. 53707 (Plt./CAA)	______	2.3	72.0	166
247	Gyro Horizon Per PAC Dwg. 99002-2, -3, -4, -7 (Coplt./Std.)	______	2.3	72.0	166
249	Gyro Horizon Per PAC Dwg. 53707 (Coplt./CAA)	______	2.3	72.0	166
251	Gyro Horizon Per PAC Dwg. 53708	______	2.3	72.0	166
253	Directional Gyro Per PAC Dwg. 99003-2, -3, -4, -6 (Coplt./Std.)	______	3.4	72.0	245

(k) Instruments
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
255	Electric Directional Gyro Per PAC Dwg. 55683-2 (Copilot)	______	2.9	72.0	209
257	Electric Gyro Horizon Per PAC Dwg. 55684-2 (Copilot)	______	2.6	72.0	187
259	Electric Gyro Horizon Per PAC Dwg. 53709 (Copilot/CAA)	______	2.6	72.0	187
261	Radar Altimeter Per PAC Dwg. 52837-5	______	7.6	222.6	1692
263	Altimeter, Millibar Per PAC Dwg. 71388-2	______	1.3	72.0	94
265	Voltmeter Per PAC Dwg. 54408-3	______	.2	72.0	14
266	Heater Hour Meter Per PAC Dwg. 74050	______	.3	41.0	12

(k) Instruments
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
267	Attitude Gyro Per PAC Dwg. 43820		2.3	72.0	166
269	Airspeed Indicator Per PAC Dwg. 46566-8		.6	72.0	43
271	Electric Directional Gyro, Per PAC Dwg. 46911 (Copilot)		3.8	72.0	274
273	Electric Gyro Horizon Per PAC Dwg. 64912 (Copilot)		3.4	72.0	245
275	Directional Gyro - Aeritalia Per PAC Dwg. 71183-2		2.2	72.0	158
277	Gyro Horizon - Aeritalia Per PAC Dwg. 71181-2		2.4	72.0	173
279	IVSI Type D6LP Per PAC Dwg. 74066-2 Cert. Basis C8b		1.0	72.0	72

(1) Autopilots
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
281	AltiMatic IIIC Autopilot (with Nav Comm) Per PAC Dwg. 54550-4 Cert. Basis - STC SA3017SW-D	______	62.7	108.7	6815
283	Yaw Damper System Instl. Per PAC Dwg. 49516-2 - . Cert. Basis - STC SA3010SW-D	______	8.3	281.3	2335
285	FCS-810 AP/FD Instl. Per PAC Dwg. 55810-10 Cert. Basis - STC SA437SO	______	52.2	192.1	10028
287	FCS-810 AP/FD Instl. Per PAC Dwg. 55810-11 Cert. Basis - STC SA437SO	______	52.2	192.1	10028
289	FCS-810 A/P with HSI Per PAC Dwg. 55811-6 Cert. Basis - STC SA437SO	______	49.7	174.3	8663

(l) Autopilots
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
290	Bendix FCS-870 Automatic Flight Control System Per PAC Dwg. 71820-4 or -7 or -10 or -13	______	24.4	121.6	2967
	a. DH-841V Flight Director Indicator Cert. Basis - TSO C4c, C52a	______	3.0	72.4	217
	b. MA-872A Mode Annunciator Cert. Basis - TSO C4c, C52a	______	0.5	72.1	36
	c. FC-872A Flight Controller Cert. Basis - C4c, C52a	______	1.0	113.5	114
	d. CA-871A Computer Amplifier Cert. Basis - TSO C4c, C52a	______	5.7	46.0	262
	e. SE-873 Pitch Servo Cert. Basis - C4c, C52a	______	2.8	313.8	879
	f. SA-873 Roll Servo	______	2.8	165.5	463
	g. ST-873 Trim Servo Cert. Basis - TSO C4c, C52a	______	3.1	321.4	996
	h. Harness Assembly and Misc.	______	5.5	as installed	
291	AltiMatic X with HSI Per PAC Dwg. 49410-4 Cert. Basis- STC SA3016SW-D	______	43.8	104.6	4582

(l) Autopilots
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
293	AltiMatic X AP/FD (with slaved HSI & split/que steering horizon) Per PAC Dwg. 49411-6 Cert. Basis - STC SA3016SW-D	______	44.8	103.9	4656
295	AltiMatic X AP/FD (with slaved HSI & single que steering horizon) Per PAC Dwg. 49411-7 Cert. Basic - STC SA3016SW-D	______	44.8	103.9	4656
297	KFC-200 FD/AP Instl. (King) Per PAC Dwg. 71040-22 Cert. Basis - STC SA1166CE	______	46.2	136.6	6311
299	KAP-200 A/P Instl. (King) Per PAC Dwg. 71040-16 Cert. Basis - STC SA1166CE	______	45.5	137.5	6255

THIS PAGE INTENTIONALLY LEFT BLANK

(l) Autopilots
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
301	KFC-200 FD/AP Instl. (King) (with yaw damper) Per PAC Dwg. 71040-25 Cert. Basis - STC SA1166CE	_____	58.1	144.6	8401
303	KAP-200 A/P Instl. (King) (with yaw damper) Per PAC Dwg. 71040-19 Cert. Basis - STC SA 1166CE	_____	57.4	145.3	8340

(m) Radio Equipment
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
317	KTS-1-31 Basic Avionics Group Instl. (Includes all standard group components. Does not include standard features) Per PAC Dwg. 54315-3				
	a. With Separate Sense Antenna	____	71.3	71.6	5105
	b. With Combined Sense/Loop Antenna and Radio Cooling Tubes Instl.	____	69.4	69.5	4823
	c. With Combined Sense/Loop Antenna and Radio Cooling Fan Instl.	____	70.8	80.5	5699

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
319	King KTS-1-31 Basic Avionics Group Instl. (Includes all standard group components. Does not include standard features.) Per PAC Dwg. 54315-5	____	95.2	65.1	6198
	a. KN-63 Distance Measuring Receiver Cert. Basis - TSO C66a	____	2.8	46.0	129
	b. KDI-572 Digital Indicator Cert. Basis - TSO C66a	____	0.8	73.1	58
	c. KA-60 Antenna Cert. Basis - TSO C66a, C74c	____	0.5	206.0	103
	d. KR-87 Automatic Direction Finder Cert. Basis - TSO C41c	____	3.2	70.7	226
	e. KA-44 Antenna Cert. Basis - TSO C41c	____	2.0	229.0	458
	f. KI-227 Indicator Cert. Basis - TSO C41c	____	0.7	76.0	53
	g. KMA-24 Audio Panel Marker Beacon Cert. Basis - TSO C35d	____	1.7	73.4	125
	h. KT-76A Transponder Cert. Basis - TSO C74b	____	3.1	70.8	219

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
319 cont)	i. KX 165-05 Transceiver/Navigation #1 with Glide Slope				
	Pilots	______	5.6	70.5	395
	Copilots	______	5.6	70.5	395
	Cert. Basis C37b, C38b, C36c C40a, C34c				
	j. KX 165-04 Transceiver/Navigation #2 Cert. Basis C37b, C38b, C36c, C40a	______	5.1	70.5	360
	k. KX-175B Transceiver/Navigation #1 Cert. Basis - TSO C37b, C38b, C40a, C36c	______	8.5	70.5	599
	l. KA-39 Voltage Converter #1 Cert. Basis - TSO C36c, C37b, C38b	______	1.2	51.0	61
	m. KN-72 VOR/LOC Converter #1 Cert. Basis - TSO C40a	______	1.3	46.0	60
	n. KN-75 Glideslope Receiver #1 Cert. Basis - TSO C34c	______	1.6	46.0	74
	o. KX- 175 B Transceiver/Navigation #2 Cert. Basis - TSO C37b, C38b, C40a, C36c	______	8.5	70.5	599
	p. KA-39 Voltage Converter #2 Cert. Basis - TSO C36c, C37b, C38b	______	1.2	51.0	61
	q. KN-72 VOR/LOC Converter #2 Cert. Basis - TSO C40a	______	1.3	46.0	60

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
319 (cont)	(m) Radio Equipment (Optional Equipment) (cont)				
	r. KN-75 Glideslope Receiver #2 Cert. Basis - TSO C34c		1.6	46.0	74
	s. KI-206 VOR/LOC/GS Indicator #2 Cert. Basis - TSO C40a		1.3	74.0	96
	t. KCS-55A Slaved Compass System				
	(1) KI-525A Navigation Indicator Cert. Basis - TSO C6c		3.9	72.4	282
	(2) KG-102A Directional Gyro Cert. Basis - TSO C6c		4.3	46.0	198
	(3) KMT-112 Flux Sensor Cert. Basis - TSO C6c		0.3	151.3	45
	(4) KA-51A Slaving Accessory Cert. Basis - TSO C6c		0.3	75.0	23
	u. KAP-200 Two Axis Autopilot				
	(1) KI-256 Indicator Cert. Basis - TSO C52a, C9c		3.3	72.6	240
	(2) KG-258 Directional Gyro Cert. Basis - TSO C52a, C9c		3.1	46.0	143
	(3) KC-292 Mode Controller Cert. Basis - TSO C52a, C9c		1.6	113.0	181
	(4) KA-285 Mode Annunciator Cert. Basis - TSO C52a, C9c		0.5	75.5	38
	(5) KS-270 Pitch Servo Cert. Basis - TSO C52a, C9c		2.2	313.9	691

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
319	(6) KS-272 Pitch Trim Servo				
(cont)	Cert. Basis - C52a, C9c	______	2.2	321.4	707
	(7) KS-271 Roll Servo				
	Cert. Basis - TSO C52a, C9c	______	2.2	165.5	364
	(8) KC-295 Flight Computer				
	Cert. Basis - TSO C52a, C9c	______	5.0	46.0	230
	(9) Harness Assembly and Misc.	______	25.0	as installed	
321	King KTS-2-31 Basic Avionics Group Instl. (Includes all standard group components. Does not include standard features.)				
	Per PAC Dwg. 71800-3	______	91.2	69.8	6366
	a. KY-196 Transceiver #1				
	Cert. Basis - TSO C37b	______	3.2	71.8	210
	b. BB-32M Broad Band Antenna #1				
	(Meriden)	______	0 9	151.3	136
	c. KY-196 Transceiver #2				
	Cert. Basis - TSO C37b	______	3.2	71.8	230
	d. BB-32M Broad Band Antenna #2				
	(Meriden)	______	0.9	181.0	163
	e. KN-53 Nav Receiver #1				
	Cert. Basis - TSO C40a, C36c	______	3.0	71.1	213
	f. Blade VOR Antenna #1 (Communications Components Corp.)				
	Cert. Basis - TSO C34c	______	0.5	352.0	176

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
321 (cont)	g. KN-72 VOR/LOC Converter #1 Cert. Basis - TSO C40a, C36c	______	1.3	46.0	60
	h. KI-525A Navigation Indicator #1 Cert. Basis - TSO C6c	______	3.9	72.4	282
	i. KN-53 Nav Receiver #2 Cert. Basis - TSO C40a, C36c	______	3.0	71.1	213
	j. KN-72 VOR/LOC Converter #2 Cert. Basis - TSO C40a, C36c	______	1.3	46.0	60
	k. KI-206 VOR/LOC/GS Indicator #2 Cert. Basis - TSO C40a	______	1.3	74.0	96
	l. KR-87 Automatic Direction Finder Cert. Basis - TSO C41c	______	3.2	70.7	226
	m. KA-44 Antenna Cert. Basis - TSO C41c	______	2.0	229.0	458
	n. KI-227 Indicator Cert. Basis - TSO C41c	______	0.7	76.0	53
	o. KT-76A Transponder Cert. Basis - TSO C34b	______	3.1	70.8	219
	p. KMA-24 Audio Panel/Marker Beacon Cert. Basis - TSO C35d	______	1.7	73.4	125
	q. KN-63 Distance Measuring Receiver Cert. Basis - TSO C66a	______	2.8	46.0	129

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
321 (cont)	r. KDI-572 Digital Indicator Cert. Basis - TSO C66a	______	0.8	73.1	58
	s. KA-60 Antenna Cert. Basis - TSO C66c	______	0.5	206.0	103
	t. KAP-200 Two Axis Autopilot				
	(1) KI-256 Indicator Cert. Basis - TSO C52a, C9c	______	3.3	72.6	240
	(2) KG-258 Directional Gyro Cert. Basis - TSO C52a, C9c	______	3.1	46.0	143
	(3) KC-292 Mode Control Cert. Basis - TSO C52a, C9c	______	1.6	113.0	181
	(4) KA-285 Mode Annunciator Cert. Basis - TSO C52a, C9c	______	0.5	75.5	38
	(5) KS-270 Pitch Servo Cert. Basis - TSO C52a, C9c	______	2.2	313.9	691
	(6) KS-272 - Pitch Trim Servo Cert. Basis - TSO C52a, C9c	______	2.2	321.4	707
	(7) KS-271 Roll Servo Cert. Basis - TSO C52a, C9c	______	2.2	165.5	364
	(8) KC-295 - Flight Computer Cert. Basis - TSO C52a, C9c	______	5.0	46.0	230

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
321 (cont)	u. KCS-55A Slaved Compass System				
	(1) KI-525A Navigation Indicator Cert. Basis - TSO C6c	______	3.9	72.4	282
	(2) KG-102A Directional Gyro Cert. Basis - TSO C6c	______	4.3	46.0	198
	(3) KMT-112 Flux Sensor Cert. Basis - TSO C6c	______	0.3	151.3	45
	(4) KA-51A Slaving Accessory Cert. Basis - TSO C6c	______	0.3	75.0	23
	(5) Harness Assembly and Misc.	______	25.0	as installed	
323	KTG-3-31 Basic Avionics Group Instl. (Includes all standard group components. Does not include standard features) Per. PAC Dwg. 54270-3	______	98.6	68.2	6725

THIS PAGE INTENTIONALLY LEFT BLANK

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
325	CT-1-31 Basic Avionics Group Instl. (Includes all standard group components. Does not include standard features) Per PAC Dwg. 54200-3	______	98.9	67.4	6666
327	CTM-1-31 Basic Avionics Group Instl. (Includes all standard group components. Does not include standard features) Per PAC Dwg. 55160-3				
	a. With Radio Cooling Tubes Instl.	______	46.2	76.1	3516
	b. With Radio Cooling Fan Instl.	______	62.5	73.4	4588

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
328	Bendix HSD-830 Horizontal Situation Display System Per PAC Dwg. 71820-4 or -7 or -10 or -13	______	10.7	48.4	518
	a. IN-831A Situation Display Indicator Cert. Basis - TSO C6c	______	3.2	72.4	232
	b. IN-835A Slaving Meter Cert. Basis - TSO C6c	______	0.1	76.0	8
	c. SG-832C Remote Slaved Gyro Cert. Basis - TSO C6c	______	4.4	46.0	202
	d. EC-834A Error Corrector Cert. Basis - TSO C6c	______	0.2	151.3	30
	e. FX-833A Flux Sensor Cert. Basis - TSO C6c	______	0.3	151.3	45
	f. Harness Assembly and Misc.	______	2.5	as installed	
329	Comm 1 Instl. (Narco) Per PAC Dwg. 54034-3 or -5	______	6.1	72.9	445
331	Comm 1 and 2 Instl. (King) Per PAC Dwg. 54264-3	______	12.9	63.9	824

THIS PAGE INTENTIONALLY LEFT BLANK

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
333	Comm 1 and 2 Instl. (Collins) Per PAC Dwg. 54229-3	______	14.9	65.0	969
335	Comm 2 Instl. (Narco) Per PAC Dwg. 54035-3 or -5	______	5.9	59.5	351
337	Nav/Comm 1 Instl. (King) Per PAC Dwg. 53558-3	______	21.9	69.7	1526
339	Nav/Comm 1 Instl. (King) Per PAC Dwg. 53558-7	______	15.8	93.4	1476
341	Nav/Comm 1 and 2 Instl. (King) Per PAC Dwg. 54690-3	______	35 9	76.3	2739
343	Nav/Comm 2 Instl. (King) Per PAC Dwg. 53559-3	______	17.1	68.0	1163

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
345	Nav/Comm 2 Instl. (King) Per PAC Dwg. 53559-6		14.1	68.5	966
347	Nav 1 Instl. (Narco) Per PAC Dwg. 54036-3		7.1	115.6	821
349	Nav 1 and 2 Instl. (King) Per PAC Dwg. 54267-3		20.3	81.4	1652
351	Nav 1 and 2 Instl. (King) Per PAC Dwg. 54267-5		21.0	80.6	1693
353	Nav 1 and 2 Instl. (Collins) Per PAC Dwg. 54215-3		20.4	80.1	1634
355	Nav 2 Instl. (Narco) Per PAC Dwg. 54038-3		3.1	73.0	226

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
357	Nav 2 Instl. (Narco) Per PAC Dwg. 54039-3		6.1	63.2	386
359	HF Comm Instl. (Sunair) Per PAC Dwg. 54077-3		29.5	130.5	3850
361	HF Comm Instl. (Sunair) Per PAC Dwg. 49413-5		33.4	257.8	8612
363	HF Comm Instl. (Sunair) Per PAC Dwg. 54077-7		29.5	130.8	3859
365	HF Comm Instl. (Sunair) Per PAC Dwg 49413-3		31.1	258.9	8051
367	ADF Instl. (Narco) Per PAC Dwg. 55416-3		12.4	83.8	1039

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
369	Dual ADF Instl. (Narco) Per PAC Dwg. 54500-3	______	18.7	93.2	1743
371	ADF Instl. (King) Per PAC Dwg. 52536-10				
	a. With Separate Sense Antenna	______	10.4	93.1	968
	b. With Combined Sense/ Loop Antenna	______	10.9	120.7	1315
373	ADF Instl. (King) Per PAC Dwg. 54269-3	______	13.3	8S.9	1142
375	ADF Instl. (King) Per PAC Dwg. 54218-5	______	13.7	83.9	1149
377	Dual ADF Instl. (King) Per PAC Dwg. 53938-3	______	28.8	104.7	3015

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
379	ADF Antenna Instl. (King) Per PAC Dwg. 55773-2	______	3.9	198.8	775
381	Dual ADF Antenna Instl. (King) Per PAC Dwg. 55773-3	______	7.6	216.7	1647
383	ADF Antenna Instl. (King) Per PAC Dwg. 55773-4	______	3.9	198.8	775
385	Dual ADF Antenna Instl. (King) Per PAC Dwg. 55773-5	______	7.6	216.7	1647
387	RMI (Collins) and Dual ADF (King) Instl. Per PAC Dwg. 54402-3	______	31.5	82.7	2605

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
389	RMI Instl. (RCA) Per PAC Dwg. 54648-3				
	a. With Separate Sense Antenna	______	30.6	84.9	2598
	b. With Combined Sense/Loop Antenna	______	32.5	100.5	3266
	c. With KFC 200 AP/FD	______	3.5	66.5	233
391	RMI Instl. (King KNI-581) Per PAC Dwg. 49297-3	______	18.7	53.7	1004
393	RMI Instl. (King KI226) Per PAC Dwg. 55441-2	______	2.0	54.1	108
	a. With AltiMatic IIIC	______	10.5	61.6	647
	b. With FCS-810 AP or AP/FD	______	9.9	54.5	540
	c. With KAP-200 or KFC-200	______	2.0	54.1	108
394	King KI-229 Radio Magnetic Indicator System Per PAC Dwg. 71804-2 or-3 or-4 Cert. Basis - TSO C6c	______	9.1	59.8	544
	a. Indicator Cert. Basis - TSO C6c	______	2.8	72.4	203
	b. P-20 Inverter (AIM)	______	4.3	40.6	175
	c. Harness Assembly and Misc.	______	2.0	as installed	

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
395	Transponder Instl. (Narco) Per PAC Dwg. 53902-3	______	4.0	58.1	232
397	Transponder Instl. (King) Per PAC Dwg. 53604-3 or -10	______	3.3	67.9	224
399	Transponder and DME Instl. (King) Per PAC Dwg. 54276-3	______	22.9	52.7	1207
401	Transponder, DME and Audio (Collins) Per PAC Dwg. 54216-3	______	28.0	53.8	1506
403	DME Antenna Instl. Per PAC Dwg. 49795-2	______	.3	76.0	23
405	Transponder Antenna Instl. Per PAC Dwg. 49795-3	______	.3	9.0	3
406	Remote Transponder Ident Switch Per PAC Dwg. 71980-2	______	Neglect Weight Change		

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
407	Marker Beacon Antenna Instl. Per PAC Dwg. 49795-4	______	.5	153.0	77
409	DME Instl. (King) Per PAC Dwg. 71130-3				
	a. Transceiver (KN63)	______	2.8	49	137
	b. Indicator (KDI-572)	______	.8	71.8	57
	c. Antenna (KA60)	______	.3	5.1	2
	d. Antenna (KA60)	______	.3	9.0	3
411	DME Instl. (King) Per PAC Dwg. 54276-7	______	16.7	47.2	788
413	DME Instl. (Narco) Per PAC Dwg. 54417-3	______	6.4	71.8	460
415	DME Instl. (Collins) Per PAC Dwg. 71137-2				
	a. Transceiver (TCR 451)	______	5.3	49	260
	b. Indicator (450)	______	.6	73.4	44
	c. Antenna (451)	______	.2	76.7	15

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
417	R-Nav Instl. (King) Per PAC Dwg. 54768-2	______	4.5	69.8	314
419	R-Nav Instl. (King) Per PAC Dwg. 54768-3	______	5.7	66.6	380
421	R-Nav, Instl. (Collins)(ANS351) Per PAC Dwg. 71144-2	______	3.8	69.9	266
422	King KNS-81 Digital Area Navigation System Per PAC Dwg. 71873-2 or -3 Cert. Basis - TSO C40a, C36c, C34c	______	5.5*	64.2	353
423	Audio Panel Instl. (Narco) Per PAC Dwg. 54428-5	______	10.5	69.9	734
425	Audio Panel Instl. (Narco) Per PAC Dwg. 54428-3	______	7.1	69.9	496
427	Audio Amp and Marker Beacon Instl. (King) Per PAC Dwg. 53575-9	______	5.6	73.0	408

*Includes Harness Assembly and Misc.

