PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL

Cessna 350 (LC42-550FG) with Garmin Integrated Flight Display

Serial Number: ____________

Registration Number: ____________

Type Certificate No. A00003SE

THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY THE FEDERAL AVIATION REGULATIONS AND ADDITIONAL INFORMATION PROVIDED BY THE MANUFACTURER, AND CONSTITUTES THE FAA APPROVED AIRPLANE FLIGHT MANUAL.

This Handbook meets GAMA Specification No. 1, *Specification for Pilot's Operating Handbook,* issued February 15, 1975 and revised September 1, 1984.

Approved by the Federal Aviation Administration

By: T. L. E. A. (Name) Title Manager, Flight Test Branch

Date: 14 Jul 06 Initial Issue: 09 Dec 05 Revised: 22 Oct 08

RB050005I

BRAZILIAN
PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE
FLIGHT MANUAL

Cessna 350 (LC42-550FG)
with
Garmin Integrated Flight Display

Serial Number: __________

Registration Number: __________

Type Certificate No. A00003SE

THIS HANDBOOK IS APPROVED BY THE FAA ON BEHALF OF THE AGÊNCIA NACIONAL DE AVIAÇÃO CIVIL (ANAC) FOR BRAZILIAN REGISTERED AIRCRAFT, IN ACCORDANCE WITH THE REGULAMENTO BRASILEIRO DE HOMOLOGAÇÃO AERONÁUTICA (RBHA) PART 21, SECTION 21.29; IT INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY THE FEDERAL AVIATION REGULATIONS AND ADDITIONAL INFORMATION PROVIDED BY THE MANUFACTURER, AND CONSTITUTES THE FAA APPROVED AIRPLANE FLIGHT MANUAL.

This Handbook meets GAMA Specification No. 1, *Specification for Pilot's Operating Handbook,* issued February 15, 1975 and revised September 1, 1984.

Approved by the Federal Aviation Administration

By: *T. L. E. A.* (Name) Title *Manager, Flight Test Branch*

Date: 14 Jul 06 Initial Issue: 09 Dec 05 Revised: 22 Oct 08

RB050005I

PILOT OPERATING HANDBOOK
LOG OF NORMAL REVISIONS

Normal Revision No.	Revised Pages	Description of Revision or Referenced Narrative Discussion Pages	Approved By Date
--	--	Initial Revision	--
A	Title Page, iii, vii to xvi, 1-2, 1-9, 2-4 to 2-6, 2-9 to 2-15, 2-17, 2-18, 3-1 to 3-3, 3-5 to 3-34, 4-1 to 4-3, 4-6 to 4-18, 4-20 to 4-23, 4-27 to 4-38, 5-6, 6-1, 6-2, 6-4 to 6-20, 6-A1 to 6-A10, 6B-1 to 6B-6, 7-2 to 7-5, 7-10 through 7-14, 7-17 to 7-19, 7-23 to 7-74, 8-11	See Narrative Discussion of Revisions	--
B	Title Page, iii, vii to xvi, 2-6, 2-9 to 2-12, 3-19, 3-31, 4-19, 4-30 to 4-32, 7-5, 7-24, 7-30, 7-32, 7-47, 7-48, 7-64 to 7-74	See Narrative Discussion of Revisions	T.L.E.A. 7/14/06
C	Title Page, iii, vii to xi, xvi, 2-4, 2-17	See Narrative Discussion of Revisions	Don A. Gibson 7/19/06
D	All	See Narrative Discussion of Revisions	Jeffrey A. Morfitt 11/02/06
E	Title Page, iii, vii to xi, xix, 1-1, 1-22, 2-9, 2-11, 5-1, 5-32 to 5-34, 6A-3 to 6A-16, 6B-1 to 6B-10, 7-1 to 7-4, 7-14, 7-15, 7-27, 7-54 to 7-57	See Narrative Discussion of Revisions	E. P. Kolano 02/08/07
F	All	See Narrative Discussion of Revisions	Luann Abrams 12/07/07

G	Title Page, iv, vii to xi, xix to xxii, 1-4, 1-5, 2-1, 2-6, 2-9 to 2-13, 2-17, 2-19, 2-21, 3-3, 3-13, 3-19, 3-24, 4-2, 4-4, 4-5, 4-9 to 4-11, 4-17, 4-19 to 4-21, 5-11, 5-23, 5-24, 5-32, 6-1, 6-2, 6-13, 6A-3 to 6A-18, 6B-1 to 6B-10, 7-1 to 7-4, 7-7, 7-17, 7-19 to 7-24, 7-28 to 7-32, 7-34, 7-38, 7-39, 7-46, 7-56, 7-59, 7-65 to 7-67, 8-4 to 8-6	See Narrative Discussion of Revisions	E. P. Kolano ANM-1605 01/28/08
H	All	See Narrative Discussion of Revisions	E. P. Kolano 05/09/08
I	Title Page, iv, vii to xii, xxii to xxiv, 2-8, 2-18, 2-23, 3-1, 3-2, 3-4 to 3-30, 4-2, 4-3, 4-9, 4-10, 4-22, 4-27 to 4-32, 6A-1, 6A-3 to 6A-18, 6B-1 to 6B-10, 7-1, 7-15, 7-34, 7-53, 7-67, 7-68, 8-1 to 8-11	See Narrative Discussion of Revisions	Shaun Ripple 11/14/08

PILOT OPERATING HANDBOOK
LOG OF TEMPORARY REVISIONS

Temporary Revision No. and Date	Revised Pages	Description of Revision or Referenced Narrative Discussion Pages	Approved By Date

This Page Intentionally Left Blank

LIST OF EFFECTIVE PAGES			
Reissue		Added Pages	
Page	Rev	Page	Rev
INTRODUCTION PAGES			
Title	I	xxiii	I
ii	H	xxiv	I
iii	H		
iv	I		
v	H		
vi	H		
vii	I		
viii	I		
ix	I		
x	I		
xi	I		
xii	I		
xiii	H		
xiv	H		
xv	H		
xvi	H		
xvii	H		
xviii	H		
xix	H		
xx	H		
xxi	H		
xxii	I		
SECTION 1 (General)			
1-1	H		
1-2	H		
1-3	H		
1-4	H		
1-5	H		
1-6	H		
1-7	H		
1-8	H		
1-9	H		

LIST OF EFFECTIVE PAGES			
Reissue		Added Pages	
Page	Rev	Page	Rev
1-10	H		
1-11	H		
1-12	H		
1-13	H		
1-14	H		
1-15	H		
1-16	H		
1-17	H		
1-18	H		
1-19	H		
1-20	H		
1-21	H		
1-22	H		
SECTION 2 (Limitations)			
2-1	H		
2-2	H		
2-3	H		
2-4	H		
2-5	H		
2-6	H		
2-7	H		
2-8	I		
2-9	H		
2-10	H		
2-11	H		
2-12	H		
2-13	H		
2-14	H		
2-15	H		
2-16	H		
2-17	H		
2-18	I		
2-19	H		

LIST OF EFFECTIVE PAGES			
Reissue		Added Pages	
Page	Rev	Page	Rev
2-20	H		
2-21	H		
2-22	H		
2-23	I		
2-24	H		
SECTION 3 (Emergency Procedures)			
3-1	I	3-29	I
3-2	I	3-30	I
3-3	H		
3-4	I		
3-5	I		
3-6	I		
3-7	I		
3-8	I		
3-9	I		
3-10	I		
3-11	I		
3-12	I		
3-13	I		
3-14	I		
3-15	I		
3-16	I		
3-17	I		
3-18	I		
3-19	I		
3-20	I		
3-21	I		
3-22	I		
3-23	I		
3-24	I		
3-25	I		
3-26	I		
3-27	I		

LIST OF EFFECTIVE PAGES			
Reissue		Added Pages	
Page	Rev	Page	Rev
3-28	I		
SECTION 4 (Normal Procedures)			
4-1	H		
4-2	I		
4-3	I		
4-4	H		
4-5	H		
4-6	H		
4-7	H		
4-8	H		
4-9	I		
4-10	I		
4-11	H		
4-12	H		
4-13	H		
4-14	H		
4-15	H		
4-16	H		
4-17	H		
4-18	H		
4-19	H		
4-20	H		
4-21	H		
4-22	I		
4-23	H		
4-24	H		
4-25	H		
4-26	H		
4-27	I		
4-28	I		
4-29	I		
4-30	I		
4-31	I		
4-32	I		

LIST OF EFFECTIVE PAGES			
Reissue		Added Pages	
Page	Rev	Page	Rev
SECTION 5 (Performance)			
5-1	H		
5-2	H		
5-3	H		
5-4	H		
5-5	H		
5-6	H		
5-7	H		
5-8	H		
5-9	H		
5-10	H		
5-11	H		
5-12	H		
5-13	H		
5-14	H		
5-15	H		
5-16	H		
5-17	H		
5-18	H		
5-19	H		
5-20	H		
5-21	H		
5-22	H		
5-23	H		
5-24	H		
5-25	H		
5-26	H		
5-27	H		
5-28	H		
5-29	H		
5-30	H		
5-31	H		
5-32	H		

LIST OF EFFECTIVE PAGES			
Reissue		Added Pages	
Page	Rev	Page	Rev
5-33	H		
5-34	H		
SECTION 6 (Weight & Balance)			
6-1	H		
6-2	H		
6-3	H		
6-4	H		
6-5	H		
6-6	H		
6-7	H		
6-8	H		
6-9	H		
6-10	H		
6-11	H		
6-12	H		
6-13	H		
6-14	H		
6-15	H		
6-16	H		
6-17	H		
6-18	H		
6-19	H		
6-20	H		
Weight & Balance (Appendix A) Type of Equipment for Operation List			
6A-1	I		
6A-2	H		
6A-3	I		
6A-4	I		
6A-5	I		
6A-6	I		
6A-7	I		
6A-8	I		

LIST OF EFFECTIVE PAGES			
Reissue		**Added Pages**	
Page	**Rev**	**Page**	**Rev**
6A-9	I		
6A-10	I		
6A-11	I		
6A-12	I		
6A-13	I		
6A-14	I		
6A-15	I		
6A-16	I		
6-A17	I		
6-A18	I		
Weight & Balance (Appendix B) Installed Equipment List			
6B-1	I		
6B-2	I		
6B-3	I		
6B-4	I		
6B-5	I		
6B-6	I		
6B-7	I		
6B-8	I		
6B-B	I		
6B-10	I		
SECTION 7 (Description of Airplane & Systems)			
7-1	I		
7-2	H		
7-3	H		
7-4	H		
7-5	H		
7-6	H		
7-7	H		
7-8	H		
7-9	H		
7-10	H		

LIST OF EFFECTIVE PAGES			
Reissue		**Added Pages**	
Page	**Rev**	**Page**	**Rev**
7-11	H		
7-12	H		
7-13	H		
7-14	H		
7-15	I		
7-16	H		
7-17	H		
7-18	H		
7-19	H		
7-20	H		
7-21	H		
7-22	H		
7-23	H		
7-24	H		
7-25	H		
7-26	H		
7-27	H		
7-28	H		
7-29	H		
7-30	H		
7-31	H		
7-32	H		
7-33	H		
7-34	I		
7-35	H		
7-36	H		
7-37	H		
7-38	H		
7-39	H		
7-40	H		
7-41	H		
7-42	H		
7-43	H		
7-44	H		

LIST OF EFFECTIVE PAGES			
Reissue		Added Pages	
Page	Rev	Page	Rev
7-45	H		
7-46	H		
7-47	H		
7-48	H		
7-49	H		
7-50	H		
7-51	H		
7-52	H		
7-53	I		
7-54	H		
7-55	H		
7-56	H		
7-57	H		
7-58	H		
7-59	H		
7-60	H		
7-61	H		
7-62	H		
7-63	H		
7-64	H		
7-65	H		
7-66	H		
7-67	I		
7-68	I		
SECTION 8 (Handling, Servicing & Maintenance)			
8-1	I		
8-2	I		
8-3	I		
8-4	I		
8-5	I		
8-6	I		
8-7	I		

LIST OF EFFECTIVE PAGES			
Reissue		Added Pages	
Page	Rev	Page	Rev
8-8	I		
8-9	I		
8-10	I		
8-11	I		
8-12	H		
8-13	H		
8-14	H		
8-15	H		
8-16	H		
8-17	H		
8-18	H		
8-19	H		
8-20	H		
SECTION 9 (Supplements)			
9-1	H		
9-2	H		

This Page Intentionally Left Blank

NARRATIVE DISCUSSION OF REVISIONS

Revision Level	Page No.	Comment
-	All	Initial revision.
A	Title Page, iii, vii through xi, xvi	Revised to indicate Revision A. Revised LOEP. Revised Narrative Discussion of Revisions.
A	1-2	Revised the Empty Weight in Figure 1-2.
A	1-9	Changed "Limit Load" to "Limit Load Factor" and "Ultimate Load" to "Ultimate Load Factor".
A	2-4 to 2-7	Revised maneuvering speed in Figure 2-1. Described airspeed markings on the PFD in the Airspeed Indicator Markings section. Deleted Maximum Manifold Pressure for Idle from the Powerplant Limitations section. Changed "on the Garmin G1000 system" to "on the MFD" in the Powerplant Gauge Markings section. Revised Figure 2-3. Revised Figure 2-5
A	2-9, 2-15, 3-7, 3-9, 3-11, 3-13, 3-15, 3-17, 4-9 through 4-17, 6-12, 6-14, 6-16, 6-18, 6-20, and 6A-10	Revised footer.
A	2-9 to 2-14	Revised table of G1000 software versions, , and changed "limit" to "minimum height" in no. 8 in the Garmin G1000 System Limitations section. Changed ", flight director or manual electric trim" to "or flight director" and the "PFT" annunciation description for the GFC 700 in no. 6 of the Garmin G1000 System Limitations section. Added explanation of automatic switching caution to no. 2 of the Approach Operation Limitations in the Garmin G1000 System Limitations section. Deleted 14 CFR Part 121 from no. 2 of the GTX33 Mode S Transponder Limitations section. Deleted no. 4 in the Garmin GFC 700 Automatic Flight Control System Limitations section. Added a Warning to verify proper operation of the oxygen system and revised the Warning against use of lipstick, chapstick, and etc. in the Oxygen Limitations section. Repaginated pages.
A	2-17	Revised maneuvering speed placard.
A	2-18	Revised location of compass placard. Added panel light dimmer placard.
A	3-1 to 3-3	Revised Table of Contents.

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
A	3-5 through 3-34	Revised maneuvering speed in Figure 3-1. Revised Emergency Procedure checklists. Changed “Boost” to “Fuel” in the Emergency Backup Boost Pump title and section. Changed “Boost” to “Fuel” in the Critical Issues (Backup Boost Pump) title and section. Revised the Failure of Engine Driven Fuel Pump section. Changed “Emergency Landing Without Engine Power” to “Forced Landing (Engine Out and Partial Power)”in the Engine Does Not Restart paragraph in the Engine Failure and Forced Landings section and in the Low Oil Pressure paragraph of the Engine and Propeller Problems section. Changed “engine” to “System” in the Electrical Problems section.
A	4-1 to 4-3	Revised Table of Contents.
A	4-6 through 4-18	Revised the Normal Procedures checklists.
A	4-20 to 4-23	Indicated ammeter/loadmeter is displayed on MFD System page in the Normal Starting paragraph of the Engine Starting section. Revised description of the tab in the Fuel Quantity section. Changed “auxiliary boost pumps are off” to “auxiliary fuel pump is off” in the Over Priming section. Changed “If the airplane” to “The airplane” in the first sentence of the Ground Power Operations section. Repaginated pages.
A	4-27 through 4-37	Added Oxygen System paragraph to the Before Takeoff section. Added paragraph directing fuel pump switch be off for descent and landing and revised the SpeedBrakes paragraph in the Descent section. Added paragraph on propeller speed intermodulation and Note on flaps use to the Glideslope Flight Procedure with Autopilot discussion under the Approach section. Changed “boost” to “fuel” in the Balked Landings section. Added Oxygen System paragraph to the Landings section. Changed “boost pumps” to “fuel pump” in the third paragraph of the Hot Weather Operations section.
A	5-6	Revised Figure 5-5.
A	6-1 and 6-2	Revised Table of Contents.
A	6-4 to 6-20	Added Caution and example regarding specific weight of Aviation Gasoline. Repaginated pages.
A	6-A1 through 6-A10	Deleted model #s and size from Items 34-35, 34-36, and 34-37.
A	6-B1 through 6-B6	Deleted model #s and size from Items 34-35, 34-36, and 34-37.
A	7-2 through 7-5	Revised Table of Contents.

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
A	7-10 through 7-14	Changed “convenience” to “inconvenience” in the Control Lock section. Changed “Engine Indication System (EIS) page” to “various pages” in the Elevator and Aileron section. Revised the Hat Switches section. Revised Trim Position Indicator section. Deleted the last sentence from the Autopilot/Trim Master Switch (A/P Trim) section. Changed “flaps does” to “flaps switch does” in the 6th sentence of the 2nd paragraph of the Wing Flaps section. Changed “on the left side” to “at the front” in the Front Seat Adjustment section. Revised Figure 7-3. Revised Figure 7-4.
A	7-17 to 7-19	Revised 2nd paragraph of the Baggage Door section. Changed “clockwise” to “inboard”, and deleted “90º counterclockwise or” in the Parking Brake section. Changed “IO-550-N25” to “IO-550-N” in the Engine Specification section.
A	7-23 through 7-74	Added a Note about airspace penetration and Warning in event of AHRS failure to the Garmin G1000 Integrated Cockpit System section. Added MFD Map Scale, MFD Holding Pattern Depiction, and VOR Frequency Display on the MFD paragraphs. Added GCU 476 Remote Keypad. Added Figure 7-6 and renumbered following figures. Changed “Boost” to “Fuel” in the Backup Boost Pump and Vapor Suppression section title. Changed “Boost” to “Fuel” in the Primer section. Added tables to the Aircraft Alerts, Caution Alerts, Annunciation Advisory, and Message Advisory Alerts sections. Revised the Backup Attitude Indicator section. Added AFCS Alerts, TAWS Alerts, and TAWS System Status Annunciations and Other Annunciations sections. Revised description of the Kollsman Window in the Backup Altimeter section. Changed “MFD EIS page” to “MFD System page” in the 3rd paragraph of the Fuel Quantity Indication section. Revised the Alerts Window paragraph and the Alert Level Definitions paragraph in the Annunciations and Alerts section. Revised the Oxygen annunciations in the Caution Alerts section. Added OXYGEN ON to the Annunciations Advisory section. Revised Figure 7-13 and renumbered it to Figure 7-14. Revised Figure 7-14 and renumbered it to Figure 7-15. Revised the Pitot-Static System section. Revised the Fuel System section and changed “MFD EIS page” to “MFD System page” in the Fuel Selector paragraph. Revised location of the backup pump and vapor suppression switches in the Backup Fuel Pump and Vapor Suppression section. Deleted “single speed” from the Airflow and Operation paragraph of the Environmental Control System section. Revised switch operation in the Overhead Reading Lights and Instrument Flood Bar sections. Revised Upper Instruments section. Revised Lower Instruments, Circuit Breaker and Master Switches Panels section. Revised Figure 7-18 and renumbered it to Figure 7-19. Revised the Flaps Panel and 5

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
		Pack Switches (Press-to-Test PTT) section and renamed it to Press-to-Test PTT Button. Added a Note on the GDL 69A to, and revised the Rudder Limiter Test paragraph in, the Stall Warning System section. Revised the Control Stick Switches and Headset Plug Positions section. Revised the Autopilot Disconnect/Trim Interrupt Switch section. Revised the description of condition required for ELT activation, and the location of the ELT switch in the Emergency Locator Transmitter section. Changed “EIS page” to “System page”, revised the Oxygen Flow Controls paragraph, revised lipstick, chapstick, etc. use Warning, and added a Preflight Testing paragraph in the Precise Flight Fixed Oxygen System section. Changed “EIS” to “System” and revised description of Test/Reset button in the CO Guardian Carbon Monoxide Detector section. Added Reference to Garmin Cockpit Reference Guide for operating instructions in the XM Weather (WX) Data System section. Revised the Ryan Model 9900BX TCAD section. Added titles to Figure 7-24 and 7-25 and renumbered to 7-25 and 7-26. Deleted the Acknowledge/Traffic Button section. Changed “maximum performance” to “maximum ACCS performance” in the 5th General Hint for ACCS Operation. Deleted GTA 82 Trim Adapter, revised CWS (Control Wheel Steering) Button paragraph, and added two Warning notes in the Garmin GFC 700 Automatic Flight Control System section. Added Go Around information to the GA (Go Around Button paragraph in the Additional AFCS Controls section. Repaginated pages and revised cross references. Added pages 7-69 through 7-74.
A	8-11	Revised Figure 8-4.
B	Title Page, iii, vii through xi, xvi	Revised to indicate Revision B. Revised LOEP. Revised Narrative Discussion of Revisions.
B	2-6	Revised Figure 2-3.
B	2-9 to 2-12	Revised software versions table and No. 10 under the Garmin G1000 System Limitations section. Reformatted No. 2 under the Approach Operation Limitations section into a caution. Revised the Garmin GFC 700 Automatic Flight Control Systems Limitations section. Revised Figure 2-7.
B	3-19	Changed “backup fuel pump” to “backup fuel pump switch” in the third paragraph under the Emergency Backup Fuel Pump section.
B	3-31	Changed “, or annunciation” to “, or annunciated” in the first note under the Oxygen System section.
B	4-19	Changed “stall warning” to “stall warning tone” in the last sentence of the Rudder Limiter Test section.
B	4-30 to 4-32	Revised Mixture Settings paragraphs under the Cruise section. Revised the Glideslope Flight Procedure with Autopilot section.

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
B	7-5	Revised Table of Contents.
B	7-24	Added “for the identified station” to the end of the last sentence in the VOR Frequency Display on the MFD section.
B	7-30	Deleted item 2.h. “OXYGEN PRES” and deleted last row from the following table. Revised the description of the “Fuel Pump” message. Changed “Fuel Pump On” to “Fuel Pump” and “Fuel pump is operating” to “Backup fuel pump is operating” in the Alerts table.
B	7-32	Changed “Fuel Pump On” to “Fuel Pump” and revised the description in the Audio Alert/Voice Message section.
B	7-47 and 7-48	Deleted duplicate sentences in the Press-to-Test PTT Button section.
B	7-64 to 7-74	Indicated engine driven or electrically driven compressor. Added section System Operation Using Ground Power describing use of ACCS to pre-cool cabin of the aircraft. This is possible only by ACCS equipped with electric compressor powered by ground power. Added “above 400 AGL” to the last sentence of the first paragraph describing GA Mode operation. Repaginated pages.
C	Title Page, iii, vii to xi, xvi	Revised to Title Page to indicate Revision C. Revised LOEP. Revised Narrative Discussion of Revisions.
C	2-4	Revised Figure 2-1.
C	2-17	Revised Maneuvering Speed placard.
D	All	Reformatted entire manual to 5.5 x 8.5. Page numbers indicated for Revision Level D were made prior to reformatting of the manual; refer to Rev. C manual to compare changes.
D	Title Page, iii, vii to xi, xvi	Revised Title Page to indicate Revision C. Revised LOEP. Revised Narrative Discussion of Revisions.
D	2-7	Revised the Maximum Empty Weight from 2580 lbs. to 2568 lbs.
D	2-18	Revised compass placard.
D	3-1	Revised Table of Contents.
D	3-16 and 3-17	Added Something Stuck in or Interfering With a Doorjamb checklist. Revised Circuit Breaker Panel section.
D	3-19	Revised the 4th paragraph under the Emergency Backup Fuel Pump section.
D	3-27 and 3-28	Revised the Under Voltage section.. Revised the last sentence in the Master Switches section.
D	3-30 and 3-31	Revised the location of the static air source switch under the Static Air Source Blockage section. Revised the bullet list in the first paragraph of the Oxygen System section.
D	4-15 to 4-18	Added Note to the Crosswind Operations section. Changed “85%” to “80%” in the Cruise checklist. Repaginated pages.

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
D	4-20	Revised location of the blue dots in the Fuel Selector section.
D	4-22 to 4-24	Deleted the second paragraph and revised the Over Priming paragraph of the Engine Starting section. Revised the Battery Recharging section. Changed “there may be no point” to “there is no point” in the Crosstie Operations Checklist section.
D	4-27 and 4-28	Revised the 3rd paragraph under the Engine Runup section.
D	4-32 to 4-38	Changed “descent speed” to “airspeed” in the 2nd sentence of the Glideslope Flight Procedure with Autopilot section. Revised the 3rd paragraph under the Hot Weather Operations section. Revised the Crosswind Landings section. Repaginated page.
D	5-20	Revised the Lean of Peak Engine Operation section.
D	6-12 and 6-13	Deleted indication of an optional restraint system from the Baggage Nets section.
D	6-16	Revised the Maximum Empty Weight section.
D	6-18 and 6-19	Revised Figure 6-19. Revised Figure 6-20.
D	6A-1 to 6A-10	Changed “five through eight” to “four through seven” in the Flight Operation Requirements on the first page. Added optional Oregon Aero seats, optional McCauley propeller, spinner and blade heaters, optional Precise Flight semi-portable oxygen system, Artex ME406 ELT, electrically driven compressor, interlock assembly, and accessories alternator. Indicated IFR for Items 34-11 and 34-18.
D	6B-1 to 6B-6	Added optional Oregon Aero seats, optional McCauley propeller, spinner, and blade heaters, optional Precise Flight semi-portable oxygen system, Artex ME406 ELT, electrically driven compressor, interlock assembly, and accessories alternator. Revised the POH/AFM weight. Revised the GTX 33 weight.
D	7-1	Revised Table of Contents
D	7-8	Revised the description of the wing cuffs in the Wings and Fuel Tanks section.
D	7-15 to 7-19	Added Warning to the Door section. DO NOT open door during flight. Changed “Door Open” to “DOOR OPEN” in the Latching Mechanism and Door Seal System sections. Changed “manifold gauge” to “manifold pressure indicator” in the Throttle paragraph under the Engine Controls section.
D	7-21	Changed “pilot’s left knee” to “pilot’s right knee” and “fuel manifold” to “intake manifold” in the Induction section. Changed “or pressure is above 18 psi” to “or a pressure differential greater than 18 psi is detected” in the Engine Oil section.
D	7-30	Changed all occurrences of “L-LOW” to “L LOW” in the Caution Alerts section.
D	7-39	Changed “L-LOW” to “L LOW” in the Fuel Low Annunciation Messages section. Revised the first paragraph of the Backup Fuel Pump and Vapor Suppression section.
D	7-47 and 7-48	Revised Figure 7-19. Revised the first sentence of the Airplane Exterior Lighting System section.

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
D	7-54 to 7-78	Revised the Emergency Locator Transmitter (ELT) section to include the Artex ME406 ELT. Revised the last paragraph in the Oxygen Display section. Changed “test/reset” to “reset” and two occurrences of “50” to “75” in the CO Guardian Carbon Monoxide Detector section. Indicated the location of the XM antenna in the XM Weather (WX) Data System section. Added GTA 82 Trim Adapter to the list of LRU in the GRC 700 AFCS. Changed “GA” to “GO AROUND” in the Additional AFCS Controls section. Added a Note to delay after turning off the system before turning it back on again in the System Operation paragraph of the Automatic Climate Control System (ACCS) section. Revised the Note in the System Operation Using Ground Power Supply paragraph to indicate 24 V ground power supply and 100 amps, and added Note to delay after turning off the system before turning it back on again.
D	8-8 and 8-9	Revised Figure 8-3. Revised the Oxygen System Servicing section.
E	Title Page, iii, vii to xi, xix	Revised Title Page. Revised LOEP. Revised Narrative Discussion of Revisions.
E	1-1	Revised Table of Contents.
E	1-22	Added atmospheric pressure relationships Figure 1-17.
E	2-9	Revised paragraph 3.b. under the Garmin G1000 System Limitations section.
E	2-11	Added A5 Flowmeters to the Oxygen Limitations section.
E	5-1	Revised Table of Contents.
E	5-32 to 5-34	Added Figure 5-27 for A5 Flowmeter and revised Figure 5-26. Revised cross references. Added pages 5-33 and 5-34.
E	6A-3 to 6A-18	Added Item 52-01 Remote Keyless Entry System to the Equipment for Types of Operation List. Revised Item 34-37. Changed shaded blocks to check marks.
E	6B-1 to 6B-10	Added Item 52-01 Remote Keyless Entry System to the Installed Equipment List.
E	7-1 to 7-4	Revised Table of Contents.
E	7-14 and 7-15	Added paragraph for description of the remote keyless entry system.
E	7-27	Revised description of Elevator Mistrim Up and Down, and Aileron Mistrim Left and Right in the AFCS Alerts table.
E	7-54 to 7-57	Added A5 Flowmeters under the Oxygen Flow Controls section. Added use of soap and water solution to get rid of static charge in the A5 Flowmeter.
F	All	Removed all occurrences of Columbia, Columbia Aircraft Manufacturing Corporation, etc. and replaced with Cessna as applicable. Repaginated pages.
G	Title Page, iv, vii to xi, xix to xxii	Revised administrative pages.

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
G	1-4 and 1-5	Revised the Total Fuel Capacity section. Pages 1-4 and 1-5 repaginated.
G	2-1	Revised Table of Contents.
G	2-6	Revised the Fuel Quantity Row in Figure 2-3.
G	2-9 to 2-13	Revised the Fuel Limitations section. Added Item 12. Flight Plan WARNING note to page 2-10. Added SafeTaxi Limitations section. Added Wide Area Augmentation System (WAAS) Limitations section. Repaginated pages.
G	2-17	Revised the Engraved On Fuel Selector Knob and Upper Plate placard.
G	2-19	Indicated "(when air conditioning is installed)" for the Air Conditioning System Bay Access Cover placard. Revised the On Bottom of Baggage Compartment Door Joggle placard.
G	2-21	Revised the Near Fill Cap of Fuel Tank placard.
G	3-3	Changed maneuvering speed from "158" to "148" in Figure 3-1.
G	3-13	Changed "75" to "50" in the Carbon Monoxide Detection procedure Note.
G	3-19	Changed "right bus" to "essential bus" in the first sentence of the last paragraph of the Trim Tab Malfunctions section.
G	3-24	Revised Figure 3-5.
G	4-2	Revised Table of Contents.
G	4-4 and 4-5	Added item 17 Induction Heated Air to Area 1, and ", bushing in place" to Item 7 of Area 3 and to Item 2 of Area 5 in the Preflight Inspection checklist.
G	4-9 to 4-11	Added Item 1 and Item 14 regarding Air Conditioning to the Crosstie Operation checklist. Repaginated pages.
G	4-17	Revised the Fuel Quantity section.
G	4-19 to 4-21	Added description of the battery charging circuit. Repaginated pages.
G	5-11	Removed the list of fuel flows from Figure 5-7.
G	5-23 and 5-24	"Full Fuel Tanks" changed to Fuel Tanks Filled to" under conditions in Figure 5-20 and Figure 5-21.
G	5-32	Revised Figure 5-26 and Figure 5-27.
G	6-13	Revised the Fuel row and footnote in Figure 6-12.
G	6-A3 to 6-A18	Revised 24-04 and added 24-05 to 24-07 Battery, 28 Volt. Deleted Item 21-26 Lower Hose Cover. Added items 33-8 to 33-11 for Precise Flight Landing and Taxi Lights. Added 34-02 GA 35 GPS Antenna, 34-03 GA 37 GPS and XM Satellite Radio Antenna, and 34-26 GDU 1044 MFD with connector. Renumbered following Item Nos. Changed "GIA 63" to "GIA 63/GIA 63W" in Item Nos. 34-24, 34-25, and 34-26, and renumbered them to 34-27, 34-28, and 34-29.

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
G	6-B1 to 6-B10	Revised 24-04 and added 24-05 to 24-07 Battery, 28 Volt. Deleted Item 21-26 Lower Hose Cover. Added items 33-8 to 33-11 for Precise Flight Landing and Taxi Lights. Added 34-02 GA 35 GPS Antenna, 34-03 GA 37 GPS and XM Satellite Radio Antenna, and 34-26 GDU 1044 MFD with connector. Renumbered following Item Nos. Changed “GIA 63” to “GIA 63/GIA 63W” in Item Nos. 34-24, 34-25, and 34-26, and renumbered them to 34-27, 34-28, and 34-29.
G	7-1 to 7-4	Revised Table of Contents.
G	7-7	Deleted the Control Lock section.
G	7-17	Revised footer to match LOEP.
G	7-19 to 7-24	Revised the System Description list of LRUs. Changed all occurrences of “GDU 1042” to “GDU 1042/GDU 1044” and GIA 63” to “GIA 63/GIA 63W” in the GDU 1040 PFD and GDU 1042 MFD, GMA 1347 Audio Panel, GIA 63, GDL 69A Data Link Receiver, GRS 77, GDC 74A, GEA 71, and GTX 33 sections, as applicable. Described the function of the GDU 1044 and GIA 63W in the sections listed above, as applicable. Indicated reference to “the latest revision” of the Garmin G1000 Cockpit Reference Guide. Also changed “190-00567-00” to “190-00567-01”, where applicable.
G	7-28	Indicated reference to “the latest revision” of the Garmin G1000 Cockpit Reference Guide. Also changed “190-00567-00” to “190-00567-01”.
G	7-29 to 7-32	Added SmartView, FliteCharts, SafeTaxi, and Wide Area Augmentation System (WAAS) descriptions. Corrected formatting in first paragraph of the Fuel System section. Repaginated pages.
G	7-34	Revised the Fuel Low Annunciation messages section.
G	7-38 and 7-39	Added Battery Charging Circuit description. Revised Figure 7-17.
G	7-46	Changed “190-00567-00” to “190-00567-01”.
G	7-56	Indicated reference to “the latest revision” of the Garmin G1000 Cockpit Reference Guide and changed “190-00567-00” to “190-00567-01” in the XM Weather (WX) Data System section.
G	7-59	Indicated reference to “the latest revision” of the Garmin G1000 Cockpit Reference Guide and changed “190-00567-00” to “190-00567-01” in the TCAD Display on the G1000 section. Added interlock assembly to the general description of the Automatic Climate Control System section.
G	7-65 to 7-67	Indicated reference to “the latest revision” of the Garmin G1000 Cockpit Reference Guide and changed “190-00567-00” to “190-00567-01”. Changed “GDU 1042” to “GDU 1042/GDU 1044” and “GIA 63” to “GIA 63/GIA 63W” throughout the Garmin GFC 700 Automatic Flight Control System (AFCS) section.

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
G	8-4 to 8-6	Changed “190-00567-00” to “190-00567-01” in the Customer Delivery Package section. Revised the Fuel Capacities under the Fuel Servicing section.
H	All	Revised due to company change to Cessna.
H	Title Page, iv, vii to xi, xxii	Revised administrative pages.
H	1-2	Revised Figure 1-1 to indicate horizontal stabilizer span is 14.1 ft.
H	2-1	Revised the Table of Contents.
H	2-5 to 2-14	Indicated “70 amp” for the Plane Power alternator in the Alternator Output Limitations section. Added color-coded range arc definitions to the Powerplant Gauge Markings section. Repaginated pages.
H	6-A3 to 6-A18	Indicated Kelly alternator on Item 24-01, added Item 24-02 for Plane Power alternator, and renumbered following items. Added Item 71-03 for the Winterization Kit.
H	6-B1 to 6-B10	Indicated Kelly alternator on Item 24-01, added Item 24-02 for Plane Power alternator, and renumbered following items. Added Item 71-03 for the Winterization Kit.
H	7-37	Added “(70 amp for Plane Power alternator)” to the General Description paragraph.
H	9-1 and 9-2	Simplified and revised the section to include optional equipment and/or devices manufactured by Cessna.
I	Title Page, iv, vii to xii, xxii to xxiv	Revised administrative pages.
I	2-8	Deleted statement related to gyros under the Approved Acrobatic Maneuvers section.
I	2-18	Indicated that the Under All Seats placard is not required under Oregon Aero seats.
I	2-23	Added Jack Point placard.
I	3-1 and 3-2	Revised the Table of Contents.
I	3-4 to 3-30	“1.3.1” changed to “3.1” in step 3 and “3-16” to “3-17” in step 3.2 of the Procedures After an Engine Restart checklist. Changed “Step 4” to “Step 5” in Step 4 under the Engine Driven Fuel Pump (EDFP) – Partial Failure checklist. Changed “3-28” to “3-30” in step 9 of the Ditching checklist. Revised the Electrical Fire in Flight and the Cabin Fire in Flight checklists. “6.1” and “6.2” changed to “3.1” and “3.2”, respectively, in step 3, and “Alt Off”” changed to “Alt Off” in step 6 of the Alternator Failure – Electrical System Discharging checklist. Added Starter Motor Engaged in Flight Checklist. “No. 6” changed to “6” in step 1 of the Rudder Limiter Malfunction checklist. Changed “3-26” to “3-29”, “3-28” to “3-30”, and “3-27” to “3-29” in the Evacuating the Airplane checklist. Revised Figure 3-2. Added Starter Motor Engaged in Flight discussion to the Amplified Emergency Procedures section. Added pages 3-29 and 3-30.

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
I	4-2	Revised the Table of Contents.
I	4-3	Revised Figure 4-1.
I	4-9 and 4-10	Revised item 1 and 14, and switched item 6 with item 7 and item 12 with item 13 under the Crosstie Operation procedure. Revised the Autopilot Autotrim Operations checklist. Revised item 3 and 4 under the Taxiing checklist.
I	4-22	Revised the first paragraph under the Taxiing section.
I	4-27 to 4-32	Added Caution and explanation about use of rapid forward stick movement with flaps fully extended at forward cg. Repaginated following pages.
I	6A-1	Deleted statement on headsets as optional items.
I	6A-3 to 6A-18	Added Item No. 25-31 Rosen Sunvisor.
I	6B-1 to 6B-10	Added Item No. 25-31 Rosen Sunvisor.
I	7-1	Revised the Table of Contents.
I	7-15	Deleted the Step (Not Installed) paragraph. Revised the Handles paragraph. Deleted “red lettered” from the Parking Brake paragraph.
I	7-34	Deleted “with red letters” and “with “amber letters”. From the Backup Fuel Pump and Vapor Suppression section.
I	7-53	Deleted Item 4 Automatic Stowage Due to Stall Warning Activation from the Precise Flight Speedbrake 2000 System section.
I	7-67 to 7-70	Added description of VNV Key. Revised Figure 7-32. Deleted pages 7-69 and 7-70.
I	8-1 to 8-11	Revised the Table of Contents. Revised all paragraphs in the Introduction section and added Airplane File paragraph. Revised the Cessna Advisory Service section and renamed it to “Cessna Owner Advisories”. Deleted the Customer Delivery Package section. Revised the Preventive Maintenance section and renamed it to “Pilot Conducted Preventive Maintenance”. Deleted sections Warranty Work and ADLOG™ Maintenance Recordkeeping System (MRS). Revised, renamed to “Airplane File”, and moved section Airplane Documentation to page 8-4. Added section Cessna Customer Care Program.

This Page Intentionally Left Blank

Section 1
General

TABLE OF CONTENTS

THREE-VIEW DRAWING OF THE AIRPLANE

SPECIFICATIONS

Wing Area	141.2 ft.^{2} (13.1 m^2)
Wing Span	35.8 ft. (10.9 m)
Length	25.2 ft. (7.68 m)
Empty Weight (±)	2450 lbs. (1111.1 kg)
Gross Weight	3400 lbs. (1542 kg)
Stall Speed	57 KIAS
Maneuvering Speed	148 KIAS
Cruising Speed	190 KTAS
Never Exceed Speed	235 KIAS
Engine	310 HP Continental IO-550-N
Propeller	Hartzell
Governor	McCauley

*Note: Wingspan is 36 ft.± with position lights.

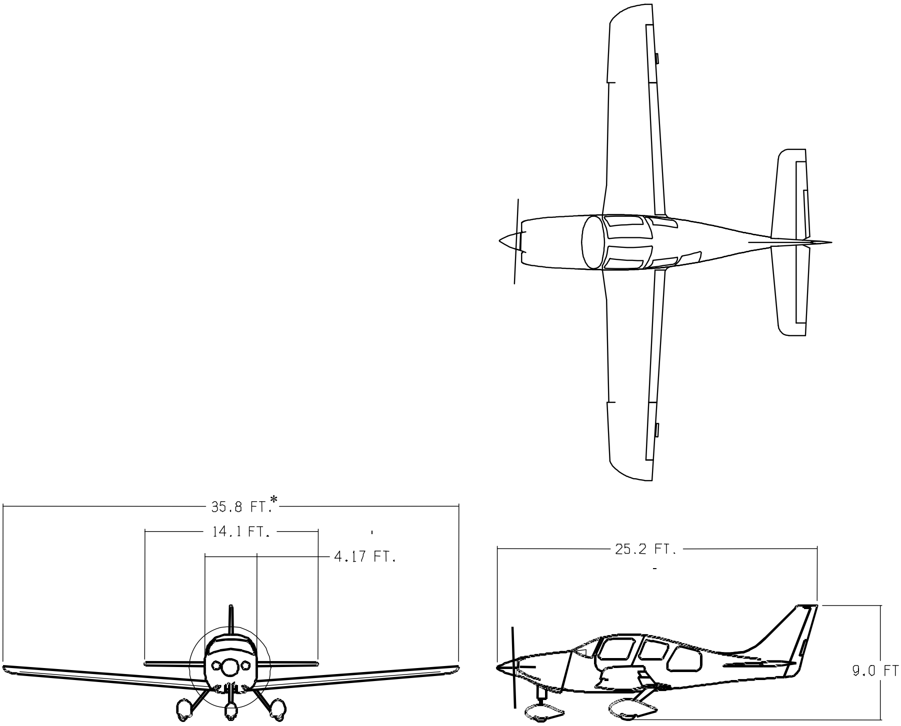


Figure 1 - 1

Section 1
General

INTRODUCTION

This handbook is written in nine sections and includes the material required to be furnished to the pilot by Federal Aviation Regulations and additional information provided by the manufacturer and constitutes the *FAA Approved Airplane Flight Manual*. Section 1 contains generalized descriptive data about the airplane including dimensions, fuel and oil capacities, and certificated weights. There are also definitions and explanations of symbols, abbreviations, and commonly used terminology for this airplane. Finally, conventions specific to this manual are detailed.

NOTE

Federal Aviation Regulations require that a current Handbook be in the airplane during flight. It is the operator's responsibility to maintain the Handbook in a current status. The manufacturer provides the registered owner(s) of the airplane with revisions.

In countries other than the United States, FAA operating rules may not apply. Operators must ensure that the aircraft is operated in accordance with national operating rules.

DESCRIPTIVE DATA

ENGINE

Number of Engines: 1
Engine Manufacturer: Teledyne Continental
Engine Model Number: IO-550-N
Engine Type: Normally aspirated, direct drive, air-cooled, horizontally opposed, fuel-injected, six-cylinder engine with 550 in.^{3} (9013 cm^3) displacement
Takeoff Power: 310 BHP at 2700 RPM
Maximum Continuous Power: 310 BHP at 2700 RPM
Maximum Normal Operating Power: Same as maximum continuous power.
Maximum Climb Power: Same as maximum continuous power.
Maximum Cruise Power: Same as maximum continuous power.

PROPELLER

Propeller Manufacturer: Hartzell
Propeller Hub and Blade Model Number: PHC-J3YF-IRF and F7691D-1
Number of Blades: 3
Propeller Diameter: 76 in. (193 cm) minimum, 77 in. (196 cm) maximum
Propeller Type: Constant speed and hydraulically actuated, with a low pitch setting of $14.1^{\circ} \pm 0.2^{\circ}$ and a high pitch setting of $34.7^{\circ} \pm 1.0^{\circ}$ (30 inch station)

FUEL

The following fuel grades, including the respective colors, are approved for this airplane.

100LL Grade Aviation Fuel (Blue)
100 Grade Aviation Fuel (Green)

Total Fuel Capacity - 106 Gallons (401 L)

Total Capacity Each Tank: 53 Gallons (201 L)
Total Usable Fuel:
S/N 42502 to 42567
49 Gallons US (186 L)/Tank, 98 Gallons US (371 L) Total
S/N 42568 and on
Standard: 43 Gallons US (163 L)/Tank, 86 Gallons US (326 L) Total
Long Range: 51 Gallons US (193 L)/Tank, 102 Gallons US (386 L) Total

NOTE

Under certain atmospheric conditions, ice can form along various segments of the fuel system. Under these conditions, isopropyl alcohol, ethylene glycol monomethyl ether, or diethylene glycol monomethyl ether may be added to the fuel supply. Additive concentrations shall not exceed 3% for isopropyl alcohol or 0.15% for ethylene glycol monomethyl ether and diethylene glycol monomethyl ether (military specification MIL-I-27686E). See Figure 8 - 1 in Section 8 for a chart of fuel additive mixing ratios.

OIL

Specification or Oil Grade (the first 25 engine hours) – Aviation Grade Straight Mineral Oil (MIL-L-6082) shall be used during the first 25 hours of flight operations.

Specification or Oil Grade (after 25 engine hours) – Teledyne Continental Motors Specification MHS-24D and MHS-25 (latest revisions). An ashless dispersant oil shall be used after 25 hours.

Viscosity Recommended for Various Average Air Temperature Ranges

Below 40°F (4°C) — SAE 30, 10W30, 15W50, or 20W50
Above 40°F (4°C) — SAE 50, 15W50, 20W/50, or 20W60

Total Oil Capacity

Sump: 8 Quarts (7.6 L)
Total: 10 Quarts (9.5 L)
Drain and Refill Quantity: 8 Quarts (7.6 L)
Oil Quantity Operating Range: 6 to 8 Quarts (5.7 to 7.6 L)

NOTE

The first time the airplane is filled with oil, additional oil is required for the filter, oil cooler, and propeller dome. At subsequent oil changes, this additional oil is not drainable from the system, and the added oil is mixed with a few quarts of older oil in the oil system.

MAXIMUM CERTIFICATED WEIGHTS

Ramp Weight:	3400 lbs. (1542 kg)
Takeoff Weight:	3400 lbs. (1542 kg)
Landing Weight:	3230 lbs. (1465 kg)
Baggage Weight:	120 lbs. (54.4 kg)

TYPICAL AIRPLANE WEIGHTS

The empty weight of a typical airplane offered with four-place seating, standard interior, avionics, accessories, and equipment has a standard empty weight of about 2300 lbs. (1043 kg).

Maximum Useful Load: 1100 lbs.* (498.9 kg)
*(The useful load varies for each airplane. Please see Section 6 for specific details.)

CABIN AND ENTRY DIMENSIONS

Maximum Cabin Width: 50 inches (127 cm)
Maximum Cabin Length (Firewall to aft limit of baggage compartment):
139.6 inches (354.6 cm)
Maximum Cabin Height: 49 inches (124.5 cm)
Minimum Entry Width: 33 inches (83.8 cm)
Minimum Entry Height: 33 inches (83.8 cm)
Maximum Entry Clearance: 46 inches (116.8 cm)

SPACE AND ENTRY DIMENSIONS OF BAGGAGE COMPARTMENT

Maximum Baggage Compartment Width: 38.5 inches (97.8 cm)
Maximum Baggage Compartment Length: 52 inches (132 cm) (Including Shelf)
Maximum Baggage Compartment Height: 34.5 inches (87.6 cm)
Maximum Baggage Entry Width: 28 inches (71.1 cm) (Diagonal Measurement)

SPECIFIC LOADINGS

Wing Loading: 24.08 lbs./sq. ft.
Power Loading: 10.97 lbs./hp.

This Page Intentionally Left Blank

ABBREVIATIONS, TERMINOLOGY, AND SYMBOLS

AIRSPEED TERMINOLOGY

CAS	*Calibrated Airspeed* means the indicated speed of an aircraft, corrected for position and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.
KCAS	Calibrated Airspeed expressed in knots.
GS	*Ground Speed* is the speed of an airplane relative to the ground.
IAS	*Indicated Airspeed* is the speed of an aircraft as shown on the airspeed indicator when corrected for instrument error. IAS values published in this Handbook assume zero instrument error.
KIAS	Indicated Airspeed expressed in knots.
TAS	*True Airspeed* is the airspeed of an airplane relative to undisturbed air, which is the CAS, corrected for altitude, temperature and compressibility.
V_H	This term refers to the maximum speed in level flight with maximum continuous power.
V_O	*The maximum operating maneuvering speed* of the airplane. Do not apply full or abrupt control movements above this speed. If a maneuver is entered gradually at V_O with maximum weight and full forward CG, the airplane will stall at limit load. However, limit load can be exceeded at V_O if abrupt control movements are used or the CG is farther aft.
V_{FE}	*Maximum Flap Extended Speed* is the highest speed permissible with wing flaps in a prescribed extended position.
V_{NE}	*Never Exceed Speed* is the speed limit that may not be exceeded at any time.
V_{NO}	*Maximum Structural Cruising Speed* is the speed that must 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_X	*Best Angle-of-Climb Speed* is the airspeed that delivers the greatest gain of altitude in the shortest possible horizontal distance.
V_Y	*Best Rate-of-Climb Speed* is the airspeed that delivers the greatest gain in altitude in the shortest possible time.

METEOROLOGICAL TERMINOLOGY

ISA	*International Standard Atmosphere* in which: 1. The air is a dry perfect gas; 2. The temperature at sea level (SL) is 15° C (59° F); 3. The pressure at SL is 29.92 inches of Hg (1013.2 mb); 4. The temperature gradient from SL to an altitude where the temperature is -56.5°C (-69.7°F) is -0.00198°C (-.003564°F) per foot, and zero above that altitude.
Standard Temperature	*Standard Temperature* is 15°C (59ºF) at sea level pressure altitude and decreases 2°C (3.2°F) for each 1000 feet of altitude.
OAT	*Outside Air Temperature* is the free air static temperature obtained either from in-flight 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 Hg (1013.2 mb).
Pressure Altitude (PA)	Altitude measured from standard sea level pressure (29.92 inches of Hg) by a pressure or barometric altimeter. It is the indicated pressure altitude corrected for position and instrument error. In this Handbook, altimeter instrument errors are assumed to be zero.
Station Pressure	Actual atmospheric pressure at field elevation.
Wind	The wind velocities recorded as variables on the charts of this handbook are to be understood as the headwind or tailwind components of the reported winds.

ENGINE POWER & CONTROLS TERMINOLOGY

BHP	*Brake Horsepower* is the power developed by the engine.
EGT Gauge	The *Exhaust Gas Temperature* indicator is the instrument used to identify the lean fuel flow mixtures for various power settings.
MP	*Manifold Pressure* is the pressure measured in the intake system of the engine and is depicted as inches of Hg.
MCP	*Maximum Continuous Power* is the maximum power for abnormal or emergency operations.
Maximum Cruise Power	The maximum power recommended for cruise.
MNOP	*Maximum Normal Operating Power* is the maximum power for all normal operations (except takeoff). This power, in most situations, is the same as Maximum Continuous Power.
Mixture Control	The *Mixture Control* provides a mechanical linkage with the fuel control unit of fuel injection engines, to control the size of the fuel feed aperture, and thus, the air/fuel mixture. It is also a primary means to shut down the engine.
Propeller Control	The lever used to select a propeller speed.

Propeller Governor	The device that regulates the RPM of the engine and propeller by increasing or decreasing the propeller pitch, through a pitch change mechanism in the propeller hub.
RPM	*Revolutions Per Minute* is a measure of engine and/or propeller speed.
Stall Strip	A small triangular strip installed along the leading edge of an airplane wing near the root. The stall strips force the roots of the wing to stall before the tips. The strips allow complete control throughout the stall.
Tachometer	An instrument that indicates propeller rotation and is expressed as revolutions per minute (RPM).
Throttle	The lever used to control engine power, from the lowest through the highest power, by controlling propeller pitch, fuel flow, engine speed, or any combination of these.
Wing Cuff	Specially shaped composite construction on the outboard leading edge of the wing. The cuff increases the camber of the airfoil and improves the slow-flight and stall characteristics of the wing.

AIRPLANE PERFORMANCE & FLIGHT PLANNING TERMINOLOGY

Demonstrated Crosswind Velocity	*Demonstrated Crosswind Velocity* is the velocity of the crosswind component for which adequate control of the airplane can be maintained during takeoff and landing. The value shown is not considered limiting.
G	A unit of acceleration equal to the acceleration of gravity at the surface of the earth. The term is frequently used to quantify additional forces exerted on the airplane and is expressed as multiples of the basic gravitational force, e.g., a 1.7-g force.
GPH	*Gallons Per Hour* is the quantity of fuel consumed in an hour expressed in gallons.
Limit Load Factor	The limit load factor is expressed in multiples of gravity (g) which the airplane can safely withstand. If the limit load factor is exceeded, the airplane may be damaged.
NMPG	*Nautical Miles per Gallon* is the distance (in nautical miles) which can be expected per gallon of fuel consumed at a specific power setting and/or flight configuration.
PPH	*Pounds Per Hour* is the quantity of fuel consumed in an hour expressed in pounds.
Unusable Fuel	*Unusable Fuel* is the amount of fuel expressed in gallons that cannot safely be used in flight. Unusable Fuel is the fuel remaining after a runout test has been completed in accordance with governmental regulations.
Ultimate Load Factor	The ultimate load factor is 1.5 times the limit load factor. If the ultimate load factor is exceeded, the airplane can fail catastrophically.

Usable Fuel	*Usable Fuel* is the quantity available that can safely be used for flight planning purposes.

WEIGHT AND BALANCE

Arm	The *Arm* is the horizontal distance from the reference datum to the center of gravity (C.G.) of an item.
Basic Empty Weight	The *Basic Empty Weight* is the Standard Empty Weight plus optional equipment.
CG	The *Center of Gravity* is the point at which the airplane will balance if suspended. Its distance from the datum is found by dividing the total moment by the total weight of the airplane.
CG Arm	The arm obtained by adding the individual moments of the airplane and dividing the sum by the total weight.
CG Limits	The extreme center of gravity locations within which the airplane must be operated at a given weight.
Maximum Empty Weight	This is the maximum allowable weight of the airplane when empty, before fuel, passengers, and baggage are added. Subtracting the minimum useful load from the maximum gross weight produces the maximum empty weight. The amount of additional equipment that can be added to the airplane is determined by subtracting the standard empty weight from the maximum empty weight. See page 6-16 for an example.
Maximum Gross Weight	The maximum loaded weight of an aircraft. Gross weight includes the total weight of the aircraft, the weight of the fuel and oil, and the weight of all the load it is carrying.
Maximum Landing Weight	The maximum weight approved for landing touchdown.
Maximum Ramp Weight	The maximum weight approved for ground maneuver. (It includes the weight of the fuel used for startup, taxi, and runup.)
Maximum Takeoff Weight	The maximum weight approved for the start of the takeoff run.
Maximum Zero-Fuel Weight	The maximum weight authorized for an aircraft that does not include the weight of the fuel. This weight includes the basic empty weight plus the weight of the passengers and baggage. The maximum zero-fuel weight can change depending on the center of gravity location. See Figure 2 - 4 for an example.
Minimum Flight Weight	This is the minimum weight permitted for flight operations and includes the basic empty weight plus fuel, pilot, passengers, and baggage. The minimum flight weight can change depending on the center of gravity location. See Figure 2 - 4 for an example.
Minimum Useful Load	For utility category airplanes, certified for night or IFR operations, a weight of 190 pounds for each installed seat plus the fuel weight for 45 minutes at maximum continuous power.

Moment	The moment of a lever is the distance, in inches, between the point at which a force is applied and the fulcrum, or the point about which a lever rotates, multiplied by the force, in pounds. Moment is expressed in inch-pounds.
Reference Datum	This is an imaginary vertical plane from which all horizontal distances are measured for balance purposes.
Standard Empty Weight	This is the weight of a standard airplane including unusable fuel, full operating fluids, and full oil.
Station	The *Station* is a location along the airplane's fuselage usually given in terms of distance from the reference datum, i.e., Station 40 would be 40 inches from the reference datum.
Useful Load	The *Useful Load* is the difference between Takeoff Weight or Ramp Weight, if applicable, and Basic Empty Weight.

MISCELLANEOUS

Flight Time-Airplanes	Pilot time that commences when an aircraft moves under its own power for the purpose of flight and ends when the aircraft comes to rest after landing.
Time in Service	Time in service, with respect to maintenance time records, means the time from the moment an aircraft leaves the surface of the earth until it touches it at the next point of landing.

This Page Intentionally Left Blank

SUPPLEMENTS

Equipment, which is not covered in Sections 1 through 8 of the Information Manual, is included in Section 9, as applicable.

USE OF THE TERMS *WARNING*, *CAUTION*, AND *NOTE*

The following conventions will be used for the terms, *Warning*, *Caution*, and *Note*.

WARNING

The use of a Warning symbol means that information which follows is of critical importance and concerns procedures and techniques which could cause or result in personal injury or death if not carefully followed.

CAUTION

The use of a Caution symbol means that information which follows is of significant importance and concerns procedures and techniques which could cause or result in damage to the airplane and/or its equipment if not carefully followed.

NOTE

The use of the term "NOTE" means the information that follows is essential to emphasize.

MEANING OF *SHALL*, *WILL*, *SHOULD*, AND *MAY*

The words *shall* and *will* are used to denote a mandatory requirement. The word *should* denotes something that is recommended but not mandatory. The word *may* is permissive in nature and suggests something that is optional.

MEANING OF *LAND AS SOON AS POSSIBLE* OR *PRACTICABLE*

The use of these two terms relates to the urgency of the situation. When it is suggested to **land as soon as possible**, this means to land at the nearest suitable airfield after considering weather conditions, ambient lighting, approach facilities, and landing requirements. When it is suggested to **land as soon as practicable**, this means that the flight may be continued to an airport with superior facilities, including maintenance support, and weather conditions.

CONVERSION CHARTS

On the following pages are a series of charts and graphs for conversion to and from U.S. weights and measures to metric and imperial equivalents. The charts and graphs are included to help pilots who live in countries other than the United States or pilots from the United States who are traveling to or within other countries.

KILOGRAMS AND POUNDS

CONVERTING KILOGRAMS TO POUNDS										
Kilograms	0	1	2	3	4	5	6	7	8	9
0		2.205	4.409	6.614	8.818	11.023	13.228	15.432	17.637	19.842
10	22.046	24.251	26.455	28.660	30.865	33.069	35.274	37.479	39.683	41.888
20	44.092	46.297	48.502	50.706	52.911	55.116	57.320	59.525	61.729	63.934
30	66.139	68.343	70.548	72.753	74.957	77.162	79.366	81.571	83.776	85.980
40	88.185	90.390	92.594	94.799	97.003	99.208	101.413	103.617	105.822	108.026
50	110.231	112.436	114.640	116.845	119.050	121.254	123.459	125.663	127.868	130.073
60	132.277	134.482	136.687	138.891	141.096	143.300	145.505	147.710	149.914	152.119
70	154.324	156.528	158.733	160.937	163.142	165.347	167.551	169.756	171.961	174.165
80	176.370	178.574	180.779	182.984	185.188	187.393	189.597	191.802	194.007	196.211
90	198.416	200.621	202.825	205.030	207.234	209.439	211.644	213.848	216.053	218.258
100	220.462	222.667	224.871	227.076	229.281	231.485	233.690	235.895	238.099	240.304

Example: Convert 76 kilograms to pounds. Locate the 70 row in the first column and then move right, horizontally to Column No. 6 and read the solution, 167.551 pounds.

Figure 1 - 2

CONVERTING POUNDS TO KILOGRAMS										
Pounds	0	1	2	3	4	5	6	7	8	9
0		0.454	0.907	1.361	1.814	2.268	2.722	3.175	3.629	4.082
10	4.536	4.990	5.443	5.897	6.350	6.804	7.257	7.711	8.165	8.618
20	9.072	9.525	9.979	10.433	10.886	11.340	11.793	12.247	12.701	13.154
30	13.608	14.061	14.515	14.969	15.422	15.876	16.329	16.783	17.236	17.690
40	18.144	18.597	19.051	19.504	19.958	20.412	20.865	21.319	21.772	22.226
50	22.680	23.133	23.587	24.040	24.494	24.948	25.401	25.855	26.308	26.762
60	27.216	27.669	28.123	28.576	29.030	29.483	29.937	30.391	30.844	31.298
70	31.751	32.205	32.659	33.112	33.566	34.019	34.473	34.927	35.380	35.834
80	36.287	36.741	37.195	37.648	38.102	38.555	39.009	39.463	39.916	40.370
90	40.823	41.277	41.730	42.184	42.638	43.091	43.545	43.998	44.452	44.906
100	45.359	45.813	46.266	46.720	47.174	47.627	48.081	48.534	48.988	49.442

Example: Convert 40 pounds to kilograms. Locate the 40 row in the first column and then move right one column to Column No. 0 and read the solution, 18.144 kilograms.

Figure 1 - 3

FEET AND METERS

CONVERTING METERS TO FEET										
Meters	0	1	2	3	4	5	6	7	8	9
0		3.281	6.562	9.843	13.123	16.404	19.685	22.966	26.247	29.528
10	32.808	36.089	39.370	42.651	45.932	49.213	52.493	55.774	59.055	62.336
20	65.617	68.898	72.178	75.459	78.740	82.021	85.302	88.583	91.864	95.144
30	98.425	101.706	104.987	108.268	111.549	114.829	118.110	121.391	124.672	127.953
40	131.234	134.514	137.795	141.076	144.357	147.638	150.919	154.199	157.480	160.761
50	164.042	167.323	170.604	173.885	177.165	180.446	183.727	187.008	190.289	193.570
60	196.850	200.131	203.412	206.693	209.974	213.255	216.535	219.816	223.097	226.378
70	229.659	232.940	236.220	239.501	242.782	246.063	249.344	252.625	255.906	259.186
80	262.467	265.748	269.029	272.310	275.591	278.871	282.152	285.433	288.714	291.995
90	295.276	298.556	301.837	305.118	308.399	311.680	314.961	318.241	321.522	324.803
100	328.084	331.365	334.646	337.927	341.207	344.488	347.769	351.050	354.331	357.612
Example: Refer to Figure 1-2 and Figure 1-3 for examples of how to use these types of tables.										

Figure 1 - 4

CONVERTING FEET TO METERS										
Feet	0	1	2	3	4	5	6	7	8	9
0		0.305	0.610	0.914	1.219	1.524	1.829	2.134	2.438	2.743
10	3.048	3.353	3.658	3.962	4.267	4.572	4.877	5.182	5.486	5.791
20	6.096	6.401	6.706	7.010	7.315	7.620	7.925	8.230	8.534	8.839
30	9.144	9.449	9.754	10.058	10.363	10.668	10.973	11.278	11.582	11.887
40	12.192	12.497	12.802	13.106	13.411	13.716	14.021	14.326	14.630	14.935
50	15.240	15.545	15.850	16.154	16.459	16.764	17.069	17.374	17.678	17.983
60	18.288	18.593	18.898	19.202	19.507	19.812	20.117	20.422	20.726	21.031
70	21.336	21.641	21.946	22.250	22.555	22.860	23.165	23.470	23.774	24.079
80	24.384	24.689	24.994	25.298	25.603	25.908	26.213	26.518	26.822	27.127
90	27.432	27.737	28.042	28.346	28.651	28.956	29.261	29.566	29.870	30.175
100	30.480	30.785	31.090	31.394	31.699	32.004	32.309	32.614	32.918	33.223
Example: Refer to Figure 1-2 and Figure 1-3 for examples of how to use these types of tables.										

Figure 1 - 5

INCHES AND CENTIMETERS

CONVERTING CENTIMETERS TO INCHES										
Centimeters	0	1	2	3	4	5	6	7	8	9
0		0.394	0.787	1.181	1.575	1.969	2.362	2.756	3.150	3.543
10	3.937	4.331	4.724	5.118	5.512	5.906	6.299	6.693	7.087	7.480
20	7.874	8.268	8.661	9.055	9.449	9.843	10.236	10.630	11.024	11.417
30	11.811	12.205	12.598	12.992	13.386	13.780	14.173	14.567	14.961	15.354
40	15.748	16.142	16.535	16.929	17.323	17.717	18.110	18.504	18.898	19.291
50	19.685	20.079	20.472	20.866	21.260	21.654	22.047	22.441	22.835	23.228
60	23.622	24.016	24.409	24.803	25.197	25.591	25.984	26.378	26.772	27.165
70	27.559	27.953	28.346	28.740	29.134	29.528	29.921	30.315	30.709	31.102
80	31.496	31.890	32.283	32.677	33.071	33.465	33.858	34.252	34.646	35.039
90	35.433	35.827	36.220	36.614	37.008	37.402	37.795	38.189	38.583	38.976
100	39.370	39.764	40.157	40.551	40.945	41.339	41.732	42.126	42.520	42.913
Example: Refer to Figure 1-2 and Figure 1-3 for examples of how to use these types of tables.										

Figure 1 - 6

CONVERTING INCHES TO CENTIMETERS										
Inches	0	1	2	3	4	5	6	7	8	9
0		2.54	5.08	7.62	10.16	12.70	15.24	17.78	20.32	22.86
10	25.40	27.94	30.48	33.02	35.56	38.10	40.64	43.18	45.72	48.26
20	50.80	53.34	55.88	58.42	60.96	63.50	66.04	68.58	71.12	73.66
30	76.20	78.74	81.28	83.82	86.36	88.90	91.44	93.98	96.52	99.06
40	101.60	104.14	106.68	109.22	111.76	114.30	116.84	119.38	121.92	124.46
50	127.00	129.54	132.08	134.62	137.16	139.70	142.24	144.78	147.32	149.86
60	152.40	154.94	157.48	160.02	162.56	165.10	167.64	170.18	172.72	175.26
70	177.80	180.34	182.88	185.42	187.96	190.50	193.04	195.58	198.12	200.66
80	203.20	205.74	208.28	210.82	213.36	215.90	218.44	220.98	223.52	226.06
90	228.60	231.14	233.68	236.22	238.76	241.30	243.84	246.38	248.92	251.46
100	254.00	256.54	259.08	261.62	264.16	266.70	269.24	271.78	274.32	276.86
Example: Refer to Figure 1-2 and Figure 1-3 for examples of how to use these types of tables.										

Figure 1 - 7

NAUTICAL MILES, STATUTE MILES, AND KILOMETERS

Nautical Miles	Statute Miles	Kilo-meters	Nautical Miles	Statute Miles	Kilo-meters	Nautical Miles	Statute Miles	Kilo-meters
5	6	9	175	202	324	345	397	639
10	12	19	180	207	333	350	403	648
15	17	28	185	213	343	355	409	657
20	23	37	190	219	352	360	415	667
25	29	46	195	225	361	365	420	676
30	35	56	200	230	370	370	426	685
35	40	65	205	236	380	375	432	695
40	46	74	210	242	389	380	438	704
45	52	83	215	248	398	385	443	713
50	58	93	220	253	407	390	449	722
55	63	102	225	259	417	395	455	732
60	69	111	230	265	426	400	461	741
65	75	120	235	271	435	405	466	750
70	81	130	240	276	444	410	472	759
75	86	139	245	282	454	415	478	769
80	92	148	250	288	463	420	484	778
85	98	157	255	294	472	425	489	787
90	104	167	260	299	482	430	495	796
95	109	176	265	305	491	435	501	806
100	115	185	270	311	500	440	507	815
105	121	194	275	317	509	445	512	824
110	127	204	280	322	519	450	518	833
115	132	213	285	328	528	455	524	843
120	138	222	290	334	537	460	530	852
125	144	232	295	340	546	465	535	861
130	150	241	300	345	556	470	541	870
135	155	250	305	351	565	475	547	880
140	161	259	310	357	574	480	553	889
145	167	269	315	363	583	485	559	898
150	173	278	320	369	593	490	564	907
155	178	287	325	374	602	495	570	917
160	184	296	330	380	611	500	576	926
165	190	306	335	386	620	505	582	935
170	196	315	340	392	630	510	587	945

Figure 1 - 8

LITERS, IMPERIAL GALLONS, AND U.S. GALLONS

CONVERTING LITERS TO IMPERIAL GALLONS										
Liters	0	1	2	3	4	5	6	7	8	9
0		0.22	0.44	0.66	0.88	1.10	1.32	1.54	1.76	1.98
10	2.20	2.42	2.64	2.86	3.08	3.30	3.52	3.74	3.96	4.18
20	4.40	4.62	4.84	5.06	5.28	5.50	5.72	5.94	6.16	6.38
30	6.60	6.82	7.04	7.26	7.48	7.70	7.92	8.14	8.36	8.58
40	8.80	9.02	9.24	9.46	9.68	9.90	10.12	10.34	10.56	10.78
50	11.00	11.22	11.44	11.66	11.88	12.10	12.32	12.54	12.76	12.98
60	13.20	13.42	13.64	13.86	14.08	14.30	14.52	14.74	14.96	15.18
70	15.40	15.62	15.84	16.06	16.28	16.50	16.72	16.94	17.16	17.38
80	17.60	17.82	18.04	18.26	18.48	18.70	18.92	19.14	19.36	19.58
90	19.80	20.02	20.24	20.46	20.68	20.90	21.12	21.34	21.56	21.78
100	22.00	22.22	22.44	22.66	22.88	23.10	23.32	23.54	23.76	23.98
Example: Refer to Figure 1-2 and Figure 1-3 for examples of how to use these types of tables.										

Figure 1 - 9

CONVERTING IMPERIAL GALLONS TO LITERS										
Imperial Gallons	0	1	2	3	4	5	6	7	8	9
0	0.00	4.55	9.09	13.64	18.18	22.73	27.28	31.82	36.37	40.91
10	45.46	50.01	54.55	59.10	63.64	68.19	72.74	77.28	81.83	86.37
20	90.92	95.47	100.01	104.56	109.10	113.65	118.20	122.74	127.29	131.83
30	136.38	140.93	145.47	150.02	154.56	159.11	163.66	168.20	172.75	177.29
40	181.84	186.39	190.93	195.48	200.02	204.57	209.12	213.66	218.21	222.75
50	227.30	231.85	236.39	240.94	245.48	250.03	254.58	259.12	263.67	268.21
60	272.76	277.31	281.85	286.40	290.94	295.49	300.04	304.58	309.13	313.67
70	318.22	322.77	327.31	331.86	336.40	340.95	345.50	350.04	354.59	359.13
80	363.68	368.23	372.77	377.32	381.86	386.41	390.96	395.50	400.05	404.59
90	409.14	413.69	418.23	422.78	427.32	431.87	436.42	440.96	445.51	450.05
100	454.60	459.15	463.69	468.24	472.78	477.33	481.88	486.42	490.97	495.51
Example: Refer to Figure 1-2 and Figure 1-3 for examples of how to use these types of tables.										

Figure 1 - 10

LITERS, IMPERIAL GALLONS, AND U.S. GALLONS (Continued)

CONVERTING LITERS TO U.S. GALLONS										
Liters	0	1	2	3	4	5	6	7	8	9
0	0.00	0.26	0.53	0.79	1.06	1.32	1.59	1.85	2.11	2.38
10	2.64	2.91	3.17	3.43	3.70	3.96	4.23	4.49	4.76	5.02
20	5.28	5.55	5.81	6.08	6.34	6.60	6.87	7.13	7.40	7.66
30	7.93	8.19	8.45	8.72	8.98	9.25	9.51	9.77	10.04	10.30
40	10.57	10.83	11.10	11.36	11.62	11.89	12.15	12.42	12.68	12.94
50	13.21	13.47	13.74	14.00	14.27	14.53	14.79	15.06	15.32	15.59
60	15.85	16.11	16.38	16.64	16.91	17.17	17.44	17.70	17.96	18.23
70	18.49	18.76	19.02	19.28	19.55	19.81	20.08	20.34	20.61	20.87
80	21.13	21.40	21.66	21.93	22.19	22.45	22.72	22.98	23.25	23.51
90	23.78	24.04	24.30	24.57	24.83	25.10	25.36	25.62	25.89	26.15
100	26.42	26.68	26.95	27.21	27.47	27.74	28.00	28.27	28.53	28.79
Example: Refer to Figure 1-2 and Figure 1-3 for examples of how to use these types of tables.										

Figure 1 - 11

CONVERTING U.S. GALLONS TO LITERS										
U.S. Gallons	0	1	2	3	4	5	6	7	8	9
0	0.00	3.79	7.57	11.36	15.14	18.93	22.71	26.50	30.28	34.07
10	37.85	41.64	45.42	49.21	52.99	56.78	60.56	64.35	68.13	71.92
20	75.70	79.49	83.27	87.06	90.84	94.63	98.41	102.20	105.98	109.77
30	113.55	117.34	121.12	124.91	128.69	132.48	136.26	140.05	143.83	147.62
40	151.40	155.19	158.97	162.76	166.54	170.33	174.11	177.90	181.68	185.47
50	189.25	193.04	196.82	200.61	204.39	208.18	211.96	215.75	219.53	223.32
60	227.10	230.89	234.67	238.46	242.24	246.03	249.81	253.60	257.38	261.17
70	264.95	268.74	272.52	276.31	280.09	283.88	287.66	291.45	295.23	299.02
80	302.80	306.59	310.37	314.16	317.94	321.73	325.51	329.30	333.08	336.87
90	340.65	344.44	348.22	352.01	355.79	359.58	363.36	367.15	370.93	374.72
100	378.50	382.29	386.07	389.86	393.64	397.43	401.21	405.00	408.78	412.57
Example: Refer to Figure 1-2 and Figure 1-3 for examples of how to use these types of tables.										

Figure 1 - 12

LITERS, IMPERIAL GALLONS, AND U.S. GALLONS (Continued)

CONVERTING IMPERIAL GALLONS TO U.S. GALLONS										
Imperial Gallons	0	1	2	3	4	5	6	7	8	9
0	0.00	1.20	2.40	3.60	4.80	6.01	7.21	8.41	9.61	10.81
10	12.01	13.21	14.41	15.61	16.81	18.02	19.22	20.42	21.62	22.82
20	24.02	25.22	26.42	27.62	28.82	30.03	31.23	32.43	33.63	34.83
30	36.03	37.23	38.43	39.63	40.83	42.04	43.24	44.44	45.64	46.84
40	48.04	49.24	50.44	51.64	52.84	54.05	55.25	56.45	57.65	58.85
50	60.05	61.25	62.45	63.65	64.85	66.06	67.26	68.46	69.66	70.86
60	72.06	73.26	74.46	75.66	76.86	78.07	79.27	80.47	81.67	82.87
70	84.07	85.27	86.47	87.67	88.87	90.08	91.28	92.48	93.68	94.88
80	96.08	97.28	98.48	99.68	100.88	102.09	103.29	104.49	105.69	106.89
90	108.09	109.29	110.49	111.69	112.89	114.10	115.30	116.50	117.70	118.90
100	120.10	121.30	122.50	123.70	124.90	126.11	127.31	128.51	129.71	130.91

Example: Refer to Figure 1-2 and Figure 1-3 for examples of how to use these types of tables.

Figure 1 - 13

CONVERTING U.S. GALLONS TO IMPERIAL GALLONS										
U.S. Gallons	0	1	2	3	4	5	6	7	8	9
0	0.00	0.83	1.67	2.50	3.33	4.16	5.00	5.83	6.66	7.49
10	8.33	9.16	9.99	10.82	11.66	12.49	13.32	14.16	14.99	15.82
20	16.65	17.49	18.32	19.15	19.98	20.82	21.65	22.48	23.32	24.15
30	24.98	25.81	26.65	27.48	28.31	29.14	29.98	30.81	31.64	32.47
40	33.31	34.14	34.97	35.81	36.64	37.47	38.30	39.14	39.97	40.80
50	41.63	42.47	43.30	44.13	44.96	45.80	46.63	47.46	48.30	49.13
60	49.96	50.79	51.63	52.46	53.29	54.12	54.96	55.79	56.62	57.45
70	58.29	59.12	59.95	60.79	61.62	62.45	63.28	64.12	64.95	65.78
80	66.61	67.45	68.28	69.11	69.95	70.78	71.61	72.44	73.28	74.11
90	74.94	75.77	76.61	77.44	78.27	79.10	79.94	80.77	81.60	82.44
100	83.27	84.10	84.93	85.77	86.60	87.43	88.26	89.10	89.93	90.76

Example: Refer to Figure 1-2 and Figure 1-3 for examples of how to use these types of tables.

Figure 1 - 14

TEMPERATURE RELATIONSHIPS (FAHRENHEIT AND CELSIUS)

Fahrenheit	Celsius	Fahrenheit	Celsius	Fahrenheit	Celsius
-40F	-40C	145F	63C	330F	166C
-35F	-37C	150F	66C	335F	168C
-30F	-34C	155F	68C	340F	171C
-25F	-32C	160F	71C	345F	174C
-20F	-29C	165F	74C	350F	177C
-15F	-26C	170F	77C	355F	179C
-10F	-23C	175F	79C	360F	182C
-5F	-21C	180F	82C	365F	185C
0F	-18C	185F	85C	370F	188C
5F	-15C	190F	88C	375F	191C
10F	-12C	195F	91C	380F	193C
15F	-9C	200F	93C	385F	196C
20F	-7C	205F	96C	390F	199C
25F	-4C	210F	99C	395F	202C
30F	-1C	215F	102C	400F	204C
35F	2C	220F	104C	405F	207C
40F	4C	225F	107C	410F	210C
45F	7C	230F	110C	415F	213C
50F	10C	235F	113C	420F	216C
55F	13C	240F	116C	425F	218C
60F	16C	245F	118C	430F	221C
65F	18C	250F	121C	435F	224C
70F	21C	255F	124C	440F	227C
75F	24C	260F	127C	445F	229C
80F	27C	265F	129C	450F	232C
85F	29C	270F	132C	455F	235C
90F	32C	275F	135C	460F	238C
95F	35C	280F	138C	465F	241C
100F	38C	285F	141C	470F	243C
105F	41C	290F	143C	475F	246C
110F	43C	295F	146C	480F	249C
115F	46C	300F	149C	485F	252C
120F	49C	305F	152C	490F	254C
125F	52C	310F	154C	495F	257C
130F	54C	315F	157C	500F	260C
135F	57C	320F	160C	505F	263C
140F	60C	325F	163C	510F	266C

Figure 1 - 15

FUEL WEIGHTS AND CONVERSION RELATIONSHIPS

The table below summarizes the weights and conversion relationships for liters, U.S. Gallons, and Imperial Gallons. The chart values are only to two decimal places. The table is intended to provide approximate values for converting from one particular quantity of measurement to another.