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
429	Audio Amp Instl. (King) Per PAC Dwg. 53575-6	______	5.6	73.0	408
431	Audio Amp. Instl. (King) Per PAC Dwg. 54279-2	______	8.7	51.2	445
433	Radar Instl. (King) Per PAC Dwg. 54289-2	______	22.4	16.3	365
435	Radar Instl. (King) Per PAC Dwg. 55716-2	______	26.3	19.5	513
437	Radar Instl. (RCA) Per PAC Dwg. 43396-3	______	27.9	11.7	326
439	Radar Instl,(RCA) Per PAC Dwg. 55725-2	______	28.2	12.7	358

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
441	Radar Instl. (Bendix) Per PAC Dwg. 54584-2	______	26.3	19.4	510
443	Radar Instl. (Bendix) Per PAC Dwg. 54687-2	______	32.6	15.7	512
445	Radar Instl. (Bendix) Per PAC Dwg. 55453-2	______	30.1	11.5	346
446	Radar Instl. (Bendix) Per PAC Dwg. 55726-2	______	18.7	22.4	419
447	Radar Instl. (Bendix) Per PAC Dwg. 55726-3	______	22.7	29.2	663

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
448	RCA Weather Scout II Monochrome Radar Per PAC Dwg. 71825-3	______	13.7	26.5	363
	a. MI-585264-1 Receiver - Transmitter, Antenna Cert. Basis - TSO C63b	______	7.0	-.1	- 7
	b. MI-585256-1 Indicator Cert. Basis - TSO C63b	______	4.8	70.1	336
	c. MI-585260 Mounting Tray Cert. Basis - TSO C63b	______	0.4	70.1	28
	d. Harness and Misc.	______	1.5	as installed	

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
449	RCA Weather Scout II Color Radar Per PAC Dwg. 71825-4	______	17.0	51.7	879
	a. MI-585264-1 Receiver - Transmitter, Antenna Cert. Basis - TSO C63b	______	7.0	-.1	-.7
	b. MI-585278 Mounting Tray Cert. Basis - TSO C63b	______	0.7	70.1	49
	c. MI-585322-1 Indicator Cert. Basis - TSO C63b	______	4.8	70.1	337
	d. MI-585323 Interface Unit Cert. Basis - TSO C63b	______	3.0	40.6	122
	e. Harness Assembly and Misc.	______	1.5	as installed	
451	Radar Altimeter (Bonzer) Per PAC Dwg. 52837-5	______	7.6	222.6	1692
452	Radard Altimeter (Bonzer) Per PAC Dwg. 52837-9	______	6.5	228.0	1482
453	Radar Altimeter (King KRA-405) Per PAC Dwg. 49356-3	______	16.7	219.1	3659

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
455	Encoding Altimeter (Aeromech) Per PAC Dwg. 15564-7 or -13 or -14 or -16	_____	2.4	71.0	170
457	Encoding Altimeter (United) Per PAC Dwg. 15570-4 or -5 or -7 or -8	_____	1.0	71.0	71
459	Radar Altimeter (KRA-10) Per PAC Dwg. 71075-9				
	a. Transceiver (KRA-10)	_____	2.0	306.9	614
	b. Indicator (KI-250)	_____	.9	74.0	67
	c. Antenna (KA131)	_____	.9	303.8	273
461	ADF Indicator (KI225-03) Per PAC Dwg. 52536	_____	1.0	74.5	75
463	Indicator Instl. (Collins) 451 (DME) Per PAC Dwg. 71370-3	_____	.9	73.2	66

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
465	2nd G/S Instl. (King) Per PAC Dwg. 54476-2	______	1.8	40.1	72
467	2nd G/S Instal. (King) Per PAC Dwg. 55766-3 Cert. Basis - TC A20SO	______	2.5	35.0	88
469	2nd G/S Instl. (King) Per PAC Dwg. 54730-2	______	2.6	68.7	179
471	2nd G/S Instl. (Collins) Per PAC Dwg. 54696-2	______	1.0	50.0	50
473	2nd G/S Instl. (Collins) Per PAC Dwg. 55180-2	______	2.3	48.0	110
474	2nd G/S Instl. (Collins) Per PAC Dwg. 55710-2	______	2.0	46.0	92
475	2nd G/S Instl. (Narco) Per PAC Dwg. 55706-3	______	7.6	52.3	397

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
477	Mike and Headset Instl.- Pilot (100-T) Per PAC Dwg. 54059	______	1.2	81.0	97
479	Mike and Headset Instl.- Pilot (M-700A) Per PAC Dwg. 54426-2	______	1.2	79.0	95
481	Mike and Headset Instl.- Copilot (100-T) Per PAC Dwg. 54059-1	______	1.2	81.0	97
483	Mike and Headset Instl. Copilot (M-700A) Per PAC Dwg. 54422-2	______	1.2	79.0	95
485	Boom Mike Instl. - Pilot Per PAC Dwg. 43369-5	______	1.6	79.0	126

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
487	Boom Mike Instl. - Copilot Per PAC Dwg. 54398-2	_____	2.6	85.5	222
489	Ramp Hailer Instl. Per PAC Dwg. 43006	_____	3.6	16.5	59
490	Ramp Hailer Instl. Per PAC Dwg. 71690-2	_____	2.6	20.0	56
491	Ramp Hailer Instl. Per PAC Dwg. 53591	_____	5.0	26.7	134
493	Radio Telephone Instl. (King KT-96) Per PAC Dwg. 49383-3	_____	9.4	115.9	1089
495	Custom Instrument Panel Instl. - Center per PAC Dwg. 54640-2	_____	Neglect	—	—

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
497	Custom Instrument Panel Instl. - Center per PAC Dwg. 54669-2	______	Neglect	—	—
499	Custom Instrument Panel Instl. - Center Per PAC Dwg. 54672-2	______	Neglect	—	—
501	Custom Instrument Panel Instl. - Center Per PAC Dwg. 53920-2	______	Neglect	—	—
503	Custom Instrument Panel Instl. - Center Per PAC Dwg. 55166-2	______	Neglect	—	—
505	Custom Instrument Panel Instl. - Left Per PAC Dwg. 54379-2	______	Neglect	—	—

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
507	Custom Instrument Panel Instl. - Right Per PAC Dwg. 54429-2 or-3	______	Neglect	—	—
509	Gables Panel (G4877)	______	11.5	71.0	817
511	Gables Panel (G-4711)	______	11.5	71.0	817
513	Gables Panel (G4683)	______	11.5	71.0	817
515	Circuit Protector Instl. Per PAC Dwg. 55971-4				
	a. NC-1-31	______	9.5	66.8	635
	b. KTS-1-31	______	8.4	65.1	547
	c. KTS-1-31 (1)	______	8.4	65.5	550
	d. KTG-3-31	______	8.9	66.0	588
	e. KTG-3-31 (1)	______	9.3	66.6	619
	f. CTM-1-31	______	8.7	65.9	573

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
517	Circuit Protector Instl. Per PAC Dwg. 54278-2 or 4 or -5 or -10	______	4.2	68.7	289
519	Circuit Protector Instl. Per PAC Dwg. 54278-9	______	4.3	69.1	297
521	Circuit Protector Instl. Per PAC Dwg. 54278-3	______	3.9	67.9	265
523	Circuit Protector Instl. Per PAC Dwg. 54278-8	______	4.1	68.4	280
525	Circuit Protector Instl. Per PAC Dwg. 54278-7	______	3.8	67.1	225
527	Circuit Protector Instl. Per PAC Dwg. 55971-2	______	4.1	92.4	379

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
529	KTG-3-31 Antenna Instl. Per PAC Dwg. 49796-3		12.6	161.9	2040
531	KTG-3-31 (1) Antenna Instl. Per PAC Dwg. 49796-5		19.0	196.6	3735
533	CTM-1-31 Equipment Instl. Per PAC Dwg. 55161-2		26.7	60.2	1607
535	CTM-1-31 Equipment Instl. Per PAC Dwg. 49452-2		31.3	61.3	1919
537	KTG-3-31 Equipment Instl. Per PAC Dwg. 49797-2		60.5	52.8	3194
539	KTG-3-31 (1) Equipment Instl. Per PAC Dwg. 49798-3		75.9	135.8	10307

(m) Radio Equipment (Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
541	Harness Instl. Per PAC Dwg. 55162-2		5.1	59.3	302
543	Harness Instl. Per PAC Dwg. 49787-2		11.0	57.9	637
545	Harness Instl. Per PAC Dwg. 49788-3		14.0	106.5	1491
547	Master Switch Instl. Per PAC Dwg. 54677-2		.1	76.0	8
549	Dimmer Instl. Per PAC Dwg. 54219-2		.8	53.6	43
551	Dimmer Instl. Per PAC Dwg. 55746-2		.68	55.1	37

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
553	Radio Cooling System Instl. Per PAC Dwg. 54306-2		.7	70.0	49
555	Cooling Fan Instl. Per PAC Dwg. 55798-2		2.5	73.9	185
557	Antenna and Coax Instl. Per PAC Dwg. 55167-3		8.8	155.3	1367
559	Static Air - VSI Instl. Per PAC Dwg. 54701-3		Neglect	—	—
561	Static Wicks Instl. Per PAC Dwg. 71065-2		.2	300.0	60
563	Placard Inst. Per PAC Dwg. 80302-2 or 80304-2		Neglect	—	—

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
565	Panel Mounting Rework Per PAC Dwg. 54602-2	_____	Neglect	—	—
567	Panel Mounting Angle Per PAC Dwg. 53563-3	_____	.1	74.0	7
569	Cover Plate Per PAC Dwg. 53607	_____	.2	75.0	15
571	Equipment Shelf Instl. Per PAC Dwg. 54106-2	_____	2.1	46.0	97
573	Equipment Shelf Instl. Per PAC Dwg. 54106-3	_____	2.1	45.0	95
575	Equipment Shelf Instl. Per PAC Dwg. 54199-2 or -3	_____	4.9	45.2	221

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
577	Equipment Shelf Instl. Per PAC Dwg. 55163-2	______	4.2	45.5	191
579	Equipment Shelf Instl. Per PAC Dwg. 55747-2 or-3	______	4.7	45.5	214
581	Ground System Instl. Per PAC Dwg. 55745-2	______	.2	51.8	10
583	Radio Support Brackets Per PAC Dwg. 54443-2	______	Neglect	—	—
585	Radio Support Brackets Per PAC Dwg. 54484-2 or -3	______	1.2	92.7	111

(m) Radio Equipment (Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
587	Radio Support Brackets Per PAC Dwg. 54881-2 and -3 and -4		.1	67.0	7
589	Radio Support Brackets Per PAC Dwg. 54432-2		.4	69.0	28
591	Radio Support Brackets Per PAC Dwg. 54204-2		.1	75.0	8
593	Radio Support Angle Per PAC Dwg. 55168-2		.3	71.0	21
595	Radio Support Angle Per PAC Dwg. 55169-2		.1	74.0	7
597	Tubes Instl. Per PAC Dwg. 54310-2		.5	66.6	33

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
599	Tubes Instl. Per PAC Dwg. 54275-2	______	Neglect	—	—
601	Radio Support Rod Per PAC Dwg. 42215	______	.2	67.0	13
603	Emergency Power Pack Per PAC Dwg. 55941-3 Cert. Basis - TSO C91	______	12.6	50.9	641
605	VOR/LOC Repeater Instl. Per PAC Dwg. 55336-2	______	1.9	74.0	141
607	Ground Clearance Energy Saver System Per PAC Dwg. 49817-2	______	.3	76.0	23

(n) Miscellaneous
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
653	Propeller Ice Shield Instl. Per PAC Dwg. 53865	______	1.6	48.5	78
655	Second Heated Pitot Tube (AN5812-1) (24 Volt)	______	1.0	40.3	40
657	Air Conditioning System Per PAC Dwg. 52677	______	75.4	102.9	7759
659	Ground Ventilation Fan Per PAC Dwg. 52516	______	6.7	250.0	1675
661	Fire Extinguisher, Per PAC Dwg. 52719-0 or -2	______	5.1	113.5	579

(n) Miscellaneous
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
663	Lightning Resistant Fuel Filler Cap Instl. Per PAC Dwg. 53857				
	a. L and R Inboard	______	0.7 ea.	131.5	92
	b. L and R Outboard	______	0.7 ea.	142.5	100
	c. Left Nacelle	______	0.7	125.0	88
	d. Right Nacelle	______	0.7	146.0	102
664	Lockable Fuel Filler Cap Instl. Per PAC Dwg. 74068				
	a. L and R Inboard	______	0.7 ea.	131.5	92
	b. L and R Outboard	______	0.7 ea.	142.5	100
	c. Left Nacelle	______	0.7	125.0	88
	d. Right Nacelle	______	0.7	146.0	102
665	Known Icing - Instl. Per PAC Dwg. 71155-4	______	65.2*	102.3	6670
667	Cargo Door Per PAC Dwg. 53330-4	______	16.7	247.1	4127
669	Pilot's Door Per PAC Dwg. 53448-3	______	7.9	99.0	782

*Weight does not include weight of pneumatic pumps.

(n) Miscellaneous
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
671	Oxygen System Instl.				
	a. Six Outlets, Bottle Forward Per PAC Dwg. 55328-2	______	53.7	54.3	2916
	b. Six Outlets, Bottle Aft Per PAC Dwg. 55343-2	______	55.7	278.1	15490
	c. Eight Outlets, Bottle Forward Per PAC Dwg. 55333-2	______	55.6	55.2	3069
	d. Eight Outlets, Bottle Aft Per PAC Dwg. 55355-2	______	57.6	271.6	15644
	e. Additional Outlets, Bottle Forward, Per PAC Dwg. 55337-2	______	2.1	231.1	485
	f. Additional Outlets, Bottle Aft Per PAC Dwg. 55363-2	______	2.1	231.1	485

(n) Miscellaneous
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
673	Cabinetry Instl. Per PAC Dwg. 55560				
	a. Fwd. Storage Divider Instl., Refreshment Cabinet With Divider, Per PAC Dwg. 55301-20 or -46	______	38.0	120.0	4560
	b. Fwd. Storage Divider Instl., Manual Storage With Divider, Per PAC Dwg. 55301-21 or -45	______	20.5	120.0	2460
	c. Fwd. Storage Divider Instl., Refreshment Cabinet Without Divider, Per PAC Dwg. 55301-22 or -47	______	35.5	120.0	4260
	d. Fwd. Storage Divider Instl., Manual Storage Without Divider, Per PAC Dwg. 55301-23 or -44	______	18.0	120.0	2160
	e. Fwd. Storage Divider Instl., Plain Storage With Divider, Per PAC Dwg. 55301-24 or -51	______	21.0	120.0	2520

(n) Miscellaneous
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
673 (cont)	f. Fwd. Storage Divider Instl Plain Storage Without Divider, Per PAC Dwg. 55301-26 or -49	______	18.5	120.0	2220
	g. Fwd. Storage Divider Instl., Manual Storage With Divider-Radio Phone (Weight of Phone Not Included) Per PAC Dwg. 55301-31 or -50	______	20.5	120.0	2460
	h. Fwd. Storage Divider Instl., Manual storage Without Divider- Radio Phone (Weight of Phone Not Included) Per PAC Dwg. 55301-32 or -52	______	18.0	120.0	2160
	i. Folding Table Instl. Per PAC Dwg. 71475	______	9.0 ea.	160.0	1440
	j. Folding Table Instl. Per PAC Dwg. 71475-3	______	9.0 ea.	160.0	1440
	k. Aft Refresh. Cabinet Instl., Thermos Storage, Per PAC Dwg. 55303-8 or -16	______	19.0	206.5	3924

(n) Miscellaneous
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
673 (cont)	l. Aft Refresh. Cabinet Instl., Vanity With Bottles, Per PAC Dwg. 55303-10 or -17		41.0	209.0	8569
	m. Aft Refresh. Cabinet Instl., Vanity Without Bottles, Per PAC Dwg. 55303-11 or -18		39 0	209.0	8151
	n. Rear Refresh. panel Instl., 7th Seat, Per PAC Dwg. 55305-4 or -8		42.0	243.0	10206
	o. Aft Refresh. Cabinet Instl. Per PAC Dwg. 55307-4 or -6				
	1. Cabinet		39.0	243.0	9477
	2. Toilet		19.0	229.0	4351
	3. Curtain		4.0	212.0	848
	p. Rear Divider Instl., Plain Panel Per PAC Dwg. 55321-3 or- 4		9.5	244.0	2318

(n) Miscellaneous (Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
675	Seats Instl. Per PAC Dwg. 55550-4 (Executive)				
	a. Seat Instl. Per PAC Dwg. 49420-2	______		Same as standard	
	b. Third Seat Instl., Aft Facing, Per PAC Dwg. 49430-6 or -8	______	21.4	138.5	2964
	c. Fourth seat Instl., Aft Facing, Per PAC Dwg. 49430-7 or -9	______	21.4	138.5	2964
	d. Passenger Seat Instl. Per PAC Dwg. 49450-18	______	25.2	as installed	
	e. Passenger Seat Instl. Per PAC Dwg. 49450-19	______	25.2	as installed	
	f. Ninth Seat Instl. Per PAC Dwg. 49460-2 or -3	______	24.4	228.0	5563
	g. Ninth Seat Instl., Toilet, Per PAC Dwg. 55310-4	______	70.4	233.0	16403

(n) Miscellaneous
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
	h. Ninth seat Instl., Toilet 7th Seat, Per PAC Dwg. 53535	______	30.0	239.0	7170
	i. Ninth Seat Instl., Toilet Per PAC Dwg. 55628-2	______	27.0	228.0	6156
	j. Tenth Seat Instl. Per PAC Dwg. 49470-2	______	21.4	247.0	5286
677	Seats Instl. Per PAC Dwg. 55550-5				
	a. Seat Instl. Per PAC Dwg. 49420-2	______	Same as standard		
	b. Third Seat Instl., Fwd. Facing,				
	Per PAC Dwg. 49440-6	______	21.4	136.0	2910
	Per PAC Dwg. 49440-8	______	20.4	136.0	2774
	c. Fourth Seat Instl., Fwd. Facing,				
	Per PAC Dwg. 49440-7	______	21.4	136.0	2910
	Per PAC Dwg. 49440-9	______	20.4	136.0	2774

(n) Miscellaneous
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
	d. Passenger Seat With Outboard Armrest Per PAC Dwg. 49450-18	______		as installed	
	e. Passenger Seat With Outboard and Inboard Armrests Per PAC Dwg. 49450-19	______		as installed	
	f. Ninth Seat Instl. Without Armrest Per PAC Dwg. 49460-2	______	24.4 ea.	233.0	S685
	g. Ninth Seat Instl. With Armrest Per PAC Dwg. 49460-3	______	25.2 ea.	233.0	5872
	h. Tenth Seat Instl. Per PAC Dwg. 49470-2	______	21.4	247.0	5286
	i. Fwd. Curtain Instl. Per PAC Dwg. 55413-3	______	3.0	116.0	348
	j. Duct Instl., Air Distribution, Per PAC Dwg. 55869-3	______		Neglect weight charge	
	k. Reading Light Instl. Mod. Per PAC Dwg. 53818	______		Neglect weight charge	

(n) Miscellaneous
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
679	Cargo Barriers Per PAC Dwg. 52480	______	12.0	120.0	1440
681	Cargo Nets Per PAC Dwg. 52414 or 53668	______	10.0 ea.	as installed	
683	Cargo Tie Down Rings Per PAC Dwg. 46654	______	.2 ea.	as installed	
685	Cargo Straps (1.8 lbs. ea., used in pairs) Per PAC Dwg. 52411	______	3.6/pr.	as installed	
687	Blanket Instl. Per PAC Dwg. 52410	______	20.0	as installed	
689	Privacy Curtain Instl. Per PAC Dwg. 55426-2 or -3	______	5.8	209.8	1217
691	Nayak Nacelle Fuel System Per PAC Dwg. 72000-2 Cert. Basis - STC SA1161SW Rev. 13	______	*		

*Included in basic empty weight of airplane

TABLE OF CONTENTS

SECTION 7

DESCRIPTION AND OPERATION OF THE AIRPLANE AND ITS SYSTEMS

TABLE OF CONTENTS (cont)

SECTION 7 (cont)

SECTION 7

DESCRIPTION AND OPERATION OF THE AIRPLANE AND ITS SYSTEMS

7.1 THE AIRPLANE

The Chieftain is a twin-engine, retractable landing gear, multi-purpose aircraft. It has a large cabin area that can be converted from a commuter cabin to a cargo or executive interior. The many options and cabin arrangements available allow the aircraft to be suited to the individual needs of the owner.

7.3 AIRFRAME

Aluminum construction is used throughout the primary structure, except for steel engine mounts and miscellaneous parts. Fiberglass and thermoplastic are used extensively for nonstructural parts. The airframe has been designed to meet the applicable Federal Government load factors.

The fuselage is a conventional, semi-monocoque structure. It has an entrance door, emergency exit, baggage doors and miscellaneous access panels.

For ease of entry and exit, a large, two piece cabin entrance door is provided on the left side of the fuselage, just aft of the wing. The door separates in the middle with the upper half, which incorporates the aft rectangular side window, swinging upward and the lower half, which houses the cabin entrance steps, swinging downward. To open the door from the outside, push on the upper portion of the door handle and pull upward on the lower portion of the handle. With the lock mechanism now released, lower the bottom half of the door and pull out the steps. (Later models are equipped with an automatic step extender.) On earlier models, raise the upper half of the door until it locks. The door is closed from the outside by pushing upward on the knurled cylinder on the upper door support and lowering the upper half of the door. On later models, pull the upper half outward a few inches and release it. From this position the gas spring support will push the door fully open and support it in the open position. To close, pull the upper door down and push it into the closed position. Next, raise the lower half of the door, making sure the door support cords do not catch in the door frame, and push in on the door halves and the door handle until the door is securely latched. As a safety feature, a locking bolt is attached to the inside of the upper half of the entrance door. When the door is closed from within the cabin, the bolt is moved to the right across the metal strike plate attachment on the door frame. This feature provides added protection in the event the cabin door should unlatch during flight due to improper latching. To open the door from the inside, pull the bolt to the left, push in and hold the lock button (adjacent to the door handle, Figure 7-1), pull the handle, lower the bottom half of the door and lower the steps. (Later models are equipped with an automatic step extender.) On earlier models, raise the upper half to the locked position. On later models, push the upper half outward a few inches and release it. The gas spring support will push the door fully open. Closing the door from the inside is performed similarly to the outside closing procedure. The door should be checked to insure proper locking by trying to pull the handle to the open position without pushing the lock button and checking that the bolt has been properly attached.

An emergency exit is located in the right forward side of the fuselage. The 23 x 30 inch exit is an integral part of the third window from the front, on the right side. To open, remove the plexiglas window located to the rear of the emergency exit window, pull the handle and push the window out (Figure 7-3).

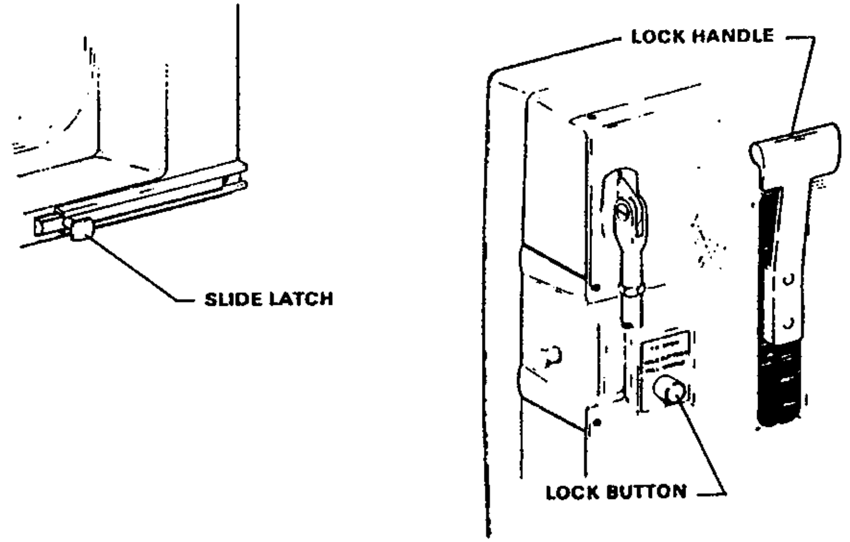
A large two-piece windshield and six windows along each side of the fuselage give excellent visibility to the pilot and passengers. The five forward side windows are of double pane construction to reduce window fogging.

Storm windows are provided for the pilot and copilot in the side windows. To open, turn handle and pull inward.

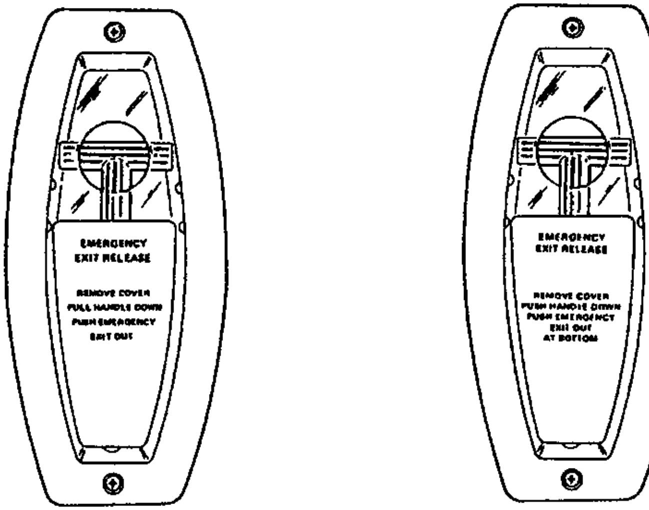
The fuselage also incorporates sufficient access panels and inspection plates to aid inspections and equipment repair.

The wing is an all-metal, cantilever, semi-monocoque structure. Each wing panel incorporates an I-beam main spar that extends into the fuselage. The two spars are bolted together with high strength butt plates giving, in effect, a continuous main spar. There is also a full length rear spar and a short front spar. All of the spars are structurally attached to the side of the fuselage.

The wing tips are made of fiberglass and are removable for repair or replacement. Two bladder fuel cells are mounted in each wing panel. Wheel



CABIN ENTRANCE DOOR LATCH
Figure 7-1



S/N 31-8052001 THRU 31-8352042

S/N 31-8452001 AND UP

EMERGENCY EXIT RELEASE
Figure 7-3

wells in each wing panel store the main gear when retracted. Wheel well doors completely enclose the gear when retracted. Access openings are provided to aid in inspecting and servicing components in the wing. A portion of the leading edge, inboard of the nacelle, is removable for access to and inspection of the wires and lines in the leading edge.

Ailerons are all metal and are fully balanced for smooth control of the aircraft.

Flaps are all metal and are actuated by an electric motor located under the cabin floor. The flap is connected to a screw transmission, which is actuated by a flexible shaft connected to the electric motor.

The engine nacelles are an integral part of the wing. They provide structure for mounting the engines and also added baggage area accessible from the rear of the nacelle.

The empennage consists of a vertical fin, a rudder, a horizontal stabilizer and elevators. They utilize an aluminum cantilever structure with fiberglass tips. The rudder and elevators both have trim tabs. The elevator tab also serves as an anti-servo tab.

7.5 ENGINES AND ACCESSORIES

The Chieftain is powered with turbocharged Avco Lycoming TIO-540-J and LTIO-540-J series engines. The left engine rotates clockwise, and the right engine rotates counterclockwise as viewed from the pilot seat. The six-cylinder engines develop 350 HP each at 2575 RPM. They are equipped with geared starters, single-drive dual magnetos, 28-volt 70-amp alternators, shielded ignition, turbochargers, hydraulic pumps, oil filters, oil coolers, pneumatic pressure pumps and three-bladed propellers. Recommended overhaul is at 1600 hours. This time is based on Avco Lycoming service experience. From time to time Lycoming revises the recommended overhaul period through a Service Instruction. The pilot should check with his dealer for the latest overhaul period on his engines plus any additional Lycoming Service information. Operation beyond the recommended overhaul period is at the discretion of the operator.

The turbocharger is designed to increase the power output and efficiency of the engine by supplying compressed air to the engine intake manifold. This allows the engines to operate at peak power at a much higher altitude than normally aspirated engines. The power to drive the turbocharger is extracted from energy in the exhaust gases. The exhaust gases are ducted through the turbine and then directed overboard at the bottom of the nacelles in the area of the cowl flaps.

The fuel injection system is based on the principle of measuring engine air consumption by use of a venturi tube and using the airflow forces therefrom to control fuel flow to the engines. Fuel distribution to the individual cylinders is obtained by the use of a fuel flow divider and air bleed nozzles. Idle cut-offs are incorporated in the injectors and should always be used to stop the engines. This is accomplished by pulling the mixture control levers to the rearmost position.

An automatic alternate air induction system is provided for each engine. Should the induction air filters become obstructed by ice or other causes, the induction air doors will open automatically to provide air to the engine.

As a backup to the automatic system there are two manual alternate air controls. These are located to the right of the control pedestal and may be used by the pilot to select air, independent of the automatic feature. Since alternate air bypasses the air filter, alternate air should never be used during ground operation.

The cowl flaps, located on the bottom of the engine nacelles, are electrically operated by switches located on the bottom of the engine control quadrant. Cowl flaps should be positioned to maintain temperatures within the normal operating range. Remote indicating gauges located next to the switches give the pilot a visual indication of cowl flap position.

The engines of the airplane are equipped with doors on the induction housings; in the event of a turbocharger compressor failure, the engine will automatically revert to normally aspirated air. Under these conditions approximately 75% of normal rated power or 235 HP will be available at sea level.

The engine mounts are of steel tube construction and incorporate vibration-absorbing dynafocal mounts. The engine cowls are cantilever structures and are attached at the fire wall. The cowlings are made of a combination of fiberglass and metal. The top cowl is quickly removable by means of quick-release fasteners. The cowl flap must be disconnected before removing the lower cowl.

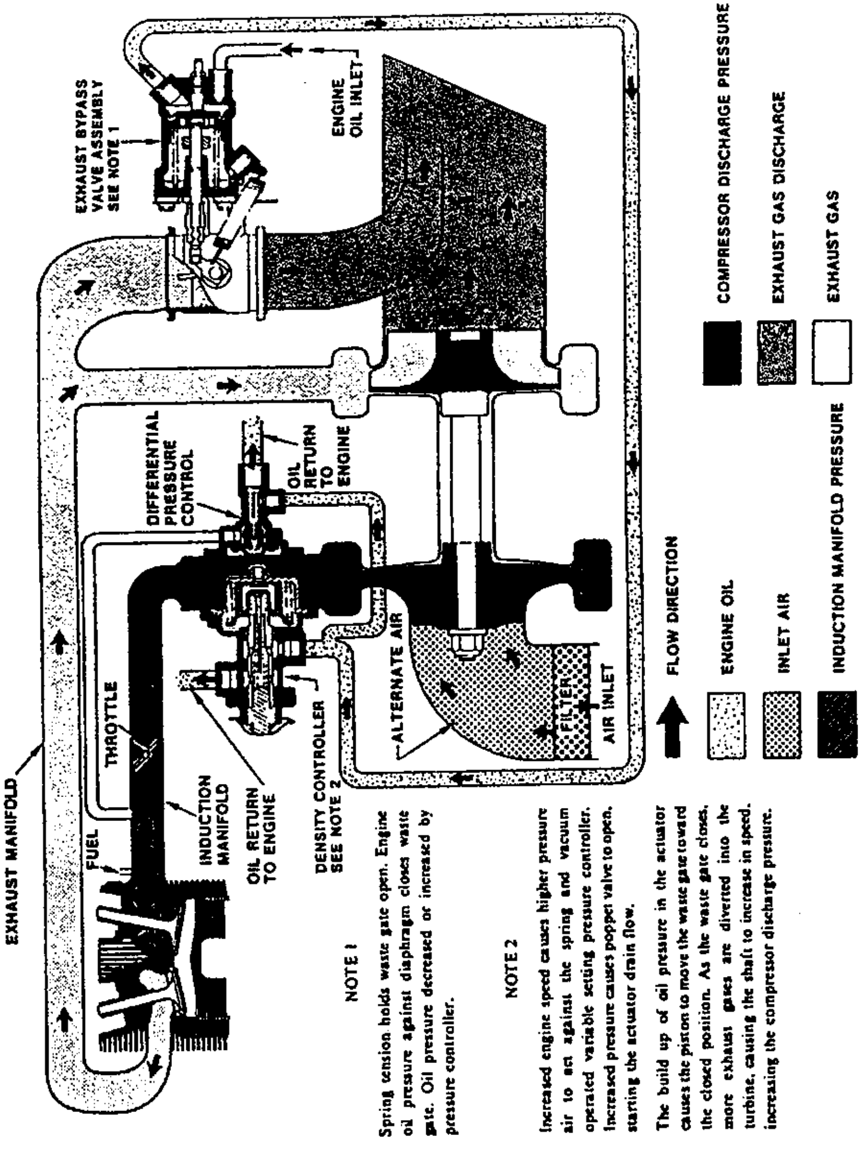
Oil coolers are attached to the engine mounts on the lower left side and below the engine. The engine incorporates a thermostat control bypass that aids in protecting the oil cooler during cool weather engine starts. The valve allows the oil to bypass the cooler when the oil is cold.

In order to obtain maximum engine efficiency and time between overhauls, the pilot should read and follow the procedures recommended by the Avco-Lycoming Operator's Manual for this engine.

7.7 PROPELLERS

The propellers are Hartzell, three-blade, constant speed, controllable pitch and full feathering. They are controlled by a propeller governor mounted on each engine. The governor is controlled by the corresponding propeller control in the pedestal.

A combination of nitrogen or air pressure, a spring, blade counter-weights and governor-regulated oil pressure is utilized to change the pitch of the propeller blades. Nitrogen or air pressure is supplied from the precharged propeller chamber. (Refer to Section 8 - Airplane Handling, Servicing and Maintenance). The nitrogen or air pressure, spring and blade counter-weight force is utilized to move the blades to the high pitch (decreased RPM) and feathered position, and the opposing governor-regulated oil pressure moves the blades to the low pitch (increased RPM) position. As the propeller control lever is moved forward, increasing the propeller RPM, a valve in the propeller governor allows increased oil pressure to enter the propeller hub and move the blades to the low pitch (increased RPM) position. Moving the propeller control lever aft decreases the propeller RPM as the propeller governor decreases the oil pressure to the hub, and the nitrogen or air pressure, spring and blade counter-weights move the propeller blades to the high pitch (decreased RPM) or, if selected, the feathered position.



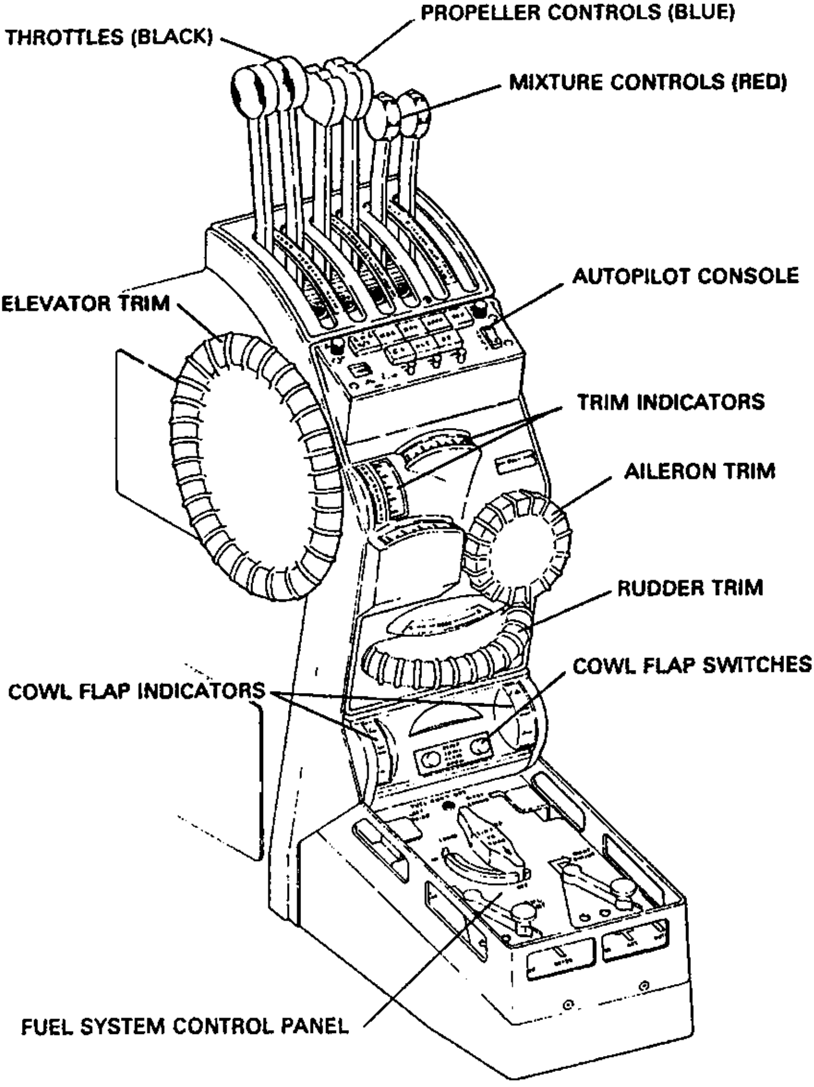
TURBOCHARGER SYSTEM SCHEMATIC
Figure 7-5

7.9 FLIGHT CONTROL SYSTEM

The primary flight controls are conventional and are operated by dual control wheels and rudder pedals. The control wheel operates the ailerons and elevators. The rudder pedals actuate the rudder and nose wheel steering. The toe brakes, which are an integral part of the pedals, operate the wheel brakes. The ailerons and rudder are interconnected, through a spring system, to reduce adverse yaw and the amount of coordination required in normal turns. All flight control systems are operated by closed circuit cable systems.

Secondary control is by aileron, elevator and rudder trim tabs. The controls are located on the pedestal (Figure 7-7). The aileron trim wheel is located below the power controls. Rotate the wheel clockwise for right wing down and counterclockwise for left wing down. The elevator trim control wheel is located on the left side of the pedestal. Rotate the wheel forward for nose down trim and aft for nose up trim. The rudder trim wheel is located below the aileron trim control. Rotate the wheel to the right (counterclockwise) for nose right and left (clockwise) for nose left. Trim indicators for the individual systems are located on the pedestal below the power controls The trim indicators are operated electrically by a rheostat on the respective control surface.

Wing flap position is controlled by a selector switch mounted on the instrument panel immediately to the right of the control pedestal. The flap position indicator is located to the right of the selector switch. An OFF position on the flap position indicator is also provided to indicate zero (0) voltage to the system. The selector switch provides for variable wing flap positioning in as little as 2° increments from 0° to 40°. Detent positions are provided at the most commonly used positions of 0°, 15°, and 40°. A wing flap position change is made by moving the selector handle to any desired position (marked on the switch selector guard). The flaps will automatically move to the selected position and indicator will display the actual flap position. The flaps may be extended to 25° at airspeeds below 162 KIAS. 40° flap extension is limited to airspeeds below 132 KIAS. The entire system is electronically monitored for system component failures and will prevent an asymmetric flap position greater than 5° differential.



CONTROL PEDESTAL
Figure 7-7

The basic electronic control system consists of an amplifier, three rheostats, two power solenoids, and one motor. The motor is of a D.C. permanent magnet type and extends or retracts the flaps through a pair of flexible shafts attached to jackscrew, transmission assemblies located on each wing flap.

The amplifier is the heart of the control system. It provides a regulated voltage supply for the three external rheostats, circuit logic to analyze the system condition and position; provides commands to the power solenoids to actuate the motor for extensions and retractions and contains its own monitoring system to ascertain the condition of critical components.

The three rheostats feed back to the amplifier the signals necessary to operate the system. One rheostat is located in the flap position selector and one each is located so as to sense the positions of the right and left flaps independently. The selector rheostat signals the amplifier, activating the motor, which positions the flaps. The left flap rheostat controls flap position in relation to the selector rheostat position and provides information to the amplifier to drive the position indicator. The right flap rheostat must agree with the left flap rheostat within 5° at all times or the system will shut down and cannot be reactivated until the imbalance and/or the cause has been corrected

The system also incorporates a FLAP annunciator light that will illuminate when an imbalance exists between the right and left wing flap rheostats or a critical component of the amplifier has failed.

Before takeoff, the operation of the FLAP annunciator may be checked by pushing the test switch located adjacent to the flap position indicator.

7.11 LANDING GEAR

The Chieftain is equipped with a hydraulically actuated, retractable tricycle landing gear. The gear incorporates air-oil oleo struts. Gear doors completely cover the gear when retracted. The nose gear doors and the outboard doors on the main gear remain in the open position when the gear is extended. The inboard main gear door, operated hydraulically, closes when the main gear is fully extended or fully retracted.

The nose gear is steerable by use of the rudder pedals. The total nose gear turning arc when steered with the rudder pedals is normally 40°. However, a feature is incorporated which allows the nose gear to temporarily disengage from the rudder pedal steering linkage, permitting the gear to be turned an additional 20° in each direction during towing operations, thus extending the turning arc to a full 80°. A spring-loaded cam device will return the nose gear to within the center 40° arc, where it automatically re-engages with the steering linkage. Although this device is intended for use during towing, while taxiing through tight turns with differential engine power and braking, the nose gear can disengage itself, permitting a shorter turning radius. Should this occur, the rudder pedal force change and accompanying noise in the nose gear is normal and should not be interpreted as a malfunction.

NOTE

Avoid unnecessary sharp turns, as excessive tire wear will result.

The nose gear incorporates a shimmy dampening device at the bottom of the outer housing. As the gear retracts, the steering linkage separates to reduce the in-flight rudder forces.

To guard against inadvertent gear retraction on the ground, a solenoid latch is incorporated in the landing gear selector. This prevents the gear selector's being moved to the UP position, while on the ground. The gear selector knob is in the shape of a wheel to differentiate it from the flap control, which has an airfoil shape. To raise or lower the gear in flight, the selector handle must first be pulled aft.

Located on the instrument panel, to the right of the gear selector control are one red and three green lights. The red light indicates when the gear is in transit between the up-locked and down-locked position. Also the light will remain on if the inboard gear doors remain open when the gear is retracted. The green lights indicate when each gear is down and locked. There is no indication when the gear is up and locked. Each light includes a press-to-test feature to check the condition of the bulb. The gear indicator lights can be dimmed individually by turning each light. A gear unsafe horn will sound if the power in one or both engines is reduced below 12 inches of manifold pressure with the landing gear retracted or not down and locked. Also, if the gear selector is in the up or up neutral position with the aircraft on the ground, the gear horn will sound when the master switch is on.

The main wheels are 6.50 x 10 Cleveland Aircraft Products units with disc type brakes and 6.50 x 10 tires with eight-ply rating. The nose wheel is a Cleveland 6.00 x 6 model fitted with a 6.00 x 6 tire with a six-ply rating. All tires have tubes.

7.13 BRAKE SYSTEM

The brakes are hydraulically actuated by individual master cylinders mounted on the left (optional on the right) set of rudder pedals. A hydraulic reservoir, separate from the main hydraulic system, supplies fluid to each master cylinder. From these cylinders, hydraulic fluid is routed through lines and hoses to a parking brake valve, located on the left aft side of the forward cabin bulkhead, through the cabin and wings to the brake assemblies on each main landing gear. The standard brakes are self-adjusting, single-disc, single-housing, four-piston assemblies.

The parking brake handle is located on the lower left face of the instrument panel. To set the parking brake, first depress and hold the toe brake pedals and then pull out the parking brake handle. To release the parking brake, first depress and hold the toe brake pedals and then push in on the parking brake handle.

WARNING

Braking may not occur if parking brake handle is pulled and held prior to brake pedal application.

7.15 HYDRAULIC SYSTEM

The hydraulic system consists of two hydraulic pumps, a power pack, emergency hand pump, actuating cylinders and filters (Figure 7-9).

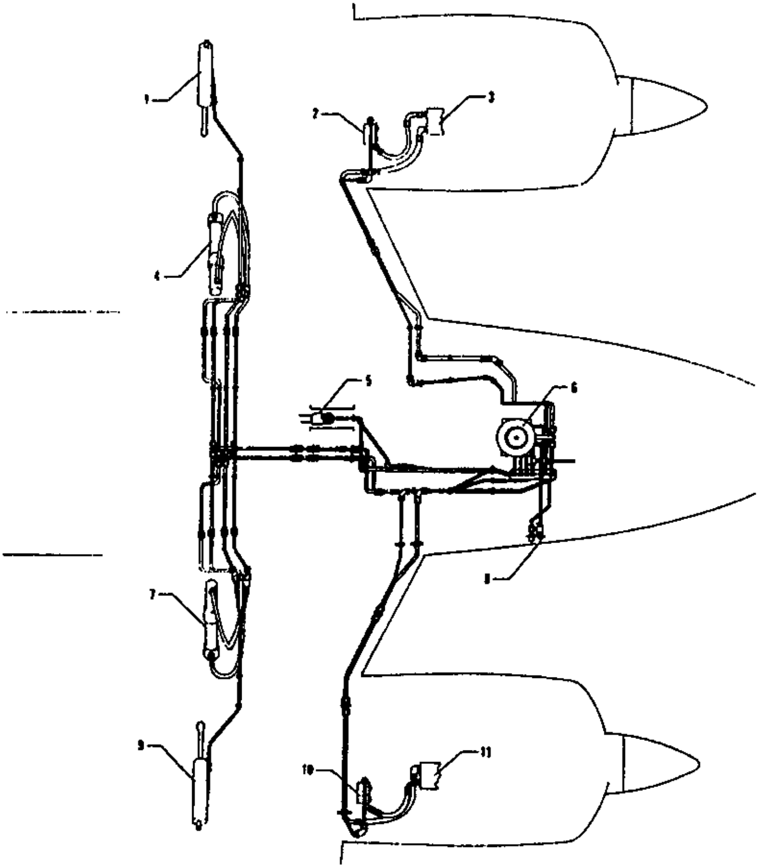
The hydraulic pumps are engine-driven and are mounted on the rear of each engine. The pumps supply the pressure required for gear operation.

The power pack is the central control unit for the hydraulic system. It contains the valves, manifold, fluid reservoir and necessary controls for operation of the landing gear.

Fluid is taken from the reservoir by the pumps and is passed through a filter mounted on each fire wall, then to the power pack. which then directs the fluid to the appropriate actuator, depending on the sequence and gear selector position.

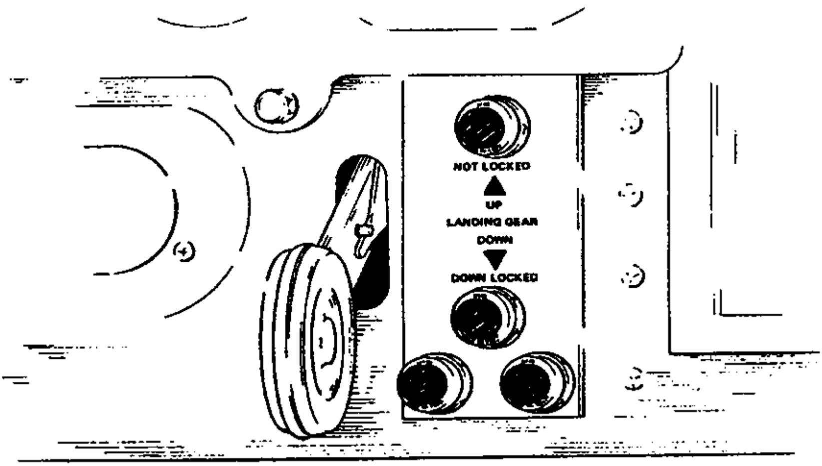
The reservoir contains a standpipe which retains sufficient fluid to operate the emergency hand pump in case of a loss of fluid. The engine-driven pumps are supplied through the standpipe, so if the fluid level is below the standpipe the only way to operate the gear is by using the hand pump.

The door solenoid valve mounted in the power pack is electrically operated and is spring loaded to the door open position. So if an electrical failure occurs, the solenoid valve will move to the door open position so that the gear can be lowered normally or with the hand pump. For a more detailed description refer to the appropriate service manual.



1. LEFT MAIN GEAR ACTUATING CYLINDER
2. LEFT HYDRAULIC PUMP FILTER
3. LEFT HYDRAULIC PUMP
4. LEFT GEAR DOOR ACTUATING CYLINDER
5. EMERGENCY HAND PUMP
6. POWER PACK ASSEMBLY
7. RIGHT GEAR DOOR ACTUATING CYLINDER
8. CHECK VALVES
9. RIGHT MAIN GEAR ACTUATING CYLINDER
10. RIGHT HYDRAULIC PUMP FILTER
11. RIGHT HYDRAULIC PUMP

HYDRAULIC SYSTEM SCHEMATIC
Figure 7-9



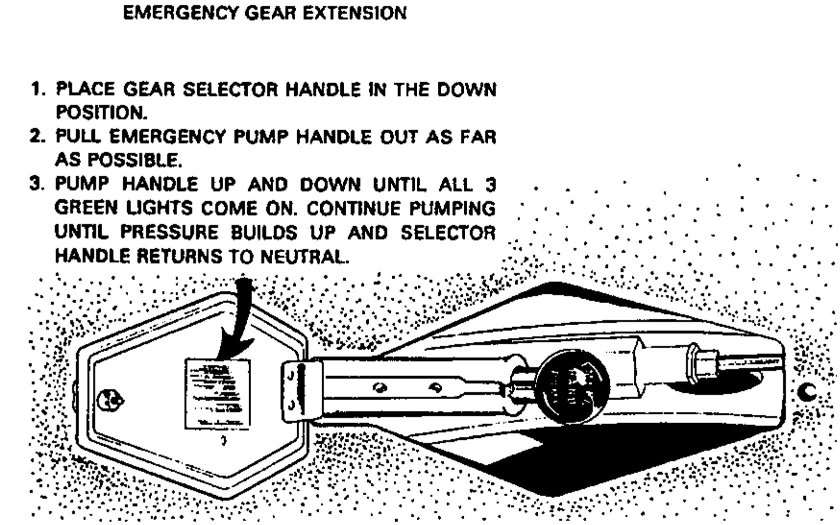
LANDING GEAR SELECTOR
Figure 7-11

To operate the gear pull out the gear selector, mounted on the left instrument panel (Figure 7-11), move it from the neutral position to the UP landing gear or DOWN landing gear position. When the desired position of the gear is obtained, the handle is forced back to the center off position by hydraulic pressure in the selector valve, allowing the hydraulic fluid to circulate freely between the pump and control unit. Gear retraction or extension will occur normally in approximately 6 seconds.

NOTE

In the event of electrical failure or when the master switch is OFF, the selector handle will not return to neutral and the gear doors will not close.

When the selector handle returns to neutral it relieves all pressure in the system. The gear is held in position by mechanical locks. The return of the control handle to the neutral position is an indication that the components have reached full extension or retraction. However, the landing gear position lights should be used as primary indications.



EMERGENCY LANDING GEAR HAND PUMP
Figure 7-13

CAUTION

When retracting the landing gear be sure that the gear unsafe light is out before exceeding the maximum gear operating speed.

The emergency hydraulic hand pump (Figure 7-13) is used to obtain hydraulic pressure in the event of failure of the engine-driven hydraulic pumps. This hand pump is located between the pilot's and copilot's seats. An access cover marked Emergency Gear Extension must be lifted to gain access to the pump handle. Follow instructions on the underside of the access plate to lower the gear. The hand pump should not be used to retract the gear in flight or to perform gear retractions while aircraft is on jacks.

NOTE

To perform an emergency gear extension, approximately 50 full strokes will be required.