Quantity	Weight		Converting To U.S. Gallons	Converting To Imperial Gallons	Converting To Liters
	Kg.	Lbs.			
Liters	0.72	1.58	26% of the liter quantity	22% of the liter quantity	
Imperial Gallons	3.72	7.2	1.2 times the number of Imperial Gallons		4.55 times the number of Imperial Gallons
U.S. Gallons	2.72	6.0		83% of the U.S. Gallon quantity	3.78 times the number of U.S. Gallons

Figure 1 - 16

ATMOSPHERIC PRESSURE RELATIONSHIPS (IN. HG AND HECTOPASCAL)

Pressure							
In. Hg	hPa	In. Hg	hPa	In. Hg	hPa	In. Hg	hPa
27.70	938	28.70	972	29.70	1006	30.65	1038
27.75	940	28.75	974	29.75	1007	30.70	1040
27.80	941	28.80	975	29.80	1009	30.75	1041
27.85	943	28.85	977	29.85	1011	30.80	1043
27.90	945	28.90	979	29.90	1013	30.85	1045
27.95	946	28.95	980	29.92	1013	30.90	1046
28.00	948	29.00	982	29.95	1014	30.95	1048
28.05	950	29.05	984	30.00	1016	31.00	1050
28.10	952	29.10	985	30.05	1018	31.05	1051
28.15	953	29.15	987	30.10	1019	31.10	1053
28.20	955	29.20	989	30.15	1021	31.15	1055
28.25	957	29.25	991	30.20	1023	31.20	1057
28.30	958	29.30	992	30.25	1024	31.25	1058
28.35	960	29.35	994	30.30	1026	31.30	1060
28.40	962	29.40	996	30.35	1028	31.35	1062
28.45	963	29.45	997	30.40	1029	31.40	1063
28.50	965	29.50	999	30.45	1031	31.45	1065
28.55	967	29.55	1001	30.50	1033	31.50	1067
28.60	969	29.60	1002	30.55	1035	31.55	1068
28.65	970	29.65	1004	30.60	1036	31.60	1070

Figure 1 - 17

Section 2
Limitations

TABLE OF CONTENTS

This Page Intentionally Left Blank

Section 2
Limitations

INTRODUCTION

Section 2 contains the operating limitations of this airplane. The Federal Aviation Agency approves the limitations included in this Section. These include operating limitations, instrument markings, and basic placards necessary for the safe operation of the airplane, the airplane's engine, the airplane's standard systems, and the airplane's standard equipment.

NOTE

This section covers limitations associated with the standard systems and equipment in the airplane. Refer to Section 9 for amended operating procedures, limitations, and related performance data for equipment installed via an STC.

LIMITATIONS

AIRSPEED LIMITATIONS

The airspeed limitations below are based on the maximum gross takeoff weight of 3400 lbs (1542 kg). The maximum operating maneuvering speeds (V_O) and applicable gross weight limitations are shown in Figure 2 - 1.

	SPEED	KCAS	KIAS	REMARKS
V_O	Max. Operating Maneuvering Speed 2500 Pounds Gross Weight 3400 Pounds Gross Weight	 128 149	 127 148	Do not apply full or abrupt control movements above this speed.
V_{FE}	Maximum Flap Extended Speed (Down or 40^O Flap Setting)	120	119	Do not exceed this speed with full flaps. Takeoff flaps can be extended at 130 KCAS (129 KIAS).
V_{NO}	Max. Structural Cruising Speed *Decrease 4 knots for each 1000-ft above 12,000 feet (Press. Alt.)	180*	179*	Do not exceed this speed except in smooth air and then only with caution.
V_{NE}	Never Exceed Speed *Decrease 5 knots for each 1000-ft above 12,000 feet (Press. Alt.)	235*	235*	Do not exceed this speed in any operation.

Figure 2 - 1

AIRSPEED INDICATOR MARKINGS

The airspeed is shown on both the PFD and backup airspeed indicator. The airspeed on the PFD is indicated with an airspeed tape and colored bands (see discussion in Section 7). The outer circumference of the backup airspeed indicator has four colored arcs. The meaning and range of each arc is tabulated in Figure 2 - 2.

MARKING	KIAS VALUE OR RANGE	SIGNIFICANCE
White Arc	57 - 119	Full Flap Operating Range - Lower limit is maximum weight stalling speed in the landing configuration. Upper limit is maximum speed permissible with flaps extended.
Green Arc	71 - 179	Normal Operating Range - Lower limit is maximum weight stalling speed with flaps retracted. Upper limit is maximum structural cruising speed.
Yellow Arc	179 – 235	Operations must be conducted with caution and only in smooth air.
Red Line	235	Maximum speed for all operations

Figure 2 - 2

POWERPLANT LIMITATIONS

Number of Engines: One (1)
Engine Manufacturer: Teledyne Continental
Engine Model Number: IO-550-N
Recommended Time Between Overhaul: 2000 Hours (Time in Service)
Maximum Power: 310 BHP at 2700 RPM
Maximum Manifold Pressure: Full power at sea level
Maximum Recommended Cruise: 248 BHP (80%)
Maximum Cylinder Head Temperature: 460°F (238°C)

POWERPLANT FUEL AND OIL DATA

Oil Grades Recommended for Various Average Air Temperature Ranges

Below 40°F (4°C) — SAE 30, 10W30, 15W50, or 20W50
Above 40°F (4°C) — SAE 50, 15W50, 20W/50, or 20W60

Oil Temperature

Maximum Allowable: 240ºF (116°C)
Recommended takeoff minimum: 100°F (38°C)
Recommended flight operations: 170°F to 200°F (77°C to 93°C)

Oil Pressures

Normal Operations: 30-60 psi (pounds per square inch)
Idle, minimum: 10 psi
Maximum allowable (cold oil): 100 psi

Approved Fuel Grades

100LL Grade Aviation Fuel (Blue)
100 Grade Aviation Fuel (Green)

Fuel Flow and Fuel Pressure

Normal Operations: 10 to 22 GPH (38 to 83 LPH) (7 to 16 psi)
Idle, minimum: 1 to 2 GPH (3.8 to 7.6 LPH) (4 psi)
Maximum allowable: 28 GPH (106 LPH) (22 psi)

ALTERNATOR OUTPUT LIMITATIONS

At altitude above 12,000 ft., with high angle of attack, and low airspeeds the alternator outputs are limited as shown below.

Left, belt driven alternator:
Kelly Aerospace alternator: 65 amp
Plane Power alternator: 70 amp
Right, gear driven alternator: 52 amp

POWERPLANT GAUGE MARKINGS

The following table, Figure 2 - 3, shows applicable color-coded ranges for the various powerplant gauges displayed on the MFD.

Green Arc – Normal operating range.

Red Line or Arc – Operation within the red line or arc is prohibited by the engine manufacturer.

Yellow Arc –Operation within the yellow arc is permitted for a limited time during normal operations such as at idle, warm-up, and take-off. Also indicates precautionary zones where operation should be minimized by pilot action.

White Arc – Operation within the white arc is permitted, take-off RPM for example. Extended operation in the white arc may reduce the engine's ability to reach Time Between Overhaul (TBO).

GAUGE	RED LINE Minimum Limit	YELLOW/ WHITE ARC	GREEN ARC Normal Operating	YELLOW/ WHITE ARC	RED LINE Limit
Tachometer	Minimum for idle 600 RPM		2000 – 2500 RPM	2500 – 2700 RPM	2700 – 3000 RPM
Manifold Pressure			10 – 30 Inches Hg		
Oil Temperature		100ºF – 170ºF (38°C – 77°C)	170ºF – 220ºF (77°C – 104°C)	220ºF – 240ºF (104°C – 116°C)	240ºF – 250ºF (116°C – 121°C)
Oil Pressure	Minimum for idle 10 psi	10 - 30 psi	30 - 60 psi		100 psi (Cold Oil)
Fuel Quantity	A red line at "zero" indicates the remaining four gallons (S/N 42502 to 42567), or two gallons (S/N 42568 and on), in each tank cannot be used safely in flight.				
Fuel Flow			10 – 22 GPH (38 – 83 LPH)		28 GPH (106 LPH)
Cylinder Head Temperature		100ºF – 240ºF (38°C – 116°C)	240ºF – 420ºF (116°C – 216°C)	420ºF – 460ºF (216°C – 238°C)	460ºF – 500ºF (238°C – 260°C)

Figure 2 - 3

PROPELLER DATA AND LIMITATIONS

Number of Propellers: 1
Propeller Manufacturer: Hartzell Propeller, Inc.
Hartzell Propeller Hub and Blade Model Numbers: PHC-J3YF-1RF and F7691D-1

Propeller Diameters

Minimum: 76 in. (193 cm)
Maximum: 77 in. (196 cm)

Propeller Blade Angle at 30 inch Station

Low: 14.1° ± 0.2º
High: 34.7° ± 1.0º

POWER SETTING LIMITATIONS

Do not exceed 20 inches of Hg of manifold pressure below 2200 RPM. This requirement is not an engine limitation, but rather a propeller harmonic condition inherent in the Cessna 350 (LC42-550FG).

WEIGHT LIMITS Utility Category

Maximum Ramp Weight:	3400 lbs. (1542 kg)
Maximum Empty Weight:	2568 lbs. (1165 kg)
Maximum Takeoff Weight:	3400 lbs. (1542 kg)
Maximum Landing Weight:	3230 lbs. (1465 kg)
Maximum Baggage Weight:*	120 lbs. (54.4 kg)

*The baggage compartment has two areas, the main area and the hat rack area. The combined weight in these areas cannot exceed 120 pounds (54.4 kg). The main area is centered at station 166.6 with maximum weight allowance of 120 pounds (54.4 kg). The hat rack area, which is centered at station 199.8, has a maximum weight allowance of 20 pounds (9.1 kg). When loading baggage in the main baggage compartment, Zone A (the forward portion of the main baggage area) must always be loaded first. See page 6-13 for a table of loading stations and baggage zones.

OTHER WEIGHT LIMITATIONS

TYPE OF WEIGHT LIMITATION	FORWARD DATUM POINT AND WEIGHT	AFT DATUM POINT AND WEIGHT	VARIATION
Minimum Flying Weight	103 inches and 2240 lbs.	110 inches and 2500 lbs.	Straight Line
Maximum Zero Fuel Weight	103 inches and 2725 lbs.	110 inches and 3228 lbs.	Straight Line
Reference Datum: The reference datum is located near the tip of the propeller spinner. As distance from the datum increases, there is an increase in weight for each of the two limitation categories. The variation is linear or straight line from the fore to the aft positions.			

Figure 2 - 4

CENTER OF GRAVITY LIMITS

Figure 2 - 5 specifies the center of gravity limits for utility category operations. The variation along the arm between the forward and aft datum points is linear or straight line. The straight-line variation means that at any given point along the arm, an increase in moments changes directly according to the variations in weight and distance from the datum.

CENTER OF GRAVITY TABLE

CATEGORY	FORWARD DATUM POINT AND WEIGHT	AFT DATUM POINT AND WEIGHT	VARIATION
Utility Category	103 inches – 2240 to 2500 lbs. 107 inches – 3400 lbs.	110 inches 2500 to 3400 lbs.	Straight Line
Reference Datum: The reference datum is located at the tip of the propeller spinner. This location causes all arm distances and moments (the product of arm and weight) to be positive values.			

Figure 2 - 5

MANEUVER LIMITS

Utility Category – This airplane is certified in the utility category. Only the acrobatic maneuvers shown in Figure 2 - 6 are approved.

APPROVED ACROBATIC MANEUVERS

MANEUVER	ENTRY SPEED
Chandelles	150 KIAS
Lazy Eights	150 KIAS
Steep Turns	150 KIAS
Stalls	Slow Deceleration*
* Ensure that maximum fuel imbalance does not exceed 10 gallons (38 L).	
SPINS PROHIBITED	

Figure 2 - 6

While there are no limitations to the performance of the acrobatic maneuvers listed in Figure 2 - 6, it is important to remember that the airplane accelerates quite rapidly in a nose down attitude, such as when performing a lazy eight.

SPINS

The airplane, as certified by the Federal Aviation Agency, is not approved for spins of any duration. During the flight test phase of the airplane's certification, spins and/or spin recovery techniques were not performed or demonstrated. It is not known if the airplane will recover from a spin.

WARNING

Do not attempt to spin the airplane under any circumstances. The airplane, as certified by the Federal Aviation Agency, is not approved for spins of any duration. During the flight test phase of the airplane's certification, spins were not performed. It is not known if the airplane will recover from a spin.

FLIGHT LOAD FACTOR LIMITS

Utility Category - Maximum flight load factors for all weights are:

Flaps Position	Max. Load Factor
Up (Cruise Position)	+4.4g and -1.76g
Down (Landing Position)	+2.0g and -0.0g

KINDS OF OPERATION LIMITS AND PILOT REQUIREMENTS

The airplane has the necessary equipment available and is certified for daytime and nighttime VFR and IFR operations with only one pilot. The operational minimum equipment and instrumentation for the kinds of operation are detailed in Part 91 of the FARs.

ICING CONDITIONS

Flight into known icing is prohibited.

FUEL LIMITATIONS

Total Capacity: 106 US Gallons (401 L)
Total Capacity Each tank: 53 US Gallons (201 L)
Maximum Fuel Imbalance: 10 gallons US (38 L) between left and right fuel tanks
Total Usable Fuel
- S/N 42502 to 42567
  - 49 Gallons US (186 L)/Tank, 98 Gallons US (371 L) Total
- S/N 42568 and on
  - Standard: 43 Gallons US (163 L)/Tank, 86 Gallons US (326 L) Total
  - Long Range: 51 Gallons US (193 L)/Tank, 102 Gallons US (386 L) Total

GARMIN G1000 SYSTEM LIMITATIONS

1. The G1000 must utilize the following or later FAA approved software versions:

Sub-System	Software Version
PFD	6.13
MFD	6.13
COM	7.00
GCU	2.01
GDC	2.05
GMA	2.11
GDL	3.02.00
GMU	2.01
GIA	4.50
GEA	2.07
GPS	3.03
GRS	2.06
GSA	2.09
GTA	2.01

   The database version is displayed on the MFD power-up page immediately after system power-up and must be acknowledged. The remaining system software versions can be verified on the AUX group sub-page 5, “AUX - SYSTEM STATUS”.

2. IFR enroute, oceanic and terminal navigation predicated upon the G1000 GPS Receiver is prohibited unless the pilot verifies the currency of the database or verifies each selected waypoint for accuracy by reference to current approved navigation data.

3. Instrument approach navigation predicated upon the G1000 GPS Receiver must be accomplished in accordance with approved instrument approach procedures that are retrieved from the GPS equipment database. The GPS equipment database must incorporate the current update cycle or be verified for accuracy using current approved navigation data.
   a. Instrument approaches utilizing the GPS receiver must be conducted in the approach mode and Receiver Autonomous Integrity Monitoring (RAIM) must be available at the Final Approach Fix.
   b. Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, MLS or any other type of approach not approved for GPS overlay using GPS for lateral guidance on the final approach segment is not authorized..
   c. Use of the G1000 VOR/ILS receiver to fly approaches not approved for GPS require VOR/ILS navigation data to be valid on the PFD display.
   d. When an alternate airport is required by the applicable operating rules, it must be served by an approach based on other than GPS navigation, the aircraft must have the operational equipment capable of using that navigation aid, and the required navigation aid must be operational.
   e. VNAV information may be utilized for advisory information only. Use of VNAV information for Instrument Approach Procedures does not guarantee step-down fix altitude protection, or arrival at approach minimums in normal position to land. VNAV also does not guarantee compliance with intermediate altitude constraints between the top of descent and the waypoint where the VNAV path terminates in terminal or enroute operations.
4. If not previously defined, the following default settings must be made in the “SYSTEM SETUP” menu of the G1000 prior to operation (refer to Pilot's Cockpit Reference Guide for procedure if necessary):
   a. **DIS, SPD** nm kt (sets navigation units to “nautical miles” and “knots”)
   b. **ALT, VS** ft fpm (sets altitude units to “feet” and “feet per minute”)
   c. **MAP DATUM** WGS 84 (sets map datum to WGS-84, see note below)
   d. **POSITION** deg-min (sets navigation grid units to decimal minutes)
   example: dd.mm.ss: 45° 30’ 30” in decimal minutes are: 45° 30.5’

NOTE

In some areas outside the United States, datums other than WGS-84 or NAD-83 may be used. If the G1000 is authorized for use by the appropriate Airworthiness authority, the required geodetic datum must be set in the G1000 prior to its use for navigation.

5. Operation is prohibited north of 70°N and south of 70°S latitudes. In addition, operation is prohibited in the following two regions: 1) north of 65°N between 75°W and 120°W longitude and 2) south of 55°S between 120°E and 165°E longitude.
6. The GFC 700 Automatic Flight Control System preflight test must be successfully completed prior to use of the autopilot or flight director. A white “PFT” annunciation will display for 2 to 3 seconds and clear upon successful completion of the test. An unsuccessful test will display a red “PFT” annunciation that will not automatically clear.
7. A pilot with the seat belt fastened must occupy the left pilot’s seat during all autopilot operations.
8. The autopilot must be off during takeoff and landing. The autopilot must be disengaged below 200’ AGL during approach operations and minimum engagement height on takeoff is 400’ AGL. Cruise engagement minimum height is 1000’ AGL.

9. Autopilot operation with the G1000 in the reversionary (Display Backup) mode is limited to training operations and display failure operations.
10. Autopilot maximum engagement speed – 200 KIAS
    Autopilot minimum engagement speed – 80 KIAS
    Electric Trim maximum operating speed – V_{NE} KIAS
11. Maximum fuel imbalance with autopilot engaged – 10 gallons (approximately 61 pounds)
12. Flight Plan: This limitation is applicable to all G1000 systems with GDU software version prior to v8.02. View the System Status Page to verify the GDU software version.

WARNING

Do not load a new arrival or departure procedure in the flight plan if one currently exists without first removing the existing arrival or departure procedure. Failing to observe this limitation can cause erroneous course deviation indications, loss of GPS navigation information, and other display anomalies.

Note: If display anomalies are noted after editing the flight plan, perform either a direct to or activate leg operation as appropriate on the flight plan to ensure correct flight plan sequencing and guidance.

Approach Operation Limitations:

1. The GFC 700 autopilot is approved for Category I precision instrument approaches and non-precision approaches only.

CAUTION

CDI automatic source switching to the ILS on Nav 1 or 2 must be set to manual for instrument approaches conducted with the autopilot coupled. Upon selection of Nav 1 or 2, APR mode or NAV mode will have to be reselected for capture. If the CDI source is changed when the autopilot is engaged in NAV mode, the autopilot lateral mode will revert to roll attitude hold mode (ROL) and NAV mode must be manually reselected by the pilot.

This caution on automatic switching is the result of potential shifting of the GPS "localizer" vs. the actual ILS localizer position. This generally is not an issue, but there is a slight possibility that an offset between the two could cause a problem with the automatic switching which would not successfully capture the localizer.

SafeTaxi Limitations

SafeTaxi displays of airport surface areas are supplementary and may not be used as primary reference for aircraft ground operations.

Wide Area Augmentation System (WAAS) Limitations

1. The aircraft must have operational ground-based navigation equipment on board.
2. Flight planning to an alternate airport cannot be based on satnav approaches, it must be based on an available approach from a ground-based navaid.
    - If the equipment indicates that satnav service is available after the aircraft gets to the alternate airport, it is permissible to fly a satnav approach.

GTX 33 MODE S TRANSPONDER LIMITATIONS

NOTE
If the optional Ryan TCAD is installed, TIS will not be available.

1. Display of TIS traffic information is advisory only and does not relieve the pilot responsibility to "see and avoid" other aircraft. Aircraft maneuvers shall not be predicated on the TIS displayed information.
2. Display of TIS traffic information does not constitute a TCAS I or TCAS II collision avoidance system as required by 14 CFR Part 135.
3. Title 14 of the Code of Federal Regulations (14 CFR) states that "When an Air Traffic Control (ATC) clearance has been obtained, no pilot-in-command (PIC) may deviate from that clearance, except in an emergency, unless he obtains an amended clearance." Traffic information provided by the TIS up-link does not relieve the PIC of this responsibility to see and avoid traffic and receive appropriate ATC clearance.

GARMIN GFC 700 AUTOMATIC FLIGHT CONTROL SYSTEM LIMITATIONS

1. Operation of the autopilot is prohibited below 80 KIAS and above 200 KIAS. Reduce the autopilot maximum operating speed by 2.8 KIAS for each 1000 feet above 12,000 feet MSL.
2. Engagement of the autopilot less than 400 feet above ground level is prohibited.
3. Operation of the autopilot during takeoff and landing is prohibited. The autopilot must be disengaged below 200' AGL during approach operations and minimum engagement height on departure is 400' AGL (Category 1 ILS). Cruise engagement minimum height is 1000' AGL.
4. Category I and non-precision approaches authorized.
5. Altitude loss during a malfunction and recovery are as follows in Figure 2 - 7.

Configuration	Bank Angle	Altitude Loss	Recovery Delay
Climb	54º	N/A	3 Seconds
Cruise	56º	- 250 feet	3 Seconds
Descent	55º	- 275 feet	3 Seconds
Maneuvering	34º	-125 Feet	1 Second
Approach	36º	-83 Feet	1 Second

Figure 2 - 7

OXYGEN LIMITATIONS

1. A4 and A5 Flowmeters and standard cannulas may be used for altitudes up to 18,000 ft PA ONLY.
2. Cannulas may only be used by persons not experiencing nasal congestion.
3. A4 and A5 Flowmeter with oxygen mask may be used for altitudes up to 18,000 ft PA ONLY.

WARNING

Prior to takeoff on a flight where the oxygen system is anticipated to be used, verify the proper operation of the system and masks assuring oxygen flow.

WARNING

Do not use oxygen when utilizing lipstick, chapstick, petroleum jelly or any product containing oil or grease. These substances become highly flammable in oxygen rich conditions.

NOTE

If the pilot has nasal congestion or other breathing conditions, flight at altitudes where oxygen is required should be avoided, and a mask with microphone should be used.

RYAN MODEL 9900BX TCAD LIMITATIONS

1. Display of TCAD traffic information is advisory only and does not relieve the pilot responsibility to “see and avoid” other aircraft. Aircraft maneuvers shall not be predicated on the TCAD displayed information.
2. Display of TCAD traffic information does <u>not</u> constitute a TCAS I or TCAS II collision avoidance system as required by 14 CFR Part 121 or Part 135.
3. Title 14 of the Code of Federal Regulations (14 CFR) states that “When an Air Traffic Control (ATC) clearance has been obtained, no pilot-in-command (PIC) may deviate from that clearance, except in an emergency, unless he obtains an amended clearance.” Traffic information provided by the TCAD does not relieve the PIC the responsibility to see and avoid traffic and receive appropriate ATC clearance.
4. The TCAD only displays intruders equipped with operative transponders. TCAD provides no indication of traffic conflicts with aircraft without transponders.
5. Airframe Shadowing –Microwave energy can be obstructed by the airframes of both the host and threat aircraft. A shadowing occurs when the signals must pass around metal structures.
    a. TCAD is designed to operate optimally when the host TCAD antenna and the threat transponder antenna are in line of sight. With the TCAD antenna top and bottom mounted, the optimal condition generally exists when threats are above, to approximately 15 degrees below, the host aircraft. When the threat is further below the host aircraft, or during turns, signals can be attenuated, causing display of greater than actual indicated nautical miles (iNM). Transponder antenna placement on the threat aircraft and flight maneuvers also have an effect. Whenever a detected threat is below the aircraft, consider airframe shadowing when analyzing the data.
    b. For a threat to remain in the shadowed region, a lengthy and parallel track between host and threat is necessary, such as final approach to a runway when the threat is below your aircraft.
    c. Airframe shadowing does not affect the accuracy of altitude separation information.
6. Transponder signals can be reflected by nearby structures. This can result in unreliable altitude and iNM indications, especially near hangars or buildings. This condition occurs primarily when the host aircraft is on the ground, since the top mounted TCAD antenna is less exposed to reflections while in flight.
7. When two aircraft are interrogated at the same instant, the replies received by TCAD can be mixed, degrading the ability to decode the replies. This is more likely to occur in higher density areas, when both aircraft are illuminated at the same moment by the same radar. By using degarbling techniques, the processor can often provide data on the closest threat. In some instances, both aircraft will be decoded, and in other instances, accurate decoding is impossible. *This means the traffic may not be displayed on TCAD at all.* By keeping the shield size small in high-density areas, the potential for garbled replies is minimized.
8. If the communication link between the TCAD and the intruder transponder is not established, the intruder will not be displayed.
9. A poor transponder transmitter on the intruder aircraft, a geometry where the antennas are shadowed from each other, and high traffic density can limit detection range.
10. When the host aircraft is above 12,000 feet pressure altitude, non-Mode C intruders are not tracked.

OTHER LIMITATIONS

Altitude – The maximum flight altitude is 18,000 MSL with an FAA approved oxygen installation and 14,000 MSL without oxygen installed. See FAR Part 91 for applicable oxygen requirements.

Flap Limitations

Approved Takeoff Range: 12°
Approved Landing Range: 12° and 40°

Passenger Seating Capacity – The maximum passenger seating configuration is four persons.

Rudder Limiter – If the rudder limiter is found to be inoperative during the preflight inspection, the problem must be corrected before flying the airplane. If the rudder limiter becomes inoperative or malfunctions during flight, then a landing must be made as soon as possible or practicable depending on the problem. In an emergency situation, with the rudder limiter permanently engaged, the airplane is limited to a maximum right crosswind component of six knots. Please see page 3-20 for a discussion of the applicable emergency procedures. Continuous operation of the rudder limiter must not exceed a 15% duty cycle. For more information on stalls and the stall warning system, please refer to pages 4-28 and 7-43, respectively.

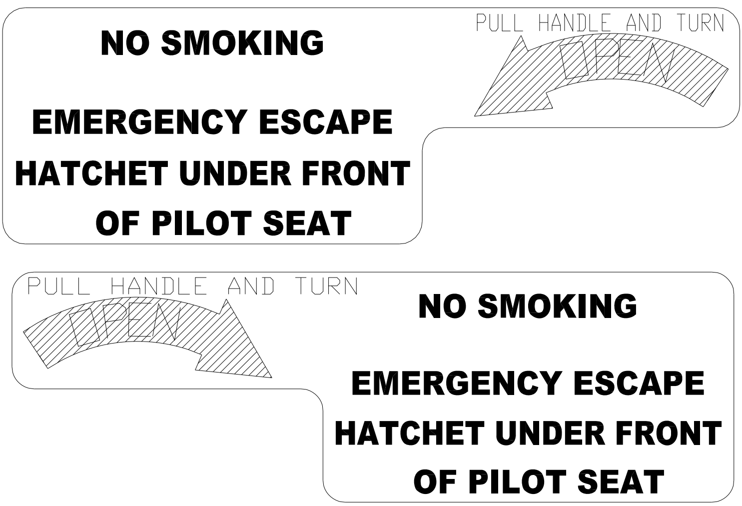
PLACARDS

GENERAL

Federal Aviation Regulations require that a number of different placards be prominently displayed on the interior and exterior of the airplane. The placards contain information about the airplane and its operation that is of significant importance. The placard is placed in a location proximate to the item it describes. For example, the fuel capacity placard is near the tank filler caps. The placards and their locations are shown on the following pages as they appear on the interior and exterior of the airplane.

INTERIOR PLACARDS

Near Pilot and Copilot Interior Door Handles

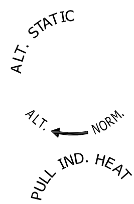


Near Door Handle on Passenger Side

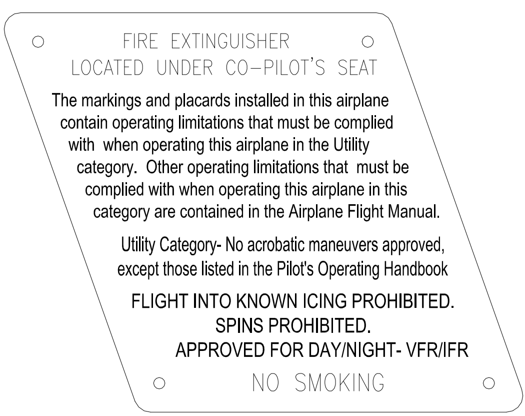
On Crash Ax

On Parking Brake Handle

On the Upper Left Side of the Tower Assembly



On Left Panel Behind Pilot's Control Stick



On Instrument Panel to Left of Backup Attitude Indicator

MANEUVERING SPEED
148 KIAS (3400 LBS)
127 KIAS (2500 LBS)

Engraved On Fuel Selector Knob and Upper Plate

S/N 42502 to 42567

LEFT RIGHT

L 49 GAL 49 GAL R

LIFT TO TURN OFF

OFF OFF

S/N 42568 and on

LEFT RIGHT

L 51 GAL 51 GAL R

LIFT TO TURN OFF

OFF OFF

On Top Front of Center Console

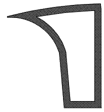
↑ PANEL LIGHT DIMMERS
LOCATED FRONT CONSOLE ↑

On Right Panel Behind Copilot's Control Stick

Acrobatic Maneuvers:
Chandelles.....150 KIAS entry speed
Lazy Eights....150 KIAS entry speed
Steep Turns....150 KIAS entry speed
Stalls............Slow Deceleration
SPINS PROHIBITED

On Flaps Panel

FLAPS



UP

T/O
129 KIAS

LANDING
119 KIAS

On the Compass

Without Electric A/C

For	N	30	60	E	120	150
Steer						
For	S	210	240	W	300	330
Steer						

Radios: On
Strobes: On
DATE __/__/__

With Electric A/C

Deviation > 10° with air conditioning on

For	N	30	60	E	120	150
Steer						
For	S	210	240	W	300	330
Steer						

Radios: On
Strobes: On
DATE __/__/__

The magnetic direction indicator is calibrated for level flight with the engine, radios, and strobes operating.

On Oxygen Distribution Manifold in Forward Overhead Panel
(when fixed oxygen system is installed)

OFF

OXYGEN SHUTOFF

ON

Under All Seats
(not required under Oregon Aero seats)

SEAT BOTTOM CAVITY
MUST REMAIN CLEAR

Under Left Rear Seat Next to Leveling Washer

AIRCRAFT LEVELING WASHER.
DO NOT REMOVE WASHER.

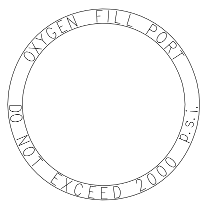
On Bottom of Baggage Compartment Door Joggle

TOTAL BAGGAGE WEIGHT 120 LBS., SHELF WEIGHT 20 LBS. MAX.
SEE WEIGHT AND BALANCE DATA FOR ADDITIONAL LOADING INSTRUCTIONS

or

TOTAL BAGGAGE WEIGHT 120 LBS. (54 kg.), SHELF WEIGHT 20 LBS. (9 kg.), MAX.
SEE WEIGHT AND BALANCE DATA FOR ADDITIONAL LOADING INSTRUCTIONS

On Oxygen Fill Port set into Hat Shelf
(when fixed oxygen system is installed)



In Aft Cabin on Aft Baggage Bulkhead

EMERGENCY LOCATION TRANSMITTER LOCATED AFT OF THIS POINT. IT MUST BE MAINTAINED IN ACCORDANCE WITH THE FEDERAL AVIATION REGULATIONS

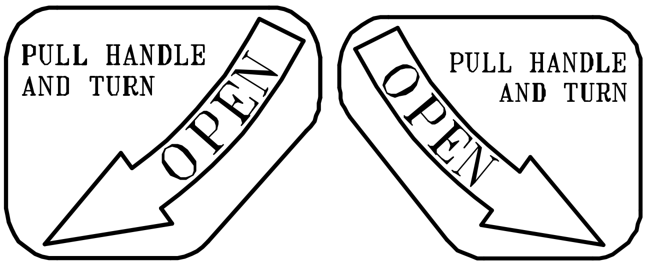
On Air Conditioning System Bay Access Cover
(when air conditioning is installed)

UPON REINSTALLATION ENSURE THIS ACCESS PANEL IS SEALED TO PREVENT CARBON MONOXIDE FROM ENTERING THE CABIN

This Page Intentionally Left Blank

EXTERIOR PLACARDS

Near Pilot and Passenger Door Handles



On Flaps Near Wing Root (Both Sides)

NO STEP

Near Fill Cap of Fuel Tank

S/N 42502 to 42567

AVGAS ONLY
MIN FUEL GRADE 100 / 100LL
TOTAL USEABLE 49 GAL US / 185 LTR
TOTAL CAPACITY 53 GAL US / 201 LTR

S/N 42568 and on

AVGAS ONLY
MIN FUEL GRADE 100 / 100 LL
TOTAL STANDARD USEABLE 43 GAL US / 163 L
TOTAL LONG RANGE USEABLE 51 GAL US / 193 L
TOTAL CAPACITY 53 GAL US / 201 L

Under Each Wing Near Fuel Drains

**FOR DRAINING OF WING FUEL SUMP:
TO OPEN: PRESS CUP GENTLY INTO BOTTOM OF VALVE TO DRAIN REQUIRED AMOUNT OF FUEL.
TO CLOSE: REMOVE CUP AND VALVE WILL CLOSE.**

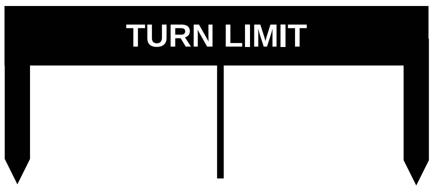
TO DRAIN WING TANKS: REFER TO MAINTENANCE MANUAL.

On Main Wheel Fairings

MAIN 55 psi

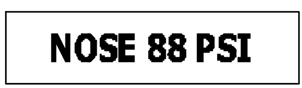
On Exterior of Fuselage – Forward of Wing on Copilot's Side

On Forward Portion of Nose Gear Fairing

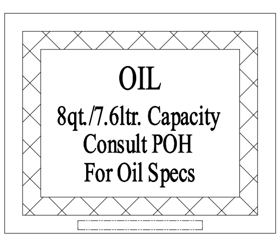


On Top of Nose Wheel Fairing – (Pointing Aft)

On Nose Wheel Fairings



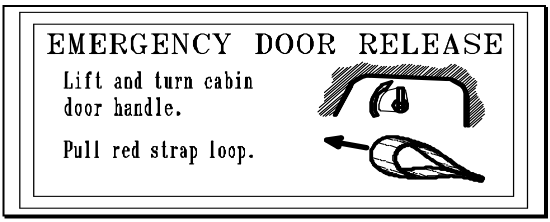
On Oil Filler Access Door



On Exterior of Gascolator Door (Underside of Fuselage)

EMERGENCY
DOOR RELEASE
PRESS BUTTONS TO OPEN

On Interior of Gascolator Door



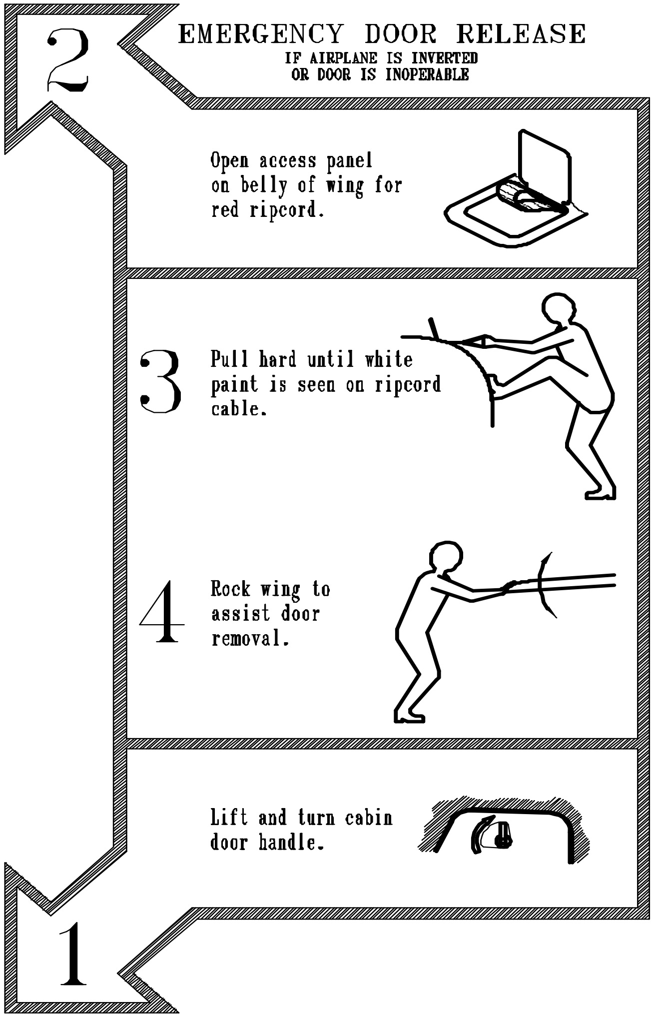
On Ground Power Supply Plug Cover

24 VDC POWER
CONNECTION

On the Underside of the Wings Forward of the Jack Points and on Each Side of the Lower Fuselage Near the Rudder (S/N 421015 and on)

JACK POINT ⬇

On Exterior of Fuselage – Forward of Wing on Pilot's Side



Section 3
Emergency Procedures

TABLE OF CONTENTS

Section 3
Emergency Procedures

INTRODUCTION

The emergency procedures are included before the normal procedures, as these items have a higher level of importance. The owner of this handbook is encouraged to copy or otherwise tabulate the following emergency procedures in a format that is usable under flight conditions. Plastic laminated pages printed on both sides and bound together are preferable. Such a checklist is included as part of the airplane's delivery package. Complete Emergency Procedures Checklists shall be carried in the aircraft at all times in a location that is easily accessible to the pilot-in-command.

Many emergency procedures require immediate action by the pilot-in-command, and corrective action must be initiated without direct reference to the emergency checklist. Therefore, the pilot-in-command must memorize the appropriate corrective action for these types of emergencies. In this instance, the Emergency Procedures Checklist is used as a crosscheck to ensure that no items are excluded and is used only after control of the airplane is established. When the airplane is under control and the demands of the situation permit, the Emergency Procedures Checklist should be used to verify that all required actions are completed.

In all emergencies, it is important to communicate with Air Traffic Control (ATC) or the appropriate controlling entity within radio range. However, communicating is secondary to controlling the airplane and should be done, if time and conditions permit, after the essential elements of handling the emergency are performed.

AIRSPEEDS FOR EMERGENCY OPERATIONS

Engine Failure After Takeoff Wing Flaps Up (Cruise Position) Wing Flaps Takeoff Position	 106 KIAS 93 KIAS	Maximum Glide (Flaps Up) 3400 lbs. (1542 kg) Gross Weight 2500 lbs. (1134 kg) Gross Weight	 106 KIAS 94 KIAS
Maneuvering Speed 3400 lbs. (1542 kg) Gross Weight 2500 lbs. (1134 kg) Gross Weight	 148 KIAS 127 KIAS	Minimum Rate of Descent (Flaps Up) 3400 lbs. (1542 kg) Gross Weight 2500 lbs. (1134 kg) Gross Weight	 85 KIAS 80 KIAS
Precautionary Landing (With engine power, flaps in the landing position)	78 KIAS	Approach Speed without Power Wing Flaps Up (Cruise Position) Wing Flaps Landing Position	 106 KIAS 90 KIAS

Figure 3 - 1

EMERGENCY PROCEDURES CHECKLISTS

ENGINE FAILURE DURING TAKEOFF

1. Throttle — IDLE
2. Brakes — APPLY STEADY PRESSURE (Release momentarily if skidding occurs.)
3. Wing Flaps — UP POSITION
4. Backup Fuel Pump — OFF
5. Mixture — CUTOFF
6. Fuel Selector — OFF
7. Ignition Switch — OFF
8. Left and Right Master Switches — OFF

ENGINE FAILURE IMMEDIATELY AFTER TAKEOFF (Below 400 Feet AGL)

1. Airspeed — 90 KIAS (with flaps in the up position)*
   90 KIAS (with flaps in the takeoff position)*
2. Mixture — CUTOFF
3. Fuel Selector — OFF
4. Ignition Switch — OFF
5. Wing Flaps — LANDING POSITION (If airspeed and height above the ground permit full extension of flaps. Otherwise, the maximum flap extension practicable should be used depending on airspeed and height above the ground.)
6. Left and Right Master Switches — OFF

*Obtain this airspeed if altitude permits; otherwise lower the nose, maintain current airspeed, and land straight ahead.

ENGINE FAILURE DURING FLIGHT

1. Airspeed — BEST GLIDE (106 KIAS with flaps up.)
2. Vapor Suppression — ON
3. Mixture — FULL RICH
4. Fuel Selector — SET TO THE FULLER TANK
5. Heated Induction Air — ON
6. Ignition Switch — VERIFY SET TO R/L
7. Backup Fuel Pump— ARM
   - 7.1. Engine Does Not Restart — PERFORM “FORCED LANDING” checklist
   - 7.2. Engine Restarts — PERFORM “PROCEDURES AFTER AN ENGINE RESTART” checklist

LOSS OF OIL PRESSURE

1. Oil Temperature — CHECK WITHIN PROPER RANGES 170° to 220°F (77° to 104 °C)
   - 1.1. If oil temperature is within operating range — LAND AS SOON AS POSSIBLE
   - 1.2. If oil temperature is above the operating range
     - 1.2.1. Throttle — REDUCE to the minimum required power
     - 1.2.2. LAND AS SOON AS POSSIBLE
     - 1.2.3. BE PREPARED FOR LOSS OF ENGINE POWER AND PREPARE FOR AN EMERGENCY LANDING

PROCEDURES AFTER AN ENGINE RESTART

1. Airspeed — APPROPRIATE TO THE SITUATION
2. Throttle — MINIMUM FOR LEVEL FLIGHT AT SAFE SPEED (Until the engine warms up.)
3. Failure Analysis — DETERMINE CAUSE (Proceed to 3.1 or 3.2 as applicable.)

3.1. Improper Fuel Management — If the engine failure cause is improper fuel management, set the backup fuel pump to OFF, adjust power and mixture as necessary, and resume flight.

3.2. Engine Driven Fuel Pump Failure — If fuel management is correct, failure of the engine driven fuel pump or a clogged fuel filter is probable. If practicable, reduce power to 75% or less and land as soon as possible. Do not set the mixture to full rich for descent or landing. Refer to the amplified discussion on page 3-17.

WARNING

If the backup fuel pump is in use during an emergency, proper leaning procedures are important. During the descent and approach to landing phases of the flight, DO NOT set the mixture to full rich as prescribed in the normal before landing procedures, and avoid closing the throttle completely. If a balked landing is necessary, coordinate the simultaneous application of mixture and throttle. Please see amplified discussion on page 3-17.

FORCED LANDING (ENGINE OUT OR PARTIAL POWER)

1. Glide
   - 1.1. Airspeed — 80 TO 106 KIAS (Figure 3 - 4)
   - 1.2. Propeller Control—FULL AFT
   - 1.3. Wing Flaps—UP
   - 1.4. Radio—TRANSMIT MAYDAY (121.5. Give estimated position and intentions.)
   - 1.5. Transponder—SQUAWK 7700
   - 1.6. ELT—ACTIVATE (If off airport.)
   - 1.7. Seat Belts and Shoulder Harnesses — FASTENED AND SECURE
   - 1.8. Loose objects — SECURE
   - 1.9. Backup Fuel Pump and Vapor Suppression — OFF
2. Landing
   - 2.1. Approach Airspeed — 90 KIAS (Full Flaps or Takeoff Flaps.)
   - 2.2. Mixture — IDLE CUTOFF (If the engine is developing partial power, delay this as long as possible.)
   - 2.3. Fuel Selector — OFF
   - 2.4. Ignition Switch — OFF
   - 2.5. Wing Flaps (When landing is assured.) — AS REQUIRED (Full flaps recommended for landing.)
   - 2.6. SpeedBrake™ Switch — OFF/DOWN POSITION
   - 2.7. Left and Right Master Switches — OFF
   - 2.8. Landing Flare— INITIATE AT APPROPRIATE POINT TO ARREST DESCENT RATE, AND TOUCHDOWN AT NORMAL LANDING SPEEDS
   - 2.9. Stopping — APPLY HEAVY BRAKING

CAUTION

At the forward CG limit, slowing below 80 KIAS prior to the flare, with idle power and full flaps, will create a situation of limited elevator authority; an incomplete flare may result.

WARNING

Two special conditions associated with forced landings are specifically applicable to the Cessna 350 (and are different from many other General Aviation airplanes). These differences must be clearly understood.

1. **Because the trim tabs and flaps are electrically operated, setting the master switches to OFF should be delayed until the pilot is certain that further use of the trim, particularly the elevator trim, and the flaps are not required.**
2. **Do not open the cabin doors in flight. The air loads placed on the doors in flight will damage them and can cause separation from the airplane. A damaged or separated door will alter the flight characteristics of the airplane and possibly damage other control surfaces.**

PRECAUTIONARY LANDING WITH ENGINE POWER

1. Seat Belts and Shoulder Harnesses — FASTENED AND SECURE
2. Loose Objects — SECURE
3. Wing Flaps — TAKEOFF POSITION
4. Airspeed — 95 to 105 KIAS
5. Select a landing area — FLY OVER AREA (Determine wind direction and survey terrain. Note obstructions and most suitable landing area. Climb to approximately 1000 feet above ground level (AGL), and retract flaps when at a safe altitude and airspeed. Set up a normal traffic pattern for a landing into the wind.)
6. Avionics Master Switch — OFF
7. Wing Flaps — LANDING POSITION (When on final approach.)
8. Airspeed — 78 KIAS
9. Left and Right Master Switches — OFF (Just before touchdown.)
10. Landing — LAND AS SLOW AS PRACTICABLE IN A NOSE UP ATTITUDE
11. Mixture — IDLE CUTOFF
12. Ignition Switch — OFF
13. Stopping — APPLY HEAVY BRAKING

ENGINE DRIVEN FUEL PUMP (EDFP) – PARTIAL FAILURE

(Fuel pressure too high to activate backup pump. Intermittent power – No fuel pump annunciation)

1. Vapor Suppression — ON
2. Backup Fuel Pump — ARM
3. Throttle — FULL OPEN
4. Primer Button — ENGAGE AND DISENGAGE (If holding in the primer switch restores fuel flow/power, the partial EDFP failure is confirmed. Release the switch and proceed to Step 5.)
5. Mixture — TOWARDS IDLE CUTOFF (At a fuel pressure of 5.5 psi, the backup pump should engage, which will restore fuel flow and engine power.)
6. Mixture — TOWARDS RICH (Degree of richness depends on altitude; see Chapter 5.)

DITCHING

1. Radio — TRANSMIT MAYDAY (121.5. Give estimated position and intentions.)
2. Loose Objects — SECURE
3. Seat Belts and Shoulder Harnesses — FASTENED AND SECURE
4. Wing Flaps — LANDING POSITION
5. SpeedBrake™ Switch — OFF/DOWN POSITION
6. Descent — ESTABLISH MINIMUM DESCENT (Set airspeed to 65 KIAS, and use power to establish minimum descent, ±200 feet/minute. See 8.2 below for landings without power.)
7. Approach — In high winds and heavy swell conditions, approach into the wind. In light winds and heavy swell conditions, approach parallel to the swell. If no swells exist, approach into the wind.
8. Touchdown Alternatives
   8.1. Touchdown (**Engine power available**) — Maintain minimum descent attitude. Apply power to slow or stop descent if necessary. When over a suitable touchdown area, reduce power and slowly settle into the water in a nose up attitude near the stalling speed.
   8.2. Touchdown (**No engine power available**) — Use an 80 to 85 KIAS approach speed down to the flare-out point, and then glide momentarily to get a feel for the surface. Allow the airplane to settle into the water in a nose up attitude near the stalling speed.
9. Evacuation of Airplane — Evacuate the airplane through the pilot or passenger doors. It may be necessary to allow some cabin flooding to equalize pressure on the doors. If the pilot or passenger doors are inoperative, use the crash ax/hatchet (located below the front seat on the pilot's side) to break either window on the main cabin doors. For more information see the Crash Ax discussion on page 3-30.
10. Flotation Devices — DEPLOY FLOTATION DEVICES

NOTE

Over glassy smooth water, or at night without sufficient light, even experienced pilots can misjudge altitude by 50 feet or more. Under such conditions, carry enough power to maintain a nose up attitude at 10 to 20 percent above stalling speed until the airplane makes contact with the water.

NOTE

In situations that require electrical system shutdown under poor ambient light conditions, cabin illumination is available through use of the overhead flip lights. The flip lights are connected directly to the battery and will operate provided there is adequate battery power.

ENGINE FIRE ON THE GROUND DURING STARTUP

If flames are observed in the induction or exhaust system, use the following procedures.

1. Mixture — CUTOFF
2. Fuel Selector — OFF
3. Throttle — FULL OPEN
4. Ignition Switch — HOLD IN START POSITION (Until fire is extinguished.)
5. Parking Brake — RELEASE (If parking brake is engaged.)
6. Fire Extinguisher — OBTAIN FROM CABIN AND EVACUATE AIRPLANE
7. Follow-up — If fire is present, extinguish it. Inspect for damage and make the appropriate repairs or replacements.

NOTE

Sometimes a fire will occur on the ground because of improper starting procedures. If circumstances permit, move the airplane away from the ground fire by pushing aft on the horizontal stabilizer, and then extinguish the ground fire. This must only be attempted if the ground fire is small and sufficient ground personnel are present to move the airplane.

ENGINE FIRE IN FLIGHT

1. Backup Fuel Pump and Vapor Suppression — OFF
2. Mixture — CUTOFF
3. Fuel Selector — OFF
4. Throttle — CLOSED
5. Ignition Switch — OFF
6. Heating and Ventilation System — OFF
7. Propeller Control — FULL AFT
8. Right Master Switch — OFF (Left master ON for Comm/Nav and PFD.)
9. Airspeed — 179 KIAS (If fire is not extinguished at this speed, increase speed to a level that extinguishes the fire if sufficient altitude exists.)
10. Landing — PERFORM “FORCED LANDING” checklist

ELECTRICAL FIRE IN FLIGHT

1. All Heating and Ventilating Controls — ON
2. Oxygen System — OFF (On MFD System page, altitude permitting – see discussion on page 3-21.)
3. Avionics Master Switch — OFF
4. Left and Right Master Switches — OFF
5. Guarded Oxygen Manual Valve — OFF
6. A/P Trim system Switch on Overhead — OFF
7. Fire Extinguisher — DISCHARGE IN AREA OF THE FIRE
8. When Fire is Extinguished — Determine if electrical power is necessary for the safe continuation of the flight. If it is required, proceed with items 9 thru 11, otherwise proceed with item 12.
9. Left and Right Master Switches — ON
10. Oxygen, if available — PUT ON MASKS OR CANNULAS AND START OXYGEN FLOW
11. Door Seals — DEACTIVATE
12. Flight — LAND AS SOON AS POSSIBLE

WARNING

The fire extinguishing substance is toxic, and the fumes must not be inhaled for extended periods. After discharging the extinguisher, the cabin must be ventilated. If oxygen is available, put masks on and start oxygen flow. Oxygen must only be used after the fire is extinguished.

CABIN FIRE IN FLIGHT (Fuel/Hydraulic Fluid)

1. All Heating and Ventilating Controls — ON
2. Oxygen System — OFF (On MFD System page, altitude permitting – see discussion on page 3-21.)
3. Left and Right Master Switches — OFF
4. Fuel Selector — OFF
5. Guarded Oxygen Manual Valve — OFF
6. Fire Extinguisher — DISCHARGE IN AREA OF THE FIRE
7. When Fire is Extinguished — MASTER SWITCHES ON

8. Oxygen, if available — PUT ON MASKS OR CANNULAS AND START OXYGEN FLOW
9. Door Seals — DEACTIVATE
10. Landing — PERFORM "FORCED LANDING" checklist

WARNING

The fire extinguishing substance is toxic, and the fumes must not be inhaled for extended periods. After discharging the extinguisher, the cabin must be ventilated. If oxygen is available, put masks on and start oxygen flow. Oxygen must only be used after the fire is extinguished.

WING FIRE IN FLIGHT

1. Pitot Heat Switch — OFF
2. Strobe and Position Lights — OFF
3. Taxi and Landing Lights — OFF
4. Flight Action — Perform a sideslip sufficient enough to keep the flames away from the fuel tank and the cabin. Sideslip only with the wing that is not on fire. Low fuel will vent from the lower wing. The sideslip may also extinguish the fire. Land the airplane as soon as possible. Use wing flaps only if essential for a safe landing.

INADVERTENT ICING

1. Detection — CHECK SURFACES (The stall strips and wing cuffs are good inspection points for evidence of structural icing.)
2. Pitot Heat and Propeller Heat — ON
3. Course — REVERSE COURSE
4. Altitude — CHANGE (To a level where the temperature is above freezing.)
5. Defroster — Divert all heated air to the defroster.
6. Propeller Control — INCREASE (Higher propeller speeds will mitigate ice accumulation.)
7. Manifold Pressure — MONITOR (A drop in manifold pressure may be an indication of induction icing; increase throttle settings as required.)
8. Heated Induction Air — ON (Operate if induction icing is evident or suspected.)
9. Alternate Static Source — AS REQUIRED (Open if static source icing is evident or suspected)
10. Flight Characteristics — ADD MARGIN OF SAFETY (An ice buildup on the wings and other surfaces will increase stalling speeds. Add a margin to approach and landing speeds.)
11. Approach Speed — Appropriate for the amount of ice accumulation and flap setting. If there is a heavy ice buildup on the windshield, a gentle forward slip or small S-turns may improve forward visibility by allowing use of the side windows.
12. Landing Attitude — LIMITED FLARE (Land at a higher speed and in a flat attitude sufficient to prevent the nose wheel from touching the ground first.)

WARNING

When flying in areas where inadvertent icing is possible, i.e., areas of visible moisture that are not forecasted to have icing conditions, turn on the pitot heat at least five minutes before entering the areas of visible moisture.

LANDING WITH A FLAT MAIN TIRE

1. Approach — NORMAL
2. Wing Flaps — LANDING POSITION
3. Touchdown — Land on the side of the runway corresponding to the good tire. Touch down on the inflated tire first and maintain full aileron deflection towards the good tire, keeping the flat tire off the ground for as long as possible. Be prepared for abnormal yaw in the direction of the flat tire.

4. Taxiing — Do not attempt to taxi. Stop the aircraft and perform a normal engine shutdown.

LANDING WITH A FLAT NOSE TIRE

1. Approach — NORMAL
2. Wing Flaps — LANDING POSITION
3. Touchdown — Touch down on the main landing gear tires first. Maintain sufficient back elevator deflection to keep the nose tire off the ground for as long as possible.
4. Taxiing — Do not attempt to taxi. Stop the aircraft and perform a normal engine shutdown.

SPEEDBRAKE™ SYSTEM MALFUNCTION

1. SpeedBrake™ Switch — OFF/DOWN POSITION
2. SpeedBrake™ Circuit Breaker — PULL

NOTE

If the SpeedBrake™ System should malfunction or perform improperly, do not attempt to identify or analyze the problem. If the malfunction results in an abnormal change in the pitch and/or roll axis, immediately regain control of the airplane by the input of control forces that override the SpeedBrake™ failure(s). Do not, under any circumstances, re-engage a SpeedBrake™ System that has malfunctioned until the problem is corrected.

ELECTRICAL SYSTEM OVERCHARGING* (Both alternators stay on-line, ammeter shows excessive charge, and voltmeter has high voltage indication.)

1. Defective Alternator Switch — OFF
2. Crosstie Switch — ON
3. Flight — If electrical system is restored, continue with flight. If electrical system is not restored, land as soon as practicable.

***NOTE**

The voltage regulator will trip the alternator off-line in conditions of over voltage, i.e., greater than 31.0 volts. If this happens the annunciations window on the PFD will indicate the alternator is out. The most likely cause is transitory spikes or surges tripped the alternator off-line.

ALTERNATOR FAILURE—ELECTRICAL SYSTEM DISCHARGING (Ammeter shows a discharging condition on the left or right bus, and the annunciations window on the PFD displays “L Alt Off” or “R Alt Off”.)

1. Crosstie Switch — OFF
2. Affected Alternator Master Switch — CYCLE OFF THEN ON
3. Alternator Annunciation Message (Follow either step 3.1 or 3.2 below)
   3.1. Alternator Annunciation Message Clears — If after recycling the system, the alternator annunciation message clears, proceed with normal operations.
   3.2. Alternator Annunciation Remains Displayed — If after recycling the system the alternator annunciation message remains displayed or trips the alternator off-line again, follow steps 4 through 6 below.
4. Affected Alternator Master Switch — OFF
5. Crosstie Switch — ON
6. Good Alternator — ENSURE PROPER OPERATION (If the “Alt Off” message is displayed, reduce loads or increase RPM until the annunciation clears and the batteries are in a charging state.)
7. Electrical System — If electrical system is not restored, land as soon as practicable.

LEFT OR RIGHT BUS FAILURE/CROSSTIE DISCHARGES WORKING BUS

(Activating the crosstie switch causes the current sensor of the working bus to discharge significantly, e.g., the left bus was showing a positive charge prior to activating the crosstie switch.)

1. Crosstie Switch — OFF
2. Master Switch of the Failed Bus — OFF
3. Review the following table for items that are on the failed bus and make appropriate allowances.

ITEMS UNAVAILABLE WITH A BUS FAILURE	
Left Bus Items	**Right Bus Items**
Aileron Trim	Strobe Lights
Pitot Heat	Taxi Light
SpeedBrakes	Right Voltage Regulator
Rudder Limiter	Door Seal/Power Point
Position Lights	Carbon Monoxide Detector
Landing Light	Oxygen
Left Voltage Regulator	Display Keypad
Fan	Air Conditioning

4. Depending on which bus failed (left or right) and the dictates of the current conditions, i.e., day, night, IMC, VMC, land the airplane as soon as practicable or possible.

STARTER MOTOR ENGAGED IN FLIGHT (The Starter Engaged annunciation comes on with the engine running.)

1. Crosstie Switch — ENSURE OFF
2. RH Master Switch — OFF
3. Monitor — ELECTRICAL BUSES VOLTAGE AND CURRENT. If battery current indicates a discharge and/or bus voltages are abnormal, switch LH Master Switch OFF THEN ON
4. Make appropriate allowances for unavailable items on the right bus.
5. Turn off non-essential electrical/avionics equipment.
6. Starter Engaged Annunciation Clears — LAND AS SOON AS PRACTICABLE
7. Starter Engaged Annunciation Persists (It may be a signal wire fault, not the starter.) — IGNORE ANNUNCIATION
8. Monitor — ELECTRICAL BUSES VOLTAGE AND CURRENT
9. High Current or Low Voltage Observed — PREPARE FOR ELECTRICAL SYSTEM FAILURE AND LAND AS SOON AS POSSIBLE
10. Normal Electrical System Indications Observed — LAND AS SOON AS PRACTICABLE

RUDDER LIMITER MALFUNCTION (The system will not disengage and/or annunciation is displayed.)

1. Left Rudder Pedal — VERIFY RUDDER LIMITER IS ENGAGED (If the system is not engaged, the annunciation is faulty. In this situation, proceed to step 6 below.)
2. Rudder Limiter Circuit Breaker — PULL OUT, WAIT 30 SECONDS, PUSH IN
3. If the rudder limiter is still engaged: — PUSH THE RUDDER LIMITER TEST SWITCH FOR 5 SECONDS AND RELEASE
4. Rudder Limiter Circuit Breaker — PULL OUT
5. If the rudder limiter is still engaged: — LAND AS SOON AS POSSIBLE
6. If the rudder limiter has disengaged: — LAND AS SOON AS PRACTICABLE

7. Landing with the Rudder Limiter Disengaged — Perform a normal landing, and avoid operations near the airplane's stalling speed.
8. Landing with the Rudder Limiter Engaged — Airport selection should be based in part on the runway length available and the amount of crosswind component. A crosswind from the left is preferable. The maximum demonstrated right crosswind component with the rudder limiter engaged is 6 knots.

RUDDER LIMITER FAILURE

1. Rudder Limiter Circuit Breaker — VERIFY IN (If the circuit breaker is out, reset and test for proper operations. If the system is functioning normally, proceed with the flight. If the circuit breaker is IN, proceed to step 2 below.)
2. Rudder Limiter Circuit Breaker — PULL OUT
3. Flight — LAND AS SOON AS POSSIBLE
4. Landing with the **Rudder Limiter Disengaged** — Perform a normal landing, and avoid operations near the airplane's stalling speed.

ELECTRIC TRIM/AUTOPILOT FAILURE (Sudden and unexplained changes in control stick force.)

1. Flight — MANUALLY CONTROL AIRCRAFT
2. Red Autopilot Disconnect/Trim Interrupt Button on Control Stick — PRESS
3. A/P Trim System Switch in Overhead — OFF
4. Power Settings — REDUCE TO 50% BHP OR LESS (Or to a setting that relieves forces.)
5. Airspeed — 100 to 110 KIAS (Or to speed that relieves forces.)
6. Circuit Breakers — PULL AS REQUIRED
   3.1. ELEV TRIM
   3.2. AILERON TRIM
   3.3. AUTOPILOT
7. Flight — TERMINATE AS SOON AS PRACTICABLE OR POSSIBLE (This depends on the magnitude of control forces(s) required to maintain a normal flight attitude.)
8. Landing — PREPARE FOR CONTROL FORCE CHANGES (When power is reduced and airspeed is reduced, there can be substantial changes in the required control pressures.)

WARNING

In a runaway trim emergency the two most important considerations are to (1) IMMEDIATELY turn off the trim system and (2) maintain control of the airplane. The airplane will not maintain level flight and/or proper directional control without pilot input to the affected flight control(s). If excessive control force is required to maintain level flight, land as soon as possible. Pilot fatigue can be increased significantly in this situation with the potential for making the landing difficult.

PARTIAL RESTORATION OF A DISABLED TRIM SYSTEM

1. A/P Trim System Switch in Overhead — ON
2. Malfunction Analysis — DETERMINE AXIS OF MALFUNCTION
3. Circuit Breaker(s) — SET PROPERLY FUNCTIONING AXIS BREAKER TO ON

MALFUNCTION OF AUTOPILOT

1. Flight — MANUALLY CONTROL AIRCRAFT
2. Autopilot Disconnect Switch on Control Stick— PRESS (If autopilot does not disconnect proceed to step 3.)
3. Pitch Trim Switch — MOVE (If autopilot does not disconnect proceed to step 4.)
4. A/P Trim System Switch in Overhead — SET TO OFF (If autopilot does not disconnect proceed to step 5.)
5. Circuit Breaker — PULL

BROKEN OR STUCK THROTTLE CABLE (With enough power for continued flight.)

1. Continued Flight — LAND AS SOON AS POSSIBLE
2. Airport Selection — ADEQUATE FOR POWER OFF APPROACH
3. Descent — CONTROL WITH PROPELLER CONTROL
4. Fuel Selector — SET TO FULLER TANK
5. Approach Airspeed — 93 KIAS (With flaps in the up position.)
   90 KIAS (With flaps in the landing position)
6. Seat Belts — FASTENED AND SECURE
7. Loose Objects — SECURE
8. Wing Flaps — AS REQUIRED (Full flaps should be extended only when reaching the runway is assured.)
9. Mixture (Reaching runway is assured) — IDLE CUTOFF
10. Touchdown — MAIN WHEELS FIRST, GENTLY LOWER NOSE WHEEL
11. Braking — AS REQUIRED

OXYGEN SYSTEM MALFUNCTION

1. Oxygen System — OFF THEN ON (On MFD System page.)
2. Guarded Oxygen Manual Valve — OFF THEN ON
3. Flow Meters — VERIFY FLOW TO BREATHING DEVICES
4. If no oxygen flowing:
   - 4.1. Descend — 12,500 ft or below (In a safe and controlled manner.)
   - 4.2. Oxygen Switch — OFF (On MFD System page.)

CARBON MONOXIDE DETECTION (When optional CO detector is installed, annunciation displays and aural warning sounds.)

1. System Softkey on the MFD — PRESS
2. CO RST Softkey — PRESS (If alert continues go to step 3.)
3. Heater — OFF
4. Vents — ON
5. Airspeed —INCREASE TO GREATER THAN 120 KIAS
6. Oxygen — DON (If installed.)
7. Flight — LAND AS SOON AS POSSIBLE

NOTE

The red annunciation will stay displayed until the CO level drops below 50 ppm. Do not recycle the unit through the circuit breaker, as there is a three minute delay for the CO sensor to stabilize.

SOMETHING STUCK IN OR INTERFERING WITH A DOOR JAMB

1. Affected Door — DO NOT OPEN THE DOOR IN FLIGHT

WARNING

Do not open any of the airplane doors in flight. The doors are not designed to be opened in flight; subsequent airloads on an opened door will forcefully pull it completely open and detach it from the airplane.

2. Flight — LAND AS SOON AS PRACTICABLE

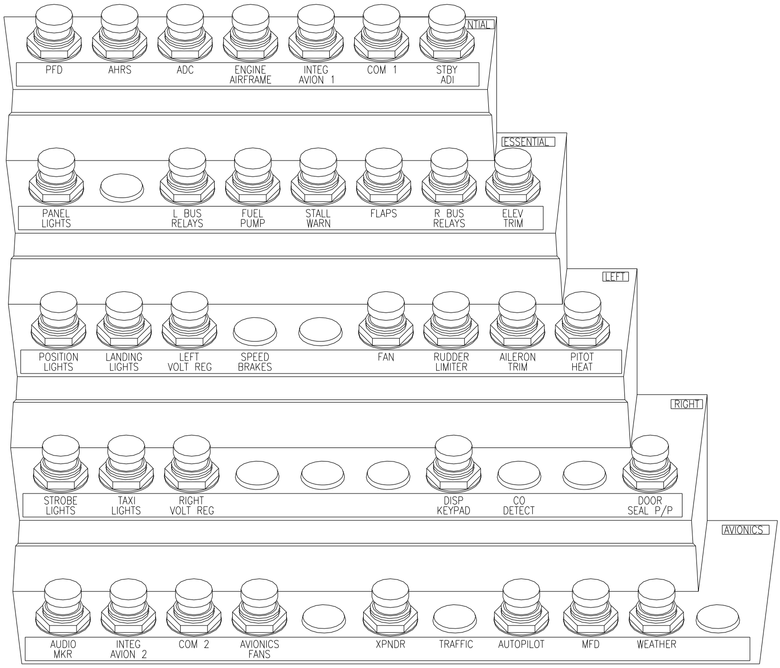
EVACUATING THE AIRPLANE

1. Seat Belts — REMOVE (Do not remove seat belts until the airplane comes to a complete stop, unless there is a compelling reason to do otherwise. If the onset of the emergency is anticipated, ensure the seat belt is as tight as possible. See discussion on page 3-29.)

2. Doors — USE BOTH IF POSSIBLE AND REQUIRED (Do not open doors in flight.)
3. Crash Ax — USE AS REQUIRED (If the cabin doors are inoperable, break out a cabin door window. See crash ax discussion on page 3-30.)
4. Exiting the Airplane — AS APPROPRIATE (If possible, use both doors. Generally, it is best to go aft unless there are compelling reasons to do otherwise. See discussion on page 3-29.)
5. Assistance — AS APPROPRIATE (If possible, necessary, and not life threatening, render assistance to others in the airplane.)
6. Congregating Point — DESIGNATE (Pilot and passengers should have a designated congregating point, say 100 feet aft of the airplane.)

CIRCUIT BREAKER PANEL

Many of the above emergency procedures involve resetting or pulling circuit breakers, which requires a good understanding of the panel's location and layout. The circuit breaker panel is located forward of the pilot's front seat on the lower side-panel. A picture of the circuit breaker panel and a table listing each circuit breaker is provided in Figure 3 - 2. See Figure 7 - 18 on page 7-37 for a diagram of the electrical system.



Essential	PFD	AHRS	ADC	Engine Airframe	Integ Avion 1	Com 1	Stby ADI				
Essential	Panel Lights	●	L Bus Relays	Fuel Pump	Stall Warn	Flaps	R Bus Relays	Elev Trim			
Left Bus	Position Lights	Landing Lights	Left Volt Reg	Speed Brakes	●	Fan	Rudder Limiter	Aileron Trim	Pitot Heat		
Right Bus	Strobe Lights	Taxi Lights	Right Volt Reg	●	●	●	Disp Keypad	CO Detect	●	Door Seal P/P	
Avionics	Audio Mkr	Integ Avion 2	Com 2	Avionics Fans	●	Xpnder	Traffic	Autopilot	MFD	Weather	●

Note 1: A ● indicates that the circuit breaker position is unused, but reserved for future optional equipment.

Note 2: The actual arrangement may vary slightly depending on the optional equipment installed.

Figure 3 - 2

AMPLIFIED EMERGENCY PROCEDURES

ENGINE FAILURE AND FORCED LANDINGS

General – The most important thing in any emergency is to maintain control of the airplane. If an engine failure occurs during the takeoff run, the primary consideration is to safely stop the airplane in the remaining available runway. The throttle is reduced first to prevent surging of the engine. Raising the flaps reduces lift, which improves ground friction and facilitates braking. In emergencies involving loss of power, it is important to minimize fire potential, which includes shutting down or closing the electrical and fuel systems.

Engine Failure After Takeoff (Below 400 feet AGL) – With an engine failure immediately after takeoff, time is of the essence. The most important consideration in this situation is to maintain the proper airspeed. The airplane will be in a climb attitude and when the engine fails, airspeed decays rapidly. Therefore, the nose must be lowered immediately and a proper glide speed established according to Figure 3 - 3. It may not be possible to accelerate to the best distance glide speed due to altitude limitations. In this instance, lower the nose, maintain current airspeed, and land straight ahead.

It is unlikely there will be enough altitude to do any significant maneuvering; only gentle turns left or right to avoid obstructions should be attempted. If there are no obstructions, it is best to land straight ahead unless there is a significant crosswind component. Flaps should be applied if airspeed and altitude permit since they can provide a 10+ knot reduction in landing speed.

Engine Failure After Takeoff (Above 400 feet AGL) – With an engine failure after takeoff, there may be time to employ modified restarting procedures. Still, the most important consideration in this situation is to maintain the proper airspeed. The airplane will be in a climb attitude and when the engine fails, airspeed decays rapidly. Therefore, the nose must be lowered immediately and a proper glide speed established according to Figure 3 - 3. It may not be possible to accelerate to the best distance glide speed due to altitude limitations. In this instance, lower the nose, maintain current airspeed, and land straight ahead.

In-Flight Engine Failure – The extra time afforded by altitude may permit some diagnosis of the situation. The first item is to establish the proper rate of descent at the best glide speed for the situation, as shown in Figure 3 - 3. If altitude and other factors permit, an engine restart should be attempted. The checklist items 2 through 7, Engine Failure During Flight, on page 3-4, ensure that the fuel supply and ignition are available. The most likely cause of engine failure is poor fuel management. The two more frequent errors are forgetting to change the fuel selector or, during an extended descent, failure to readjust the mixture.

	Best Distance Glide (Most Distance)	**Min. Rate Glide (Min. rate of descent)**
Gross Weight	KIAS	KIAS
3400 lbs. (1542 kg)	106	85
2500 lbs. (1134 kg)	93	80

Figure 3 - 3

Best Glide Speed Versus Minimum Rate of Descent Speed – The best distance glide speed will provide the most distance covered over the ground for a given altitude loss, while the minimum rate of descent speed, as its name suggests, will provide the least altitude lost in a given time period. The best distance glide speed might be used in situations where a pilot, with an engine failure but several thousand feet above the ground, is attempting to reach a distant airport. The minimum rate of descent could be used in a situation when the pilot is over the desired landing spot and wishes to maximize the time aloft for checklists and restart procedures.

Emergency Backup Fuel Pump – The backup fuel pump is intended for use during an emergency situation when failure of the engine driven pump has occurred. The switch that controls this operation is on the flap panel. The labeling on the switch reads BACKUP PUMP ARMED. The switch is normally in the ARMED position for takeoff and climb to cruise altitude and in the OFF position for cruise, descent, and approach to landing. The top of the switch is engraved with the word OFF and is readable only when the switch is off.

If the engine driven pump malfunctions, ensure the backup fuel pump is in the ARMED position, and the backup fuel pump will turn on automatically when the fuel pressure is less than about 5.5 psi. This condition will also activate a yellow caution message “FUEL PUMP” in the PFD annunciation window and an associated aural message “FUEL PUMP”. There may be degradation in the smoothness of engine operation as well. With the backup pump operating, fuel is not as precisely metered, compared to the normal engine driven system, and frequent mixture adjustments are necessary when changes are made to the power settings. In particular, avoid large power changes, since an over-rich or over-lean mixture will affect the proper operation of the engine. With a failed engine driven pump, full power should be available, but power should be reduced below 85% as soon as practical.

In the unlikely event of an engine driven fuel pump failure and a backup fuel pump switch failure, the primer switch may be held down to effectively restore fuel flow.

In general, as power is reduced below the 75% of BHP level, there must be a corresponding leaning of the mixture. On an approach to landing, the normal checklist procedures must be modified to exclude setting the mixture to full rich. It is best to make a partial power approach with full flaps, and only reduce power when over the runway. If a balked landing is necessary, coordinate the simultaneous application of mixture and throttle.

At power settings above the 75% level the engine will operating with a very lean mixture. At full throttle, the engine will produce approximately 79% of its rated BHP. In this situation, the fuel-air mixture is lean of peak, and higher cylinder head temperatures and EGT readings will result from extended use in the condition. Full throttle operations must be kept to a minimum and only used to clear an obstacle, execute a balked landing, or other similar situations that require use of all available power.

Critical Issues (**Backup Fuel Pump)** – One of the more critical times for an engine driven fuel pump failure is when the engine is at idle power, such as a descent for landing. There are two reasons that make this situation more serious compared with other flight phases. (1) The airplane is more likely to be at a lower altitude, which limits time for detection, analysis, and corrective measures. (2) With the engine at idle power, there is no aural indication of engine stoppage. If the engine failure is a result of fuel starvation with a fuel pressure less than 5.5 psi, then the FUEL PUMP message in the PFD annunciation window will provide a visual indication.

There is a latching relay that basically controls the logic of the system. For example, it turns the backup pump on, when the backup boost switch is in the ARMED position and the fuel pressure drops below 5.5 psi. Moreover, if the backup system is automatically turned on while the vapor suppression is on, it will suspend operation of the vapor suppression. Most functions in the system are integrated with the latching relay, and failure of this relay will result in failure of the system.

However, the FUEL PUMP message is independent of this system and will operate anytime the fuel pressure is less than 5.5 psi.

In a situation involving a double failure, i.e., a malfunction of the engine driven pump and the latching relay, the FUEL PUMP message will be displayed. Since the primer and backup fuel pump are one and the same, the pilot can bypass the latching relay by holding the primer switch in the depressed position. In this particular situation, this would restore engine power and permit continuation of the flight and a landing, which must be done as soon as possible. Of course, the pilot must continually depress the primer switch, which increases the cockpit workload.

CAUTION

Do not shut down an engine for practice or training purposes. If engine failure is to be simulated, it shall be done by reducing power. A few minutes of exposure to temperatures and airspeeds at flight altitudes can have the same effect on an inoperative engine as hours of cold-soaking in sub-Arctic conditions.

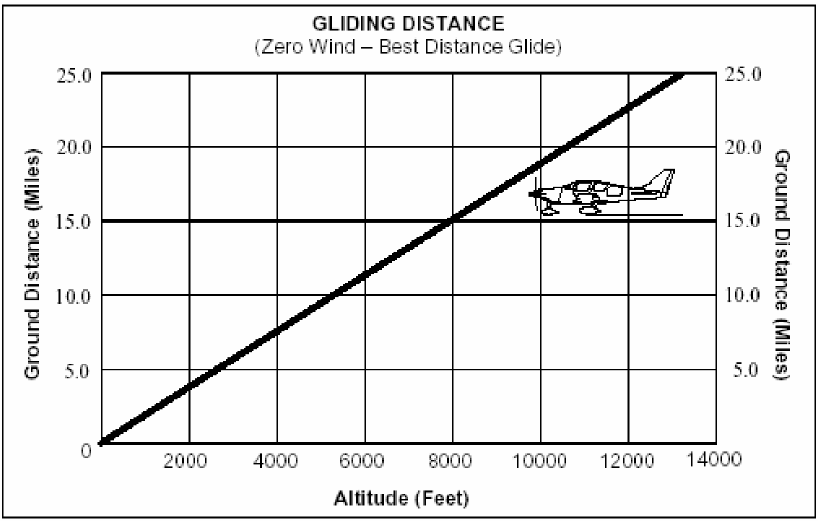


Figure 3 - 4

Engine Restarts – If the engine restarts, two special issues must be considered: (1) If the airplane was in a glide for an extended period of time at cold ambient air temperatures, the engine should be operated at lower RPM settings for a few minutes until the oil and cylinder temperatures return to normal ranges if possible. (2) If the engine failure is not related to pilot error, i.e., poor fuel management or failure to enrich the mixture during a long descent from a high altitude, then a landing should be made as soon as possible to determine the cause of the engine failure.