7.17 FUEL SYSTEM

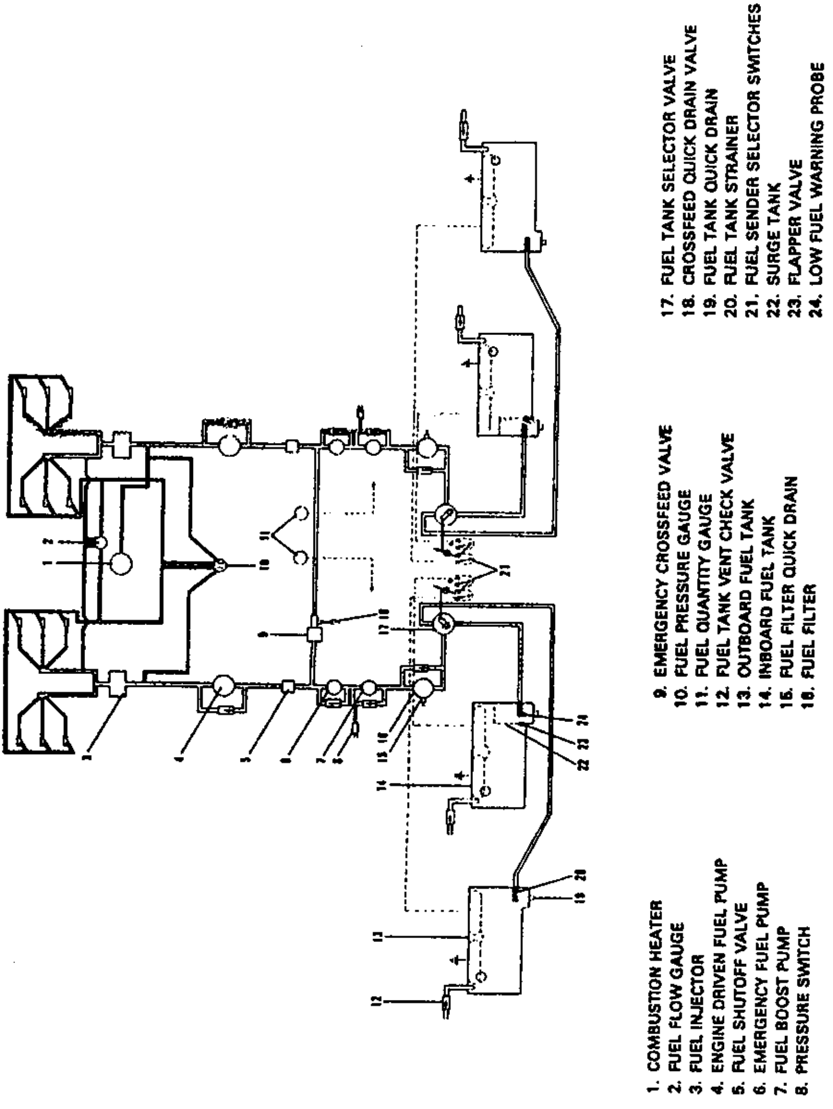
The fuel system consists of fuel cells, engine-driven and emergency fuel pumps, fuel boost pumps, control valves, fuel filters, fuel pressure and fuel flow gauges, fuel drains and non-icing NACA fuel tank vents (Figure 7-15). Lockable filler caps are optional equipment.

Fuel is stored in four flexible fuel cells, two in each wing panel. The outboard cells hold 40 U.S. gallons each, and the inboard cells hold 56 U.S. gallons each, giving a total of 192 gallons, of which 182 gallons are usable. Fuel is routed from the fuel cells to the selector valve, the fuel filter, the fuel boost pump, the emergency fuel pump, the firewall shutoff, the engine-driven fuel pump, to the injector, then to the cylinders. The fuel selector, filter, fuel boost pump, emergency fuel pump and firewall shutoff are located on the butt-rib of each wing panel.

The emergency fuel pumps are installed for emergency use in case of an engine-driven fuel pump failure. They are also used for takeoff and landing and, when necessary, to prime the engines. Control switches for the emergency fuel pumps are located in the overhead switch panel to the right of the fuel gauges.

Two electric fuel-quantity gauges are mounted in the overhead switch panel. The right fuel-quantity gauge indicates the quantity of fuel in the selected right fuel system tank (right inboard or right outboard), and the left fuel-quantity gauge indicates the quantity of fuel in the selected left fuel system tank (left inboard or left outboard). The fuel gauges are connected electrically to micro switches mounted in the fuel selector console. The fuel senders are also connected electrically to the micro switches. When a fuel tank is selected, its corresponding micro switch is actuated, which completes the circuit between the fuel senders and its fuel quantity gauge, providing a visual reading of the fuel quantity in the selected tank. The gauges are illuminated, and the lights are controlled by a rheostat switch on the left side of the overhead switch panel.

The fuel boost pumps are operated continuously and are provided to maintain fuel under pressure to the other fuel pumps, improving the altitude performance of the fuel system. There are no fuel boost pump control switches or pressure gauges provided. Each fuel boost pump is controlled by a separate circuit breaker, located in the circuit breaker control panel. The fuel boost pumps are activated when the master switch is turned on and



FUEL SYSTEM SCHEMATIC
Figure 7-15

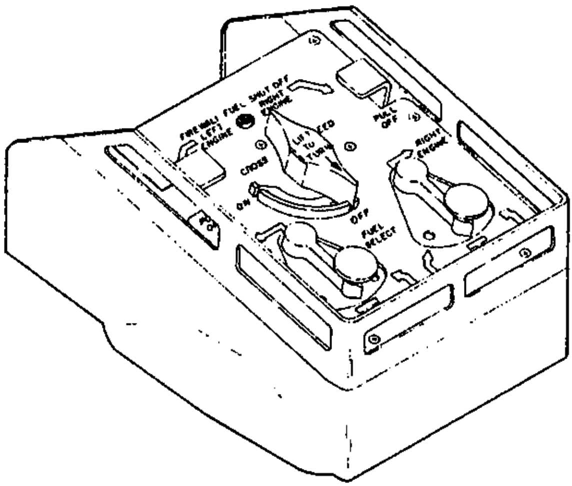
continue to operate until the master switch is turned off or the fuel boost pump circuit breakers are pulled (off). Fuel boost pump warning lights, mounted on the annunciator panel, illuminate when the fuel boost pressure is less than 3 PSI. In a full power continuous climb from takeoff to high altitude under conditions of high ambient temperature, high climb rate, and extremely volatile fuel, the boost pump may not maintain a sufficient pressure head to the engine-driven fuel pump. This condition would be indicated by engine fuel pressure fluctuations of 2-5 PSI and/or illumination of the boost pump warning light. The pilot may continue the climb by using the emergency fuel pump to provide steady fuel pressure for the high power operation; the emergency pump can be turned OFF after level-out if reduction to cruise power extinguishes the boost pump warning light. Cruise can be continued with the emergency fuel pump OFF if fuel pressure remains steady and above 34 PSI, as indicated on the engine fuel pressure gauge.

The fuel management controls (Figure 7-17) are located in the fuel control panel at the base of the pedestal. Located here are the fuel tank selectors, fuel shut offs and crossfeed controls. During normal operation each engine is supplied with fuel from its own respective fuel system. The fuel controls on the right control the fuel from the right cells to the right engine and the controls on the left control the fuel from the left fuel cells to the left engine.

For emergencies, fuel from one system can supply the opposite engine through a crossfeed system. The crossfeed valve is located in the left wing butt area and is intended only for emergencies. The crossfeed control is located in the center of the fuel control panel. A warning lights located on the fuel control panel is incorporated in the firewall shut off system to indicate that one or both of the shut off valves are not fully open.

NOTE

The crossfeed system is not to be used for normal operation. When the crossfeed valve is on, be certain fuel selector valve on tank not in use is off. Do not use crossfeed to compensate for an inoperative emergency fuel pump.



FUEL SYSTEM CONTROL CONSOLE
Figure 7-17

Fuel drains for checking fuel contamination are located at the rear inboard corner of the fuel cells, on the fuel filters and the lowest point of the crossfeed system. The quick drain for the crossfeed is located on the left wing fillet just forward of the main spar. The drains on the filters are at the base of the filter and are accessible through access doors in the lower wing fillets aft of the wing leading edge.

Right and left fuel flow warning lights illuminate to warn the pilot of an impending fuel flow interruption. The lights are activated by a sensing probe mounted near each inboard fuel tank outlet. In the event the fuel level near the tank outlet drops to a point where a fuel flow interruption and power loss could occur, the sensing probe will illuminate its corresponding warning light. The warning light will be on for a minimum of 10 seconds and will remain on if the cause is not corrected.

The warning lights are incorporated in the annunciator panel. For press-to-test procedures, refer to Paragraph 7.23.

NOTE

Heater operation will cause the right fuel pressure gauge to fluctuate during heater cycling.

7.19 ELECTRICAL SYSTEM

The electrical system is a 28-volt system (Figure 7-19). Control switches are located in the overhead switch panels and in the circuit breaker panel. The circuit breaker panel (Figure 7-21), located on the side wall of the cockpit, has provisions to handle a full complement of equipment. Switches and circuit breakers are clearly marked as to their function. Switches are of the toggle and rocker type and the circuit breakers are the push to reset type. If a breaker pops it is recommended to allow the breaker to cool for a couple of minutes before resetting. When a white band can be seen around the shank of the circuit breaker button, the breaker is open. The breakers can be manually tripped by pulling on the reset button.

The standard electrical equipment includes alternators, starters, ammeter, battery, voltage regulators and external power source receptacle.

The starters are energized by a rocker style switch located in the overhead switch panel (Figure 7-23 or 7-24) between the magneto switches. To operate, push on the side of the switch that corresponds to the engine to be started and hold until the selected engine has started. Release the switch and it will return to neutral.

NOTE

Starters should not be energized for more than 30 seconds of continuous cranking. Allow to cool between starting attempts.

The primary electrical source is two 28-volt 70-ampere alternators (Figure 7-19). The alternators are controlled independently by two voltage regulators which are interconnected electrically to provide parallel outputs at normal engine operating speeds. Alternator inoperative lights illuminate when the respective alternator fails to provide voltage. The lights can be checked by turning on the master switch with the engines shut down. If a light fails to illuminate, it should be replaced. Whenever the engines are operating at a high differential RPM, the alternator inoperative light for the slower engine may come on.

A single ammeter in the overhead panel indicates both battery charging current and alternator output. When the ammeter needle indicates to the left of center, the battery is being discharged; when the needle indicates to the right of center, the battery is being charged. During single-engine operation, this feature can be used to determine how much the electrical load should be reduced. To check the output of each alternator individually, use the press-to-test buttons located on either side of the ammeter. The left button, when depressed, will cause the ammeter to indicate left alternator output, and the right button, when depressed, will indicate right alternator output. These buttons are the momentary type, and indicate alternator output only while depressed.

NOTE

When flying in heavy rain, the electrical load on the right alternator must be reduced to 40-amperes or less to insure against alternator belt slippage.

The master switch on the left side panel is a split rocker type and gives the pilot control over the field of the respective alternator.

NOTE

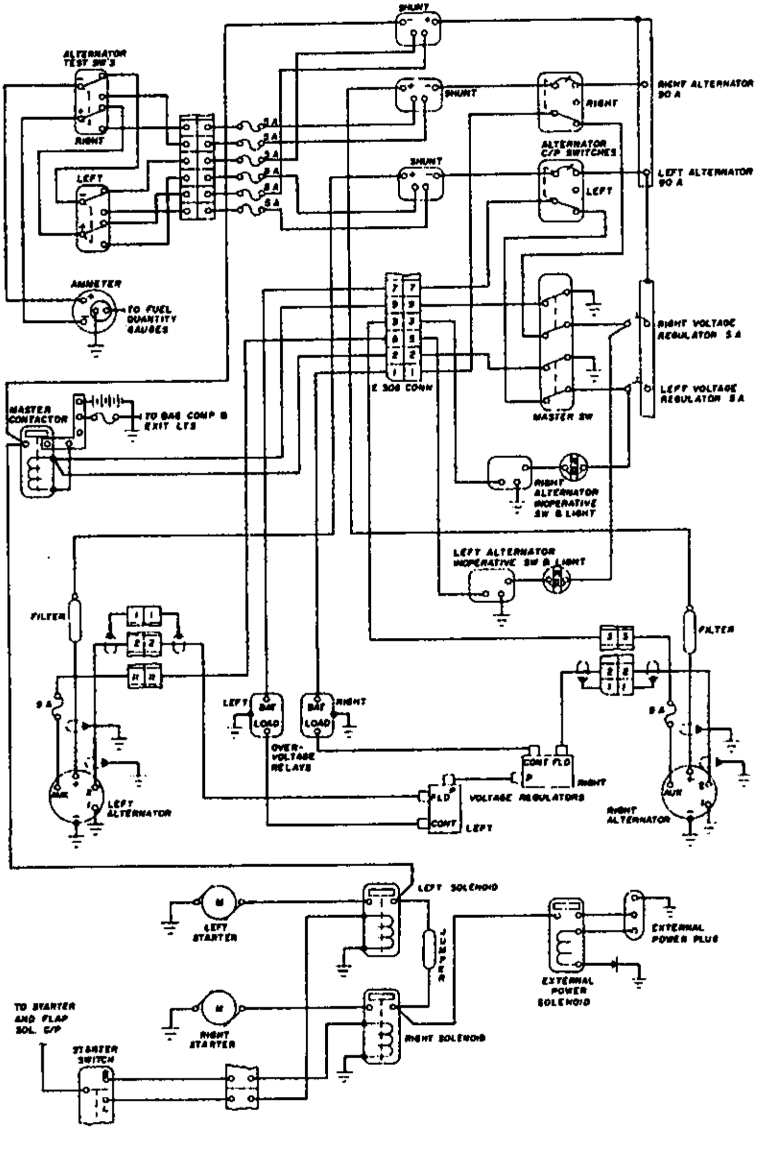
For alternator failure emergency procedure, see Section 3 - Emergency Procedures.

Secondary electrical power is provided by a 24-volt 17-ampere hour battery as standard equipment. A 24-volt 25-ampere hour battery is offered as optional equipment.

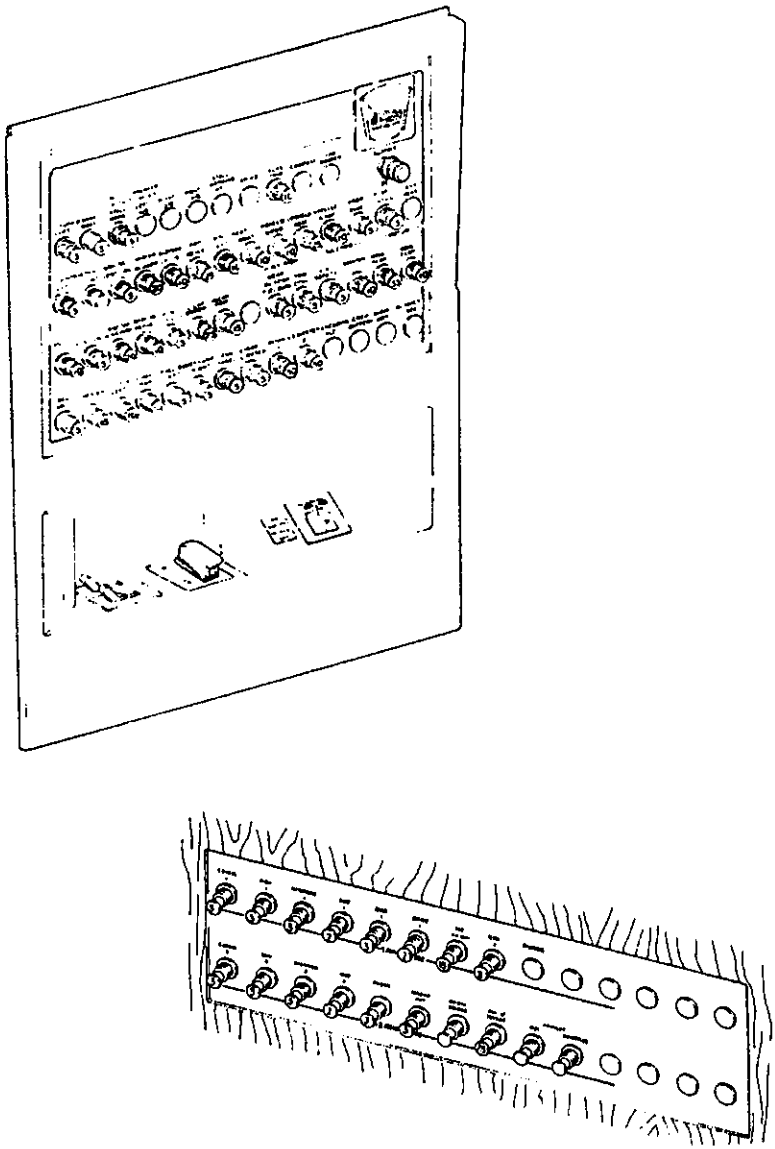
An external power source receptacle is installed in the lower left side of the nose of the aircraft. It is provided to utilize a 24-volt D.C. external power source when the aircraft battery is low or during cold weather to prevent a dead battery because of extended starting procedures. It can be used also to save the battery when ground checking the aircraft systems. Turn the master switch off before inserting the external power plug into the receptacle. The master switch should be off when using an external supply source.

NOTE

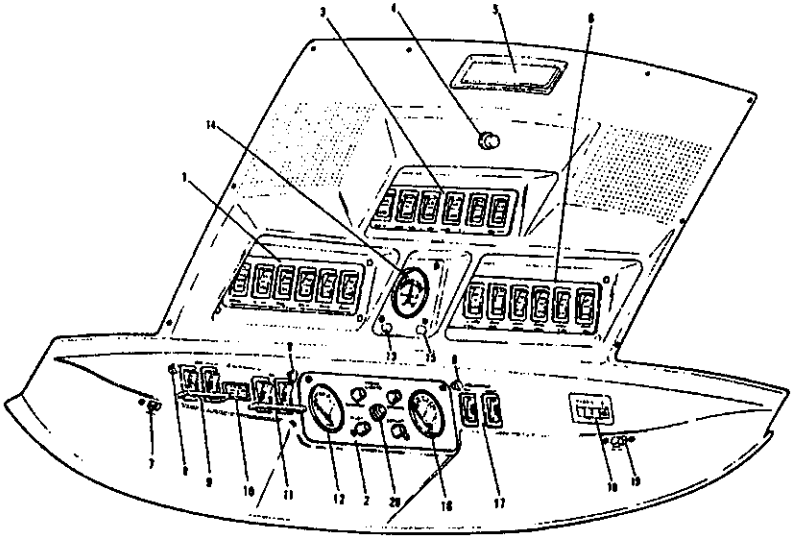
The aircraft battery must be removed before recharging.



ELECTRICAL SYSTEM SCHEMATIC
Figure 7-19

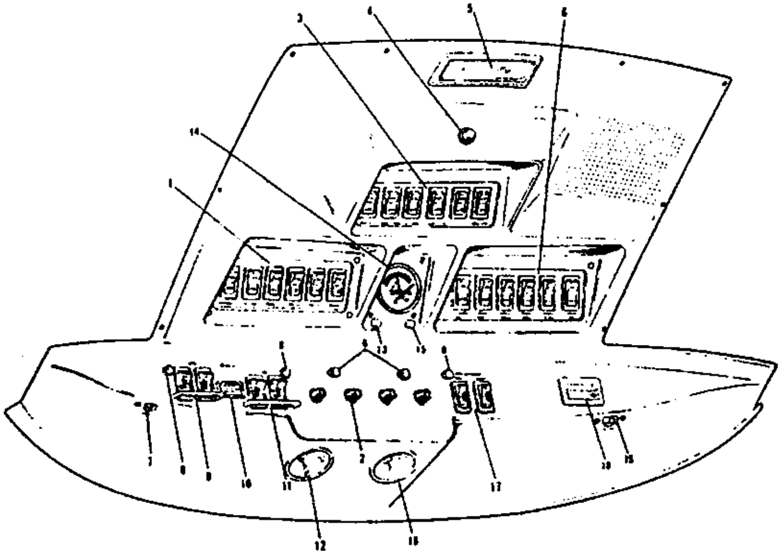


TYPICAL CIRCUIT BREAKER PANEL
Figure 7-21



1. LIGHT SWITCH PANEL
2. RHEOSTAT SWITCHES
3. ELECTRICAL SWITCHES
4. DOME LIGHT SWITCH
5. DOME LIGHT
6. VARIOUS DEICING SYSTEM SWITCHES
7. LEFT MAP LIGHT SWITCH
8. POST LIGHTS
9. LEFT ENGINE MAGNETO SWITCHES
10. STARTER SWITCH
11. RIGHT ENGINE MAGNETO SWITCHES
12. LEFT FUEL GAUGE
13. LEFT ALTERNATOR PRESS-TO-TEST SWITCH
14. AMMETER
15. RIGHT ALTERNATOR PRESS-TO-TEST SWITCH
16. RIGHT FUEL GAUGE
17. FUEL PUMP SWITCHES
18. ENGINE HOUR METER
19. RIGHT MAP LIGHT SWITCH
20. DIAL LIGHT

OVERHEAD PANEL
(AIRCRAFT WITH S/N 31-8052001 THRU 31-8252075)
Figure 7-23



1. LIGHT SWITCH PANEL
2. RHEOSTAT SWITCHES
3. ELECTRICAL SWITCHES
4. DOME LIGHT SWITCH
5. DOME LIGHT
6. VARIOUS DEICING SYSTEM SWITCHES
7. LEFT MAP LIGHT SWITCH
8. POST LIGHTS
9. LEFT ENGINE MAGNETO SWITCHES
10. STARTER SWITCH
11. RIGHT ENGINE MAGNETO SWITCHES
12. LEFT FUEL GAUGE
13. LEFT ALTERNATOR PRESS-TO-TEST SWITCH
14. AMMETER
15. RIGHT ALTERNATOR PRESS-TO-TEST SWITCH
16. RIGHT FUEL GAUGE
17. FUEL PUMP SWITCHES
18. ENGINE HOUR METER
19. RIGHT MAP LIGHT SWITCH

OVERHEAD PANEL
(AIRCRAFT WITH S/N 31-8252076 AND UP)
Figure 7-24

A pilot/copilot dome light is located in the overhead panel. The push button switch is located just forward of the lens. The light will operate with the master switch off.

A reading light is available for each passenger seat. The switch is incorporated in the light assembly.

A rear dome light and a rear exit flood light are controlled by a switch mounted in the overhead switch panel marked EXIT and a switch located just inside the cabin door. The lights operate with the master switch off to aid night loading. In addition, an optional timer is available to operate the lights for 30 seconds upon opening the main cabin door.

Position/ strobe light assemblies are installed in each wing tip. The right wing tip incorporates a green position light and a white strobe light and the left wing tip, a red position light and a white strobe light. A white position and a white strobe light are also installed on the tail cone of the airplane. The position lights and the strobe lights are controlled by switches on the overhead 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.

The landing and taxi lights are mounted to the upper nose gear strut. The rocker style switches are located in the overhead switch panel. During retraction, if the lights have not been turned off manually, they will be turned off automatically because they are wired through the gear down micro switch. If the switch is left on, when the gear is extended the lights will again illuminate.

7.21 INSTRUMENT PANEL

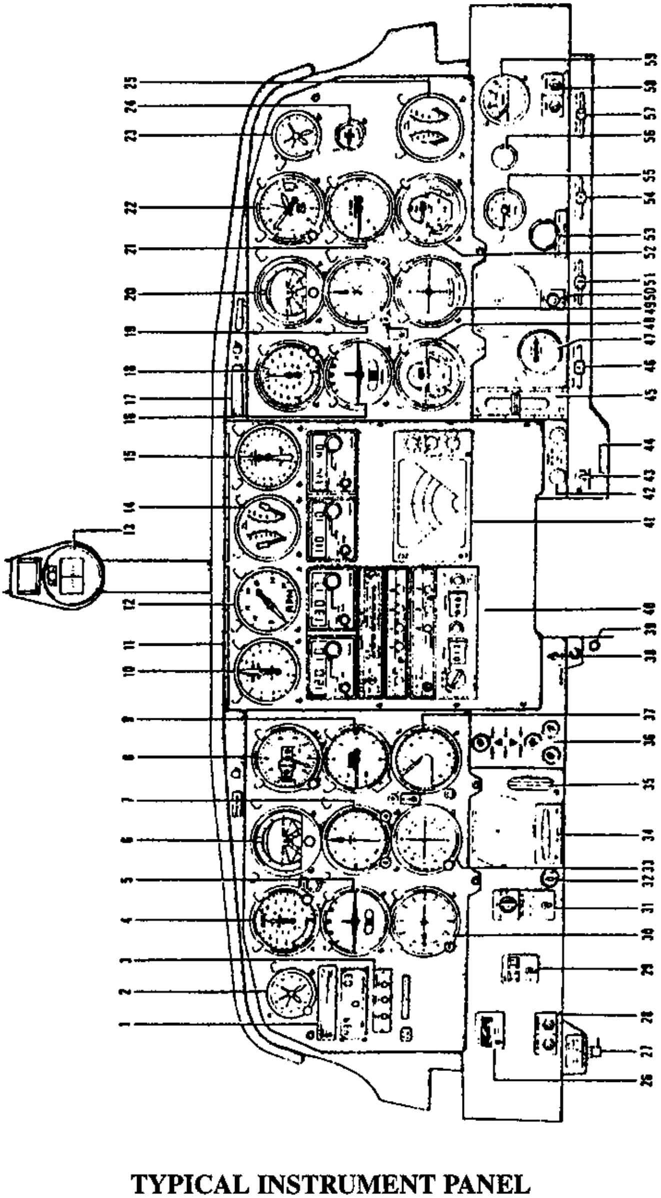
The instrument panel (Figure 7-25) is designed to accommodate complete instruments and avionics for VFR or IFR flights.