Engine Does Not Restart – If the engine does not restart, then a forced landing without power must be completed as detailed earlier in this section on page 3-5, Forced Landing (Engine Out and Partial Power). Maintaining the best distance glide speed provides the maximum distance over the ground with the least altitude loss. The preceding graph Figure 3 - 4 provides information on ground distance covered for a given height above the ground. At the best distance glide speed, a good rule of thumb, under zero wind conditions, is to anticipate approximately 1¾ miles over the ground for each 1000-foot increment above the ground.

Forced Landing with the Throttle Stuck in the Idle Position – If the throttle is stuck at idle or near idle power, then a forced landing must be performed. The procedures are somewhat similar to those associated with a complete power loss. However, powerplant shutdown should be delayed as long as safely practicable since the stuck throttle may be spontaneously cured. Changes in altitude, temperature, and other atmospheric conditions associated with the descent may combine to alleviate the stuck throttle condition. On the other hand, the problem could be the result of a broken throttle cable, which has no immediate cure. Regardless of the cause, the pilot lacks both the time and resources to properly analyze the cause. Running the engine until the last practicable moment, within the confines of safety, is the most prudent course of action.

It is possible that the throttle may stick at a power setting that is above idle, but at insufficient brake horsepower to sustain level flight. At the same time, this condition may restrict the desired rate of descent. In this situation, the pilot can set the mixture control to idle cutoff to momentarily stop the operation of the engine. If cylinder head temperatures fall below 240º, restart the engine as necessary by enriching the mixture.

Stuck Throttle with Sufficient Power to Sustain Flight – If the throttle sticks at a power setting that produces enough power for continued flight then a landing should be made as soon as possible. If the airplane is near the ground, climb to an altitude that provides a greater margin of safety, provided there is sufficient power to do so. Do not begin the descent for land until the airplane is near or over the airport. Again, as mentioned in the previous paragraph, the pilot can set the mixture control to idle cutoff to momentarily stop the operation of the engine. If cylinder head temperatures fall below 240º, restart the engine as necessary by enriching the mixture. A checklist for a stuck throttle condition that will sustain flight is discussed on page 3-12.

FLIGHT CONTROLS MALFUNCTIONS

General – The elevator and aileron controls are actuated by pushrods, which provide direct positive response to the input of control pressures. The rudder is actuated by cable controls. The pushrod system makes the likelihood of a control failure in the roll and pitch axis remote.

Aileron or Rudder Failure – The failure of the rudder or ailerons does not impose a critical situation since control around either the vertical and longitudinal axes can still be approximately maintained with either control surface. Plan a landing as soon as practicable on a runway that minimizes the crosswind component. Remember that the skidding and slipping maneuvers inherent in such an approach will increase the airplane's stall speed, and a margin for safety should be added to the approach airspeed.

Elevator Failure – In the event of a failure of the elevator control system, the airplane can be controlled and landed using the elevator trim tab. The airplane should be landed as soon as possible. En route, establish horizontal flight at 65% to 75% power. When within 15 miles of the landing airport, slow to 120 KIAS, set the flaps to the takeoff position, and establish a timed shallow descent. Adjust the descent with power to enter the downwind leg at or slightly above pattern altitude. Make a slightly wider than normal pattern so more time is provided for setup. On final approach, set the flaps to the landing position and re-trim the airplane to a 500 fpm descent at about 80 KIAS. Do not make further adjustment to the elevator trim, and avoid excessive power adjustments. On the final approach to landing, make small power changes to control the descent. Do not reduce power suddenly at the flare-out point as this will cause an excessive nose down change and may cause the airplane to land on the nose wheel first. At the flare-out point, coordinate the reduction of power with the full nose-up application of elevator trim.

TRIM TAB MALFUNCTIONS

The airplane has two axis electrically powered trim tabs. There is a trim system on/off switch located on the right side of the overhead rocker switch panel, which turns off power to the actuators in both axes and the autopilot. If a runaway trim condition is encountered in flight, characterized by sudden and unexplained changes in control forces, the red autopilot disconnect/trim interrupt button must be depressed and held and the autopilot/trim system switch must immediately be set to the OFF position. If the pilot wishes to restore part of the system's trim, the following procedure should be used.

1. After the trim system switch has been set to OFF, the trim circuit breakers (elevator and aileron) should be pulled to the OFF position.
2. Turn the autopilot/trim system switch to the ON position.
3. Based on the forces experienced during the trim runaway, determine which tab is least likely to have caused the runaway and which tab is most likely to have caused the runaway.
4. Set the circuit breakers least likely to have caused the runaway to the ON position. The pilot should be prepared to set the trim system switch to the OFF position in the event the diagnosis is incorrect and the faulty trim actuator is brought back on line. In most situations, the pilot should be able to easily determine which trim axis experienced the runaway condition.

WARNING

In a runaway trim emergency the two most important considerations are to (1) IMMEDIATELY press and hold the red autopilot disconnect/trim interrupt button on the stick and turn off the trim system and (2) maintain control of the airplane. The airplane will not maintain level flight and/or proper directional control without pilot input to the affected flight control(s). If excessive control force is required to maintain level flight, the flight must be terminated as soon as possible. Pilot fatigue can increase significantly in this situation with the potential for making the landing more difficult.

The left bus supplies the power to the aileron actuator motor, and the essential bus supplies the power to the elevator actuator motor. In the event of a power failure, the trim tabs will not operate, and the settings in place before the failure will be maintained until power is restored. Flight under these conditions or during a trim runaway condition should not impose a significant problem. Atypical control forces will be required and the flight should be terminated as soon as possible or practicable (depending on flight conditions) to mitigate pilot fatigue. Remember that during touchdown, when power is reduced and airspeed decays, there can be substantial changes in the required control forces.

STARTER MOTOR ENGAGED IN FLIGHT

If the starter engages in flight, it may draw large currents and drain the batteries quickly. It is necessary to turn both buses off temporarily to kill the power to the starter relay. This may reset the relay, but it is best to leave the right bus off until the faulty component can be determined. A number of items will be unavailable with the right bus off (see Table under Left or Right Bus Failure). If it is necessary to turn both buses off in IMC, the standby attitude indicator will continue to provide attitude information for 3 minutes before it becomes unreliable. This is sufficient time for the PFD to power up again.

The engine does not get damaged if the starter engages while it is running, but the starter and/or starter adapter will most likely need to be replaced.

RUDDER LIMITER FAILURE OR MALFUNCTION

General – The purpose of the rudder limiter is to restrict adverse rudder application when the airplane is near the critical angle of attack with the throttle set to more than 12 inches of Hg of manifold pressure. For more information about the rudder limiter, see the Stall Warning System discussion on page 7-43. A pilot must follow certain procedures if a failure or malfunction occurs. A distinction is made between the words *failure* and *malfunction*. A failure means the rudder limiter system is completely inoperative, and the components of the system do not interfere with the normal operation of the rudder. A malfunction means one or more of the system components are stuck or operating improperly.

Failure – Failure of the rudder limiter system does not present significant problems during normal flight operations. If the rudder limiter system fails in flight, the pilot must not make adverse rudder deflections or fly near the airplane's critical angle of attack, particularly at higher power settings. A landing shall be made as soon as practicable. Since a shorted or broken wire might cause failure of the system, it is a good idea to pull the circuit breaker.

Malfunction – A malfunction of the rudder limiter system is a more serious issue, particularly if it is stuck in the engaged position. With a stuck solenoid, the RUDR LMTR annunciation normally will be displayed, and left rudder travel will be restricted. The first step is to verify that the rudder limiter is engaged, and the cause of the problem is not a faulty annunciation. If the problem is a faulty annunciation, pull the rudder limiter circuit breaker, and land as soon as practicable.

If the rudder limiter is stuck in the engaged position, the pilot should first take steps to disengage the system. To do this, pull the rudder limiter circuit breaker, waiting about 30 seconds, and then reset the circuit breaker. If this does not disengage the rudder limiter, the next step is to press the test switch under the A/P TRIM switch in the overhead console . If this action does not release the solenoid, which is holding the rudder limiter in the engaged position, then the rudder limiter circuit breaker must be pulled and a landing made as soon as possible. If recycling the system disengages the rudder limiter, then the rudder limiter circuit breaker should be pulled and a landing made as soon as practicable.

If the solenoid is stuck, the rudder will be limited to 11º ± 0.5º of left travel. In this situation, select an airport with an adequate runway length that minimizes crosswind component. Since the airplane tends to turn into the wind during a crosswind landing, if given a choice, a crosswind from the left is more desirable. The maximum demonstrated right crosswind component with the rudder limiter engaged is 6 knots.

Total Electrical Failure – During a total electrical failure, with the batteries inoperative, the rudder limiter and the stall warning indicator will not function. In this situation, the pilot must give special attention to maintenance of proper airspeeds, particularly when near the airplane's stalling speed.

FIRES

General – Fires in flight (either engine, electrical, or cabin) are inherently more critical; however, the likelihood of such an occurrence is extremely rare. The onset of an in-flight fire can, to some degree, be forestalled through diligent monitoring of the engine instruments and vigilance for suspicious odors. Fires on the ground can be mitigated through proper starting techniques, particularly when the engine is very cold.

Engine Fires – The most common engine fires occur on the ground and are usually the result of improper starting procedures. The immoderate use of the primer pump is a primary reason since this causes engine flooding. In situations of extensive primer pump use, the excess fuel drains from the intake ports and puddles on the ground. If this happens, the aircraft should be moved away from the puddle. Otherwise, the potential exists for the exhaust system to ignite the fuel puddle on the ground. Inadvertent engine flooding is likely during situations where the engine has been cold-soaked at temperatures below 25°F (-4°C) for over two hours. See cold weather operations on page 4-30.

Cabin Fire – Follow the manufacturer's instructions for use of the fire extinguisher. For more information on using the fire extinguisher see the discussion on page 7-51. Once a cabin fire is extinguished, it is important to ventilate the cabin as soon as possible. The residual smoke and toxins from the fire extinguisher must not be inhaled for extended periods. The ventilation system should be operated at full volume with the cabin fan on. Deactivating the door seals enhances the ventilation process.

Oxygen should be turned off in the event of a cabin fire and only used after it is determined that the fire is extinguished. However, good pilot judgment should be used when flying at altitudes where oxygen is required to weigh the effects of lack of oxygen with the potential fire hazard. Once the fire is extinguished and if oxygen is available, put masks on and start the oxygen flow. If fire cannot be extinguished, open the guard on the oxygen system in the overhead panel, place the manual valve in the OFF position, and press the oxygen softkey on the MFD to the OFF position.

LIGHTNING STRIKE

In order to prevent as much damage as possible to the electrical system, components, and avionics in the event of a lightning strike, surge protection has been built into the Cessna 350's electrical system. This surge protection comes from large MOVs (metal oxide varistor) soldered in behind the circuit breaker panel. The Cessna 350 system has one MOV on the avionics bus and one on the essential bus. The MOVs are located behind the circuit breaker panel and are not accessible by the pilot in-flight. It is imperative that after a lightning strike, the MOVs are replaced before the next flight.

CAUTION

After a lightning strike, the MOVs must be replaced before the next flight.

If the aircraft is struck by lightning in flight, the MOVs will have likely prevented significant damage to the electrical components. The most likely damage will be to the equipment on the extreme ends of the airplane, such as the strobe and anti-collision lights. After the lightning strike, the pilot should reset all tripped circuit breakers. If any of the circuit breakers trip off again, they should not be reset a second time. The pilot should then determine which equipment is operating properly, and adjust the flight accordingly.

ENGINE AND PROPELLER PROBLEMS

Engine Roughness – The most common cause of a rough running engine is an improper mixture setting. Adjust the mixture in reference to the power setting and altitude in use. Do not immediately go to a full rich setting since the roughness may be caused by too rich of a mixture. If adjusting the mixture does not correct the problem, reduce throttle until roughness becomes minimal, and perform a magneto check.

Check operations on the individual left and right magnetos. If the engine operates smoothly when operating on an individual magneto, adjust power as necessary and continue. However, do not operate the engine in this manner any longer than necessary. Land as soon as possible for determination and repair of the problem. If individual magneto operations do not improve performance, set the magneto switch to BOTH, and land as soon as possible for engine repairs.

High Cylinder Head Temperatures – High cylinder head temperatures are often caused by too lean of a mixture setting. Be sure the mixture is adjusted to the proper fuel flow for the power setting in use. Put the aircraft in a gentle descent to increase airspeed. If cylinder head temperatures cannot be maintained within the prescribed limits, land as soon as possible to have the problem evaluated and repaired.

High Oil Temperature – A prolonged high oil temperature indication is usually accompanied by a drop in oil pressure. If oil pressure remains normal, then the cause of the problem could be a faulty gauge or thermo-bulb. If the oil pressure drops as temperature increases, put the aircraft in a gentle descent to increase airspeed. If oil temperature does not drop after increasing airspeed, reduce power and land as soon as possible.

CAUTION

If the above steps do not restore oil temperature to normal, severe damage or an engine failure can result. Reduce power to idle, and select a suitable area for a forced landing. Follow the procedures described on page 3-5, Emergency Landing Without Engine Power. The use of power must be minimized and used only to reach the desired landing area.

Low Oil Pressure – If oil pressure drops below 30 psi at normal cruise power settings without apparent reason and the oil temperature remains normal, monitor both oil pressure and temperature closely, and land as soon as possible for evaluation and repair. If a drop in oil pressure from prescribed limits is accompanied by a corresponding excessive temperature increase, engine failure should be anticipated. Reduce power and follow the procedures described on page 3-5, Forced Landing (Engine Out and Partial Power). The use of power must be minimized and used only to reach the desired landing area.

CAUTION

The engine oil annunciation is set to display when the oil pressure is less than 5 psi, which provides important information for ground operations. It is not designed to indicate the onset of potential problems in flight.

Failure of Engine Driven Fuel Pump – In the event the engine driven fuel pump fails in flight or during takeoff, there is an electrically operated backup fuel pump located in the wing area. The first indication of failure of the engine driven pump is a rise in EGT, reduced fuel flow, and rough engine followed by a FUEL annunciation and a loss of engine power.

The backup pump is normally in the ARMED position for takeoff and climb and will be activated if fuel pressure drops below 5.5 psi. In the cruise and descent configurations, the pump arming is normally in the OFF position. At the first indication of engine driven pump failure (fuel pump warning annunciation, or rough engine operations), set the throttle to full open, and set the backup pump switch to the ARMED position. Thereafter, it must remain in this position and a landing must be made as soon as practicable to repair the engine driven fuel pump. Please see an amplified discussion on page 3-17.

NOTE

When operating at high altitudes, 15000 MSL or above, it may be necessary to set the vapor suppression switch to ON in order to keep the engine driven fuel pump from cavitating. Operation of the vapor suppression may be required at lower altitudes when the ambient temperature is significantly above normal.

Propeller Surging or Wandering – If the propeller has a tendency to surge up and down or the RPM settings seem to slowly and gently vary (propeller wandering), one or more of the following conditions may exist.

1. There may be excessive leakage in the transfer bearing. The governor may not be able to get enough oil pressure, which causes a delay in propeller responsiveness. By the time the propeller responds to earlier governor inputs, they have changed, resulting in propeller wandering.
2. Dirty oil is another cause. Contaminants in engine oil cause blockage of close tolerance passages in the governor, leading to erratic operations.
3. Excessive play in the linkage between the governor and cockpit control can lead to erratic operations.

NOTE

Propeller surging or wandering in most instances does not limit the safe continuation of the flight. However, to preclude the occurrence of more serious problems, the issue should be corrected in a timely manner, i.e., at the conclusion of the flight. If the surging or wandering is excessive, then a landing should be made as soon as practicable.

ELECTRICAL PROBLEMS

The potential for electrical problems can be reduced by systematic monitoring of the voltmeter, and ammeter readings on the MFD. The onset of most electrical problems is indicated by abnormal readings from any or all of these gauges. The dual ammeter, which is presented on vertical bar gauges, measures the condition of the battery output/input and alternator output while the voltmeter indicates the condition of the airplane's electrical system on a bar graph on the MFD System page. The MFD System page shows bus voltage, as well as battery and alternator current on bar graphs with a boundary around the group marked "electrical".

Under Voltage – If there is an electrical demand above what can be produced by the alternator on either the right or left bus, the battery temporarily satisfies the increased requirement and a battery discharging condition exists. For example, if either alternator should fail, the associated battery carries the entire electrical demand of the affected bus. As the battery charge is expended, the voltage to the system will read something less than the optimum 24 volts. At approximately 8 volts, most electrical components on the affected bus will cease to work or will operate erratically and unreliably. For Garmin G1000 installations, minimum voltage for proper operation is 9 volts. Anytime the electrical demand is greater than what can be supplied by the alternator at any RPM on either the left or right bus, the battery is in a discharging state. The PFD annunciation window will display "L ALT OFF" or "R ALT OFF" when that bus drops below 24 volts. The alternator will continue to output as much as it can for the RPM the engine is producing. Reducing loads on the affected bus or increasing RPM will clear the "L ALT OFF" or "R ALT OFF" annunciation message and the battery will be in a charging state. If the discharging state is not corrected, in time, there is a decay in the voltage available to the electrical system of the airplane and systems will cease to operate.

Alternator Failure – If the left or right alternator has an internal failure, i.e., it cannot be recycled and the annunciation remains displayed, the alternator side of the split master switch for the appropriate alternator should be set to the OFF position. A relay will disconnect it from its bus and prevent battery drain if the failure is associated with an internal short. The crosstie switch should then be turned on to allow the good alternator to carry the entire load on both buses.

Load Shedding – If the under voltage condition cannot be fixed either by turning on the crosstie switch or reducing the electrical load to the system, land as soon as possible or as soon as practicable depending on flight conditions. All nonessential electrical and avionics equipment must be turned off.

Over Voltage – The voltage regulator is designed to trip the left or right alternator off-line in conditions of over voltage, i.e., greater than 31.0 volts. When this happens a message on the PFD will indicate the left or right alternator is offline. The most likely cause is transitory spikes or surges tripping the alternator off-line in the electrical system. If the alternator is not automatically disconnected in an over voltage situation, the voltage regulator is probably faulty. In this situation, the pilot must manually turn off the alternator, otherwise, damage to the electrical and avionics equipment is likely. There is increased potential for an electrical fire in an uncorrected over voltage situation.

Master Switches – The system's two master switches are located in the master switch panel in the overhead with the bus crosstie and avionics master switches. This manual refers to each of the left and right split-rocker switches as a master switch (left master switch and right master switch). Although these switches are not technically "master" switches, as they do not control the entire system, it is a common term used to prevent confusion. Each switch is a split-rocker design with the alternator switch on the left side and the battery switch on the right side. Pressing the top of the alternator portion of the split-switch turns on both switches, and pressing the bottom of the battery portion of the split-switch turns off both switches. The battery side of the switch is used on the ground for checking electrical devices and will limit battery drain since power is not required for alternator excitation. The alternator switches are used individually (with the battery on) to recycle the alternators and are turned off during load shedding.

COMPLETE LEFT OR RIGHT BUS FAILURE

General – Normally, a pilot can anticipate the onset of a complete electrical failure. Items like an alternator failure and a battery discharging state usually precedes the total loss of electrical power on the left or right bus. At the point the pilot first determines the electrical system is in an uncorrectable state of decay, appropriate planning should be initiated. Turning on the crosstie switch should restore the bus to normal operation. If turning on the crosstie switch negatively affects the good bus, the crosstie switch should be turned off and only the remaining bus should be used. The checklist should be reviewed for items that are on the failed bus and rendered inoperative. The table shown in Figure 3 - 5 lists the equipment driven by each bus.

Crosstie Switch – The crosstie switch is the white switch located between the left and right master switches. This switch is to remain in the OFF position during normal operations. The crosstie switch is only closed, or turned on, when the aircraft is connected to ground power or in the event of an alternator failure. This switch will join the left and right buses together for ground operations when connected to ground power. In the event of a left or right alternator failure, this switch will join the two buses allowing the functioning alternator to carry the load on both buses and charge both batteries.

SUMMARY OF BUSES		
Bus	**Bus Component**	**Circuit Breaker**
AVIONICS BUS	• Audio/MKR • Integrated Avionics #2 • Com #2 • Transponder • Avionics Fan • Traffic • Autopilot • MFD • Weather	5 amp 5 amp 5 amp 5 amp 3 amp 3 amp 5 amp 5 amp 3 amp
LEFT BUS	• Aileron Trim • Pitot Heat • SpeedBrakes • Rudder Limiter • Position Lights • Landing Light • Left Voltage Regulator • Fan	2 amp 7.5 amp 3 amp 5 amp 5 amp 5 amp 5 amp 5 amp
RIGHT BUS	• Strobe Lights • Taxi Light • Right Voltage Regulator • Door Seal/Power Point • Carbon Monoxide Detector • Oxygen • Display Keypad • Air Conditioning	5 amp 2 amp* 5 amp 5 amp 2 amp 3 amp 2 amp 15 amp
ESSENTIAL BUS	• PFD • Attitude Horizon • Elevator Trim • Panel Lights • Air Data Computer • Engine Airframe • Integrated Avionics #1 • Com #1 • Left Bus Relays • Fuel Pump • Stall Warning • Flaps • Standby Attitude Horizon • Right Bus Relays	5 amp 5 amp 2 amp 7.5 amp 5 amp 5 amp 5 amp 5 amp 1 amp 5 amp 2 amp 10 amp 3 amp 1 amp
BATTERY BUS	• Hobbs Meter • ELT • Courtesy Light	3 amp 3 amp 3 amp

* 5 amp for Precise Flight taxi light, S/N 42502 and on.

Figure 3 - 5

STATIC AIR SOURCE BLOCKAGE

The static source for the airspeed indicator, the altimeter, the rate of climb indicator, and encoder is located on the right side of the airplane's fuselage, between the cabin door and the horizontal stabilizer. The location of the static port is in an area of relatively undisturbed air. Because of the airplane's composite construction, the static source is less susceptible to airframe longevity error inherent with aluminum airplanes.

If the normal static source is blocked, an alternate static source, which uses pressure within the cabin, can be selected. Access for the alternate static source is on the tower to the right of the pilot's knee and is labeled ALT STATIC. To access the alternate static source, rotate the static control knob clockwise until it locks in the ALT position. When the alternate static source is in use, the indications of the airspeed indicator and altimeter will vary slightly. Airspeed calibration charts are in Section 5 and begin on page 5-3. No altimeter calibrations are shown since the error is less than 50 feet.

SPINS

The airplane, as certified by the Federal Aviation Agency, is not approved for spins of any duration. During the flight test phase of the airplane's certification, spins and/or spin recovery techniques were not performed or demonstrated. It is not known if the airplane will recover from a spin.

WARNING

Do not attempt to spin the airplane under any circumstances. The airplane, as certified by the Federal Aviation Agency, is not approved for spins of any duration. During the flight test phase of the airplane's certification, spins were not performed. It is not known if the airplane will recover from a spin.

MULTI-FUNCTION DISPLAY

If the MFD should malfunction or perform improperly, you may continue to utilize those portions of the MFD data that are not in question. Moving map errors may be associated with a RAIM alarm indicating the loss of adequate GPS position containment. Data or functions that have failed are typically removed and replaced with a red X in the appropriate area.

PRIMARY FLIGHT DISPLAY

If the malfunction results in improper information from the air data computer and/or an abnormal display of attitude information, use the standby instruments on the left side of the cockpit. The loss of air data (altitude, airspeed) is indicated by the affected indicator being removed from the display and replaced with a red X. Loss of attitude data (pitch, roll, heading) is indicated by the affected indicator being removed from the display and replaced with a red X.

Those functions that do not have a red X may still be usable.

AUTOPILOT

If the autopilot should malfunction or perform improperly, do not attempt to identify or analyze the problem. If the malfunction results in an abnormal change in the pitch and/or roll axis, immediately regain control of the airplane by the disengaging the autopilot using either the pilot's or copilot's red disengagement button located on the stick. Do not, under any circumstances, reengage an autopilot that has malfunctioned until the problem is corrected.

Loss of instruments or components of the Garmin G1000 system will affect the GFC 700 Autopilot as follows:

- Loss of the AHRS will cause the autopilot to disconnect. The autopilot will be inoperative.

- Loss of the heading function of the AHRS will result in loss of the HDG mode. If in heading mode at the time, the autopilot will revert to a basic roll mode (ROL)
- Loss of the MFD will not cause the autopilot to disconnect, and will remain engaged with limited functionality, but the autopilot cannot be re-engaged after disconnect by the pilot.
- Loss of the PFD will cause the autopilot to disconnect. The autopilot will be inoperative.
- Loss of air data computer information will cause the autopilot to disconnect. The autopilot will be inoperative.
- Loss of either GIA will cause the autopilot to disconnect. The autopilot will be inoperative.

OXYGEN SYSTEM

General – The Garmin G1000 and oxygen system have monitoring logic to notify the pilot via the PFD annunciations and aural tone if any of the following advisory conditions exist:

- The system has not been activated above approximately 12,000 ft pressure altitude.
- There is an inadequate quantity of oxygen (system pressure less than 250 psig) with the system turned on.
- The oxygen outlet pressure is not within range for proper operation.
- Low pressure at the distribution manifold (Outlet Pressure less than 16.5 psig).
- Oxygen system ON while on the ground.

Check the oxygen display on the Engine Indication page on the MFD for more detailed information.

NOTE

Failures in the breathing stations, cannulas, masks, and flow meters are not indicated on the display panel or annunciated unless it causes one of the three alarms to activate.

Failures that the pilot may rectify in flight are leaks downstream of the distribution manifold, which may consist of misadjusted or pinched flexible lines, or replacement of failed flow devices in the system. These failures can be indicated by the outlet pressure display at the bottom of the oxygen panel and by inadequate flows as indicated by the flow meter or flow indicators.

NOTE

If oxygen is flowing into the cabin and the oxygen system master softkey on the MFD will not turn the oxygen system off, the guarded overhead switch can be used to terminate the flow of oxygen to the cabin in the event of an emergency as required by the pilot.

Cabin Fire – See the discussion on page 3-21 for information on the use of oxygen after a cabin fire.

EMERGENCY EXIT

General – It is impossible to cover all the contingencies of an emergency situation. The pilot-in-command must analyze all possible alternatives and select a course of action appropriate to the situation. The discussion on the following pages is intended as a generalized overview of recommended actions and issues associated with emergency egress.

Doors – In most emergencies, the main cabin doors are used as exit points. The operation of these doors is discussed on page 7-13, and there are placards near the door handles, which explain their operation. In addition, the Passenger Briefing Card discusses the operation of the cabin doors in an emergency situation. It is important that passengers are familiar with their operation since the pilot may be incapacitated during emergency exiting operations.

Seat Belts – The seat belt should not be removed until the airplane has come to a complete stop, unless there are compelling reasons to do otherwise. At other times, such as when the airplane has come to rest in an area of treetops, leaving the belts fastened might be the best course of action. When the seat belts are removed, it is helpful if the pilot and passengers stow them in a manner that minimizes interference with airplane egress patterns.

Exiting (Cabin Door(s) Operable) – If possible, use both cabin doors as exit points. In the event of a wing fire, exit on the side away from the fire. The front seat passengers should normally exit first and then, if appropriate, render assistance to the rear seat occupants. When outside and on the wing, move to the rear of the airplane, over the trailing edge of the wing, all other things being equal. If practicable, all passengers and the pilot should have a designated congregating point. For example, 100 feet aft of the airplane.

Exiting (Cabin Doors Inoperable) – If the cabin doors are inoperable, there is a crash ax (hatchet) located under the pilot's seat that can be used to break out one of the cabin door windows. Please see the crash ax discussion on page 3-30.

INVERTED EXIT PROCEDURES

General – In emergencies where the airplane has come to rest in an inverted position, the gull wing doors will not open sufficiently to exit the airplane. If this happens, there is a crash ax below the pilot's front seat that can be used to break either of the cabin door windows. Use the following procedure.

1. Release the seat belt. The pilot should position himself or herself in a manner that minimizes injury before releasing the seat belt.
2. Remove crash ax from its holder.
3. If the airplane is situated with one wing down and touching the ground and one wing up, break the cabin door window on the up-wing side. If the wings are about level, break the door window that offers the best access. See crash ax discussion on page 3-30.
4. Exit the airplane and/or render assistance to passengers as required.

Exterior Emergency Exit Release – There is an emergency exit door hinge release that can be activated by ground personnel in the event the pilot and passengers are incapacitated. The release strap loop is located on the bottom of the airplane near the left wing saddle inside the same compartment that contains the gascolator.

It is important for the pilot to understand the procedures for using the exterior release. In some instances, the pilot may be incapacitated but conscious and able to offer verbal instructions to ground personnel. The following procedures are applicable to exterior removal of the door by ground personnel.

1. Open the gascolator compartment by pressing the two spring buttons.
2. Move the door latching mechanism of the pilot's door to the open position.
3. Pull up sharply on the emergency strap loop door hinge release.
4. Pull on the door release handle to open the door a few inches, and then move the door latching mechanism to the locked position. This will prevent the door from closing and provide an adequate handhold for removing the door.
5. Using both hands, grasp the left and right edges of the door, near the middle, and pull it away from the fuselage.
6. Rock wing to assist in the removal of the door.

WARNING

Do not pull the emergency release strap loop to test its operation. An operational test is specified during the airplane's annual inspection. If the

door release is inadvertently activated, the airplane is unsafe to fly, and an appropriately trained and certificated mechanic must rearm the system.

CRASH AX

A crash ax is located under the pilot's seat for use in the event the normal cabin and the emergency door releases cannot be used. The blade of the ax points down and is inserted in an aluminum sheath, and the unit is secured with a Velcro strip. To use the ax, open the Velcro fastener and remove the ax from its sheath.

It generally works best to strike the corner edge of the window near the doorframe. Several smart blows to the window area around the perimeter of the doorframe will remove enough pieces so that the middle portion of the window can be removed with a few heavy blows. Once the major portion of the window is removed and if time and circumstances permit, use the ax blade to smooth down the jagged edges around the doorframe. This will minimize injury when egressing the airplane through the window.

WARNING

The crash ax/hatchet is a required item for the safe operation of the airplane. It must be installed and secured in its sheath during all flight operations. Do not use the crash ax for any other purposes, such as chopping wood, since it can diminish the effectiveness of the tool.

Section 4
Normal Procedures

TABLE OF CONTENTS

Section 4
Normal Procedures

INTRODUCTION

Section 4 contains checklists for normal procedures. As mentioned in Section 3, the owner of this handbook is encouraged to copy or otherwise tabulate the following normal procedures checklists in a format that is usable under flight conditions. Plastic laminated pages printed on both sides and bound together (if more than one sheet) are preferable. The first portion of Section 4 contains various checklists appropriate for normal operations. The last portion of this section contains an amplified discussion in a narrative format.

INDICATED AIRSPEEDS FOR NORMAL OPERATIONS

The speeds tabulated below, Figure 4 - 1, provide a general overview for normal operations and are based on a maximum certificated gross weight of 3400 pounds. At weights less than maximum certificated gross weight, the indicated airspeeds are different. The pilot should refer to Section 5 for specific configuration data.

Takeoff	Flaps Setting	Airspeed
Normal Climb Out	Up Position	106-115 KIAS
Short Field Takeoff to 50 feet	Takeoff Position	78 KIAS
Climb To Altitude	**Flaps Setting**	**Airspeed**
Normal (Best Engine Cooling)	Up Position	106-115 KIAS
Best Rate of Climb at Sea Level	Up Position	106 KIAS
Best Rate of Climb at 10,000 Feet	Up Position	93 KIAS
Best Angle of Climb at Sea Level	Up Position	80 KIAS
Best Angle of Climb at 10,000 Feet	Up Position	84 KIAS
Approach To Landing	**Flaps Setting**	**Airspeed**
Normal Approach	Up Position	105-110 KIAS
Normal Approach	Down (Landing Position)	80-85 KIAS
Short Field Landing	Down (Landing Position)	78 KIAS
Balked Landing (Go Around)	**Flaps Setting**	**Airspeed**
Apply Maximum Power	Takeoff Position	88 KIAS
Apply Maximum Power	Landing Position	80 KIAS
Maximum Recommended Turbulent Air Penetration Speed	**Flaps Setting**	**Airspeed**
3400 lbs. (1542 kg)	Up Position	148 KIAS
2500 lbs. (1134 kg)	Up Position	127 KIAS
Maximum Demonstrated Crosswind Velocity*	**Flaps Setting**	**Airspeed**
Takeoff	Takeoff Position	23 Knots
Landing	Landing Position	23 Knots

* The maximum demonstrated crosswind velocity assumes normal pilot technique and a wind with a fairly constant velocity and direction. The maximum demonstrated crosswind component of 23 knots is not considered limiting. See pages 4-12, 4-24, 4-27, and 5-7 for a discussion of techniques and a computation table.

Figure 4 - 1

NORMAL PROCEDURES CHECKLISTS

PREFLIGHT INSPECTION

Figure 4-2 depicts the major inspection points, and the arrow shows the sequence for inspecting each point. The inspection sequence in Figure 4 - 2 runs in a clockwise direction; however, it does not matter in which direction the pilot performs the preflight inspection so long as it is systematic. The inspection should be initiated in the cockpit from the pilot's side of the airplane.

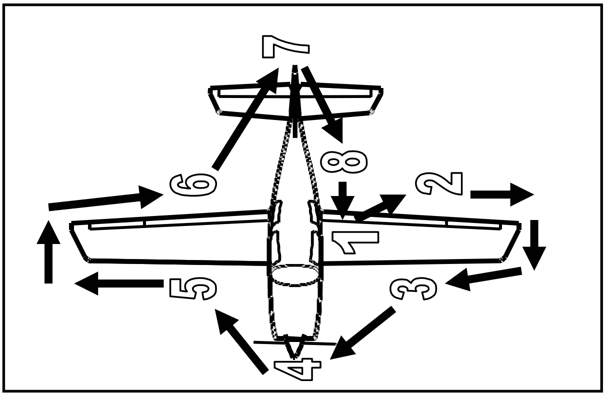


Figure 4 - 2

Area 1 (The Cabin)

1. Pitot Tube Cover — REMOVE AND STORE
2. *Required Aircraft Documents* — AVAILABLE IN THE AIRPLANE
3. Ignition Switch — OFF
4. Mixture — IDLE CUTOFF
5. Avionics Master Switch — OFF
6. Crosstie Switch — OFF
7. Left Battery Switch — ON (Press right side of split rocker switch.)
8. Right Battery Switch — ON (Press right side of split rocker switch.)
9. A/P Trim System Switch in Overhead — CHECK ON
10. Rudder Limiter — TEST (See Amplified Discussion on page 4-16.)
11. Flaps — TAKEOFF THEN LANDING POSITION
12. Trim Tabs — NEUTRAL
13. Fuel Quantity Indicators — CHECK FUEL QUANTITY
14. Fuel Annunciation— NOT DISPLAYED
15. Oxygen System— CHECK IF REQUIRED
    - 15.1. Avionics Switch — ON
    - 15.2. Oxygen System — ON, CHECK QUANTITY, ENSURE SYSTEM RETAINS PRESSURE, VERIFY PROPER OXYGEN FLOW AT ALL BREATHING DEVICES
    - 15.3. Oxygen System — OFF
    - 15.4. Avionics Switch — OFF
16. Pitot Heat, Propeller Heat, and Exterior Lights — ON AS REQUIRED, CHECK OPERATION
17. Induction Heated Air — CYCLE THEN OFF
18. Stall Warning Vane — CHECK WARNING HORN
19. Pitot Heat, Propeller Heat, and Exterior Lights— OFF
20. Left and Right Battery Switches — OFF
21. Circuit Breakers — CHECK IN

NOTE

The heated pitot housing should be warm to the touch in a minute or so, and it should not be operated for more than one to two minutes when the airplane is in the static condition. For this reason the operational check must be performed out of sequence. The pitot heat system includes a relay which will keep it from getting too hot on the ground. Full pitot heat is only available during flight.

WARNING

The pitot tube can get hot within one minute, and care must be used when touching the housing. The technique used for testing the hotness of an iron should be employed.

Area 2 (Left Wing Flap, Trailing Edge and Wing Tip)

1. Flap — CHECK (Proper extension and security of hardware.)
2. Left Wing Tie-down — REMOVE
3. Aileron — CHECK (Movement, condition, and security of hardware.)
4. Aileron Servo Tab — CHECK FOR PROPER OPERATION
5. Static Wicks (2) — CHECK FOR INSTALLATION AND CONDITION
6. Wing Tip — CHECK (Look for damage; check security of position and anti-collision lights.)

Area 3 (Left Wing Leading Edge, Fuel Tank, and Left Tire)

1. Leading Edge, Leading Edge Tape, and Stall Strips — CHECK (Look for damage.)
2. Fuel Vent — CHECK FOR OBSTRUCTIONS
3. Landing Light — CHECK (Look for lens cracks and check security.)
4. Fuel Quantity — CHECK VISUALLY AND SECURE FILLER CAP
5. Stall Warning Vane — CHECK FOR FREE MOVEMENT AND ENSURE NOT BENT
6. Wing Fuel Drain — CHECK FOR CONTAMINATION (Preceding first flight of the day or after refueling.)
7. Left Main Strut and Tire — CHECK (Remove wheel chocks, check tire for proper inflation, check gear strut for evidence of damage, bushing in place.)
8. Main Fuel Drain — CHECK FOR CONTAMINATION (Preceding first flight of the day or after refueling.)
9. Gascolator Access Door and Inspection Panels— CHECK (Security of hardware.)

Area 4 (Nose Section)

1. Left Windscreen, Cowl, and Exhaust— CHECK (Condition and security of hardware.)
2. Engine Oil — CHECK LEVEL (Maintain between 6 and 8 quarts; fill to 8 quarts for extended flights.)
3. Engine Oil Filler Cap and Accessory Door — CAP AND ACCESSORY DOOR SECURE
4. Propeller and Spinner — CHECK (Look for nicks, security, and evidence of oil leakage.)
5. Alternator Belt — CHECK (Condition and tension.)
6. Nose Wheel Strut — CHECK INFLATION (Approx. 3 to 4 inch of chrome strut must be visible.)
7. Nose Tire — CHECK (Remove wheel chocks, check tire for proper inflation.)
8. Right Windscreen, Cowl, Cabin Air Inlet, and Exhaust — CHECK (Condition, no obstructions, and security of hardware.)

Area 5 (Right Wing Leading Edge, Fuel Tank, and Right Tire)

1. Wing Fuel Drain — CHECK FOR CONTAMINATION (Preceding first flight of the day or after refueling.)
2. Right Main Strut and Tire — CHECK (Remove wheel chocks, check tire for proper inflation, check gear strut for evidence of damage, bushing in place.)

3. Leading Edge, Leading Edge Tape, and Stall Strips — CHECK (Look for damage.)
4. Fuel Quantity — CHECK VISUALLY AND SECURE FILLER CAP
5. Fuel Vent — CHECK FOR OBSTRUCTIONS
6. Pitot Tube — CHECK FOR OBSTRUCTIONS

Area 6 (Right Wing Tip, Trailing Edge, Wing Flap, and Right Fuselage Area)

1. Wing Tip — CHECK (Look for damage; check security of position and anti-collision lights.)
2. Aileron — CHECK (Movement, condition, and security of hardware.)
3. Aileron Trim Tab — CHECK FOR NEUTRAL POSITION
4. Static Wicks (2) — CHECK FOR INSTALLATION AND CONDITION
5. Right Wing Tie-down — REMOVE
6. Flap — CHECK (Visually check for proper extension and security of hardware.)
7. Antennas Bottom of Fuselage — CHECK FOR SECURITY
8. Static Port — CHECK FOR BLOCKAGE

Area 7 (Tail Section)

1. Leading Edge of Horizontal and Vertical Surfaces — CHECK (Look for damage.)
2. Leading Edge Tape — CHECK (Attached and in good condition.)
3. Antennas Vertical Stabilizer — CHECK FOR SECURITY
4. Rudder/Elevator Hardware — CHECK (General condition and security.)
5. Rudder Surface — CHECK (Freedom of movement.)
6. Fixed Elevator Surfaces — CHECK SECURE, CHECK CLEARANCE TO RUDDER TO FULL DEFLECTION
7. Elevator Surface — CHECK (Freedom of movement.)
8. Elevator Trim Tab — CHECK FOR NEUTRAL POSITION
9. Static Wicks (5) — CHECK FOR INSTALLATION AND CONDITION
10. Tail Tie-Down — REMOVE

Area 8 (Aft Fuselage and Cabin)

1. Baggage Door — CHECK CLOSED AND LOCKED
2. Fire Extinguisher — CHECK FOR PRESENCE AND SECURITY
3. Crash Ax/Hatchet – CHECK FOR PRESENCE AND SECURITY

BEFORE STARTING ENGINE

1. Preflight Inspection — COMPLETE
2. Fresh Air Vents — CLOSED FOR ENGINE START
3. Seat Belts and Shoulder Harnesses — SECURE (Stow all unused seat belts.)
4. Fuel Selector — LEFT OR RIGHT TANK
5. Avionics Master Switch — OFF
6. Crosstie Switch — VERIFY OFF
7. Brakes — TESTED AND SET
8. Circuit Breakers — CHECK IN
9. Oxygen Masks and Cannulas — CHECK (Kinks in hose, rips or tears.)
10. Passenger Briefing Card — ADVISE PASSENGERS TO REVIEW

CAUTION

There is a significant amount of electric current required to start the engine. For this reason, the avionics master switch must be set to the OFF position during starting to prevent possible serious damage to the avionics equipment.

STARTING COLD ENGINE

1. Mixture — RICH
2. Propeller — HIGH RPM
3. Vapor Suppression — OFF
4. Induction Heated Air — OFF
5. Throttle — CLOSED, THEN OPEN APPROXIMATELY ONE INCH
6. Left and Right Battery Switches — ON
7. Anti-Collision/Position Lights — ON AS REQUIRED
8. Primer Switch — PUSH IN (Approximately 5 seconds.)
9. Throttle — CLOSED THEN OPEN ½ INCH
10. Check Propeller Area — CLEAR (Ensure people/equipment are not in the propeller area.)
11. Ignition Switch — START
12. Throttle — ADJUST IDLE (900 to 1000 RPM)
13. Oil Pressure— CHECK (Ensure the oil pressure gauge reads between 30 to 60 psi.)

CAUTION

If no oil pressure is noted within 30 seconds, shut down the engine and investigate the cause. Operating the engine without oil pressure may result in engine malfunction or stoppage.

14. Left and Right Alternator Switches— ON

STARTING HOT ENGINE

1. Mixture — IDLE CUTOFF
2. Propeller — HIGH RPM
3. Throttle — CLOSED
4. Induction Heated Air — OFF
5. Left and Right Battery Switches — ON
6. Anti-Collision/Position Lights — ON AS REQUIRED
7. Vapor Suppression — ON FOR 30 TO 60 SECONDS THEN OFF
8. Mixture — RICH
9. Primer Switch — PUSH IN (Approximately 3 seconds.)
10. Throttle — CLOSED, THEN OPEN APPROXIMATELY ¼ INCH OR FULL OPEN
11. Check Propeller Area — CLEAR (Ensure people/equipment are not in the propeller area.)
12. Ignition Switch — START

NOTE

It may be necessary to leave the vapor suppression on during starting (steps 7 – 10) and turn it off approximately one minute after engine start. If the engine is only moderately warm it may be necessary to push the primer switch for a few seconds before starting.

13. Throttle — IDLE (900 to 1000 RPM)
14. Oil Pressure — CHECK (Ensure the oil pressure gauge reads between 30 to 60 psi.)
15. Left and Right Alternator Switches — ON

STARTING ENGINE WITH GROUND POWER CART

CAUTION

When starting with a ground power cart, the battery conditions cannot be monitored during the start cycle. Do not start the engine if both batteries are completely dead. Recharge or replace the batteries if weak or dead; before flight.

1. Left and Right Master Switches — VERIFY OFF
2. Check Propeller Area — CLEAR (Ensure people/equipment are not in the propeller area.)
3. Auxiliary Power — CONNECTED AND ON (Use a 24 volt DC source.)
4. Crosstie Switch — ON
5. Aircraft Buses — VERIFY POWERED UP (Do not turn on the BATT or ALT Switch.)
6. Anti-Collision/Position Lights — ON AS REQUIRED
7. Mixture — RICH
8. Propeller — HIGH RPM
9. Vapor Suppression — OFF
10. Induction Heated Air — OFF
11. Throttle — CLOSED, THEN OPEN APPROXIMATELY ONE INCH
12. Primer Switch — PUSH IN (Approximately 5 seconds.)
13. Throttle — CLOSED, THEN OPEN ½ INCH
14. Check Propeller Area — CLEAR (Ensure people/equipment are not in the propeller area.)
15. Ignition Switch — START

CAUTION

If the engine starter is engaged for 30 seconds and the engine will not start, release the starter switch, and allow the starter motor to cool for three to five minutes. Release the starter as soon as the engine fires. Never engage the starter while the propeller is still turning.

CAUTION

The master switches should not be turned on until after the engine has started and the ground power plug has been removed.

16. Throttle — ADJUST IDLE (900 TO 1000 RPM)
17. Oil Pressure — CHECK (Ensure oil pressure gauge reads between 30 to 60 psi.)
18. Auxiliary Power — SIGNAL LINE SERVICE TO TURN OFF AND DISCONNECT
19. Crosstie Switch — OFF
20. Left and Right Master Switches — ON
21. Before Moving — CLEAR (Wait for the line service technician to clear you to move.)
22. Left and Right Alternator Switches — ON

AFTER ENGINE START

1. Avionics Master Switch — ON
2. Engine Indication Systems — CHECK
3. Ammeters — CHECK (Ensure the alternator annunciation message is not displayed and the ammeters are indicating the left and right batteries are charging.)
4. MFD Fuel Remaining — INITIALIZE
5. Radios and Required Avionics — SET AS REQUIRED
   - 5.1. COM Radios — SET
   - 5.2. NAV Radios — SET
   - 5.3. PFD and Backup Altimeters — SET
   - 5.4. FMS Flight Plan — LOADED

5.5. Altitude and Heading Bugs — SET
5.6. Transponder — SET CODE

CROSSTIE OPERATION

1. Environmental Control System (ECS) — OFF
2. Left Master Switch — OFF (Ensure the essential and avionics buses are energized.)
3. L BUS OFF Annunciation — DISPLAYED
4. Crosstie Switch — ON (Ensure the right ammeter is showing charge and load increase for left and right buses.)
5. L BUS OFF Annunciation — CLEARS
6. Crosstie Switch — OFF
7. Left Master Switch — ON
8. Right Master Switch — OFF (Ensure the essential and avionics buses are energized.)
9. R BUS OFF Annunciation — DISPLAYED
10. Crosstie Switch — ON (Ensure the left ammeter is showing charge and load increase for left and right buses.)
11. R BUS OFF Annunciation — CLEARS
12. Crosstie Switch — OFF
13. Right Master Switch — ON
14. Environmental Control System (ECS) — USE AS DESIRED

SPEEDBRAKE™ GROUND OPERATIONS

1. SpeedBrake™ Switch — ON/UP POSITION
2. Rudder Limiter — TEST (Ensure SpeedBrakes™ have stowed after the Rudder Limiter annunciation has displayed.)
3. SPEED BRAKES Annunciation — DISPLAYED
4. SpeedBrake™ Switch — OFF/DOWN POSITION (Ensure both SpeedBrakes™ are retracted.)
5. SPEED BRAKES Annunciation — CLEARS

NOTE

The SpeedBrake™ system should be functionally checked for proper operation prior to flight. The independent electrical clutches need to be synchronized by SpeedBrake™ activation before flight and/or after SpeedBrake™ circuit breaker pull. If the SpeedBrakes™ remain slightly extended, it indicates SpeedBrake™ failure and the SpeedBrake™ circuit breaker should be pulled.

AUTOPILOT AUTOTRIM OPERATIONS

1. Autopilot — ENGAGE
2. Control Stick — APPLY FORWARD PRESSURE TO OVERRIDE PITCH SERVO
3. Control Stick — APPLY SIDE PRESSURE TO OVERRIDE ROLL SERVO
4. Electric Trim Switch — MOVE UP AND DOWN, ENSURE AUTOPILOT DISCONNECTS (Trim should operate in the commanded direction.)
5. Autopilot — ENGAGE
6. Depress Autopilot Disconnect/Trim Interrupt Switch on Control Stick — ENSURE AUTOPILOT DISCONNECTS (Ensure all controls for freedom of motion and ensure the autopilot is disconnected.)

WARNING

If the Autotrim fails any portion of the above check procedures, do not attempt to use the autopilot pitch axis until the fault is corrected.

GROUND OPERATION OF AIR CONDITIONING

1. Control Head — SELECT MODE AND TEMPERATURE DESIRED
2. Engine RPM — KEEP RPM AT OR ABOVE 1000 RPM
3. Ammeters — MONITOR BATTERIES (Decrease electrical load if a discharge is displayed.)

BEFORE TAXI

1. Engine Instruments — CHECK (Within proper ranges.)
2. Fuel Gauges — CHECK PROPER INDICATION
3. Ammeters — CHARGING
4. Wing Flaps — TAKEOFF THEN UP (Cruise Position)
5. Radio Clearance — AS REQUIRED
6. Taxi Light — AS REQUIRED
7. Brakes — RELEASE

TAXIING

1. Brakes — CHECK FOR PROPER OPERATION
2. PFD and Standby Flight Instruments — CHECK FOR PROPER OPERATION
3. Rate Of Turn Indicator — CHECK FOR PROPER OPERATION
4. Horizontal Situation Indicator (HSI) — CHECK FOR PROPER OPERATION

BEFORE TAKEOFF

1. Runup Position — MAXIMUM HEADWIND COMPONENT
2. Parking Brake/Foot Brakes — SET or HOLD
3. Flight Controls — FREE AND CORRECT
4. Crosstie Switch — VERIFY OFF
5. Autopilot (A/P) Trim System Switch in Overhead— VERIFY ON
6. Autopilot — VERIFY DISENGAGED
7. Trim Tabs — SET FOR TAKEOFF
8. PFD and Backup Flight Instruments — CROSSCHECK AND SET
9. Fuel Selector — SET OUT OF DETENT (Ensure that 2 seconds after the annunciation displays the aural warning is played.)
10. Alerts Softkey on PFD — PRESS (Ensure aural warning stops.)
11. Fuel Selector — SET TO FULLER TANK
12. Cabin Doors — CLOSED AND LATCHED (Verify that red annunciation message is not displayed.)
13. Passenger Side Door Lock — IN THE UNLOCKED POSITION
14. Engine Runup — OIL TEMPERATURE CHECK (Above 75°F)
15. Throttle — 1700 RPM
16. Ignition Switch — L POSITION (25 RPM drop minimum, 150 RPM drop maximum, EGTs should rise.)
17. Ignition Switch — R POSITION (25 RPM drop minimum, 150 RPM drop maximum, 50 RPM difference between L and R, EGTs should stay stable.)
18. Ignition Switch — R/L POSITION (EGTs should drop.)
19. Propeller — CHECK OPERATION (Cycle two or three times with a 300 to 500 RPM drop.)
20. Engine Instruments and Ammeter — CHECK (Within proper ranges.)
21. Batteries—VERIFY CHARGE CONDITION BEFORE TAKEOFF (At 1700 RPM, the battery charge rate should be less than 10 amps for each battery.)
22. Throttle — VERIFY IDLE THEN 900 TO 1000 RPM
23. Illuminated Switch Bulb Test — ALL LAMPS ILLUMINATED

24. Radios — SET, CROSSCHECK NAV INDICATORS
25. Flight Director — AS REQUIRED
26. Transponder — VERIFY CODE
27. Wing Flaps — TAKEOFF POSITION
28. SpeedBrake™ Switch — VERIFY OFF/DOWN POSITION
29. Doors — LATCHED AND DETENTED
30. PFD Annunciation Window — ALL MESSAGES ADDRESSED
31. Door Seals — ON
32. Backup Fuel Pump — ARMED
33. Oxygen Switch — ON
34. Mask or Cannula — DON
35. Flowmeters — CHECK AND ADJUST TO PLANNED CRUISE ALTITUDE (Ensure that the internal metering ball moves freely and oxygen is flowing to the delivery devices.)
36. Time — NOTED
37. Brakes — RELEASE

WARNING

The absence of RPM drop when checking magnetos may indicate a malfunction in the ignition circuit resulting in a hot magneto, i.e., one that is not grounding properly. Should the propeller be moved by hand (as during preflight inspection) the engine might start and cause death or injury. This type of malfunction must be corrected before operating the engine.

CAUTION

Do not underestimate the importance of pre-takeoff magneto checks. When operating on single ignition, some RPM drop should always occur. Normal indications are 25 to 75 RPM and a slight engine roughness as each magneto is switched off. A drop in excess of 150 RPM may indicate a faulty magneto or fouled spark plugs.

NOTE

When checking the oxygen flowmeter, the reading is taken at the midpoint of the ball. Ensure the flowmeter is held vertically when adjusting flow rate or reading.

MINOR SPARK PLUG FOULING (Minor plug fouling can usually be cleared as follows.)

1. Brakes — HOLD BRAKES MANUALLY
2. Throttle — 2200 RPM
3. Mixture — ADJUST FOR MAXIMUM PERFORMANCE (Move towards idle cutoff until RPM peaks, and hold for 10 seconds. Return mixture to full rich.)
4. Throttle — 1700 RPM
5. Magnetos — RECHECK (50 RPM difference with a maximum drop of 150 RPM.)
6. Throttle — IDLE (900 to 1000 RPM)

CAUTION

Do not operate the engine at a speed of more than 2000 RPM longer than necessary to test engine operations and observe engine instruments. Proper engine cooling depends on forward speed. Discontinue testing if temperature or pressure limits are approached.

NORMAL TAKEOFF

1. Landing/Taxi Lights — AS REQUIRED
2. Mixture — AS REQUIRED
3. Pitot Heat and Propeller Heat — AS REQUIRED
4. Throttle — ADVANCE SLOWLY TO FULL POWER (2700 RPM)
5. Elevator Control — LIFT NOSE AT 75 KIAS
6. Climb Speed — ACCELERATE TO CLIMB SPEED OF 115 KIAS
7. Wing Flaps — RETRACT (At 400 feet AGL, and at or above 95 KIAS.)

SHORT FIELD TAKEOFF (Complete "BEFORE TAKEOFF" checklist first)

1. Landing/Taxi Lights — AS REQUIRED
2. Wing Flaps — TAKEOFF POSITION
3. Brakes — APPLY
4. Mixture — AS REQUIRED
5. Backup Fuel Pump — ARMED
6. Throttle — ADVANCE SLOWLY TO FULL POWER (2700 RPM)
7. Brakes — RELEASE
8. Elevator Control — MAINTAIN LEVEL NOSE ATTITUDE
9. Rotate Speed — 65 KIAS
10. Climb Speed — 78 KIAS
11. Wing Flaps — RETRACT (At 400 feet AGL, and at or above 95 KIAS.)

NOTE

If usable runway length is adequate, it is preferable to use a rolling start to begin the takeoff roll as opposed to a standing start at full power. Otherwise, position the airplane to use all of the runway available.

CROSSWIND OPERATIONS

Crosswind takeoffs and landings require a special technique but not specific procedures and, as such, do not require a dedicated checklist. Please see the amplified discussion on pages 4-24 and 4-28 for applicable crosswind techniques.

NOTE

If the cross control method is used during a crosswind approach, the resulting slight sideslip causes the airspeed to read up to 5 kts higher or lower, depending on the direction of the sideslip.

NORMAL CLIMB

1. Airspeed — 115 KIAS (See cruise climb discussion on page 4-24.)
2. Power Settings — ADJUST AS NECESSARY
3. Fuel Selector — SET TO RIGHT OR LEFT TANK
4. Mixture — AS REQUIRED (See discussion on page 4-25.)
5. Backup Fuel Pump — ARMED
6. Landing/Taxi Lights — AS REQUIRED

MAXIMUM PERFORMANCE CLIMB

1. Airspeed — 106 to 93 KIAS (Sea level and 10,000 feet, respectively.)
2. Power Settings — 2700 RPM AND FULL THROTTLE
3. Fuel Selector — SET TO RIGHT OR LEFT TANK (As appropriate.)
4. Mixture — NEAR OR AT FULL RICH
5. Backup Fuel Pump — ARMED

CRUISE

1. Throttle — SET AS APPROPRIATE TO ACHIEVE 80% POWER OR LESS (Refer to the cruise performance charts.)
2. Propeller — SET AS APPROPRIATE TO ACHIEVE 80% POWER OR LESS (Refer to the cruise performance charts.)
3. Mixture — LEAN AS REQUIRED (Use the EGT gauge or performance charts in Section 5.)
4. Backup Fuel Pump — OFF
5. Changing Fuel Tanks — PERFORM STEPS 5.1 AND 5.2.
   - 5.1. Vapor Suppression — SET TO ON DURING FUEL TANK CHANGEOVERS
   - 5.2. Fuel Selector — CHANGE AS REQUIRED (The maximum permitted fuel imbalance is 10 gallons (38 L).)
6. Landing/Taxi Lights — AS REQUIRED
7. Oxygen Quantity — CHECK PERIODICALLY (Approximately every 20 minutes.)
8. Oxygen Outlet Pressure — CHECK PERIODICALLY (Approximately every 20 minutes.)
9. Flowmeter or Flow Indicator — CHECK PERIODICALLY FOR OXYGEN FLOW (Approximately every 10 minutes.)
10. Altitude Change — ADJUST FLOW DEVICES TO NEW ALTITUDE
11. Physiological Requirement — ADJUST FLOW DEVICE TO HIGHER ALTITUDE

NOTE

The vapor suppression must be turned on before changing the selected fuel tank. After proper engine operations are established, the pump is turned off.

When changing power, the sequence control usage is important. To increase power, first increase mixture (not necessarily to full rich), then increase RPM with the propeller control and then increase manifold pressure with the throttle control. To decrease power, decrease manifold pressure first with the throttle control and then decrease RPM with the propeller control.

DESCENT

1. Fuel Selector — SET TO RIGHT OR LEFT TANK (As appropriate.)
2. Power Settings — AS REQUIRED
3. Mixture — AS REQUIRED
4. Backup Fuel Pump — OFF
5. PFD and Backup Altimeters — SET
6. Altitude Bug — SET
7. Landing/Taxi Lights — AS REQUIRED

APPROACH

1. Approach — LOADED INTO FLIGHTPLAN
2. PFD Baro Min — SET
3. GPS Raim/Map Integrity — VERIFY
4. PFD OBS/SUSP Softkey — REVIEW and BRIEF USAGE DURING APPROACH
5. PFD CDI Softkey — SELECT NAV SOURCE
6. Nav aids —TUNED AND IDENTIFIED
7. Approach Course — SET
8. Mixture — AS REQUIRED

NOTE

Passing FAF, new course may be needed.

BEFORE LANDING

1. Seat Belts and Shoulder Harnesses — SECURE (Both pilot and passengers.)
2. Mixture — AS REQUIRED
3. Fuel Selector — SET TO RIGHT OR LEFT TANK (As appropriate.)
4. Backup Fuel Pump — OFF
5. Propeller — HIGH RPM
6. Autopilot — DISENGAGED (If applicable.)

NORMAL LANDING

1. Approach Airspeed — AS REQUIRED FOR CONFIGURATION
   Flaps (Cruise Position) .... 95 to 100 KIAS
   Flaps (Takeoff Position) .... 90 to 95 KIAS
   Flaps (Landing Position) .... 85 to 90 KIAS
2. Trim Tabs — ADJUST AS REQUIRED
3. Touchdown — MAIN WHEELS FIRST
4. Landing Roll — GENTLY LOWER NOSE WHEEL
5. Braking — AS REQUIRED

SHORT FIELD LANDING (Complete "BEFORE LANDING" Checklist first)

1. Wing Flaps — LANDING POSITION
2. Initial Approach Airspeed — 90 KIAS
3. Minimum Approach Speed — 78 KIAS
4. Trim Tabs — ADJUST AS REQUIRED
5. Power — REDUCE AT THE FLARE POINT
6. Touchdown — MAIN WHEELS FIRST
7. Landing Roll — LOWER NOSE WHEEL SMOOTHLY AND QUICKLY
8. Braking and Flaps — APPLY HEAVY BRAKING AND RETRACT FLAPS (Up position.)

BALKED LANDING (Go Around)

1. Throttle — FULL (At 2700 RPM)
2. SpeedBrake™ Switch — OFF/DOWN POSITION
3. Wing Flaps — TAKEOFF POSITION
4. Airspeed — 80 KIAS
5. Climb — POSITIVE (Establish Positive Rate of Climb.)
6. Backup Fuel Pump — ARM
7. Wing Flaps — RETRACT (At 400 feet AGL and at or above 95 KIAS.))

AFTER LANDING

1. Wing Flaps — UP (Cruise Position)
2. SpeedBrake™ Switch — OFF/DOWN POSITION
3. Door Seal, Pitot Heat, and Propeller Heat — OFF
4. Transponder — VERIFY STANDBY/GROUND MODE
5. Landing/Taxi Lights — AS REQUIRED
6. Time — NOTE

SHUTDOWN

1. Parking Brake — SET
2. Throttle — IDLE (900 to 1000 RPM)
3. Oxygen System — OFF
4. ELT — CHECK NOT ACTIVATED
5. Trim Tabs — SET TO NEUTRAL
6. Avionics Master Switch — OFF (Ensure shutdown.)
7. Electrical/Environmental Equipment — OFF

8. Mixture — IDLE CUTOFF
9. Left and Right Master Switches — OFF
10. Ignition Switch — OFF (After engine stops.)
11. Anti-Collision/Position Lights — OFF

AMPLIFIED PROCEDURES

PREFLIGHT INSPECTION

The purpose of the preflight inspection is to ascertain that the airplane is physically capable of completing the intended operation with a high degree of safety. The weather conditions, length of flight, equipment installed, and daylight conditions, to mention a few, will dictate any special considerations that should be employed.

For example, in cold weather, the pilot needs to remove even small accumulations of frost or ice from the wings and control surfaces. Additionally, the hinging and actuating mechanism of each control surface must be inspected for ice accumulation. If the flight is initiated in or will be completed at nighttime, the operation of the airplane's lighting system must be inspected. Flights at high altitude have special oxygen considerations for the pilot and passengers. Clearly, a pilot must consider numerous special issues depending on the circumstances and conditions of flight. The preflight checklist provided in this handbook covers the minimum items that must be considered. Other items must be included as appropriate, depending on the flight operations and climatic conditions.

Wing Flaps – Extending the wing flaps as part of the preflight routine permits inspection of the attachment and actuating hardware. The pilot can also roughly compare that the flaps are equally extended on each side. The flaps are not designed to serve as a step. Stepping on the flaps places unnatural loads in excess of their design and can cause damage. If the flaps are extended during the preflight inspection, it is unlikely that an uninformed passenger will use them as a step.

Aileron Servo Tab – The aileron servo tab on the trailing edge of the left aileron assists in movement of the aileron. The servo tab is connected to the aileron in a manner that causes the tab to move in a direction opposite the movement of the aileron. The increased aerodynamic force applied to the tab helps to move the aileron and reduces the level of required force to the control stick. During the preflight inspection, it should be noted that movement of the left aileron, up or down, produces an opposite movement of the servo tab. When the aileron is in the neutral position, the servo tab should be neutral.

Rudder Limiter Test – There is a press-to-test feature for the rudder limiter located in the overhead console below the A/P TRIM switch. This is the same switch that is used to verify operation of all LEDs associated with the flaps panel and 5 pack switches. This test of the rudder limiter is done in the cockpit during the preflight inspection. However, the test only confirms that the solenoid operates when power is applied. It does not check the logic of the system and its interface with the stall warning microswitch and the manifold pressure gauge. To verify operation of the total system, the stall warning microswitch is held in the up position for two to three seconds. The aural stall warning tone will be heard immediately followed by an audible "click" of the rudder limiter solenoid. See page 7-43 for more information on the stall warning system.

Fuel Drains – The inboard section of each tank contains a fuel drain near the lowest point in each tank. The fuel drain operates with a typical sampling device and can be opened intermittently for a small sample or it can be locked open to remove a large quantity of fuel. The accessory door for the gascolator/fuel strainer is located under the fuselage, on the left side, near the wing saddle. It is a conventional drain device that operates by pushing up on the valve stem. The access door in this area must be opened to access the gascolator.

During the preflight inspection, the fuel must be sampled from each drain before flying to check for the proper grade of fuel, water contamination and fuel impurities. The test must be performed before the first flight of the day and after each refueling. If the system has water contamination, it will form as a bubble in the bottom of the collection reservoir while sediment appears as floating specks. If fuel grades are mixed, the sample will be colorless. If contamination is detected, continue to draw fuel until the samples are clear. If fuel grades were mixed, the entire fuel system may require draining. See page 8-7 for an expanded discussion of fuel contamination.

Fuel Vents – The airplane has a fuel vent for each wing tank. The vents are wedge shaped recesses built into an inspection cover. They are located under each wing approximately five feet inboard from the wing tip. The vents are installed to ensure that air pressure inside the tank is the same as the outside atmospheric pressure. The vents should be open and free of dirt, mud, and other types of clogging substances.

FUEL SELECTOR

The fuel system design does not favor the use of one fuel tank over the other. The various checklists used in this manual specify “Set to Left or Right Tank.” During takeoff and landing operations, it is recommended that the fuel selector be set to the fuller tank if there are no compelling reasons to do otherwise. Under low fuel conditions, selecting the fuller tank may provide a more positive fuel flow, particularly in turbulent air. The vapor suppression must be operated while changing the selected fuel tank. However, switching the fuel tanks at low altitudes above the ground is normally not recommended unless there is a compelling reason to do otherwise.

When a tank is selected and the selector is properly seated in its detent, one of two blue dots on the fuel indicator illuminate to indicate which tank is selected. If a dot is not illuminated, then the selector handle is not properly seated in the detent. In addition, if the fuel selector is not seated or is in the OFF position, a red FUEL VALVE indication is displayed on the PFD annunciation window.

FUEL QUANTITY

The Cessna 350 fuel quantity measuring system described on page 7-32 provides a fairly accurate indication of the onboard fuel. The system has two sensors in each tank, and flat spots in the indicating system are minimized. Still, the gauges must never be used in place of a visual inspection of each tank. A raised metal tab is installed in the bottom of each tank, directly below the filler neck, which limits inadvertent damage to the bottom of the tank from a fuel nozzle. A cutout in the tab allows observation of fuel level below the tab. For S/N 42502 to 42567, the top of the tab corresponds to a fuel quantity in the tank of approximately 25 gallons US (95 L). For S/N 42568 and on, the tab has two steps, the tops of which correspond to a usable quantity of fuel in the tank of approximately 27 gallons US (102 L) for the lower step and 43 gallons US (163 L) for the upper step, respectively.

These tabs provide the pilot with an approximate indication of fuel quantity. However, the best procedure for establishing the precise quantity of fuel is by having empty tanks filled to the level of the tabs from a metered fuel supply. For fuel quantities above the level of the tabs, a measuring stick can be made that indicates precise quantities.

Since the tab is directly below the filler hole, it is suggested that the measuring stick be placed on these tabs when this procedure is used to determine fuel quantity. Of course, this means that it is not possible to visually sample levels less than indicated by the lowest tab. However, setting a sampling device in the tanks at an angle to avoid the tabs will skew indications on the stick. If such a stick is made, it must be of sufficient length to preclude being dropped into the tank.

Here are a few final suggestions regarding the measuring stick. (1) Marks on the stick should be etched into the wood or labeled with a paint that is impermeable to aviation fuel. (2) Remember, that sticking the tanks may not be a precise indication, and a margin for safety should be added. (3) It is a good idea to make a reference mark at the top of the measuring device that indicates the position of the top of the filler neck. If the reference mark on the stick goes below the tank neck when it is inserted in the tank, the measuring stick is resting on the bottom of the tank, rather than on the tab.

STATIC WICKS

The static wicks are designed to discharge accumulated static electricity created by the airplane's movement through the air. Because the Cessna 350 (LC42-550FG) cruises at high speeds, the wicks are the solid type with a carbon interior and a plastic exterior. The static wick can be broken without obvious exterior indications. To check the wick's integrity, hold its trailing edge between the thumb and forefinger, and gently move it left and right about two inches. If the unit flexes at point A as shown in Figure 4 - 3, the wick is broken and should be replaced.

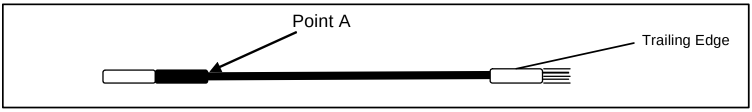


Figure 4 - 3

In some instances, the owners and/or operators prefer to remove the wicks after each flight to prevent breakage during storage. If the wicks are removed, they must be reinstalled before each flight. Flight without the wicks can cause the loss of, or problems with communications and navigation. See Section 7, page 7-52 for more information.

BEFORE STARTING ENGINE

Fresh Air Vents – The fresh air eyeball vents for all unoccupied seats shall be closed when the pilot is the only person in the airplane. This is because, in the event of an engine fire, all ventilation must be turned off. Turning off inaccessible fresh air ventilation while attending to the demands of the emergency makes the situation more difficult.

Three Point Restraints (Seat Belts and Shoulder Harnesses) – The pilot-in-command is usually diligent about securing his or her restraint device; however, it is important to ensure that each passenger has their belt properly fastened. The lower body restraints on all seats are adjustable. However, they may not be similar to airline or automotive restraint devices. A passenger may have the seat belt fastened but not properly adjusted. See page 7-12 for a detailed discussion. The use of seat belts is also explained on the Passenger Briefing Card.

Stow the restraint devices on unoccupied seats to prevent fouling during emergency exiting of the airplane. Unoccupied rear seat restraints should be drawn to the smallest size possible and the male and female ends of the buckle engaged in the rear seat positions. The front seat passenger restraint buckle must not be engaged, even if the seat is unoccupied.

Child Restraints – The use of seat belts and child restraint systems (car seats) for children and infants is somewhat more complicated. The FARs state that a child may be held by an adult who is occupying an approved seat, provided that the person being held has not reached his or her second birthday and does not occupy or use any restraining device. If a restraining device is used, the FARs require a type approved under one of the following conditions.

1. Seats manufactured to U.S. standards between January 1, 1981, and February 25, 1985 must bear the label: "This child restraint system conforms to all applicable federal motor vehicle safety standards."
2. Seats manufactured to U.S. standards on or after February 26, 1985 must bear two labels: "This child restraint system conforms to all applicable federal motor vehicle safety standards" and "This restraint is certified for use in motor vehicles and aircraft" in red lettering.
3. Seats that do not meet the above requirements must bear either a label showing approval of a foreign government or a label showing that the seat was manufactured under the standards of the United Nations.

Approved child restraint systems usually limit the maximum child weight and height to 40 lbs. (18 kg) and 40 inches (102 cm), respectively. Placing higher weights in the seat exceeds the intended design of the child restraint system, and the only alternative is use of a passenger seat restraint. However, use of the diagonal torso restraint for a small child presents special issues since the shoulder strap may not fit across the child's shoulder and upper chest.

For a child under 55 inches (140 cm) tall, The Academy of Pediatrics (AOP) recommends the use of a lap belt, and to put the shoulder strap behind the child. This is not as protective as an adjustable lap/shoulder combination would be. In fact, use of the lap belt alone has been associated with a number of different injuries. According to the AOP, the least desirable alternative is to put the shoulder strap under one arm.

ENGINE STARTING

Normal Starting – Under normal conditions there should be no problems with starting the engine. The most common pilot mistake is over-priming of the engine. The engine is primed by introducing fuel to the intake ports. The start should then be initiated immediately. As the engine starts it is important to advance the throttle slowly to maintain the proper fuel-air mixture. Abnormal atmospheric conditions require special procedures and techniques for starting the airplane. Please refer to Warm and Cold Weather Operations later in this section, which begins on page 4-30.

Under Priming – If the engine does not start in three or four revolutions of the propeller, the engine may not be adequately primed. This condition is also characterized by seemingly normal smokeless start of four or five revolutions of the propeller followed by a sudden stop, as though the mixture were in idle cutoff. When the engine first starts to quit, hold the primer switch on for a few seconds until the engine runs smoothly. If this does not work, the cause of the excessively lean mixture after starting may be related to an assortment of atmospheric conditions rather than improper priming procedures. Repeat the starting procedure but allow a few extra seconds of priming.

Over Priming – If the engine starts intermittently and is followed by puffs of black smoke, over priming is the most likely cause. The black smoke means the mixture is too rich and the engine is burning off the excess fuel. The condition also occurs in hot weather where the decreased air density causes an excessive rich mixture. If this should happen, ensure that the vapor suppression and backup fuel pump are off, set the mixture to idle cutoff, advance the throttle to full, and restart the engine. When the engine starts, advance the mixture to full rich and reduce the throttle setting to idle.

CAUTION

Over priming can cause a flooded intake resulting in a hydrostatic lock and subsequent engine malfunction or failure. If the engine is inadvertently or accidentally over primed, allow all the fuel to drain from the intake manifold before starting the engine.

BATTERY RECHARGING

Ground Power Operations – A ground power unit can be connected to the airplane in the event the normal battery system is inoperative or inadequate. An inoperative battery could occur if the master switches were not secured at the end of the previous flight or in very cold weather. The battery master and crosstie switches must be turned on when using a ground power unit to charge the batteries. The ammeter must be monitored when recharging the batteries, as damage to the batteries can occur if the voltage from the ground power unit is too high. The ground power unit voltage must not exceed 28 VDC. The initial surge current for charging should not exceed 30 Amps within 1 minute and the continuous charging current thereafter should be below 10 Amps. The battery master and crosstie switches must be turned off before removing the ground power plug; if the switches are on, the cables to the plug will stay energized. If one, or both, of the batteries is completely dead, the master relay will not energize for ground power charging. In this case the battery(ies) must be removed for charging.

A battery charging circuit has been added to the power grid on aircraft built mid 2007, or is available for retrofit, that will energize the battery relays and allow ground power charging of flat or discharged batteries without removing the battery(ies) from the aircraft. The circuit does not affect the operation of the master and crosstie switches.

Use the following procedure to charge the batteries using a ground power unit (GPU):

1. Connect the GPU.
2. Both battery master switches then crosstie switch – ON
3. Turn on the GPU.
4. Once batteries are charged, both battery master switches and crosstie switch – OFF
5. Disconnect the GPU.

NOTE

Batteries that are suspected to be bad must be removed from the aircraft and serviced or replaced. See Chapter 24 of the Maintenance Manual for battery testing and maintenance procedures.

CAUTION

The ammeter must be monitored when recharging the batteries, as damage to the batteries can occur if the voltage from the ground power unit is too high.

Left Battery Inoperative – If the flip lights are inadvertently left on for an extended period of time, the left battery will drain. In this event one of two procedures can be used to recharge the battery.

NOTE

When observing the recharging progress of a battery, two things should be considered. If the ammeter continuously has a high indication with little or no decrease in the charging amperage, the battery has a short. If the ammeter continuously indicates zero, the battery has an open cell. In either event, the battery needs to be replaced.

1. **Ground Power Available** – The battery can be recharged using a ground power unit when monitoring the ammeter. This will normally take about 30 minutes. The battery should indicate five amps or less of current draw before charging operations are suspended.

2. **Ground Power Not Available** – If a ground power unit is not available, the airplane can be started using the right battery. Turn off the flip light for 15 to 20 minutes. This time is needed for the battery to *bounce back* and develop enough charge to energize the left battery relay. If the flip light has been on for several days or the battery is old, it may not *bounce back,* and the battery must be removed from the aircraft and charged with a battery charger.

   Use the normal starting procedures checklist, which includes turning on the right master switch. It is not necessary to use the crosstie switch to start the airplane. When the starter is engaged, it will only energize the right starter contactor, since there is no battery power to energize the left contactor.

   Once the engine is running, the crosstie switch must be turned on to charge the left battery.

   Check the charge condition of the batteries at 1700 RPM. If the battery charging current is less than 10 amps for each battery, the batteries are sufficiently charged.

Right Battery Inoperative – It is possible that the right master was not secured and inadvertently left on. In this case, the right battery would be discharged. The right battery may be charged in the same manner as the left battery.

CROSSTIE OPERATIONS CHECKLIST

The Crosstie Operations Checklist is performed prior to the Before Taxi Checklist. If the crosstie system is not operational, there may be no point in completing the remaining checklists. In addition, completing the checklist at this point will limit the time spent in the runup area where other aircraft are waiting to depart. The checklist is important because it checks the integrity of the crosstie system. In particular, it verifies the operation of all four diodes (two on the avionics bus and two on the essential bus), and ensures that these two buses have neither a shorted or open circuit.

PASSENGER BRIEFING CARD

There are a number of items with which the passengers must be familiar. These items can easily be covered through use of the Passenger Briefing Cards that are included in the airplane as part of the delivery package. It is recommended that passengers be advised of the briefing cards' location before taxiing the airplane. This will provide ample time for the passengers to review the cards before takeoff. The information contained on the briefing cards is shown below.

1. **Seat Belt** – Federal Aviation Regulations require each passenger to use the installed restraint devices during taxi, takeoff, and landing. Use of the three-point restraint system is accomplished by grasping the male end of the buckle, drawing the lap webbing and diagonal harness across the lower and upper torso, and inserting it into the female end of the buckle. There is a distinctive snap when the two parts are properly connected. To release the belt, press the red button on the female portion of the buckle.

2. **Seat Belt and Harness Adjustment –** Adjusting two devices in the lap-webbing loop varies the length of the lap belt. One end of the adjustment loop contains a dowel, and the other has a small strap. Draw the dowel and strap together to enlarge the lap belt size, and draw them apart to tighten the lap belt. The upper torso restraints are connected to an inertia reel and no adjustment is required.

3. **Headsets** – If there are headsets for the passenger seating positions, their use is recommended. Comfort is enhanced in terms of noise fatigue, and the use of headsets facilitates intercom communications. To use the voice-activated microphone, position the boom mike about one quarter of an inch from the mouth, and speak in a normal voice.