Flight instruments are directly in front of the pilot and are grouped in a standard "T" configuration. The radios are located in the middle panel and the engine instruments are mounted horizontally across the top of the center panel or stacked vertically at the right side of the center panel. Additional engine gauges are located in the right instrument panel. Optional dual flight instruments, when installed, are located in the right instrument panel. The tachometer and manifold pressure gauges are located in the center panel.

The standard attitude indicator and standard heading indicator are operated by air under pressure, whereas the turn and slip indicator is operated electrically to serve as a standby instrument in case the pneumatic system becomes inoperative.

Instrument lighting is provided by individual post lamps mounted adjacent to each instrument. These lights are controlled by a rheostat switch located on the overhead panel. The lights are turned on by the first movement of the knob and light intensity is increased by further rotation of the knob.

Pilot and copilot map lights are located in the overhead switch panel. The switch is located on the bottom of the horizontal surface of the panel assembly.



TYPICAL INSTRUMENT PANEL
Figure 7-25

1. AIRSPEED PLACARD
2. CLOCK
3. DME
4. AIRSPEED INDICATOR
5. TURN AND BANK INDICATOR
6. ATTITUDE GYRO
7. DIRECTIONAL GYRO
8. ALTIMETER
9. RATE OF CLIMB INDICATOR
10. DUAL MANIFOLD PRESSURE GAUGE
11. ANNUNCIATOR PANEL
12. DUAL TACHOMETER
13. COMPASS
14. DUAL EGT GAUGE
15. DUAL FUEL FLOW GAUGE
16. TURN AND BANK INDICATOR - COPILOT
17. CATEGORY PLACARD
18. AIRSPEED INDICATOR - COPILOT
19. DIRECTIONAL GYRO - COPILOT
20. ATTITUDE GYRO - COPILOT
21. RATE OF CLIMB INDICATOR - COPILOT
22. ALTIMETER - COPILOT
23. CLOCK
24. GYRO PRESSURE GAUGE
25. DUAL FUEL PRESSURE GAUGE
26. EMERGENCY LOCATOR TRANSMITTER
27. ALTERNATE STATIC SOURCE VALVE
28. MIKE AND EARPHONE JACKS - PILOT
29. AUTOPILOT CONTROLS
30. ADF
31. WINDSHIELD WIPER CONTROL/
    EMERGENCY BATTERY PACK
32. CIGAR LIGHTER
33. NAV 2
34. PARKING BRAKE
35. GEAR SELECTOR
36. GEAR INDICATOR LIGHTS
37. RADAR ALTIMETER
38. AVIONICS MASTER SWITCH
39. PA VOLUME CONTROL/ON-OFF KNOB (1980 MODELS ONLY)
40. AVIONICS
41. RADAR
42. MANUAL ALTERNATE AIR CONTROLS
43. HEATER CONTROL SWITCH
44. HEATER START/RESET SWITCH
45. WING FLAP SELECTOR SWITCH
46. CABIN TEMP. CONTROL
47. WING FLAP POSITION INDICATOR
48. OIL PRESS. CYL. HEAD TEMP., AND
    OIL TEMP - LEFT ENGINE
49. NAV 2 - COPILOT
50. FLAP TEST SWITCH
51. DEFROSTER CONTROL
52. OIL PRESS - CYL. HEAD TEMP., AND
    OIL TEMP - RIGHT ENGINE
53. CABIN EXHAUST CONTROL KNOB
54. CABIN AIR CONTROL LEVER
55. OXYGEN SUPPLY PRESSURE GAUGE
56. OXYGEN CONTROL KNOB
57. COCKPIT AIR CONTROL LEVER
58. MIKE AND EARPHONE JACKS COPILOT
59. VOLTMETER

TYPICAL INSTRUMENT PANEL
Figure 7-25 (cont)

THIS PAGE INTENTIONALLY LEFT BLANK

7.23 ANNUNCIATOR PANEL

The warning lights are grouped together in an annunciator panel which extends across the upper center of the instrument panel. Monitored functions include the pneumatic system, fuel boost pumps, low fuel flow, flap condition, alternator operation, combustion heater temperature, and cabin and baggage door security. There are also provisions in the annunciator panel for the addition of warning lights for various optional systems.

To the left of the annunciator display is a press-to-test switch. With the master switch ON, depressing the test switch will illuminate all of the annunciator lights except the FLAP light. A separate flap annunciator test switch is located adjacent to the flap position gauge. (See paragraph 7.9, Flight Control System.) Failure of a light to illuminate is an indication of a burnt out bulb or other annunciator system abnormality. The switch should be held for at least 3 seconds, as the low fuel flow warning light will take a few seconds longer than the others to illuminate and will remain lit for as long as 10 seconds after the others have extinguished. To the right of the annunciator display is a dimmer switch which raises or lowers the intensity of the lights in the display. During the press-to-test procedure, the lights will test either bright or dim, depending upon the position of the dimmer switch. During daylight operations, the annunciator lights should be in the bright mode.

7.25 RADIO OPERATION

Electrical power for avionics equipment is controlled by a master switch located in the center of the instrument panel below the radios. The audio control panel allows the pilot to select radio audio individually. This allows presetting of frequencies or volume and also provides the option of listening with either the speaker or the headphones.

An Emergency Avionics Bus Power circuit breaker switch is located below the left circuit breaker panel. The switch is protected from inadvertent activation by a red switch guard.

In normal operating conditions, the switch is in the OFF position and the guard is closed. The ON position is' for emergency use only and causes power from the primary bus to go directly to the number 1 avionics bus. In this configuration, number 1 avionics bus power is independent of the avionics master circuit breaker number 1.

NOTE

To avoid chatter in the speaker with the Emergency Avionics Bus Power ON, pull the avionics master number I circuit breaker before turning the Emergency Avionics Bus Power ON.

A public address (PA) volume control knob is mounted on the left side of the pedestal, below and forward of the propeller synchrophaser switch. The control is a rheostat type switch providing variable volume control through the rear speaker system. If operation with oxygen masks is required and the airplane is equipped with Collins radios and Scout Duo-Seal oxygen masks, communications between the pilot and copilot are possible through the headphones by selecting the PA mode and turning down the rear speaker volume. This will allow the pilot and copilot to communicate and still receive incoming communications. Starting with the 1981 models the PA system operates at a fixed volume level with passengers able to monitor the crew conversations mentioned above.

A ground clearance energy saver system is available to provide direct power to '1 Comm without turning on the master switch. An internally lit pushbutton switch, located on the instrument panel, provides annunciation for engagement of the system. When the button is engaged direct aircraft battery power is applied to '1 Comm, the pilot's mike and audio amplifier (speaker). The system is reset to the OFF position by activating the aircraft master switch.

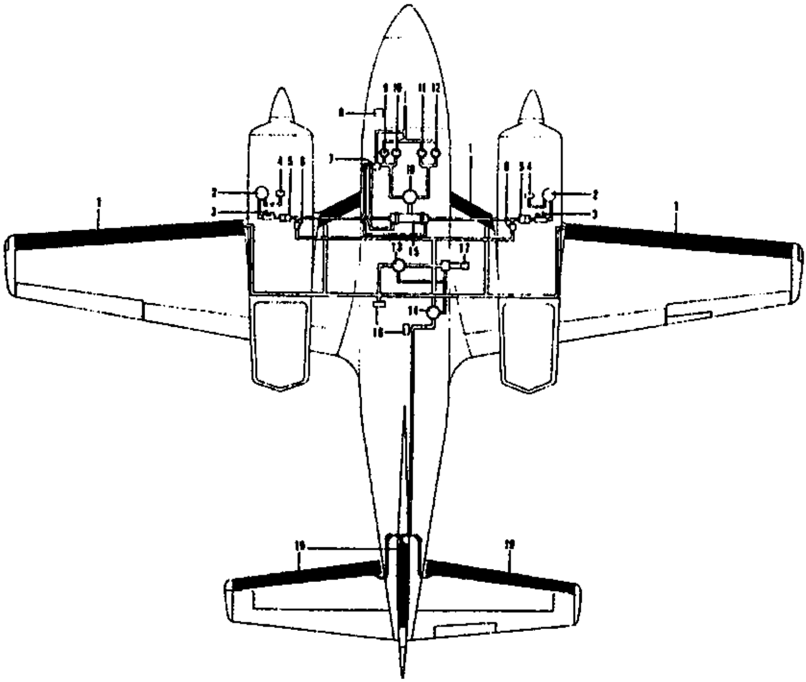
7.27 PNEUMATIC SYSTEM

The pneumatic system supplies air pressure to run the air driven gyros. When the surface deicing system is installed the pneumatic system supplies air to operate the deicing boots on the wings and empennage surfaces (Figure 7-27).

Basically, the pneumatic system is divided into two independently operated pressure supply systems: the left engine supply and the right engine supply. Both systems utilize a common manifold check valve and pressure gauge. Each side of the pneumatic system incorporates its own inlet, inlet filter, engine driven pneumatic pump, regulator and inline filter. Recessed inlets, just aft of the fire wall on the bottom-outboard side of the engine nacelle, extract constant supplies of outside air, which are passed through inlet filters and directed to the left and right engine driven pneumatic pumps. Air pressure from each pump is then routed to its respective pressure regulator. Each pressure regulator has its own adjustment to provide a means of setting the pump outlet pressure. Any airflow supplied by the pumps in excess of the adjusted setting is expelled from the system at the regulators. Regulated air pressure is then passed through a .3 micron inline filter for further protection against contaminated air reaching the instruments. Once filtered, pressure from the left engine supply and pressure from the right engine supply are united in a manifold check valve, common to both sides of the system. The manifold check valve supplies a single outlet line to the gyros. In the event one of the engine driven pneumatic pumps fail, the other side of the system can maintain air pressure to the gyros and/or deicers. Air pressure supplied by the system is utilized to operate the attitude gyro and the directional gyro and exhausted through a bulkhead forward of the instrument panel.

Each pressure pump is capable of operating the air driven gyros and the pneumatic deicers up to single engine service ceiling and with both pumps operating normally, up to the maximum approved altitude of the airplane.

A gyro pressure gauge, mounted in the right segment of the instrument panel, indicates system pressure in inches of mercury. A graduated green arc on the face of the gauge indicates pressure readings within normal operating limits. Two annunciator lights, mounted in the annunciator panel, provide a visual warning to the pilot that either the right or left pneumatic source is inoperative. The lights are placarded, R. PNEU. INOP. and L. PNEU. INOP.



1. WING DEICER BOOT
2. PNEUMATIC PUMP
3. DUAL REGULATOR - SOLENOID VALVE
4. INLET AIR FILTER
5. INLINE FILTER
6. CHECK VALVE
7. PRESSURE GAUGE
8. DEICER CYCLE TIMER
9. DIRECTIONAL GYRO - PILOT
10. ATTITUDE GYRO - PILOT
11. DIRECTIONAL GYRO - COPILOT
12. ATTITUDE GYRO - COPILOT
13. "A" SYSTEM (WING) SOLENOID VALVE
14. "B" SYSTEM (TAIL) SOLENOID VALVE
15. MANIFOLD CHECK VALVE
16. PRESSURE SWITCH
17. EJECTOR
18. PNEUMATIC PRESSURE REGUALTOR (RELAY VALVE)
19. EMPENNAGE DEICING BOOT

PNEUMATIC/WING AND EMPENNAGE DEICING
Figure 7-27

7.29 WING AND EMPENNAGE DEICING*

Pneumatic wing and empennage boots are installed on the leading edges of the wings, the vertical stabilizer (fin) and the horizontal stabilizer. A constant suction is applied to all of the surface deicer boots by an ejector to provide smooth streamlined leading edges during normal operation with the deicing system off. The ejector assembly utilizes air pressure supplied by the pneumatic system to obtain a vacuum to hold the boots in the flat, deflated condition.

The deicing system is controlled by a "momentary on" type control switch. When this WING DEICE switch is actuated, the boots perform one complete inflation cycle. The switch must be actuated for each additional inflation cycle. This allows the pilot to manually select boot inflation in any desired time interval that icing conditions require. After each inflation cycle, the timer automatically resets to allow the inflation cycle to begin when the switch is actuated.

Actuation of the momentary switch triggers a system cycle timer, which in turn shifts the two stage regulators to high pressure (18 psi), opens the 'A' system solenoid valve to send air to the wing boots, and cuts off air to the copilot's gyros (when installed). After six seconds, the 'A' system solenoid is closed and the 'B' system solenoid is opened to send air to the tail boots for six seconds. At the completion of the tail cycle, the 'B' system solenoid closes, the two stage regulators return to low pressure (gyro pres.) and the copilot's air supply resumes.

When the inflation cycle is complete, the deicer solenoid valves permit overboard exhaustion of the pressurized boots. Suction is then reapplied to the deicer boots to hold them close to the airfoil surface.

Two blue indicator lights with press-to-test and dimming features, illuminate when each surface deicer boot system inflates to a predetermined pressure. Illumination of the indicator light is controlled by a pressure sensitive switch connected to the deicer pressure lines (one in the 'A' system, and one in the 'B' system).

To insure good ice shedding, the boots should be clean and free of any oils or dirt and in good condition. No special coating is required; but ice

*Optional equipment

shedding may be slightly improved by the application of B.F. Goodrich 'Icex'. It is authorized for use and has been tested in natural icing. The manufacturer's instructions (B.F. Goodrich) must be followed explicitly.

7.31 PITOT STATIC SYSTEM

The pitot static system (Figure 7-29) supplies dynamic and static air pressure for the operation of the airspeed indicator. Static air is also supplied to the vertical velocity indicator and altimeter.

A heated pitot head is located under the nose of the aircraft just forward of the nose gear doors. A second heated pitot system is installed when dual flight instruments are installed.

Static source pickups (about the size of a half dollar) are located on both sides of the rear fuselage forward of the horizontal tail. They connect to a single line leading to the instruments. The dual pickups are provided to reduce side slip effects on the airspeed indicator.

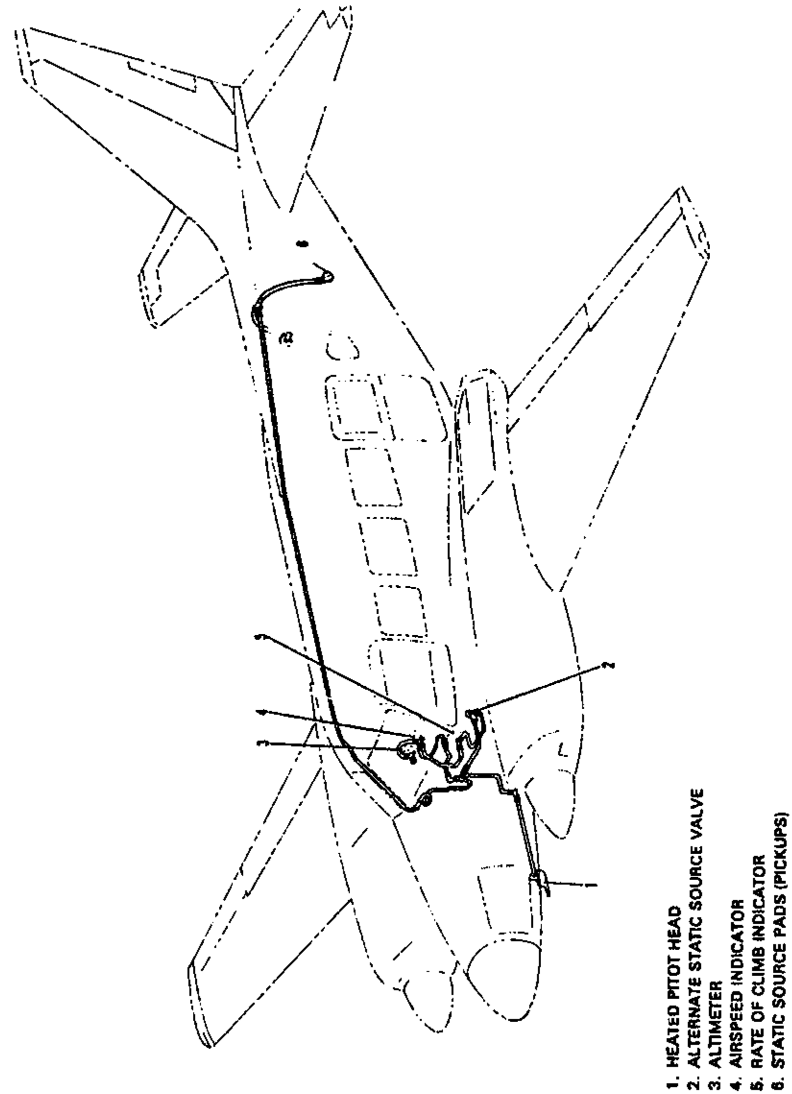
An alternate static source valve is located under the instrument panel near the pilot's left knee. To actuate, push the lever up and to the left to lock the valve in the open position. This valve can also be used to drain condensed water from the static system. To drain, move lever up. If water appears leave open till water stops flowing; then close valve.

When the alternate static source is selected, the pilot's instruments are vented to cabin pressure. This means that the altimeter and airspeed indicator will indicate higher readings than normal. (See correction chart in Section 5 - Performance.) The vertical velocity indicator will show a momentary climb.

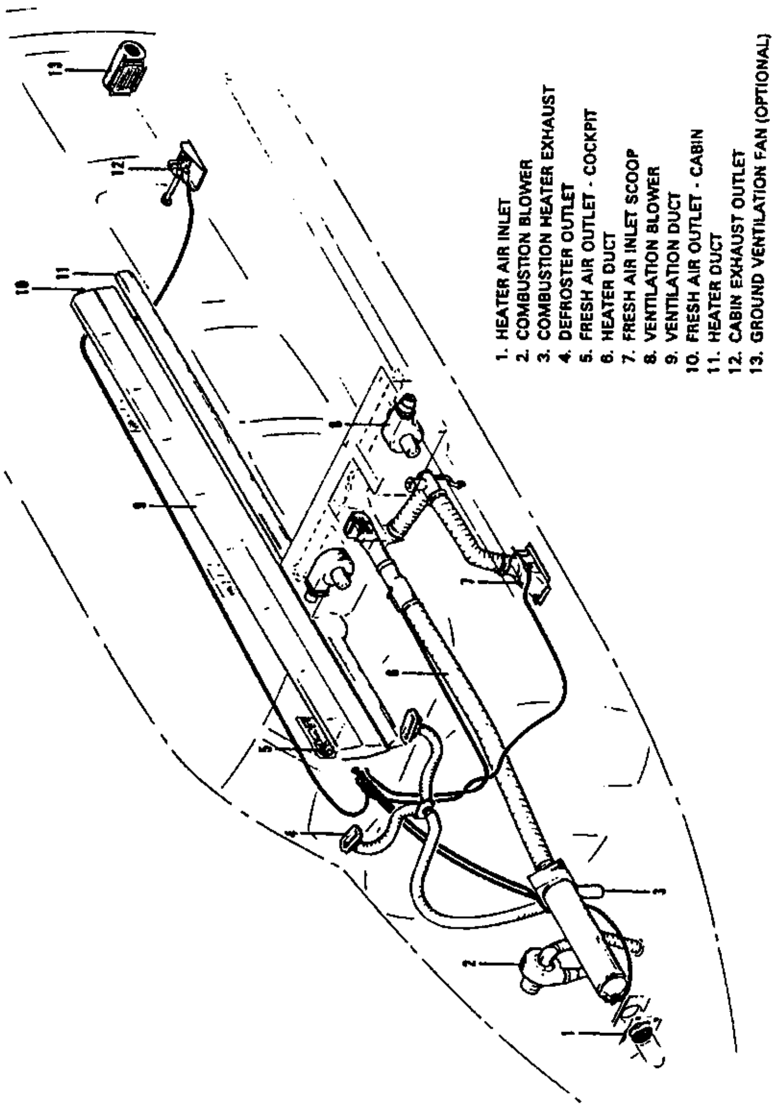
The switches for the pitot heat are located in the right overhead switch panel. Pitot covers are provided with each pitot head and should be installed when the aircraft is parked to prevent bugs and rain from entering the pitot head. A partially or completely blocked pitot system will give erratic or zero reading on the airspeed indicator.

NOTE

Before every flight, check to make sure the pitot cover has been removed.



PITOT STATIC SYSTEM
Figure 7-29



HEATING, VENTILATING AND DEFROSTING SYSTEM
Figure 7-31

7.33 HEAT, VENTILATING AND DEFROSTING SYSTEM

The heating, ventilating, and defrosting system (Figure 7-31) includes a heater, fuel regulator, heat and defroster ducts, heat and defroster outlets, and corresponding controls.

A 50,000 B.T.U. Janitrol heater, installed in the right nose section, furnishes hot air for cabin heating and windshield defrosting. Fuel is supplied from the right wing fuel cells only. The air inlet for the heater is located on the lower right side of the nose section. The air passes through the heater, into the distribution box and then to the heater outlets and/or the defroster outlets. Heat outlets are provided in the cockpit and cabin areas. The cockpit outlets are located below and at the end of the armrests. The cabin outlets are located below the full length air ducts along the floor, giving good heat distribution. The defroster outlets are located in the instrument panel cover giving good airflow distribution to each windshield.

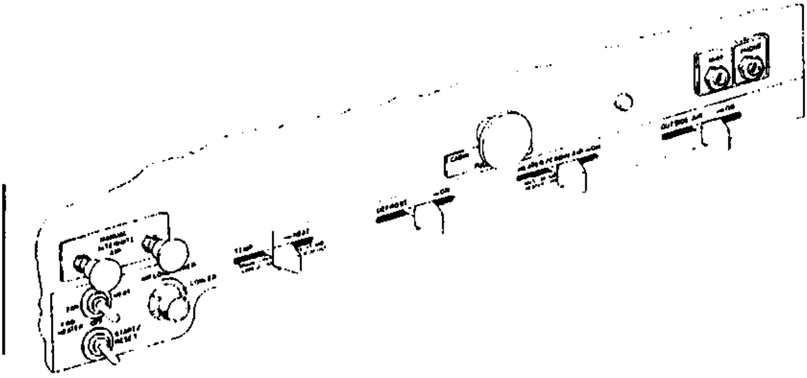
Heater operation is controlled by two switches mounted one below the other and located in the lower right panel just to the right of the pedestal. The upper switch has three positions: FAN, OFF and HEAT. The lower switch is a momentary on type and is marked START/RESET.

When FAN is selected, the vent blower is turned on and air is circulated through the heat ducts while on the ground or used to defog the windshield when heat is not desired. This position is also used to cool the heater, so as not to trip the heat limit switch, after use on the ground. When HEAT is selected and the START/RESET switch is momentarily depressed, the heater fuel pump turns on and ignition occurs simultaneously, providing heated air within a few seconds.

The heater and defroster controls (Figure 7-33) are located on the lower right instrument panel. The temperature control is below the flap switch. Outboard of the temperature control are the defroster and cockpit controls. The temperature control regulates the cabin temperature. To increase temperature move the control to the right.

NOTE

For ground operation, takeoff and climb, do not exceed midpoint.



CABIN AIR CONTROL PANEL
Figure 7-33

The defroster control turns the defrosters on when the control is moved to the right. The air is picked up at the heat distribution box and then ducted directly to the defroster outlets. Because of this, it is suggested that the defroster be turned on full until the windshield is defrosted. Then move the control back toward the off position until just enough heated air is flowing to keep the windshield defrosted.

A heater air inlet valve is located just aft of the heater air inlet scoop. It is used to shut off the air to the heater if the heater becomes inoperative or when the incoming air is cool, but doesn't necessitate turning the heater on.

CAUTION

The heater air inlet valve must be full open prior to and during heater operation. If this valve is not full open during heater operation the heater will become inoperative from overheating.

The heater has a circulating fan that is controlled by a landing gear safety switch and operates only when the aircraft is on the ground.

To turn the heater off, move the heater switch to OFF. If the heater is turned off after operation on the ground, the switch should first be turned to the FAN position for a few minutes to cool the heater, then turned off. If the heater is turned off while in the air, it is not necessary to select the FAN position.

The heater is protected from overheating by a heat limit switch. If the heater temperature reaches a predetermined setting, the limit switch opens and the heater becomes inoperative. This is indicated by the illumination of the HTR FAIL warning light in the annunciator panel. The heat limit switch will automatically reset when sufficient time is allowed for the heater to cool. By depressing the START/RESET switch momentarily, the heater can be restarted. Heater restart is indicated by the HTR FAIL warning light extinguishing after the START/RESET switch is released. Prior to restarting the heater, ensure the following precautions are followed:

(a) The heater air inlet lever must be full open prior to and during heater operation.
(b) Open all heater outlets to the full open position.
(c) The TEMP HEAT lever should only be half open.
(d) Immediately shut off heater if annunciator comes on again after attempting to restart. Do not operate heater again until it has been serviced by a qualified repair station.

WARNING

Operating a defective heater may be a serious fire hazard.

(e) After heater has restarted, wait approximately 5 minutes and then, if desired, the temperature lever may be moved to a higher selection.

The ventilating system is designed to operate both on the ground and during flight. The system employs a retractable air scoop, ventilating fans, air distribution ducts and fresh air outlets for up to eight occupants.

The air is picked up by the air scoop on the bottom of the fuselage forward of the main spar, then ducted to circulation fans enclosed in air boxes located forward of the spar cover and on each side of the aisle. The air then flows through air ducts along each side of the fuselage to the fresh air outlets. For individual comfort, the amount of air to the outlets is regulated by rotating the rim of the outlet clockwise to decrease the amount of flow and counterclockwise to increase. The direction of the airflow can be changed by moving the outlet in the desired direction of flow.

Cabin air is recirculated through an aisle grill located in each air box. The aisle in the grill area should be clear of obstacles to allow free movement of air. The air boxes contain ventilating fans which are controlled by a switch placarded AIR CONTROL located in the overhead switch panel. The air scoop is operated by the OUTSIDE AIR control located to the right of the HEATER AIR INLET control.

A cabin exhaust is located in the raised floor panel in the aft cabin area. It is provided to aid air distribution within the cabin. A retractable exhaust outlet is located in the lower aft section of the fuselage just aft of the main cabin door. It is controlled by a push-pull control located below and to the right of the copilot control wheel. The outlet should be open when the heater is operating or, if desired, to aid ventilation.

To aid in cabin ventilation during ground operation, a ground ventilation fan is installed aft of the cabin exhaust in the raised floor panel in the aft cabin area. An on-off control switch labeled GROUND VENT FAN is mounted in the overhead switch panel. The fan extracts cabin air from beneath the floorboards and expells it into the cabin through the ventilating grill.

7.35 CABIN FEATURES

The interior has been designed for multi-purpose use. Pilot and copilot seats are standard. The cabin area will accommodate up to eight commuter passengers, five to six passengers in executive style or it can be quickly changed into a cargo area.

All passenger seats have folding armrests.

Shoulder harnesses are available. To use, the shoulder harness should be routed over the shoulder nearest the window and latched when the seat belt is latched. An inertia reel is available with the shoulder harness. The inertia reel operation can be checked by pulling sharply on the shoulder strap. The reel will lock in place when a 3g force is applied to the strap. The locking feature prevents the strap from extending and holds the user in place. Under normal movement the strap will extend and retract as required. Shoulder harnesses should be routinely worn during takeoffs, landings and emergency situations.

The pilot and copilot seats adjust fore, aft and vertically and also recline. The seat controls are on the aisle side of each seat. The lower handle adjusts the fore and aft position. Pull the handle up and move the seat to the desired position; then release the handle. Move the seat until the locking pin engages the seat track.

The middle handle adjusts the vertical position. To raise, relieve some of the weight on the seat, pull the handle and the seat will rise. To lower, raise the handle and apply weight to the seat until the desired position is reached. Make sure the locking pin engages the vertical track when the handle is released after adjustment.

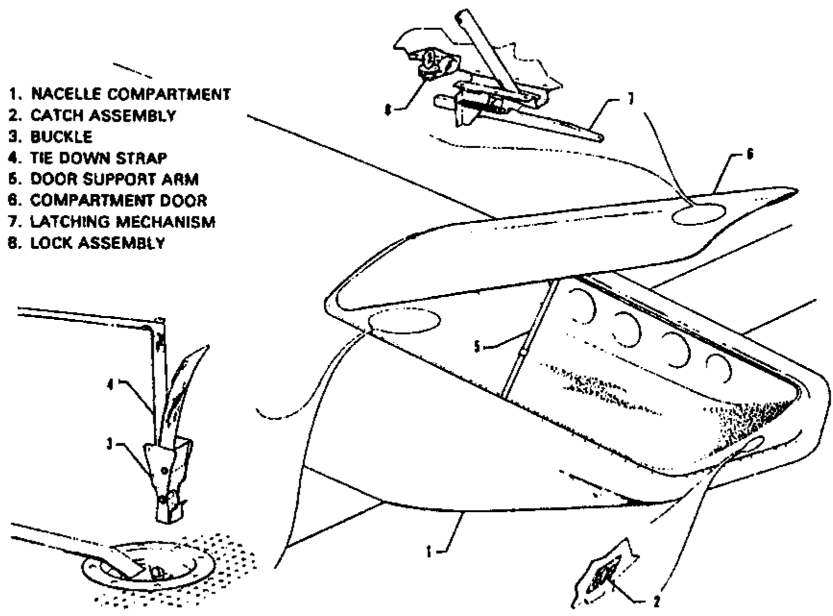
The upper handle controls the reclining position of the seat back. Pull the handle, lie back in the seat and release the handle. To erect, pull forward on the seat back.

The passenger seats adjust fore and aft and recline except when the seats are facing aft. The seat located aft of the cabin door and the one located forward of the cabin divider do not adjust or recline.

Pockets are located on the back of the passenger seat backs. A map pocket is located on the right side panel under the instrument panel.

Additional features include storm windows, sun visors and ash trays for the pilot and copilot, and a pull curtain cockpit divider between the passenger and crew areas. NO SMOKING and FASTEN SEAT BELT lighted signs, installed overhead in the cabin, are controlled by switches in the overhead panel. An optional chime will sound when these switches are activated.

Optional equipment includes choice of interior, front and rear cabin dividers, toilet, forward and aft refreshment center, bar, ash trays, folding tables, tinted windows and cargo net. The interior comes in a choice of fabric, vinyls and leather. Scotchguard fabrics are used throughout. The blend of fabric, vinyls and leather gives long wear and comfort.



NACELLE BAGGAGE COMPARTMENT
Figure 7-35

7.37 BAGGAGE AREA

There are four baggage compartments. One is located in the nose, one in the aft portion of each engine nacelle and a walk-in baggage area is aft of the main cabin door. The cabin can be converted into a cargo area. (See Section 6 - Weight and Balance.)

The forward baggage compartment measures 25 x 20 inches and has a loading capacity of 200 lbs and a volume of 14 cubic feet. Access to the compartment is gained through a hinged door on the left side of the nose. A placard on the inner side of the door indicates the maximum allowable baggage weight. To open, unlock, push in on the forward end of the door handle, pull out on the aft end and raise the door until it latches in the up position. To lower, the latch (placarded PUSH TO RELEASE) must be pushed in, the door lowered and the handle pushed in and locked. The nose compartment is equipped with a courtesy light for night loading. This light will illuminate even if the master switch is off, consequently, leaving the door open for extended periods is not recommended.

Each nacelle compartment has a load capacity of 150 pounds and a volume of 13.25 cubic feet. Access to the compartment is gained through a door atop the nacelle. The interior floors of the compartments, which measure approximately 90 inches long, 23.5 inches wide and 11 inches high, are carpeted to prevent baggage items from being damaged. To open, unlock, push on the aft end of the handle and raise the forward end of the handle. The door will now open and remain in the up position, held by a self-contained gas cylinder in the baggage door rod. The door can be closed with one hand. A placard on the underside of each door details the loading capacity and restrictions for the nacelle baggage compartment.

Access to the aft baggage compartment is gained through the main cabin entrance door and, if installed, an optional cargo door mounted aft of the main cabin door. The compartment has a volume of 22 cubic feet and will accommodate up to 200 lbs of cargo (including 50 lbs on the shelf). A placard attached to the interior panel in the rear of the compartment indicates the maximum loading capacity of the aft compartment. The compartment is accessible from the cabin even in flight.

Baggage tie down straps should be used in all baggage areas for safe and secure stowage of baggage.

NOTE

It is the pilot's responsibility to be sure that the aircraft is properly loaded and that the aircraft C.G. falls within the allowable C.G. range. (See Section 6 - Weight and Balance.)

7.39 FINISH

All aluminum sheet components of the PA-31-350 Chieftain are carefully finished inside and out to insure maximum service life. Both sides of all pieces are alodine treated and sprayed with zinc chromate primer to prevent corrosion of all structural and non-structural parts. The exterior surface of the airplane is coated with durable polyurethane in a variety of colors and color combinations to fulfill the desires of each individual owner.

7.41 NUMBER PLATES

The manufacturer's name plate is located on the fuselage underside even with the forward edge of the cabin door. A second plate containing only the serial number is located to the left of the tail skid. The serial number should always be used in referring to the airplane in service or warranty matters.

7.43 STALL WARNING

An approaching stall is indicated by the sounding of a stall warning horn. This warning is activated by a sensing vane on the leading edge of the right wing. Stall warning is given at about 4 to 10 knots before an actual stall would occur. The stall warning system may be checked during preflight by lifting the sensing vane while the airplane master switch is ON. The horn should activate.

Stall speed information is presented in graphs in Section 5 - Performance.

7.45 OXYGEN SYSTEM*

The Scott oxygen system (Figure 7-39) is designed to provide supplementary oxygen for the crew and passengers for flight at altitudes above 10,000 feet.

Eight oxygen plug-in receptacles are in the cabin side panels and each one is an ON-OFF valve. An oxygen supply gauge and flow control knob are mounted on the lower right instrument panel. A pressure regulator is mounted directly on the oxygen cylinder.

The 115 cubic foot oxygen cylinder is mounted either aft of the forward baggage compartment or aft of the rear baggage compartment and, when fully charged, contains oxygen at a pressure of 1850 pounds per square inch.

Before taking off for high altitude flying, be sure that the oxygen supply is adequate for the proposed flight (see Figure 7-37) and that passengers are briefed on oxygen use. When oxygen is required, pull the control knob to ON and oxygen will flow from the cylinder through the connecting tubing and into the receptacles.

*Optional equipment

Crew	Passengers	Oxygen Supply Range in Hours
1		25.76
1	1	12.88
1	2	8.58
1	3	6.44
1	4	5.15
1	5	4.29
1	6	3.68
1	7	3.22
	8	2.86
	9	2.57

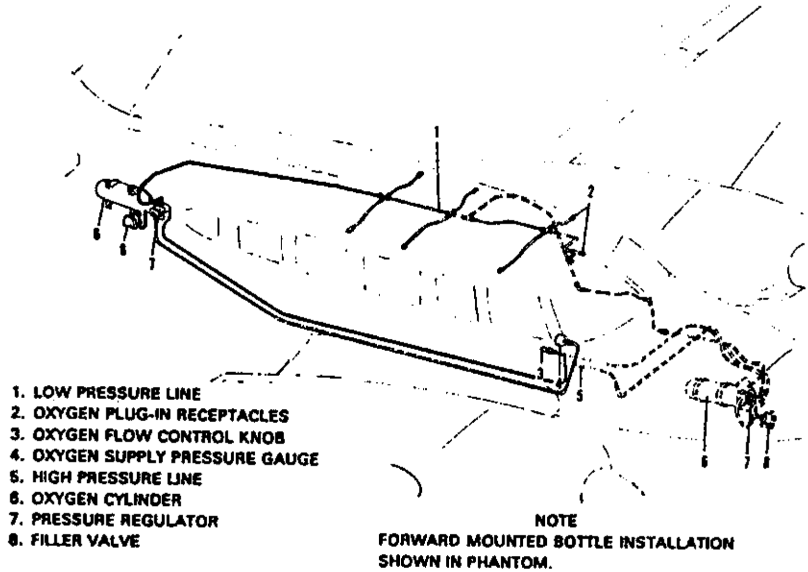
With 2 Pilot's Masks		Oxygen Supply Range in Hours
2		12.88
2	1	8.58
2	2	6.44
2	3	5.15
2	4	4.29
2	5	3.68
2	6	3.22
	7	2.86
	8	2.57

OXYGEN DURATION TABLE
Figure 7-37

To use oxygen, connect a constant flow mask fitting into a receptacle and don the mask. A flow indicator shows oxygen pressure to the mask by the absence of the red pellet, which is forced toward the mask.

The oxygen masks are stowed beneath the seats.

The pilot's mask (identified with a red band on the supply hose) supplies 120 liters per hour. The passenger masks are identified with a gold or red band on the supply hose and supply 90 liters per hour or 120 liters per hour, respectively.



OXYGEN SYSTEM
Figure 7-39

Always remove the fitting from receptacle and stow mask when not-in use. Oxygen will flow through the mask whenever the fitting is in the receptacle and the control knob is ON. The mask may be damaged if not stowed.

To prevent fire, oil, grease, hydraulic fluid, paint or other inflammable material should be kept away from oxygen equipment.

CAUTION

Positively NO SMOKING while oxygen is being used by anyone in the airplane.

7.47 EMERGENCY LOCATOR TRANSMITTER*

The Emergency Locator Transmitter (ELT), when installed, is enclosed under the removable dorsal fin forward of the vertical tail attachment to the fuselage. The unit meets the requirements of FAR 91.52. The transmitter operates on a self-contained battery.

A battery replacement date is marked on the transmitter label. To comply with FAA regulations, the battery must be replaced on or before this date. The battery must also be replaced if the transmitter had 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.

When installed in the airplane, the ELT transmits through the antenna mounted on the fuselage. The unit is also equipped with an integral portable antenna to allow the locator to be removed from the airplane in an emergency and used as a portable signal transmitter. Should it become necessary to remove the ELT from the airplane, be sure that the switch on the unit is in the OFF position before the transmitter is disconnected from the fuselage antenna. After the portable antenna is attached the unit may be turned ON as desired.

The locater should be checked during the preflight ground check to make sure that it has not been accidentally activated. Check by turning a radio receiver to 121.5 MHz. If there is an oscillating sound, the locator may have been activated and should be turned off immediately, Rearm the unit and then recheck.

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 tests must be made at any other time the tests should be coordinated with the nearest FAA tower or flight service station.

*Optional equipment

CC CIR 11 OPERATION

On the unit itself is a three position selector switch placarded OFF, ARM and ON. The ARM position is provided to set the unit to the automatic position so that it will transmit only after impact and will continue to transmit until the battery is drained to depletion or until the switch is manually moved to the OFF position. The ARM position should be selected whenever the unit is in the airplane. The ON position is provided so the unit can be used as a portable transmitter or in the event the automatic feature was not triggered by impact or to periodically test the function of the transmitter.

Select the OFF position when changing the battery, when rearming the unit if it has been activated for any reason, or to discontinue transmission.

NOTE

If the switch has been placed in the ON position for any reason, the OFF position has to be selected before selecting ARM. If ARM is selected directly from the ON position, the unit will continue to transmit in the ARM position.

A pilot's remote switch, located on the lower left instrument panel allows the transmitter to be controlled from inside the cabin. The pilot's remote switch is placarded ON, ARM (Normal Flight Position), RESET. If the pilot's remote switch has been placed in the ON position for any reason, the momentary RESET position must be selected for 3 seconds before allowing it to return to the ARM position. If for any reason the impact switch becomes inadvertently activated, it may be reset by selecting the momentary RESET position for 3 seconds before allowing it to return to the ARM position.

NARCO ELT 10 OPERATION

On the unit is a switch placarded ON, OFF, and ARM. The ARM position allows the unit to be set to the automatic mode so that it will transmit only after activation by impact and will continue to transmit until the battery is drained to depletion or until the switch is manually moved to the OFF position. The ARM position should be selected whenever the unit is in the airplane. The ON position is provided so that the unit can be used as a portable transmitter or in the event the automatic feature was not triggered by impact or to periodically test the function of the transmitter. The OFF position should be selected while changing the battery or to discontinue transmission after the unit has been activated.

A pilot's remote switch, located on the lower left instrument panel allows the transmitter to be controlled from inside the cabin. The pilot's remote switch is placarded ON. ARM. The ARM position should be selected for all normal flight operations. If activation occurs with the remote switch in the ARM position, the transmitter must be reset. A button labeled RESET is located above the selector switch. To rearm the unit after it has been turned off or after it has been activated, the RESET button should be pressed in after the selector switch has been placed in the ARM position. This will end transmission and rearm the unit.

7.49 PROPELLER SYNCHROPHASER* (HARTZELL)

The propeller synchrophaser eliminates slight manual propeller adjustments to reduce the "beat" effect of the propellers and minimizes vibration.

A two position PROP SYNC control switch is mounted on the lower portion of the instrument panel to the left of the control pedestal. The switch positions are MANUAL and SYNC.

With the switch in the MANUAL position, the engines and propellers are operated and controlled in the conventional manner. The synchrophaser automatically maintains selected rpm after the pilot manually sets the desired propeller speed and selects the SYNC position of the control switch. This rpm will be maintained by the synchrophaser until the pilot readjusts the propeller speed.

The major components of the system are two pulse generators, a computer, and an electrically slaved, mechanically operated propeller governor. With this system, the right engine is utilized as the slave engine and the left engine as the master. The pulse generators are driven from the adapted tach drive output and are interconnected electrically to the computer which senses the speed of the engines through the magnetic pickups in the pulse generators. The computer synchronizes the right engine to the left, through a solenoid in the right propeller governor.

Circuit protection is provided by a push-to-reset type circuit breaker in the circuit breaker control panel to the left of the pilot's seat on the sidewall. The breaker is labeled PROP SYNC.

For Taxiing:
Set the synchrophaser switch to MANUAL.

For Takeoff and Landing:
Set the synchrophaser switch to MANUAL.

For Cruise:
Synchronize the propellers as close as possible manually; then set the synchrophaser switch in the Prop Sync. position.

*Optional equipment

NOTE

Normally, propeller synchrophasing is achieved in a few seconds but occasionally it may take a full minute to achieve full propeller synchrophasing.

If a change in power setting is desired, set the synchrophaser switch to MANUAL position; wait 30 seconds. Adjust the power setting; then set the synchrophaser switch in the Prop Sync. position.

Propeller "Phase" is preset at the factory. For further information on Phase control and the Propeller Synchrophasing System, consult the aircraft service manual.

NOTES

Should it be necessary to completely deactivate the Prop Sync. system the circuit breaker must be pulled.

Each time a propeller RPM differential greater than 50 RPM occurs, it will be necessary to recycle the system to MANUAL for 30 to 40 seconds. Manually resynchronize propellers; then turn switch to Prop Sync. position.

In the event of an electrical system failure or if the master switch is off, the slave engine will return to the controlled selected RPM plus approximately 25 RPM regardless of the position of the synchrophaser switch (out of synchronization).

For all single engine operations set the synchrophaser switch to the manual position.

7.51 ELECTRIC PROPELLER DEICER*

An electrical propeller deicer system can be installed as optional equipment. The installation consists of: propeller deicer pads bonded to the leading edges of the propeller blades; modified starter ring gears incorporating slip rings to distribute power to the propeller deicers: brush assemblies for power distribution to the slip ring; a timer which cycles power to the propeller deicers; an ammeter, mounted in the circuit protector panel, indicating current through the deicing system; and a propeller deice switch located in the overhead switch panel.

When the propeller deicer switch is placed in the ON position, electrical power is supplied to the propeller deicers from the airplane's electrical power supply. The propeller deicer ammeter will indicate a reading of from 8 to 12 amps.

Deicing is accomplished by heating portions of the deicer pads in a sequence which is controlled by the timer. The heat reduces the adhesion between the ice and the propeller so that centrifugal force and the blast of the airstream causes the ice to be thrown off the propeller blades. Heating of the deicer pads is according to the following cycle:

(a) Outboard halves of propeller deicer pads, right engine (30 seconds).
(b) Inboard halves of propeller deicer pads, right engine (30 seconds).
(c) Outboard halves of propeller deicer pads, left engine (30 seconds).
(d) Inboard halves of propeller deicer pads, left engine (30 seconds).

When the system is turned on heating may begin on any one of the cycles depending upon the initial positioning of the timing switch. Once begun, cycling will proceed in the order of (a), (b), (c) and (d) as indicated above until the system is turned off.

A preflight check of the propeller deicers can be performed by turning the PROP DE-ICE switch on and feeling the deicer pads for proper heating sequence. The deicer pads should be warm to the touch.

A less vigorous test may be accomplished by turning the PROP DE-ICE switch on with the engine's operating at idle and noting that the ammeter needle remains in the green arc for one complete cycle. (2 minutes)

*Optional equipment

The heat provided by the deicer pads reduces the adhesion between the ice and the propeller so that centrifugal force and the blast of airstream cause the ice to be thrown off the propeller blades in very small pieces. This ice can produce minor damage to the fuselage if ice shields* have not been installed.

CAUTIONS

When conducting the above described ground test, do not operate system longer than two complete cycles.

If the ammeter reading is less than in the green arc this indicates that one or more of the pads is not functioning. If propeller deice is used under this condition the pilot can expect an uneven build up of ice with consequent undesirable vibration.

Propeller imbalance may be relieved by varying the RPM; increase RPM briefly and return to desired setting, repeating if necessary.

7.53 ICE DETECTION LIGHT*

An ice detection light can be installed on the outboard side of the left engine nacelle for checking icing conditions during night flight. This light is controlled by a switch mounted in the overhead switch panel.

7.55 24 VOLT - 25 AMPERE HOUR BATTERY*

A 24 volt - 25 ampere hour battery is available for longer engine cranking time and prolonged electrical life in case the alternators become inoperative.

*Optional equipment

7.57 AIR CONDITIONER*

A 16,000 B.T.U. recirculating air conditioning system (Figure 7-41) is available for cooling the interior of the aircraft. This rated capacity is for ground operation and increases to a higher rating in flight. Major components of the system are: compressor, condenser, evaporators, cooling fans, movable scoop and operating controls. The air conditioner utilizes the normal ventilating air ducts for air distribution.

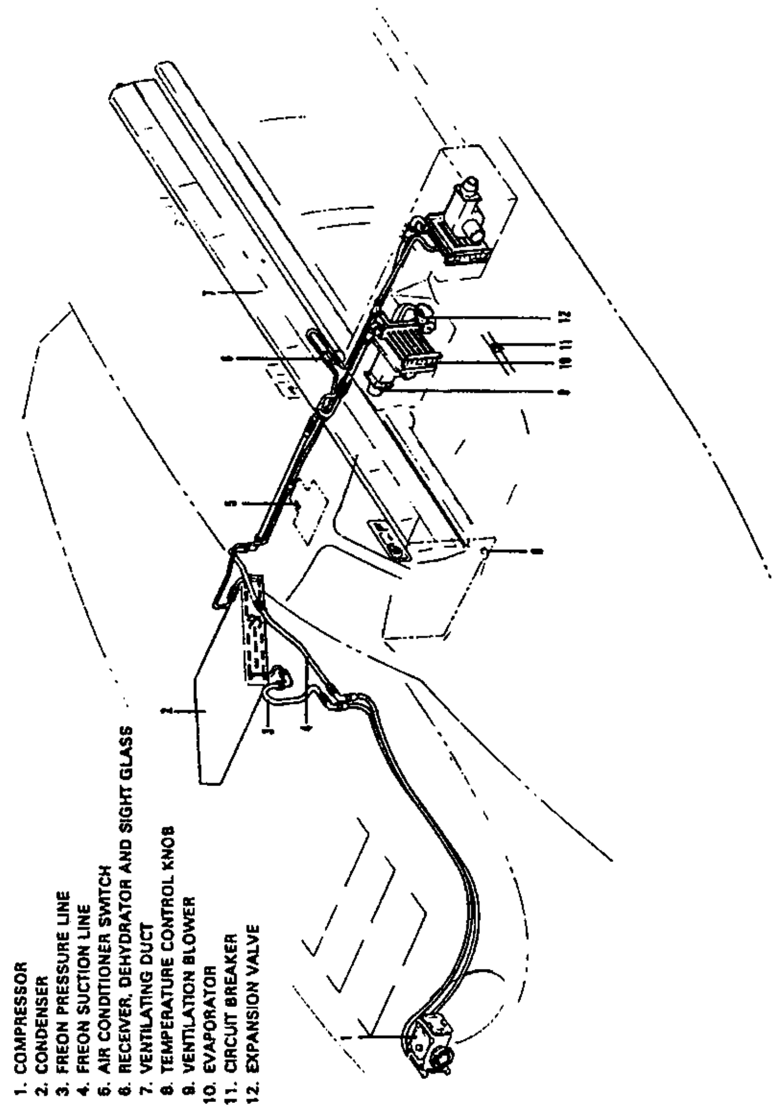
Two evaporator modules are installed in the ventilating air boxes. Enclosed in each box is an evaporator and fan. Also, a temperature control switch is located in the right air box. Water that is extracted when the air passes through the evaporators is dumped overboard through drain tubes in the bottom of the fuselage.