4. **Emergency Exit Procedures (Cabin Doors)** – In most emergencies, the cabin doors are used for exiting the airplane. The interior door handles are located near the bottom-aft portion of the cabin doors. To open a door, pull the handle away from the door and lift up until the handle is slightly past the horizontal position. There are placards on the interior doors labeled "Open" and "Closed" with direction arrows.

5. **Crash Ax/Hatchet** – A crash ax is located under the pilot's seat for use in the event the normal cabin and the emergency door releases are inoperable. To use the ax, open the Velcro fastener, and remove the ax from its sheath. It generally works best to strike the corner edge of the window near the doorframe. Several smart blows to the window area around the perimeter of the doorframe will remove enough pieces so that the middle portion of the window can be removed with a few heavy blows. Once the major portion of the window is removed and if time and circumstances permit, use the ax blade to smooth down the jagged edges around the doorframe. This will minimize injury when exiting the airplane through the window.

6. **Oxygen System Operation** – If the airplane is equipped with an oxygen system, the pilot will notify you when use of oxygen is required. The pilot will explain use of the equipment and applicable emergency procedures.

7. **No Smoking** – There is no smoking permitted in the airplane, no ashtrays are provided for smoking, and the airplane is not certified as such. It is a violation of Federal Aviation Regulations to smoke in this airplane.

CONTROL POSITIONS VERSUS WIND COMPONENT

The airplane is stable on the ground. The low wing design minimizes the tipping tendency from strong winds while taxiing. Still, the proper positioning of control surfaces during taxiing will improve ground stability in high wind conditions. The following table, Figure 4 - 4, summarizes control positions that should be maintained for a given wind component.

Wind Component	Aileron Position	Elevator Position
Left Quartering Headwind	Left Wing Aileron Up (Move Aileron Control to the Left)	Neutral Hold Elevator Control in Neutral Position
Right Quartering Headwind	Right Wing Aileron Up (Move Aileron Control to the Right)	Neutral Hold Elevator Control in Neutral Position
Left Quartering Tailwind	Left Wing Aileron Down (Move Aileron Control to the Right)	Down Elevator (Move Elevator Control Forward)
Right Quartering Tailwind	Right Wing Aileron Down (Move Aileron Control to the Left)	Down Elevator (Move Elevator Control Forward)

Figure 4 - 4

TAXIING

The first thing to check during taxiing is the braking system. This should be done a few moments after the taxi roll is begun. Apply normal braking to verify that both brakes are operational. The operation of the rate-of-turn indicator and Horizontal Situation Indicator (HSI) can be checked during taxiing provided enough time has elapsed for the AHRS to align, normally 2 to 3 minutes. Make a few small left and right S-turns, and check the instruments for proper operation.

When taxiing, minimize the use of the brakes. Since the airplane has a free castoring nose wheel, steering is accomplished with light braking. Avoid the tendency to ride the brakes by making light steering corrections as required and then allowing the feet to slide off the brakes and the heels to touch the floor. Avoid taxiing in areas of loose gravel, small rocks, etc., since it can cause abrasion and damage to the propeller. If it is necessary to taxi in these areas, maintain low propeller speeds. If taxiing from a hard surface through a small area of gravel, obtain momentum before reaching the gravel.

The aircraft should never be taxied while the doors are in the full up position. The doors may be opened six to eight inches during taxi, which can be controlled by grasping the arm rest or looping the door strap around the arm.

BEFORE TAKEOFF

Engine Temperatures – The control of engine temperatures is an important consideration when operating the airplane on the ground. The efficient aerodynamic design and closely contoured cowling around the engine maximizes cooling in flight. However, care must be used to preclude overheating during ground operations. Before starting the engine runup check, be sure the airplane is aligned for the maximum headwind component. Conversely, when the ambient temperature is low, time may be needed for temperatures to reach normal operating ranges. Do not attempt to run up the engine until the oil temperature reaches 75°F (24°C).

Engine Runup – The engine runup is performed at 1700 RPM. To check the operation of the magnetos, move the ignition switch first to the L position and note the RPM drop. Return the switch to the R/L position, and then move the switch to the R position to check the RPM drop. Return the switch to the R/L position. The difference between the magnetos when operated individually cannot exceed 50 RPM, and the maximum drop on either magneto cannot be greater than 150 RPM.

To check the propeller operation, move the propeller control to the low RPM position for a few seconds until a 300 to 500 RPM drop is registered on the tachometer. Return the propeller control to the high RPM position and ensure that engine speed returns to 1700 RPM. Repeat this procedure two or three times to circulate warm oil into the propeller hub.

While the engine is set to 1700 RPM, check the engine instruments to verify that all indications are within normal limits.
Check the charge condition of the batteries at 1700 RPM. If the battery charging current is less than 10 amps, for each battery, the batteries are sufficiently charged.

Door Seals – The door seal switch is not turned on until the baggage door and both cabin doors are latched, usually just before takeoff. If the Door Open annunciation is displayed and/or the aural warning is annunciating that the door is open, then one of the doors is not completely closed and the door seal system will not operate.

Oxygen System – To assure proper operation of the oxygen system, insert a mask into the overhead distribution manifold. Verify the overhead switch is in the On position (guard closed). Verify the overhead master switches and avionics switch are ON. Select the SYSTEM key on the MFD. Select the Oxygen key on the System page ON, and verify the PFD displays a white advisory indicating "OXYGEN ON". Open the flowmeter on the oxygen mask and verify steady oxygen flow (flow ball in the mid-position or greater), for at least 5 seconds. Verify the PFD does not display a caution annunciation for low oxygen manifold pressure (OXYGEN PRES), and oxygen outlet pressure indicates normally.

TAKEOFFS

Normal Takeoff – In all takeoff situations, the primary consideration is to ascertain that the engine is developing full takeoff power. This is normally checked in the initial phase of the takeoff run. The engine should operate smoothly and provide normal acceleration. The engine RPM should read 2700 RPM and the manifold pressure should be near anticipated output. At high altitudes and/or abnormally high ambient temperatures, the mixture may need adjustment to produce maximum takeoff power. This should be done just before or during the takeoff run. With the engine set to full power, lean the mixture as required to eliminate engine roughness. When the airplane is established in a normal climb and clear of the airport, adjust the mixture as required according to the instructions on page 4-24.

Avoid the tendency to ride the brakes by making light steering corrections as required and then allowing the feet to slide off the brakes and the heels to touch the floor. For normal takeoffs (not short field) on surfaces with loose gravel and the like, the rate of throttle advancement should be slightly less than normal. While this extends the length of the takeoff run somewhat, the technique permits the airplane to obtain momentum at lower RPM settings, which reduces the potential for propeller damage. Using this technique ensures that the propeller blows loose gravel and rocks aft of the propeller blade. Rapid throttle advancement is more likely to draw gravel and rocks into the propeller blade.

Short Field Takeoff – The three major items of importance in a short field takeoff are developing maximum takeoff power, maximum acceleration, and utilization of the entire runway available. Be sure the mixture is properly set for takeoff if operating from a high altitude airport. During the takeoff run, do not raise the nose wheel too soon since this will impede acceleration. Finally, use the entire runway that is available; that is, initiate the takeoff run at the furthest downwind point available. Use a rolling start if possible, provided there is adequate usable runway. If a rolling start is practicable, any necessary mixture adjustment should be made just before initiating the takeoff run.
The flaps are set to the takeoff position. After liftoff, maintain the best angle of climb speed (80 to 84 KIAS at sea level and 10,000 MSL, respectively) until the airplane is clear of all obstacles. Once past all obstacles, accelerate to the best rate of climb speed (106 KIAS), and raise the flaps. If no

obstacles are present, accelerate the airplane to the best rate of climb speed, and raise the flaps when at a safe height above the ground.

Crosswind Takeoff – Crosswind takeoffs should be made with takeoff flaps. When the take off run is initiated, the aileron is fully deflected into the wind. As the airplane accelerates and control response becomes more positive, the aileron deflection should be reduced as necessary. Accelerate the airplane to approximately 75 knots, and then quickly lift the airplane off the ground. When airborne, turn the airplane into the wind as required to maintain alignment over the runway and in the climb out corridor. Maintain the best angle of climb speed (80 KIAS) until the airplane is clear of all obstacles. Once past all obstacles, accelerate to the best rate of climb speed (106 KIAS); at or above 400 feet AGL, raise the flaps.

NORMAL AND MAXIMUM PERFORMANCE CLIMBS

Best Rate of Climb Speeds – The normal climb speed of the airplane, 106 to 115 KIAS, produces the most altitude gain in a given time period while allowing for proper engine cooling and good forward visibility. This airspeed range is above the actual best rate of climb airspeed (V_Y) of 106 KIAS at sea level to 93 KIAS at 10,000 feet. The best rate of climb airspeed is used in situations which require the most altitude gain in a given time period, such as after takeoff when an initial 2,000 feet or so height above the ground is desirable as a safety buffer. In another situation, ATC might require the fastest altitude change possible. The mixture should be well rich of peak, near best power or at full rich if high CHT indications are experienced.

Cruise Climb – Climbing at speeds above 115 KIAS is preferable, particularly when climbing to higher altitudes, i.e., those that require more than 6,000 feet of altitude change. A 500 FPM rate climb at cruise power provides better forward visibility and engine cooling. In addition, a normal leaning schedule can be employed, which lowers fuel consumption.

Best Angle of Climb Speeds – The best angle of climb airspeed (V_X) for the airplane is 80 KIAS at sea level to 84 KIAS at 10,000 feet, with flaps in the up position. The best angle of climb airspeed produces the maximum altitude change in a given distance and is used in a situation where clearance of obstructions is required. When using the best angle of climb airspeed, the rate at which the airplane approaches an obstruction is reduced, which allows more space in which to climb. For example, if a pilot is approaching the end of a canyon and must gain altitude, the appropriate V_X speed should be used. Variations in the V_X and V_Y speeds from sea level to 10,000 feet are more or less linear, assuming ISA conditions. This equates to approximately 1.3 knots/1000 feet reduction in the V_Y speed and about 0.4 knots/1000 feet increase in the V_X speed.

Power Settings – Use maximum continuous power until the airplane reaches a safe altitude above the ground. Ensure the propeller RPM does not exceed the red line limitation. When the airplane is a safe altitude above the ground, power should be reduced to at least 80% of BHP. When changing power, the sequence control usage is important. To decrease power, decrease manifold pressure first with the throttle control and then decrease RPM with the propeller control. The traditional practice of initially squaring power settings (for example, 25" MAP and 2500 RPM) is an acceptable procedure. If operating from an airport that is significantly above sea level elevation, no adjustment to manifold pressure may be necessary.

CRUISE

Flight Planning – Several considerations are necessary in selecting a cruise airspeed, power setting, and altitude. The primary issues are time, range, and fuel consumption. High cruise speeds shorten the time en route, but at the expense of decreased range and increased fuel consumption.

Cruising at higher altitudes increases true airspeed and improves fuel consumption, but the time and fuel used to reach the higher cruise altitude must be considered. Clearly, numerous factors are weighed to determine what altitude, airspeed, and power settings are optimal for a particular flight.

Section 5 in this manual contains detailed information to assist the pilot in the flight planning process.

In general, the airplane cruises at 60% to 80% of available power. Figure 4 - 5 is provided as a broad overview of how power settings and altitude affect true airspeed, range, and fuel consumption. The chart is based on standard temperatures for a particular altitude. This table is not intended for flight planning purposes. Refer to Section 5 for specific information.

BASIC CRUISE AND CRUISE-CLIMB PERFORMANCE CHART

WARNING: THIS TABLE CANNOT BE USED FOR FLIGHT PLANNING

	Altitude	2000 ft.	4000 ft.	6000 ft.	8000 ft.	10,000 ft.
60% Power	Fuel Consumption (GPH)	11.3	11.3	11.3	11.3	11.3
	Range (nm - no reserve)	1360	1375	1395	1420	1430
	True Airspeed (Knots)	157	159	161	164	165
70% Power	Fuel Consumption (GPH)	15.1	15.1	15.1	15.1	
	Range (nm - no reserve)	1095	1120	1135	1145	
	True Airspeed (Knots)	169	173	175	177	
80% Power	Fuel Consumption (GPH)	17.2	17.2	17.2	17.2	
	Range (nm - no reserve)	980	995	1050	1080	
	True Airspeed (Knots)	172	175	185	190	

Figure 4 - 5

Mixture Settings – In cruise flight and cruise climb, care is needed to ensure that engine instrument indications are maintained within normal operating ranges. After reaching the desired altitude and engine temperatures stabilize (usually within five minutes), the mixture must be adjusted. Two methods can be used to establish the optimum mixture setting.

1. **Control by Exhaust Gas Temperature (EGT) –** First, adjust the RPM and manifold pressure (MP) to the desired setting. Next, slowly move the mixture control toward the lean position while observing the EGT gauge. Note the point at which the first EGT peaks or starts to drop as the mixture is leaned further. Use of the lean assist function can be helpful for this. At settings between 65% and 75% power, advance the mixture control towards rich (clockwise) until the first EGT to peak is 50ºF (10ºC) richer than the peak; resulting in the highest power output. The engine can be also be operated at 50ºF (10ºC) lean of peak EGT; resulting in lower power output.
2. **Control by Fuel Flow –** First, adjust the RPM and MP to the desired cruise setting. Next, refer to fuel flow charts in Section 5 and determine the optimum fuel flow for the cruise altitude and temperature. (Be sure to account for nonstandard temperature conditions.) Adjust the mixture setting towards the lean position until the applicable fuel flow is obtained.
3. If the power setting is above 80% of BHP, the mixture must only be adjusted to compensate for altitude or when roughness is experienced. During climb, the power output decreases with pressure altitude. The mixture will become too rich if it is not adjusted at higher altitudes (>5000 ft.). If CHT allows, adjust the mixture in climb to maintain the highest EGT between 1200 ºF and 1300 ºF.

CAUTION

Do not attempt to adjust the mixture by using the EGT at a setting above 75% of maximum power. To prevent detonation, when increasing power, enrich mixture, advance RPM, and adjust throttle setting, in that order. When reducing power, retard throttle, then adjust RPM and mixture.

Door Seals – Normally, the door seal switch remains in the On position for the entire flight. If the system pressure drops below 12 psi, the air pump will cycle on until pressure is restored. If the pump runs continuously, it is an indication that a seal is damaged and incapable of holding pressure. In this situation, the door seal system should not be operated until repairs are made.

Inoperative Door Seal Dump Valve – If the door seal dump valve should fail, the door seal system can still be operated. However, the door seals must not be turned on until after takeoff and must be turned off before landing. This procedure ensures rapid egress from the airplane in an emergency situation. Moreover, opening the doors with the seals inflated can damage the inflatable gaskets. For more information on the door seals and dump valve refer to page 7-14.

DESCENT

The primary considerations during the descent phase of the flight are to maintain the engine temperatures within normal indications and to systematically increase mixture settings as altitude is decreased. The descent from altitude is best performed through gradual power reductions and gradual enrichment of the mixture. Avoid long descents at low manifold pressure as the engine can cool excessively and may not accelerate properly when power is reapplied.

The fuel pump switch should only be in the "armed" position for takeoff and climb. It should be off for descent and landing; during very low power operation and improper fuel system setup it may be possible that the fuel pressure will drop below the 5.5 psi limit at which time the fuel pump will come on. If this happens, the engine will flood and quit.

If power must be reduced for long periods, set the propeller to the minimum low RPM setting, and adjust manifold pressure as required to maintain the desired descent. If the outside air temperature is extremely cold, it may be necessary to add drag to the airplane by lowering the flaps so that additional power is needed to maintain the descent airspeed. Do not permit the cylinder head temperature to drop below 240°F (116°C) for more than five minutes.

WARNING

During longer descents it is imperative that the pilot occasionally clear the airplane's engine by application of partial power. This helps keep the engine from over cooling and verifies that power is available. If the engine quits during a glide, there may be no positive instrument indication or annunciation of this condition, and with power reduced, there is no aural indication.

SpeedBrakes may be used for expedited descents. The pilot should be familiar with the proper operation of the SpeedBrakes (see the discussion on page 7-53).

APPROACH

On the downwind leg, adjust power to maintain 110 KIAS to 120 KIAS with the flaps retracted. When opposite the landing point, reduce power, set the flaps to the takeoff position, and reduce speed to about 90 KIAS. On the base leg, set the flaps to the landing position, and reduce speed to 85 or 90 KIAS. Be prepared to counteract the ballooning tendency which occurs when full flaps are applied. On final approach, maintain airspeed of 80 to 85 KIAS depending on crosswind condition and/or landing weight. Reduce the indicated airspeed to 80 knots as the touchdown point is approached.

CAUTION

At the forward CG limit, slowing below 80 KIAS prior to the flare with idle power and full flaps, will create a situation of limited elevator authority; an incomplete flare may result. The application of a very small amount of power will improve elevator authority.

Glideslope Flight Procedure with Autopilot – Approach the ILS glideslope intercept point (usually the OM) with the flaps set to the takeoff position at 100 to 115 KIAS (recommended approach speed in turbulence is 110 KIAS or greater) and with the aircraft stabilized in altitude hold mode. At the glideslope intercept, adjust power for the desired airspeed. For best tracking results make power adjustment in small, smooth increments to maintain desired airspeed. At the FAF (final approach fix), full flaps should be applied and the aircraft slowed to 90 KTS. This technique will typically require a power setting in excess of 1900 RPM. At no lower than 200 feet AGL disconnect the autopilot and manually fly the aircraft. If a missed approach is required, the autopilot may be re-engaged after the aircraft has been reconfigured for and established in a stabilized climb above 400 feet AGL.

NOTE

When using flaps, it is recommended that flaps be extended from up to approach and then approach to down sequentially with a "pregnant pause" of 5-10 seconds at each flap selection while the autopilot stabilizes and retrims the airplane. Going from flaps up to flaps full down generates a large pitch attitude change which is not desirable especially in the clouds.

LANDINGS

Normal Landings – Landings under normal conditions are performed with the flaps set to the landing position. The landing approach speed is 80 to 85 KIAS depending on gross weight and wind conditions. The approach can be made with or without power; however, power should be reduced to idle before touchdown. The use of forward and sideslips are permitted if required to dissipate excess altitude. Remember that the slipping maneuver will increase the stall speed of the airplane, and a margin for safety should be added to the approach airspeed.

The landing attitude is slightly nose up so that the main gear touches the ground first. After touchdown, the back-pressure on the elevator should be released slowly so the nose gear gently touches the ground. Brakes should be applied gently and evenly to both pedals. Avoid skidding the tires or holding brake pressure for sustained periods.

CAUTION

Avoid sideslips with full flaps, as there is potential for the aircraft to pitch down unintentionally.

CAUTION

At forward CG with flaps in landing position, avoid rapid forward stick movement as this can cause an unexpected excessive nose-down pitch result.

At forward cg, with the flaps fully extended, rapid forward movement of the stick may lead to airflow separation on the elevator, increasing the airplane pitchdown rate beyond what was commanded. Holding the stick in one position or pulling it back will immediately restore the airflow over the elevator and arrest the pitchdown.

Short Field Landings – In a short field landing, the important issues are to land just past the beginning of the runway at minimum speed. The initial approach should be made at 85 to 90 KIAS and reduced to 80 KIAS when full flaps are applied. A low-power descent, from a slightly longer than normal final approach, is preferred. It provides more time to set up and establish the proper descent path. If there is an obstacle, cross over it at 78 KIAS. Maintain a power on approach until just prior to touchdown. Do not extend the landing flare; rather, allow the airplane to land in a slight nose up attitude on the main landing gear first. Lower the nose wheel smoothly and quickly, and apply heavy braking. However, do not skid the tires. Braking response is improved if the flaps are retracted after touchdown.

Crosswind Landings – When landing in a strong crosswind, use a slightly higher than normal approach speed, and avoid the use of landing flaps unless required because of runway length. If practicable, use an 85 to 90 KIAS approach speed with the flaps in the takeoff position. A power descent, from a slightly longer than normal final approach, is preferred. It provides more time to set up and establish the proper crosswind compensation. Maintain runway alignment either with a crab into the wind, a gentle sideslip (upwind wing down), or a combination of both. Touch down on the upwind main gear first by holding aileron into the wind. As the airplane decelerates, increase the aileron deflection. Apply braking as required. Raising the flaps after landing will reduce the lateral movement caused by the wind, and also improves braking.

Sideslipping the airplane will cause the airspeed to read up to 5 kts higher or lower, depending on the direction of the sideslip. This occurs because the static air source for the airplane is only on one side of the fuselage.

Balked Landing – In a balked landing or a go-around, the primary concerns are to maximize power, minimize drag, and establish a climb. Initiate a go-around by the immediate but smooth full application of power. If the flaps are in the landing position, reduce them to the takeoff positions once a positive rate of climb is established at 80 KIAS. Increase speed to 88 KIAS and continue to accelerate to V_Y. When the airplane is a safe distance above the surface and at 106 KIAS or higher, retract the flaps to the up position and arm the backup fuel pump.

Heavy Braking – After heavy braking, especially when the airplane is near gross weight, allow the brakes to cool for about 20 minutes before additional heavy braking. The brakes may overheat if there is repeated heavy braking without adequate cooling time.

Oxygen System – After landing, select the Oxygen system OFF, and verify the valve closed by leaving a mask inserted into the overhead outlet, releasing the outlet pressure. If oxygen continues to flow after 5 seconds, the oxygen valve has failed to close.

STALLS

The stall characteristics of the airplane are influenced by the stall strips and the leading edge tape on the wings and on the horizontal surface of the tail. If there is any damage to the stall strips or the leading edge tape, do not attempt to stall the airplane.

Practicing Stalls – Stalls and slow flight should be practiced at safe altitudes to allow for recovery. Any of these maneuvers should be practiced at an altitude in excess of 6,000 feet above ground level.

As stall attitude is approached, be alert. Take prompt corrective action to avoid the stall or if you are practicing stalls, react the moment the stall buffet occurs. In addition the following is recommended:

1. Do not carry passengers.
2. Be certain that the aircraft’s center of gravity is as far forward as possible without exceeding the approved flight envelope.
3. Be certain that both the student pilot and instructor pilot have a full set of operable controls including toe brakes.
4. Conduct such practice at altitudes in excess of 6,000 ft above ground level.

5. Air conditioning and other nonessential electrical systems should be turned off to prevent battery discharge during low engine RPM operations.
6. Increased fresh air ventilation may be needed to ensure pilot comfort at the lower airspeeds during slow flight or stalls practice.

For unaccelerated stalls (a speed decrease of one knot/second or less), the stall recovery should be initiated at the first indication of the stall or the so-called “break” that occurs while in the nose high pitch position. A drop in attitude that cannot be controlled or maintained with the elevator control normally indicates this break.

There are fairly benign stall characteristics when the airplane is loaded with a forward CG. In most cases, there is not a discernable break even though the control stick is in the full back position. In this situation, after two seconds of full aft stick application, stall recovery should be initiated. To recover from a stall, simultaneously release back-pressure, and apply full power; then level the wings with the coordinated application of rudder and aileron.

Accelerated stalls can occur at higher-than-normal airspeeds due to abrupt and/or excessive control applications. These stalls may occur in steep turns, pull-ups, or other abrupt changes in flight path. Accelerated stalls usually are more severe than unaccelerated stalls and are often unexpected because they occur at higher-than-normal airspeeds. The recovery from accelerated stalls (a speed change of three to five knots/second) is essentially the same as unaccelerated stalls. The primary difference is the indicated stall speed is usually higher and the airplane’s attitude may be lower than normal stalling attitudes.

Stalling speeds, of course, are controlled by flap settings, center of gravity location, gross weight, and the rate of change in angle of attack. A microswitch in the left wing, which sounds an aural warning, is actuated when the critical angle of attack is approached. Stall speed data at various configurations are detailed on page 5-6.

Rudder Limiter Duty Cycle – The rudder limiter (RL) is an integral part of the stall warning system. During stall practice, the rudder limiter is activated during all power on stalls, and extensive operation of the system can cause overheating of the RL solenoid. The solenoid has a 15% duty cycle, which means that within a given time period, the system can be engaged only 15% of the time and at rest 85% of the time for cooling. In the period of one minute this works out to nine seconds engaged and 51 seconds at rest, or approximately one power on stall per minute.

Loading and Stall Characteristics – The center of gravity location and lateral fuel imbalance affects the airplane’s stall handling characteristics. It was noted above that stall characteristics are docile with a forward CG. However, as the center of gravity moves aft, the stall handling characteristics, in terms of lateral stability, will deteriorate. On the Cessna 350, it is particularly noticeable at higher power settings with flaps in the landing position. Lateral loading is also an issue, particularly with an aft CG. When the airplane is at the maximum permitted fuel imbalance of 10 gallons, stall-handling characteristics are degraded.

The loading of the airplane is an important consideration since, for example, most checkouts are performed with two pilots and no baggage, which results in a forward CG and fairly benign stall characteristics. It is recommended, during the checkout and indoctrination phase for the Cessna 350 (LC42-550FG), that the pilot investigates stall performance at near gross weight with a CG towards the aft limit of the envelope. This training, of course, should be under the supervision of a qualified and certificated flight instructor.

SPINS

The airplane, as certified by the FAA, is not approved for spins of any duration. During the flight test phase of the airplane's certification, spins and/or spin recovery techniques were not performed or demonstrated. It is not known if the airplane will recover from a spin.

WARNING

Do not attempt to spin the airplane under any circumstances. The airplane, as certified by the Federal Aviation Agency, is not approved for spins of any duration. During the flight test phase of the airplane's certification, spins were not performed. It is not known if the airplane will recover from a spin.

COLD WEATHER OPERATIONS

Engine starting during cold weather is generally more difficult than during normal temperature conditions. These conditions, commonly referred to as "cold soaking," causes the oil to become more viscous or thicker. Cold weather also impairs the operation of the battery. The thick oil, in combination with decreased battery effectiveness, makes it more difficult for the starter to crank the engine. At low temperatures, aviation gasoline does not vaporize readily, further complicating the starting procedure.

CAUTION

Superficial application of preheat to a cold-soaked engine can cause damage to the engine since it may permit starting but will not warm the oil sufficiently for proper lubrication of the engine parts. The amount of damage will vary and may not be evident for several hours of operation. In other situations, a problem may occur during or just after takeoff when full power is applied.

The use of a preheater is required to facilitate starting during cold weather and is required when the engine has been cold soaked at temperatures of 25°F (-4°C) or below for more than two hours. Be sure to use a high volume hot air heater. Small electric heaters that are inserted into the cowling opening do not appreciably warm the oil and may result in superficial preheating.

Apply the hot air primarily to the oil sump, filter, and cooler area for 15 to 30 minutes, and turn the propeller by hand through six to eight revolutions at 5 to 10 minute intervals. Periodically feel the top of the engine, and when some warmth is noted, apply heat directly to the upper portion of the engine for five minutes to heat the fuel lines and cylinders. This will ensure proper vaporization of the fuel when the engine is started. Start the engine immediately after completing the preheating process. Since the engine is warm, use the normal starting procedures.

WARNING

To prevent the possibility of serious injury or death, <u>always</u> treat the propeller as though the ignition switch is set to the ON position. Before turning the propeller by hand, use the following procedures. Verify the magnetos switch is set to off, the throttle is closed, and the mixture is set to idle cutoff. It is recommended the airplane be chocked, tied down, with the pilot's cabin door open to allow easy access to the engine controls.

After starting the engine, set the idle to 1000 RPM or less until an increase in oil temperature is noted. Monitor oil pressure closely, and watch for sudden increases or decreases in oil pressure. If necessary, reduce power below 1000 RPM to maintain oil pressure below 100 psi. If the oil pressure drops suddenly to below 30 psi, shut the engine down, and inspect the lubricating system. If no damage or leaks are noted, preheat the engine for an additional 10 to 15 minutes.

Before takeoff, when performing the runup check, it may be necessary to incrementally increase engine RPM to prevent oil pressure from exceeding 100 psi. At 1700 RPM, adjust the propeller control to the full decrease position until minimum RPM is observed. Repeat this procedure three or four times to circulate warm oil into the propeller dome. Check magnetos and other items in the normal manner. When the oil temperature has reached 100°F and oil pressure does not exceed 70 psi at 2500 RPM, the engine has warmed sufficiently to accept full rated power. During takeoff and climb, the fuel flow may be high; however, this is normal and desirable since the engine will develop more horsepower in the substandard ambient temperatures.

NOTE

In cold weather below freezing, ensure engine oil viscosity is SAE 30, 10W30, 15W50, or 20W50. In case of temporary cold weather, consideration should be given to hangaring the airplane between flights.

The pitot tube housing contains a heating element to heat the pitot tube in the event icing conditions are encountered in flight. Do not fly in conditions which may require the use of pitot heat if the temperature is below 15°F (-9°C). If conditions are such that pitot heat may be required, turn on the pitot heat at least 5 minutes prior to takeoff.

HOT WEATHER OPERATIONS

Flight operations during hot weather usually present few problems. It is unlikely that ambient temperatures at the selected cruising altitude will be high enough to cause problems. The airplane design provides good air circulation under normal flight cruise conditions. However, there are some instances where abnormally high ambient temperatures need special attention. These are:

1. Starting a hot engine
2. Ground operations under high ambient temperature conditions
3. Takeoff and initial climb out.

After a hot engine is stopped, the temperature of its various components begins to stabilize. Engine parts with good airflow will cool faster. In some areas, where conduction is high and circulation is low, certain engine parts will increase in temperature. In particular, the fuel injection components (especially the fuel injection pump) will become heat-soaked and may cause the fuel in the system to become vaporized.

During subsequent starting attempts the fuel pump will be pumping a combination of fuel and fuel vapor. Until the entire system is filled with liquid fuel, difficult starting and unstable engine operations can normally be expected. To correct this problem, set the fuel selector to either tank, close the throttle, set the mixture to idle cutoff, and operate the primer for approximately 3 seconds; proceed with normal starting procedures. It may be necessary to leave the vapor suppression on during starting and turn it off approximately one minute after engine start.

Ground operations during high ambient temperature conditions should be kept to a minimum. In situations which involve takeoff delays, or when performing the Before Takeoff Checklist, it is imperative that the airplane is pointed into the wind. During climb out, it may be necessary to climb at a slightly higher than normal airspeed. Be sure the mixture is set properly, and do not operate at maximum power for any longer than necessary. Temperatures should be closely monitored and sufficient airspeed maintained to provide cooling of the engine.

NOTE

Heat soaking is usually the highest between 30 minutes and one hour after shutdown. At some point after the first hour the unit will stabilize, though it may take as long as two or three hours (total time from shutdown) depending on wind, temperature, and the airplane's orientation (upwind or downwind) when it was parked. Restarting attempts will be most difficult in the period 30 minutes to one hour after shutdown.

NOISE ABATEMENT

Many general aviation pilots believe that noise abatement is an issue reserved for the larger transport type airplanes. While larger airplanes clearly generate a greater decibel level, the pilot operating a small single or multiengine propeller driven airplane should, within the limits of safe operations, do all that is possible to mitigate the impact of noise on the environment. In some instances, the noise levels of small airplanes operating at smaller general aviation airfields are more noticeable. This is because at larger airports with frequent large airplane activity, there is an expectation of airplane ambient noise.

The general aviation pilot can enhance the opinion of the general public by demonstrating a concern for the environment in terms of noise pollution. To this end, common sense and courteousness should be used as basic guidelines. Part 91 of the Federal Air Regulations (FARs) permit an altitude of 1,000 feet above the highest obstacle over congested areas. However, an altitude of 2,000, where practicable and within the limits of safety, should be used. Similarly, during the departure and approach phases of the flight, avoid prolonged flight at lower heights above the ground. At airports where there are established noise abatement procedures in the takeoff corridor, the short field takeoff procedure should be used. This is a courteous thing to do even though the noise abatement procedure might be applicable only to turbine-powered aircraft. The certificated level for the Cessna 350 (LC42-550FG) at 3400 lbs. (1542 kg) gross weight is 85.0 dB(A), which is the maximum permitted level. The FAA has made no determination that these noise levels are acceptable or unacceptable for operations at any airport.

Section 5
Performance

TABLE OF CONTENTS

This Page Intentionally Left Blank

INTRODUCTION

The performance charts and graphs on the following pages are designed to assist the pilot in determining specific performance characteristics in all phases of flight operations. These phases include takeoff, climb, cruise, descent, and landing. The data in these charts were determined through actual flight tests of the airplane. At the time of the tests, the airplane and engine were in good condition and normal piloting skills were employed.

There may be slight variations between actual results and those specified in the tables and graphs. The condition of the airplane, as well as runway condition, air turbulence, and pilot techniques, will influence actual results. Fuel consumption assumes proper leaning of the mixture and control of the power settings. The combined effect of these variables may produce differences as great as 10%. The pilot must apply an appropriate margin of safety in terms of estimated fuel consumption and other performance aspects, such as takeoff and landing. Fuel endurance data include a 45-minute reserve at the specified cruise power setting. When it is appropriate, the use of a table or graph is explained or an example is shown on the graph.

When using the tables that follow, some interpolation may be required. If circumstances do not permit interpolation, then use tabulations that are more conservative. The climb and descent charts are based on sea level, and some minor subtraction is required for altitudes above sea level. For example, if 4.5 and 8.5 minutes are needed to climb from sea level to 4000 and 8000 feet respectively, then a climb from 4000 feet to 8000 feet will take about four minutes.

AIRSPEED CALIBRATION

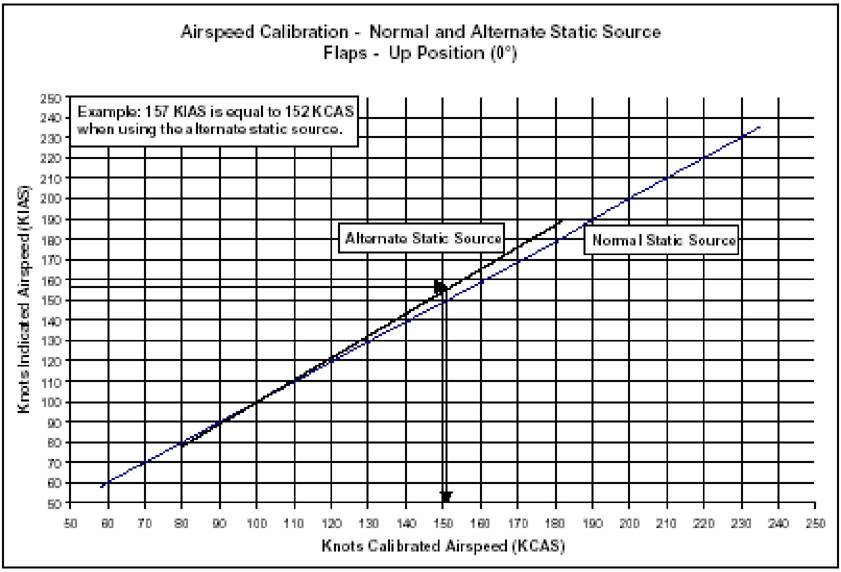


Figure 5 - 1

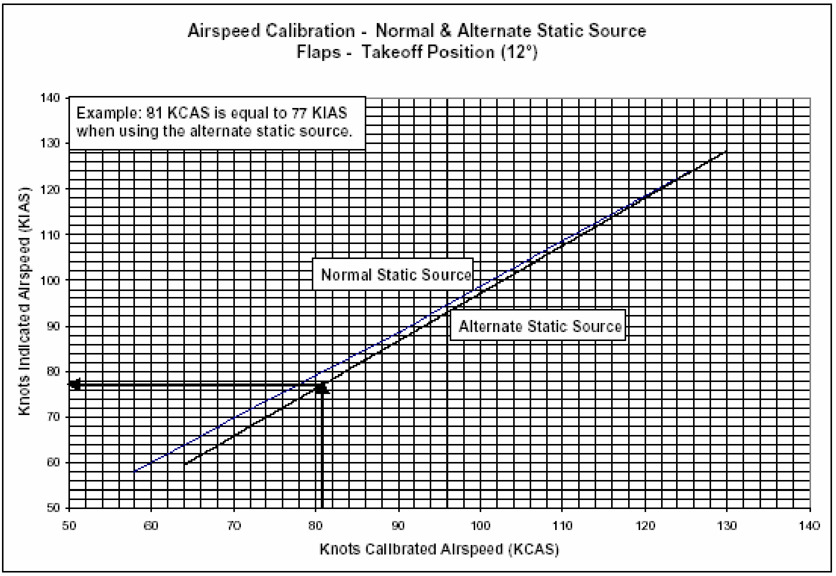


Figure 5 - 2

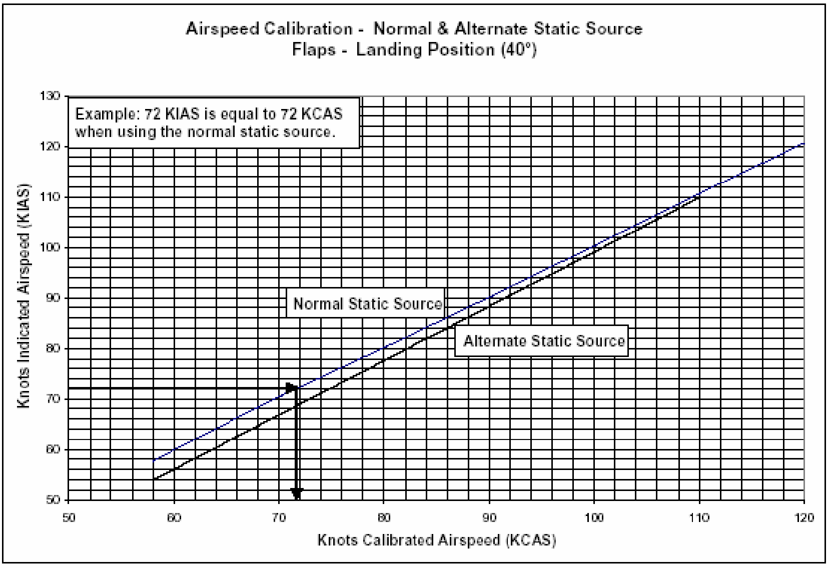


Figure 5 - 3

TEMPERATURE CONVERSION

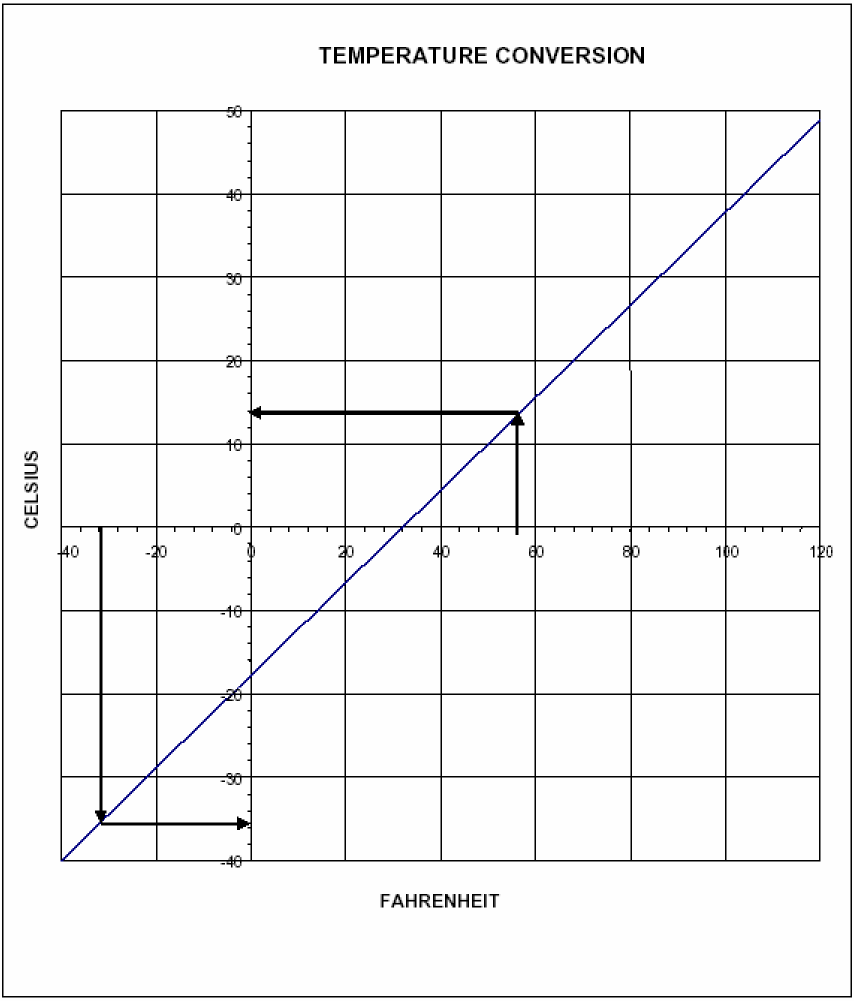


Figure 5 - 4

STALL SPEEDS

Figure 5 - 5 shows the stalling speed of the airplane for various flap settings and angles of bank. To provide a factor of safety, the tabulated speeds are established using maximum gross weight and the most forward center of gravity (CG), i.e. 3400 pounds with the CG located 107 inches from the datum. This configuration will produce a higher stalling speed when compared with the speed that would result from a more rearward CG or a lesser gross weight at the same CG. While an aft CG lowers the stalling speed of the airplane, the benign stalling characteristics attendant with a forward CG are noticeably diminished. Please see stall discussion on page 4-28. The maximum altitude loss during power off stalls is about 200 feet. Nose down attitude change during stall recovery is generally less than 5°. **Example**: Using the table below, stall speeds of 61 KIAS and 63 KCAS are indicated for 30º of bank with landing flaps.

STALLING SPEEDS

CONDITIONS		ANGLE OF BANK (Most Forward Center of Gravity – Power Off – Coordinated Flight)							
Weight		0°		30°		45°		60°	
	Flap Setting	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
3400 lbs. (1542 kg)	Flaps - Cruise	74	73	80	79	87	87	103	103
	Flaps - Takeoff	68	67	72	72	81	80	96	95
	Flaps - Landing	58	58	63	63	70	70	83	83

Figure 5 - 5

SPEEDBRAKES™

When SpeedBrakes™ are installed it is important to be aware of the following performance changes that may result when the speed brakes are deployed.

1. During takeoff with the SpeedBrakes™ inadvertently deployed, expect an extended takeoff roll and reduction in rate of climb until the SpeedBrakes™ are retracted.
2. During cruise flight with the SpeedBrakes™ deployed, expect the cruise speed and range to be reduced 20%.
3. In the unlikely event of one SpeedBrake™ cartridge deploys while the other remains retracted, a maximum of 1/4 to 1/3 of corrective aileron travel, and up to 20 lbs. of additional rudder pressure are required for coordinated flight from stall through V_{NE}. Indication of this condition will be noted by an annunciation message with the SpeedBrakes™ switch ON.

CROSSWIND, HEADWIND, AND TAILWIND COMPONENT

Degrees Wind Off Runway Centerline		10º		20º		30º		40º		50º		60º		70º		80º	
		Component in knots of		Component in knots of		Component in knots of		Component in knots of		Component in knots of		Component in knots of		Component in knots of		Component in knots of	
		Crosswind	Headwind or Tailwind	Crosswind	Headwind or Tailwind	Crosswind	Headwind or Tailwind	Crosswind	Headwind or Tailwind	Crosswind	Headwind or Tailwind	Crosswind	Headwind or Tailwind	Crosswind	Headwind or Tailwind	Crosswind	Headwind or Tailwind
WIND VELOCITY KNOTS	5	1	5	2	5	2	4	3	4	4	3	4	3	5	2	5	1
	10	2	10	3	9	5	9	6	8	8	6	9	5	9	3	10	2
	15	3	15	5	14	7	13	10	11	11	10	13	8	14	5	15	3
	20	3	20	7	19	10	17	13	15	15	13	17	10	19	7	20	3
	25	4	25	9	23	12	22	16	19	19	16	22	13	23	9	25	4
	30	5	30	10	28	15	26	19	23	23	19	26	15	28	10	30	5
	35	6	34	12	33	17	30	22	27	27	22	30	18	33	12	34	6
	40	7	39	14	38	20	35	26	31	31	26	35	20	38	14	39	7

This table is used to determine the headwind, crosswind, or tailwind component. For example, a 15-knot wind, 55° off the runway centerline, has a headwind component of 9 knots and a crosswind component of 12 knots. For tailwind components, apply the number of degrees the tailwind is off the centerline and read the tailwind component in the headwind/tailwind column. A 20-knot tailwind, 60º off the downwind runway centerline, has a tailwind component of 10 knots and a crosswind component of 17 knots.

Figure 5 - 6

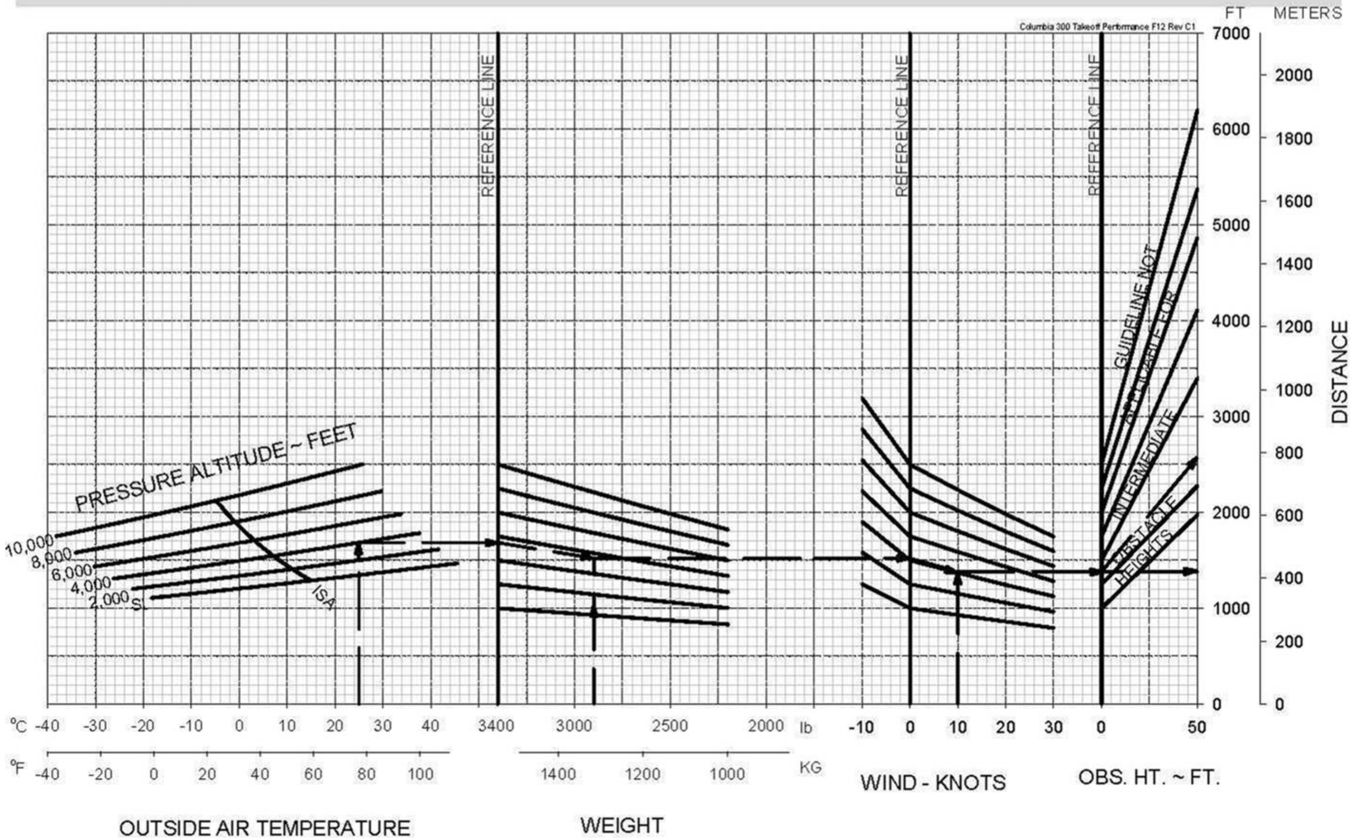
This Page Intentionally Left Blank

SHORT FIELD TAKEOFF DISTANCE (12º - TAKEOFF FLAPS)

SHORT FIELD TAKEOFF DISTANCE (12º- TAKEOFF FLAPS)

ASSOCIATED CONDITIONS		EXAMPLE	
Power	Takeoff Power Set Before Brake Release	Outside Air Temperature (OAT)	25°C
Flaps	12° (Flaps in Takeoff Position)	Pressure Altitude (PA)	4000 Ft.
Runway	Paved, Level, Dry Surface	Takeoff Weight	2900 lbs
Takeoff Speeds	Rotation 65 KIAS	Headwind Component	10 Knots
(All weights)	At 50 Feet 78 KIAS	Ground Roll = 1383 ft (421 m) 50 Ft. Obstacle = 2576 ft (785 m)	

For operation on a known level, smooth, mowed grass runway, which is either wet or dry but does not include standing water, the ground roll distance obtained from this takeoff performance chart must be multiplied by a factor of 1.3 to obtain the correct field length. In the above example, the ground roll distance would be 1798 feet (548 m) (1.3 x 1383). The total distance to clear a 50 foot (15 m) obstacle would be 2991 feet (912 m) in this instance.



This Page intentionally Left Blank

MAXIMUM RATE OF CLIMB

Weight	Pressure Altitude – Ft.	Climb Speed – KIAS	ISA - 20°C	ISA	ISA + 20°C
			Rate of Climb (Feet/Minute)		
3400 lbs. (1542 kg)	SL	106	1335	1225	1123
	2000	102	1246	1136	1034
	4000	100	1157	1047	945
	6000	97	1068	958	857
	8000	95	979	869	768
	10000	92	890	780	679
	12000	90	801	691	590
	14000	87	713	602	501
	16000	84	624	513	412
3000 lbs. (1361 kg)	SL	99	1513	1388	1273
	2000	96	1412	1287	1172
	4000	94	1311	1186	1072
	6000	91	1211	1085	971
	8000	89	1110	985	870
	10000	86	1009	884	769
	12000	85	908	788	669
	14000	82	808	682	568
	16000	79	707	581	467
2500 lbs. (1134 kg)	SL	90	1861	1666	1528
	2000	88	1695	1545	1407
	4000	86	1574	1424	1286
	6000	83	1453	1303	1165
	8000	81	1332	1182	1044
	10000	79	1211	1061	923
	12000	77	1090	940	802
	14000	75	969	819	681
	16000	72	848	698	561

Example	Associated Conditions	Notes
Weight.... 3200 lbs. (1451 kg) Pressure Altitude............7000 Ambient Air Temp.......... 1°C	Power.......... Max. continuous at 2700 RPM. Flaps ....Cruise Mixture.......At recommended leaning schedule	Fuel mixture should be leaned appropriately for altitude.
Climb Speed............ 93 KIAS Rate of Climb.....975± ft/min.		

Figure 5 - 7

TIME, FUEL, AND DISTANCE TO CLIMB

Pressure Altitude Feet	Climb Speed KIAS	Weight lbs. (kg)	Rate of Climb ft/min	From Sea Level		
				Time Min.†	Fuel Used Gallons (Liters)	Distance – N.M.
2000	102	3400 (1542) 3000 (1361) 2500 (1134)	1136 1287 1545	2.5 2.2 2.0	0.9 (3.4) 0.8 (3.0) 0.8 (3.0)	3.0 2.6 2.2
4000	99	3400 (1542) 3000 (1361) 2500 (1134)	1047 1186 1424	4.3 3.9 3.3	1.5 (5.7) 1.4 (5.3) 1.2 (4.5)	5.2 5.5 4.6
6000	97	3400 (1542) 3000 (1361) 2500 (1134)	958 1085 1303	6.3 5.6 4.8	2.1 (7.9) 1.9 (7.2) 1.6 (6.1)	9.8 8.6 7.2
8000	95	3400 (1542) 3000 (1361) 2500 (1134)	869 985 1182	8.5 7.6 6.4	2.7 (10.2) 2.5 (9.5) 2.1 (7.9)	13.7 12.1 10.0
10000	92	3400 (1542) 3000 (1361) 2500 (1134)	780 884 1061	10.9 9.7 8.2	3.4 (12.9) 3.0 (11.4) 2.6 (9.8)	18.0 15.9 13.2
12000	90	3400 (1542) 3000 (1361) 2500 (1134)	691 783 940	13.6 12.1 10.2	4.1 (15.5) 3.6 (13.6) 3.1 (11.7)	22.9 20.2 16.8
14000	87	3400 (1542) 3000 (1361) 2500 (1134)	602 682 819	16.8 14.9 12.5	4.8 (18.2) 4.3 (16.3) 3.6 (13.6)	28.5 25.1 20.9
16000	84	3400 (1542) 3000 (1361) 2500 (1134)	513 581 698	20.4 18.0 15.2	5.6 (21.2) 5.0 (18.9) 4.2 (15.9)	35.0 30.9 35.7
18000	82	3400 (1542) 3000 (1361) 2500 (1134)	424 480 576	24.7 21.8 18.3	6.5 (24.6) 5.8 (22.0) 4.9 (18.5)	42.7 37.7 31.4

Example	Associated Conditions	Notes
Weight .... 3400 lbs. (1542 kg) Cruise Press. Altitude .... 8500 Ambient Air Temp ....-12°C Climb Speed** .... 94 KIAS R of C** .... 910± ft/min. (Corrected for ISA -10ºC temp) Time .... 9.1 min Fuel............. 17.4 lbs. (7.9 kg) Distance................... 12.8 NM	Power.......... Max. Man. Press at 2700 RPM Flaps .... Cruise Mixture ...... At recommended leaning schedule Temp.... Standard Day (ISA)* *See Note 2 for approximate performance above or below ISA temperatures. **At cruise altitude	1. Distances shown are based on zero wind. 2. For temperatures above standard, decrease the rate of climb 57 ft/min for each 10°C above the temperature. 3. For temperatures below standard, increase the rate of climb 63 ft/min for each 10°C below the temperature. † Times include 45 seconds for takeoff and acceleration to V_Y.

Figure 5 - 8

CRUISE PERFORMANCE OVERVIEW

The tables on pages 5-14 through 5-21 contain cruise data to assist in the flight planning process. This information is tabulated for even thousand altitude increments and ranges from Sea Level feet to 16000 feet. Interpolation is required for the odd number altitudes, i.e., 5000 feet, 7000 feet, etc., as well as altitude increments of 500 feet, such as 7500 and 9500.

The tables assume proper leaning at the various operating horsepowers. Between 65% and 75% of brake horsepower, the mixtures should be leaned through use of the exhaust gas temperature (EGT) gauge and adjusted to 50ºF rich of the peak setting. Please refer to page 4-25 in this handbook for proper leaning techniques. At brake horsepowers below 65%, the mixture may be leaned to 50ºF lean of the peak EGT setting.

The maximum recommended cruise setting is 80% of brake horsepower; however, settings of 75% and below provide better economy with only a modest sacrifice in true airspeed. The mixture must not be leaned above settings that produce more than 80% of brake horsepower unless rough engine operations are encountered. In this instance, lean the mixture slowly until smooth engine operations are reestablished. Be sure to monitor engine instruments to ensure safe ranges.

In some instances, the interpolation process will involve power settings from two different leaning schedules. For example, in Figure 5 - 13, to determine the fuel flow for 2400 RPM and 22 inches of manifold pressure, temperature 26ºC (78ºF), requires interpolation between values for 2300 RPM and 2500 RPM. The brake horsepower and fuel flow at 2500 RPM are 67% BHP and 14.4 GPH (54.5 LPH). At 2300 RPM, it is 57% BHP and 10.8 GPH (40.9 LPH). Interpolating between the two sets of numbers will yield 62% BHP and 12.6 GPH (47.7 LPH). The interpolated fuel consumption, in this instance, is high because of the different leaning schedules for 57% BHP and 67% BHP. The correct answer, 11.7 GPH, is found by using the interpolated brake horsepower, 62%, and looking up the fuel consumption in Figure 5 - 9. Note: By scanning the particular Cruise Performance table in use, the appropriate fuel consumption can usually be found without the need to reference Figure 5 - 9.

BRAKE HORSEPOWER (BHP) AND FUEL CONSUMPTION

Percent Brake Horsepower and Fuel Consumption											
Pct. BHP	GPH	LPH	Pct. BHP	GPH	LPH	Pct. BHP	GPH	LPH	Pct. BHP	GPH	LPH
40%	7.6	28.8	51%	9.6	36.3	62%	11.7	44.3	73%	15.7	59.4
41%	7.8	29.5	52%	9.8	37.1	63%	11.9	45.0	74%	15.9	60.2
42%	7.9	29.9	53%	10.0	37.9	64%	12.1	45.8	75%	16.2	61.3
43%	8.1	30.7	54%	10.2	38.6	65%	14.0	53.0	76%	16.4	62.1
44%	8.3	31.4	55%	10.4	39.4	66%	14.2	53.7	77%	16.6	62.8
45%	8.5	32.2	56%	10.6	40.1	67%	14.4	54.5	78%	16.8	63.6
46%	8.4	31.8	57%	10.8	40.9	68%	14.6	55.3	79%	17.0	64.3
47%	8.9	33.7	58%	11.0	41.6	69%	14.9	56.4	80%	17.2	65.1
48%	9.1	34.4	59%	11.2	42.4	70%	15.1	57.2	81%	17.4	65.9
49%	9.3	35.2	60%	11.3	42.8	71%	15.3	57.9	82%	17.7	67.0
50%	9.5	36.0	61%	11.5	43.5	72%	15.5	58.7	83%	17.9	67.8

Figure 5 - 9

CRUISE PERFORMANCE SEA LEVEL PRESSURE ALTITUDE

		-18°C (33°C Below Standard)				15°C (Standard Temperature)				37°C (22°C Above Standard)			
RPM	MP	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS
2700	25	**89**	**19.3**	**73.1**	**177**	**85**	**18.2**	**68.9**	**180**	**82**	**17.7**	**67.0**	**181**
	24	**85**	**18.3**	**69.3**	**174**	80	17.2	65.1	176	77	16.6	62.8	177
2500	26	84	18.1	68.5	173	80	17.2	65.1	176	77	16.6	62.8	177
	25	80	17.2	65.1	170	76	16.4	62.1	172	73	15.7	59.4	173
	24	76	16.4	62.1	166	71	15.3	57.9	168	69	14.9	56.4	169
2300	28	80	17.2	65.1	170	76	16.4	62.1	172	73	15.7	59.4	173
	27	76	16.4	62.1	167	72	15.5	58.7	168	69	14.9	56.4	169
	26	72	15.5	58.7	163	68	14.6	55.3	164	66	14.2	53.7	165
	25	69	14.9	56.4	159	65	14.0	53.0	160	62	11.7	44.3	161
	24	65	14.0	53.0	156	61	11.5	43.5	156	59	11.2	42.4	156

3400 lbs. (1542 kg) Gross Weight

Recommended Mixture Setting

Numbers shown in bold are outside recommended cruise horsepower limits and are included for interpolation purposes only.

Do not attempt mixture adjustment by use of EGT indications for operations above 75% of maximum power; use the fuel flow settings shown in this chart. At cruise settings between 65% and 75% power, set the mixture to 50ºF (10ºC) rich of peak EGT. See page 4-30 for a discussion of the adjustment procedures. At cruise settings below 65% power, operations at 50ºF (28ºC) lean of peak EGT will provide the lowest fuel consumption. Data in these charts are based on this leaning schedule. Finally, do not exceed 20 inches of manifold pressure below 2200 RPM.

EXAMPLE PROBLEM AND SOLUTION

Conditions

Cruise Altitude ....1000 feet
Temperature .... 13°C
Manifold Pressure..............................25 inches Hg
RPM..2500

Determine

1. ....% of BHP
2. .... Fuel Consumption (GPH)
3. ....True Airspeed

Solution

% of BHP... 76.5%
Fuel Consumption............... 16.5 GPH (62.5 LPH)
True Airspeed ....175 Knots

Figure 5 - 10

CRUISE PERFORMANCE 2000 FEET PRESSURE ALTITUDE

		-22°C (33°C Below Standard)				11°C (Standard Temperature)				33°C (22°C Above Standard)			
RPM	MP	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS
2700	23	**83**	**17.9**	**67.8**	**175**	78	16.8	63.6	177	75	16.2	61.3	178
	22	79	17.0	64.3	172	74	15.9	60.2	174	72	15.5	58.7	174
	21	73	15.7	59.4	167	69	14.9	56.4	168	67	14.4	54.5	169
	20	69	14.9	56.4	162	65	14.0	53.0	163	62	11.7	44.3	163
	19	64	12.1	45.8	157	60	11.3	42.8	157	58	11.0	41.6	157
	18	59	11.2	42.4	151	55	10.4	39.4	150	53	10.0	37.9	149
2500	25	83	17.9	67.8	175	77	16.6	62.8	177	75	16.2	61.3	178
	24	78	16.8	63.6	171	74	15.9	60.2	173	71	15.3	57.9	174
	23	73	15.7	59.4	167	69	14.9	56.4	169	67	14.4	54.5	169
	22	69	14.9	56.4	162	65	14.0	53.0	163	62	11.7	44.3	163
	21	65	14.0	53.0	159	61	11.5	43.5	159	59	11.2	42.4	159
	20	60	11.3	42.8	153	57	10.8	40.9	152	55	10.4	39.4	152
2300	25	71	15.3	57.9	164	66	14.2	53.7	166	64	12.1	45.8	165
	24	67	14.4	54.5	160	63	11.9	45.0	161	60	11.3	42.8	160
	23	63	11.9	45.0	156	59	11.2	42.4	156	57	10.8	40.9	156
	22	59	11.2	42.4	151	56	10.6	40.1	151	53	10.0	37.9	149
	21	56	10.6	40.1	147	53	10.0	37.9	146	51	9.6	36.3	144
	20	52	9.8	37.1	141	49	9.3	37.1	139	47	8.9	33.7	137

3400 lbs. (1542 kg) Gross Weight — Recommended Mixture Setting

Numbers shown in bold are outside recommended cruise horsepower limits and are included for interpolation purposes only.

Do not attempt mixture adjustment by use of EGT indications for operations above 75% of maximum power; use the fuel flow settings shown in this chart. At cruise settings between 65% and 75% power, set the mixture to 50ºF (10ºC) rich of peak EGT. See page 4-30 for a discussion of the adjustment procedures. At cruise settings below 65% power, operations at 50ºF (28ºC) lean of peak EGT will provide the lowest fuel consumption. Data in these charts are based on this leaning schedule. Finally, do not exceed 20 inches of manifold pressure below 2200 RPM.

EXAMPLE PROBLEM AND SOLUTION

Conditions

Cruise Altitude .... 2000 feet
Temperature .... 22°C
Manifold Pressure................................ 25 inch Hg
RPM... 2500

Determine

1. .... % of BHP
2. ....Fuel Consumption (GPH)
3. .... True Airspeed

Solution

% of BHP 77%
Fuel Consumption ....16.4 GPH (62.1 LPH)
True Airspeed... 177 Knots*

*As a rule, always round to the more conservative number when using the various performance tables in this handbook.

Figure 5 - 11

CRUISE PERFORMANCE 4000 FT PRESSURE ALTITUDE

		-26°C (33°C Below Standard)				**7°C (Standard Temperature)**				**29°C (22°C Above Standard)**			
RPM	MP	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS
2700	23	**86**	**18.5**	**70.0**	**181**	**81**	**17.4**	**65.9**	**184**	78	16.8	63.6	184
	22	**81**	**17.4**	**65.9**	**177**	77	16.6	62.8	179	74	15.9	60.2	180
	21	76	16.4	62.1	173	72	15.5	58.7	174	69	14.9	56.4	174
	20	71	15.3	57.9	167	66	14.2	53.7	168	64	12.1	45.8	168
	19	66	14.2	53.7	162	62	11.7	44.3	162	60	11.3	42.8	161
	18	61	11.5	43.5	156	57	10.8	40.9	155	55	10.4	39.4	154
2500	24	81	17.4	65.9	176	76	16.4	62.1	178	73	15.7	59.4	179
	23	76	16.4	62.1	172	71	15.3	57.9	174	69	14.9	56.4	174
	22	71	15.3	57.9	167	67	14.4	54.5	168	64	12.1	45.8	168
	21	68	14.6	55.3	164	64	12.1	45.8	164	61	11.5	45.8	164
	20	63	11.9	45.0	159	59	11.2	42.4	158	57	10.8	40.9	157
	19	59	11.2	42.4	153	55	10.4	39.4	152	53	10.0	37.9	150
2300	25	73	15.7	59.4	169	68	14.6	55.3	170	66	14.2	53.7	170
	24	69	14.9	56.4	165	65	14.0	53.0	166	62	11.7	44.3	165
	23	65	14.0	53.0	160	61	11.5	43.5	160	59	11.2	42.4	159
	22	62	11.7	44.3	156	58	11.0	41.6	156	56	10.6	40.1	155
	21	58	11.0	41.6	151	54	10.2	38.6	150	52	9.8	37.1	148
	20	54	10.2	38.6	146	51	9.6	36.3	144	49	9.3	35.2	141

3400 lbs. (1542 kg) Gross Weight Recommended Mixture Setting

Numbers shown in bold are outside recommended cruise horsepower limits and are included for interpolation purposes only.

Do not attempt mixture adjustment by use of EGT indications for operations above 75% of maximum power; use the fuel flow settings shown in this chart. At cruise settings between 65% and 75% power, set the mixture to 50ºF (10ºC) rich of peak EGT. See page 4-30 for a discussion of the adjustment procedures. At cruise settings below 65% power, operations at 50ºF (28ºC) lean of peak EGT will provide the lowest fuel consumption. Data in these charts are based on this leaning schedule. Finally, do not exceed 20 inches of manifold pressure below 2200 RPM.

EXAMPLE PROBLEM AND SOLUTION

Conditions

Cruise Altitude .... 4000 feet
Temperature .... -9°C
Manifold Pressure ....24 inch Hg
RPM 2400

Determine

1. ....% of BHP
2. .... Fuel Consumption (GPH)
3. .... True Airspeed

Solution

% of BHP... 73%
Fuel Consumption............... 15.7 GPH (59.4 LPH)
True Airspeed .... 171 Knots

Figure 5 - 12

CRUISE PERFORMANCE 6000 FT PRESSURE ALTITUDE

		-30°C (33°C Below Standard)				3°C (Standard Temperature)				25°C (22°C Above Standard)			
RPM	MP	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS
2700	22	**84**	**18.1**	**68.5**	**182**	79	17.0	64.3	185	76	16.4	62.1	185
	22	78	16.8	63.6	177	73	15.7	59.4	179	70	15.1	57.2	179
	20	74	15.9	60.2	173	69	14.9	56.4	174	66	14.2	53.7	174
	19	68	14.6	55.3	167	64	12.1	45.8	168	62	11.7	44.3	167
	18	63	11.9	45.0	161	60	11.3	42.8	161	57	10.8	40.9	159
	17	59	11.2	42.4	155	55	10.4	39.4	154	53	10.0	37.9	152
2500	23	78	16.8	63.6	177	74	15.9	60.2	179	71	15.3	57.9	179
	22	74	15.9	60.2	173	70	15.1	57.2	175	67	14.4	54.5	175
	21	70	15.1	57.2	169	66	14.2	53.7	169	63	11.9	45.0	169
	20	65	14.0	53.0	164	61	11.5	43.5	163	59	11.2	42.4	162
	19	61	11.5	43.5	157	57	10.8	40.9	156	55	10.4	39.4	155
	18	56	10.6	40.1	151	53	10.0	37.9	149	52	9.8	37.1	146
2300	23	67	14.4	54.5	165	62	11.7	44.3	169	60	11.3	42.8	164
	22	63	11.9	45.0	161	60	11.3	42.8	164	57	10.8	40.9	159
	21	59	11.2	42.4	156	56	10.6	40.1	158	53	10.0	37.9	152
	20	55	10.4	39.4	150	52	9.8	37.1	151	50	9.5	36.0	145
	19	52	9.8	37.1	144	49	9.3	35.2	146	47	8.9	33.7	137
	18	48	9.1	34.4	137	45	8.5	32.2	137	43	8.1	30.7	126

3400 lbs. (1542 kg) Gross Weight — Recommended Mixture Setting

Numbers shown in bold are outside recommended cruise horsepower limits and are included for interpolation purposes only.

Do not attempt mixture adjustment by use of EGT indications for operations above 75% of maximum power; use the fuel flow settings shown in this chart. At cruise settings between 65% and 75% power, set the mixture to 50ºF (10ºC) rich of peak EGT. See page 4-30 for a discussion of the adjustment procedures. At cruise settings below 65% power, operations at 50ºF (28ºC) lean of peak EGT will provide the lowest fuel consumption. Data in these charts are based on this leaning schedule. Finally, do not exceed 20 inches of manifold pressure below 2200 RPM.

EXAMPLE PROBLEM AND SOLUTION

Conditions	Solution
Cruise Altitude .... 6000 feet	% of BHP 62%
Temperature .... 25°C	Fuel Consumption .... 11.7 GPH* (44.3 LPH)
Manifold Pressure .... 22 inch Hg	True Airspeed .... 167 Knots
RPM 2400	*The exact mathematical answer is 12.6 GPH by interpolation. However, leaning at 65% to 75% of BHP is different than at settings below 65% BHP. In this instance, locate a 62% BHP setting on the performance chart to determine fuel consumption. See page 5-11 for discussion details.
Determine	
1. .... % of BHP	
2. .... Fuel Consumption (GPH)	
3. .... True Airspeed	

Figure 5 - 13

CRUISE PERFORMANCE 8000 FT PRESSURE ALTITUDE

		-34°C (33°C Below Standard)				-1°C (Standard Temperature)				21°C (22°C Above Standard)			
RPM	MP	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS
2700	22	**86**	**18.5**	**70.0**	**188**	**81**	**17.4**	**65.9**	**191**	78	16.8	63.6	191
	21	**81**	**17.4**	**65.9**	**183**	76	16.4	62.1	184	73	15.7	59.4	185
	20	75	16.2	61.3	178	71	15.3	57.9	178	68	14.6	55.3	178
	19	71	15.3	57.9	172	66	14.2	53.7	173	64	12.1	45.8	172
	18	65	14.0	53.0	166	61	11.5	43.5	166	59	11.2	42.4	164
	17	61	11.5	43.5	160	57	10.8	40.9	159	55	10.4	39.4	157
2500	22	77	16.6	62.8	179	72	15.5	58.7	181	69	14.9	56.4	180
	21	72	15.5	58.7	173	67	14.4	54.5	174	64	12.1	45.8	173
	20	68	14.6	55.3	169	63	11.9	45.0	169	61	11.5	43.5	168
	19	63	11.9	45.0	163	59	11.2	42.4	162	57	10.8	40.9	160
	18	58	11.0	41.6	156	55	10.4	39.4	154	52	9.8	37.1	151
	17	54	10.2	38.6	149	50	9.5	36.0	145	48	9.1	34.4	141
2300	22	65	14.0	53.0	166	61	11.5	43.5	166	59	11.2	42.4	164
	21	61	11.5	43.5	160	57	10.8	40.9	159	55	10.4	39.4	157
	20	57	10.8	40.9	155	54	10.2	38.6	152	51	9.6	36.3	149
	19	53	10.0	37.9	149	50	9.5	36.0	145	48	9.1	34.4	140
	18	50	9.5	36.0	141	47	8.9	33.7	136	45	8.5	32.2	129
	17	46	8.7	32.9	133	43	8.1	30.7	124	41	7.8	29.5	115

3400 lbs. (1542 kg) Gross Weight — Recommended Mixture Setting

Numbers shown in bold are outside recommended cruise horsepower limits and are included for interpolation purposes only.

Do not attempt mixture adjustment by use of EGT indications for operations above 75% of maximum power; use the fuel flow settings shown in this chart. At cruise settings between 65% and 75% power, set the mixture to 50ºF (10ºC) rich of peak EGT. See page 4-30 for a discussion of the adjustment procedures. At cruise settings below 65% power, operations at 50ºF (28ºC) lean of peak EGT will provide the lowest fuel consumption. Data in these charts are based on this leaning schedule. Finally, do not exceed 20 inches of manifold pressure below 2200 RPM.

EXAMPLE PROBLEM AND SOLUTION

Conditions

Cruise Altitude .... 8000 feet
Temperature ....-1°C
Manifold Pressure ....22 inch Hg
RPM 2700

Determine

1. ....% of BHP
2. .... Fuel Consumption (GPH)
3. .... True Airspeed

Solution

% of BHP 81%*
Fuel Consumption .... 17.4 GPH* (65.9 LPH)
True Airspeed...191 Knots

*Fuel flow shown is for best power mixture. This power setting is above the maximum recommended cruise setting of 80% and does not represent a recommended mixture setting.

Figure 5 - 14

CRUISE PERFORMANCE 10000 FT PRESSURE ALTITUDE

		-38°C (23°C Below Standard)				-5°C (Standard Temperature)				17°C (22°C Above Standard)			
RPM	MP	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS
2700	20	78	16.8	63.6	183	73	15.7	59.4	184	70	15.1	57.2	184
	19	75	16.2	61.3	179	70	15.1	57.2	180	67	14.4	54.5	180
	18	68	14.6	55.3	172	64	12.1	45.8	172	61	11.5	43.5	171
	17	63	11.9	45.0	166	59	11.2	42.4	164	57	10.8	40.9	162
	16	62	11.7	44.3	164	58	11.0	41.6	162	55	10.4	39.4	159
	15	53	10.0	37.9	150	50	9.5	36.0	145	48	9.1	34.4	139
2500	20	70	15.1	57.2	174	66	14.2	53.7	174	63	11.9	45.0	173
	19	65	14.0	53.0	168	61	11.5	43.5	167	58	11.0	41.6	165
	18	60	11.3	42.8	161	56	10.6	40.1	159	54	10.2	38.6	156
	17	56	10.6	40.1	155	53	10.0	37.9	151	51	9.6	36.3	147
	16	52	9.8	37.1	147	48	9.1	34.4	141	47	8.9	33.7	135
2300	20	59	11.2	42.4	160	55	10.4	39.4	157	53	10.0	37.9	154
	19	55	10.4	39.4	153	52	9.8	37.1	149	50	9.5	36.0	145
	18	52	9.8	37.1	147	48	9.1	34.4	141	47	8.9	33.7	135
	17	48	9.1	34.4	139	45	8.5	32.2	130	43	8.1	30.7	121

3400 lbs. (1542 kg) Gross Weight — Recommended Mixture Setting

Do not attempt mixture adjustment by use of EGT indications for operations above 75% of maximum power; use the fuel flow settings shown in this chart. At cruise settings between 65% and 75% power, set the mixture to 50ºF (28ºC) rich of peak EGT. See page 4-30 for a discussion of the adjustment procedures. At cruise settings below 65% power, operations at 50ºF (28ºC) lean of peak EGT will provide the lowest fuel consumption. Data in these charts are based on this leaning schedule. Finally, do not exceed 20 inches of manifold pressure below 2200 RPM.

EXAMPLE PROBLEM AND SOLUTION

Conditions

Cruise Altitude .... 9000 feet
Temperature ....-3°C
Manifold Pressure ....20 inch Hg
RPM 2700

Determine

1. ....% of BHP
2. .... Fuel Consumption (GPH)
3. .... True Airspeed

Solution

% of BHP 72%
Fuel Consumption .... 15.5 GPH (58.7 LPH)
True Airspeed.. 180 Knots

Figure 5 - 15

CRUISE PERFORMANCE 12000 FT PRESSURE ALTITUDE

		-42°C (33°C Below Standard)				-9°C (Standard Temperature)				13°C (22°C Above Standard)			
RPM	MP	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS
2700	19	75	16.2	61.3	183	70	15.1	57.2	183	67	14.4	54.5	183
	18	70	15.1	57.2	178	66	14.2	53.7	177	63	11.9	45.0	176
	17	66	14.2	53.7	171	61	11.5	43.5	170	59	11.2	42.4	168
	16	60	11.3	42.8	163	56	10.6	40.1	160	54	10.2	38.6	157
	15	55	10.4	39.4	155	52	9.8	37.1	150	49	9.3	35.2	145
2500	19	67	14.4	54.5	174	63	11.9	45.0	173	60	11.3	42.8	171
	18	62	11.7	44.3	167	58	11.0	41.6	164	56	10.6	40.1	161
	17	58	11.0	41.6	160	54	10.2	38.6	156	52	9.8	37.1	152
	16	54	10.2	38.6	153	51	9.6	36.3	148	49	9.3	35.2	142
	15	48	9.1	34.4	140	45	8.5	32.2	131	43	8.1	30.7	119
2300	19	57	10.8	40.9	158	53	10.0	37.9	154	51	9.6	36.3	149
	18	53	10.0	37.9	151	50	9.5	36.0	145	48	9.1	34.4	138
	17	49	9.3	35.2	143	46	8.7	32.9	134	44	8.3	31.4	124
	16	46	8.7	32.9	133	43	8.1	30.7	120	41	7.8	29.5	102

3400 lbs. (1542 kg) Gross Weight — Recommended Mixture Setting

At cruise settings between 65% and 75% power, set the mixture to 50ºF (28ºC) rich of peak EGT. See page 4-30 for a discussion of the adjustment procedures. At cruise settings below 65% power, operations at 50ºF (28ºC) lean of peak EGT will provide the lowest fuel consumption. Data in these charts are based on this leaning schedule. Finally, do not exceed 20 inches of manifold pressure below 2200 RPM.