The air conditioner temperature control is located to the right of the power quadrant. It is a rheostat control and once a desired setting is selected it will normally be left in that position. If the control is rotated counterclockwise to the stop position the air conditioner will not operate nor will it operate if the ambient cabin temperature is at or below 65°F. The control is rotated clockwise to increase cooling. This rheostat controls the cabin temperature through a range of 65°F to 85°F.

The air conditioner switch is located in the overhead switch panel. This switch is used normally for turning the air conditioner on or off. It is a three position switch and is marked OFF, FAN and AIR COND. The fan position circulates the cabin and cockpit air. This position can also be used to aid heated air circulation when the heater is being operated. The AIR COND position turns the air conditioning system on. An adjacent switch controls the fan speed at either high or low.

For cooling the interior of the aircraft on the ground, operate the right engine at 1000 RPM (compressor is mounted on right engine) and select AIR COND on the air conditioner switch. Select desired temperature with the air conditioner rheostat control. To allow recirculation of the cabin air, make sure the fresh air scoop is closed, (fresh air control off) and the cabin exhaust vent is closed.

*Optional equipment



AIR CONDITIONING SYSTEM
Figure 7-41

Whenever the compressor is operating while the aircraft is on the ground, the condenser scoop located on the top of the right nacelle will open. In flight, the door will remain closed. This scoop is operated by an electric motor and is actuated automatically. Whenever the compressor cycles off the scoop will close. So if the system is operating for an extended period on the ground the scoop may close and open. Because the air is being recirculated, the cabin will be cooled to a comfortable temperature within a few minutes. If the scoop doesn't open, the cooling capacity will be reduced considerably.

NOTE

If no cooling effect is noted within two minutes after the system is turned on, turn the system off. With a low or zero refrigerant charge, continuous operation may result in oil starvation of the compressor and subsequent failure of the compressor. If this happens, the system should be checked before further use.

Because the compressor is mounted on the right engine the system may be operated while loading and unloading passengers, if desired. This also allows precooling of the interior of the aircraft before loading passengers.

During ground operation at temperatures of 70°F and above and with a crosswind component of ten knots or greater, the right engine should be operated at 1500 RPM to ensure full cooling capacity.

For cooling during flight, close the fresh air scoop and exhaust vent if open. Select AIR COND on the air conditioner switch; then select the desired temperature. Fresh air input to the cabin, after the cabin has been cooled, can be obtained by utilizing the normal cabin ventilating system, if desired.

NOTE

For single engine operation the air conditioner system should be turned off or the fan position selected.

A pressure switch is provided in the freon system to prevent the compressor from operating during low ambient temperatures or to prevent the compressor from operating with a low refrigerant charge.

7.59 RADAR*

A weather radar system can be installed in this airplane. The basic components of this installation are an antenna, a transmitter/ receiver, and a cockpit indicator. The function of the weather radar system is to detect weather conditions along the flight path and to visually display a continuous weather outline on the cockpit indicator. Through interpretation of the advance warning given on the display, the pilot can make an early decision on the most desirable weather avoidance course.

In addition to its primary purpose, weather mapping, the system can be used for navigation. A ground mapping feature allows the pilot to identify coastlines, water masses, islands, high ground, etc. This provides the pilot with a guidance feature which may be useful in adverse weather conditions or over areas where ground-based navigational aids are limited.

For detailed information on the weather radar system and for procedures to follow in operating and adjusting the system to its optimum efficiency, refer to the appropriate operating and service manuals provided by the radar system manufacturer.

NOTE

When operating weather avoidance radar systems inside moderate to heavy precipitation it is advisable to set the range scale of the radar to its lowest setting.

*Optional equipment

WARNING

Heating and radiation effects of radar can cause serious damage to the eyes and tender organs of the body. Personnel should not be allowed within fifteen feet of the area being scanned by the antenna while the system is transmitting. Do not operate the radar during refueling or in the vicinity of trucks or containers accomodating explosives or flammables. Flashbulbs can be exploded by radar energy. Before operating the radar in any mode other than STANDBY, direct the nose of the airplane so that the forward 120 degree sector is free of any metal objects such as other aircraft or hangars for a distance of at least 100 yards, and tilt the antenna upward 15 degrees. Do not operate the radar while the airplane is in a hangar or other enclosure.

7.61 ELECTRICALLY HEATED WINDSHIELD*

An electrically heated pilot's windshield can be installed on the PA-31-350, Chieftain as optional equipment.

The electrically heated windshield, used to prevent and/or remove icing and fogging, is controlled by a WINDSHIELD HEAT switch mounted in the overhead switch panel. With the engines running, a preflight check can be made by activating the control switch. The windshield is operating properly if it feels warm to the touch.

Ground operation should be kept to a minimum to prevent overheating of the windshield. Distorted vision or small bubbles in the plastic of the windshield may indicate an overheat condition.

The exterior surface of the windshield has a Nesa coating to prevent static discharge. Use care when cleaning (refer to Section 8 - Airplane Handling, Servicing and Maintenance).

*Optional equipment

7.63 ELECTRIC WINDSHIELD WIPER*

An electrically operated windshield wiper can be installed in conjunction with the electrically heated windshield on the pilot's side.

The system is protected by a circuit breaker located in the circuit breaker control panel and controlled by a speed adjustment knob mounted on the left side of the instrument panel. The speed adjustment knob has four positions: PARK, OFF, LOW and HIGH. To operate the wiper, select the desired speed position.

CAUTION

Do not operate the windshield wiper at airplane speeds above 127 KIAS or on a dry windshield.

When operation of the wiper is no longer required, turn the speed adjustment knob to OFF and to PARK. The PARK position resets the wiper blade and will automatically return the knob to the OFF position when released.

7.65 RIGHT INSTRUMENT PANEL LIGHTING*

Instrument lighting for the right instrument panel is provided by individual post lamps mounted adjacent to each instrument. These lights are controlled by a rheostat switch located on the overhead panel. The lights are turned on with the first movement of the rheostat knob and the light intensity is increased by further rotation of the knob.

7.67 FIRE EXTINGUISHER (PORTABLE)*

A portable fire extinguisher is mounted to the seat frame beneath the pilot's seat. The extinguisher is suitable for use on liquid or electrical fires. It is operated by aiming the nozzle at the base of the fire and squeezing the trigger grip. Releasing the trigger automatically stops further discharge of the extinguishing agent. Read the instructions on the nameplate and become familiar with the unit before an emergency situation. The dry powder type extinguisher is fully discharged in about 10 seconds, while the Halon 1211 type is discharged in 15 to 20 seconds.

*Optional equipment

WARNING

The concentrated agent from extinguishers using Halon 1211 or the by-products when applied to a fire are toxic when inhaled. Ventilate the cabin as soon as possible after fire is extinguished to remove smoke or fumes. Use oxygen, if necessary.

7.69 ANTI-STATIC WICKS**

Anti-static wicks can be installed on the trailing edges of the wing panels and the tail surfaces to aid in clearing the airplane of surface static electricity, which may disrupt LF reception, cause a loss of ADF indication or cause VHF interference. A total of eighteen wicks are attached to the airplane: three on each aileron; three outboard and one inboard on each elevator; and three on the upper part and one on the lower part of the rudder.

7.71 RAMP HAILER*

The ramp hailer is used to give instructions to ground personnel outside the aircraft. A speaker is located in the nose section forward of the nose wheel area. To operate, turn on the master switch, select EXT on the transmitter selector switch on the radio control panel, key the microphone and give your instructions. The ramp hailer works best with the engines idling or shut down.

7.73 CARGO DOOR*

A large cargo door can be installed adjacent to the main cabin entrance door to facilitate loading of the aft baggage compartment (refer to Figure 7-43). The door latch handle, mounted in the forward side of the door, is revealed by opening the cabin entrance door. To open the cargo door on earlier models, pull down on the top of the handle and raise the door until it latches in the up position. On later models, pull outward on the door until the gas spring support goes "over center" and begins to push up on the door Release the door and allow the gas spring support to raise it to the full open position. The additional width and height of the fuselage opening will allow

*Optional equipment
**Optional on early models, standard on later models.

convenient, unhindered loading of bulky items. To lower the door on earlier models, push up on the knurled knob on the door support arm, lower the door and push in on the bottom of the door handle until it latches securely to the fuselage. To close the door on later models, pull it down to the closed position. (As the door approaches the closed position, the gas spring support will assist in closing the door.) While pushing inward on the bottom of the door, move the top of the latch handle aft to latch the door securely to the fuselage.

The aft main cabin entrance door support cable is provided with a fitting that enables it to be detached in the center. After the cable is separated, the lower portion of the cable can be attached to the eye bolt fitting on the fuselage. This features provides an unobstructed fuselage opening for loading cargo.

When the optional cargo door is installed, the standard, triangular shaped aft window in the left side of the fuselage is deleted and a cargo loading placard is installed in the aft baggage compartment. The interior of the cargo door is deeply upholstered to match the interior styling of the cabin.

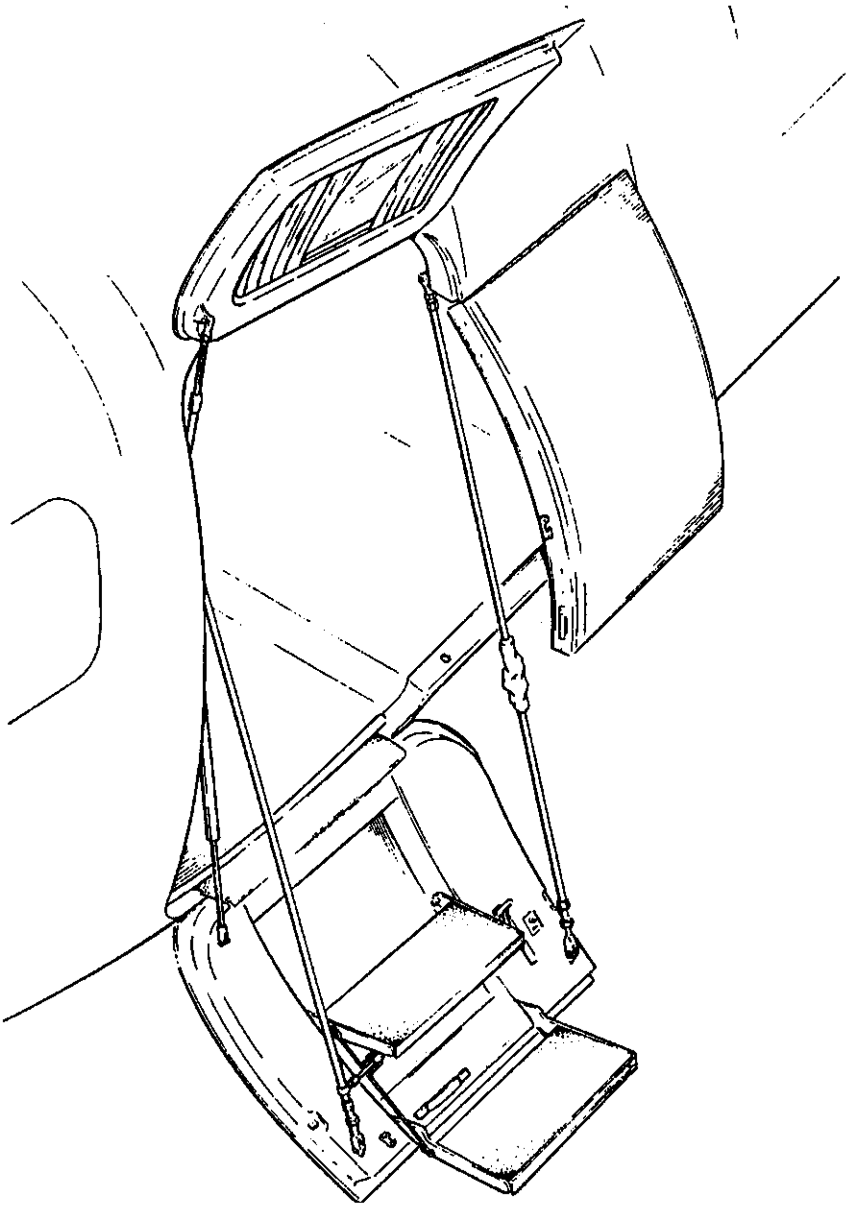
7.75 PILOT'S DOOR*

The pilot door installation provides direct access to the pilot compartment from the left side of the fuselage. The feature permits convenient pilot entry when the cabin area is loaded with cargo.

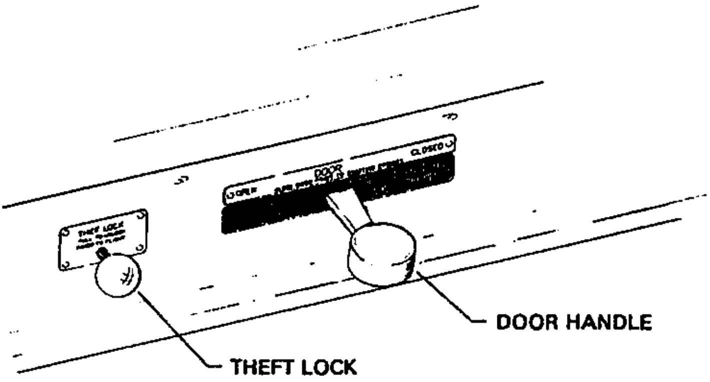
The door incorporates the pilot's side window and storm window. A door handle, theft lock and latching mechanism are provided on the inside of the pilot's door to maintain a secure theft-proof cockpit (Figure 7-45). To open the door from within the cockpit, release the latch on the bottom edge of the door and move the door handle to the OPEN position (aft). This will allow the door to be pushed out and forward until it latches in place. The door is held in place by a support arm, which must be released before the door can be closed. This is accomplished by pushing upward on the adjustment knob attached to the support arm.

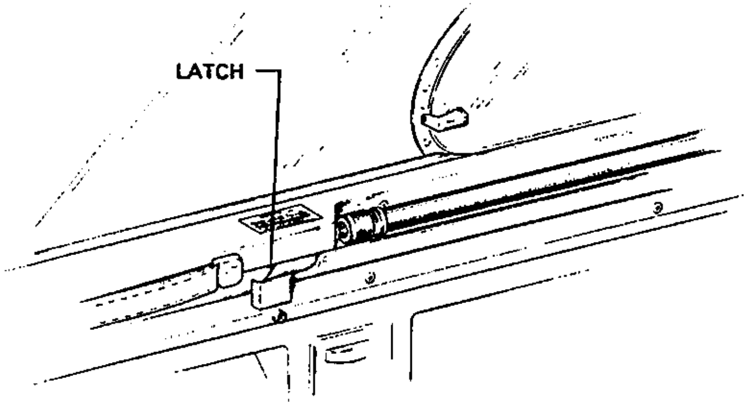
The theft lock is an integral part of the main latching mechanism. This locking device is intended for ground purposes only, and should be unlocked prior to flight to allow the door to be opened from the outside in the event of an emergency landing.

*Optional equipment



TYPICAL CABIN ENTRANCE DOOR AND CARGO DOOR
Figure 7-43





PILOT'S DOOR
Figure 7-45

To open the pilot's door from outside the airplane, turn the door handle counterclockwise and pull out on the door. If the theft lock is pushed, or the door was previously locked from the outside, the key provided with the airplane must be used to unlock the door before opening.

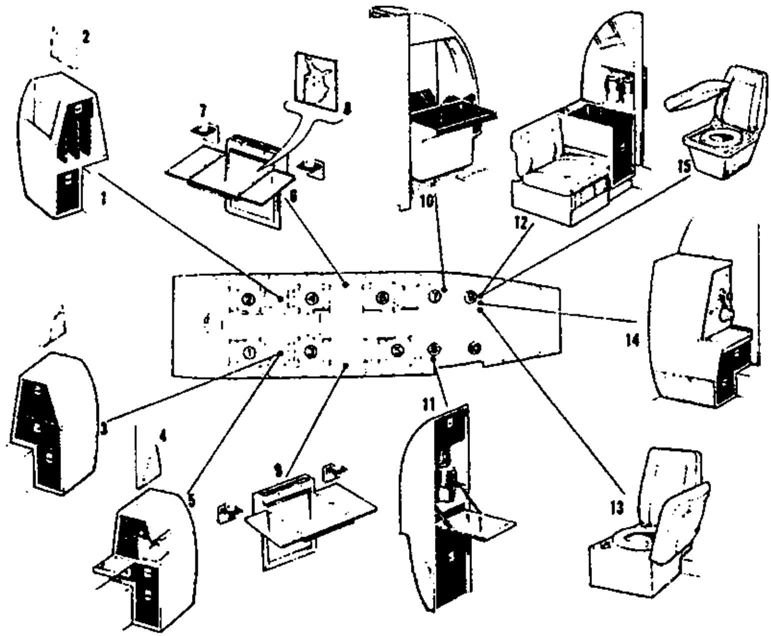
7.77 CABINETRY*

Among the optional interior appointments available in the Chieftain is a variety of cabinet installations (Figure 7-47).

Storage cabinets or a combination storage cabinet and refreshment unit may be installed aft of the crew seats, between the cockpit and the main cabin areas. The storage cabinet units include slots for map, chart, or manual storage and several slide-out drawers. The refreshment unit includes storage drawers, an ice chest, a one quart electrically heated liquid unit, a cup dispenser, and a pull-out work surface. The area between the cabinets and the cabin ceiling may be closed off with cabin dividers, and the walkway between the cabinet units may be equipped with a draw curtain to allow the cockpit area to be completely separated from the main cabin.

Cabinetry available for the aft cabin area includes storage cabinets, vanity, and refreshment units, which may be installed in the aft cabin area either forward of the cabin door or forward of the rear baggage area. Among the optional vanity and refreshment facilities available with rear cabinetry installations are: a mirror, an outlet for an electric razor, an ice chest, a beverage container, thermos pitchers, a half-gallon electrically heated liquid unit, a serving tray, a litter container, and storage drawers. The aft cabinets arc mounted on vertical dividers extending the height of the cabin, and several are available with privacy curtains or folding doors to allow the aft cabin to be closed off from the passenger area.

*Optional equipment



1. RIGHT FORWARD STORAGE CABINET
2. RIGHT FORWARD CABIN DIVIDER
3. LEFT FORWARD STORAGE CABINET
4. LEFT FORWARD CABIN DIVIDER
5. FORWARD REFRESHMENT UNIT
6. RIGHT FOLDING TABLE
7. CUP HOLDER
8. INLAID MAP TABLE TOP
9. LEFT FOLDING TABLE
10. RIGHT AFT VANITY/REFRESHMENT UNIT
11. LEFT AFT REFRESHMENT UNIT
12. AFT COMBINATION UNIT - REFRESHMENT/NINTH SEAT/TOILET
13. COMBINATION UNIT - NINTH SEAT/TOILET
14. AFT REFRESHMENT UNIT/CABIN DIVIDER
15. COMBINATION UNIT - NINTH SEAT/TOILET

CABINETRY OPTIONS
Figure 7-47

7.79 FOLDING TABLES*

Folding tables (Figure 7-47) can be installed on either or both sides of the cabin between the second and third windows. A table can be used only when the first seat in the passenger area is installed facing aft, conference style. The drop-leaf table pulls up from its wall rack and folds down into position. The table installation includes ash trays, glass holders, and recesses for holding small items.

7.81 TOILET INSTALLATION*

A self-contained toilet can be installed in the aft section of the cabin (Figure 7-47). In either a side-facing or forward-facing seat position, the unit may be used as a passenger seat. The seat cushion conceals the toilet. Either a folding door or a draw curtain may be installed forward of the toilet to close off the aft cabin, assuring the occupant of privacy.

Plastic disposable bags which are available from Piper dealers should be placed in the toilet receptacle. After use, remove the plastic bag, close it with a wire tie, and, after landing, dispose of it in the proper field facilities. Do not attempt to flush the bag in a toilet.

A relief tube is exposed when the toilet seat is raised. The relief tube also serves as a vent for the toilet; therefore, be sure that the tube system is not blocked or obstructed.

7.83 EMERGENCY ELECTRICAL POWER PACK*

An optional emergency electrical power supply installation is available for the Chieftain. This installation includes a 28 volt nickle-cadmium battery which will provide a short-term emergency electrical source to power nav 2, comm 2 and glide slope 2.

This installation is to be used only in an emergency situation and only after all emergency procedures for electrical failure outlined in Section 3 have been completed and no power from either alternator or from the airplane's battery is available to the avionics bus.

*Optional equipment

The switch for the emergency power supply is located on the pilot's instrument panel. When the emergency mode is selected, nav 2, comm 2 and glide slope 2 are removed from the primary electrical system and are transferred to the emergency power supply.

The emergency power supply battery has a 3.8 amp hour life when fully charged. Limited operation (equipment turned OFF when not in actual use) of the nav 2, comm 2 and glide slope 2 is required to extend the life of the emergency battery. The pilot must become familiar with the current consumption of these avionics installations to allow budgeting of emergency electrical power to insure arrival at a landing site. Current consumption information is available in the manuals provided by the manufacturer of the avionics equipment.

For a complete description of the system, its operation and maintenance, refer to the appropriate operating and service manuals supplied by the system manufacturer.

NOTE

Under IFR conditions, an approach and landing should be made at the nearest suitable airport no more than 45 minutes after activation of the Emergency Power Switch. The 45 minute limitation assumes a fully charged emergency battery.

BLANK PAGE

TABLE OF CONTENTS

SECTION 8

AIRPLANE HANDLING, SERVICING AND MAINTENANCE

BLANK PAGE

SECTION 8

AIRPLANE HANDLING, SERVICING AND MAINTENANCE

8.1 GENERAL

This section provides general guidelines relating to the handling, servicing, and maintenance of the Chieftain. For complete maintenance instructions, refer to the PA-31-350 Maintenance 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 aircraft and keeping it in the best mechanical condition. Consequently, Piper Aircraft, from time to time, issues services releases including Service Bulletins, Service Letters, 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 Piper 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 the 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 intervals (i.e.: 50, 100, 500, and 1000 hours) for the specific model airplane. 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 FAA.

A programmed Inspection, approved by the Federal Aviation Administration (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 maintaining proper documentation in log books and/or maintenance records.

A spectrographic 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-1362B.
  (2) Aircraft Registration Certificate Form FAA-500A.
  (3) Aircraft Radio Station License Form FCC-404A, 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 towed by use of the nose wheel tow bar stowed in the baggage area or with power equipment that will not damage or excessively strain the nose gear steering assembly.

CAUTION

When towing with power equipment, do not turn the nose gear beyond its turning radius in either directions as this may result in damage to the nose gear and steering mechanism. Turn limits are marked on a placard on the nose gear strut assembly.

CAUTION

Do not tow the airplane when the controls are secured. Do not push or pull on the propeller or the control surfaces when handling the airplane on the ground.

(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 and taxiing 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 procedures should be followed:

(1) Taxi with the propeller in the low pitch, high RPM setting.
(2) When taxiing on uneven ground, avoid holes and ruts.
(3) Observe wing clearances when taxiing near buildings or other stationery objects. If possible, station an observer outside to guide the airplane.
(4) Do not operate the engines at high RPM when running up or taxiing over ground containing loose stones, gravel, or any loose material that might cause damage to the propeller blades.

(5) Be sure that alternate air is not being used.
(6) After taxiing forward a few feet, apply the brakes to determine their effectiveness.
(7) While taxiing, make slight turns to ascertain the effectiveness of the steering.
(8) When the aircraft is stopped on the taxiway or runway and brake freeze-up occurs, actuate the brakes several times using maximum pressure. To reduce the possibility of brake freeze-up during taxi operation in severe weather conditions, one or two taxi slow-downs (from 25 to 5 knots) may be made using light brake pressure, which will assist moisture evaporation within the brake.

(c) Parking

When parking the airplane, be sure that it is sufficiently protected against 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) When parking the airplane, head it into the wind if possible.
(2) The parking brake handle is located on the lower left face of the instrument panel. To set the parking brake, first depress and hold the toe brake pedals and then pull out the parking brake handle. To release the parking brake, first depress and hold the toe brake pedals and then push in on the parking brake handle.

WARNING

Braking may not occur if parking brake handle is pulled and held prior to brake pedal application.