EXAMPLE PROBLEM AND SOLUTION

Conditions

Cruise Altitude .... 12000 feet
Temperature .... -9°C
Manifold Pressure .... 19 inch Hg
RPM 2500

Determine

1. .... % of BHP
2. .... Fuel Consumption (GPH)
3. ....True Airspeed

Solution

% of BHP 63%
Fuel Consumption .... 11.9 GPH (45.0 LPH)
True Airspeed .... 173 Knots

Figure 5 - 16

CRUISE PERFORMANCE 14000 FT PRESSURE ALTITUDE

		-46°C (33°C Below Standard)				-13°C (Standard Temperature)				9°C (22°C Above Standard)			
RPM	MP	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS
2700	17	74	15.9	60.2	185	69	14.9	56.4	185	67	14.4	54.5	184
	16	62	11.7	44.3	169	58	11.0	41.6	166	56	10.6	40.1	162
	15	57	10.8	40.9	160	53	10.0	37.9	155	51	9.6	36.3	149
	14	48	9.1	34.4	141	45	8.5	32.2	129	43	8.1	30.7	114
2500	17	60	11.3	42.8	165	56	10.6	40.1	161	54	10.2	38.6	156
	16	55	10.4	39.4	155	51	9.6	36.3	149	49	9.3	35.2	142
	15	50	9.5	36.0	146	47	8.9	33.7	137	45	8.5	32.2	125

3400 lbs. (1542 kg) Gross Weight Recommended Mixture Setting

At cruise settings between 65% and 75% power, set the mixture to 50ºF (10ºC) rich of peak EGT. See page 4-30 for a discussion of the adjustment procedures. At cruise settings below 65% power, operations at 50ºF (28ºC) lean of peak EGT will provide the lowest fuel consumption. Data in these charts are based on this leaning schedule. Finally, do not exceed 20 inches of manifold pressure below 2200 RPM.

Figure 5 - 17

CRUISE PERFORMANCE 16000 FT PRESSURE ALTITUDE

		-50°C (33°C Below Standard)				-17°C (Standard Temperature)				5°C (22°C Above Standard)			
RPM	MP	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS
2700	16	64	12.1	45.8	175	60	11.3	42.8	171	58	11.0	41.6	167
	15	56	10.6	40.1	159	52	9.8	37.1	152	50	9.5	36.0	143
2500	16	56	10.6	40.1	160	53	10.0	37.9	154	50	9.5	36.0	146

3400 lbs. (1542 kg) Gross Weight Recommended Mixture Setting

See page 4-30 for a discussion of the adjustment procedures. At cruise settings below 65% power, operations at 50ºF (28ºC) lean of peak EGT will provide the lowest fuel consumption. Data in these charts are based on this leaning schedule. Finally, do not exceed 20 inches of manifold pressure below 2200 RPM.

Figure 5 - 18

LEAN OF PEAK ENGINE OPERATION

Leaning is done in reference to EGT, using the leanest cylinder (which peaks first). Operation lean of peak should be limited to <70% power. Starting from full rich, the power increases about 1% as "Best Power" mixture is reached. For cruise operation, best power is about 50ºF rich of peak. If the mixture is leaned further past peak EGT, the power drops 8-12%. "Best Economy" is reached at about 50ºF lean of peak. Because of the drop in power, speed will be reduced. Once a lean of peak mixture setting is reached, the RPM and manifold pressure can be increased carefully. By increasing the manifold pressure while operating lean of peak, the power loss from leaning can be compensated. Figure 5 - 19 below shows a comparison of fuel flows for best power and best economy and is valid for one RPM (about 2500 RPM). At higher RPM the fuel flow is slightly higher or slightly lower at lower RPM respectively. The power setting in Figure 5 - 19 is actual power.

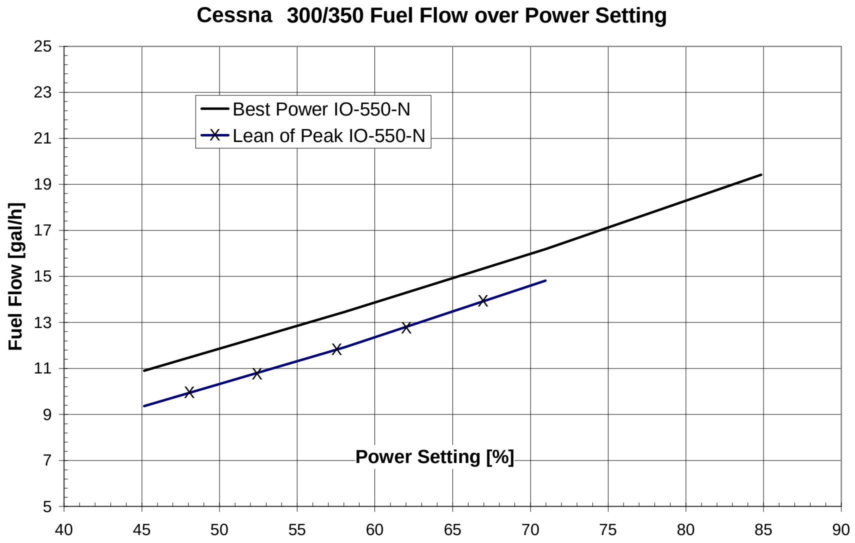


Figure 5 - 19

RANGE PROFILE

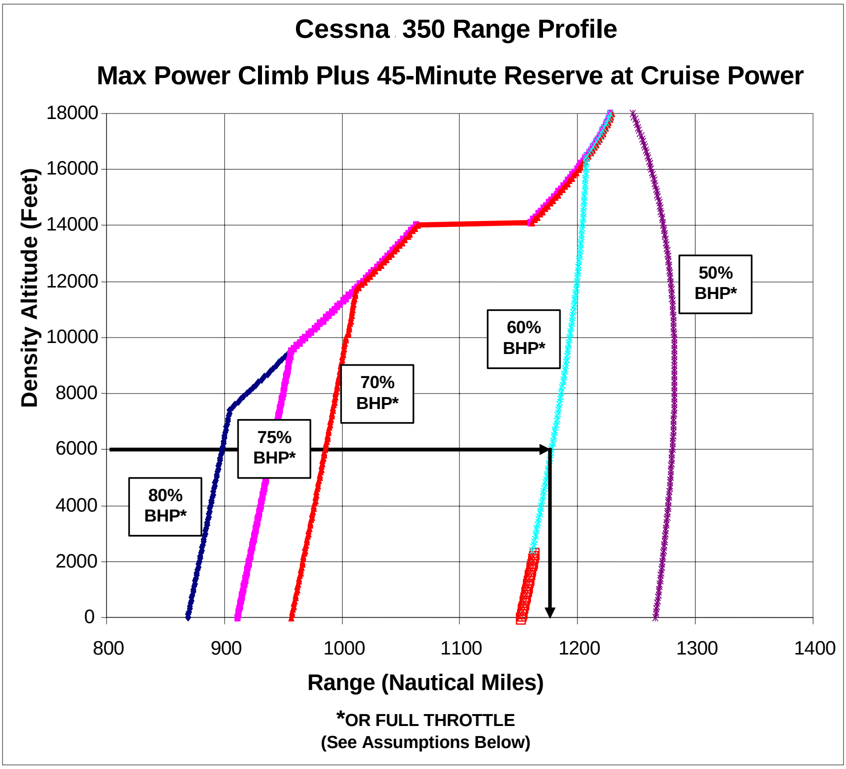


Figure 5 - 20

Conditions	Assumptions	Note
3400 lbs. (1542 kg) Max. Gross Weight Standard Temperature Proper Leaning Fuel Tanks Filled To 98 Gallons (371 L)	Chart assumes applicable BHP is maintained until full throttle is reached. After that, BHP will decrease with altitude.	The chart includes fuel for starting the engine, taxi, takeoff, and climb to altitude. The 45 minute reserve allowance is based on the applicable percentage of BHP for 45 minutes.

Example: At a density altitude of 6000 feet, with a 60% BHP power setting, the range is approximately 1175 miles.

ENDURANCE PROFILE

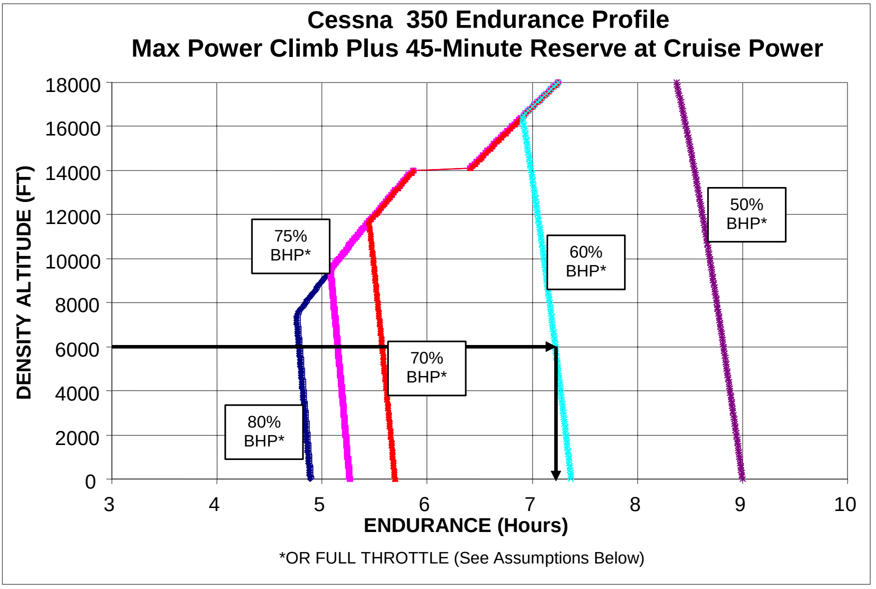


Figure 5 - 21

Conditions	Assumptions	Note
3400 lbs. (1542 kg) Max. Gross Weight Standard Temperature Proper Leaning Fuel Tanks Filled To 98 Gallons (371 L)	Chart assumes applicable BHP is maintained until full throttle is reached. After that, BHP will decrease with altitude.	The chart includes fuel for starting the engine, taxi, takeoff, and climb to altitude. The 45 minute reserve allowance is based on the applicable percentage of BHP for 45 minutes.

Example: At a density altitude of 6000 feet, with a 60% BHP power setting, the endurance is approximately 7.2 hours.

HOLDING CONSIDERATIONS

When holding is required, it is recommended that takeoff flaps be used with an indicated airspeed of 120± knots. Depending on temperature, gross weight, and RPM, the manifold pressure will range from about 13 to 17 inches. The fuel consumption has wide variability as well and can range from about 8 to 10 GPH (30.3 to 37.9 LPH). The graph below,
Figure 5 - 22, provides information to calculate either fuel used for a given holding time or the amount of holding time available for a set quantity of fuel.

The graph is based on a fuel consumption of 9 GPH (34.1 LPH) and is included here to provide a general familiarization overview. Under actual conditions, most pilots can perform the calculation for *fuel used* or the *available holding time* without reference to the graph. Moreover, the graph is only an approximation of the average anticipated fuel consumption. There will be wide variability under actual conditions.

In the example below, a 35-minute holding time will use about 5.2 gallons (19.7 L) of fuel. Conversely, if only 8 gallons (30.3 L) of fuel are available for holding purposes, the maximum holding time is 53 minutes before other action must be taken. Note that this is about the amount of fuel remaining in a tank when the low-level fuel warning light illuminates.

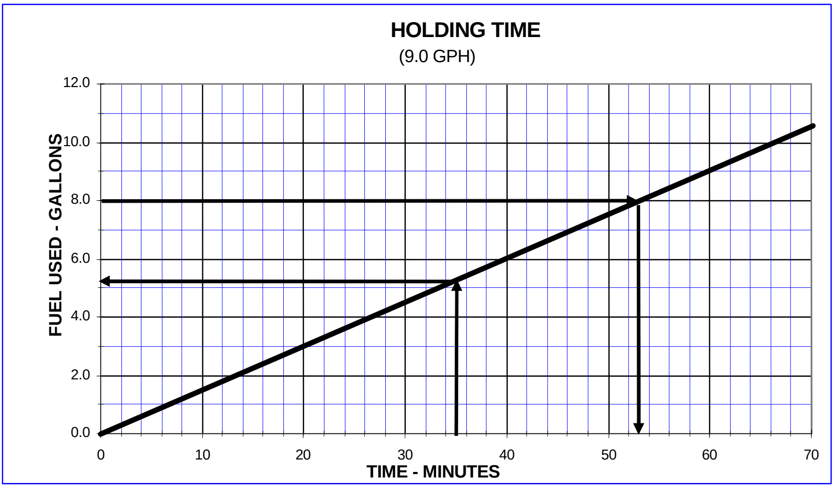


Figure 5 - 22

TIME, FUEL, AND DISTANCE FOR CRUISE DESCENT

The table below, Figure 5 - 23, has information to assist the pilot in estimating cruise descent times, fuel used, and distance traveled from cruise altitude to sea level or to the elevation of the destination airport. For descents from cruise altitude to sea level, locate the cruise altitude for the descent rate in use, and read the information directly. These data are determined for a weight of 3000 lbs. but are representative of normal operating weights during descent.

For example, a descent at 500 FPM from 9000 feet to sea level will take approximately 18 minutes, consume 1.3 gallons of fuel, and 57 miles will be traveled over the ground under no wind conditions. For descent from cruise altitude to a field elevation above sea level, subtract the performance data numbers for the field elevation from the respective cruise altitude numbers. Suppose in this example that the descent from 9000 feet is not to sea level, but rather to a field pressure altitude of 3000 feet. In this instance, the descent time is 12 minutes (18 – 6 = 12), the fuel used is 0.9 gallons (1.3 – 0.4 = 0.9), and the distance covered is 39 nm (57 – 18 = 39).

Power will be at 50% BHP± and lower, depending on altitude. As altitude decreases, power must be reduced and the mixture set to a slightly richer setting. The pilot should be aware of the limitation on V_{NO} at altitudes above 12000 feet MSL and adjust indicated airspeed accordingly, if flying in other than smooth air. See Figure 2 - 1 for airspeed limitations and page 1-7 for the definition of V_{NO}.

	180 KIAS 500 FPM DESCENT Rate (No Wind – Standard Temperature)				**180 KIAS 1000 FPM DESCENT Rate (No Wind – Standard Temperature)**			
Pressure Altitude	KTAS	Time Min	Fuel Used Gal. (L)	Distance NM	KTAS	Time Min	Fuel Used Gal. (L)	Distance NM
15000	-	-	-	-	227	15	2.4 (9.1)	50
14000	-	-	-	-	223	14	2.2 (8.3)	46
13000	-	-	-	-	220	13	2.0 (7.6)	42
12000	-	-	-	-	216	12	1.8 (6.8)	38
11000	212	22	1.6 (6.1)	71	212	11	1.7 (6.4)	35
10000	209	20	1.4 (5.3)	64	209	10	1.5 (5.7)	32
9000	206	18	1.3 (4.9)	57	206	9	1.3 (4.9)	28
8000	203	16	1.1 (4.2)	50	203	8	1.2 (4.5)	25
7000	200	14	1.0 (3.8)	44	200	7	1.0 (3.8)	21
6000	197	12	0.9 (3.4)	37	197	6	0.9 (3.4)	18
5000	194	10	0.7 (2.6)	31	194	5	0.7 (2.6)	15
4000	191	8	0.6 (2.3)	24	191	4	0.6 (2.3)	12
3000	188	6	0.4 (1.5)	18	188	3	0.4 (1.5)	9
2000	185	4	0.3 (1.1)	12	185	2	0.3 (1.1)	6
1000	183	2	0.1 (0.4)	6	183	1	0.1 (0.4)	3
0	180	0.0	0.0 (0.0)	0.0	180	0.0	0.0 (0.0)	0.0

Figure 5 - 23

SHORT FIELD LANDING DISTANCE (12º - TAKEOFF FLAPS)

SHORT FIELD LANDING DISTANCE (12° - TAKEOFF FLAPS)			
ASSOCIATED CONDITIONS		**EXAMPLE**	
Power	As Required to Maintain 3° Approach	Outside Air Temperature (OAT)	25ºC
Flaps	12° (Flaps in Takeoff Position)	Pressure Altitude (PA)	4000 Ft.
Runway	Paved, Level, Dry Surface	Headwind Component	10 Knots
Approach Speed	88 KIAS ($V_{at\ 50\ ft}$ Speed 88 KIAS All Weights)	**Ground Roll**	**1950 Ft. (594 m)**
Braking	Maximum	**Total Distance Over 50 Ft. Obstacle**	**3120 Ft. (951 m)**

For operation on a known level, smooth, mowed grass runway, which is either wet or dry but does not include standing water, the ground roll distance obtained from this landing performance chart must be multiplied by a factor of 1.6 to obtain the correct field length. In the above example, the ground roll distance would be 3120 feet (951 m) (1.6 x 1950). In this instance, the total landing distance from a 50-foot (15 m) obstacle would be 4290 feet (1308 m).

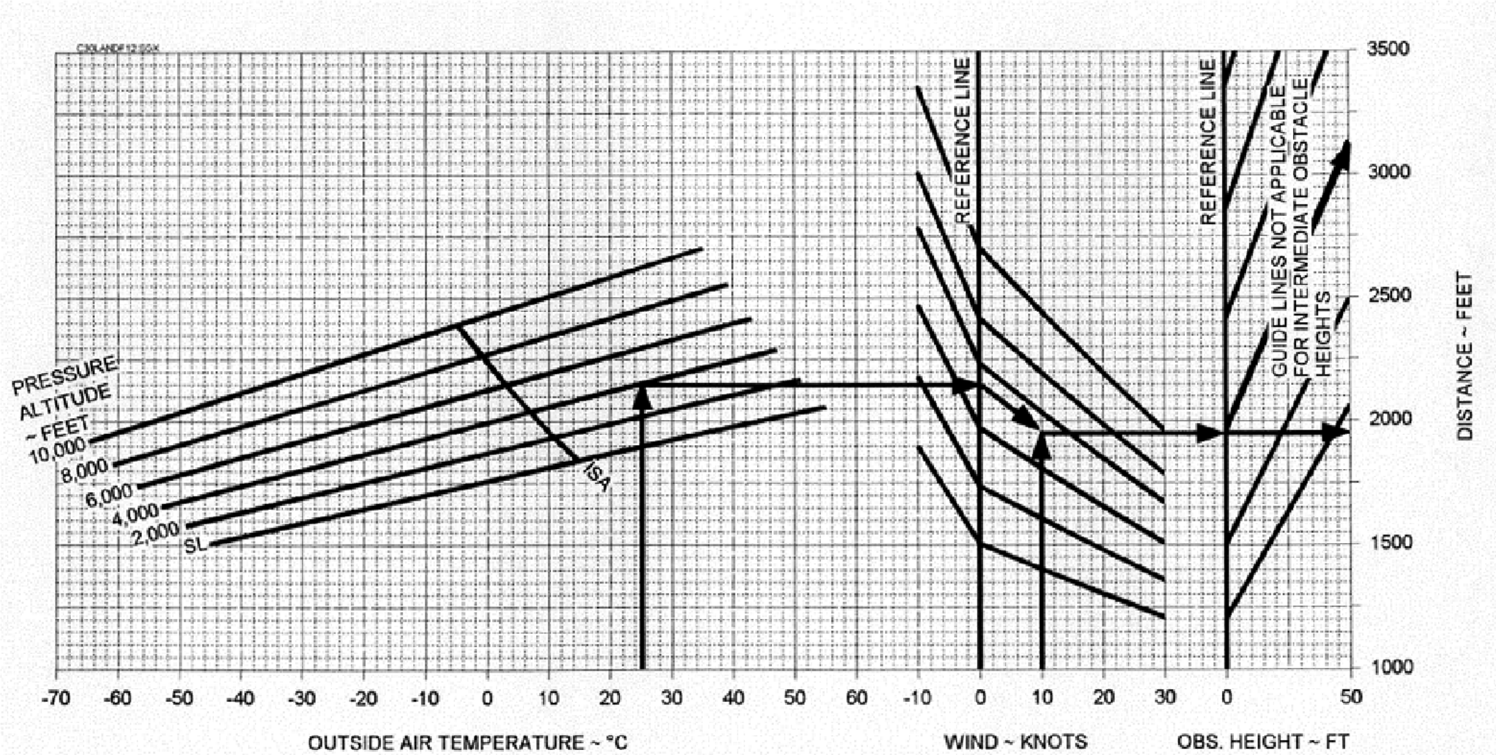


Figure 5 - 24

This Page Intentionally Left Blank

SHORT FIELD LANDING DISTANCE (40º - LANDING FLAPS)

SHORT FIELD LANDING DISTANCE (40° - LANDING FLAPS)			
ASSOCIATED CONDITIONS		**EXAMPLE**	
Power	As Required to Maintain 3° Approach	Outside Air Temperature (OAT)	25°C
Flaps	40° (Flaps in Landing Position)	Pressure Altitude (PA)	4000 Ft.
Runway	Paved, Level, Dry Surface	Headwind Component	10 Knots
Approach Speed	78 KIAS ($V_{at\ 50\ ft.}$ Speed 78 KIAS All Weights)	**Ground Roll**	**1620 Ft. (494 m)**
Braking	Maximum	**Total Distance Over 50 Ft. Obstacle**	**2650 Ft. (808 m)**

For operation on a known level, smooth, mowed grass runway, which is either wet or dry but does not include standing water, the round roll distance obtained from this landing performance chart must be multiplied by a factor of 1.6 to obtain the correct field length. In the above example, the ground roll distance would be 2592 feet (790 m) (1.6 x 1620). In this instance, the total distance from a 50-foot (15 m) obstacle would be 3622 feet (1104 m).

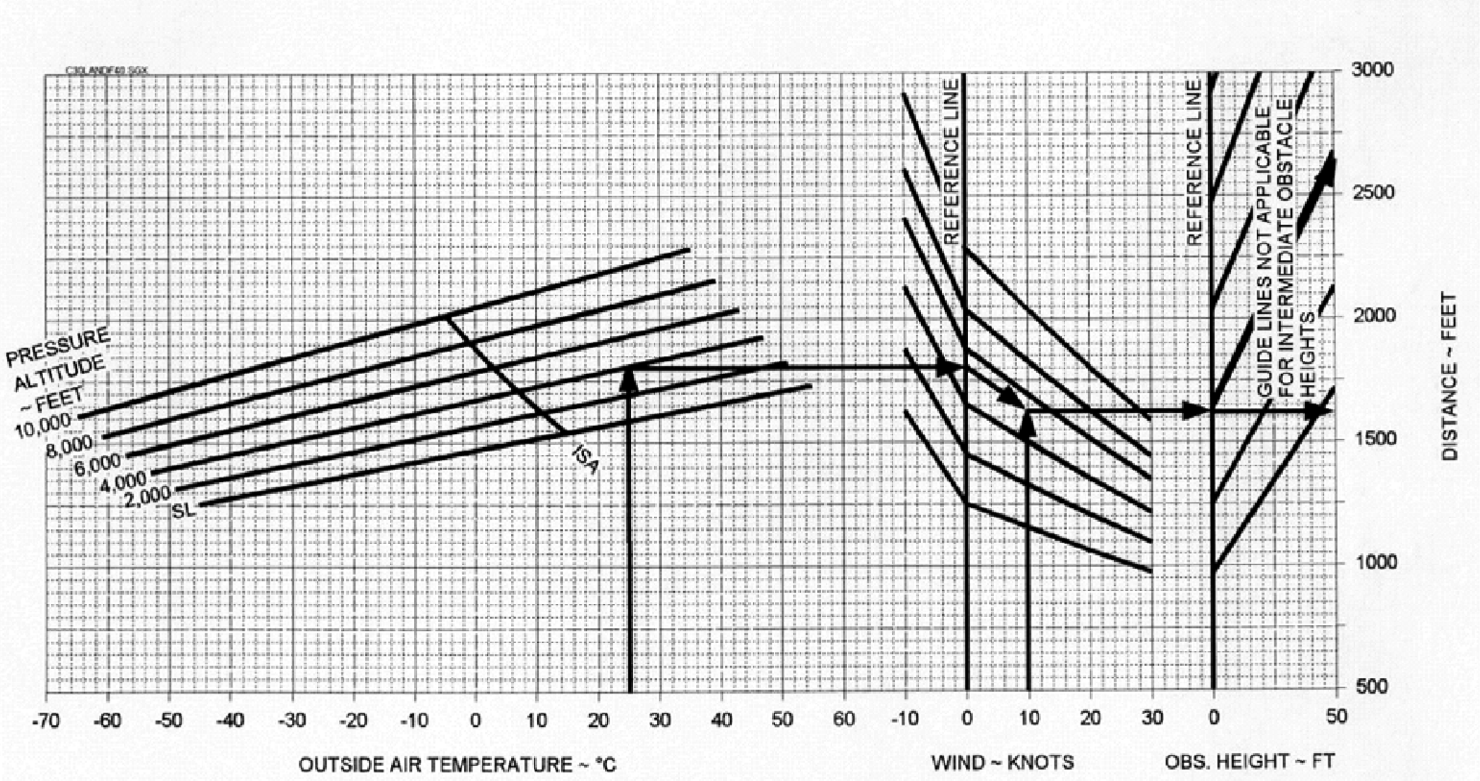


Figure 5 - 25

This Page Intentionally Left Blank

SAMPLE PROBLEM

Airplane Configuration	Cruise Environment
Takeoff Weight ... 3400 lbs. (1542 kg) Maximum Gross Weight Usable Fuel .... 98 Gallons (371 L)	Distance of Trip ....412 Nautical Miles Pressure Cruise Altitude .... 8000 Feet Cruise Power........80% BHP Ambient Air Temperature .... -1°C (Standard) En Route Winds .... 30 Knot Headwind

Takeoff Environment	Landing Environment
Airport Pressure Altitude........ 3500 Feet Ambient Air Temperature .... 25°C (17°C above standard) Headwind Component .... 30 Knots Runway Length .... 3000 Feet Obstacle at the end of the runway........ 50 Feet Climb to Cruise Altitude........Max. Continuous Power	Airport Pressure Altitude .... 2000 Feet Ambient Air Temperature ...... 30°C (16.5°C above standard) Landing Runway Number .... 36 Wind Direction & Velocity .... 040º at 25 Knots Runway Length .... 3000 Feet Obstacle at approach end of the runway .... None

SOLVE FOR THE FOLLOWING ITEMS

No.	Item	Solution	Comments
1.	What is the takeoff ground run distance at the departure airport?	725± Feet	Problem is different than example arrows, i.e., takeoff weight - 3400 lbs. and headwind - 30 knots.
2.	What is the total takeoff distance at the departure airport (ground run and obstacle clearance)?	1400± Feet	Major indices are 500 and minor indices (not printed on the graph) are 250 feet. Each line is 50 feet.
3.	Assume a climb to cruise altitude is started at a pressure altitude of 4000 feet. What is the approximate fuel used to reach cruise altitude?	1.2 Gallons (4.5 L)	The fuel required to reach a pressure altitude of 4000 and 8000 feet is 1.5 and 2.7 gallons, respectively. The difference between these two altitudes yields 1.2 gallons. No adjustment for non-standard temperature is possible.
4.	What distance over the ground is covered in the climb under no wind conditions.? What is the approximate time?	8.5 Miles 4.2 Minutes	Using the technique described in No. 3 subtract the 4000 pressure altitude distance/time from the 8000 pressure altitude distance/time.
5.	What is the fuel flow at the 8000 foot cruise altitude?	17.2 GPH (65.1 LPH)	Basic interpolation problem between 81% and 76% BHP.
6.	What is the true airspeed at the 8000 foot cruise altitude (to the nearest whole knot)?	190 knots	Basic interpolation problem between 81% and 76% BHP.
7.	Using the cruise and range profiles, what are the approximate miles covered and time aloft at 80% BHP?	910 NM 4.8 Hours	Notice that range and endurance are significantly reduced when operating at higher power settings.
8.	If 30 minutes of holding is required at the destination airport, how much fuel is used?	5.1 Gallons (19.3 L)	When holding, it is recommended that the fuel flow be set to 10.2 GPH (38.6 LPH).
9.	Assume a 500 FPM descent is used for arrival at the destination airport. At what distance from the airport should the descent begin to arrive at 1000 feet above the surface?	32 Miles	The airport elevation is 2000 feet and the descent is from 8000 feet; hence, calculations should compare 8000 feet with 3000, which is 1000 feet above the surface. See the instruction on page 5-24 for descents to airports above sea level.
10.	What are the crosswind and headwind components at the destination airport?	16 kts xwind 19 kts hdwnd	The wind is 40º off the runway centerline. See Figure 5-6 for a detailed explanation.
11.	What is the landing distance required at the destination airport, with landing flaps?	1450± Feet	In No. 10 above, the headwind component is 19 knots. Insert this information along with the airport elevation and temperature into Figure 5-25.
12.	What is the landing distance required at the destination airport, with takeoff flaps?	1800± Feet	In No. 10 above, the headwind component is 19 knots. Insert this information along with the airport elevation and temperature into Figure 5-26.
13.	Assume that the destination airport has a 50 foot obstacle and the strong crosswind limits flap usage to the takeoff setting. Is landing at the destination a prudent action?	No	Under these circumstances, the required runway is almost 2800 feet, which leaves a cushion of only 200 feet.

OXYGEN SYSTEM DURATION CHARTS

The charts shown in Figure 5 - 26 or Figure 5 - 27 should be used to determine the amount of oxygen available when using the Precise Flight Fixed Oxygen System A4 or A5 Flowmeter with cannulas or masks.

A4 FLOWMETER WITH CANNULA OR MASKS

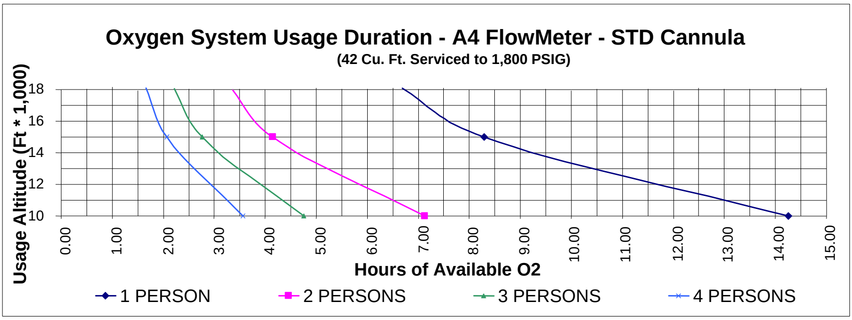


Figure 5 - 26

A5 FLOWMETER WITH CANNULA OR MASKS

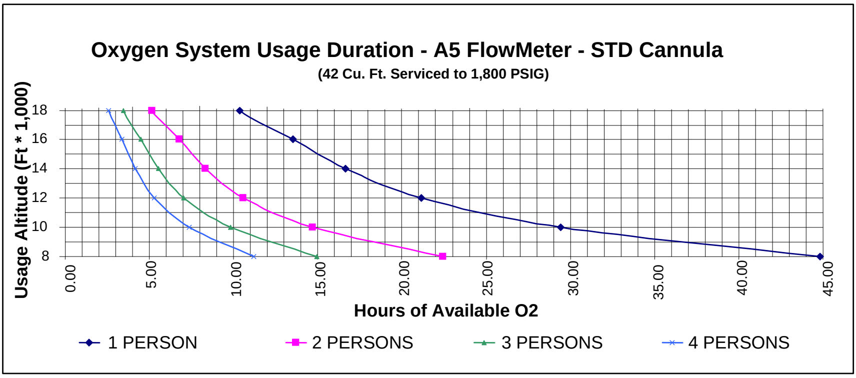


Figure 5 - 27

AUTOMATIC CLIMATE CONTROL SYSTEM (ACCS)

When Automatic Climate Control System (ACCS) is installed it is important to be aware of the following performance changes that may result. If the Automatic Climate Control System is not operating properly, all or any of the following factors may change. It is the pilot's responsibility to monitor fuel burn, time in flight and time to destination during all flight operations and make appropriate decisions to maintain a safe flight.

Takeoffs – Brake Horsepower (BHP) reduction, with the ACCS operating the compressor, during takeoff, has been determined to be **5** BHP or *less* than **2**% of total BHP. If runway conditions are short, soft or grass, and if pressure altitude, temperature or humidity is high, it is recommended that the ACCS be switched to the "Compressor Off" mode during the takeoff portion of the flight by pressing the button until the adjacent indicator light is out.

Normal and Maximum Performance Climbs – The Maximum Rate of Climb performance has been determined to be approximately 14 ft. per minute lower with the air conditioning compressor operating and the system operating properly. The pilot should compute fuel burn, range, and endurance data based on this reduced rate of climb factor. For maximum performance the ACCS should be switched to the "Compressor Off" mode during the climb portion of the flight by pressing the button until the adjacent indicator light goes out.

Cruise – Flight tests have determined that the cruise performance with the air conditioning compressor operating is reduced by 2%. The pilot should compute fuel burn, range, and endurance data based on this reduced cruise factor. If maximum performance is desired, the ACCS should be switched to the "Compressor Off" mode during the cruise portion of the flight by pressing the button until the adjacent indicator light is out.

This Page Intentionally Left Blank

Section 6 Weight & Balance and Equipment List (Appendix A)

TABLE OF CONTENTS

Section 6
Weight & Balance/Equipment List

INTRODUCTION

Weight and Balance Procedures – This section, after the introduction, is divided into three parts. The first part contains procedures for determining the empty weight and empty center of gravity of the airplane. Its use is intended primarily for mechanics and companies or individuals who make modifications to the airplane. While the procedures are not directly applicable for day-to-day pilot use, the information will give the owner or operator of the airplane an expanded understanding of the weight and balance procedures.

The procedures for determining the empty weight and empty CG are excerpted from the maintenance manual and included in *Pilot's Operating Handbook* to aid those who need to compute this information but do not have access to a maintenance manual. This section also contains procedures for maintaining and updating weight and balance changes to the airplane. While a mechanic or others who make changes to the airplane's configuration normally update the section, the pilot, owner, and/or operator of the airplane are responsible for ensuring that the information is maintained in a current status. The last entry on this table should contain the current weight and moments for this airplane.

The second part of this section is applicable to pilots, as it has procedures for determining the weight and balance for each flight. This part details specific procedures for airplane loading, how loading affects the center of gravity, plus a number of charts and graphs for determining the loaded center of gravity.

For pilot purposes, in the Cessna 350 (LC42-550FG), the datum point is at or near the tip of the propeller spinner. All measurements from this point are positive or aft of the datum point and are expressed in inches. It is important to remember that the weight and balance for each airplane varies somewhat and depends on a number of factors. The weight and balance information detailed in this manual only applies to the airplane specified on the cover page.

This weight and balance information is part of the *FAA Approved Airplane Flight Manual* (AFM). Under the provision of Part 91 of the Federal Aviation Regulations no person can operate a civil aircraft unless there is available in the aircraft a current AFM. It is the responsibility of the pilot-in-command to ensure that the airplane is properly loaded.

Equipment List – The final portion of this section contains the equipment list. The equipment list includes standard and optional equipment and specifies both the weight of the installed item and its arm, i.e., distance from the datum. This information is useful in computing the new empty weight and CG when items are temporarily removed for maintenance or other purposes. In addition, equipment required for a particular flight operation is tabulated. The equipment is generally organized and listed in accordance with ATA maintenance manual chapter numbering specifications.

PROCEDURES FOR WEIGHING & DETERMINING EMPTY CG

GENERAL

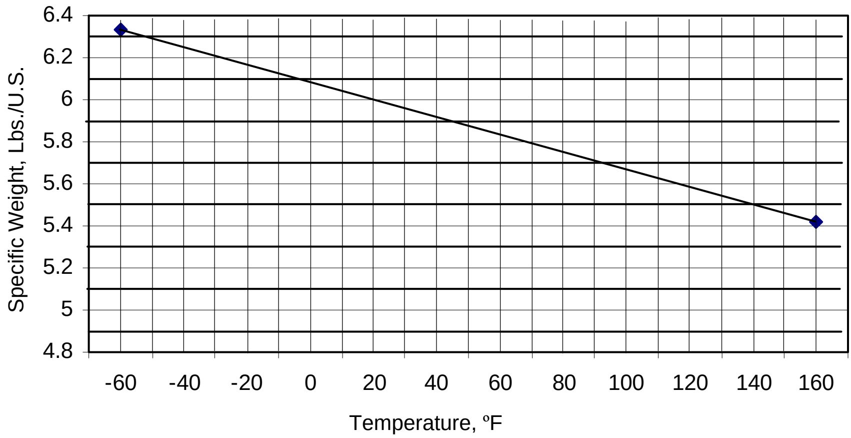
To determine the empty weight and center of gravity of the airplane, the airplane must be in a level area and in a particular configuration.

AIRPLANE CONFIGURATION (Empty Weight)

1. The airplane empty weight includes eight quarts of oil (dipstick reading), unusable fuel, hydraulic brake fluid, and installed equipment.
2. Defuel airplane per instruction in Chapter 12 of the maintenance manual.
3. Ensure the oil sump is filled to eight quarts (cold engine). Check the reading on the dipstick and service as necessary.
4. Place the pilots and front passenger's seat in the full aft position.
5. Retract the flaps to the up or 0° position.
6. Center the controls to the neutral static position.
7. Ensure all doors, including the baggage door, are closed when the airplane is weighed.

CAUTION

It is not recommended to weigh an airplane with full fuel and subtract the weight of the fuel to obtain empty weight because the weight of fuel varies with temperature. If this method of weight determination is used, fuel weight should be calculated conservatively. Use the specific weight of fuel at ambient temperature. See table and example below.



Average Specific Weight of Aviation Gasoline (Mil-F-5572 Grade 100/130 Type) Versus Temperature

The following is offered as an example only. It is important to remember that the aircraft weight in the example <u>does not</u> apply to a specific airplane.

Example:

Unconservative Calculation

Conventionally used fuel specific weight (6 lbs./U. S. gal.)

Total Aircraft weight with fuel	= 3038 lbs.
Weight of fuel (98 gal. x 6 lbs./U. S. gal.)	= 588 lbs.
Airplane empty weight (3038 lbs – 588 lbs.)	= 2450 lbs.

Conservative Calculation

Fuel specific weight at 60 ºF (5.83 lbs./U. S. gal.)

Total Aircraft weight with fuel	= 3038 lbs.
Weight of fuel (98 gal. x 5.83 lbs./U. S. gal.)	= 571 lbs.
Airplane empty weight (3038 lbs – 571 lbs.)	= 2467 lbs.

AIRPLANE LEVELING

Since there are no perfectly level reference areas on the airplane and the use of Smart Levels is not common, the airplane is leveled by use of a plumb bob suspended over a fixed reference point under the rear seats. Moreover, since the use of jacks with load cells is not prevalent, the wheel scales method is described in this manual. The following steps specify the procedures for installing the plumb bob and leveling the airplane. These steps must be completed before taking readings from the wheel scales.

1. The airplane must be weighed in a level area.
2. Remove the left rear seat cushion and place in the footwell. When the cushion is removed, a small washer, which is bonded to the bottom of the seat frame, will be exposed.

Figure 6 - 1

3. Using a string with a plumb bob attached to it, run the string over the gas strut door flange between the flange ball and the point where the gas strut attaches to the ball, and tie the string off around the front seatbelt bracket. See Figure 6 - 1.
4. Using the two jack method (Raising Both Wings) discussed in Chapter 7 of the maintenance manual, position the two main tires and the nose tire of the airplane on three scales. Ensure the brakes are set before raising the airplane off the floor. When all of the airplane's weight is on the three scales, move the jacks to a location that is not under the wings. The pointed end of the plumb bob, in a resting state, will be near a 3/16-inch washer bonded into the seat frame.
5. It will be necessary to either deflate the nose tire or strut and/or main tires to center the plumb bob point over the washer. When the pointer of the plumb bob is over any part of the washer, the airplane is level.
6. Once the airplane is level, be sure to release the brakes.

USING THE PERMANENT REFERENCE POINT

1. To determine the empty weight center of gravity of the airplane, it is more convenient to work with the permanent reference. The permanent reference point on the airplane is located at the forward part of the wing bottom, in the center of the wing saddle and is 97.05 inches aft of the datum. The location is shown in. There is a pronounced seam at the point where the fuselage is attached to the wing, and the leading edge of the wing bottom is easy to identify. Suspend a plumb bob from the permanent reference point in the exact center as shown in Figure 6 - 2 through Figure 6 - 4.

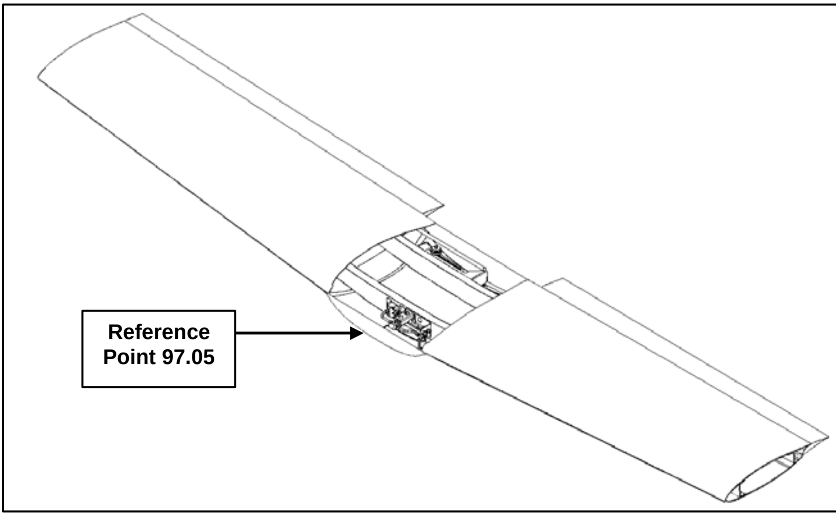


Figure 6 - 2

2. Determine the center point on each tire, and make a chalked reference mark near the bottom where the tire touches the floor. On the main gear tires, the mark should be on the inside, near where the arrows point in Figure 6 - 3.

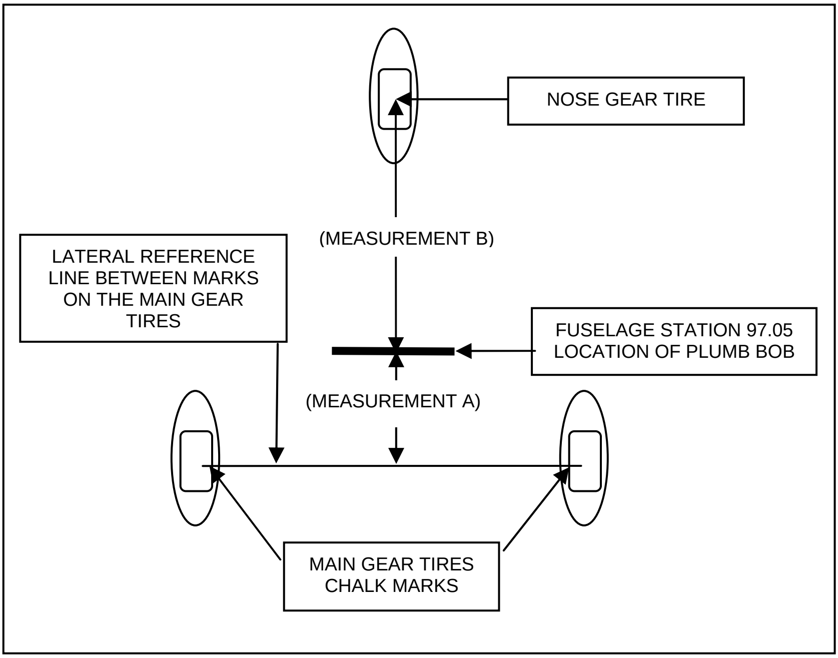


Figure 6 - 3

3. Create a lateral reference line between the two main gear tires. This can be accomplished by stretching a string between the two chalk marked areas of the tires, snapping a chalk line between these two points, or laying a 7.3 foot board between the points.

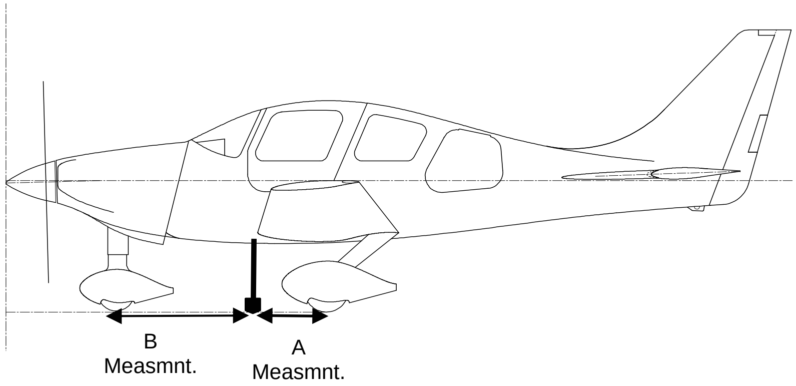


Figure 6 - 4

MEASUREMENTS

Measure the distance along the longitudinal axis from the permanent reference point (tip of the plumb bob) to the lateral reference line between the main gear tires. This is Measurement A in Figure 6 - 3 and Figure 6 - 4. Measure the distance along the longitudinal axis between the plumb bob to the mark on nose tire. This is Measurement B in Figure 6 - 3 and Figure 6 - 4.

CONVERTING MEASUREMENTS TO ARMS

To convert Measurement A and B distances to an arm, use the formulas shown in Figure 6 - 5 and Figure 6 - 6, respectively.

MAIN GEAR
Measurement A Distance + 97.05 inches = Main Gear Arm

Figure 6 - 5

NOSE GEAR
97.05 inches - Measurement B Distance = Nose Gear Arm

Figure 6 - 6

WEIGHTS AND COMPUTATIONS

Each main gear scale should be capable of handling weight capacities of about 1200 lbs., while the nose gear scale needs a capacity of at least 750 lbs. Computing the total weight and moments requires seven steps or operations. These seven operations are discussed below and also shown in Figure 6 - 7.

	Operation No. 1	**Operation No. 2**	**Operation No. 3**		**Operation No. 4**		**Operation No. 5**
Scale Location	Weight Reading (lbs.)	Tare or Scale Error	Corrected Weight (lbs.)	X	Arm (Inches)	=	Moments (lbs.- inches)
Right Main Gear	Right Scale Reading	Scale Error	Right Scale Wt. ± Error	X	Main Gear Arm	=	Right Gear Moments
Left Main Gear	Left Scale Reading	Scale Error	Left Scale Wt. ± Error	X	Main Gear Arm	=	Left Gear Moments
Nose Gear	Nose Scale Reading	Scale Error	Nose Scale Wt. ± Error	X	Nose Gear Arm	=	Nose Gear Moments
Total Empty Weight and Empty Moments			Total Corrected Weight Operation No. 6				Total Moments Operation No. 7

Figure 6 - 7

1. **Operation No. 1** - Enter the weight for each scale into the second column.
2. **Operation No. 2** - Next, enter the scale error. The scale error is sometimes referred to as the tare and is entered in the third column for each scale.
3. **Operation No. 3** - Add or subtract the respective tare for each scale, and enter the result into the fourth column. This is the correct weight.
4. **Operation No. 4** - Using the formulas shown in Figure 6 - 5 and Figure 6 - 6, determine the arm for the main gear and nose gear. Enter this information into the fifth column.

5. **Operation No. 5** - Multiply the corrected scale weights times their respective arms to determine the moments for each location. Enter the moments for each computation in the sixth column.
6. **Operation Nos. 6 and 7** – Sum the weights in the fourth column and the moments in the sixth column. Note: The areas of primary calculations have a double outline.
7. The final step, which is to determine the empty center of gravity, is to divide the total moments by the total corrected weight. A detailed example of this computation is shown in Figure 6 - 9.

EXAMPLE OF EMPTY CENTER OF GRAVITY (CG) DETERMINATION

The following is offered as an example problem to aid in understanding the computation process. It is important to remember that the weights, arms, and moments used in the example problem are for demonstration purposes only and **do not** apply to a specific airplane. For the example problem, assume the following.

1. Scale Weights
   a. Right Main Gear – 887 pounds
   b. Left Main Gear – 886 pounds
   c. Nose Gear – 522 pounds
2. Scale Error (Tare)
   a. Right Main Gear Scale is –2 pounds
   b. Left Main Gear Scale is –1 pound
   c. Nose Gear Scale is + 3 pounds
3. Measurements
   a. Measurement Distance A is 24.05 inches
   b. Measurement Distance B is 56.15 inches
   c. These uncorrected scale weights and tares are shown in Figure 6 - 8. Note that after correcting for scale error, the right, left, and nose gear weights are 885.0, 885.0, and 525.0 pounds, respectively.
   d. The arm for the main gear is computed as follows using the formula in Figure 6 - 5.

Measurement distance A + 97.05 inches = Main Gear Arm (MGA)
or
24.05 inches + 97.05 inches = 121.1 inches MGA

4. The arm for the nose gear is computed as follows using the formula in Figure 6 - 6.

97.05 inches – Measurement Distance B = Nose Gear Arm (NGA)
or
97.05 inches – 56.15 inches = 40.9 inches NGA

5. The main and nose gear arms, as computed, are shown in Figure 6 - 8.
6. The corrected weights of 885 pounds are then multiplied with the 121.1 inch main gear arm, which produces total moments of 107,173.5 lbs.-inches. In this example the moments are the same for both the right and left gear since the weights are the same. However, it is not uncommon for the right and left gear weights to vary a few pounds.
7. Next, the corrected 525 pound nose gear weight is multiplied times its 40.9 inch arm, which produces a moment value of 21,472.5 lbs.-inches.
8. Finally, the total moments and corrected weight are summed. In the example below, the total weight is 2,295 pounds and the total moments are 235,819.5 lbs.-inches. All this information is summarized in Figure 6 - 8. All required data for determining the empty center of gravity are now available.

Scale Location	Weight Reading (lbs.)	Tare or Scale Error	Corrected Weight (lbs.)	X	Arm (Inches)	=	Moments (lbs.- inches)
Right Main Gear	887	- 2	885.0	X	121.1	=	107,173.5
Left Main Gear	886	-1	885.0	X	121.1	=	107,173.5
Nose Gear	522	+3	+525.0	X	40.9	=	+21,473.5
Total Empty Weight and Empty Moments			2295.0				235,819.5 (Rounded) 235,820

Figure 6 - 8

9. The formula for determining empty weight center of gravity is shown in Figure 6 - 9; in the example below, the empty center of gravity of the airplane is at fuselage station (FS) 102.75.

$$\frac{Total\ Moments}{Empty\ Weight} = Center\ of\ Gravity \quad or \quad \frac{235{,}820\ lbs.-inches}{2{,}295\ lbs.} = 102.75\ inches$$

Figure 6 - 9

CHANGES IN THE AIRPLANE'S CONFIGURATION

1. **Determining Location (FS) of Installed Equipment in Relation to the Datum –** If equipment is installed in the airplane, the weight and balance information must be updated. Individuals and companies who are involved with equipment installations and/or modifications are generally competent and conversant with weight and balance issues. These individuals or companies must be aware that the fixed reference point is located at fuselage station (FS) 97.05. Please see Figure 6 - 2 on page 6-6 for more information.
2. **Weight and Balance Forms –** There is a form that is inserted after Appendix A of Chapter 6 of the *AFM/POH* that is used to track changes in the configuration of the airplane. When equipment is added or removed, these pages or an appropriate approved form must be updated. In either instance the required information is similar.
3. **Updating the Form –** Fill in the date the item is added or removed, a description of the item, the arm of the item, its weight, and the moment of the item. Remember, multiply the weight times the arm of the item to obtain the moment. Finally, compute the new empty weight and empty moment by adjusting the running totals. If an item is removed, subtract the weight and moment of the item from the running totals. If an item is added, add the weight and moment of the item to the running totals.

PROCEDURES FOR DETERMINING GROSS WEIGHT AND LOADED CENTER OF GRAVITY (CG)

USEFUL LOAD AND STATIONS

The useful load is determined by subtracting the empty weight of the airplane from the maximum allowable gross weight of 3400 pounds. The current information obtained from the Weight & Balance Record in the previous discussion contains the empty weight and empty moments for this airplane. The useful load includes the weight of pilot, passengers, usable fuel, and baggage.

The objective in good weight and balance planning is to distribute the useful load in a manner that keeps the loaded center of gravity within prescribed limits and near the center of the CG range. The center of gravity is affected by both the amount of weight added and the arm or distance from the datum. The arm is sometimes expressed as a station. For example, if weight is added at station 110, this means the added weight is 110 inches from the datum or zero reference point. The drawing below, Figure 6 - 10, shows the location of passenger and baggage loading stations. The fuel is loaded at station 118 and is not shown in the figure. These loading stations are summarized in Figure 6 - 12.

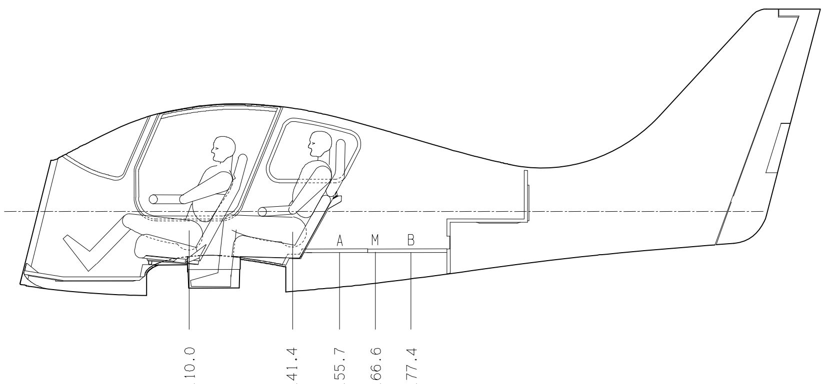


Figure 6 - 10

BAGGAGE

The space between the rear seat and the aft bulkhead is referred to as the main baggage area, and the shelf aft of this area is called the hat rack or simply the shelf. In Figure 6 - 10 and Figure 6 - 12 there are listings for three main area baggage stations, which are labeled A, M, and B. Area A is the forward baggage zone and area B is the aft baggage zone. Point M is the middle point of the baggage compartment. The arm for the shelf is measured from the datum point to the center portion of the shelf.

Since the main baggage area, exclusive of the hat rack, is about three and one half feet in length, consideration must be given to the arm of weights placed within this area. The use of multiple baggage loading stations contribute to more precise center of gravity computations and facilitate redistribution of baggage when the aft CG limit is exceeded. If no weight is placed on the hat rack, then up to 120 lbs. can be placed in either zone or distributed evenly over the main baggage area. This, of course, assumes that the placement of such weight does not exceed the maximum gross weight or the center of gravity limitations.

The floor attachment points define the physical limits of each zone. That is, the area between the forward and middle cross strap defines Zone A, and the middle cross strap and aft attachment points define Zone B. There is a cargo net in the airplane that secures the contents in the baggage compartment in three basic configurations. The table below, Figure 6 - 11, summarizes the three different arrangements. The term "bubble" refers to the shape of the cargo net.

BAGGAGE CONFIGURATION TABLE

NO.	ZONE	CONFIGURATION OF CARGO NET	APPLICABLE ARM
1.	A Only	Single forward bubble, anchored at the forward and middle attachment points.	155.7 inches
2.	A and B	Double bubble, anchored at forward, middle, and aft attachment points	155.7 and 177.4 inches times respective weights
3.	Main Area	Weight is evenly distributed over the main baggage area. There can be one or two bubbles depending on the shape of the baggage.	166.6 inches

Figure 6 - 11

Baggage is always loaded in the forward area first (Zone A). Heavier items, of course, should be placed near the floor, regardless of loading area, and never load the baggage compartment to a level higher than the top of the hat rack. If only Zone A is utilized, the computations are based on an arm of 155.7 inches. If both Zones A and B are utilized, with defined weights in each area as shown in Configuration No. 2 in Figure 6 - 11, two computations will be made to determine the total baggage weight and moments.

In this situation, each zone will have a significantly different quantifiable weight. For example, assume that 100 lbs. are loaded in Zone A and 20 lbs. in Zone B. These combined weights and respective arms produce a baggage CG of 159.3, over seven inches forward of the middle point of the baggage area. Conversely, if the respective Zone A and B weights are 55 and 65 lbs., the baggage CG moves less than one inch from the middle CG point. As a general rule, if the weights placed in Zones A and B do not vary more than 15%, then the middle CG arm of 166.6 can be used to compute the main baggage area moment.

BAGGAGE NETS

The airplane has two baggage nets. The hat rack net secures items placed on the hat rack. The floor net secures items in the main baggage area. A summary of the two nets follows.

1. **The floor net** provides a total of four anchoring points. The points are all on the floor with two behind the back seat and two just below the hat rack bulkhead. In addition, the floor net can be adjusted at any one of the four straps at the attachment points by pressing on the cinch and sliding the strap. The net can be removed by releasing each of the four attachments by pressing down and holding on the button on the top of the attachment and sliding it out of its mount. The net can be reinstalled by reversing the removal process. The floor net must be used any time baggage is carried in the main baggage compartment area.
2. **The hat rack net** is attached at four points, two in the overhead and two on the face of the hat rack bulkhead. The net is not adjustable. To remove the net, unhook each of the four hook attachments from the mounting slot. To attach the net, hook each of the four hook attachments into the mounting slot. This net must be used anytime items are stored in the hat rack area.

SUMMARY OF LOADING STATIONS

Description	Arm (Inches From Datum)	Maximum Weight
Front Seat Pilot and Passenger	110.0 inches	N/A
Rear Seat Passenger(s)	141.4 inches	N/A
Fuel	118.0 inches	S/N 42502 to 42567: 588 lbs. (98 Gallons)* S/N 42568 and on : 612 lbs. (102 Gallons)*
Forward Baggage Area (Zone A)	155.7 inches	120 Lbs.
Middle of Baggage Area (Point M)	166.6 inches	120 Lbs.
Aft Baggage Area (Zone B)	177.4 inches	120 Lbs.
Center Rear Baggage Shelf	199.8 inches	20 Lbs.†

*Usable Fuel (The unusable fuel is included in the empty weight.)

†The maximum total allowed baggage weight is 120 lbs., and only 20 lbs. of this total allowable weight can be placed on the rear baggage shelf. The weight of items placed on the rear shelf must be subtracted from 120 lbs. of total allowable baggage weight.

Figure 6 - 12

COMPUTING THE LOADED CENTER OF GRAVITY (CG)

All information required to compute the center of gravity as loaded with passengers, baggage, and fuel is now available. Refer to the sample-loading problem in Figure 6 - 13. This table is divided into two sections; the first section contains a sample-loading problem with computations, and the second section provides space for actual calculations. It is recommended that the second section of this table be copied or otherwise duplicated so that the pilot has an unmarked document with which to perform the required calculations.

In the sample problem, multiplying the weight of a particular item, i.e., pilot, passengers, baggage and fuel, times its arm, computes the moment for that item. The moments and weight are then summed with the basic empty weight and the empty moment of the airplane. In the example, these totals are 3,260 pounds and 353,175 moments. The loaded center of gravity of 108.34 inches is then determined by dividing the total moments by the gross weight.

CALCULATOR METHOD

Sample Problem **Calculator Method**				**Actual Calculation For This Airplane**			
ITEM	**WT.** (Lbs.)	**ARM** (Inches)	**MOMENTS** (lbs.-in.)	**ITEM**	**WT.** (Lbs.)	**ARM** (Inches)	**MOMENTS** (lbs.-in.)
Basic Empty Wt.**	2,295		235,820	Basic Empty Wt.			
Front Seat Wts.	380	110.0	41,800	Front Seats		110.0	
Rear Seats Wts.	175	141.4	24,745	Rear Seats		141.4	
Baggage (Main)	50	166.6	8,330	Baggage (Main)*		166.6	
Baggage (Zone A)	0	155.7	0	Baggage (Zone A)*		155.7	
Baggage (Zone B)	0	177.4	0	Baggage (Zone B)*		177.4	
Baggage (Shelf)	0	199.8	0	Baggage (Aft)		199.8	
Fuel (At 6 lbs./gal.)	360	118.0	42,480	Fuel (At 6 lbs./gal.)		118.0	
Totals	3,260		353,175	Totals			

$$\frac{353{,}175\ lbs.\!-\!in.}{3{,}260\ lbs.} = 108.34\ inches \qquad \frac{\quad lbs.\!-\!in.}{\quad lbs.} = \qquad inches$$

*When computing baggage moment use the arm for either the Main Baggage Area, Zone A, or Zones A and B as applicable. Refer to the Baggage discussion on page 6-11 for more information. In this example, the weight is evenly distributed over the main baggage area.

****NOTE**

The basic empty weight used in this example will vary for each airplane. Refer to the Weight and Balance Record, which follows Appendix A of this section.

Figure 6 - 13

GRAPHICAL METHOD

The multiplying graphs, which begin on page 6-17, can be used to determine the moments for each weight location. The answer is not as accurate as doing the calculation with a hand-held calculator; however, the margin of error is not significant and within acceptable parameters of safety. The example arrows in the graphs on pages 6-17 to 6-18 use the data from the sample problem in Figure 6 - 13.

When using the multiplying graphs, it is more convenient to divide the moments on the Y or vertical axis by 1000. For example, 70,000 lbs.-in. is read as 70.0 (x 1000) lbs.-in. Once all the calculations are made, the answer can then be multiplied by 1000. The numbers shown in Figure 6 - 14 are moment values obtained by reading directly from the graphs and are expressed as 1000 lbs.-in. It should be noted that there is a nominal difference in center of gravity location between the two procedures.

SAMPLE PROBLEM GRAPHICAL METHOD (Using moments obtained from the Graphs)*		
ITEM	WT. (Lbs.)	MOMENTS (1000 lbs.-in.)
Basic Empty Wt.	**2,295**	**235.8** (Figure 6 - 8)
Front Seat Wts.	**380**	**42.0*** (Figure 6 - 15)
Rear Seats Wts.	**175**	**25.0*** (Figure 6 - 17)
Baggage (Main)	**50**	**8.3*** (Figure 6 - 19)
Baggage (Shelf)	**0**	**0.0*** (Figure 6 - 19)
Fuel (At 6 lbs./gal.)	**360**	**42.0*** (Figure 6 - 18)
Totals	**3,260**	353.1 x 1000 = 353,100

$$\frac{353{,}100\ lbs.\text{–}in,}{3{,}260\,lbs.} = 108.31\ inches$$

Figure 6 - 14

WEIGHT AND BALANCE LIMITATIONS

As its name suggests, weight and balance limitations have two components, a weight limitation and a balance or center of gravity limitation. The maximum gross weight of the airplane is 3400 pounds. This is the first limitation that must be considered in weight and balance preflight planning. If the gross weight is more than 3400 pounds, then fuel, baggage, and/or passenger weight must be reduced. Once the gross weight is at or below 3400 pounds, consideration is then made for distribution of the weight.

The objective in dealing with the balance limitation is to ensure that the center of gravity is within prescribed ranges at the specified gross weight. The center of gravity range is referred to as the "envelope." The center of gravity envelope graph on page 6-19 shows the envelope for the Cessna 350 (LC42-550FG). Using data from the sample problem in Figure 6 - 14, a CG of 108.31 inches at 3260 lbs. gross weight indicates the airplane, as loaded, is within the envelope.

If the center of gravity is outside the envelope, the airplane is not safe to fly. If the range is exceeded to the left of the envelope, then the airplane is nose heavy and weight must be redistributed with more to the aft position. Conversely, if the range is exceeded to the right of the envelope, then the airplane is tail heavy and weight must be redistributed with more to the forward position. Notice that the range of the envelope decreases as weight increases. At 3400 lbs. maximum gross weight, the range of the envelope is 107 inches to 110 inches, a range of three inches. At 2500 lb. gross weight, the range increases to about seven inches. From this example, it can be seen that as gross weight is decreased, the forward CG range increases.

OTHER WEIGHT LIMITATIONS

TYPE OF WEIGHT LIMITATION	FORWARD DATUM POINT AND WEIGHT	AFT DATUM POINT AND WEIGHT	VARIATION
Minimum Flight Weight	103 inches and 2240 lbs.	110 inches and 2500 lbs.	Straight Line
Maximum Zero Fuel Weight	103 inches and 2725 lbs.	110 inches and 3228 lbs.	Straight Line

Reference Datum: The reference datum is located at the tip of the propeller spinner. As distance from the datum increases, there is an increase in weight for each of the two limitation categories. The variation is linear or straight line from the fore to the aft positions.

Figure 6 - 15

MAXIMUM EMPTY WEIGHT

The maximum empty weight of the Cessna 350 (LC42-550FG) is 2568 pounds. The FAA requires the determination of this weight for FAA certification. For airplanes certified in the IFR utility category, a passenger weight of 190 pounds for each seat plus the fuel weight for 45 minutes of flight are used for this computation. This equates to 72 pounds of fuel and 760 pounds of passenger weight for a total of 832 pounds. For the purpose of this discussion, the 832 pounds is referred to as the minimum useful load. Subtracting the minimum useful load from the maximum gross weight of 3400 pounds produces the maximum empty weight of 2568 pounds.

The maximum empty weight is not an abstract concept as it has practical applications. For example, assuming an empty weight of 2200 pounds, the 368 pound difference between the empty weight and the maximum empty weight defines the maximum additional weight of optional equipment that can be added to the airplane.

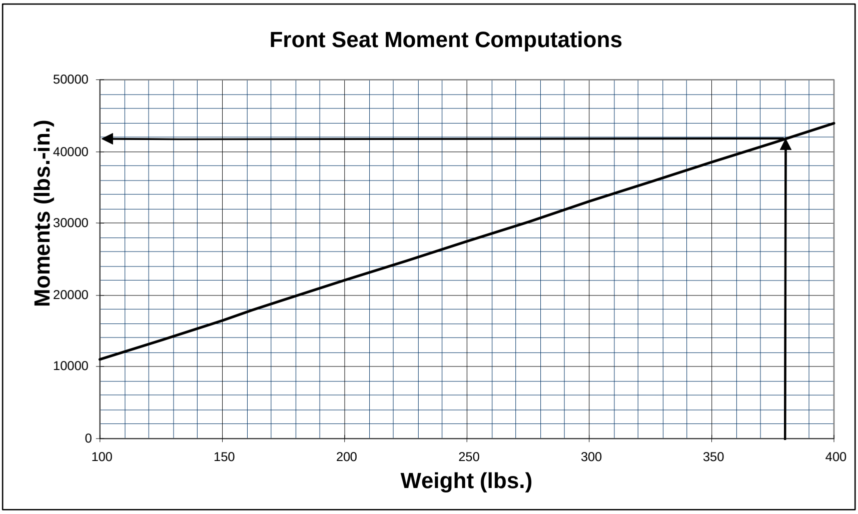


Figure 6 - 16

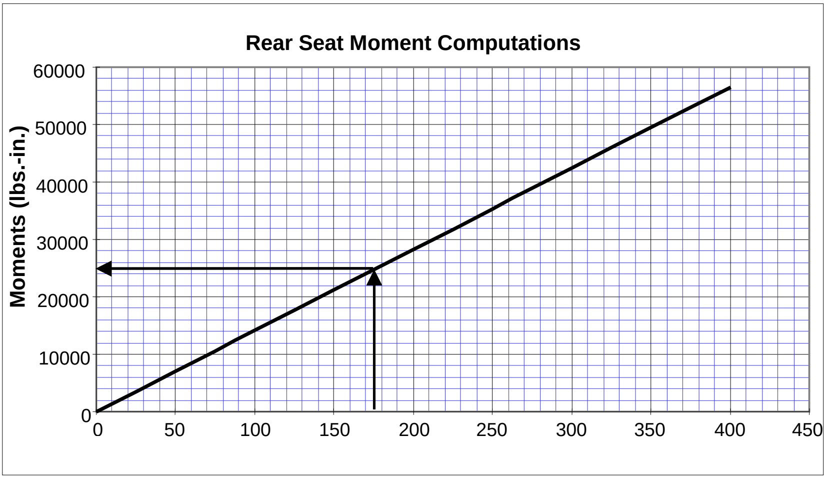


Figure 6 - 17

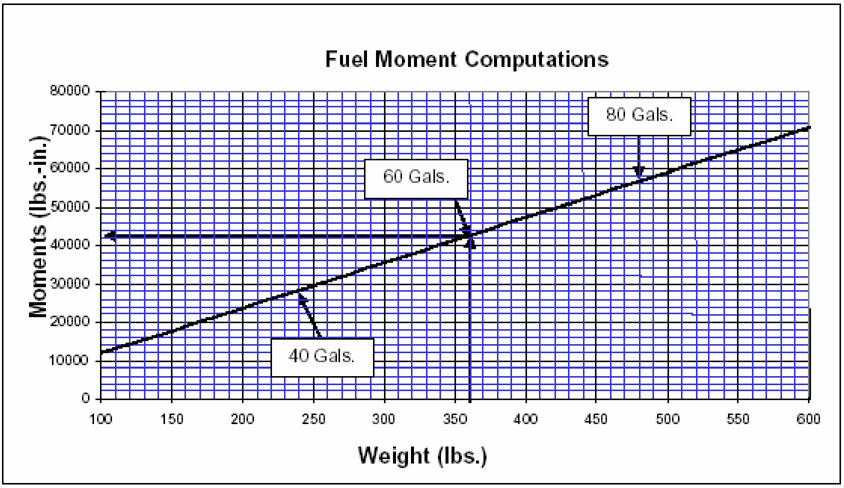


Figure 6 - 18

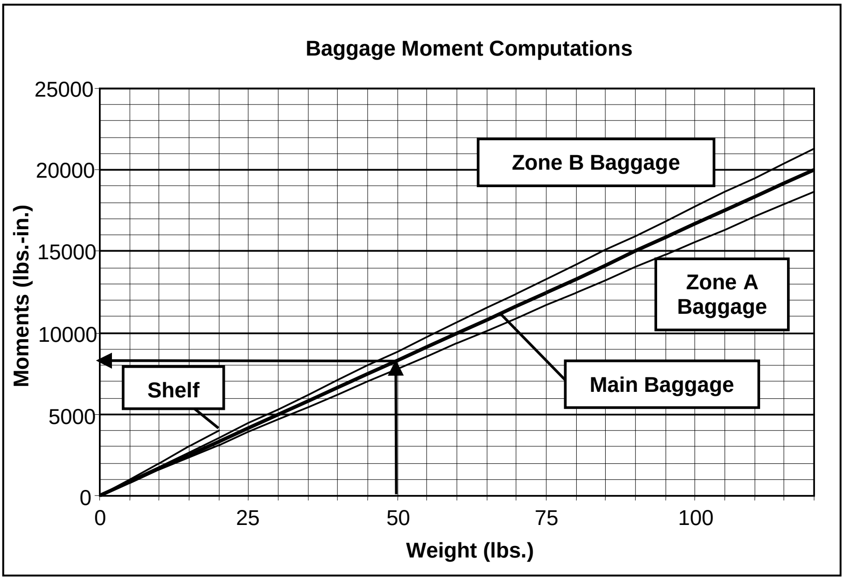


Figure 6 - 19

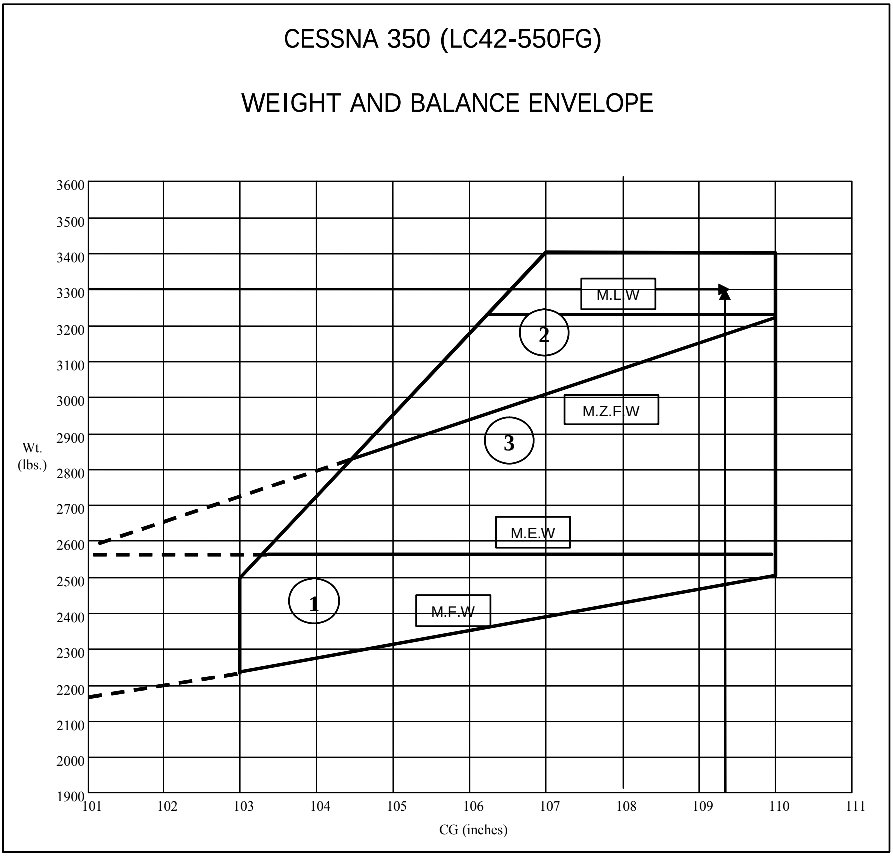


Figure 6 - 20

1. Airplane basic empty weight must be below Maximum Empty Weight (M.E.W.) and above Minimum Flight Weight (M.F.W.).
2. Weight must be below Maximum Landing Weight (M.L.W.) for landing. (If overweight landing occurs, see maintenance manual for required inspection prior to further flight.)
3. Weight and Center of Gravity (CG) without fuel must be below the Maximum Zero Fuel Weight (M.Z.F.W.) line.
4. See Section 2 of the AFM/POH for a listing of weight limitations.

This Page Intentionally Left Blank

EQUIPMENT FOR TYPES OF OPERATION

Install Code – The following pages contain a listing of equipment that can be installed in the airplane; this is indicated in the Install Code column by the letters B and O. The meaning of each letter code follows.

- **B (Basic Equipment)** – The equipment is installed in all airplanes.
- **O (Optional Equipment)** – This equipment can be installed at the factory at the option of the purchaser.

Chapter Numbers – The chapter numbers listed in the equipment list correspond to the maintenance manual chapter where information regarding the maintenance of the part can be found.

Flight Operation Requirements – There is certain minimum equipment for IFR and night operations. Some equipment is required for all flight operations, while other items are optional. Columns four through seven, under the subheading *Flight Operation Requirements*, identifies which equipment must be installed and functioning for the various flight conditions.

Headsets – Use of the communications equipment requires a headset with a boom mike. The pilot should add the actual weight of the headset to his or her weight and, when applicable, to each passenger's weight for weight and balance calculations.

This Page Intentionally Left Blank

EQUIPMENT FOR TYPES OF OPERATION LIST Cessna 350						
All – Required for all flight operations		**IFR** – Required for IFR flight operations		√	A check mark in one of the four Flight Operation Requirements columns indicates the requirement for that item.	
Night – Required for night flight operations		**Opt.** – Optional, not required for flight operations				
Item No.	Install Code	Item	**Flight Operation Requirements**			
			All	**Night**	**IFR**	**Opt.**
CHAPTERS 21-24						
21-01	B	Front Seat Eyeball Vents				√
21-02	B	Rear Seat Eyeball Vents				√
21-03	B	ECS Cabin Fan				√
21-04	B	ECS Heat Box				√
21-05	B	ECS Heat Exchanger				√
21-06	B	ECS Servomotor	√			
21-07	O	Automatic Climate Control System Control Panel				√
21-08	O	Compressor Belt Guard				√
21-09	O	Compressor to Firewall Refrigerant Hoses				√
21-10	O	Compressor Assembly (Engine Driven)				√
21-11	O	Compressor Assembly (Electrically Driven)				√
21-12	O	Fuselage Wire Harness				√
21-13	O	Evaporator Assembly				√
21-14	O	A/C Bay Access Panel				√

EQUIPMENT FOR TYPES OF OPERATION LIST Cessna 350						
All – Required for all flight operations		**IFR** – Required for IFR flight operations	√	A check mark in one of the four Flight Operation Requirements columns indicates the requirement for that item.		
Night – Required for night flight operations		**Opt.** – Optional, not required for flight operations				
Item No.	Install Code	Item	**Flight Operation Requirements**			
			All	**Night**	**IFR**	**Opt.**
21-15	O	Firewall to Condenser and Evaporator Hoses				√
21-16	O	Condenser to Expansion Valve Hoses				√
21-17	O	Condenser Assembly and Seals				√
21-18	O	ECU/Blower Module				√
21-19	O	Rear Mounted Relays				√
21-20	O	Interlock Assembly				√
21-21	O	Receiver Dryer and Associated Hoses				√
21-22	O	Cabin Temperature Sensor and Wiring				√
21-23	O	Outside Temperature Sensor				√
21-24	O	Defog/Floor Vent Valve Assembly				√
21-25	O	ECS Shut-off Valve Assembly				√
21-26	O	Drain Cover				√
22-01	O	GSM 85 Pitch Servo Mount				√
22-02	O	GSA 81 Pitch Servo				√
22-03	O	GSM 85 Roll Servo Mount				√
22-04	O	GSA 81 Roll Servo				√
22-05	O	GTA 82 Pitch Trim Adapter				√

EQUIPMENT FOR TYPES OF OPERATION LIST Cessna 350							
All – Required for all flight operations		**IFR** – Required for IFR flight operations	√	A check mark in one of the four Flight Operation Requirements columns indicates the requirement for that item.			
Night – Required for night flight operations		**Opt.** – Optional, not required for flight operations					
Item No.	Install Code	Item	**Flight Operation Requirements**				
			All	**Night**	**IFR**	**Opt.**	
23-01	B	Static Wicks Ailerons/Wings (4)			√		
23-02	B	Static Wicks Elevator/Horizontal Stabilizer (4)			√		
23-03	B	Static Wick Rudder (1)			√		
23-04	B	GMA 1347 Audio Panel			See[1]		
23-05	B	GMA 1347 Mounting Rack with Connector			√		
23-06	B	G1000 Fan Rack, (2) (Each)	√				
23-07	B	GCF 328 Cooling Fan (2) (Each)	√				
23-08	B	GCF 328 Cooling Fan (Avionics)	√				
24-01	B	Belt-driven Alternator 65 Amp 28 Volt (Kelly)	√				
24-02	O	Belt-driven Alternator 70 Amp 28 Volt (Plane Power)	√				
24-03	B	Gear-driven Alternator 52 Amp 28 Volt	√				
24-04	O	Accessories Alternator				√	

1 If an ILS approach will be used during IFR operations, then the audio panel and PFD must be operative.

EQUIPMENT FOR TYPES OF OPERATION LIST
Cessna 350

All – Required for all flight operations	**IFR** – Required for IFR flight operations	√	A check mark in one of the four Flight Operation Requirements columns indicates the requirement for that item.
Night – Required for night flight operations	**Opt.** – Optional, not required for flight operations		

Item No.	Install Code	Item	Flight Operation Requirements			
			All	**Night**	**IFR**	**Opt.**
24-05	O	Battery, 28 Volt, 6.5 Amp-hour, Lead-acid (2) (Each)	√			
24-06	O	Battery, 28 Volt, 8.5 Amp-hour, Lead-acid (2) (Each)	√			
24-07	O	Battery, 28 Volt, 13.0 Amp-hour, Lead-acid (2) (Each)	√			
24-08	O	Battery, 28 Volt, 13.6 Amp-hour, Lead-acid (2) (Each)	√			
24-09	B	Voltage Regulators, 28 Volt (2) (Each)	√			
24-10	B	Battery Box (Dual Battery)	√			
24-11	B	Ground Power Plug Relay				√
24-12	B	Ground Power Plug Socket				√
24-13	B	Ground Power Plug Wiring				√
24-14	B	Power Grid Panel	√			
CHAPTER 25						
25-01	B	Artex ELT-200 Emergency Locator Transmitter Unit	√			
25-02	B	Artex ELT-ME406 Emergency Locator Transmitter Unit	√			
25-03	B	ELT Antenna	√			

EQUIPMENT FOR TYPES OF OPERATION LIST **Cessna 350**							
All – Required for all flight operations		**IFR** – Required for IFR flight operations	√	A check mark in one of the four Flight Operation Requirements columns indicates the requirement for that item.			
Night – Required for night flight operations		**Opt.** – Optional, not required for flight operations					
Item No.	Install Code	Item	**Flight Operation Requirements**				
			All	**Night**	**IFR**	**Opt.**	
25-04	B	Circuit Breaker Panel	√				
25-05	B	Flap/Rocker Switch Panel	√				
25-06	B	Ignition Switch/Primer Switch Panel	√				
25-07	B	Light Dimmer Switch Panel				√	
25-08	B	GCU 476 Keypad Controller				√	
25-09	B	Pilot's Adjustable Seat	√				
25-10	B	Copilot's Adjustable Seat	√				
25-11	B	Rear Seat Cushion	√				
25-12	B	Rear Seatback Cushion	√				
25-13	O	Oregon Aero Pilot's Seat w/Thin Bottom Cushion[2]	√				
25-14	O	Oregon Aero Pilot's Seat w/Medium Bottom Cushion[2]	√				
25-15	O	Oregon Aero Pilot's Seat w/Thick Bottom Cushion[2]	√				

2 If installed, must be installed via STC SA01597SE. Only one pilot's and copilot's seat assembly per aircraft.

EQUIPMENT FOR TYPES OF OPERATION LIST Cessna 350							
All – Required for all flight operations		**IFR** – Required for IFR flight operations	√	A check mark in one of the four Flight Operation Requirements columns indicates the requirement for that item.			
Night – Required for night flight operations		**Opt.** – Optional, not required for flight operations					
Item No.	Install Code	Item	**Flight Operation Requirements**				
			All	**Night**	**IFR**	**Opt.**	
25-16	O	Oregon Aero Copilot's Seat w/Thin Bottom Cushion[2]	√				
25-17	O	Oregon Aero Copilot's Seat w/Medium Bottom Cushion[2]	√				
25-18	O	Oregon Aero Copilot's Seat w/Thick Bottom Cushion[2]	√				
25-19	O	Oregon Aero Rear Seat Cushion (2) (Each) [2]	√				
25-20	O	Oregon Aero Rear Seatback Cushion (2) (Each) [2]	√				
25-21	B	Pilot's and Copilot's Three-Point Restraint (Each)	√				
25-22	B	Rear Seat Passengers' Three-Point Restraint (Each)	√				
25-23	B	Baggage Tie Downs and Restraining Net	See [3]			See [3]	
25-24	B	POH and FAA AFM (Stowed in Copilot's Seatback)	√				
25-25	B	Garmin G1000 Cockpit Reference Guide (Latest Revision)	√				
25-26	O	Carbon Monoxide Detector				√	
25-27	B	Instrument Panel	√				

3 Baggage tie downs and a restraining net are required if baggage is carried in the baggage compartment.

EQUIPMENT FOR TYPES OF OPERATION LIST Cessna 350							
All – Required for all flight operations		**IFR** – Required for IFR flight operations		√	A check mark in one of the four Flight Operation Requirements columns indicates the requirement for that item.		
Night – Required for night flight operations		**Opt.** – Optional, not required for flight operations					
Item No.	Install Code	Item	**Flight Operation Requirements**				
			All	**Night**	**IFR**	**Opt.**	
25-28	B	G1000 System Racks (2) (Each)	√				
25-29	B	CHIPS Harness Assembly (2) (Each)	√				
25-30	B	Sandia Relay	√				
25-31	O	Rosen Sunvisor (2) (Each) (Must be installed via STC SA 01838SE.)				√	
CHAPTERS 26-31							
26-01	B	Fire Extinguisher Unit	√				
26-02	B	Fire Extinguisher Mounting Bracket	√				
27-01	B	Pilot's Control Stick	√				
27-02	B	Pilot's Rudder Pedals (2) (Each)	√				

EQUIPMENT FOR TYPES OF OPERATION LIST Cessna 350						
All – Required for all flight operations		**IFR** – Required for IFR flight operations	√	A check mark in one of the four Flight Operation Requirements columns indicates the requirement for that item.		
Night – Required for night flight operations		**Opt.** – Optional, not required for flight operations				
Item No.	Install Code	Item	**Flight Operation Requirements**			
			All	**Night**	**IFR**	**Opt.**
27-03	B	Copilot’s Control Stick	See [4]			
27-04	B	Copilot’s Rudder Pedals (2) (Each)	See [4]			
30-01	O	Propeller Heat Module with Harness				√
30-02	O	Brush Block Assembly				√
30-03	O	Blade Heaters and Hardware for Hartzell Propeller				√
30-04	O	Blade Heaters and Hardware for McCauley Propeller[12]				√
31-01	B	Flight Hour Meter				√
CHAPTER 32						
32-01	B	Main Wheel, Brake and Tire 15x6.00-6 (6-Ply)/Side	√			
32-02	B	Main Gear Fairings (Each)	√			
32-03	B	Main Wheel Fairings (Each)	√			

4 The right side controls may be removed provided permanent-type covers are placed over **all** openings from which the controls were removed and the procedure is approved and documented in the airframe logbooks by an appropriately certificated A & P mechanic.

EQUIPMENT FOR TYPES OF OPERATION LIST
Cessna 350

All – Required for all flight operations	**IFR** – Required for IFR flight operations	√	A check mark in one of the four Flight Operation Requirements columns indicates the requirement for that item.
Night – Required for night flight operations	**Opt.** – Optional, not required for flight operations		

Item No.	Install Code	Item	Flight Operation Requirements			
			All	**Night**	**IFR**	**Opt.**
32-04	B	Main Wheel Fairings Mounting Plate (2) (Each)	√			
32-05	B	Nose Strut Fairing	√			
32-06	B	Nose Wheel Fairing	√			
32-07	B	Nose Gear Assembly	√			
32-08	B	Nose Wheel, Tire and Tube 5.00-5 (10-Ply)	√			
CHAPTER 33						
33-01	B	Flip Lights				√
33-02	B	Step Lights				√
33-03	B	Overhead Reading Lights (4)				√
33-04	B	Strobe Lights/ Position Lights	√	√		
33-05	O	Whelen Landing Light		See [5]		

5 A landing light is required if the airplane is used to carry passengers for hire.

EQUIPMENT FOR TYPES OF OPERATION LIST Cessna 350						
All – Required for all flight operations			**IFR** – Required for IFR flight operations		√	A check mark in one of the four Flight Operation Requirements columns indicates the requirement for that item.
Night – Required for night flight operations			**Opt.** – Optional, not required for flight operations			
Item No.	Install Code	Item	Flight Operation Requirements			
			All	**Night**	**IFR**	**Opt.**
33-06	O	Xenon Landing Light		See [5]		
33-07	O	Xenon Landing Light Ballast		See [5]		
33-08	O	Precise Flight Landing Light		See [5]		
33-09	O	Precise Flight Landing Light Ballast		See [5]		
33-10	O	Precise Flight Taxi Light				√
33-11	O	Precise Flight Taxi Light Ballast				√
33-12	O	Taxi Light				√
CHAPTER 34						
34-01	B	Garmin GPS Antenna (2) (Each)			See [6]	See [6]
34-02	B	GA 35 GPS Antenna			See [6]	See [6]
34-03	B	GA 37 GPS and XM Satellite Radio Antenna			See [6]	See [6]

EQUIPMENT FOR TYPES OF OPERATION LIST Cessna 350						
All – Required for all flight operations		**IFR** – Required for IFR flight operations	√	A check mark in one of the four Flight Operation Requirements columns indicates the requirement for that item.		
Night – Required for night flight operations		**Opt.** – Optional, not required for flight operations				
Item No.	Install Code	Item	**Flight Operation Requirements**			
			All	**Night**	**IFR**	**Opt.**
34-04	B	Marker Beacon Antenna			See [6]	See [6]
34-05	B	COMM 1 Antenna			√	
34-06	B	COMM 2 Antenna			√	
34-07	B	NAV Antenna			√	
34-08	B	Transponder Antenna			√	
34-09	B	Magnetic Compass	√			
34-10	B	Stall Warning Lift Transducer	√			
34-11	B	Stall Warning Horn	√			
34-12	B	Rudder Limiter Assembly	√			
34-13	B	Heated Pitot Tube			√	
34-14	O	Precise Flight SpeedBrake™ 2000 System – Wing Units (2) (Each)				√
34-15	O	Precise Flight SpeedBrake™ 2000 System – Computer				√
34-16	O	TCAD Processor				√

6 If an ILS approach will be used during IFR operations, then the SL15 or GMA 340 audio panel and remote marker beacon lights must be operative.

EQUIPMENT FOR TYPES OF OPERATION LIST Cessna 350							
All – Required for all flight operations		**IFR** – Required for IFR flight operations		√	A check mark in one of the four Flight Operation Requirements columns indicates the requirement for that item.		
Night – Required for night flight operations		**Opt.** – Optional, not required for flight operations					
Item No.	Install Code	Item		**Flight Operation Requirements**			
				All	**Night**	**IFR**	**Opt.**
34-17	O	TCAD Transponder Coupler					√
34-18	O	TCAD Top Antenna					√
34-19	O	TCAD Bottom Antenna					√
34-20	B	GTP 59 OAT Probe				√	
34-21	B	GRS 77 Mounting Rack and Connectors		√			
34-22	B	GRS 77 AHRS		√			
34-23	B	GMU 44 Magnetometer with Mounting and Connectors		√			
34-24	B	GDU 1040 PFD with Connector		√			
34-25	B	GDU 1042 MFD with Connector		√			
34-26	B	GDU 1044 MFD with Connector		√			
34-27	B	GIA 63/GIA 63W Mounting Rack with Connectors (2) (Each)		√			
34-28	B	GIA 63/GIA 63W No. 1 Comm/Nav/GPS/AP Computer		See[7]	See [7]		

7 A single GIA 63 is acceptable for VFR operations, however the autopilot will not be functional unless both units are operating.

EQUIPMENT FOR TYPES OF OPERATION LIST Cessna 350						
All – Required for all flight operations		**IFR** – Required for IFR flight operations	√	A check mark in one of the four Flight Operation Requirements columns indicates the requirement for that item.		
Night – Required for night flight operations		**Opt.** – Optional, not required for flight operations				
Item No.	Install Code	Item	**Flight Operation Requirements**			
			All	**Night**	**IFR**	**Opt.**
34-29	B	GIA 63/GIA 63W No. 2 Comm/Nav/GPS/AP Computer	See [7]	See [7]		
34-30	B	GDC 74A Mounting Rack with Connectors	√			
34-31	B	GDC 74A Air Data Computer	√			
34-32	B	GEA 71 Mounting Rack with Connectors	√			
34-33	B	GEA 71 Engine Airframe Unit	√			
34-34	B	GDL 69A Mounting Rack with Connectors				√
34-35	B	GDL 69A Data Link				√
34-36	B	GA 55 XM Antenna				√
34-37	B	GTX 33 Mounting Rack with Connectors	√			
34-38	B	GTX 33 Transponder	√			
34-39	B	Standby Airspeed Indicator	See [8]		√	
34-40	B	Standby Altimeter	See [8]		√	
34-41	B	Standby Electric Attitude Indicator	√			

8 At least one airspeed indicator and altimeter must be operational, i.e., either the PFD or the standby indicator.

EQUIPMENT FOR TYPES OF OPERATION LIST Cessna 350							
All – Required for all flight operations		**IFR** – Required for IFR flight operations		√	A check mark in one of the four Flight Operation Requirements columns indicates the requirement for that item.		
Night – Required for night flight operations		**Opt.** – Optional, not required for flight operations					
Item No.	Install Code	Item		**Flight Operation Requirements**			
				All	**Night**	**IFR**	**Opt.**
CHAPTERS 35							
35-01	O	Regulator Valve Assembly		See [9]	See [9]	See [9]	See [9]
35-02	O	Cabin Distribution Manifold Assembly		See [9]	See [9]	See [9]	See [9]
35-03	O	Face Mask (Rear Passengers) (2)		See [9]	See [9]	See [9]	See [9]
35-04	O	Face Mask with microphone (1)		See [9]	See [9]	See [9]	See [9]
35-05	O	Face Mask (Front Passenger) (1)		See [9]	See [9]	See [9]	See [9]
35-06	O	Bottle 1 with Manifold		See [9]	See [9]	See [9]	See [9]
35-07	O	Bottle 2 with Manifold		See [9]	See [9]	See [9]	See [9]
35-08	O	Bottle 3 with Manifold		See [9]	See [9]	See [9]	See [9]
35-09	O	Precise Flight Semi-Portable Oxygen System[10]		See [9]	See [9]	See [9]	See [9]

9 Oxygen is required for the pilot above 12,500 ft for flight time exceeding 30 minutes and above 14,000 ft for the duration of the flight above 14,000 ft. Oxygen is required for passengers above 15,000 ft.
10 If installed, must be installed via STC SA01060SE.

EQUIPMENT FOR TYPES OF OPERATION LIST
Cessna 350

All – Required for all flight operations	**IFR** – Required for IFR flight operations	√	A check mark in one of the four Flight Operation Requirements columns indicates the requirement for that item.
Night – Required for night flight operations	**Opt.** – Optional, not required for flight operations		

Item No.	Install Code	Item	Flight Operation Requirements All	Night	IFR	Opt.
CHAPTERS 52-77						
52-01	O	Remote Keyless Entry System				√
53-01	B	Cabin Entry Steps (Each) [11]				√
53-02	O	Cabin Entry Handles (Each)				√
61-01	B	Hartzell Propeller	√			
61-02	B	Hartzell Propeller Spinner	√			
61-03	B	McCauley Propeller[12]	√			
61-04	B	McCauley Propeller Spinner[12]	√			
61-05	B	Propeller Governor	√			
71-01	B	Starter Motor	√			

11 The step is included in the basic package; however, some owners/operators elect to not have it installed since it lowers cruise speed slightly.
12 If installed, must be installed via STC SA01390WI.

EQUIPMENT FOR TYPES OF OPERATION LIST Cessna 350						
All – Required for all flight operations		**IFR** – Required for IFR flight operations	√	A check mark in one of the four Flight Operation Requirements columns indicates the requirement for that item.		
Night – Required for night flight operations		**Opt.** – Optional, not required for flight operations				
Item No.	Install Code	Item	**Flight Operation Requirements**			
			All	**Night**	**IFR**	**Opt.**
71-02	B	Engine Intake Filter	√			
71-03	O	Winterization Kit				√
77-01	B	IO-550-N TCM Engine Complete	√			

INSTALLED EQUIPMENT LIST (IEL) Equipment List NXXXX ─ S/N 42XXX ─ Date A/C was weighed ─ XXXX				
Item No	**Installed**	**Item**	**Weight**	**Arm**
21-01	✓	Front Seat Eyeball Vents (2) (Each)	0.22	79.0
21-02	✓	Rear Seat Eyeball Vents (2) (Each)	0.18	130.4
21-03	✓	ECS Cabin Fan	2.05	63.43
21-04	✓	ECS Heat Box	2.44	63.43
21-05	✓	ECS Heat Exchanger	1.6	56.6
21-06	✓	ECS Servomotor	0.26	63.43
21-07		Automatic Climate Control System Control Panel	0.30	84.0
21-08		Compressor Belt Guard	0.33	60.0
21-09		Compressor to Firewall Refrigerant Hoses	2.26	60.0
21-10		Compressor Assembly (Engine Driven)	14.92	56.5
21-11		Compressor Assembly (Electrically Driven)	14.2	194.03
21-12		Fuselage Wire Harness	3.52	109.48
21-13		Evaporator Assembly	10.68	186.0
21-14		A/C Bay Access Panel	2.04	174.0
21-15		Firewall to Condenser and Evaporator Hoses	3.69	125.56
21-16		Condenser to Expansion Valve Hoses	0.62	164.2
21-17		Condenser Assembly and Seals	11.14	174.0
21-18		ECU/Blower Module	0.44	188.0
21-19		Rear Mounted Relays	0.28	188.0
21-20		Interlock Assembly	8.1	195.44

INSTALLED EQUIPMENT LIST (IEL)
Equipment List NXXXX — S/N 42XXX — Date A/C was weighed — XXXX

Item No	Installed	Item	Weight	Arm
21-21		Receiver Dryer and Associated Hoses	1.7	149.0
21-22		Cabin Temperature Sensor and Wiring	0.08	82.0
21-23		Outside Temperature Sensor	0.2	168.0
21-24		Defog/Floor Vent Valve Assembly	0.83	69.0
21-25		ECS Shut-off Valve Assembly	0.93	68.0
21-26		Drain Cover	0.20	63.0
22-01		GSM 85 Pitch Servo Mount	1.41	206.0
22-02		GSA 81 Pitch Servo	2.23	206.0
22-03		GSM 85 Roll Servo Mount	1.41	133.0
22-04		GSA 81 Roll Servo	2.23	133.0
22-05		GTA 82 Pitch Trim Adapter	1.3	83.5
23-01	✓	Static Wicks Ailerons/Wings (4) (Each)	.018	140
23-02	✓	Static Wicks Elevator/Horizontal Stabilizer (4) (Each)	.018	279.4
23-03	✓	Static Wick Rudder (1)	.018	301.3
23-04	✓	GMA 1347 Audio Panel	1.7	80.84
23-05	✓	GMA 1347 Mounting Rack with Connector	0.7	80.84
23-06	✓	G1000 Fan Rack, (2) (Each)	0.58	79.48
23-07	✓	GCF 328 Cooling Fan (2) (Each)	1.40	79.48
23-08	✓	GCF 328 Cooling Fan (Avionics)	0.70	84.0
24-01	✓	Belt-driven Alternator 65 Amp 28 Volt (Kelly)	12.0	22.6

INSTALLED EQUIPMENT LIST (IEL)
Equipment List NXXXX — S/N 42XXX — Date A/C was weighed — XXXX

Item No	Installed	Item	Weight	Arm
24-02		Belt-driven alternator 70 Amp 28 Volt (Plane Power)	9.38	22.6
24-03	✓	Gear-driven Alternator 52 Amp 28 Volt	12.8	28.0
24-04		Accessories Alternator	18.16	57.87
24-05		Battery, 28 Volt, 6.5 Amp-hour (2) (Each)	18.0	63.0
24-06		Battery, 28 Volt, 8.5 Amp-hour (2) (Each)	22.0	63.0
24-07		Battery, 28 Volt, 13.0 Amp-hour (2) (Each)	29.55	63.0
24-08		Battery, 28 Volt, 13.6 Amp-hour (2) (Each)	29.5	63.0
24-09	✓	Voltage Regulator, 28 Volt (2) (Each)	3.0	70.0
24-10	✓	Battery Box (Dual Battery)	2.17	63.0
24-11	✓	Ground Power Plug Relay	0.9	55.0
24-12	✓	Ground Power Plug Socket	0.8	153.0
24-13	✓	Ground Power Plug Wiring	3.9	104.0
24-14		Power Grid Panel	10.6	59.4
25-01		Artex ELT-200 Emergency Locator Transmitter Unit	2.47	215
25-02		Artex ELT-ME406 Emergency Locator Transmitter Unit	2.46	215
25-03	✓	ELT Antenna	0.11	217.1
25-04	✓	Circuit Breaker Panel	3.9	89.5
25-05	✓	Flap/Rocker Switch Panel	0.7	89.50

INSTALLED EQUIPMENT LIST (IEL) Equipment List NXXXX ─ S/N 42XXX ─ Date A/C was weighed ─ XXXX				
Item No	**Installed**	**Item**	**Weight**	**Arm**
25-06	✓	Ignition Switch/Primer Switch Panel	0.5	89.0
25-07	✓	Light Dimmer Switch Panel	0.14	110.36
25-08	✓	GCU 476 Keypad Controller	0.72	99.75
25-09	✓	Pilot's Adjustable Seat	24.0	106.6
25-10	✓	Copilot's Adjustable Seat	24.0	106.6
25-11	✓	Rear Seat Cushion (2) (Each)	5.7	134.9
25-12	✓	Rear Seatback Cushion (2) (Each)	11.3	150.2
25-13		Oregon Aero Pilot's Seat w/Thin Bottom Cushion*	27.25	106.6
25-14		Oregon Aero Pilot's Seat w/Medium Bottom Cushion*	28.07	106.6
25-15		Oregon Aero Pilot's Seat w/Thick Bottom Cushion*	28.62	106.6
25-16		Oregon Aero Copilot's Seat w/Thin Bottom Cushion*	27.25	106.6
25-17		Oregon Aero Copilot's Seat w/Medium Bottom Cushion*	28.07	106.6
25-18		Oregon Aero Copilot's Seat w/Thick Bottom Cushion*	28.62	106.6
25-19		Oregon Aero Rear Seat Cushion (2) (Each)*	6.15	134.9
25-20		Oregon Aero Rear Seatback Cushion (2) (Each)*	12.25	150.2
		* If installed, must be installed via STC SA01597SE. Only one pilot's and copilot's seat assembly per aircraft		
25-21	✓	Pilot's and Copilot's Three Point Restraint (2) (Each)	1.82	128.5
25-22	✓	Rear Seat Passengers' Three Point Restraint (2) (Each)	1.76	145.7

INSTALLED EQUIPMENT LIST (IEL) Equipment List NXXXX ─ S/N 42XXX ─ Date A/C was weighed ─ XXXX				
Item No	**Installed**	**Item**	**Weight**	**Arm**
25-23	✓	Baggage Tie Downs and Restraining Net	1.51	175.0
25-24	✓	POH and FAA AFM (Stowed in Copilot's Seatback)	1.34	128.5
25-25	✓	Garmin G1000 Cockpit Reference Guide (Latest Revision)	1.6	128.5
25-26	✓	Carbon Monoxide Detector	0.22	68.19
25-27	✓	Instrument Panel	8.94	87.0
25-28	✓	G1000 System Racks (2) (Each)	0.84	80.86
25-29	✓	CHIPS Harness Assembly (2) (Each)	1.60	79.87
25-30	✓	Sandia Relay	1.38	84.25
25-31	✓	Rosen Sunvisor (2) (Each) (Must be installed via STC SA 01838SE.)	1.0	103.85
26-01	✓	Fire Extinguisher Unit	3.56	88.0
26-02	✓	Fire Extinguisher Mounting Bracket	0.32	89.8
27-01	✓	Pilot's Control Stick	1.59	91.4
27-02	✓	Pilot's Rudder Pedals (2) (Each)	1.0	71.6
27-03	✓	Copilot's Control Stick	1.59	91.4
27-04	✓	Copilot's Rudder Pedals (2) (Each)	1.0	71.6
30-01		Propeller Heat Module with Harness	0.97	75.0
30-02		Brush Block Assembly	0.25	22.6

INSTALLED EQUIPMENT LIST (IEL) Equipment List NXXXX ─ S/N 42XXX ─ Date A/C was weighed ─ XXXX				
Item No	**Installed**	**Item**	**Weight**	**Arm**
30-03		Blade Heaters and Hardware for Hartzell Propeller	1.0	14.0
30-04		Blade Heaters and Hardware for McCauley Propeller (If installed, must be installed via STC SA01390WI.)	1.0	15.0
31-01	✓	Flight Hour Meter	0.13	78.0
32-01	✓	Main Wheel, Brake and Tire 15x6.00-6 (6-Ply)/Side	18.4	122.1
32-02	✓	Main Gear Fairings (2) (Each)	2.4	131.7
32-03	✓	Main Wheel Fairings (2) (Each)	3.9	122.1
32-04	✓	Main Wheel Fairings Mounting Plate (Each)	0.4	122.1
32-05	✓	Nose Strut Fairing	0.76	40.89
32-06	✓	Nose Wheel Fairing	1.89	40.89
32-07	✓	Nose Gear Assembly	12.2	40.89
32-08	✓	Nose Wheel, Tire, and Tube 5.00-5 (10-ply)	14.8	40.89
33-01	✓	Flip Lights (2) (Each)	.02	116.0
33-02	✓	Step Lights (2) (Each)	0.05	150.0
33-03	✓	Overhead Reading Lights (4) (Each)	0.12	102.62
33-04	✓	Strobe Lights/ Position Lights	0.54	135.9
33-05		Whelen Landing Light	0.29	102.4
33-06		Xenon Landing Light	0.52	102.4
33-07		Xenon Landing Light Ballast	0.84	111.08

INSTALLED EQUIPMENT LIST (IEL) Equipment List NXXXX ─ S/N 42XXX ─ Date A/C was weighed ─ XXXX				
Item No	**Installed**	**Item**	**Weight**	**Arm**
33-08		Precise Flight Landing Light	0.72	102.4
33-09		Precise Flight Landing Light Ballast	0.31	111.08
33-10		Precise Flight Taxi Light	0.72	102.4
33-11		Precise Flight Taxi Light Ballast	0.31	111.08
33-12		Taxi Light	0.29	102.4
34-01	✓	Garmin GPS Antenna (2) (Each)	0.36	226.4
34-02	✓	GA 35 GPS Antenna	0.47	185.51
34-03	✓	GA 37 GPS and XM Satellite Radio Antenna	0.50	222.80
34-04	✓	Marker Beacon Antenna	0.45	120.5
34-05	✓	COMM 1 Antenna	0.56	164.0
34-06	✓	COMM 2 Antenna	0.56	199.0
34-07	✓	NAV Antenna	0.41	276.5
34-08	✓	Transponder Antenna	0.3	111.5
34-09	✓	Magnetic Compass	0.75	76.0
34-10	✓	Stall Warning Lift Transducer	0.24	99.5
34-11	✓	Stall Warning Horn	0.19	129.74
34-12	✓	Rudder Limiter Assembly	1.51	68.5
34-13	✓	Heated Pitot Tube	0.39	117.7

INSTALLED EQUIPMENT LIST (IEL)
Equipment List NXXXX — S/N 42XXX — Date A/C was weighed — XXXX

Item No	Installed	Item	Weight	Arm
34-14	✓	Precise Flight SpeedBrake™ 2000 System - Wing Units (2) (Each)	4.0	124.0
34-15	✓	Precise Flight SpeedBrake™ 2000 System – Computer	0.5	147.0
34-16		TCAD Processor	6.8	153.42
34-17		TCAD Transponder Coupler	0.5	75.0
34-18		TCAD Top Antenna	0.66	142.87
34-19		TCAD Bottom Antenna	0.75	129.74
34-20	✓	GTP 59 OAT Probe	0.23	119.5
34-21	✓	GRS 77 Mounting Rack and Connectors	0.63	70.0
34-22	✓	GRS 77 AHRS	2.40	70.0
34-23	✓	GMU 44 Magnetometer with Mounting and Connectors	0.50	118.0
34-24	✓	GDU 1040 PFD with Connector	6.70	83.82
34-25	✓	GDU 1042 MFD with Connector	6.70	83.82
34-26	✓	GDU 1044 MFD with Connector	6.70	83.82
34-27	✓	GIA 63/GIA 63W Mounting Rack with Connectors (2) (Each)	1.80	77.92
34-28	✓	GIA 63/GIA 63W No. 1 Comm/Nav/GPS/AP Computer	4.90	77.92
34-29	✓	GIA 63/GIA 63W No. 2 Comm/Nav/GPS/AP Computer	4.90	77.92
34-30	✓	GDC 74A Mounting Rack with Connectors	0.35	78.25
34-31	✓	GDC 74A Air Data Computer	1.69	78.25

INSTALLED EQUIPMENT LIST (IEL) Equipment List NXXXX ─ S/N 42XXX ─ Date A/C was weighed ─ XXXX				
Item No	**Installed**	**Item**	**Weight**	**Arm**
34-32	✓	GEA 71 Mounting Rack with Connectors	0.78	78.38
34-33	✓	GEA 71 Engine Airframe Unit	1.75	78.38
34-34	✓	GDL 69A Mounting Rack with Connectors	0.97	78.38
34-35	✓	GDL 69A Data Link	1.86	78.38
34-36	✓	GA 55 XM Antenna	0.36	226.4
34-37	✓	GTX 33 Mounting Rack with Connectors	0.8	77.73
34-38	✓	GTX 33 Transponder	3.10	77.73
34-39	✓	Standby Airspeed Indicator	1.00	82.55
34-40	✓	Standby Altimeter	0.81	82.40
34-41	✓	Standby Electric Attitude Indicator	1.75	78.38
35-01		Regulator Valve Assembly	2.07	119.0
35-02		Cabin Distribution Manifold Assembly	0.54	130.6
35-03		Face Mask (Rear Passengers) (2)	0.23	140.0
35-04		Face Mask with Microphone (1)	0.58	140.0
35-05		Face Mask (Front Passenger) (1)	0.12	140.0
35-06		Bottle 1 (Fwd) with Manifold	7.2	111.0
35-07		Bottle 2 (Center) with Manifold	7.1	116.5

INSTALLED EQUIPMENT LIST (IEL) Equipment List NXXXX ─ S/N 42XXX ─ Date A/C was weighed ─ XXXX				
Item No	**Installed**	**Item**	**Weight**	**Arm**
35-08		Bottle 3 (Aft) with Manifold	7.2	122.0
35-09		Precise Flight Semi-Portable Oxygen System (If installed, must be installed via STC SA01060SE.)	13.2	133.0
52-01		Remote Keyless Entry System	0.65	114.5
53-01	✓	Cabin Entry Step (2) (Each)	2.15	160.2
53-02	✓	Cabin Entry Handle (2) (Each)	.05	162.0
61-01	✓	Hartzell Propeller	70.0	15.0
61-02	✓	Hartzell Propeller Spinner	7.3	14.0
61-03	✓	McCauley Propeller**	77.5	15.0
61-04	✓	McCauley Propeller Spinner**	6.5	15.0
	✓	** If installed, must be installed via STC SA01390WI.		
61-05	✓	Propeller Governor	2.80	28.0
71-01	✓	Starter Motor	6.4	58.0
71-02	✓	Engine Intake Filter	0.80	28.0
71-03		Winterization Kit	1.0	38.0
77-01	✓	IO-550-N TCM Engine Complete	465.0	44.45

The use of this page is optional and is provided for listing items that were added to the airplane via a Supplemental Type Certificate (STC) or other FAA approved procedures. This page is included in this section as a convenience to provide consistency in presentation. The page does <u>not</u> replace or amend any required documentation attendant with the after-market installation and/or modification.

TABULATED AFTER-MARKET EQUIPMENT LIST (TAMEL)

Cessna 350

Item No.	Serial/Part No.	ATA Chapter	Item	Weight (lbs.)	Arm (ins.)
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					

TABULATED AFTER-MARKET EQUIPMENT LIST (TAMEL) Cessna 350					
Item No.	Serial/Part No.	ATA Chapter	Item	Weight (lbs.)	Arm (ins.)
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

WEIGHT & BALANCE RECORD

(Continuing History of Changes in Structure or Equipment Affecting Weight and Balance)

AIRPLANE MODEL: CESSNA 350 (LC42-550FG)				SERIAL NUMBER: 1 Date Airplane Weighed – May 21, 1927 (Initial)						PAGE NO. 1	
DATE MOVED	ITEM MOVED		DESCRIPTION OF ARTICLE OR MODIFICATION	WEIGHT /MOMENT CHANGE						RUNNING TOTALS	
				WEIGHT ADDED			WEIGHT REMOVED				
	IN	OUT		(Lbs.)	(Inches)	(Lbs. – in.)	(Lbs.)	(Inches)	(Lbs. – in.)	(Lbs.)	(Lbs. – in.)
	N/A	N/A	BASIC AIRPLANE AS DELIVERED	N/A	N/A	N/A	N/A	N/A	N/A	**2,268.0**	**244,241.00**

WEIGHT & BALANCE RECORD

(Continuing History of Changes in Structure or Equipment Affecting Weight and Balance)

AIRPLANE MODEL: CESSNA 350 (LC42-550FG)

SERIAL NUMBER: 1

Date Airplane Weighed – May 21, 1927 (Initial)

PAGE NO. 2

DATE MOVED	ITEM MOVED		DESCRIPTION OF ARTICLE OR MODIFICATION	WEIGHT /MOMENT CHANGE						RUNNING TOTALS	
				WEIGHT ADDED			WEIGHT REMOVED				
	IN	OUT		(Lbs.)	(Inches)	(Lbs. – in.)	(Lbs.)	(Inches)	(Lbs. – in.)	(Lbs.)	(Lbs. – in.)

Section 7
Description of Airplane and Systems

TABLE OF CONTENTS

Section 7
Description of Airplane and Systems

INTRODUCTION

Section 7 provides a basic understanding of the airplane's airframe, powerplant, systems, avionics, and components. The systems include: electrical and lighting system; flight control system; wing flap system; fuel system; braking system; heating and ventilating system; door sealing system; pitot pressure system; static pressure system; and the stall warning system. In addition, various non-system components are described. These include: control locks; doors and exits; baggage compartment; seats, seat belts and shoulder harnesses; and the instrument panel.

Terms that are not well known and not contained in the definitions in Section 1 are explained in general terms. The description and discussion on the following pages assume a basic understanding of airplane nomenclature and operations.

AIRFRAME AND RELATED ITEMS

The Cessna 350 (LC42-550FG) is a pre-molded, composite built, semi-monocoque, four seat, single engine, low wing, tricycle design airplane. The airplane is certified in the utility category and is used primarily for transportation and related general aviation uses.

BASIC CONSTRUCTION TECHNIQUES

The construction process used to build the shell or outer surfaces of the fuselage, wing, and most control surfaces involves creating a honeycomb sandwich. The sandwich consists of outer layers of pre-preg fiberglass around a honeycomb interior. The term “pre-preg fiberglass” means the manufacturer impregnates the fibrous material with catalyzed epoxy resin. This process ensures consistency in surface thickness and strength. The honeycomb sandwich is assembled in molds of the wing, fuselage, and control surfaces. Air pressure is used during the heat curing procedure to ensure a tight bond. Other structural components of the airplane, like ribs, bulkheads, and spars, are constructed in the same manner. In areas where added structural strength is needed, such as the wing spars, carbon fibers are added to the honeycomb sandwich.

Fuselage – The fuselage is built in two halves, the left and right sides; each side contains the area from the firewall back to and including the vertical stabilizer. The bulkheads are inserted into the right side of the fuselage through a process known as secondary bonding. The two fuselage halves are bonded together, and the floors are bonded in after fuselage halves are joined. Before the fuselage is assembled into one unit, cables, control actuating systems, and conduits are added because of the ease in access. To prevent damage to the leading edge of the vertical stabilizer, anti-erosion tape may be installed.

Wings and Fuel Tanks – The bottom of the wing is one continuous piece. The spars are placed in the bottom wing and bonded to the bottom inside surface. Next, the ribs are inserted and bonded to the inside surfaces of the bottom wing and to the spars. Finally, after wires, conduits, and control tubes are inserted, the two top wing halves are bonded to the bottom wing and all the spars and ribs. The airplane has integral fuel tanks, commonly referred to as a “wet wing.” The ribs, spars, and wing surfaces are the containment walls of the fuel tanks. All interior seams and surfaces within the fuel tanks are sealed with a fuel impervious substance. The wing cuffs along the outboard leading edge of the wing increase the camber, or curvature, of the airfoil. This improves the slow-flight and stall characteristics of the wing. To prevent damage to the leading edge of the wing, anti-erosion tape may be installed.

Horizontal Stabilizer – The horizontal stabilizer is two separate halves mounted to two horizontal tubes that are bonded to the fuselage. The shear webs and ribs are bonded into the inside surface of the lower skin and the upper skin is then bonded to the lower assembly. To prevent damage to the leading edge of the horizontal stabilizer, anti-erosion tape may be installed.

FLIGHT CONTROLS

Ailerons and Elevator – The ailerons and elevator are of one-piece construction with most of the stresses carried by the control surface. The end caps and drive rib that are used to mount the control’s actuating hardware provide additional structural support. The aileron and elevator

Aileron Servo Tab – The aileron servo tab on the trailing edge of the left aileron assists in movement of the aileron. The servo tab is connected to the aileron in a manner that causes the tab to move in a direction opposite the movement of the aileron. The increased aerodynamic force applied to the tab helps to move the aileron and reduces the level of required force applied to the control stick.

Rudder – The rudder is of one-piece construction with most of the stresses carried by the control surface. The drive rib that is used to mount the control's actuating hardware provides additional structural support. The rudder control system is operated through a series of cables and mechanical linkages that run between the control surface and the rudder pedals in the cockpit. See Figure 7 - 1.

Flight Control System Diagram

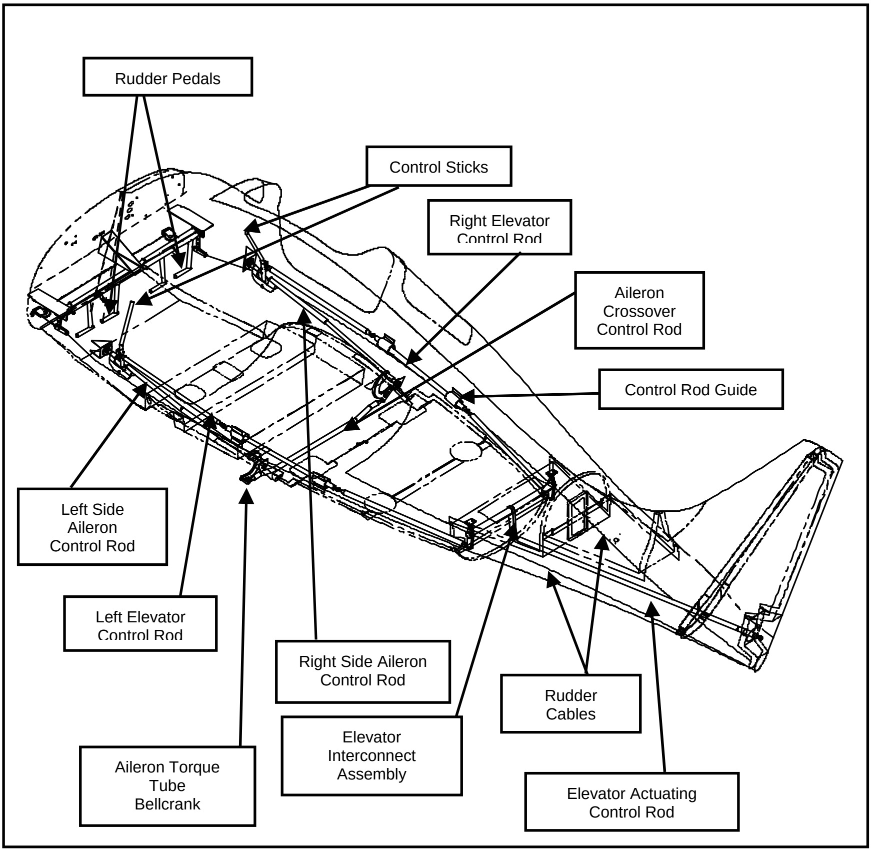


Figure 7 - 1

Rudder Limiter – When the system is activated, a restricting device limits the left rudder travel from 17º ± 1º to 11º ± 0.5º. The system is engaged when the stall warning is active and the manifold pressure is above 12 in. of Hg. For more information, see the Stall Warning System discussion on page 7-43.

TRIM SYSTEM

Elevator and Aileron – The airplane has a two axis trimming system. The elevator trim tab is located on the right side of the elevator, and the aileron trim tab is on the right aileron. A hat switch on each control stick electrically controls both tabs, and the trim position is annunciated on various pages of the MFD. The trim servos are protected by two-amp circuit breakers. See Figure 7 - 2 for an illustration of the trim system.

Trim System Diagram

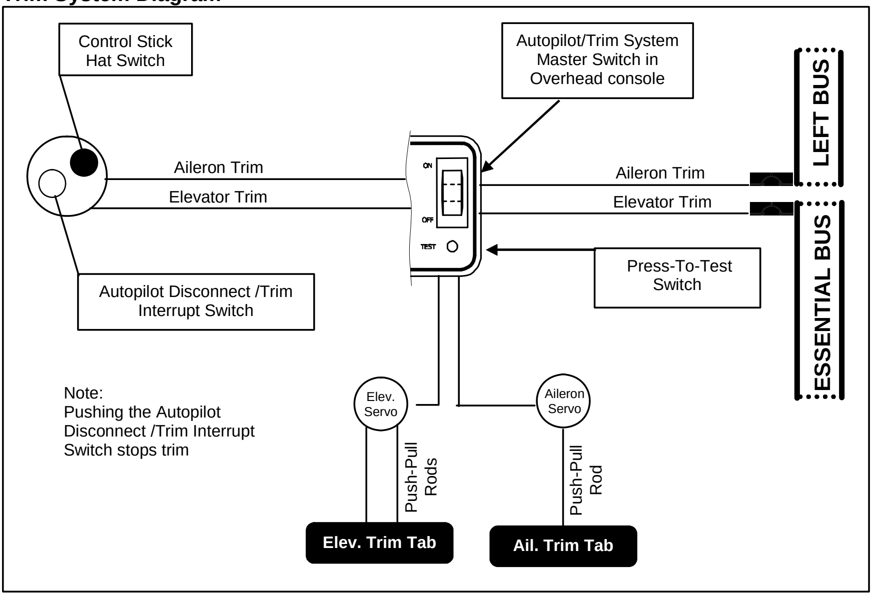


Figure 7 - 2

The trim surfaces are moved by push rods connected between each tab and a servomotor. The aileron tab has one actuating rod and the elevator tab has two. The second actuating rod on the elevator is a redundant system and is provided for the more critical tab in the system. The frictional device installed on the aileron tab should never be lubricated.

Hat Switches – The trim tabs are controlled through use of a hat switch on the top portion of the pilot and copilot's control stick. Moving the switch forward will correct a tail heavy condition, and moving it back will correct a nose heavy condition. Moving the hat switch left or right will correct right wing heavy and left wing heavy conditions, respectively.

Simultaneous Trim Application – If both switches, pilot's and copilot's, are moved in the **same** direction at the same time, the trim will operate in the direction selected. For example, nose down trim is selected on both hat switches. If the switches are simultaneously moved in **opposite** directions, e.g., pilot's is nose down and copilot's is nose up, the trim will not move. Finally, if trim is simultaneously selected in **different** directions, e.g., elevator trim is input by one pilot and aileron trim is input by the other, each trim tab will move in the direction selected.

Trim Position Indicator – The trim position is displayed in the Trim Group on the System page of the MFD. Other pages on the MFD also display the elevator trim position. The vertical mark indicates the position of the elevator trim and the horizontal mark shows the position of the aileron trim. The green band for each axis indicates the approved takeoff ranges.

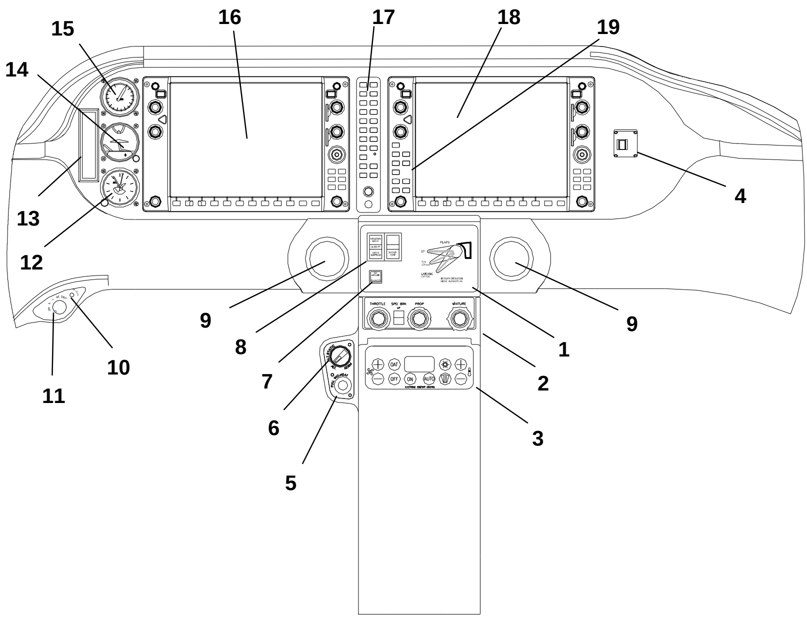
Autopilot/Trim Master Switch (A/P TRIM) – The autopilot/trim master switch, located to the right of the avionics master switch in the overhead console, turns off power on all the trim tabs. This switch is used if a runaway trim condition is encountered. The switch can be cycled to reset or restore normal trim operations. See page 3-19 for an expanded discussion of this issue.

Rudder Trim – The airplane has a manually adjustable tab on the lower portion of the rudder. The tab is adjusted at the factory to produce near neutral rudder pressures at 8,000 feet MSL and 75% power. At other power settings and/or altitudes a slight amount of rudder pressure or aileron trim may be required. The owner or operator of the airplane may wish to adjust this tab to accommodate the most frequently used cruise configuration. The procedures for adjusting the manual tab are contained in Chapter 27 of the *Cessna 350 Airplane Maintenance Manual*.

NOTE

Do not adjust the manual rudder tab by hand since this can produce an uneven deflection or warping of the tab. Refer to the procedures in Chapter 27 of the *Cessna 350 Airplane Maintenance Manual* for adjustment of the manual tab.

INSTRUMENT PANEL AND COCKPIT LAYOUT DIAGRAM



Instrument Panel and Cockpit

1. Flap Panel – Flap Switch and Annunciator
2. Engine Controls
3. Environmental Control System (ECS) Panel or Automatic Climate Control System (ACCS) Panel
4. ELT Remote Switch
5. Heated Induction Air
6. Alternate Static Air
7. Go Around Switch
8. Rocker Switches: Backup Fuel Pump and Vapor Suppression
9. Air Vents
10. Primer Switch
11. Ignition Switch
12. Altimeter
13. Pitot Heat, Door Seals, and Optional Switches
14. Attitude Indicator
15. Airspeed Indicator
16. Primary Flight Display (PFD)
17. Audio Panel
18. Multi-Function Display (MFD)
19. Autopilot Controls

Figure 7 - 3

WING FLAPS

The airplane is equipped with electric Fowler-type flaps. During flap extension, the flaps move out from the trailing edge of the wing, which increases both the camber and surface area of the wing. A motor located under the front passenger's seat and protected by a 10-amp circuit breaker powers the flaps. A flap-shaped switch located in the flap switch panel, which is to the right of the engine controls, operates the flaps.

The flap switch is labeled with three positions: **UP** (0°), **T/O** (12°), and **LANDING** (40°). Rotating the flap switch clockwise retracts the flaps, and moving it counterclockwise extends the flaps. A light bar on the flap knob flashes, at approximately 2 hertz, while the flaps are in motion. When the flaps reach the selected position the flashing light stops. When landing flaps is selected, the in-transit light will not extinguish until the airspeed drops below 100 KIAS. The load caused by the higher airspeed prevents the flaps from going past approximately 37° until the speed drops below 100 KIAS and the load on the flaps is reduced. The illumination of the flaps switch does not change with adjustments to the dimmer slide switch. Controlling light intensity and testing of the lights is discussed later in this section on page 7-42. See Figure 7 - 3 for a drawing of the instrument panel and cockpit layout.

When the flaps are in the up position, the knob is in a position parallel to the floor and points to the UP label on the panel overlay. When flaps are in the takeoff position the knob is rotated 30° counterclockwise from UP, and pointed to the T/O label. When flaps are in the down position, the knob is rotated 30° more and points to the LANDING label. Flap extension speed placards are posted on the flap switch panel overlay. See Figure 7 - 4 for a drawing of the flap panel.

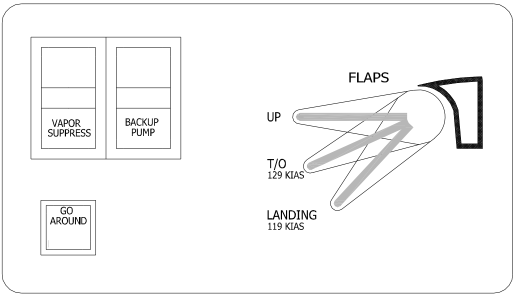


Figure 7 - 4

LANDING GEAR

Main Gear – The airplane has tricycle landing gear with the two main wheels located behind the center of gravity (CG) and a nose wheel well forward of the CG point. The main gear is made from high quality rod steel that has been gun-drilled (drilled through the center like the bore of a gun barrel). The main gear is attached to a tubular steel gearbox that is bolted to the bottom of the fuselage, just aft of the wing saddle. There are 15x6.00-6 tires (tire width and rim diameter in inches) that are inflated to 55 psi and mounted to the gear with Cleveland disc brakes. Composite wheel fairings are mounted over each tire to reduce drag.

Nose Gear – The nose gear has a nitrogen and oil-filled oleo-type strut that is bolted to the engine mount and serves as a shock absorber. Forcing oil through orifices in the piston and an internal plug or barrier absorbs landing or vertical impact. A rotation key or vane working within an oil-filled pocket contains rotational movements (shimmy dampening). Both of these movements, vertical and rotational, are fully contained within the main cylinder body and under normal usage will require little maintenance. Pressurized (250 psi) nitrogen supports the aircraft weight, absorbs small shocks from taxiing, and returns the oleo to full extension.

When the airplane is on the ground, with pressure on the nose strut, the nose wheel is free castoring and has rotational travel through about 120º, 60° to the left and 60° to the right. When the airplane is in flight with pressure off the nose strut, the nose wheel will self-center, which is accomplished by a key in the cylinder rod and a fixed cam. The nose tire is 5.00-5 and should be filled to 88 psi. A composite wheel fairing is mounted over the tire to reduce drag.

SEATS

Front Seats (General) – Two individual, adjustable, tubular frame seats provide the front seating for the pilot and passenger. The base of the tubular seat frame is covered with sheet aluminum, and the seat cushions are attached to the aluminum through a series of Velcro strips. The seatbacks on the front seats fold forward to permit access to the aft seating area. The seat cushions and seatbacks are foam filled and covered with natural leather and ultra-leather. For added protection, both the front and rear seats incorporate a special rigid, energy absorbing foam near the bottom of the cushion. The cushion is designed for the loads applied by a seated passenger, and it is possible to damage the seat if concentrated loads are applied. Care must be taken to avoid stepping on the seats with high-heeled shoes or placing heavy objects on the seat that have small footprints.

Front Seat Adjustment – The front seats are adjustable fore and aft through a range of approximately seven inches. The adjustment control for the seats is located below the seat cushion at the front. To adjust the position of either seat, move the control lever towards the middle until the seat unlocks from the seat track, and adjust the seat to the desired position. Release the adjustment control when the seat is in the desired position, and test for positive seat locking by applying a slight fore and aft movement to the seat cushion. The tilt of front seat backs is adjustable on the ground by loosening the jam nut on the coarse-threaded bolts on each side of the seatback and then raising or lowering the bolts that control the tilt of the seat. See Chapter 25 in the maintenance manual for specific limitations.

Rear Seats – The rear seats are a split bench-type design and are nonadjustable. The bench seat frame is composite construction and bolted to the interior of the fuselage. The foam-filled seat and seatback cushions are covered with natural leather and ultra-leather and attached to the seat bench with Velcro fasteners. The seatbacks are attached to a metal crossbar and secured with quick release pins; however, removal of the rear seat back is not permitted for normal operations.

SEAT BELTS AND SHOULDER HARNESSES

The seat belts and shoulder harnesses are an integrated three-point restraint type of design. With this type of restraint, the lap belt and diagonal harness are incorporated using one continuous piece of belt webbing. The webbing is anchored on each side of the seat for the lap belt restraint and then in the overhead for the harness restraint.

Use of the three-point restraint system is accomplished by grasping the male end of the buckle, drawing the lap webbing and diagonal harness across the lower and upper torso, and inserting it into the female end of the buckle. There is a distinctive snap when the two parts are properly connected. Adjusting two devices in the lap-webbing loop varies the length of the lap belt. One end of the adjustment loop contains a dowel, and the other has a small strap. Draw the dowel and strap together to enlarge the lap belt size, and draw them apart to tighten the lap belt. To release the belt, press the red button on the female portion of the buckle. The torso part of the webbing is on inertial reels that permit the freedom of movement required for piloting operations and passenger comfort. In case of rapid deceleration, the inertial reel will engage a locking mechanism and provide positive restraint.

DOORS

WARNING

Do not open any of the airplane doors in flight. The doors are not designed to be opened in flight; subsequent airloads on an opened door will forcefully pull it completely open and detach it from the airplane.

Gull Wing Cabin Doors – The airplane has entrance doors on each side, which permits easy access to front and rear seat positions. The doors are hinged at the top and open to an almost vertical position above the fuselage. The doors are part of the fuselage contour and when both are fully opened, have a gull wing type of appearance. In the full up or full open position, each door is supported and kept open by a gas strut. The strut will only hold the door open when the door is in the vertical or near vertical position.

The hinges, in conjunction with the dual slide bolts of the door latching mechanism, which extend through the fore and aft door jam, keep the door secure with four points of contact. A distinction is made here between the latching mechanism and the security door locks. The latching mechanism ensures that the doors will remain secured during flight. The door locks are primarily antitheft devices and restrict use of the latching mechanism.

The aircraft should never be taxied while the doors are in the full up position. The doors may be opened 6 to 8 inches during taxi, which can be controlled by grasping the armrest or use of the door strap.

Latching Mechanism – From the exterior, the latching mechanism on each cabin door is operated through movement of the exterior door handle. The handle is mounted on the side of the door in the bottom-aft position and has two ranges of movement. The handle is recessed into the door with adequate room for a handhold. A safety release on the handle must be disengaged before the door will open. Pulling the handle away from the door activates the release. Moving the forward end of the handle from its normal middle position to the six o'clock position disengages the latching mechanism. To secure the door, return the handle to the middle position.

From the interior, both latching mechanisms are engaged and disengaged through use of a handle near the bottom-aft position of the interior door. Again, pulling the handle away from the door disengages the safety release. To activate the latching mechanism, move the door handle down from its near horizontal position until the slide bolts are fully engaged and the curved end of the handle is resting in the safety detent. There are placards on the interior doors labeled "Open" and "Closed" with direction arrows. When both doors are properly closed with the latching mechanism, and the baggage door is secured and locked, the "DOOR OPEN" annunciation message on the PFD will not be displayed. If the "DOOR OPEN" annunciation message is present, an associated aural warning will be heard when the engine RPM exceeds 1800.

WARNING

If the red "Door Open" annunciation message on the PFD is displayed or the aural warning is playing, then one or more doors are not properly secured, and the airplane is unsafe to fly.

Door Locks – There are door locks for each door that restrict use of the latching mechanism and are intended as antitheft devices. The door lock on the pilot's side is a tube-type lock and is operated with a key. On the passenger's side, there is an interior latch control for locking the door. The keyed lock and the latch are moved counterclockwise to lock the door.

To lock the airplane, first engage the door latching mechanism on the passenger side, and then activate the door lock by moving the interior latch. Next, close and latch the pilot's door, and use the key to activate the door lock. Ensure that the baggage door is locked.

CAUTION

The passenger's door must not be locked during flight operations. Locking the door would inhibit rescue operations in case of an emergency.

Remote Keyless Entry System (Optional) – An optional remote keyless entry system allows unlocking of the pilot's door through use of a remote transmitter. The door lock has three key operated positions; "LOCK", "AUTO", and "UNLOCK". The system is armed by turning the key to "LOCK" then to "AUTO". An LED located in the left edge of the overhead console illuminates when the door lock is in the "AUTO" position indicating the door is locked and the remote keyless entry system is active. When the pilot's door is unlocked using the remote transmitter an overhead light in the cockpit will illuminate and the LED will extinguish.

Door Seal System – The airplane is equipped with a pneumatic door seal system that limits air leakage and improves soundproofing. An inflatable gasket around each main door expands when the door seal system is turned on. An electric motor near the pilot's rudder pedals operates the system, which maintains a differential pressure of 12 to 15 psi. The system is activated by a switch in the instrument panel to the left of the PFD labeled "Door Seals" and is protected by a five-amp circuit breaker. The cabin and baggage doors must be closed for the door seal system to operate. The latching mechanism of each door moves a microswitch, which clears the "DOOR OPEN" annunciation message. The "DOOR OPEN" annunciation message must be extinguished for the door seal system to operate.

The cabin door latching mechanism also controls the door seal dump valve. When either cabin door latching mechanism is moved more than a half inch towards the open position, the dump valve is engaged, and the pressure in the seals is dumped. This prevents inadvertent operation of the doors when they are sealed; however, setting the door seal switch to the off position after landing is recommended.

NOTE

It is difficult to open a door with the door seal inflated. If rapid egress is necessary, turn the door seal off.

Normally, the door seal switch remains in the On position for the entire flight. If the system pressure drops below 12 psi, the air pump will cycle on until pressure is restored. If the pump runs continuously, it is an indication that a seal is damaged and incapable of holding pressure. In this situation, the door seal system should not be operated until repairs are made.

Baggage Door – The baggage access door is located on the left side of the airplane, approximately two and one half feet from the left cabin entrance door. The door has Ace type locks on each side of the door, and both locks are used to secure and unsecure the door. There is a piano hinge at the top, and the door is held open by a gas strut during loading and unloading operations.

To open the baggage door, insert the key into each lock and rotate 90º Clockwise. The key cannot be removed from the forward baggage door lock when unlocked; hence, when opening it, release the aft lock first. Once the aft lock is unlatched, remove the key and open the forward lock. This design reduces the possibility of taking off with the baggage door open, provided the ignition and baggage door keys are on the same key ring. When the second lock is unlatched, the gas strut will raise the door. The baggage door is part of the door annunciation system. If the baggage door is not properly closed and the forward latch secured, the red "Door Open" annunciation message on the PFD will display and the aural warning will sound at engine RPM greater than 1800 RPM.

Step – On each side of the airplane there is an entrance step mounted to the fuselage and located aft of the flaps. The entrance step is used for access to the airplane; however, the flaps cannot be stepped on during ingress and egress operations. Placing weight on the top of the flaps imposes unnatural loads on the control's surface and hardware and may cause damage. Both flaps are placarded with the words "No Step."

Handles –The handles are located behind the passenger windows. Do not hang or otherwise put your full weight on the handles.

BRAKE SYSTEM

The airplane braking system is hydraulically operated by a dedicated braking system. Each rudder pedal has a brake master cylinder built into it. Depressing the top portion of the rudder pedals translates this pressure into hydraulic pressure. This pressure is transmitted through a series of hard aluminum and steel grade Teflon lines to pistons in the brake housing of each brake. The piston activates the brake calipers that apply friction to the chrome steel discs. Each disc is connected to a wheel on the main landing gear, and when the caliper clamps onto the disc, it creates friction, which impedes its rotation. Since the disc is part of the wheel, the friction on the disc slows or stops the forward momentum of the airplane.

Parking Brake – The parking brake is near the floor, forward of the circuit breaker panel on the pilot's side of the airplane. When disengaged, the handle is flush with the side panel. The black handle is placarded with the statement, "Brake Engaged," which is only visible when the brake is engaged. To operate, apply and maintain brake pressure to both brakes, and move the parking brake control 90° inboard by grasping the forward portion of the handle. Once the parking brake handle is set, release pressure on the brake pedals.

Moving the parking brake control to the "On" position causes a valve to close the line between the master cylinders and the parking brake. The pressure introduced by the foot pedals before the brake was set is maintained in the system between the parking brake handle and the brake housing. To release the parking brake, apply pressure to the brake pedals, and move the parking brake selector back to the flush position. When the parking brake is on, the position of the handle restricts access to the left rudder pedal and limits inadvertent operation with the parking brake system engaged.

Steering – Directional control of the airplane is maintained through differential braking. Applying pressure to a single brake introduces a yawing moment and causes the free castoring nose wheel to turn in the same direction. As is the case with most light aircraft, turning requires a certain amount of forward momentum. Once the airplane is moving forward, applying right or left brake will cause the airplane to steer in the same direction. There are two important considerations. First, use enough power so that forward momentum is maintained, otherwise the differential braking will stop the airplane. Second, avoid the tendency to ride the brakes since this will increase wear. Some momentary differential braking may be required for takeoff until the control surfaces become effective.

ENGINE

ENGINE SPECIFICATIONS

The airplane engine is a Teledyne Continental Motors Aircraft Engine Model IO-550-N. It is a horizontally opposed, six-cylinder, fuel injected, air-cooled engine that uses a high-pressure wet-sump type of oil system for lubrication. There is a full flow, spin-on, disposable oil filter. The engine has top air induction, an engine mounted throttle body, and a bottom exhaust system. On the front of the engine, accessories include a hydraulically operated propeller governor and a gear driven alternator. Rear engine accessories include a starter, gear-driven oil pump, gear-driven fuel pump, and dual gear-driven magnetos.

ENGINE CONTROLS

Throttle – The throttle controls the volume of air that enters the cylinders. The control has a black circular knob and is located below and to the left of the flap switch. The control has a vernier feature, which permits small adjustments by rotating the knob either clockwise (increase) or counterclockwise (decrease). Changes in throttle settings are displayed on the manifold pressure indicator. Moving the throttle forward increases engine power and manifold pressure, while moving it back will reduce power and manifold pressure.

Propeller – The propeller control allows the pilot to vary the speed or RPM of the propeller. The control has a blue knob with large raised ridges around the circumference and is located between the throttle and the mixture controls. The control has a vernier feature, which permits small adjustments by rotating the knob either clockwise (increase) or counterclockwise (decrease). Large adjustments, such as "exercising the prop" (moving the control to the full aft position), can be made by pressing in the locking button in the center of the knob and moving the control as desired. The high-speed position is with the control full forward.

Mixture – The mixture control allows the pilot to vary the ratio of the fuel-air mixture. The control has a red knob with small raised ridges around the circumference and is located below the flap switch. The control has a vernier feature, which permits small adjustments by rotating the knob either clockwise (increase) or counterclockwise (decrease). Large adjustments, such as when the control is set to idle cutoff (moving the control to the full aft position), can be made by pressing in the locking button in the center of the knob and moving the control as desired. The richest position is with the control full forward.

ENGINE SUB-SYSTEMS

Starter and Ignition – Turning the keyed ignition switch, which is located on the extreme lower left of the instrument panel in front of the pilot's control stick, activates the starter. The key rotates in a clockwise direction and is labeled: "Off" – "R" – "L" – "R/L" – "Start." The "R" and "L" items of this label relate to which magneto (left or right) is turned on or <u>not</u> grounded. Turning the key to "R/L" will cause both magnetos to be ungrounded or "Hot."

The airplane engine is equipped with TCM-Bendix S6RN-25 series, high-tension magnetos with impulse couplings on each magneto. The left magneto fires the three upper left and lower right set of spark plugs, and the right magneto fires the three upper right and lower left set of spark plugs. Turning the switch to the "L" or left magneto grounds the right magneto and makes it non-functioning**.** Conversely, turning the switch to the "R" or right magneto position grounds the left magneto and makes it non-functioning.

The key will turn with minimum resistance to the "R/L" position and is spring-loaded (provides greater resistance) from the "R/L" to the "Start" position. Starting is initiated from the "R/L" position with the master switch on. Rotating the key to the start position will engage the starter. Once the engine starts, release the key, and the spring loading mechanism will return it to the "R/L" position. A geared right-angle drive starter adapter and a direct current starter motor accomplish engine cranking.

Propeller and Governor – The airplane is equipped with a Hartzell three-bladed constant speed propeller with a McCauley governor. In a constant speed propeller system, the angle of the propeller blade changes automatically to maintain the selected RPM. For this to happen the angle of the propeller blade must change as power, air density, or airspeed changes. A decrease in blade angle decreases the air loads on the propeller, while an increase in blade angle increases air loads. If, for example, the manifold pressure is reduced, the angle of the blade will decrease (decreased air loads) to maintain a constant RPM. When operating at high altitudes with reduced air resistance, the blade angle will increase (increased air loads) to maintain a constant RPM.

An oil-driven piston in the propeller hub uses oil from the engine oil system to operate the propeller governor. If a greater blade angle is needed to maintain a constant RPM, the valve in the governor pumps oil into the propeller hub to increase the propeller blades' angle of attack. If a smaller blade angle is needed to maintain a constant RPM, the governor diverts oil away from the piston. With oil pressure removed, spring pressure and a centrifugal blade twisting moment cause the propeller blades' angle of attack to decrease. The propeller is connected directly to the drive shaft of the engine; hence, propeller and engine RPM indications are the same.

There are limits at which the propeller can no longer maintain a constant RPM. As power is reduced, the blade angle decreases to maintain a constant RPM. When the propeller reaches its lowest angle of attack position, approximately 14°, further reductions in power will result in decreased RPM. There is a theoretical high angle position, approximately 35°, at which further applications of power and speed will cause an increase in RPM. However, this latter condition is only theoretical since a high manifold pressure setting, in conjunction with a low RPM setting, can cause engine damage.

The sequence in which power changes are made is important. The objective is to not have a high manifold pressure setting in conjunction with a low RPM setting. When increasing power settings, increase RPM first with the propeller control, and then increase manifold pressure with the throttle. When decreasing power settings, decrease the manifold pressure first and then decrease the RPM setting. **Do not exceed 20 inches of Hg of manifold pressure below 2200 RPM. This requirement is not an engine limitation, but rather a propeller harmonic condition inherent in the Cessna 350 (LC42-550FG).**

Induction – The induction system routes outside air through an air filter to the throttle valve and then to each individual cylinder where fuel from the injector nozzle of the cylinder is mixed with the induction air. The components of the induction system include air filter and a heated induction air door. Normally, ram air enters through the left intake hole in the front of the cowling and passes through the air filter where it is sent on to the intake manifold.

In the event the normal induction system is obstructed by ice, there is a control, which permits introduction of heated air into the induction system. This control is below the rocker switch panel near the pilot's right knee and labeled "Induction Heat." Heated induction air is routed through the induction system when the knob is pulled out. The ram air intake is located by the right intake hole in the front of the cowling. When the induction heat control is pulled out, it moves a butterfly valve that shuts off the airflow of outside induction air and opens the airflow for heated air from the engine. There is no need for an air-to-air heat exchanger manifold. The ambient air that circulates around the engine provides a sufficient temperature rise for the heated induction air.

Cooling – The airplane has a pressure cooling system. The basic principle of this design is to have high pressure at the intake point and lower pressure at the exit point. This type of arrangement promotes a positive airflow since higher pressure air moves towards the area of low pressure. The high pressure source is provided by ram air that enters the left and right intake openings in the front of the cowling. The low pressure point is created at the bottom of the cowling near the engine exhaust stacks. The flared cowl bottom causes increased airflow, which lowers pressure.

Within the cowling, the high-pressure intake air is routed around and over the cylinders through an arrangement of strategically placed baffles as it moves towards the lower pressure exit point. In addition, fins on the cylinders and cylinder heads, which increase the surface area and allow greater heat radiation, promote increased cooling. The system is least efficient during ground operations since the only source of ram air is from the propeller or possibly a headwind.

Engine Oil – The IO-550-N has a wet sump, high pressure oil system. The system provides lubrication for the moving parts within the engine and is the oil source for operation of the propeller governor. In addition, a squirt nozzle that directs a stream of oil on the inner dome of each piston cools each piston. The engine has an oil cooler with a pressure-temperature bypass. The oil bypasses the oil cooler if the oil temperature is below 170°F (77°C) or a pressure differential greater than 18 psi is detected. If the oil temperature is above 170°F (77°C), oil is sent through the oil cooler before entering the engine. This type of arrangement keeps the oil at constant temperature of about 180°F (82°C). Ram air for the oil cooler is provided by the engine's pressure cooling system.

The term "wet sump" means the oil is stored within the engine sump as opposed to a separate oil tank. The oil is drawn out of the sump by the engine-driven oil pump where it is sent to a full flow oil filter, i.e., a filter that forces all the oil to pass through the filter each time it circulates. The system pressure is kept constant by a spring-loaded pressure relief valve that is between the pump and the filter. From the oil filter, the oil flows into the oil cooler if the temperature is high enough and then is routed to the left oil gallery (an oil dispersal channel or passage). The oil in the left gallery flows forward to the front of the engine and a portion of the flow is sent to the propeller governor. The oil flow is then directed to the right engine gallery and flows towards the rear of the engine and back to the oil sump.

Oil within the left and right galleries is injected onto the crankshaft, camshaft, propshaft bearing, accessory drive bearings, cylinder walls, and other various parts within the engine. After lubricating the engine, gravity causes the oil to flow downward through transfer tubes and drain holes where it is returned to the oil sump.

If the filter becomes clogged and prevents oil from moving through the system, a bypass valve reroutes the oil around the filter. In this event, the lubricating oil is, of course, unfiltered. However, rerouting the oil will prevent engine failure. It is important to note that the pilot will have no indication that the oil filter has clogged, and this situation compounds the problem. Since the filter failure was most likely caused by contaminated oil, the oil system will be lubricated with contaminated oil. The best solution is timely and frequent oil changes.

The dipstick and oil filler cap access door are located on the top left engine cowl about two feet from the propeller hub. The engine must not be operated with less than six quarts of oil and must not be filled above eight quarts. For extended flights, the oil should be brought up to full capacity. Information about oil grades, specifications, and related issues are covered in Section 8 of this handbook.

Exhaust – Gases that remain after combustion flow from the cylinders through the exhaust valves and into the exhaust manifold (a series of connected pipes) and are expelled into the outside atmosphere. There is an exhaust manifold on each side of the engine, and each of these manifolds is connected to three cylinders. The manifolds are connected to a muffler and tail pipe that extend out the bottom of the engine cowling. A heat shroud is attached to the exhaust pipe on the left side and serves as a heat exchanger. The air-to-air heat exchanger is used for cabin heat.

INSTRUMENTS

GARMIN G1000 INTEGRATED COCKPIT SYSTEM

The following is a general description of the Garmin G1000 Integrated Cockpit System. For operating instructions on the features of the G1000 system, refer to the latest revision of the Garmin G1000 Cockpit Reference Guide, document number 190-00567-01.

NOTE

The G1000 may provide erroneous messages indicating to the pilot that airspace has been penetrated when the airplane is only close to that airspace. This generally occurs when there is a substantial difference between GPS altitude and baro-corrected altitude. Ensure your baro-correction is accurate to the nearest reporting station.

WARNING

In the event of an AHRS failure where heading information is no longer provided on the G1000, it is recommended that the pilot make use of the digital TRK readout in the waypoint data field – located at the top center of the PFD, and the information on the moving map display to supplement the wet compass heading information. This will reduce the need for excessive head and eye movement and aid in the prevention of spatial disorientation of the pilot.

System Description – The Garmin G1000 includes the following Line Replaceable Units (LRUs):

- GDU 1040 Primary Flight Display (PFD)
- GDU 1042/GDU 1044 Multi function display (MFD)
- GCU 476 Remote Keypad
- GIA 63/GIA 63W Integrated Avionics Units (2)
- GDL 69A Data Link Receiver
- GEA 71 Engine/Airframe Unit
- GDC 74A Air Data Computer (ADC)
- GRS 77 Attitude & Heading Reference System (AHRS)
- GMU 44 Magnetometer
- GMA 1347 Audio System with Integrated Marker Beacon Receiver
- GTX 33 Mode S Transponder

All LRUs have a modular design, which greatly eases troubleshooting and maintenance of the G1000 system.

GDU 1040 PFD and GDU 1042/GDU 1044 MFD – The GDU 1040, GDU 1042, and GDU 1044 each have a 10.4-in. LCD display with 1024x768 resolution. The displays are located side-by-side, with the GMA 1347 Audio Panel located in-between. Both displays provide control and display of nearly all functions of the G1000 integrated cockpit system. They communicate with each other through a High-Speed Data Bus (HSDB) Ethernet connection. Each display is also paired with an Ethernet connection to a GIA 63/GIA 63W Integrated Avionics Unit. The GDU 1044 MFD and the GIA 63W are used for aircraft equipped to utilize the Wide Area Augmentation System (WAAS). See Figure 7 - 5.

Reversionary Mode – Should a system detected failure occur in either display, the G1000 automatically enters reversionary mode. In reversionary mode, critical flight instrumentation is combined with engine instrumentation on the remaining display. Minimal navigation capability is available on the reversionary mode display.

Reversionary display mode can also be manually activated by the pilot if the system fails to detect a display problem. The reversionary mode is activated manually by pressing the red DISPLAY BACKUP button on the bottom of the audio panel (GMA 1347). Pressing the red DISPLAY BACKUP button again deactivates reversionary mode.

MFD Map Scale – The MFD map scale shown in the lower right corner of the display represents the total distance from the bottom of the moving map to the top of the map. It does not represent the distance from the airplane symbol to the top of the moving map.

MFD Holding Pattern Depiction – The depiction of the holding pattern on the MFD is sized according to the airplane's groundspeed. The G1000 will calculate the appropriate size of the hold to provide 1 minute legs in the hold. Changes in the airplane's groundspeed will cause the size of the holding pattern to change

VOR Frequency Display on the MFD – If the Nearest VOR page is selected, the fields on the page may be highlighted to select data. The VOR frequency displayed may be selected and changed on the page. However, changing this field will not replace the information in the database and subsequent use of the VOR data page will show the correct database frequency for the identified station.

Figure 7 - 5

GMA 1347 Audio Panel – The GMA 1347 integrates NAV/COM digital audio, intercom system, and marker beacon controls. The GMA 1347 also controls manual display reversionary mode (red DISPLAY BACKUP button) and is installed between the MFD and the PFD. The GNA 1347 communicates with both GIA 63/GIA 63Ws using a RS-232 digital interface. See Figure 7 - 5.

GCU 476 Remote Keypad – The GCU 476 interfaces with the GDU 104x PFD/MFD. The GCU 476 Remote Keypad provides alphanumeric, softkey, and flight planning function keys used to interface with the G1000. In addition to alphanumeric, softkey, and flight planning function keys the GCU 476 provides COM/NAV tuning capabilities. The GCU 476 mounts on the center console using a single jackscrew. See Figure 7 - 6.

Figure 7 - 6

GIA 63/GIA 63W – The GIA 63/GIA 63W is the Integrated Avionics Unit (IAU) of the G1000 system. The GIA 63/GIA 63W is the main communications hub, linking all LRUs with the PFD and the MFD displays. Each GIA 63/GIA 63W contains a GPS receiver, VHF COM/NAV/GS receivers, and system integration microprocessors. Each GIA 63/GIA 63W is paired with either the 1040 GDU, 1042 GDU, or 1044 GDU, respectively. The GIA 63W and the 1044 GDU are used on aircraft equipped to utilize the Wide Area Augmentation System (WAAS). Only one type of GIA, either GIA 63 or GIA 63W will be installed. GIAs do not communicate with each other directly. See Figure 7 - 7.

Figure 7 - 7

GDL 69A Data Link Receiver – The GDL 69A is an XM Satellite Radio data link receiver with the addition of XM Satellite Radio audio entertainment. For display of weather information and control of audio channel and volume, the GDL 69A is interfaced to the GDU 1042/GDU 1044 via an Ethernet link. Audio volume and channel changes may also be controlled with remotely mounted switches located in the center console. The GDL 69A is also interfaced to a Garmin audio panel for amplification and distribution of the audio signal. The GA 55 XM Satellite Radio antenna (aircraft not equipped for WAAS) or the GA 37 GPS and XM Satellite Radio antenna (aircraft equipped for WAAS) receives the XM Satellite Radio data signal and passes it to the GDL 69A. See Figure 7 - 8.

Figure 7 - 8

GRS 77 – The GRS 77 is an Attitude and Heading Reference System (AHRS) that provides aircraft attitude and heading information to both the G1000 displays and the GIA 63/GIA 63Ws. The unit contains advanced sensors, accelerometers, and rate sensors. In addition, the GRS 77 interfaces with the GDC 74A Air Data Computer and the GMU 44 Magnetometer. The GRS 77 also utilizes two GPS signal inputs sent from the GIA 63/GIA 63Ws. Attitude and heading information is sent using an ARINC 429 digital interface to the GDU 1040 PFD, GDU 1042/GDU 1044 MFD, and GIA 63/GIA 63Ws. See Figure 7 - 9.

Figure 7 - 9

GMU 44 – The GMU 44 Magnetometer measures local magnetic field information. Data is sent to the GRS 77 AHRS for processing to determine aircraft magnetic heading. This unit receives power directly from the GRS 77 and communicates with the GRS 77 using a RS-485 digital interface. See Figure 7 - 10.