CAUTION

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

When excessive moisture/freezing temperature conditions exist, parked aircraft should have their brakes in the OFF condition and wheel chocks should be properly positioned. If brake freeze-up is suspected, actuate the brakes several times using maximum pressure.

(3) Aileron and elevator controls may be secured with the front seat belts. Wheels should be blocked if chocks are available.

(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 elevator by looping the seat belts through the control wheel and pulling it snug.
(4) Block the wheels.
(5) Secure tie-down ropes to the wing tie-down rings and 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.

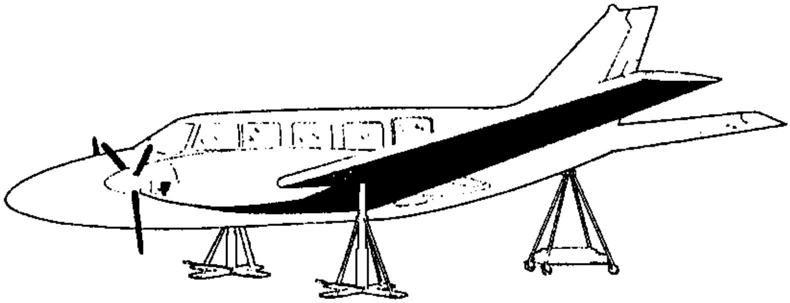
CAUTION

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



JACKING ARRANGEMENT
Figure 8-1

(e) Jacking

When it is necessary to place the airplane on jacks for landing gear servicing or other servicing operations, be sure that the jack pads (located on the underside of the front wing spars outboard of the engine nacelles) are used (Figure 8-1). A tail support will be necessary and should be attached to the tail skid and weighted with approximately 500 pounds of ballast. For complete jacking instructions refer to the Service Manual.

CAUTION

Be sure to apply sufficient tail support ballast or the airplane will tip forward. Should it be necessary to raise the nose gear while the main gear remain on the ground, use the seat belts to hold the control wheel aft, raising the elevators to neutral or higher. If the elevators are down, the tabs will contact the ground before the skid and could be damaged.

8.11 SERVICING AIR FILTERS

Induction air filters should be cleaned and examined at least once every fifty hours. Filters should be replaced if the paper filter material is torn or ruptured, if the housing is damaged, or if the filter is excessively dirty. The usable life of an air filter should be restricted to one year or 500 hours, whichever comes first. Depending on the conditions in which the airplane is operated, filters may have to be cleaned or replaced at shorter intervals.

(a) Remove the screws from the securing brackets on both sides of the filter box and remove the filter.
(b) Check the filter. If its damaged or excessively dirty, replace it immediately.
(c) Clean the filter by one of the two following methods:
    (1) Keeping the air nozzles at least one inch from the filter, direct a jet of air not exceeding 100 psi up and down the pleats on the clean air side of the filter. This method will remove grit, dust, and sand from the filter.
    (2) If carbon, soot, or oil remain on the filter after completing the above procedure, soak the filter for 15 minutes in a good non-sudsing detergent; then swish it gently in the solution for about two minutes. Rinse the filter with a stream of water not exceeding 40 psi until the rinse water is clear. Dry the filter thoroughly before reinstalling, but do not use light bulbs or extreme heat for drying.
(d) Recheck the filter for damage, and if it is found to be clean and sound, reinstall the filter.
(e) Before reinstalling the filter, examine the filter gasket. It should have no tears and should be securely in place.

8.13 BRAKE SERVICE

The brake system is filled with MIL-H-5606 (petroleum base, red) hydraulic fluid. This should be checked at every 50 hour inspection and replenished when necessary.

Do not use vegetable base brake fluids (blue) when refilling the system. The brake fluid reservoir is filled by opening the access door, which is located above the forward access panel on the right side of the fuselage, and removing the filler cap. Then add fluid to the reservoir to the required level.

If it is necessary to bleed the brake system to get air out of the lines, fluid should be added under pressure at the bleeder attachment on the brake unit.

No adjustment of brake clearances is necessary. If, after extended service, braking action requires too much movement of the toe pedal or the brakes are spongy, check the Service Manual for corrective action.

Main wheels are easily removed by removing the dust cover. hub cap cotter pin, and axle nut. The wheel will slip off the axle.

8.15 HYDRAULIC SYSTEM SERVICE

The fluid level of the hydraulic reservoir should be checked every 50 hours by placing the airplane in a level position and viewing the fluid level through the sight gauge on the reservoir dome. Access to the reservoir is through the forward baggage compartment door. The reservoir is mounted directly aft of the radio shelf.

If fluid is required, filtered hydraulic fluid MIL-H-5606 should be added. Fluid may be added by utilizing the filler line located at the upper forward corner of the access panel on the right side of the nose section. See Service Manual for filling instructions.

8.17 LANDING GEAR SERVICE

The operation of the landing gear oleos is standard for the air-oil type. Hydraulic fluid passing through an orifice serves as the major shock absorber, while air compressed statically acts as a taxiing spring. The piston tube has a total travel of 8 inches on the nose and 9 inches on the main. About 3.25 inches of tube should be exposed under normal static loads.

All of the oleos are inflated through readily accessible valves on the top of the unit. All major attachments and actuating bearings are equipped with grease fittings for lubrication of the bearing surfaces, and should be lubricated periodically. (Refer to the Lubrication Chart in the Service Manual.)

In the event the oleo strut slowly loses pressure and extension, the most probable source of trouble is the air valve attachment to the leg or the core of the air valve. These parts should be checked first to determine whether or not air leaks are occurring. If a hydraulic fluid leak is evident on the exposed chrome plated oleo strut, the O-rings on the piston tube bearing units may need to be replaced. If the landing gear is washed with a degreaser (refer to Paragraph 8.43), the strut must be lubricated or the O-ring will fail.

NOTE

The exposed portion of the strut piston should be wiped down regularly with hydraulic fluid. This can contribute to the service life of the strut seals.

To add air to the oleo struts, a strut pump is attached at the air valve and the oleo pumped up until 3..25 inches of piston tube is exposed with normal static weight on the gears. To add hydraulic fluid, first place the airplane on jacks; then release all the air through the valves, allowing the oleo to extend fully. Next, remove the air valve and fill the unit through this opening. Compress the oleo again to within 1/4 inch of full compression, allowing excess hydraulic fluid to overflow and working out trapped air. Then reinsert the valve core and pump up the strut.

The turning arc of the nose wheel is 20 degrees in either direction and is factory adjusted at stops on the bottom of the forging. The turning radius of the nose wheel is approximately 25 feet.

8.19 TIRE SERVICE

For maximum service from the tires, keep them inflated to the proper pressure of 42 psi for the nose wheel and 66 psi for the main wheels. When inflating the tires, visually inspect them for cracks and breaks. If necessary, reverse the tires on the wheels or interchange them for even wear. All tires and wheels are balanced before original installation, and the relationship of tire, wheel, and lube should be maintained upon reinstallation. If new components are installed, it may be necessary to rebalance the wheels with the tires mounted. Out-of-balance wheels can cause extreme vibration during takeoff and landing.

8.21 PROPELLER SERVICE

Since propellers will pick up loose pieces of rock or debris from the ramp and runway, the blades should be checked periodically for damage. Minor nicks in the leading edge of blades should be filed out and all edges rounded, since cracks sometimes start from such defects. Use fine emery cloth for finishing the depressions. Repairs should be accomplished by authorized personnel. Refer to FAA Advisory Circular 43.13-1 for blade repair recommendations and repair limitations. The daily inspection should include examination of blades and spinner for visible damage or cracks and inspection for grease or oil leakage.

Remove spinner cap and check air pressure or, if necessary, charge the cylinder with dry air or nitrogen gas to the prescribed pressure. Refer to the placard in the spinner cap or following Table for an exact pressure for the existing temperature. It is most important that an accurate air charge be maintained.

NOTE

Do not check pressure or charge with propeller in feathered position.

CHAMBER PRESSURE REQUIREMENTS
WITH TEMPERATURE

Temperature °F	Chamber Pressure (PSI)
70 to 100	41 ± 1 lb.
40 to 70	38 ± 1 lb.
0 to 40	36 ± 1 lb.
-30 to 0	33 ± 1 lb.

8.23 OIL REQUIREMENTS

The oil capacity of the Lycoming and LTIO-540-J2BD engines is 12 quarts. The minimum safe quantity of oil in the sump is 2 3/4 quarts. It is recommended that the engine oil be drained and renewed, and the engine oil filter be replaced every 50 hours of flying time, or sooner under unfavorable conditions. Textron Lycoming also recommends that, under no circumstances, should the interval between engine oil changes and oil filter replacements exceed four months.

It is recommended that single or multi-viscosity aviation grade oils in accordance with latest issue of Avco-Lycoming Service Instruction 1014 be used. The following seasonal aviation oil grades and seasonal ambient temperature ranges are recommended.

LUBRICATING OIL RECOMMENDATIONS
USE AVIATION ENGINE OIL FOR PISTON ENGINES

Average Ambient Temperature	MIL-L-6082B 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
0°F to 90°F	20W50	20W50 or 15W50
Below 10°F	20	30 or 20W-30

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

NOTE

When checking oil level, read right engine side of dipstick for right engine, and left engine side of dipstick for left engine.

8.25 FUEL SYSTEM

(a) Fuel Requirements (AVGAS ONLY)

Aviation grade 100/130 (minimum) octane should be used in the Chieftain. The use of lower grades of fuel can cause serious damage in a very short period of time, and is considered of such importance that the engine warranty is invalidated by such use. Refer to Paragraph 1.7, Fuel.

The operation of the aircraft is approved with or without an anti-icing additive in the fuel. When an anti-icing additive is used it must meet the specification MIL-1-27686, must be uniformly blended with the fuel while refueling, must not exceed 0.15% by volume of the refueled quantity and to ensure its effectiveness should be blended at not less than 0.10% by volume. One and one half liquid ozs. per ten gallon of fuel would fall within this range. A blender supplied by the additive manufacturers should be used. Except for the information contained in this section, the manufacturer's mixing or blending instructions should be carefully followed.

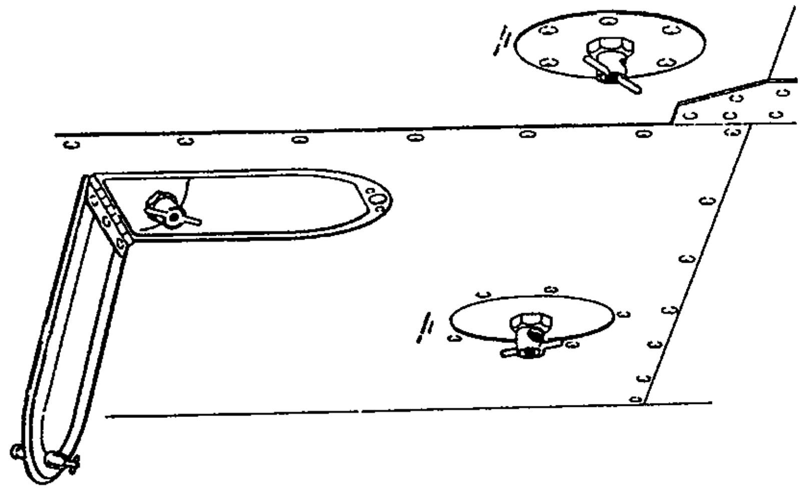
CAUTIONS

Assure that the additive is directed into the flowing fuel system. 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.

This additive should not be used as a replacement for preflight draining of the fuel system drains.

(b) Inspection

At every 50 hour inspection or every 90 days, screens and bowls in the fuel filter units should be cleaned.



FUEL DRAINS
Figure 8-3

(c) Filling Fuel Cells

The fuel supply is carried in two 56 gallon main cells and two 40 gallon auxiliary cells. A filler neck is provided in the upper center section of each wing for servicing the main cells, while another filler neck in the upper outboard section of each wing is provided for servicing the auxiliary cells. Observe all safety precautions required when handling gasoline.

When refueling the Chieftain, ground the refueling hose before beginning the transfer of fuel. Secure the filler cap immediately after servicing each cell. The optional lockable filler cap need not be locked to be secure.

NOTE

Never leave the fuel cells completely dry, or the cell inner liners may dry out and crack, permitting fuel to diffuse through the walls of the cell after refueling. If the cell is to be left empty for a week or more, spray the inner liner with a light coat of engine oil.

(d) Fuel Draining

Condensed water vapor can be drained from the main or auxiliary cells by the quick-drain fittings on the wing panel lower surface (Figure 8-3).

The fuel filter drain and inboard fuel cell fuel line drain valves are located inboard of the main wheel wells, and the outboard fuel cell drain valves are outboard of the main wheel wells. They are fitted with quick drains and should be drained regularly. In order to check the fuel system for possible moisture content, the inboard fuel cell line quick drain valve should be opened and drained and the quick drain valve on the fuel filter should be opened and drained. This procedure should be repeated at the quick drain valves located outboard of the main wheel well. Fuel screens are provided at the cell outlets, in the injectors, and in the fuel filter bowls.

A crossfeed line drain valve is located to the rear of the left fuel filter drain valve. This valve should be opened occasionally, with the crossfeed on, the left emergency fuel pump on, and then the right emergency fuel pump on to allow any water that might accumulate at that point to be drained out.

CAUTION

When draining fuel, care should be taken to insure that no fire hazard exists before starting the engines.

8.27 BATTERY SERVICE

Access to the battery is through the forward baggage compartment opening. The stainless steel battery box has a plastic drain tube, located on the bottom right rear corner, to drain off any electrolyte that may have overflowed into the box.

Corrosion on the battery terminals and connections may be neutralized by applying a solution of baking soda and water mixed to the consistency of thin cream. Do not allow any of this soda solution to enter the battery. Repeat this application until all bubbling action has ceased before washing battery and box with clean water. Dry battery and box and close drain tube clamp.

Whenever checking the battery, ascertain that all connections are clean and tight and the fluid level is above the baffle plates. If it is necessary to add fluid, use distilled water.

A hydrometer check should be performed to determine the percentage of charge present in the battery.

Hydrometer Readings	Percent of Charge
1280	100
1250	75
1220	50
1190	25
1160	Very little useful capacity
1130 or below	Discharged

The battery should be removed for recharging. Starting recharge current should be 2 amperes. Finishing current should be 1 ampere.

8.29 PRESSURE GYRO SYSTEM

The pressure gyro system operates at a pressure of 4.3 to 6.1 inches of mercury. The system obtains the regulated pressure from the engine driven pressure pumps. The filters on the pumps should be inspected regularly and changed every 100 hours. The setting of the pressure regulators should be performed by an experienced mechanic.

8.31 HEATING SYSTEM

A preflight check should be made of the air inlet scoop, combustion air inlet scoop, exhaust outlet, and fuel drain for possible obstructions. Make sure that all of the openings are clear of any restrictions and that no damage has occurred to the exhaust outlet or combustion air inlet.

An operational check can be performed by moving the airplane master switch to the ON position and the heater control toggle switch to the HEAT position. The ventilating air blower and combustion air blower should operate.

To proceed with the operational check, move the right tank fuel control and the right emergency fuel pump switch to ON. This will start the fuel and ignite the burner simultaneously; heat should be felt within a few minutes.

8.33 PROPELLER DEICING*

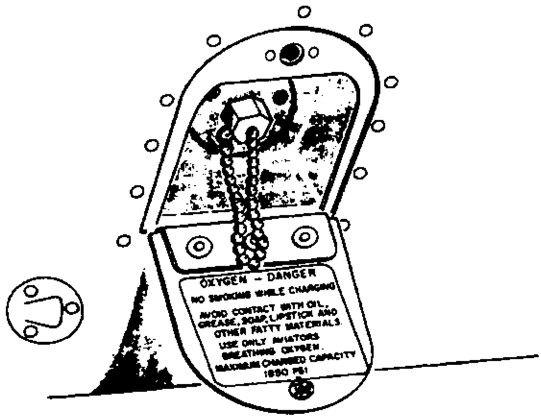
Lock brakes and operate engines at near takeoff power. Turn deicer system switch ON and observe deicer ammeter for at least 2 minutes. Ammeter needle must stay within the shaded band except for a "flicker," approximately each 30 seconds, as the step switch of the timer operates.

With engines stopped, turn the deicer switch ON and feel deicers on propellers for proper sequence of heater operation. The starting point is not important but sequence is vital and must be: RIGHT OUTBOARD, RIGHT INBOARD, LEFT OUTBOARD and LEFT INBOARD heaters, in that order. Temperature rise should be noticeable and each heater should warm for about 30 seconds. Local hot spots indicate surface damage of deicer heaters.

CAUTION

When conducting above static test, do not operate system longer than two complete cycles.

*Optional equipment



OXYGEN FILLER
Figure 8-5

8.35 OXYGEN SYSTEM SERVICE*

Depending upon whether the oxygen cylinder is mounted forward or aft, the filler valve for the oxygen cylinder is serviced by opening the access panel on the lower left nose section just aft of the forward baggage compartment door or on the right side of the fuselage tail section aft of the rear baggage compartment (Figure 8-5). To charge the oxygen system, remove the protective cap from the filler valve and attach the fitting from an oxygen cart.

WARNING

Inspect the filler connection for cleanliness before attaching it to the filler valve. Be sure your hands, tools and clothing are very clean and free from grease and oil since these contaminants will ignite when in contact with pure oxygen under pressure.

*Optional equipment

Open the cylinder supply valve on the airplane and fill the system slowly by adjusting the recharge rate with the pressure regulating valve on the cart. When the pressure gauge on the cylinder reads 1800 to 1850 psi, close the pressure regulating valve and replace the protective cap on the filler valve.

8.37 AIR CONDITIONER*

The compressor drive belt should be checked for a broken or loose belt during preflight. If the system becomes inoperative, consult the aircraft service manual.

8.39 NUMBER PLATES

The manufacturer's name plate is located on the fuselage underside even with the forward edge of the cabin door. A second plate containing only the serial number is located to the left of the tail skid. The serial number should always be used in referring to the airplane in service or warranty matters.

8.41 LUBRICATION

For lubricating instructions, a chart showing lubrication points and types of lubricants to be used, and lubrication methods, refer to the PA-31-350 Service Manual.

8.43 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.

*Optional Equipment

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 the solvent has evaporated or otherwise been removed.

(4) Remove the protective covers from the magnetos.
(5) Lubricate the controls, bearing surfaces, etc., in accordance with the Lubrication Chart in the Service Manual.

(b) Cleaning Landing Gear

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

(1) Place a pan under the gear to catch waste.
(2) Spray or brush the gear with solvent or a mixture of solvent and degreaser. To remove especially heavy dirt and grease deposits, it may be necessary to brush areas that were sprayed.
(3) Allow the solvent to remain on the gear from five to ten minutes. Then rinse the gear with additional solvent and allow it to dry.
(4) Remove the protective cover and the catch pan.
(5) Lubricate the gear in accordance with the Lubrication Chart in the Service Manual.

CAUTION

Do not brush the micro switches.

(c) Cleaning Exterior Surfaces

The airplane should be washed with a mild soap and water solution. Harsh abrasives or alkaline soaps or detergents could scratch painted or plastic surfaces or corrode metal. Cover areas where a 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 a soft bristle brush.
(3) To remove exhaust stains, allow the solution to remain on the surface longer.
(4) To remove stubborn oil and grease stains, use a soft cloth dampened with naphtha.
(5) Rinse all surfaces thoroughly.
(6) Any good automotive wax may be used to protect and preserve painted surfaces. Soft cleaning cloths or a chamois should be used to prevent scratches when cleaning or polishing. A heavier coat of wax on leading surfaces will reduce the abrasion problems in these areas. Refer to item (h) when surface deicers are installed.

(d) Cleaning Windshield and Windows

(1) Remove dirt, mud, and other loose particles from exterior surfaces with clean water.
(2) Wash interior and exterior window surfaces 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 dampened with kerosene.

CAUTION

Use only mild soap and water when cleaning the heated windshield. Use of ANY other cleaning agent or material may cause distortion or damage to windshield coatings.

CAUTION

Do not use gasoline, alcohol, benzene, carbon tetrachloride, thinner, acetone, other strong solvents, or window cleaning sprays. Do not use plastic cleaner on heated glass windshields.

(4) A severe scratch or mar in plastic can be removed by rubbing out the scratch with jeweler's rouge.
(5) When windows are clean, apply a thin coat of hard polishing wax. Rub lightly with a soft cloth. Do not use a circular motion. Do not apply wax on the optional heated windshield.

(e) Cleaning Interior

(1) Headliners and other vinyl interior surfaces may be cleaned with a damp cloth and mild soap and water solution.
(2) Window curtains may be dry cleaned but it is not recommended that they be laundered.
(3) Leather may be cleaned with a mild hand soap and water solution or with saddle soap. Follow the precautions which apply to the cleaning of any fine leather product. Avoid saturation and never use detergents or harsh cleaning solutions on leather.
(4) Wood surfaces may be cleaned with any good household liquid or spray cleaner/polish manufactured for this purpose.
(5) All upholstery fabrics are "Scotchgard" treated and may be cleaned as follows:

Spilled oily and watery liquids will generally bead up on the fabric and can be blotted away leaving little or no stain. Blot spills up as quickly as possible with an absorbent cloth, tissue or sponge. If the material is a solid or semi-solid, such as butter, remove the excess by gentle scraping with a table knife. Often, blotting with remove all traces of stain but if the staining agent is not completely removed by blotting, the following techniques are suggested:

a. Water-based stains such as ketchup, milk, ice cream, coffee:

Wipe the stain with a cloth wet with water containing a detergent or ammonia (1/2 cup ammonia to a gallon of water). Repeat if necessary.

b. Oil based stains such as salad dressing, butter, and mayonnaise, may be removed by either of the following procedures:

Apply "Texize K-2R Spot Remover" by spraying or rubbing into the fabric, and let dry. Vacuum off the residual powder. Repeat if necessary.

or

Wet a cloth with a solvent type spot cleaner such as "Energine" or "Renuzit" and wipe or gently rub the stained area. Turn cloth and rewet with solvent often. Repeat until stain disappears.

Fabrics treated with "Scotchgard" Fabric Protector with Extra Soil Defense offer remarkable oil resistance. This means that dirt will sit on the fabric surface and can be readily vacuumed off. Frequent vacuuming of loose dirt will prevent its being worked into the fabric.

Fabrics which have accumulated significant overall soil must be vacuumed thoroughly. A suitable foam cleaner should then be applied. The following cleaners have been found to be suitable: "Fiber Fresh Concentrate," "Bissell Foam Upholstery Cleaner," "Glamorene," and "Ivory Flakes" or any other similar product. Carefully follow the manufacturer's instructions.

NOTE

It is best to test the cleaner on an inconspicuous portion of the fabric to test for discoloration. Also, avoid soaking or harsh rubbing.

To remove residual detergent left on the fabric, wipe the entire fabric surface with a cloth dampened with water. The cloth should be rinsed in clean water several times. This procedure will ensure that the treatment will continue to function.

CAUTION

Solvent cleaners require adequate ventilation.

(f) Cleaning Carpets

Use a small whisk broom or vacuum cleaner to remove dirt. For soiled spots, use a nonflammable dry cleaning fluid. Floor carpets may be removed and cleaned like any household carpet.

(g) Cleaning Toilet*

(1) To dispose of the sanitary bag, pull the top of the bag from the pail and close with a wire tie. Remove it from the airplane in the covered pail and dispose of according to field facilities. Do not attempt to flush the bag in a toilet.
(2) To clean and deodorize the airplane's toilet, mix a solution of disinfectant type cleaner. Using a soft bristled brush, rag and solution, wash the toilet pail and seat. The toilet may be removed for cleaning by disconnecting the two fasteners at the inside forward end of the unit. Slide it back and lift from the floor.
(3) When offensive odor remains, use a stronger solution and reclean.
(4) Rinse with fresh water and dry.
(5) To install a new sanitary bag, place it over the top edge of the pail and push it into the bottom of the pail.

*Optional equipment

(h) Cleaning Surface Deicing Equipment*

The deicers should be cleaned when the aircraft is washed using a mild soap and water solution.

In cold weather, wash the boots with the airplane inside a warm hangar if possible. If the cleaning is to be done outdoors, heat the soap and water solution before taking it out to the airplane. It difficulty is encountered with the water freezing on boots, direct a blast of warm air along the region being cleaned, using a portable type ground heater.

As an alternate cleaning solvent, use benzol or nonleaded gasoline. Moisten the cleaning cloth in the solvent, scrub lightly, and then, with a clean, dry cloth, wipe dry so that the cleaner does not have time to soak into the rubber. Petroleum products such as these are injurious to rubber, and therefore should be used sparingly if at all.

When the deicers are clean, a coating of B.F. Goodrich Icex should be applied. Icex is compounded to lower the strength of adhesion between ice and the rubber surface of the deicer boots. The manufacturers instructions (B.T . Goodrich) must be followed explicitly.

*Optional equipment