Figure 7 - 10

GDC 74A – The GDC 74A Air Data Computer processes information received from the pitot/static system and the outside air temperature (OAT) sensor. The GDC 74A provides pressure altitude, airspeed, vertical speed, and OAT information to the G1000 system. The GDC 74A communicates with both GIA 63/GIA 63Ws, GDU 1040 PFD, GDU 1042/GDU 1044 MFD, and GRS 77 using an ARINC 429 digital interface. See Figure 7 - 11.

Figure 7 - 11

GEA 71 – The GEA 71 receives and processes signals from engine and airframe sensors. Sensor types include engine temperature and pressure sensors as well as fuel measurement and pressure sensors. The GEA 71 communicates with both GIA 63/GIA 63Ws using a RS-485 digital interface. See Figure 7 - 12.

Figure 7 - 12

GTX 33 – The GTX 33 is a solid-state Mode S transponder providing Modes A, C, and S operation. The GTX 33 is controlled through the PFD, and communicates with both GIA 63/GIA 63Ws through a RS-232 digital interface. See Figure 7 - 13.

Figure 7 - 13

Annunciations and Alerts
For a more detailed description of annunciations and alerts displayed on the PFD and/or MFD, refer to the latest revision of the Garmin G1000 Cockpit Reference Guide, document number 190-00567-01.

Annunciation Window: The annunciation window displays abbreviated annunciation text. The annunciation window is located to the right of the Altitude and Vertical Speed windows on the PFD display (or the MFD if system is in reversionary mode). Up to 12 annunciations can be displayed simultaneously. A white horizontal line separates annunciations that are acknowledged from annunciations that are not yet acknowledged. Acknowledged annunciations are always above the line. Annunciations are displayed in order of priority from top to bottom. The highest priority annunciation is displayed at the top of the annunciation window.

Alerts Window: The Alerts window displays alert text messages. Up to 64 prioritized alerts can be displayed in the Alerts window. New alerts are placed on top of the stack and older ones are pushed down. Alerts that are no longer valid are grayed out and then subsequently removed after the window is refreshed. Pressing the ALERTS softkey displays the Alerts window. Pressing the ALERTS softkey again removes the Alerts window from the display. When the Alerts window is displayed, the pilot may use the large FMS knob to scroll through the alert list. Higher priority alerts are displayed at the top of the window. Lower priority alerts are displayed at the bottom of the window.

ALERTS Softkey Annunciation: When the Alerting System issues an alert, the ALERTS softkey is used as a flashing annunciation to accompany an alert. During the alert, the ALERTS softkey assumes a new label consistent with alert level (WARNING, CAUTION, or ADVISORY). Pressing the softkey annunciation acknowledges that the pilot is aware of the alert. The softkey then returns to the previous ALERTS label. The pilot can then press the ALERTS softkey again to view alert text messages.

System Annunciations: Typically, a large red ‘X’ appears in a window when a related LRU fails or detects invalid data.

Alert Level Definitions – The G1000 Alerting System, as installed in Cessna 350 aircraft, uses three alert levels.

WARNING: This level of alert requires immediate pilot attention. A warning alert is accompanied by an annunciation in the annunciation window. Warning text appearing in the annunciation window is RED. A warning alert is also accompanied by a flashing WARNING softkey annunciation. Pressing the WARNING softkey acknowledges the presence of the warning alert and stops the aural tone, if applicable.

CAUTION: This level of alert indicates the existence of abnormal conditions on the aircraft that may require pilot intervention. A caution alert is accompanied by an annunciation in the annunciation window. Caution text appearing in the annunciation window is YELLOW. A caution alert is also accompanied by a flashing CAUTION softkey annunciation. Pressing the CAUTION softkey acknowledges the presence of the caution alert.

MESSAGE ADVISORY: This level of alert provides general information to the pilot. A message advisory alert does not issue annunciations in the Alerts window. Instead, message advisory alerts only issue a flashing ADVISORY softkey annunciation. Pressing the ADVISORY softkey acknowledges the presence of the message advisory alert and displays the alert text message in the Alerts window.

Aircraft Alerts

1. **WARNING Alerts**
   a. If the DOOR OPEN message is displayed, one or more of the airplane's doors is not properly secured.
   b. If the **FUEL VALVE** message is displayed, the fuel selector is not set to either the left or right tank, or is not properly seated in the detent of the selected tank.
   c. If the **L BUS OFF** or **R BUS OFF** message is displayed, the electrical bus is either not turned on or is damaged.
   d. If the **CO LVL HIGH** message is displayed, the carbon monoxide level has reached 50 parts per million by volume or greater.
   e. If the **OIL PRES LOW** message is displayed, the engine oil pressure is less than 5 psi.

Annunciation Window Text	Alerts Window Message	Audio Alert/Voice Message (Repeating)
DOOR OPEN	Door not secured	Chime/"Door Open"
FUEL VALVE	Fuel tank is not correctly selected or is in the OFF position	Chime/"Fuel Valve"
L BUS OFF	No power on the left bus	Chime
R BUS OFF	No power on the right bus	Chime
CO LVL HIGH	Carbon Monoxide level is too high	Chime/"Carbon Monoxide"
OIL PRES LOW	Low oil pressure	Chime/"Oil Pressure Low"

2. **CAUTION Alerts**
   a. If the **L ALT OFF** or **R ALT OFF** message is displayed, then either the alternator is not turned on, the alternator was tripped off-line by an over voltage condition, or low voltage conditions exist. In either case, the corresponding battery is in a state of discharge.
   b. If the **FUEL PUMP** message is displayed, the backup fuel pump is active.
   c. If either the **L LOW FUEL** or **R LOW FUEL** message is displayed, the indicated tank has less than eight gallons of usable fuel remaining in that tank.
   d. If the **RUDR LMTR** message is displayed, the rudder limiter is engaged.
   e. The **STARTER ENGD** message is displayed, when the starter is activated.
   f. If the **OXYGEN** message is displayed, the system has not been activated above approximately 12,000 ft PA, there is inadequate quantity of oxygen, or the oxygen outlet pressure is not within range for proper operation.

g. The **OXYGEN QTY** message is displayed when the oxygen quantity is below 250 psi.

Annunciation Window Text	Alerts Window Message	Audio Alert/Voice Message
L ALT OFF	Left Alternator offline	Single Chime/ "Left Alternator Out"
R ALT OFF	Right Alternator offline	Single Chime/ "Right Alternator Out"
FUEL PUMP	Backup fuel pump is operating	Single Chime/ "Fuel Pump"
L LOW FUEL	Low fuel in the left tank	Single Chime/None
R LOW FUEL	Low fuel in the right tank	Single Chime/None
STARTER ENGD	Starter relay has power applied	Single Chime/None
OXYGEN	Oxygen system needs attention or is off	Single Chime/None
OXYGEN QTY	Oxygen quantity below 250 psi	Single Chime/None

3. **Annunciation Advisory**
   a. If the **OXYGEN ON** message is displayed, this is a reminder to turn off oxygen.
   b. If the **SPEED BRAKES** message is displayed, the speedbrakes are deployed. When deploying the speedbrakes, the message stays off until they are full deployed. When retracting the speedbrakes, the message stays on until fully retracted.

Annunciation Window Text	Alerts Window Message	Audio Alert/Voice Message
OXYGEN ON	Reminder: Turn off oxygen	None
SPEED BRAKES	Speed brakes are active	None

4. **Message Advisory Alerts**
   a. If the **PFD FAN FAIL** message is displayed, the cooling fan for the PFD is inoperative.
   b. If the **MFD FAN FAIL** message is displayed, the cooling fan for the MFD is inoperative.
   c. If the **AVIONICS FAN** message is displayed, the cooling fan for the remote avionics is inoperative.
   d. If the **TIMER ZERO** message is displayed, the timer has counted down to zero.
   e. If the **FUEL IMBAL** message is displayed, fuel imbalance is greater than 10 gallons.
   f. If the **LOW MAN PRES** message is displayed, manifold pressure is below 15 in.
   g. If the **VAPOR SUPPR** message is displayed, turn on vapor suppression.

Alerts Window Message	Audio Alert
PFD FAN FAIL – The cooling fan for the PFD is inoperative	None
MFD FAN FAIL – The cooling fan for the MFD is inoperative	None
AVIONICS FAN – the cooling fan for remote avionics is inoperative	None
TIMER ZERO – Timer has counted down to zero	"Timer Expired"
FUEL IMBAL – Fuel imbalance is greater than 10 gallons	None
LOW MAN PRES – Manifold pressure is below 15 in.	None
VAPOR SUPPR – Turn on Vapor Suppression	None

Audio Alert/Voice Message – The audio alert/voice message warning system activates in coordination with some of the annunciation messages. The audio alert/voice message warnings consist of a female voice speaking in English and/or a chime. If the Ryan TCAD is installed, the audio alert/voice message system will provide a traffic advisory for aircraft detected in the vicinity. Additionally, a voice message will provide a reminder when the count down timer reaches zero.

The audio alert/voice message system operates when the avionics master is on and there is engine oil pressure. This feature prevents the warning system from going through all the commands when power is first applied. There is also a two second delay to allow fuel tank selection without a nuisance warning.

The audio alert/voice message will be played over the cabin speaker and the headsets regardless of the audio panel switch positions. The voice message warnings that play are:

1. Door Is Open – this warning is activated when any of the doors are unlatched and the engine RPM is over 1800 RPM.

2. Fuel Valve – this warning is activated when the fuel valve is not in the left or right tank detents.
3. Carbon Monoxide – this warning is activated by the carbon monoxide detector.
4. Oil Pressure Low – this warning is activated when oil pressure is less than 5 psi.
5. Left Alternator Out or Right Alternator Out – this warning is activated when any of the following occur:
    a. The left or right alternator is switched off.
    b. The over voltage relay has been activated.
    c. The bus voltage is below 24.0 volts.
    d. The left or right alternator has failed.
6. Fuel Pump– this caution is activated when the backup fuel pump is running.
7. Traffic:
    With TCAD installed – This warning phrase is always preceded by a tone and then begins as "Traffic." The clock position, relative altitude, and range of the intruder is then announced. Refer to Audible Advisories on page 7-59 for a more detailed description.
    With TIS only installed – The warning phrase is either "Traffic" when TIS traffic alert is received or "Traffic Not Available" when TIS service is not available or out of range.
8. Timer Expired – this annunciation is activated by the G1000 Count Down timer and is programmed by the pilot.

AFCS Alerts –The following alert annunciations appear in the AFCS System Status Field on the PFD.

Condition	Annunciation	Description
Pitch Failure	PTCH	Pitch axis control failure. AP is inoperative.
Roll Failure	ROLL	Roll axis control failure. AP is inoperative.
MET Switch Stuck, or Pitch Trim Axis Control Failure	PTRM	If annunciated when AP is engaged, take control of the aircraft and disengage the autopilot. If annunciated when AP is not engaged, move each half of the MET switch separately to check if a stuck switch is causing the annunciation.
System Failure	AFCS	AP and MET are unavailable. FD may still be available.
Elevator Mistrim Up	↑ELE	A condition has developed causing the pitch servo to provide a sustained force. Be prepared to apply a substantial stick force in either direction upon AP disconnect.
Elevator Mistrim Down	↓ELE	A condition has developed causing the pitch servo to provide a sustained force. Be prepared to apply a substantial stick force in either direction upon AP disconnect.
Aileron Mistrim Left	←AIL	A condition has developed causing the roll servo to provide a sustained force. Ensure the slip/skid indicator is centered and observe any maximum fuel imbalance limits. Be prepared to apply a substantial stick force in either direction upon AP disconnect.
Aileron Mistrim Right	AIL→	A condition has developed causing the roll servo to provide a sustained force. Ensure the slip/skid indicator is centered and observe any maximum fuel imbalance limits. Be prepared to apply a substantial stick force in either direction upon AP disconnect.
Preflight Test	PFT	Performing preflight system test. Upon completion of the test, the aural alert will be heard.
	PFT	Preflight system test has failed.

TAWS Alerts –Annunciations appear on the PFD and MFD. Pop-up alerts appear only on the MFD.

Alert Type	PFD/MFD TAWS Page Annunciation	MFD Map Page Pop-Up Alert	Aural Message
Excessive Descent Rate Warning (EDR)	PULL UP	PULL-UP	"Pull Up"
Reduced Required Terrain Clearance Warning (RTC)	PULL UP	TERRAIN - PULL-UP or TERRAIN AHEAD - PULL-UP	"Terrain, Terrain; Pull Up, Pull Up" or "Terrain Ahead, Pull Up; Terrain Ahead, Pull Up"
Imminent Terrain Impact Warning (ITI)	PULL UP	TERRAIN AHEAD - PULL-UP or TERRAIN - PULL-UP	Terrain Ahead, Pull Up; Terrain Ahead, Pull Up" or "Terrain, Terrain; Pull Up, Pull Up"
Reduced Required Obstacle Clearance Warning (ROC)	PULL UP	OBSTACLE - PULL-UP or OBSTACLE AHEAD - PULL-UP	"Obstacle, Obstacle; Pull Up, Pull Up" or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"
Imminent Obstacle Impact Warning (IOI)	PULL UP	OBSTACLE AHEAD - PULL-UP or OBSTACLE - PULL-UP	"Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up" or "Obstacle, Obstacle; Pull Up, Pull Up"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION - TERRAIN or TERRAIN AHEAD	"Caution, Terrain; Caution, Terrain" or "Terrain Ahead; Terrain Ahead"
Imminent Terrain Impact Caution (ITI)	TERRAIN	TERRAIN AHEAD or CAUTION - TERRAIN	"Terrain Ahead; Terrain Ahead" or "Caution, Terrain; Caution, Terrain"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION - OBSTACLE or OBSTACLE AHEAD	"Caution, Obstacle; Caution, Obstacle" or "Obstacle Ahead; Obstacle Ahead"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	OBSTACLE AHEAD or CAUTION - OBSTACLE	"Obstacle Ahead; Obstacle Ahead" or "Caution, Obstacle; Caution, Obstacle"
Premature Descent Alert Caution (PDA)	TERRAIN	TOO LOW - TERRAIN	"Too Low, Terrain"
Altitude Callout "500"	None	None	"Five-Hundred"
Excessive Descent Rate Caution (EDR)	TERRAIN	SINK RATE	"Sink Rate"
Negative Climb Rate Caution (NCR)	TERRAIN	DON'T SINK or TOO LOW - TERRAIN	"Don't Sink" or "Too Low, Terrain"

TAWS System Status Annunciations

Alert Type	PFD/MFD TAWS Page Annunciation	MFD Pop-Up Alert	Aural Message
TAWS System Test Fail	TAWS FAIL	None	"TAWS System Failure"
TAWS Alerting is disabled	TAWS INHB	None	None
No GPS position or excessively degraded GPS signal	TAWS N/A	None	"TAWS Not Available"
System Test in progress	TAWS TEST	None	None
System Test pass	None	None	"TAWS System Test OK"

Other Annunciations – For Garmin G1000 system annunciations and message advisories related to the PFD, MFD, LRUs, and databases refer to the latest revision of the Garmin G1000 Cockpit Reference Guide, document number 190-00567-01.

ChartView
Garmin ChartView brings an electronic version of Jeppesen's extensive library of charts and airport diagrams directly to the MFD. ChartView displays approach charts, geopolitical features, airspace, airways, and airport diagrams. In addition, pilots will see the aircraft's present position on the chart. Pilots subscribing to ChartView will receive periodic DVD updates from Jeppesen so they can update the information on the aircraft. The DVD may also be loaded onto a personal computer to display and print charts while on the ground. Refer to the latest revision of the Garmin G1000 Cockpit Reference Guide, document number 190-00567-01, for operational procedures.

FliteCharts
Garmin FliteCharts is an electronic version of the National Aeronautical Chart Office (NACO) U.S. Terminal Procedures Publication. FliteCharts lets pilots quickly find and view all NACO Departure Procedures (DP), Standard Terminal Arrival Routes (STARs), approach charts, and airport diagrams on the MFD. G1000 equipped aircraft with FliteCharts will have access to all approach plates currently published by NACO, which encompasses 17,500 approach plates at over 2,916 airports. Garmin will offer regular updates to FliteCharts as they become available from NACO. Refer to the latest revision of the Garmin G1000 Cockpit Reference Guide, document number 190-00567-01, for operational procedures.

SafeTaxi
Garmin SafeTaxi is a service that helps pilots navigate unfamiliar airports while taxiing. SafeTaxi identifies runways, taxiways, and hangars, as well as the aircraft's exact location on the field. The SafeTaxi information is integral in the basemap and is displayed on the MFD. Over 700 U.S. airports and diagrams are loaded on G1000 equipped aircraft with the SafeTaxi feature, and Garmin will continue to develop and offer new airport charts as NACO provides new information. Garmin also plans to offer international airport diagrams in the future, pending approvals from the necessary agencies. Refer to the latest revision of the Garmin G1000 Cockpit Reference Guide, document number 190-00567-01, for operational procedures.

Wide Area Augmentation System (WAAS)
The Federal Aviation Administration (FAA) and the Department of Transportation (DOT) are developing the WAAS program for use in precision flight approaches. WAAS corrects for GPS signal errors caused by ionospheric disturbances, timing, and satellite orbit errors, and it provides vital integrity information regarding the health of each GPS satellite. Typical WAAS position accuracy is less than 9 feet (3 meters).

WAAS consists of approximately 25 ground reference stations positioned across the United States that monitor GPS satellite data. Two master stations, located on either coast, collect data from the reference stations and create a GPS correction message. This correction accounts for GPS satellite orbit and clock drift plus signal delays caused by the atmosphere and ionosphere. The corrected differential message is then broadcast through one of two geostationary satellites positioned over the equator. Currently, WAAS satellite coverage is only available in North America.

A GDU 1044 MFD, two GIA 63W Integrated Avionics Units, a GA 35 antenna, and a GA 37 antenna are required to utilize WAAS. Refer to the latest revision of the Garmin G1000 Cockpit Reference Guide, document number 190-00567-01, for operational procedures.

FLIGHT INSTRUMENTS
The backup attitude, airspeed, and altitude indicators are located in a column next to the PFD. The discussion that follows will identify each instrument. A drawing of the airplane cockpit is shown on page 7-10.

Magnetic Compass – The airplane has a conventional aircraft, liquid filled, magnetic compass with a lubber line on the face of the window, which indicates the airplane's heading in relation to magnetic north. The instrument is located on top, center of the windshield and is labeled at the 30°

points on the compass rose with major increments at 10° and minor increments at 5°. A compass correction card is on the compass and displays compass error at 30° intervals with the engine, radios, and strobes operating.

Backup Airspeed Indicator – The backup airspeed indicator is part of the pitot-static system, which is discussed on page 7-31. The instrument measures the difference between ram pressure and static pressure and, through a series of mechanical linkages, displays an airspeed indication. The source of the ram pressure is from the pitot tube, and the source of the static pressure is from the static air vent. The instrument shows airspeed in knots on the outer circumference of the instrument, which ranges from 0 to 260 knots with 10-knot increments. Airspeed limitations in KIAS are shown on colored arcs as follows: white arc – 57 to 119 knots; green arc – 71 to 179 knots; yellow arc – 179 to 235 knots; and red line – 235 knots.

Backup Attitude Indicator – The backup attitude indicator is electrically powered and protected by a three-amp circuit breaker. The instrument uses a self-contained vertical gyroscope mounted on a pitch gimbal that is mounted on a roll gimbal. The gyro provides information relating to movement around the pitch and roll axes. The indicator has no restriction on operation through 360 degrees of aircraft pitch and roll displacement. The instrument has a caging knob that provides simultaneous erection of the pitch and roll axes. The instrument has a power warning flag on the lower left side of the instrument. When the flag is in view, power is off. When retracted, normal operation is indicated.

To cage the instrument pull the "PULL TO CAGE" knob to the fully extended position until the display stabilizes, then carefully allow the knob to quickly return to the inward position avoiding a snap release. The instrument does not normally need to be caged prior to takeoff. If necessary, the instrument may be caged prior to takeoff. In the event of excessive attitude errors caused by extended bank, acceleration or deceleration, the indicator should be momentarily caged after the aircraft is returned to level flight.

Picture of the Attitude Indicator

Figure 7 - 14

The roll is indicated by displacement from a fixed white index at the top of the instrument. The displacement indications range left and right between 0° and 90° with major indexes of 30° and minor indexes of 10° between the 0° to 30° ranges. Roll is also indicated by the relationship between horizon display is a painted disc with a white horizontal line through the diameter. The upper portion of the disc is blue to represent the sky, and the lower ground portion is brown. Pitch is indicated by displacement of the orange airplane-like bar above and below the horizon line. There are white lines above and below the horizon line indexed in increments of 5° with a label at the 10° and 20º points. The position of the orange bar may be adjusted for parallax using a 5/64" Allen wrench on the adjustment bolt to the left of the cage knob.

Backup Altimeter – The backup altimeter is part of the pitot-static system, which is discussed on page 7-31. The instrument measures the height above sea level and is correctable for variations in local pressure. The pressure source for the instrument is from the static air vent. An aneroid or diaphragm within the instrument either expands or contracts from changes in air pressure, and this movement is transferred, through a series of mechanical linkages, into an altitude reading. Adjustments for variations in local pressure are accounted for by setting the station pressure (adjusted to sea level) into the pressure adjustment window, most commonly known as the Kollsman Window. The altimeter has one Kollsman Window calibrated in inches of mercury (labeled inches Hg). The adjustment knob for the window is at the seven o'clock position on the dial.

HOUR METER

The hour meter is located on the pilot's side of the center console. Two conditions are required for the hour meter to operate. The airplane must have an indicated speed of approximately 60 knots to activate the air switch, and oil pressure must be present at a sufficient level to activate the oil pressure switch. There are some airplanes that only use an air switch to activate the hour meter. The oil pressure switch is integrated to preclude inadvertent operation of the hour meter when the airplane is secured on the ground during extremely high wind conditions.

The hour meter will run even if the master switches are turned off during flight operations. The hour meter is provided to record time in service, which is the basis for routine maintenance, maintenance inspections, and the time between overhaul (TBO) on the engine and other airplane components.

PITOT-STATIC SYSTEM

The pitot-static system, as the name suggests, has two components, ram air from the pitot tube and ambient air from the static air vent. The amount of ram compression depends on air density and the rate of travel through the air. The ram air, in conjunction with static air, operates the airspeed indicator. The static system also provides ambient uncompressed air for the altimeter, and the Garmin GDC 74A air data computer. (See page 7-30 for a discussion of the static system instruments.)

The pitot tube is located in the pitot housing on the right wing of the airplane, and the static air vent is on the right side of the fuselage between the cabin door and horizontal stabilizer. The pitot housing contains a heating element to heat the pitot tube in the event icing conditions are encountered. The heating element is protected by a 7.5-amp circuit breaker, which is located in the cockpit circuit breaker panel. If the normal static source becomes blocked, an alternate static source, which uses pressure within the cabin, can be selected. The alternate static source is located on the pilot's side of the tower under the instrument panel. To access the alternate static source, rotate the knob clockwise from the NORM to the ALT position.

Water accumulation in the static line reservoirs is a possibility, and certain precautions should be taken to prevent excessive accumulation. Normal accumulation is anticipated in the system, which is why a reservoir is incorporated. The reservoir is designed to collect this accumulation, but excessive accumulation can result in errors to the instruments and equipment connected with the pitot-static system causing erroneous flight instrument indications that may affect the autopilot. At 100-hour and annual inspections, a routine inspection is performed. Asking your mechanic how much fluid there was in the reservoir after an inspection can give you an idea of how well the airplane has been protected from excessive water accumulation. To prevent water accumulation, be sure to cover the pitot tube and static port inlet when washing the airplane. When these items are covered, they MUST be removed prior to flight. Leaving the airplane exposed to strong wind and rainstorms may also cause accumulation. If at all possible, hangar the airplane or ensure the aircraft cover protects the static port.

ENGINE RELATED SYSTEMS

FUEL SYSTEM

The fuel system has two tanks that gravity feed to a three-position (Left, Right, and Off) fuel selector valve located in the forward part of the armrest between the pilot and copilot seats. The fuel flows from the selected tank to the auxiliary fuel pump and then to the strainer. From this point it goes to the engine-driven pump where, under pressure, it is sent to the throttle/mixture control unit and then to the fuel manifold valve for distribution to the cylinders. Unused fuel from the continuous flow is returned to the selected fuel tank. The diagram in Figure 7 - 15 shows a general layout of the fuel system.

Each fuel tank contains a slosh box near the fuel supply lines. A partial rib near the inboard section of the fuel tank creates a small containment area with a check valve that permits fuel flow into the box but restricts outflow. The slosh box is like a mini-fuel tank that is always full. Its purpose, in conjunction with the flapper valves, is to ensure short-term positive fuel flow during adverse flight attitudes, such as when the airplane is in an extended sideslip or subject to the bouncing of heavy turbulence.

Fuel Quantity Indication – The airplane has integral fuel tanks, commonly referred to as a “wet wing.” Each wing has two internal, interconnected compartments that hold fuel. The wing’s slope or dihedral produces different fuel levels in each compartment and requires two floats in each tank to accurately measure total quantity.

The floats move up and down on a pivot point between the top and bottom of the compartment, and the position of each float is summed into a single indication for the left and right tanks. The positions of the floats depend on the fuel level; changes in the float position increases or decreases resistance in the sending circuit, and the change in resistance is reflected as a fuel quantity indication on the MFD.

The pilot is reminded that the fuel calculation group of the MFD System page provides approximate indications and are never substitutes for proper planning and pilot technique. Always verify the fuel onboard through a visual inspection, and compute the fuel used through time and established fuel flows.

Fuel Selector – The fuel tank selector handle is between the two front seats, at the forward part of the armrest. The selector is movable to one of three positions, Left, Right, and Off. The fuel tank selector handle is connected to a drive shaft that moves the actual fuel valve assembly, which is located in the wing saddle. Moving the fuel tank selector handle applies a twisting force to move the fuel selector valve.

When the fuel tank selector handle is moved to a particular position, positive engagement occurs when the fuel selector valve rests in one of the three available detents: Left, Right, and Off. Rotating the handle to the desired tank position changes the left and right tanks; initially, a small amount of additional pressure is required to move the valve out of its detent.

Fuel System Diagram

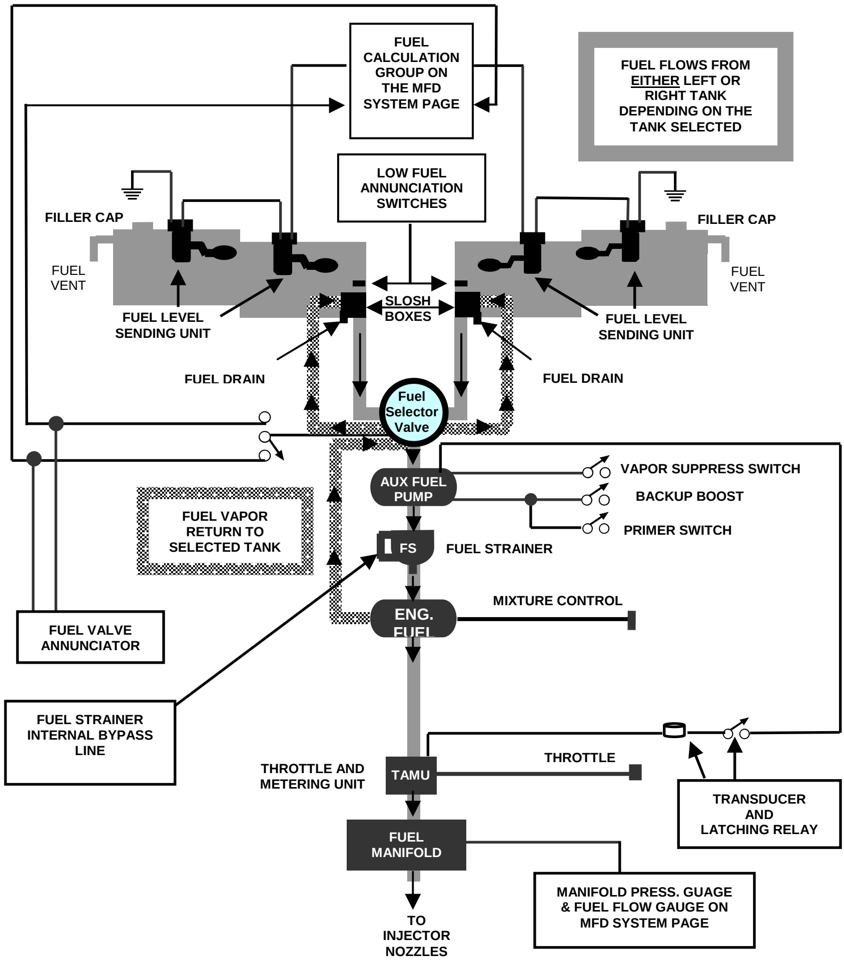


Figure 7 - 15

A spring-loaded release knob in the selector handle prevents inadvertent movement beyond the right and left tank positions. To move to the Off position, pull up on the fuel tank selector, and rotate the handle until the pointer is in the Off position and the fuel valve is seated in the detent. To move the handle from the Off position to the left or right tank, pull up on selector, and rotate the handle to the desired tank.

When a tank is selected and the selector is properly seated in its detent, one of two blue lights on the fuel calculation group on the MFD System page will illuminate to indicate which tank is selected. If a tank is selected, and a blue light is not illuminated, then the selector handle is not properly seated in the detent. In addition, if the fuel selector is not positively seated in either the left or right detent, or is in the Off position, the PFD annunciation window will display a red FUEL VALVE message.

Fuel Low Annunciation Messages – There is a separate system, independent of the fuel quantity indicators, which displays a low fuel state. A fuel level switch in each tank activates a L LOW FUEL or R LOW FUEL message in the PFD annunciation window when there is less than 8 gallons (30 L) (S/N 42502 to 42567), or 10 gallons US (38 L) (S/N 42568 and on), of usable fuel remaining in that tank. The fuel warning annunciation message has a 30 second delay switch, which limits false indications during flight in turbulent air conditions.

Fuel Vents – There is a ventilation source for the fuel tank in each wing. The vents are wedge-shaped recesses built into the access panel. They are located under the wing approximately five feet inboard from the wing tip and positioned to provide positive pressure to each tank. The vents should be open and free of dirt, mud and other types of clogging substances. When fuel expands beyond a tank's capacity, it is sent out the fuel vent if both tanks are full. An internal tank pressure of more than two to three psi will allow fuel to drain from the vents.

Fuel Drains and Strainer – The inboard section of each tank contains a fuel drain near the lowest point in each tank. The fuel drain can be opened intermittently for a small sample or it can be locked open to remove a large quantity of fuel. The gascolator or fuel strainer is located under the fuselage, on the left side, near the wing saddle. Open the accessory door in this area for access to the gascolator. There is a conventional drain device that operates by pushing up on the valve stem. There is an internal bypass in the strainer that routes fuel around the filter if it becomes clogged.

Backup Fuel Pump and Vapor Suppression – The auxiliary fuel pump is connected to two switches located in flaps panel, just to the left of the flaps switch. One switch is labeled BACKUP PUMP, and the other is labeled VAPOR SUPPRESS. The vapor suppression switch, which uses the low power function of the auxiliary pump, is used primarily to purge the system of fuel vapors that form in the system at high altitudes or atypical operating conditions. The vapor suppression must be turned on before changing the selected fuel tank. If proper engine operations are observed, turn off the pump.

The positions on the backup pump switch are placarded with the terms BACKUP PUMP, ARMED, and OFF. The switch is normally in the ARMED position for takeoff and climb to cruise altitude and in the OFF position for cruise, descent, and approach to landing. If the engine driven pump malfunctions and the backup pump is in the ARMED position, the backup fuel pump will turn on automatically when the fuel pressure is less than about 5.5 psi (±0.5 psi). This condition will also activate a yellow FUEL PUMP message in the PFD annunciation window. Please see an amplified discussion on page 3-17.

Primer – The primer is a push-button switch located next to the ignition switch. Depressing the primer button activates the backup fuel pump and sends raw gasoline, via the fuel manifold, to the cylinders. The mixture must be rich and throttle partially opened for the primer to work properly.

Fuel Injection System – The engine has a continuous-flow fuel injection system. This system meters fuel flow as a function of engine speed, throttle position, and the mixture control. Metered flow is passed to air-bled, continuous flow nozzles at individual intake ports. The engine is equipped with a speed-sensing pump that delivers a nominal 28-psi discharge pressure at takeoff. The continuous-flow system uses a rotary vane pump. A relief valve maintains optimum fuel flow, and there is no need for an intricate mechanism for timing injection to the engine.

ENVIRONMENTAL CONTROL SYSTEM

The aircraft is equipped with the environmental control system (ECS) or the optional Automatic Climate Control System (ACCS). The ACCS utilizes much of the valves, vents, and ducting of the ECS. For information on the ACCS see page 7-59.

The ECS incorporates the use of an air-to-air heat exchanger, ram intake air, and an electric fan to distribute heated and outside air to various outlets within the cabin. The ECS essentially consists of two subsystems, heated air and the fresh air. Heated air is sent to floor vent system and defroster, and fresh air is ducted through the eyeball vents. The system demand affects the volume of flow to a particular vent. As more vents are opened, the airflow to each vent is decreased.

Airflow and Operation – Ram air enters through a duct on the right side of the engine cowling and flows to either the heat exchanger (located on the right exhaust manifold) or the fresh air manifold. Air to the heat exchanger, depending on the control settings, is mixed with outside air in the heater box. The air next passes through a fan unit before entering the distribution system. Operating the fan will increase the airflow through the system (not including the eyeball vents). A diagram of the ECS system is shown in Figure 7 - 16.

Floor Vent System – The floor vent system provides mixed air to vents under both knee bolsters in the front seat area and to an eyeball vent in the back lower portion of the front seat center storage console. Rotating the vents clockwise and counterclockwise controls the airflow to the rear floor eyeball vents, while the front vents have fixed grates. The ECS control panel is used to adjust the temperature of the air and the amount of airflow. Additional airflow is provided by operating the ECS fan. In flight, under most conditions, the ram air provides sufficient airflow, and use of the fan is unnecessary. However, the fan is useful for ground operations when the ram air source is limited.

Defrosting System – The defrosting system is operated by adjustment of the ECS control panel.

Individual Eyeball Vents – Outside, unheated ram air is ducted to the eyeball vents. Individual eyeball vents are located at each of the four seating positions. The pilot's vent is below the Garmin G1000 flight displays to the left of the flap panel, and the copilot's vent is positioned in a similar location to the right of the flap panel. The two rear vents are behind the left and right cabin doorsills. Each vent is adjustable in terms of airflow volume and direction. Turning the adjustment ring on the vent counterclockwise opens the vent and increases airflow; turning the vent clockwise closes the vent and decreases airflow. In most situations, the eyeball vents are for fresh air, and the floor vents are for heated air. On warmer days, during taxi operations, some additional circulation is available from the floor vent system by operating the cabin fan with the heat control set to the lowest setting.

Environmental Control System Diagram and Panel

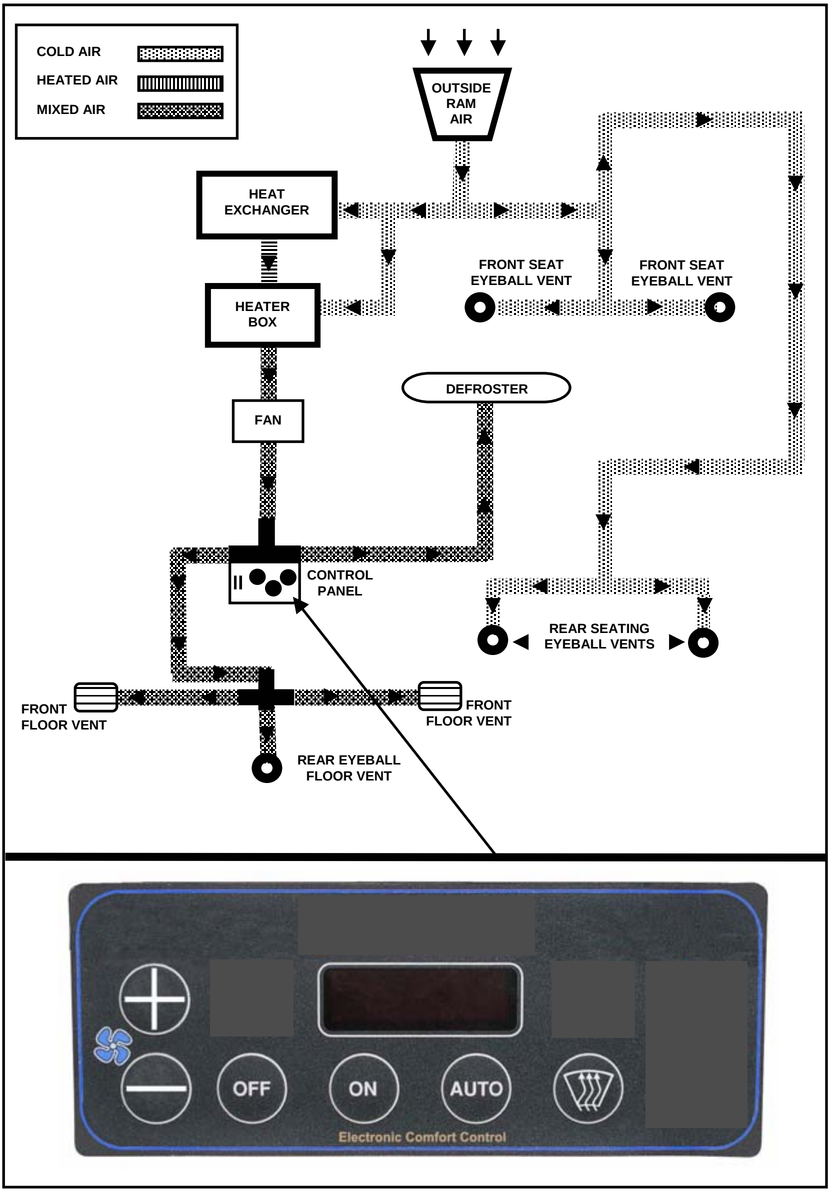


Figure 7 - 16

ELECTRICAL AND RELATED SYSTEMS

ELECTRICAL SYSTEM

General Description – The electrical system in this aircraft consists of two independent buses, which are referred to as the left bus and right bus. The left and right (continuous output) alternators are 65 amp (70 amp for Plane Power alternator) and 52 amp, respectively, and provide charging power for the two 28 volt lead-acid batteries, as well as system power. The batteries will also provide additional power in the event of an over demand situation where the requirements on the system are greater than what can be provided by the alternator. The left and right buses in turn feed the avionics and essential buses. Please refer to Figure 7 - 18 for a diagram of the electrical system. A summary of the busses and related circuit breaker protection is shown in Figure 7 - 17.

Five current limiters protect the alternators and bus outputs. In addition, the left and right buses are physically isolated inside a covered area mounted to the firewall. Left and right bus controls, grounds, and outputs are routed through separate holes, connectors, and cable runs so any failure on one bus will not affect the operation of the other bus.

Control of the buses is via the master switch panel located on the overhead. There is also a crosstie switch on this panel, which will restore power in the event of failure of the right or left systems. For example, if the alternator or some other component on the left side should fail, the crosstie switch will restore power to the electrical items on the left bus by connecting the left bus to the right bus.

As its name may suggest, power to the essential bus is never affected, provided power from at least one bus (left or right) is available. The essential bus is diode fed, i.e., current will only flow in one direction, from both the right bus and the left bus allowing the essential equipment to have two sources of power.

Avionics Bus – The avionics bus provides power to the Audio/MKR, Integrated Avionics #2, Com #2, Transponder, Avionics Fan, Traffic, Autopilot, MFD, and Weather.

Left Bus – The left bus provides power for the Aileron Trim, Pitot Heat, SpeedBrakes, Rudder Limiter, Position Lights, Landing Light, Left Voltage Regulator, and Fan.

Right Bus – The right bus provides power for the Strobe Lights, Taxi Light, Right Voltage Regulator, Door Seal/Power Point, Carbon Monoxide Detector, Oxygen, Display Keypad, and Air Conditioning.

Essential Bus – The essential bus is diode fed from either the right or the left bus and provides power for the PFD, Attitude Horizon, Elevator Trim, Panel Lights, Air Data Computer, Engine Airframe, Integrated Avionics #1, Com #1 Left Bus Relays, Fuel Pump, Stall Warning, Flaps, Standby Attitude Horizon, and the Right Bus Relays.

Battery Bus – The Hobbs Meter, ELT, and courtesy lights/flip lights are connected to the battery bus. These items will operate even if the left and right buses are turned off since the Hobbs meter and ELT are directly connected to right battery, and the courtesy lights/flip lights are directly connected to the left battery. A 3-amp fuse protects each component and is not accessible from the cockpit.

Master Switches – The system's two master switches are located in the master switch panel in the overhead console. This manual refers to each of the left and right split-rocker switches as a master switch (left master switch and right master switch). Although these switches are not technically "master" switches, as they do not control the entire system, it is a common term used to prevent confusion. Each switch is a split-rocker design with the alternator switch on the left side and the battery switch on the right side. Pressing the top of the alternator portion of the split-switch turns on both switches, and pressing the bottom of the battery portion of the split-switch turns off both switches. The battery side of the switch is used on the ground for checking electrical devices and will limit battery drain since power is not required for alternator excitation. The alternator switches are used individually (with the battery on) to recycle the system and are turned off during load shedding. See the discussion on page 3-24.

Crosstie Switch – The crosstie switch is the white switch located between the left and right master switches. This switch is to remain in the OFF position during normal operations. The crosstie switch is only closed, or turned on, when the aircraft is connected to ground power or in the event of an alternator failure. This switch will join the left and right buses together for ground operations when connected to ground power. In the event of a left or right alternator failure, this switch will join the two buses allowing the functioning alternator to carry the load on both buses and charge both batteries. If the crosstie switch is turned on during normal operations, the system will operate normally, however, the two main buses will not be isolated and they will function as a single bus.

Avionics Master Switch – The avionics master switch is located in the master switch panel to the right of the master switches. The switch is a rocker-type design and connects the avionics distribution bus to the primary distribution bus when the switch is turned on. The purpose of the switch is primarily for secondary protection of delicate avionics equipment when the engine is started. When the switch is turned off, no power is supplied to the avionics distribution bus.

Battery Charging Circuit – A battery charging circuit is standard on aircraft built mid 2007 or is available for retrofit. The battery charging circuit allows the battery relays to be closed allowing flat or discharged batteries to be charged, without removal from the aircraft, using an external ground power unit. Batteries will start charging when the ground power unit is connected and the Master and Crosstie switches are ON. Flat or discharged batteries on aircraft without the battery charging circuit must be removed from the aircraft before charging.

NOTE

Batteries that are suspected to be bad must be removed from the aircraft and serviced or replaced. See Chapter 24 of the Maintenance Manual for battery testing and maintenance procedures.

SUMMARY OF BUSES		
Bus	**Bus Component**	**Circuit Breaker**
AVIONICS BUS	• Audio/MKR	5 amp
	• Integrated Avionics #2	5 amp
	• Com #2	5 amp
	• Transponder	5 amp
	• Avionics Fan	3 amp
	• Traffic	3 amp
	• Autopilot	5 amp
	• MFD	5 amp
	• Weather	3 amp
LEFT BUS	• Aileron Trim	2 amp
	• Pitot Heat	7.5 amp
	• SpeedBrakes	3 amp
	• Rudder Limiter	5 amp
	• Position Lights	5 amp
	• Landing Light	5 amp
	• Left Voltage Regulator	5 amp
	• Fan	5 amp
RIGHT BUS	• Strobe Lights	5 amp
	• Taxi Light	2 amp*
	• Right Voltage Regulator	5 amp
	• Door Seal/Power Point	5 amp
	• Carbon Monoxide Detector	2 amp
	• Oxygen	3 amp
	• Display Keypad	2 amp
	• Air Conditioning	15 amp
ESSENTIAL BUS	• PFD	5 amp
	• Attitude Horizon	5 amp
	• Elevator Trim	2 amp
	• Panel Lights	7.5 amp
	• Air Data Computer	5 amp
	• Engine Airframe	5 amp
	• Integrated Avionics #1	5 amp
	• Com #1	5 amp
	• Left Bus Relays	1 amp
	• Fuel Pump	5 amp
	• Stall Warning	2 amp
	• Flaps	10 amp
	• Standby Attitude Horizon	3 amp
	• Right Bus Relays	1 amp
BATTERY BUS	• Hobbs Meter	3 amp
	• ELT	3 amp
	• Courtesy Light	3 amp

* 5 amp for Precise Flight taxi light, S/N 42502 and on.

Figure 7 - 17

ELECTRICAL SYSTEM DIAGRAM

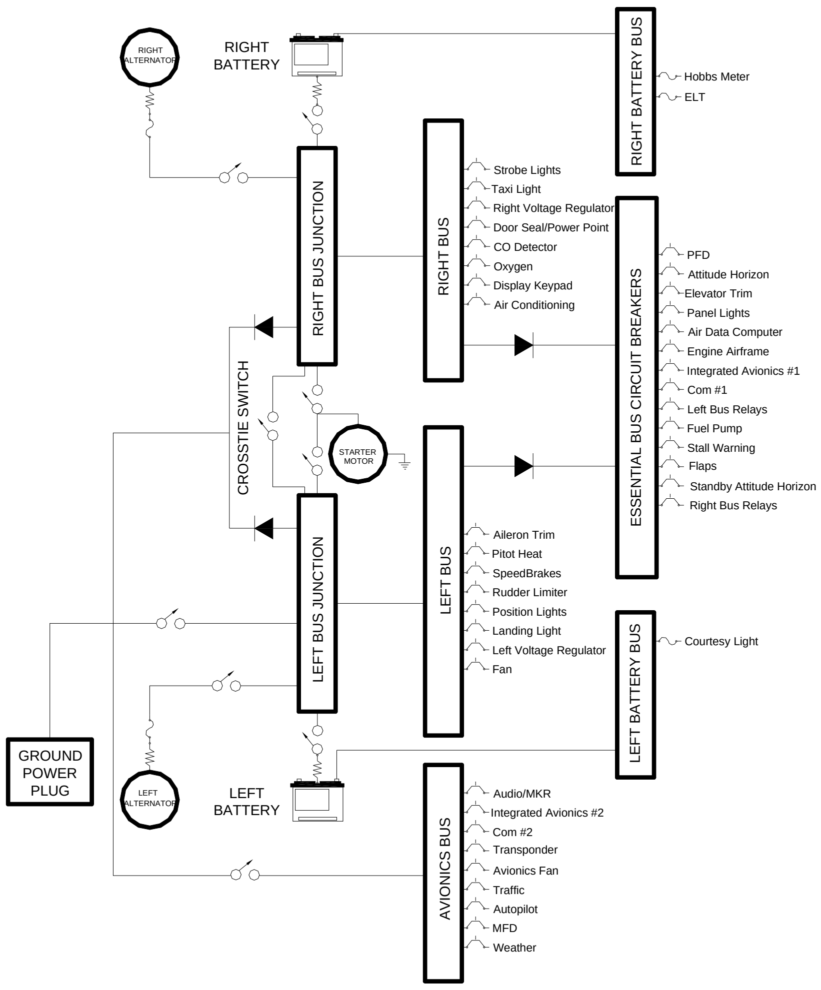


Figure 7 - 18

AIRPLANE INTERIOR LIGHTING SYSTEM

The interior lighting system is one of the more sophisticated systems available for single-engine, general aviation airplanes. A good understanding of the following discussion is important to properly use all the features of the interior lighting system. The salient features of this system are summarized in Figure 7 - 19, on page 7-42.

Flip and Access Lights – The flip-lights are rectangular shaped fixtures located in the middle of the overhead panel and in the baggage compartment. The lights bypass the system master switch and operate without turning on power to the system. Rotating or flipping the lens right or left turns on the two flip-lights. In the center position, they are used as part of the airplane's access lighting system.

When either entrance door is unlatched, a switch in the door latching mechanism activates the two flip-lights and two lights that illuminate each entrance step. The access lights are on a ten-minute timer and turn off automatically unless reset by activating both main door-latching mechanisms when all the doors are closed.

This design has two advantageous features. First, opening either of the main cabin doors provides an immediate light source for preflight operations, passenger access, and baggage loading. Second, the flip-lights, when rotated either left or right, serve as emergency lighting in situations, which necessitate turning off the master switch. The only disadvantage is that the flip-lights can inadvertently be left on, depleting battery power. To prevent this from happening, ensure the flip-lights are in the centered or flush position when securing the airplane at the end of a flight.

Overhead Reading Lights – There are four overhead reading lights, two between the front seats and two between the two backseat positions. Each light is on a swivel that can be adjusted to an infinite number of positions. The intensity of the lights can be adjusted by moving the left slide-type dimmer switch located in the center of the overhead panel, just aft of the master switches. The dimmer has an on-off switch at the extreme forward position, and moving the slide aft increases the light intensity.

Instrument Flood Bar – There is a tube array of LEDs inserted under the glare shield. The intensity of the lights can be adjusted by moving the right slide-type dimmer switch located in the center of the overhead panel, just aft of the master switches. The dimmer has an on-off switch at the extreme forward position, and moving the slide aft increases the light intensity.

Upper Instruments – The brightness of the PFD, MFD, audio panel, and keypad are controlled by photo cells located on the devices. The brightness of backlighting for the backup flight instruments is controlled by the left slide dimmer switch at the front of the center console. The dimmer has an on-off switch at the extreme up position, and moving the slide down increases the light intensity.

Lower Instruments, Circuit Breaker, and Master Switches Panels – Backlighting of the pitot heat, door seals, and optional equipment switches, flap panel, lighted position bar, slide dimmer labels, master switches and circuit breaker panel is controlled by the right slide switch at the front of the center console. Backlighting of the fuel pump "armed" light is controlled by the position lights switch. The backlighting illuminates the placards on or next to the breaker, switch or control, and the internally lighted switches. The dimmer has an on-off switch at the extreme up position, and moving the slide down increases the light intensity. Backlighting of the pitot heat, door seals, and optional items switches will dim down to a preset value while all other lighting controlled by this switch will dim to zero.

NOTE

The slide dimmer switches are "alive" at all times. During daylight operation they should be slid to "off" to increase bulb life.

Summary of Interior Lights and Switches

LIGHT	LOCATION OF LIGHTS	LOCATION OF SWITCH	REMARKS
Courtesy Lights	• Front and rear flip lights in overhead console • Exterior lights near the right and left entrance steps	♦ If all doors are latched, flip-light is activated by flipping the lens from the neutral position. ♦ If a door is unlatched, a switch activates flip-lights when the lens is in the neutral position.	▪ Door switch activates timer that turns off access lights after 10 minutes. ▪ Operates with master switch on or off
Overhead Swivel Lights	• Two overhead swivel lights in the front seat area • Two overhead swivel lights in the rear seat area	♦ The left slide-type dimmer switch is in the overhead panel.	▪ Master switch and navigation lights must be on for the system to operate.
Glare Shield Flood Bar	• Flood bar under the glare shield which lights the flight instruments and front panel areas	♦ The right slide-type dimmer switch is in the overhead panel.	▪ Master switch must be on for the system to operate.
Upper Instrument Panel	• Provides backlighting for the flight instruments	♦ The left slide-type dimmer switch is on the front of the center console.	▪ Master switch must be on for the system to operate.
Lower Inst. & Circuit Breaker Panels	• Provides backlighting for switches, or placards next to switches, circuit breakers, and controls	♦ The right slide-type dimmer switch is on the front of the center console.	▪ Master switch must be on for the system to operate.

Figure 7 - 19

Press-to-Test PTT Button – The Press-to-Test PTT button is located to the right of the master switches in the overhead console. Pushing the test button verifies the operation of all the LEDs or indicators associated with the flaps panel, pitot heat, door seals, and optional equipment switches. When the test position is selected, all related LEDs illuminate in the bright mode. A light that fails to illuminate should be replaced. The PTT is also used to verify operation of the rudder limiter and is discussed under a separate heading on page 7-43.

The position light switch on the center console controls the intensity of these lights. When the position lights are on, the flaps lights operate in the dim mode. When the position lights are off, the lights operate in the bright mode. The degree of luminance is set in at the factory and cannot be adjusted manually. In the daytime, during periods of reduced ambient light, the position lights can be turned on if the illumination of the LEDs is distracting.

Interior Light Protection – With the exception of the flip-lights, all interior lights are connected to the essential bus and will only operate when the master switches are on. The light systems are protected by circuit breakers in the circuit breaker panel.

AIRPLANE EXTERIOR LIGHTING SYSTEM

Aircraft position and anti-collision or strobe lights are required to be lighted whenever the aircraft is in operation. Anti-collision lights, however, need not be lighted when the pilot-in-command determines that, because of operating conditions, it would be in the interest of safety to turn off the lights. For example, strobe lights shall be turned off on the ground if they adversely affect ground personnel or other pilots and in flight when there are adverse reflections from clouds.

The exterior lighting system includes the position lights, the strobe or anti-collision lights, the landing light, and the taxi lights. These lights are activated through use of switches located on the center console. The light system is protected by circuit breakers in the circuit breaker panel.

Position and Anti-collision Lights – The left and right position lights (red and green) are mounted on each wing tip. Each wing position light contains the required aft or rearward projecting white lights. The anti-collision lights are on each wingtip and contained within the same light fixture as the position lights.

Taxi and Landing Lights – The taxi and landing lights are contained in the leading edge of the left wing. The outboard bulb in the light housing is the taxi light that provides a diffused light in the immediate area of the airplane. The inboard bulb is the landing light, which has a spot presentation with a slight downward focus. The taxi and landing lights are sized for continuous duty and can be left on for operations in high-density traffic areas.

STALL WARNING SYSTEM

Stall Warning – The aural stall warning buzzer in the overhead console is actuated by a vane-type switch located on the leading edge of the left wing. Under normal flight conditions, the angle of relative wind flow keeps the vane in the down position. The vane is connected to an electrical switch that is open under normal flight operations. When the airplane approaches its critical angle of attack, the relative wind pushes the vane up and closes the switch. The switch is set to activate approximately five to ten knots above the actual stall speed in all normal flight configurations.

NOTE

The audio entertainment from the GDL 69A is inhibited automatically when the stall horn is active.

Rudder Limiter – The rudder limiter, which is an integral part of the stall system, is designed to limit the normal full left rudder deflection of 17° ± 1° to only 11.5° ± 0.5°. The rudder limiter system is automatically armed in a relaxed position when the aircraft's electrical power is turned on. The system is activated when two conditions exist, (1) the airplane's stall warning is active, and (2) the engine manifold pressure is more than 12 in. of Hg. When the system is activated, a solenoid near the left rudder pedal moves a cam that physically limits the travel of the left rudder pedal. There is a time delay of approximately one second before the system is activated. This delay feature prevents inadvertent activation of the rudder limiter in turbulent air. An annunciation on the PFD, triggered by a magnetic sensor located next to the rudder limiter cam acts as a visual indication of when the rudder limiter is engaged.

Two points need to be emphasized about operation of the rudder limiter. First, if a left rudder deflection greater than 12°± exists before the stall warning is active with a throttle setting equal to or greater than 12 in. of Hg, the cam cannot engage. In addition, if a left rudder deflection of 12°± exists while the stall warning is active and the throttle is advanced to or beyond 12 in. of Hg, the rudder limiter cannot engage. Second, if the rudder limiter is activated and heavy pressure is applied to the left rudder, the rudder limiter will not disengage when the stall horn is silenced and/or the manifold pressure is reduced below 12 inches. It should also be noted that if the manifold pressure gauge or the stall warning horn become inoperative, the rudder limiter would still be functional provided that the stall-warning vane is still operative.

Rudder Limiter Test – There are provisions for ground testing the rudder limiter during the preflight inspection. The purpose of the test is to verify operation of the manifold pressure transducer, the solenoid, and the cam next to the rudder pedal. With the master switches on and the engine off, depress the test button in the overhead console. When the test button is depressed, the pilot will hear and feel the solenoid near the left rudder pedal engage, the RUDR LMTR annunciation will display, and left rudder travel will be restricted. When the operation is verified, release the test switch. The rudder limiter test switch is also used to test the operation of the trim, and flaps LEDs. The pilot should remember that anytime these lights are tested, the rudder limiter will engage.

While the press-to-test feature verifies the individual operation of the system's basic components, it does not test the functionality of the system. For a function test of the system, turn on the master switches (engine off), and move the stall warning microswitch to the up position for two to three seconds. The aural stall warning will be heard and immediately followed by an audible "click" of the rudder limiter solenoid.

Rudder Limiter Fail-Safe Feature – The system is armed when the airplane's electrical power is turned on; however, all electronic and electrical switching is in the relaxed position. When the stall warning is active and manifold pressure is more than 12 inches of Hg, the system activates from this so-called "relaxed armed" position. If either of the two inputs to the system should fail, the rudder limiter will still operate. For example, if the manifold pressure transducer becomes inoperative, the rudder limiter will be activated by the sole input from the stall warning. Conversely, if the stall warning fails, the rudder limiter will be functional, provided the stall-warning vane is operative, i.e., freely moves up and down.

Fail-Safe Test – The operating condition of the fail-safe system can be verified from time to time through use of a special ground testing procedure. With the master switch on and the engine off, pull the stall warning circuit breaker and have someone move the stall vane to the up position. The rudder limiter should engage even though there is no aural stall warning. Repeat the procedure with engine instruments circuit breaker pulled and the stall-warning breaker reset. This time the rudder limit will engage with an aural stall warning, even though there is no manifold pressure indication.

Inadvertent Overriding of the Rudder Limiter – In flight, it is possible to inadvertently override the rudder limiter. The sequence of flight control input is the controlling factor. If full left rudder is applied while operating with the throttle set to more than 12 inches of Hg of manifold pressure and then the speed is reduced enough to activate the stall warning, the rudder limiter will attempt to engage. However, the deflected left rudder will limit movement of the cams and the system will be overridden until the left rudder pressure is released. The cams are spring-loaded and will engage when pressure on the left rudder pedal is released.

Stall Warning System (Electrical) – Operation of the stall warning system requires the master switch to be on since both the stall warning and rudder limiter are connected to the left and right buses. Breakers in the circuit breaker panel protect both items. The stall warning is protected by a 2-amp circuit breaker and the rudder limiter is protected by a 5-amp circuit breaker. The two breakers are isolated from each other, and failure of one system will not cause the other system to fail.

GROUND POWER PLUG

The ground power plug allows external power to be connected to the aircraft. The ground power plug is located below and aft of the baggage door. The plug allows connection to a 24-volt DC power source for maintenance and allows the engine to be started from a ground power cart. The aircraft power must be off when the plug is connected or disconnected to the 24-volt DC power source. Once connected, turning the BATT switches on will charge the batteries.

CAUTION

The battery should be carefully monitored while charging. Do not exceed 28 volts DC input.

During normal operation of the ground power plug, the crosstie switch should be on to energize the left and right buses, and the BATT and ALT switches should be off to keep from overheating the battery.

The procedure for starting the engine using the ground power plug and a power cart is contained on page 4-8 of this manual.

12 VDC AUXILIARY POWER OUTLETS

There are two 12 VDC auxiliary power outlets. One located in the front of the center console and the other located in the back of the center console. These outlets have a 2 amp continuous, 5 amp intermittent, limit.

CAUTION

Use of 12 VDC power exceeding 2 amps for more than 5 minutes may over heat the regulator causing it to shut down.

STANDARD AVIONICS INSTALLATION

NOTE

The Garmin G1000 Cockpit Reference Guide, document number 190-00567-01 is the primary source document for operation of the airplane's avionics and autopilot. This manual describes operation as well as G1000 system integration with other standard and optional systems.

CONTROL STICK SWITCHES AND HEADSET PLUG POSITIONS

As discussed on page 7-8, there is a hat switch on the top portion of the pilot's and copilot's control stick for operation of the trim tabs. In addition, both sticks have a Push-to-talk (PTT) microphone transmitter switch and an autopilot switch (A/P DISC). A control wheel steering switch (CWS) is on the pilot's stick only. Please see Figure 7 - 20 for a drawing of the pilot's control stick grip.

Autopilot Disconnect/Trim Interrupt Switch (A/P DISC) – The A/P DISC is a spring-loaded push button switch on the top left side of the control stick. Pressing the switch will disengage the autopilot and trim. Operating the elevator trim switch will also disconnect the autopilot

Push-to-Talk (PTT) Switch – The PTT is a trigger switch on the forward side of the grip and, on the pilot's side, is engaged with the index fingertip of the left hand. There is a PTT switch on the copilot's stick that is normally operated with the index fingertip of the right hand. The PTT switches are used in conjunction with headsets that have a small, adjustable, boom-type microphone.

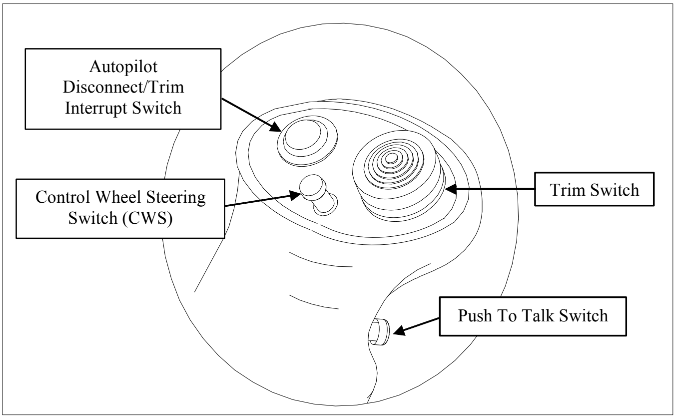


Figure 7 - 20

Plug Positions – The airplane has four headset plug positions, two at the front of the center console and two in the backseat area under each fresh air vent. The headsets, in conjunction with voice activated microphones, are normally used for communications and intercom functions. See page 7-20 for a discussion of the audio panel and intercom. However, either the pilot or copilot's plug can be used to add a hand-held microphone if desired. The airplane has special Bose headset plugs, which are designed to operate with the active noise reduction (ANR) headsets. The Bose headsets provide a significant reduction in cabin noise. The Bose headset jacks for the pilot and copilot are located under the entertainment center panel in the back of the center console.

Headsets – It is suggested that the owner or operator purchase headsets for use in the airplane, as opposed to use of a hand-held microphone and cabin speaker. Pilot and passenger comfort is enhanced in terms of noise fatigue, and the use of headsets facilitates both radio and intercom communications. Moreover, in situations involving extended over water operations, where two microphones are required, a second headset with a boom microphone will fulfill this requirement and eliminate the purchase of a seldom-used, hand-held microphone.

MISCELLANEOUS ITEMS

EMERGENCY LOCATOR TRANSMITTER (ELT)

General – The Emergency Locator Transmitter (ELT) is installed in the airplane as required by Federal Aviation Regulations to aid in search and rescue operations. It is located aft of the baggage compartment hat rack or storage shelf. There is an access panel in the vertical partition of the storage shelf with the following placard: EMERGENCY LOCATION TRANSMITTER LOCATED AFT OF THIS POINT. IT MUST BE MAINTAINED IN ACCORDANCE WITH FAR PART 91. In this instance, the ELT battery must be replaced every two years (Artex 200) or every 5 years (Artex ME406). The batteries must also be replaced when the transmitter has been in use for more than one cumulative hour; or when 50 percent of their useful life has expired. The access panel is secured with Velcro strips and is removable.

Artex 200 ELT -- The ELT is automatically activated from the ARM setting when subjected to a change in velocity of more than 3.5 feet per second. When activated, the unit will transmit a signal on 121.5 and 243.0 MHz for about 50 hours depending on the age and condition of the battery. The range of the ELT depends on weather and topography. Transmission can be received up to 100 miles distant depending on the altitude of the search aircraft. In case of a forced landing in which the ELT is not activated, the unit can be turned on with either the remote switch or the switch on the ELT. Do not turn the ELT off even at night, as search aircraft may be en route 24 hours per day. Turn off the unit only when the rescue team arrives at the landing site.

Switches – There is a two-position remote ELT switch located to the right of the MFD which is used to arm, test, and reset the transmitter. In addition, there is a three-position switch on the ELT that is used to arm, test, reset, and turn off the unit. Under normal conditions, the switch on the ELT is set to the ARM position, and accessing the unit is unnecessary since most functions are accomplished with the remote switch. The one exception is the ELT cannot be turned off with the remote switch. In the event the ELT remains on during normal operations and cannot be reset, moving the three-position toggle switch on the ELT to neutral turns off the transmitter.

Since there are three selectable switch positions on the ELT and two positions on the remote panel, a total of six switch combinations exist. The table below, Figure 7 - 21, summarizes the six possible combinations and describes how the unit will work with each switch combination.

ELT Unit Switch Setting	Remote Switch Setting	How ELT Will Function
ARM (Normal)	ARM (Normal)	ELT G-switch is activated by 3.5 ft. /sec. change in velocity
ON ARM ON	ARM ON ON	Overrides G-switch and activates ELT. Normally this setting is used for maintenance and emergencies when the ELT is not activated.
OFF OFF	ARM ON	WARNING, the ELT will not operate under any of these conditions.

Figure 7 - 21

Testing and Reset Functions – If the ELT is tested while installed in the airplane, use the following procedures. First, the test shall be conducted only during the first 5 minutes after any hour unless special arrangements are established with the controlling ATC entity. Next, place the remote switch in the ON position and verify that the red light on the remote switch flashes. Also, verify that the ELT is heard on the airplane's communication radio, which shall be set to 121.5 MHz. Limit the test period to about three bursts or three flashes of the remote red light, and then move the remote switch to the ARM position. Verify that a signal is no longer audible on 121.5 MHz and that the red light on the remote switch is not flashing.

If desired, a system function test is possible using the switch combinations in Figure 7 - 21 with verification that the appropriate function is displayed. Remember that the functional check does not verify the condition of system components such as antenna, G-switch, cabling, and battery condition.

During post flight shutdown operations, monitoring 121.5 MHz on the communications radio will verify the absence of an ELT transmission. If an ELT tone is heard, reset the unit by moving the remote switch to the ON position for one second and then moving the switch back to the ARM position. The ELT, if it is functioning properly, should be reset. If this procedure does not reset the ELT and a tone is still audible on the communication radio, the ELT must be turned off by moving the switch on the transmitter to the neutral position. The problem with the ELT shall be corrected in a timely manner. Refer to FAR 91.207 for additional information.

Artex ME406 ELT – In the event of a crash, the ME406 activates automatically, and transmits the standard swept tone on 121.5 MHz lasting until battery power is gone. This 121.5 MHz signal is mainly used to pinpoint the beacon during search and rescue operations.

NOTE

In October 2000 the International Cospas-Sarsat Program, announced at its 25th Council Session held in London, UK that it plans to terminate satellite processing of distress signals from 121.5 and 243 MHz emergency beacons on February 1, 2009.

In addition, for the first 24 hours of operation, a 406 MHz signal is transmitting at 50- second intervals. This transmission lasts 440 ms and contains identification data programmed into the beacon and is received by Cospas-Sarsat satellites. The transmitted data is referenced in a database (maintained by the national authority responsible for ELT registration) and used to identify the beacon and owner.

Accuracy – Doppler positioning is employed using both 121.5 MHz and 406 MHz signals. Position accuracy of the 121.5 MHz signal is within an area of approximately 15-20 km radius about the transmitter. Due to the better signal integrity of the 406 MHz, its location accuracy is within about a 3 km radius.

Switch Operation – An acceleration activated crash sensor (G-switch) turns the ELT ‘on’ automatically when the ELT experiences a change in velocity (or deceleration) of 4.5 fps ±0.5 fps. Activation is also accomplished by means of the remote switch located to the right of the MFD or the panel (local) switch on the ELT. To deactivate the ELT set either switch to the ‘ON’ position, then back to ‘ARM’. The ELT does not have an ‘OFF’ position. Instead, a jumper between two pins on the front D-sub connector must be in place for the G-switch to activate the unit. The jumper is installed on the mating half of the connector so that when the connector is installed, the beacon is armed. This allows the beacon to be handled or shipped without ‘nuisance’ activation (front connector removed).

NOTE

The ELT can still be manually activated using the local switch on the front of the ELT.

Care should be taken when transporting or shipping the ELT not to move the switch or allow packing material to become lodged such as to toggle the switch.

Self Test Mode – Upon turn-off, the ELT automatically enters a self-test mode that transmits a 406 MHz test coded pulse that monitors certain system functions before returning to the ‘ARM’ed mode. The 406 MHz test pulse is ignored by any satellite that receives the signal, but the ELT uses this output to check output power and correct frequency. If the ELT is left activated for approximately 50 seconds or greater, a distress signal is generated that is accepted by one or more SAR satellites. Therefore, when the self-test mode is required, the ELT must be activated, then, returned to ‘ARM’ within about 45 seconds otherwise a “live” distress message will be transmitted.

NOTE

All activations of the ELT should be kept to a minimum. Local or national regulations may limit testing of the ELT or special requirements or conditions to perform testing. For the “self test”, Artex recommends that the ELT be “ON” for no more than 5 seconds during the first 5 minutes after the hour.

In addition to output power of the 121.5/406 MHz signals and 406 MHz frequency, other parameters of the ELT are checked and a set of error codes generated if a problem is found. The error codes are displayed by a series of pulses of the ELT LED, remote LED and alert buzzer. See below.

Testing – Always perform the tests within the first 5 minutes of the hour. Notify any nearby control tower of your intensions, in accordance with AC 43.13-1B, Section 12-22, Note 3. If outside of the US, always follow all local or national regulations for testing of ELT’s.

WARNING

Do not allow test duration to exceed 5 seconds.

Any time the ELT is activated it is transmitting a 121.5 MHz distress signal. If the unit operates for approximately 50 seconds, a “live” 406 MHz distress signal is transmitted and is considered valid by the satellite system. Any time that the ELT is cycled from “ARM” to “ON” and then back to “ARM”, a 406 MHz signal is transmitted, however it is specially coded as a “self test” signal that is ignored by the COSPAS-SARSAT satellites.

Self Test – Artex recommends that the ELT be tested every 1-2 months. Follow the steps outlined below.

NOTE

The self-test time is accumulated in a register on the battery pack. The register records activation time in 30 second increments so all activations will count as at least 30 seconds, even if the actual time is much less. Total allowable time is 60 minutes as determined by FAR 91.207 and RTCA DO-204. After this time has been accumulated a 7- flash error will be presented after the self test. The battery must be replaced at this point for the ELT to remain in compliance. Always follow ELT testing requirements per local or national authorities.

Tune a receiver (usually the aircraft radio) to 121.5 MHz. Turn the ELT aircraft panel switch “ON” for about 1 second, then back to the “ARM” position. The receiver should voice about 3 audio sweeps. At turn-off (back to ‘ARM’ state) the panel LED and buzzer should present 1 pulse. If more are displayed, determine the problem from the list below. Codes displayed with the associated conditions are as follows:

1 Flash – Indicates that the system is operational and that no error conditions were found.

3 Flashes – Bad load detect. Detects open or short condition on the antenna output or cable. These problems can probably be fixed by the installer.

- Check that the RF cable is connected and in good condition. Perform continuity check of center conductor and shield. Check for a shorted cable.
- Check for intermittent connection in the RF cable.
- If this error code persists there may be a problem with the antenna installation. This can be checked with a VSWR meter. Check the antenna for opens, shorts, resistive ground plane connection.

4 Flashes – Low power detected. Occurs if output power is below about 33 dBm (2 watts) for the 406 signal or 17 dBm (50 mW) for the 121.5 MHz output. Also may indicate that 406 signal is off frequency. For this error code the ELT must be sent back for repair or replacement.

5 Flashes – Indicates that the ELT has not been programmed. Does not indicate erroneous or corrupted programmed data.

6 Flashes – Indicates that G-switch loop between pins 5 and 12 at the D-sub connector is not installed. ELT will not activate during a crash.

- Check that the harness D-sub jumper is installed by verifying less than 1 ohm of resistance between pins 5 and 12.

7 Flashes – Indicates that the ELT battery has too much accumulated operation time (> 1hr). Battery may still power ELT; however, it must be replaced to meet FAA specifications. May also indicate damage to the battery circuit.

FIRE EXTINGUISHER

General – The airplane fire extinguisher is located below the copilot's seat in a metal bracket and is mounted parallel to the lateral axis. The extinguisher is stored with the top of the unit near the middle of the airplane so that it is accessible from the pilot's seat.
The extinguisher is filled with a 1211/1301 Halon mixture (commonly called Halonaire) that chemically interrupts the combustion chain reaction rather than physically smothering the fire. The hand extinguisher is intended for use on Class B (flammable liquids, oil, grease, etc.) and Class C (energized electrical equipment) type fires.

Temperature Limitations – The fire extinguisher has temperature storage limitations that may need to be considered depending on the operating environment of the airplane. If it is anticipated that the cabin temperature will exceed the extremes shown in the table below Figure 7 - 22 the extinguisher must be removed and stored in a more temperate location.

Temperature Extremes	Maximum/Minimum Temperatures
Lowest Cabin Temperature	-40ºF (-40ºC)
Highest Cabin Temperature	120ºF (49ºC)

Figure 7 - 22

Operation and Use – To operate the fire extinguisher, use the following procedures after securing the ventilation system:

1. Remove the fire extinguisher from its mounting bracket by pulling up on the bracket release clamp.
2. With the unit in an upright position, remove the retaining pin from the handle.
3. Discharge the extinguisher by pushing down on the top handle. For best results, direct the discharge towards the base of the fire, near the edge. Use a small side-to-side sweeping motion while moving towards the back of the fire. The extinguisher has a continuous discharge capability of approximately eight seconds. Do not direct the initial discharge at the burning surface at close range since the high velocity stream may scatter the burning materials.
4. Short bursts from the extinguisher of one or two seconds are more effective than a long continuous application.
5. When the fire is extinguished, open all ventilation and return the fire extinguisher to its mounting bracket. Do not lay it on the floor or in a seat.
6. Have the fire extinguisher replaced or recharged before the next flight.

LIGHTNING PROTECTION/STATIC DISCHARGE

While composite construction provides both strength and low air resistance, it does have high electrical resistance and, hence, very little electrical conductivity. Conductivity is necessary for lightning protection, since it is important that all parts of the airplane to have the same electrical potential. Moreover, in the event of a lightning strike, the energy is distributed to and absorbed by all the skin area, rather than to an isolated location. One method of lightning protection, which is used in this airplane, is achieved by integrating aluminum and copper mesh as part of the composite sandwich. The depth of the mesh varies from 10 to 30 thousandths of an inch below the surface of the paint and encompasses most surfaces of the airplane. The various parts of the airplane are then interconnected through use of metal fasteners inserted through several plies of mesh, mesh overlaps, and bonding straps.

WARNING

The thickness of the surface paint is important for lightning protection issues, and the color is important because of heat reflection indices. The owner or operator of the airplane must only repaint the airplane according to the specifications for Cessna 350 LC42-550FG as shown in the airplane maintenance manual.

Static wicks are used to bleed an accumulated static electrical charge off the airplane's surface and discharge it into the air. An airplane that does not properly dissipate static build-ups is susceptible to poor or inoperative radio navigation and communication. The wick is made of carbon, enclosed in a plastic tube. One end of the wick is connected to the trailing edge of a airplane's surface, and the other end sticks out into the air. As the airplane flies through the air, static electricity builds up on the surfaces, travels through the mesh to the static wicks, and discharges into the air. The over application of wax increases the generation of static electricity. See page 8-17 in Section 8 for instructions about the care of the airplane's surfaces. Also refer to page 4-18 in Section 4 for more information about the static wicks.

OPTIONAL EQUIPMENT

PRECISE FLIGHT SPEEDBRAKE™ 2000 SYSTEM

System Overview – Precise Flight SpeedBrake™ 2000 System is installed to provide expedited descents at low cruise power, glide path control on final approach, airspeed reduction, and an aid to the prevention of excessive engine cooling in descent. The SpeedBrakes™ can be extended at aircraft speeds up to V_{NE}.

WARNING

> **If icing is encountered with the SpeedBrakes™ extended, retract the SpeedBrakes™ immediately. Do not extend the SpeedBrakes™ when flying in areas of potential structural icing.**

The Series 2000 SpeedBrake™ option consists of wing mounted electric SpeedBrake™ cartridges. A central logic-switching unit interconnects each SpeedBrake™ cartridge electronically and a panel mounted SpeedBrake™ actuator switch controls SpeedBrake™ deployment. The SpeedBrake™ cartridges receive electrical power from the aircraft electrical bus through a disconnect type circuit breaker.

The SpeedBrake™ rocker switch is located next to the throttle in the center of the instrument panel. The switch is positioned UP/ON to fully deploy and is positioned DOWN/OFF to retract the SpeedBrakes™. A message will display in the PFD annunciation window to indicate SpeedBrake™ deployment, if and only if, both SpeedBrake™ units are deployed. A failure of a single cartridge drive unit will prevent the annunciation.

If both brakes do not extend after the switch is toggled on, it indicates a failure of one or both SpeedBrake™ cartridge(s) and the SpeedBrake™ switch should be toggled off. The system can be checked again for proper operation, but after the second attempt the SpeedBrake™ switch should be left off. When the SpeedBrake™ switch is toggled OFF, the annunciation message will clear when both brakes are fully stowed in the wing.

Extended SpeedBrakes™ will stow immediately upon application of the rudder limiter and will require the pilot to cycle the SpeedBrake™ switch OFF and then ON to re-extend the SpeedBrakes™. The SpeedBrakes™ will not automatically re-extend and must be recycled after the following conditions:

1. Circuit Breaker Pull
2. Automatic Stowage Due to Asymmetric Deployment or Low Voltage
3. Rudder Limiter Solenoid Engagement

PRECISE FLIGHT FIXED OXYGEN SYSTEM

The Precise Flight fixed oxygen system is installed to provide supplemental oxygen for the pilot and passengers. The system consists of three, 14 cu ft oxygen bottles located in the right wing, a regulator/valve assembly, a filler port in the aft baggage compartment, an overpressure protection device, a guarded overhead emergency manual valve, an overhead distribution manifold, and associated lines, fittings, valves, and sensors. The oxygen bottles are located in the right hand wing locker between WS 25.0 and WS 46.0 wing rib, and between the forward and aft spars. The total oxygen capacity of the system is 42 cu. ft. (1189 L). The maximum oxygen cylinder pressure is 2000 psi. The low pressure operating pressure is 20 to 33 psi. The bottles are interconnected by bottle fittings and the high-pressure stainless steel lines to the high-pressure manifold of the regulator valve assembly mounted to the inboard side of the root rib. Also attached to this high-pressure manifold are the stainless steel lines connected to the filler port located in the baggage compartment and to the remote overpressure burst assembly located in the belly of the wing. The regulator/valve assembly includes a regulator to reduce the bottle pressure to the low-pressure manifold for distribution. This assembly also includes a valve, on the low-pressure side, that is activated by a latching solenoid to turn on and off the flow of oxygen to the cabin distribution (low pressure) manifold. The low-pressure lines are then routed into the cabin area, behind the interior, to a manual valve, and then to the low-pressure distribution manifold where the dispensing systems are attached to deliver the supplemental oxygen to the pilot and passengers. Attached to both the high pressure manifold and the low-pressure distribution manifold are electronic pressure transducers to measure the oxygen pressure at the respective locations. These values are sent to the Oxygen Quantity Gauge and the Oxygen Outlet Pressure Gauge displayed on the MFD System page.

Oxygen is required to be used by the pilot above 12,500 ft. for flight time exceeding 30 minutes and above 14,000 ft. for the duration of the flight. If climbing to an altitude where oxygen will be required, it is recommended that at approximately 10,000 ft., the pilot should begin using the oxygen. Passengers are required to be supplied with oxygen above 15,000 ft.

Oxygen Flow Controls – Four manually operated oxygen flow controls can be connected to the oxygen distribution manifold. The flow controls are calibrated and adjustable for altitude by the user. The flow controls can be A4 or A5 Flowmeters, Oxygen Conserving Cannulas, and Masks (Standard and Microphone).

The flow controls provide the means to distribute the appropriate amount of oxygen for the pressure altitude of flight and indicate the presence of flowing oxygen to the pilot or passenger(s). The flowmeter or flow indicator and the oxygen quantity gauge should be checked periodically (approximately every 10 minutes). The flow control should be reset with each change in pressure altitude or as required by the user for physiological requirements.

The A5 Flowmeter may develop static charge/buildup that causes the ball to stick and work in an erratic manner. This condition can be remedied by filling the flowmeter with a mild soap and water solution; fill from the breathing station side with the valve open until the fluid reaches the tapered tube and a slight amount is visible around the ball. The flowmeter is then attached to an air or oxygen pressure source and run until the flowmeter and tubing are visibly dry.

Oxygen Display – Oxygen system information is provided on the Oxygen Quantity Gauge and the Oxygen Outlet Pressure Gauge of the MFD System page. The Oxygen Quantity Gauge displays the amount of remaining oxygen in terms of pressure. The Oxygen Outlet Pressure Gauge displays the oxygen outlet pressure at the distribution manifold in psi.

The pilot may choose at this time to connect a flow control and breathing device to the oxygen distribution manifold as required. Pressing the OXYGEN softkey on the MFD turns the oxygen system on or off. Higher outlet pressures will be indicated at lower altitudes and with fewer users, whereas increasing the altitude and/or number of users will cause a normal decrease in the indicated outlet pressure. Outlet pressure in the green band indicates normal outlet pressure with the system ON. If the outlet pressure is in the red area, it is an indication of a malfunction and the system should be checked. Problems with oxygen distribution as indicated through low pressure, or low flow indications on the breathing stations due to leaks or due to constrictions must be identified and must be corrected. Normally there will be an annunciation that oxygen should be used if the pressure altitude is above 12,000 ft. and the oxygen is not turned on. There will **not** be an annunciation if the oxygen is turned on but the flow is turned off at the flow meter.

Oxygen Annunciation Messages – There are two possible messages that may be displayed in the PFD annunciation window. They are as follows.

1. OXYGEN – Altitude is at or above 12,000 ft. PA and the oxygen system has not been turned on.
2. OXYGEN QTY – Low oxygen quantity pressure.
3. OXYGEN PRES – Low oxygen pressure on the distribution manifold.
4. OXYGEN ON – Reminder that the oxygen system is still turned on and the aircraft is on the ground.

When the OXYGEN annunciation displays, the pilot should confirm the altitude and use oxygen as required.

Breathing Devices (Masks and Cannulas) – The breathing devices have attached placards indicating the proper method for donning, use, and safety precautions. When using nasal cannula devices, breathing exclusively through the mouth, extremely light breathing, or nasal blockage will inhibit oxygen flow.

NOTE

Breathing through the nose, and limiting conversation is required for the user to achieve proper oxygenation when using nasal cannulas.

WARNING

Do not use oxygen when utilizing lipstick, chapstick, petroleum jelly, or any product containing oil or grease. These substances become highly flammable in oxygen rich conditions.

NOTE

If the pilot has nasal congestion, or other breathing conditions, a mask with microphone should be used.

Flowmeter – The oxygen flowmeters (see Figure 7 - 23) are simple devices to regulate the flow of oxygen and provide flow indication to the pilot and passengers. Connect the flowmeters to the distribution manifold and while holding the flowmeter vertical, adjust the ball so that the center of the ball rests on the line for the planned cruise altitude for the type of breathing device used. If changing altitude or requiring more oxygen for physiological reasons, adjust the flowmeter as required. Periodically check the flowmeter (approximately every 10 min.) to ensure oxygen is flowing and at the correct amount for the conditions.

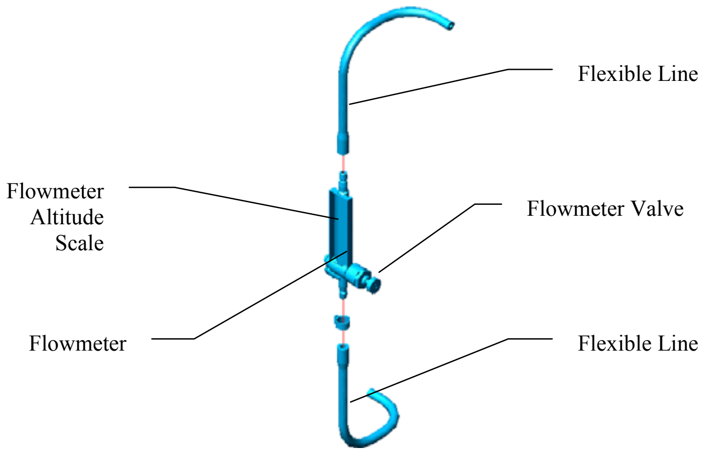


Figure 7 - 23

Filler Port – The filler port for refilling the oxygen bottles is located on the pilot's side of the hat rack in the aft portion of the baggage compartment. The port is placarded "Oxygen Fill Port Do Not Exceed 2000 p.s.i." Refer to page 8-9 for details on servicing the oxygen system.

Preflight Testing – Prior to any flight that may require the use of the oxygen system, the pilot should verify the oxygen valve opens and the system retains pressure (low pressure will be indicated as an annunciation on the PFD). This test may be accomplished on the MFD System page. The pilot should also verify the proper flow of oxygen to each mask plugged into the oxygen manifold prior to departure. At the conclusion of the test the pilot may close the main oxygen valve.

CO GUARDIAN CARBON MONOXIDE DETECTOR

The Model 452-201 Series Carbon Monoxide Detector is designed to detect, measure, and provide a visual and aural alert to the pilot before the level of carbon monoxide (CO) reaches a critical level.

The installation consists of a single carbon monoxide detector installed behind the instrument panel that activates a red message in the PFD annunciations window, a flashing red annunciation in the lower left of the MFD System page, and an aural warning. The aircraft supplied power and aircraft wiring is protected by a 2 amp circuit breaker. There is a reset softkey labeled CO RST located on the MFD System page.

The carbon monoxide alarm level is calibrated to alert the pilot within five minutes or less whenever the carbon monoxide level reaches 50 parts per million (PPM) by volume or above. The warning time is shortened at higher levels of CO concentrations and becomes approximately instant should the CO level reach 400 parts per million by volume (PPM) or above.

In case of a CO alert, the red annunciation message will display, the CO level will display on the MFD, and the aural warning will state "Carbon Monoxide" every two seconds. The visual alert will remain until the CO level is again reduced below the alert level. The aural warning may be silenced by pressing the alert softkey on the PFD. The indicator is automatically reset when the CO level drops below 50 PPM.

On initial power up, the detector goes through a self-test. There will be a three minute warm-up time before the detector is operational. To reset the system, press the reset softkey on the MFD. If the detector sensor fails, a message will be displayed on the PFD indicating the detector has failed.

XM WEATHER (WX) DATA SYSTEM

The Garmin GDL 69A Data Link Receiver receives broadcasts from XM Satellite Radio, Inc. through one or both of the two geosynchronous satellites which transmit over the contiguous 48-states of the USA. Broadcast weather information received is displayed on the MFD. For additional information on the Garmin GDL 69A see page 7-22. For operating instructions on the system, refer to the latest revision of the Garmin G1000 Cockpit Reference Guide, document number 190-00567-01.

The tear-drop style antenna receives "line-of-site" transmissions from the satellites. The antenna consists of a LH circular polarized, hemispherical element with an integrated low noise amplifier (LNA). This LNA is powered by a +5VDC offset from the receiver through the coax cable. The antenna is mounted on the antenna bulkhead located behind the hat rack at the aft of the airplane.

RYAN MODEL 9900BX TCAD (TRAFFIC AND COLLISION ALERT DEVICE)

General – The Ryan Model 9900BX TCAD is an on-board air traffic display system used to identify potential collision threats. The TCAD, within defined limits, creates a shield of airspace around the aircraft, whereby detected traffic cannot penetrate without generating an alert. The TCAD will display multiple aircraft threats. TCAD information is displayed through integration with the Garmin G1000 system. See Figure 7 - 24 for a schematic of TCAD, Traffic Information System (TIS), and G1000 integration.

CAUTION

The intruder bearing information provided by the traffic system is only accurate to within 45 degrees of true intruder track. Take this into account when visually acquiring system reported traffic.

Keep in mind that intruder traffic can maneuver at any time, and the displayed intruder track direction does not guarantee the intruder will continue along that track.

WARNING

The 9900BX TCAD (Traffic and Collision Alert Device) does not detect all aircraft. It is designed as a backup to the See and Avoid concept and the ATC Radar environment.

It is dangerous to rely on the 9900BX as your sole source of data for collision avoidance.

Maneuver your aircraft based only on ATC guidance or positive acquisition of conflicting traffic. It is your duty as pilot in command to See and Avoid.

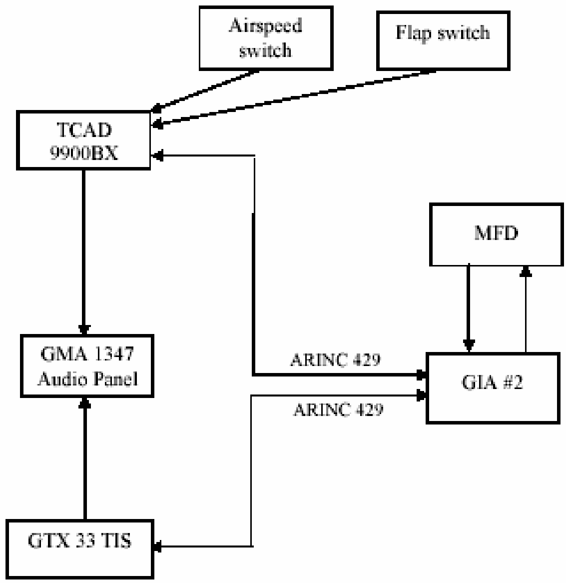
The system is comprised of a processor, a transponder coupler, and two antennas (one antenna mounted to the top of the aircraft and the other mounted to the bottom). The processor is located on the avionics shelf and the transponder coupler is located in the foot well of the passenger seats.

The TCAD monitors the altitude difference and range, and warns the pilot when the calculated time to closest approach (CPA) of the intruder meets a certain threshold (15 to 30 seconds, depending on aircraft configuration). The altitude data from the intruder is referenced to pressure altitude (29.92 inches or 1013mb), as is the onboard encoder. The range is determined using radar time of arrival technique. Bearing to the traffic is determined using the dual directional antennas, on the top and bottom of the aircraft.

The TCAD actively interrogates transponders from nearby aircraft to identify and track intruders. The vertical separation of the host and intruder is determined by comparing the decoded altitude replies to the host's altitude (from the altitude encoder). The TCAD computes relative altitude and range of threats from nearby Mode C and Mode S equipped aircraft. Aircraft with non-Mode C transponders can provide range, bearing and horizontal closure information only. The TCAD will not detect aircraft without operating transponders. Use of the TCAD is advisory only, and is a back up to the See and Avoid Concept, and the ATC radar environment.

Additional functions provided by the TCAD are:

Data and Altitude – The TCAD will display the identity, transponder code (when available), and N-number (Mode S traffic) of detected aircraft.



- Traffic Audio →from TCAD only.
- When 'Airspeed' switch is grounded (aircraft speed less than 60 kts), TCAD system turns to Ground mode, all advisory audio muted.
- When Flap switch is 'Down', TA is Sensitivity Level A (SL A). See Figure 7 – 25.
- When Flap switch is 'Up', TA is in Sensitivity Level B (SL B). See Figure 7 – 26.

Figure 7 - 24

Advisory Levels – There are three advisory levels: Traffic Advisories (TA), Proximate Advisories (PA), and Other Traffic (OT). A TA is audibly announced, a PA is displayed traffic within defined display parameters, and OT is defined as intruders that are not TAs or PAs.

A TA is generated and an initial TA announcement is issued when an intruder's tau (time to closest approach) value and/or range and altitude separation is less than the TA threshold. A TA is also generated if the processor detects that the current track of the intruder could result in a near miss or collision. A TA remains in effect until the range between the host aircraft and the intruder begins to diverge or for 8 seconds, whichever is longer. See Figure 7 - 25 for TA thresholds (SL A) when the TCAD is in Approach or Departure Mode (automatically activated when flaps are deployed). See Figure 7 - 26 for TA thresholds (SL B) for all other flight conditions.

Approach or Departure Mode TA Thresholds

Intruder Type	Host to Intruder		
	Tau (seconds)	**Range (nm)**	**Altitude Separation (ft.)**
Altitude reporting intruders	< 20	< 0.20	< 600
Non-altitude reporting intruders	< 15	< 0.20	< N/A

Figure 7 - 25

All Other Flight Condition TA Thresholds

Intruder Type	Host to Intruder		
	Tau (seconds)	**Range (nm)**	**Altitude Separation (ft.)**
Altitude reporting intruders	< 30	< 0.55	< 800
Non-altitude reporting intruders	< 25	< 0.20	< N/A

Figure 7 - 26

Audible Advisories – When an intruder generates a TA, the TCAD creates an audible voice annunciation. The announced phrase is always preceded by a tone and then begins as “Traffic.” The clock position, relative altitude, and range of the intruder is then announced. If the intruder is more than 200 feet above or below the host aircraft, the relative altitude is announced as “High” or “Low.” If the intruder’s relative altitude is within 200 feet, “Same Altitude” is announced. The TCAD announces “Altitude Unavailable” for non-Mode C TAs.

TCAD Display on the G1000 – Refer to the latest revision of the G1000 Cockpit Reference Guide, document number 190-00567-01.

AUTOMATIC CLIMATE CONTROL SYSTEM (ACCS)

General – The Automatic Climate Control System (ACCS), incorporating an R-134a Air Conditioning System in coordination with the aircraft’s Environmental Control System (ECS), is fully automatic and designed to cool and heat the aircraft cabin to desired temperature settings during all phases of flight operations. See Figure 7 - 27. The ACCS cools cabin air temperature, establishes the humidity level of the cabin at a comfortable level and reduces dust and pollen particles from the cabin air. The system may be used during any phase of the flight, offering a choice of fully automatic or mode override.

The air conditioning system components of the ACCS consist of an engine driven or electrically driven compressor, a condenser with fans, a receiver-dryer with trinary pressure switch, an evaporator with an expansion valve, an evaporator coil temperature sensor, and an interlock assembly (only with electrically driven compressor).

On aircraft equipped with the electrically driven compressor the ACCS may be used to pre-cool the cabin using ground power supply.

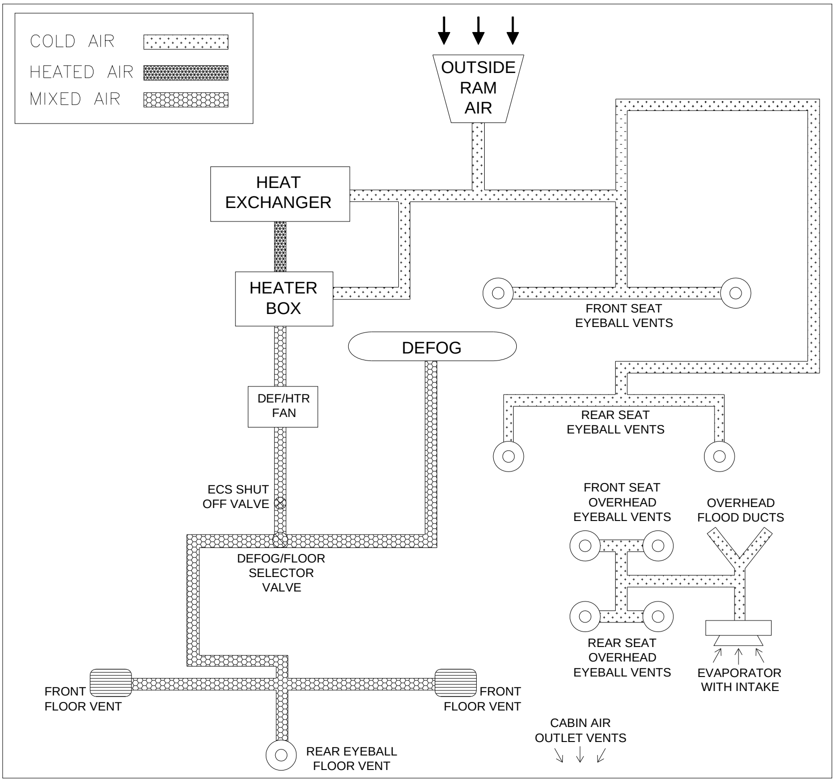


Figure 7 - 27

System Operation – Electric fan, forced air, directed through the condenser coil, located beneath the baggage compartment floor, cools the hot, high pressure R-134a refrigerant. The condenser intake air is taken from two screen covered ducts on the belly of the aircraft. Condenser exhaust air exits through four screen covered ducts on the belly of the aircraft, aft of the two condenser intake ducts. Control of the refrigeration temperature cycle is done with a computer controlled thermostatic cycling switch. The switch senses evaporator temperature and cycles the engine driven compressor to regulate the evaporator coil temperature and to prevent the coil from “freezing up”.

Outside air can be introduced into the cabin through the eyeball vents on the side interior panels of the aircraft by opening the instrument panel and rear side wall vents at any time.

During warm cabin temperatures the ACCS operates in the air conditioning mode, supplying cooled, dehumidified air to the ceiling console vents and the flood ducts above the rear seats. When the system switches to “heating” operation during cool cabin temperatures, heated, outside air will be delivered to the front and rear floor vents and/or the windshield based on temperature conditions and the mode of operation settings.

In the rare occurrence of a refrigeration "overpressure" condition, a high/low pressure trinary safety switch, located on the receiver/dryer, will disengage the compressor to allow pressures to return to a safe level. This same switch senses a low pressure condition in the system and disengages the compressor to prevent damage. The trinary safety switch automatically resets once refrigerant pressures have returned to a safe level.

The ACCS can be left on in any mode at the time of aircraft shut-down and will resume the previously selected temperature and mode when reactivated. The system will be active once both electrical buses are on and the voltage annunciation message are cleared.

For safety purposes the ACCS will deactivate if the voltage annunciation message displays or either bus voltage falls below a predetermined threshold.

In the event that the Air Conditioning portion of the ACCS does not seem to be functioning correctly, the ACCS should be switched to the "Compressor Off" mode by pressing the button until the adjacent indicator light is out. An air conditioning performance evaluation should be performed by an authorized Cessna Service Center to determine and correct the problem prior to resuming the use of the air conditioning portion of the ACCS.

NOTE

If the air conditioning system is turned off, on aircraft equipped with the electric compressor, wait at least 3 minutes before turning it on again. This ensures the electric compressor will start, otherwise the compressor may not start until the system stabilizes.

System Operation Using Ground Power Supply – Only 28 Volt ACCS equipped with electrically driven compressor may be used to pre-cool the aircraft cabin using a ground power supply. After connecting a ground power source and switching the unit on, the ACCS can be activated by pushing the external switch found near the ground power receptacle. When activated the aircraft power grid is disabled and the electric compressor and evaporator blower will run continuously while the condenser fans automatically cycle as needed. The external ACCS switch does not function when a battery master is on. The ACCS control panel is disabled during external power air conditioning operation and the ACCS cools at max capability. External power ACCS operation can be deactivated by pushing the external switch, removing the ground power source, or turning on either battery master switch. With a battery master on, the ACCS will be fully functional except the electric compressor will be off.

NOTE

Ground power operation of the air conditioning will require a 24 V ground power source that can deliver 100 amps during use.

NOTE

If the air conditioning system is turned off, wait at least 3 minutes before turning it on again. This ensures the electric compressor will start, otherwise the compressor may not start until the system stabilizes.

Control Buttons – The system is operated by control buttons. See Figure 7 - 28 and Figure 7 - 29. A small LED indicator light will glow next to the " -AIR CONDITIONING", " -DEFOG" and "AUTO" buttons to indicate which of those operating modes has been selected. The selected temperature is displayed in the control panel. A list of the control buttons and their use and functions follows:

AUTO-All Season Standard Setting – Air temperature, air delivery and air distribution are regulated automatically to achieve and maintain the desired interior temperature as quickly as possible. The system automatically compensates for any variations in outside temperature. In cold outside temperatures, heated air will flow from the front and rear floor vents along with a small amount from the windshield defog duct. In warmer outside temperatures, cooled air will flow from the vents on the ceiling console and the overhead flood ducts above the rear seats. A panel light adjacent to the "AUTO" button indicates when this mode is active.

Defogging the Windshield – Use this setting to defog the windshield. Maximum air volume is directed towards the windshield. A panel light adjacent to the button indicates when this mode is active. Press the button again to cancel the defog mode.

Compressor on/off – When maximum aircraft performance is desired the compressor can be switched off. In this case the system no longer provides full climate control. If the cabin becomes too warm, press the switch again to activate the compressor to provide cooling and dehumidification. A panel light adjacent to the button indicates when "compressor on" mode is active. Pressing the button alternately will "toggle" the compressor selection On and Off.

NOTE

If maximum aircraft performance is desired, the Automatic Climate Control System should be switched to the "Compressor Off" mode by pressing the button until the adjacent indicator light is out.

Temperature Setting (+) or (-) – The desired interior temperature can be preset within a range from 55°F (13°C) to 95°F (35°C). Within this range, the temperature will be automatically adjusted. The settings selected prior to the shutdown of the aircraft will be restored upon restart.

Fan (+) or (-) – The automatically selected fan speed (volume of air delivery) can be reduced or increased manually by operating these buttons. This mode overrides the automatic fan speed control feature. Incremental fan speeds up or down in 11 steps are available. The digital display indicates the fan speed as a percentage or "HI" when the maximum fan speed is reached or "LO" when the minimum fan speed is reached. The digital display returns to the normal mode of interior temperature selection 5 seconds after either fan speed button is depressed. The selected fan speed is maintained until it is changed or the "**AUTO**" button is depressed.

OAT (Outside Air Temperature) – When depressed, the outside air temperature is displayed as measured by the outside air temperature sensor. The outside air temperature will be displayed for a duration of 5 seconds then return to the normal mode of interior temperature selection. The sensor is mounted in the condenser bay and will often indicate a higher temperature than the ship OAT.

WARNING

The outside temperature display is not to be considered an indicator for possible icing conditions. Ice formation can occur at indicated temperatures above freezing and in a multitude of conditions.

OFF – When the OFF button is depressed, the entire climate control system is switched off. In this mode of operation the heater/ECS mixing valve closes the hot air supply from the engine heat exchanger. This mode does NOT need to be selected prior to aircraft shutdown.

ON – This switches on the climate control system. The LED numeric display will show the current interior temperature and mode selections.

WARNING

At lower engine RPM operations of the air conditioning, the “BATT” mode of the ammeter must be monitored. The electrical load must be reduced, or the RPM increased, to prevent a discharge of the batteries.

Figure 7 - 28

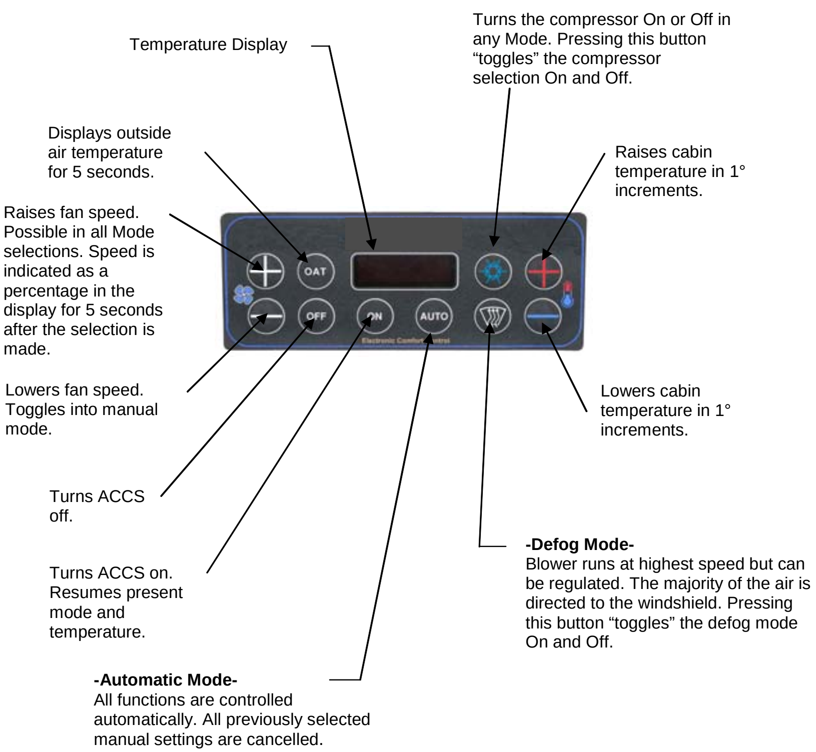


Figure 7 - 29

General Hints for ACCS Operation

- At low outside air temperatures the air conditioning compressor will shut off automatically.
- When the air conditioning is operating, the interior temperatures and humidity will be reduced. This helps to reduce the possibility of windshield and side window fog up.
- For the quickest cooling of a hot cabin, leave cabin doors open for a few minutes prior to startup to allow the hot air to escape.
- When it is very hot and humid, condensed water can drip from the evaporator drain tube onto the surface beneath the aircraft for an extended period of time. This is normal and does not indicate a leak.
- For maximum ACCS performance during air conditioning or heating modes of operation, assure that the instrument panel vents and the rear side wall fresh air vents are closed.
- The condenser should be checked periodically for cleanliness. If clogged with dirt or debris, the condenser should be cleaned with compressed air and/or water.
- Should you suspect that the air conditioning system has been damaged through outside influences (i.e. by debris, "FOD"); the system should be checked immediately by an authorized Cessna Service Center.
- If there is a defect in the refrigerant circuit of the air conditioner, a safety switch switches the compressor off temporarily or completely. In this case contact your authorized Cessna Service Center.
- Repairs or maintenance to the air conditioning system require trained personnel and special tools. If there should be any malfunction in the system, contact your nearest authorized Cessna Service Center.

GARMIN GFC 700 AUTOMATIC FLIGHT CONTROL SYSTEM (AFCS)

The GFC 700 is a digital Automatic Flight Control System (AFCS) which is fully integrated within the G1000 system avionics architecture. For operating instructions on the features of the GFC 700 system, refer to the latest revision of the Garmin G1000 Cockpit Reference Guide, document number 190-00567-01.

The GFC 700 AFCS is made up of the following Line Replaceable Units (LRUs):

- GDU 1040 Primary Flight Display (PFD)
- GDU 1042/GDU 1044 Multi-Function Display (MFD)
- GIA 63/GIA 63W Integrated Avionics Units (2)
- GSA 81 Servos (2)
- GSM 85 Servo Mounts (2)
- GTA 82 Trim Adapter

The GFC 700 AFCS system can be divided into Two main operating functions:

Flight Director – Flight Director operation takes place within the #1 GIA 63/GIA 63W and the GDU 1040 PFD. The Flight Director provides the system with:

- Command Bars showing Pitch/Roll Guidance
- Pitch/Roll Mode Selection & Processing
- Autopilot Communication

Autopilot – Autopilot operation occurs within the pitch, roll, and pitch trim GSA 81 servos and provides:

- Automatic Flight Control

- Servo Monitoring

WARNING

When using GPS autopilot mode in the terminal area, care should be exercised when selecting Vectors to Final on the G1000. When VTF mode is selected without selecting HDG or another autopilot roll mode first, the airplane will turn to a 45 degree intercept to the final approach course regardless of the airplane's position relative to the airport or the approach.

WARNING

The G1000 cannot command the autopilot to fly procedure turns or holding patterns automatically. Use HDG mode to accomplish both of these tasks. Generally, switching to HDG upon receipt of the holding pattern entry or procedure turn message is appropriate. Failing to use HDG mode will cause the airplane to navigate away from the hold or procedure turn.

GIA 63/GIA 63W Integrated Avionics Units – Each GIA 63/GIA 63W contains the AFCS software which controls the Flight Director. During normal operation, the GRS 77 AHRS and GDC 74A Air Data Computer send attitude and air data information to the GIA 63/GIA 63Ws. This information, combined with GPS and other system data, is used by the Flight Director and Autopilot. Flight Director commands are calculated within the #1 GIA 63/GIA 63W and are sent to the PFD for display and mode annunciation. Flight information is also sent to the GSA 81 servos for Autopilot operation. A GIA #1 failure results in the loss of the AFCS system. Any GIA 63/GIA 63W failure results in loss of the Autopilot, and Manual Electric Trim functions.

GSA 81 AFCS Servos (2) – Two GSA 81 servos are used for automatic control of the aircraft flight control surfaces. One servo is used for the each of the following:

- Pitch
- Roll

Each servo moves its respective aircraft control surface in response to commands generated by internal servo calculations. For pitch trim, the servo positions the aircraft pitch trim surface in response to commands generated by automatic and manual electric pitch trim calculations. Calculations are performed using data sent through the common serial data bus from the GIA 63/GIA 63W. Manual electric pitch trim is also provided in response to the Manual Electric Trim (MET) switch. See Figure 7 - 30.

GSM 85 Servo Mounts (2) – The GSM 85 servo mounts are used to connect the servos to the aircraft control system. They contain a spiral capstan which connects via a bridle cable to the main aircraft control cables. There is also a slip clutch to limit overpower forces in the unlikely event of a mechanical jam. An engage clutch is used to disconnect the capstan from the servo when the AFCS is disengaged. See Figure 7 - 30.

Figure 7 - 30

GTA 82 Trim Adapter – The GTA 82 Trim Adapter is a remote mounted device that is used to allow the GFC 700 to drive a trim actuator. The GTA 82 interfaces with two GIA 63/GIA 63Ws Integrated Avionics Units through serial communication on separate RS-485 ports. See Figure 7 - 31.

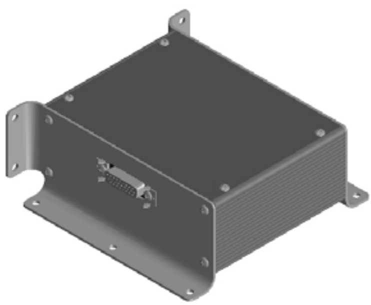


Figure 7 - 31

Dedicated AFCS Controls –The GDU 1042/GDU 1044 MFD has the following dedicated AFCS keys located on the lower left side of the bezel (See Figure 7 - 32):

- **AP Key** – Engages/disengages the Autopilot
- **FD Key** – Activates/deactivates the Flight Director only

  Pressing the **FD** key turns on the Flight Director in the default vertical and lateral modes. Pressing the **FD** key again deactivates the Flight Director and removes the command bars, unless the Autopilot is engaged. If the Autopilot is engaged, the **FD** key is disabled.

- **NAV Key –** Selects/deselects the Navigation mode
- **ALT Key –** Selects/deselects the Altitude Hold mode
- **VS Key –** Selects/deselects the Vertical Speed mode
- **FLC Key –** Selects/deselects the Flight Level Change mode
- **HDG Key –** Selects/deselects the Heading Select mode
- **APR Key** – Selects/deselects the Approach mode
- **NOSE UP/NOSE DN Keys** – Controls the active pitch reference for the Pitch Hold, Vertical Speed, and Flight Level Change modes
- **VNV Key –** Selects/deselects the Vertical Navigation mode (if present)

Figure 7 - 32

Additional AFCS Controls – The following buttons and switches used by the AFCS are located in the cockpit separately from the PFD and MFD:

- **A/P DISC (Autopilot Disconnect) Button** – Disengages the Autopilot and interrupts pitch trim operation.

  This button may be used to mute the aural alert associated with an Autopilot disconnect. The **A/P DISC** button is colored red and is located on the pilot's and copilot's control stick. The **A/P DISC** button mutes AP disconnect alerting if pressed during an alert.

- **CWS (Control Wheel Steering) Button** – Momentarily disengages the Autopilot and synchronizes the Flight Director's command bar to the current aircraft attitude.

  The **CWS** button is located on pilot's control stick. Upon release of the **CWS** button, the Flight Director may establish new reference points, depending on the current pitch and roll modes.

- **GO AROUND Button** – Disengages the Autopilot and selects the Go Around pitch and roll modes on the Flight Director.

  The **GO AROUND** button is located on the flap panel.

Before using Go Around Mode, review the missed approach procedure in the Garmin G1000 Cockpit Reference Guide carefully and then determine the best sequence of autopilot modes to be used to execute the missed approach as published. Upon selection of GA mode, the autopilot will automatically disconnect. The pilot should apply go around power, select flaps up when sufficient airspeed is achieved, and then select the appropriate autopilot roll and pitch modes. The autopilot may be coupled to the flight director after the airplane has been cleaned up and trimmed appropriately above 400 AGL.

GA mode will automatically capture the missed approach altitude selected on the altitude preselector on the G1000 (ALT in white). FLC is recommended for missed approach climbout using Vx or Vy as appropriate. Depending upon the missed approach procedure, autopilot HDG mode may be required for initial maneuvering if the missed approach
sequence requires a heading to be flown to a particular altitude.

Section 8 Handling, Servicing, and Maintenance

TABLE OF CONTENTS

Section 8
Handling, Servicing, and Maintenance

INTRODUCTION

GENERAL

This section contains factory recommended procedures for proper ground handling and routine care and servicing of your airplane. It also identifies certain inspection and maintenance requirements which must be followed if your airplane is to retain that new airplane performance and dependability. It is important to follow a planned schedule of lubrication and preventive maintenance based on climatic and flying conditions encountered in your local area.

Keep in touch with your local Cessna Service Station and take advantage of their knowledge and experience. Your Cessna Service Station knows your airplane and how to maintain it, and will remind you when lubrications and oil changes are necessary, as well as other seasonal and periodic services.

The airplane should be regularly inspected and maintained in accordance with information found in the airplane maintenance manual and in company issued service bulletins and service newsletters. All service bulletins pertaining to the airplane by serial number should be accomplished and the airplane should receive repetitive and required inspections. Cessna does not condone modifications, whether by Supplemental Type Certificate (STC) or otherwise, unless these certificates are held and/or approved by Cessna. Other modifications may void warranties on the airplane since Cessna has no way of knowing the full effect on the overall airplane. Operation of an airplane that has been modified may be a risk to the occupants, and operating procedures and performance data set forth in the operating handbook may no longer be considered accurate for the modified airplane.

Identification Plate – All correspondence regarding the airplane should include the airplane serial number. The airplane serial number, make, model, Type Certificate (TC) number, year of manufacture, and Production Certification (PC) number is contained on the Identification Plate on the tail cone of the airplane.

Publications

Various publications and flight operation aids are furnished in the airplane when delivered from the factory. These items are listed below.

- Customer Care Program Handbook
- Pilot's Operating Handbook and FAA Approved Airplane Flight Manual
- Pilot's Checklist
- Passenger Briefing Card
- Cessna Service Directory

To obtain additional publications or owner advisory information, you may contact Cessna Customer Service Department at (316) 517- 5800. Fax (316) 517-7271 or write to Cessna Aircraft Company, Dept 751C , P.O. Box 7706, Wichita, KS 67277.

The following additional publications, plus many other supplies that are applicable to your airplane, are available from your local Cessna Service Station.

- Information Manual (contains Pilot's Operating Handbook Information)
- Maintenance Manual, Electrical Manual, and Illustrated Parts Catalog

Your local Cessna Service Station has a Customer Care Supplies and Publications Catalog covering all available items, many of which the Service Station keeps on hand. The Service Station can place an order for any item which is not in stock.

NOTE

A Pilot's Operating Handbook and FAA Approved Airplane Flight Manual which is lost or destroyed may be replaced by contacting your local Cessna Service Station. An affidavit containing the owner's name, airplane serial number and reason for replacement must be included in replacement requests.

AIRPLANE FILE

There are miscellaneous data, information and licenses that are a part of the airplane file. The following is a checklist for that file. In addition, a periodic check should be made of the latest Federal Aviation Regulations to ensure that all data requirements are met.

To be displayed in the airplane at all times:

1. Aircraft Airworthiness Certificate (FAA Form 8100-2).
2. Aircraft Registration Certificate (FAA Form 8050-3).
3. Aircraft Radio Station License, (if applicable).

To be carried in the airplane at all times:

1. Current Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.
2. Garmin G1000 Cockpit Reference Guide (latest revision of 190-00567-01).
3. Weight and Balance, and associated papers (latest copy of the Repair and Alteration Form, FAA Form 337, if applicable).
4. Equipment List.

To be made available upon request:

1. Airplane Logbook.
2. Engine Logbook.

Most of the items listed are required by the United States Federal Aviation Regulations. Since the Regulations of other nations may require other documents and data, owners of airplanes not registered in the United States should check with their own aviation officials to determine their individual requirements.

Cessna recommends that these items, plus the Pilot's Checklists, Customer Care Program Handbook and Customer Care Card, be carried in the airplane at all times.

SERVICES AND SERVICING

CESSNA OWNER ADVISORIES

Cessna Owner Advisories are sent to Cessna Aircraft FAA Registered owners of record at no charge to inform them about mandatory and/or beneficial airplane service requirements and product changes. Copies of the actual bulletins are available from Cessna Service Stations and Cessna Customer Service.

United States Airplane Owners
If your airplane is registered in the U.S., appropriate Cessna Owner Advisories will be mailed to you automatically according to the latest aircraft registration name and address which you have provided to the FAA. Therefore, it is important that you provide correct and up to date mailing information to the FAA.

If you require a duplicate Owner Advisory to be sent to an address different from the FAA aircraft registration address, please complete and return an Owner Advisory Application (otherwise no action is required on your part).

International Airplane Owners
To receive Cessna Owner Advisories, please complete and return an Owner Advisory Application.

Receipt of a valid Owner Advisory Application will establish your Cessna Owner Advisory service for one year, after which you will be sent a renewal notice. It is important that you respond promptly to update your address for this critical service.

FUEL SERVICING

Recommended Fuel Grades

100LL Grade Aviation Fuel (Blue)
100 Grade Aviation Fuel (Green)

Fuel Capacities

Total Capacity: 106 US Gallons (401 L)
- Total Capacity Each Tank: 53 Gallons US (201 L)
- Total Usable Fuel:
  - S/N 42502 to 42567
    - 49 Gallons US (186 L)/Tank, 98 Gallons US (371 L) Total
  - S/N 42568 and on
    - Standard: 43 Gallons US (163 L)/Tank, 86 Gallons US (326 L) Total
    - Long Range: 51 Gallons US (193 L)/Tank, 102 Gallons US (386 L) Total

Approved Fuel Additives – Under certain ambient conditions of temperature and humidity, water can be supported in the fuel in sufficient quantities to create restrictive ice formation along various segments of the fuel system. To alleviate the possibility of this occurring, it is permissible to add Isopropyl Alcohol to the fuel supply in quantities not to exceed 3% of the total. In addition, ethylene glycol monomethyl ether (EGME) and diethylene glycol monomethyl ether (DiEGME) compounds to military specification MIL-I-27686E may be added for this purpose. The ethylene glycol monomethyl ether and diethylene glycol monomethyl ether compounds must be carefully mixed with fuel concentrations not to exceed 0.15 percent by volume.

FUEL ADDITIVE MIXTURE TABLE

Fuel Gal. (L)	Isopropyl Alcohol (3%) Fluid Ounces	EGME & Di-EGME (0.15%) Fluid Ounces	Fuel Gal. (L)	Isopropyl Alcohol (3%) Fluid Ounces	EGME & Di-EGME (0.15%) Fluid Ounces
1 (3.8)	3.8	0.2	27 (102.2)	103.7	5.2
2 (7.6)	7.7	0.4	28 (106.0)	107.5	5.4
3 (11.4)	11.5	0.6	29 (109.8)	111.4	5.6
4 (15.1)	15.4	0.8	30 (113.6)	115.2	5.8
5 (18.9)	19.2	1.0	31 (117.3)	119.0	6.0
6 (22.7)	23.0	1.2	32 (121.1)	122.9	6.1
7 (26.5)	26.9	1.3	33 (124.9)	126.7	6.3
8 (30.3)	30.7	1.5	34 (128.7)	130.6	6.5
9 (34.1)	34.6	1.7	35 (132.5)	134.4	6.7
10 (37.9)	38.4	1.9	36 (136.3)	138.2	6.9
11 (41.6)	42.2	2.1	37 (140.1)	142.1	7.1
12 (45.4)	46.1	2.3	38 (143.8)	145.9	7.3
13 (49.2)	49.9	2.5	39 (147.6)	149.8	7.5
14 (53.0)	53.8	2.7	40 (151.4)	153.6	7.7
15 (56.8)	57.6	2.9	41 (155.2)	157.4	7.9
16 (60.6)	61.4	3.1	42 (159.0)	161.3	8.1
17 (64.4)	65.3	3.3	43 (162.8)	165.1	8.3
18 (68.1)	69.1	3.5	44 (166.5)	169.0	8.4
19 (71.9)	73.0	3.6	45 (170.3)	172.8	8.6
20 (75.7)	76.8	3.8	46 (174.1)	176.6	8.8
21 (79.5)	80.6	4.0	47 (177.9)	180.5	9.0
22 (83.3)	84.5	4.2	48 (181.7)	184.3	9.2
23 (87.1)	88.3	4.4	49 (185.5)	188.2	9.4
24 (90.8)	92.2	4.6	50 (189.3)	192.0	9.6
25 (94.6)	96.0	4.8	51 (193.0)	195.8	9.8
26 (98.4)	99.8	5.0	52 (196.8)	199.7	10.0

Figure 8 - 1

It is important that the approved fuel additives are mixed in correct proportions. Consideration is required to ensure the appropriate concentration levels are achieved when the tank is filled. For example, adding 40 gallons (151 L) of fuel with a 0.15 percent concentration of EGME to a tank with 10 gallons (38 L) of untreated fuel will produce a mixture of something less than 0.15 percent. Consideration must also be made for the unusable fuel in the tank since it will be combined with the total mixture.

The additives shall be added as the fuel is introduced to the fuel tank so that the mixture is properly combined. Alternatively, the additive can be mixed with a small amount of fuel in a separate container, such as a five-gallon can, and added to the fuel tank before normal fueling. The table in Figure 8 - 1 lists the number of ounces of each additive for a given fuel quantity.

WARNING

Mixing of ethylene glycol monomethyl ether and diethylene glycol monomethyl ether compounds is extremely important because concentrations more than the 0.15 percent by volume can have a harmful effect on engine components.

Grounding During Refueling and Defueling – The high-speed characteristics of the airplane make generation of static electricity more likely, so it is important for the airplane to be grounded to the fuel source during refueling and defueling operations. Place the fuel source grounding clamp on the right or left exhaust stack of the airplane before touching the filler neck of the fuel tanks with metal parts of the ground refueling equipment. Remember that refueling is often done at the conclusion of a flight and the exhaust stacks may still be hot, so care must be used when attaching the clamp.

Some defueling is possible using the defueling feature on the delivery system of the Avgas fuel supplier. This procedure is usually adequate for removing fuel when gross takeoff weight is an issue. To completely defuel the airplane, refer to Chapter 12 in the Cessna 350 Airplane Maintenance Manual.

Fuel Contamination – To test for fuel contamination, fuel samples must be taken from each of the wing drains and from the gascolator before each flight and after the airplane is refueled. There are three types of contaminants that can inadvertently be introduced to the fuel system: (1) sediment such as dirt and bacteria, (2) water, and (3) the improper grade of fuel.

1. The accumulation of sediments is an inherent issue with most aircraft and can never be completely eliminated. Refueling the airplane at the conclusion of each flight and using fuel from a supplier who routinely maintains the filtration of the refueling equipment will lessen the problem somewhat. If specks are observed in the fuel sampler, continue the sampling operation until no debris is observed. Be sure the sampling device is clean before using it.
2. The two more common sources of water contamination are condensation of water from the air within a partially filled fuel tank and water-contaminated Avgas from a fuel supplier. Again, refueling after each flight and proper filtration of the fuel delivery system will mitigate water contamination. Water, which is heavier than Avgas, will collect near the bottom of the sampling device. If water is observed in the fuel sampler, take additional fuel samples until all the water is removed.
3. Aviation fuel is dyed according to its grade and on new aircraft, like the Cessna 350 (LC42-550FG), the filler neck is sized to only accept fuel of the proper grade. Still, the color of the fuel shall be verified according to the specifications on page 8-5, since the fuel truck might have been refilled improperly. If fuels of two different grades are mixed, the fuel sample will be clear. If an inferior, improper grade of fuel is noted, completely defuel both tanks, and refuel with the proper grade of Avgas.

Persistent fuel contamination is a serious problem. If repeated fuel sampling is ineffective or there is chronic contamination, approved personnel must inspect the airplane, and it is unsafe to fly. Two final thoughts about refueling and contamination: First, remember that fuel service personnel are people of unknown training and background. It is always a good idea to personally observe refueling operations. Second, if it is necessary to operate in areas where there is questionable fuel delivery, the use of a portable fuel filter is recommended.

NOTE

There are a number of fuel additives on the market that are formulated for automotive use. While the additives may be beneficial for cars, trucks, etc., they are not approved for aircraft use.

OIL SERVICING

The oil grades shown below are recommended after the initial engine break-in period. Refer to the Required Oil Changes and Special Inspections heading on page 8-10 for additional details about oil grades during the engine break-in period. Only lubricant oils conforming to Teledyne Continental Motors Specification MHS-24D (latest revision) can be used. Note, the use of MHS-25 synthetic oils has been removed.

NOTE

Oil is added to the engine through the filler neck that contains the dipstick. To remove the dipstick, rotate it counterclockwise to unseat it; raise the dipstick approximately six to eight inches or until a slight resistance is felt; rotate the dipstick 90º clockwise and remove from the filler neck.

Oil Grades Recommended for Various Average Air Temperature Ranges

Below 40°F (4°C) — SAE 30, 10W30, 15W50, or 20W50
Above 40°F (4°C) — SAE 50, 15W50, 20W/50, or 20W60

Sump Capacity – The system has a wet type oil sump with a drain-refill capacity of eight quarts.

Oil Filter – A full flow, spin-on type, 20-micron oil filter is used.

NOTE

There are a number of oil additives on the market that are formulated for automotive use; however, they are not approved for aircraft operations.

BRAKES AND TIRE/NOSE STRUT PRESSURES

Proper inflation of the tires reduces tire external damage and heat, which reduces tire wear. Proper inflation of the nose strut ensures a smoother ride. Maneuverability on the ground is enhanced when tire and strut pressures are at proper levels. Figure 8 - 2 summarizes the recommended pressures and types of tires.

Tire Considerations – The airplane is normally delivered with Goodyear tires. These tires have a profile that provides about ⅜ in. (0.95 cm) clearance between the tire and wheel pants. Other brands of tires with similar specifications and TSOs may have slightly larger profiles. Tires with larger profiles are not recommended since damage to the tire or wheel pant is possible, particularly during landing. If other brands of tires are used, the profile of the tire must be precisely measured and compared with the Goodyear tire.

CAUTION

The profile of replacement tires that are not a recommended brand should be measured precisely to ensure they are the same height and width. The use of tires that have slightly larger profiles can cause damage to the tire and to the wheel pant, particularly during landing operations.

ITEM	SPECIFICATIONS	PRESSURE	TYPE OF GAS
Nose Strut	LC-42 NGO	250 psi	Nitrogen
Nose Gear Tire	5.00-5 (10 ply)	88 psi	Air
Main Gear Tires	15x6.00-6 (6-ply)	55 psi	Air

Figure 8 - 2

Normally, a trained mechanic adds brake fluid. However, this is an approved item of preventive maintenance, and servicing by a private pilot who is the owner or operator is permitted. The brake fluid levels shall be serviced according to instructions contained in the *Cessna 350 (LC42-550FG) Maintenance Manual* with MIL-H-5606 hydraulic fluid.

BATTERY REPLACEMENT CYCLES

The Cessna 350 has three separate batteries that require periodic replacement. While the system batteries indicate their charge on the installed voltmeter and ammeter, the ELT battery does not have a positive test to indicate its charge. The table below summarizes the replacement cycles.

BATTERY REPLACEMENT CYCLES		
BATTERY TYPE	BATTERY LOCATION	REPLACEMENT CYCLE
Emergency Locator Transmitter (ELT) Battery	Aft of the baggage compartment hat rack – Please see page 7-48 for more information.	Every 2 years (Artex 200), every 5 years (Artex ME406), or when the battery had been used for more than one hour or used 50% if its power
System – Dry Sealed Lead-Acid Type Battery (Two each)	Just forward of the firewall on the copilot's side	Alternate replacement every two years – First replace the right battery, after two more years replace the left battery. Alternate replacement every two years. However, if the battery fails to hold a charge, it must be replaced.

Figure 8 - 3

OXYGEN SYSTEM SERVICING

When servicing the oxygen, only the following approved oxygen may be used:

Oxygen per Mil-O-27210 – Aviators Breathing Oxygen

To refill the oxygen supply, use the following steps:

1. Set the Right Bus switch to ON.
2. Set the Avionics Master to ON.
3. Unscrew the filler port safety cap, and connect the service line to the Oxygen Service fitting located in the aft baggage on the left hand side of the aircraft.
4. Slowly fill the oxygen supply. By filling slowly, the temperature rise due to the compressed gas in the oxygen supply bottles will be kept to a minimum.
5. Monitor the cockpit oxygen on the MFD EIS page to ensure that the oxygen supply is filled.

NOTE

This fixed oxygen system has a maximum bottle pressure of 2,000 psi.

6. When the system is filled to the intended capacity, turn the oxygen system on using the OXYGEN softkey on the MFD.
7. Ensure that the Outlet Pressure Display is in the green band. Outlet pressure in the green or amber bands is normal unless the amber indication remains on with multiple flow devices plugged in, and flowing oxygen.
8. Turn the oxygen system off using the OXYGEN softkey on the MFD.
9. Set the Avionics Master to OFF.
10. Set the Right Bus switch to OFF.
11. Ensure safety cap is installed over the filler port.

See the Cessna 350 Maintenance Manual for additional maintenance instructions if oxygen quantity drops faster than the duration charts in Chapter 5 indicate or there is either very high or very low outlet pressure.

MAINTENANCE AND DOCUMENTATION

MAINTENANCE

Airplane Inspection Periods – Part 91, Subpart E of the Federal Aviation Regulations requires that each U.S. civil registered airplane not used for hire be inspected every 12 calendar months in accordance with Part 43. If the airplane is used for hire, the regulations require that it must be inspected before or at each 100 hours of time in service.

Airworthiness Directives – The FAA may issue notifications known as Airworthiness Directives (ADs) that are applicable to the airplane or one of its components. The directives specify what action is required and normally have a compliance period. It is the responsibility of the owner/operator of the airplane to ensure compliance with all applicable ADs.

Pilot Conducted Preventive Maintenance – A certified pilot who owns or operates an airplane not used as an air carrier is authorized by 14 CFR Part 43 to perform limited maintenance on his airplane. Refer to 14 CFR Part 43 for a list of the specific maintenance operations which are allowed.

NOTE

Pilots operating airplanes of other than U.S. registry should refer to the regulations of the country of certification for information on preventive maintenance that may be performed by pilots.

A Maintenance Manual must be obtained prior to performing any preventive maintenance to ensure that proper procedures are followed. Your local Cessna Service Station should be contacted for further information or for required maintenance which must be accomplished by appropriately licensed personnel.

Alterations or Repairs – All alterations or repairs to the airplane must be accomplished by licensed personnel. In addition, an alteration may violate the airworthiness of the airplane. Before alterations are made, the owner or operator of the airplane should contact the FAA for approval.

Required Oil Changes and Special Inspections – During the engine break-in period, straight mineral oil must be used for the first 25 hours. After the first 25 hours of the airplane's time in service, the oil and oil filter must be changed and a new supply of Teledyne Continental Motors specification MHS-24 (latest revision) ashless dispersant oil must be used. At 50 hours of time in service, the oil and oil filter shall be changed and the filter and discarded oil checked for evidence of metal particles. Thereafter, the oil and oil filter must be changed at every 100 hours of time in service.

At the first oil change, the engine and related accessories (including the magnetos, starter, alternator, engine driven fuel and oil pumps, oil cooler, and propeller governor) should be inspected for oil leaks and security. Spark plug leads and other electrical circuits should be checked for proper routing, abrasion, chafing, and security. Check engine controls and linkages for proper operation. Finally, check the intake and exhaust system for security and evidence of cracking.

Recommended Oil Changes and Special Inspections – At approximately every 50 hours of time in service, it is recommended the engine oil be changed. Since the cowling is removed for an oil change, a cursory inspection of other engine systems is possible, and the engine can be cleaned and degreased if necessary. The airplane's engine is the single most expensive component in the airplane and arguably the most important. The comparative nominal expense and time involved in doing 50-hour oil changes are more than offset by the long-term benefits and peace of mind.

Cessna Customer Care Program

Specific benefits and provisions of the Cessna Warranty plus other important benefits for you are contained in your Customer Care Program Handbook supplied with your airplane. The Customer Care Program Handbook should be thoroughly reviewed and kept in the airplane at all times.

You will also want to return to your Cessna Service Station either at 50 hours for your first Progressive Care Operation, or at 100 hours for your first 100 hour inspection depending on which program you choose to establish for your airplane. While these important inspections will be performed for you by any Cessna Service Station, in most cases you will prefer to have the Cessna Service Station from whom you purchased the airplane accomplish this work.

HANDLING AND STORAGE

GROUND HANDLING

Towing – A locking, hand-held tow bar is provided with the airplane and stored in the baggage compartment. The tow bar is inserted into two small holes in the nose wheel fairing, forward of the nose wheel axle. The tow bar must be locked in place before attempting to move the airplane.

Removing the locking pin in the bottom of the sleeve and pulling up on the tow-handle extends the tow bar handle. When the hole at the end of the tow-handle is aligned with the hole in the sleeve, reinsert the locking pin to keep the tow-handle in place. To collapse the tow bar, reverse the previous steps. Attach the tow bar to the airplane using the following steps:

1. Open the towing fork by pushing on the expansion handle until it is locked in place, past the over-centering point.
2. Insert one of the two fork tips into one of the nose wheel pant holes.
3. Carefully close the fork so that the remaining fork tip is inserted into the other wheel pant hole.

CAUTION

When attaching the tow bar to the nose wheel pant, care must be taken when closing the fork. Maintain a good amount of forward pressure on the expansion handle when inserting the second fork tip into the wheel pant hole. Once the expansion handle is released past the over-centering point, the fork can close quickly and scratch the wheel pant.

It is recommended that the airplane only be maneuvered during towing by use of the hand-held tow bar. If it is necessary to tow with a vehicle, extreme care is required to ensure the rotation limits of the nose wheel (60° left and right) are not exceeded. Since the rotation of the nose gear is limited by physical stops, rotating the gear beyond 60° will damage the airplane.

It is always a good idea to have another person serve as a spotter when moving the airplane. Remember that the airplane has vertical limitations as well as horizontal restrictions. The vertical stabilizer is frequently overlooked as an airplane is being pushed into a hanger with most of the attention directed towards the wingtips. When moving the airplane over uneven surfaces, remember that small up and down oscillations of the nose strut result in amplified movement of the vertical stabilizer. Finally, keep in mind that inflation levels of both the nose tire and strut affect the height of the vertical stabilizer. A flat tire or low nose strut will increase the height of the vertical stabilizer.

CAUTION

Do not attempt to move the airplane by pushing or pulling on the propeller. This a common practice for airplanes with fixed pitch propellers; however, it is not recommended for constant speed propellers, since pressures applied to the propeller blades are transmitted to moving parts within the propeller hub. Over time, these forces could cause damage to the propeller.

Parking – During parking operations, it is best to head the airplane into the wind if possible. Normally, setting the parking brake is recommended; however, there are two situations where doing so is not a good idea.

1. If the brakes are overheated, which might result from a short field landing or extensive taxiing, it is best to not set them until they have had a sufficient cooling period. A brake pad clamped to a hot chrome disc can cause uneven cooling of the brake disc, which has the potential of warping it.
2. It is also not a good idea to set the brakes in cold weather. Accumulations of freezing rain, ice, and snow can freeze-weld the brake pad to the disc. Landing or taxiing in standing water

at near freezing temperatures can cause similar problems if the brakes are set when the airplane is parked.

Securing the Airplane – In any event, whether the brakes are set or not set, the airplane should be chocked and the following items should be accomplished to secure the airplane.

1. Install the control lock.
2. Chock the main gear tires with chocks on both sides of each tire.
3. Attach a rope or chain to each tie-down point, and secure the rope or chain to a ramp tie-down point. There are three tie-down points, one on each wing and one on the tail. The ropes or chains should have a tensile strength of at least 750 lbs.
4. Install the pitot tube cover.

WARNING

Do not use any device except approved tie-down rings to secure the airplane. While the proper size eyebolt from a hardware store will fit in the threaded tie-down socket, the eyebolt length is critical. A tie-down bolt of incorrect length could cause jamming or interfere with proper movement of the ailerons.

Windshield Cover – The use of a windshield cover is an often-debated issue and is a decision the owner or operator of the airplane must make. Windshield covers have both positive and negative benefits. Ultimately, a number of factors must be weighed, including (1) the geographical area of operations, (2) the time of year, (3) the specific parking location, and (4) the integrity of the covering device.

1. From a positive standpoint, the cover limits the intrusion of ultraviolet (UV) light. Over time, UV rays significantly accelerate the aging process, which makes the windshield and windows more brittle and impregnates them with an irremovable yellowish tinge.
2. On the negative side, dust and dirt can accumulate between the cover and the windshield. When the wind blows, the whipping action of the cover beats the dust and dirt into the windshield.

JACKING AND LEVELING

Jacking – There are two jack points under each wing proximate to the wing saddle. The points are near the center of mass of the longitudinal axis, and great care must be used when jacking the airplane. The tailskid is used as a third point of stabilization. The following points should be considered when the airplane is raised by jacks.

1. If the airplane is simultaneously lifted by both jacks, then specific procedures established in Chapter 7 of the maintenance manual must be followed. This procedure is fairly involved. It requires special equipment to stabilize the airplane, sandbags for tail ballast, and three or four people to operate the jacks and keep the airplane steady.
2. If only one jack is used, as when changing a single tire, the airplane can be safely jacked by one person using the following procedure:
   a. The operation must be performed in a level area, such as an airplane hangar.
   b. Set the parking brake and chock the nose tire and the main gear tire that is not raised.
   c. Place 50 pounds of ballast (usually sandbags) on the engine cowling, near the propeller.
   d. Place a jack under the jack point of the wing to be lifted and raise the jack up to the wing jack point. Take extra precaution to ensure the jack is properly stabilized, the base is locked in position, and the jack is lifting vertically. Be sure the raising point of the jack is properly inserted into the jack point on the wing.
   e. Slowly raise the jack until the desired ground clearance is achieved. However, the clearance between the bottom of the tire and lifting surface (ground or hangar floor) must not exceed three inches.

Leveling – Please see page 6-5 for information about leveling the airplane.

STORAGE

The storage of an airplane mostly deals with engine related items. Very little needs to or can be done to preserve the airframe, particularly for flyable and temporary storage. The best protection for the exterior is, of course, to hangar the airplane, if possible. If the airplane cannot be hangared, then a coat of wax using the material and techniques described on page 8-17 should be applied to all exterior surfaces. In addition, all typical items associated with securing the airplane should be done. These include: (1) installing the pitot tube cover, (2) chocking all wheels and tying the airplane down with the parking brakes released, (3) installing the control lock, (4) topping off the fuel tanks, (5) cleaning the bolts and nuts on the brakes and applying a non-stick preservative like graphite or a silicone, and (6) installing other owner-option protection devices. There are three types of storage categories, flyable, temporary, and indefinite. The time period and applicable storage procedure for each type is discussed below.

Flyable Storage (7 to 30 days) – If the airplane is to be maintained in flyable storage, then it should be flown for a minimum of 30 minutes every 30 days; ground running the engine is <u>not</u> a substitute for flying the airplane. During flyable storage, the propeller should be rotated by hand every seven days. This operation should include at least six complete revolutions of the engine. Stop the propeller 45º to 90º from its original position. For maximum safety use the following procedures:

1. Ensure that the ignition switch is set to the OFF position.
2. Set the throttle to the CLOSED position.
3. Set the mixture to IDLE CUTOFF.
4. Set the parking brake, and chock the wheels.
5. Ensure that airplane tie-downs are secure.
6. Open cabin door on the pilot’s side of the airplane.
7. Always assume the propeller could start when moving it manually, and use an appropriate technique for hand turning the propeller.
8. Release the parking brake when the operation is completed.

WARNING

Always assume that the engine could start when rotating the propeller by hand. Remain clear of the arc of the propeller blades at all times.

Temporary Storage (up to 90 days) – Use the following procedures to preserve the engine for temporary storage. See the Airframe Preservation for Temporary and Indefinite Storage heading on page 8-16 for airframe preservation items.

1. Remove the top spark plug from each of the six cylinders, and apply an atomized injection of preservation oil, MIL-L-46002, Grade 1. As the oil is injected into each cylinder, the piston should be near bottom dead center, and the preservation operation should be done at room temperature.
2. When Step 1 is complete, and with none of the pistons at dead center, re-spray each cylinder thoroughly making sure to cover all interior surfaces.
3. Install spark plugs.
4. Spray approximately two ounces of preservation oil through the oil filler tube.
5. Seal all engine openings exposed to the atmosphere with suitable plugs or moisture resistant tape.
6. Tag engine, cowling, and other appropriate areas with the statement, “Do not turn propeller, engine preserved.”

Return to Service from Temporary Storage – To return an airplane that has been in temporary storage to active service, perform the following steps:

1. Remove seal plugs, tape, and all methods of tagging the airplane, including items tagged on the airframe.
2. Remove the bottom spark plug from each of the six cylinders, and rotate the propeller several times to remove the preservation oil.
3. Reinstall the spark plugs according to manufacturer’s recommendations.

4. Conduct a normal engine start, and idle the engine for several minutes until oil temperature is within normal limits. Monitor engine instruments to ensure they are within normal operating ranges.
5. Stop the engine and inspect the entire airplane before test flying.

Indefinite Storage (Over 90 Days) – If the airplane is to be stored for a long period, follow the procedures listed below to preserve the engine. See the Airframe Preservation for Temporary and Indefinite Storage heading on page 8-16 for airframe preservation items.

1. Drain the engine oil and refill with MIL-C-6529 Type II preservation oil. Start the engine and operate until normal temperature ranges are achieved. Fly the airplane for about 30 minutes and then allow the engine to cool to the ambient temperature.
2. Follow Steps 1, 2, and 4 above for Temporary Storage.
3. Install dehydrator plugs MS27215-1 or -2, in each of the top spark plug holes. Ensure the dehydrator plug is blue when installed. Protect and support the spark plug leads with AN-4060 protectors.
4. Place a bag of desiccant in the exhaust pipes, and seal the openings with moisture resistant tape.
5. Seal the induction system with moisture resistant tape.
6. Seal the engine breather by taping a dehydrator plug, M527215-2, in the lower end. Seal the "whistle hole" vent in the breather tube with moisture resistant tape.
7. Tag engine, cowling, and other appropriate areas with the statement, "Do not turn propeller, engine preserved."
8. Install plugs in the engine cowl inlets and all other openings. **Do not plug or seal tank vents on the bottom of each wing.**

NOTE

During the various storage periods, FAA Airworthiness Directives and manufacturer's service bulletins may apply which require action based on calendar dates, not operating hours. These items must still be completed even though the airplane is in storage.

Return to Service from Indefinite Storage – To return an airplane that has been in indefinite storage to active service, perform the following steps:

1. Remove all dehydrator plugs, seal plugs, tape, and all methods of tagging the airplane including items tagged on the airframe.
2. Drain the preservation oil, and service the engine with the recommended lubricating oil.
3. Remove the bottom spark plugs from each of the six cylinders, and rotate the propeller several times to remove the preservation oil.
4. Re-install the spark plugs and carefully rotate the propeller by hand several times to check for possible liquid lock.
5. Conduct a normal engine start, and idle the airplane for several minutes until oil temperature is in within normal limits. Monitor all engine instruments to ensure they are within normal operating ranges.
6. Stop the engine and inspect the entire airplane before test flying.
7. Test fly the airplane.

NOTE

The dehydrator plugs must be visually checked every 30 days to verify that the color has not changed. Bad dehydrator plugs should be replaced. If more than half of the plugs change color, the bad plugs and all the desiccant bags on the engine should be replaced. Every six months the dehydrator plugs should be replaced and the cylinders re-sprayed with preservation oil. When removing the plugs, check the cylinder interior. If rust stains are noted, spray the cylinder with

preservation oil, turn the prop through six revolutions, and then re-spray all cylinders.

Airframe Preservation for Temporary and Indefinite Storage – If the airplane is to be stored for over 30 days, some or all the procedures below may be applicable, depending on the anticipated storage time period.

1. Ensure the tires are free of grease, oil, tar, and gasoline. The presence of these items accelerates the aging process. Sunlight and static electricity convert oxygen to ozone, a substance that accelerates the aging process. Special tire covers can be installed which retard the erosion process.
2. It is best if the weight of the airplane is removed from the tires to prevent flat spots. If the airplane cannot be blocked or set on jacks, then every 30 days each wheel should be rotated about 90º to expose a new tire pressure point.
3. If the airplane does not have a recent coat of wax, a new coat should be applied as discussed on page 8-17.
4. Lubricate exposed exterior metal fittings, hinges, push rods, etc. Use plugs or moisture resistant tape to seal all openings except fuel vent holes and drain holes.
5. Remove the battery and store in a cool, dry location. The battery may need periodic servicing and recharging depending on the storage period.
6. Prominently tag areas where tape and plugs are installed.

Airframe Preservation Return to Service – To return the airframe portion of an airplane that has been in temporary or indefinite storage to active service, perform the following steps, as applicable:

1. Remove all methods of tagging and sealing including any items on or in the engine area.
2. Remove tire covers or other protection devices. Check the condition of the tires and service to proper pressures. Cracked, deformed, and desiccated tires should be replaced.
3. Thoroughly clean the exterior of the airplane including the transparencies. If necessary, renew the protective wax coat. See page 8-17 for instructions on care of the airframe.
4. Check the condition and charge of the battery. If the battery is still serviceable, reinstall it in the airplane; otherwise, install a new battery.

NOTE

When an airplane has been in storage for a long period, the date of the required annual inspection may have passed. There is no requirement to perform this inspection during the temporary or indefinite storage period. However, the inspection must be completed before than airplane is returned to service.

Inspections During Temporary Storage – The following inspections should be performed while the airplane is in temporary storage:

1. Check the cleanliness of the airframe as frequently as possible, and remove any dust that has collected.
2. Check the condition and durability of the protective wax coat, and renew as required.
3. Every 30 days, check the interior of at least one cylinder for evidence of corrosion.

Inspections During Indefinite Storage – The following inspections should be performed while the airplane is in indefinite storage:

1. Check the condition of the dehydrator plugs every 30 days to verify that the color has not changed. Bad dehydrator plugs should be replaced. If more than half of the plugs change color, the bad plugs and all the desiccant bags on the engine should be replaced.
2. Every six months the dehydrator plugs should be replaced and the cylinders re-sprayed with preservation oil. When removing the plugs, check the cylinder interior. If rust stains are noted, spray the cylinder with preservation oil, turn the prop through six revolutions, and then re-spray all cylinders.

AIRFRAME AND ENGINE CARE

AIRFRAME

Exterior – The exterior painted surfaces are cleaned by washing with a mild soap and water and drying with a soft towel or chamois. The seal coats that are applied to the painted surface, in most instances, will provide adequate protection from moisture and the sun. Some additional protection is provided by waxing the painted surface and facilitates washing the airplane since bugs and dirt will not adhere as tightly to a waxed surface. A wax with a high concentration of carnauba is recommended. There are several commercial boat waxes available that are ideal for this use. Be sure to read the label with an eye for the percentage of carnauba in the compound.

CAUTION

Do not wax the airplane with silicone-based wax for at least 60 days from the date of purchase. The paint curing process involves the expulsion of certain substances within paint. A coat of wax can impede or stop the curing process, which inhibits adhesion of the paint to the composite surface.

The exterior paint color on the upper fuselage area and the top of the wings has a good heat reflection index. This good index is required to ensure the continued bonding and integrity of the composite material. Only approved Cessna paint colors are permitted in these areas. Care must be taken to not lay dark, heat absorbing material on the top area of the wings and fuselage.

Anti-erosion Tape – The anti-erosion tape is located on the leading edges of the wings, horizontal tail, vertical tail, and gear fairings. Care should be taken to prevent damage to the tape on the wing when entering the aircraft. People who sit on the wing by lifting themselves up over the leading edge should take care not to drag their legs over the tape when sliding on or off the wing. If the tape is starting to fray, detach, crack, crinkle, etc., it should be replaced using the instructions in the maintenance manual.

Windshield and Windows – The proper care of the windshield and windows (sometimes referred to as transparencies) is one of the more important exterior care items on the airplane and often the least understood. The cardinal rule is never do anything that will scratch the surface of the acrylic plastic. The following points for cleaning and caring for the transparencies will help to keep windows looking and performing like new.

1. First, when cleaning the windows, it is recommended that rings and watches be removed as they can cause deep scratches. In this vein, long sleeve shirts should be turned up a few rolls to hide exposed buttons.
2. When removing bugs and dirt, avoid touching the surface. If possible, remove most of the dirt by flushing the windows and windshield with water and a mild dish soap mixture. Allow the accumulation of dirt and/or bugs to soak for a few minutes. If rubbing is required, a bare hand is best. When all the debris on the surface of the window is loosened, apply a second water flush and then dry with a 100% cotton cloth.
3. Use a good quality non-abrasive cleaner/polish specifically intended for acrylic windows, and apply per the manufacturer's instructions. Use up and down or side to side movements when polishing. **Never use a circular movement** as this can cause glare rings.
4. The best polishing cloth is the softest cotton available. One hundred percent cotton flannel is ideal and available in yard goods stores. <u>**Never use**</u> any type of paper product or synthetic material. In particular, never use shop rags or shop towels. Be sure the polishing cloth is clean and dry. Reserve polishing cloths should be stored in a plastic bag to limit dirt accumulation.
5. Small scratches, the type that can be seen but cannot be felt with a fingernail, should be filled with a polishing compound that has scratch filling properties. The cleaner/polisher mentioned in paragraph 3 frequently has scratch filling properties and is satisfactory for regular use. Some scratches are not correctable with a scratch-filling product. While the scratches cannot

be felt, they are still visible, particularly when flying into the sun. In this instance, a mildly abrasive scratch removal cream can be used per manufacturer's recommendations. Scratches of greater magnitude require the use of high abrasives and removal of some of the window's surface around the greatest depth of the scratch. This procedure requires considerable expertise and frequently makes areas where the scratch was removed more objectionable than the original scratch.

6. As mentioned previously in this section, the use of canopy or window covers can grind dirt particles into the acrylic and are virtually impossible to remove.

CAUTION

Do not use anything containing ammonia, aromatic solvents like methyl ethyl ketone, acetone, lacquer thinner, paint stripper, gasoline, benzene, alcohol, anti-ice fluid, hydraulic fluid, fire extinguisher solutions, or window cleaner on the acrylic window surfaces. The use of these substances may cause the surface to craze.

NOTE

To remove difficult substances such as tape residue, oil, and grease, the safest solvents are 100% mineral spirits or kerosene. Some alcohols are safe, such as isopropyl alcohol.

Interior Cleaning and Care – The useful life of the airplane's interior can be extended through proper care and cleaning. One of the major elements in the aging process is the interior's exposure to sunlight. If possible, the airplane should be hangared. Routine vacuuming is another item that helps extend the life of the airplane's interior. A general rule for spills is to blot the affected area with firm pressure for a few seconds. Never rub or pat an area to remove a spill.

Portions of the airplane's seats are covered with leather. The leather is treated with a sealant, which provides a protective cover. Do not attempt to feed the leather in any way. In particular, the use of spray polishes, saddle soaps, waxes, and so-called hide foods create a sticky surface, which attracts dirt and can cause irreversible damage.

The leather and ultra-leather seats, seatbacks, knee bolsters, and the like, should be routinely wiped with a moist soft cotton cloth after vacuuming. Use a mild non-detergent soap such as Neutrogena. Wipe the leather and ultra-leather using a light circular motion taking care not to soak the surface. Once the seats and other areas are clean, repeat the process using clean water and then wipe the surfaces with a dry cloth. For ink stains, use a special application available through Douglas Interior Products known as a D.I.P. Stick. Since the D.I.P. Stick application must be used within 24 hours, one should be held in reserve at all times.

The carpet can be cleaned with a mild foam product, but care must be used not to over saturate. Follow the manufacturer's instructions regarding use of the foam cleaner. Small spots can be cleaned with a commercial spot remover; however, this must be done with care. Again, follow the recommended procedure of the manufacturer, and try a test application in an area of limited exposure.

ENGINE AND PROPELLER

Engine Cleaning and Care – If necessary, the engine is normally cleaned at the recommended 50-hour oil change interval since the cowling is removed to change the oil. In addition, the air filter should be cleaned at every 100 hours of time in service; it may require more frequent cleaning depending on the operating environmental conditions. If the engine is cleaned at the 50 or 100-hour oil change intervals, this should be adequate under most operating conditions.

In any event, the engine must be kept relatively clean for all flight operations. It is difficult to establish a precise time in service recommendation since much depends on the environmental conditions and the types of airplane operations. Engine cleaning, air filter cleaning and replacement, and lubrication of the engine controls is permitted as an item of preventive maintenance and can be performed by the owner or operator if that person possesses a private pilot or higher level of certification.

It is best to clean the engine with a spray type cleaner, preferably under pressure. There are a number of approved commercial solvents specifically designed for this use. Care must be exercised to ensure that application of the solvent does not damage other components in the engine area. Refer to the *Cessna 350 (LC42-550FG) Approved Maintenance Manual* for additional instructions.

Propeller Cleaning and Care – It is important to keep the propeller clean since it facilitates detection of cracks and other problems. The propeller must be cleaned with a non-oil based substance such as Stoddard Solvent. The solvent must only be applied to the surface of the blades with a soft brush or cloth; care must be used to avoid contact with the propeller hub and seals. Do not use any type of spray application, pressurized or unpressurized, since over-spray particles could contact the propeller hub and seals. The use of water and a mild soap is also acceptable; however, never use any alkaline-based products.

Nicks on the leading edge of the propeller blade, particularly towards the blade’s tip should be dressed out as soon as possible. Undressed nicks, over time, can lead to problems that are more serious. The repair of the airplane’s propeller, including propeller nicks, can only be performed by authorized maintenance personnel and is <u>not</u> an item of authorized preventive maintenance.

When the propeller is clean, dry the surface with a soft cloth and wax the blades with a good quality automobile paste wax. The major issue with propeller care is corrosion control. Frequent cleaning and applications of paste wax will significantly retard the erosion process. These procedures are particularly applicable in geographical areas of high humidity and salt particles. Never try to remove corrosion pitting with an abrasive material such as steel wool or sandpaper since this accelerates the corrosion process.

This Page Intentionally Left Blank

Section 9
Supplements

GENERAL

This section contains information about optional equipment manufactured by Cessna and supplemental equipment that is installed in the airplane as a Supplemental Type Certificate (STC). A log for optional and STC equipment is provided on page 9-2. Each optional equipment and STC installation will have an FAA approved supplement that must be included in this section of the *FAA Approved Airplane Flight Manual* and *Pilot's Operating Handbook* (AFM/POH).

LOG OF SUPPLEMENTS

The table below is for tabulating the installation of optional equipment and/or devices manufactured by Cessna and equipment and/or devices that are installed as supplemental equipment under a Supplemental Type Certificate (STC).

Supplemental equipment and/or devices must have their own Supplemental Type Certificate number. Some supplemental equipment may be installed at the Cessna factory, in which case, the STC information will be logged in this section. The installation of after-market supplemental items is totally at the discretion of the owner or operator of the airplane. Cessna neither endorses nor opposes after-market installations; however, such an installation can limit or invalidate the warranty on the airplane. Cessna does not provide technical support or documentation for after-market installations. The holder of the STC normally provides these services.

Supp. No.	Manufacturer/Type of Equipment	Date Installed	Revision No.
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			