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

Cessna 400 (LC41-550FG) with Garmin Integrated Flight Display

Serial Number: 411126

Registration Number: N1133G

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: E. P. Kolano
(Name)

Title: Manager. Seattle Area Certification Office

Date: 31 Mar 06 Initial Issue: 09 Dec 05 Revised: 22 Oct 08

RC050005I

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

Cessna 400 (LC41-550FG)
with
Garmin Integrated Flight Display

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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.

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NOTE: The accompanying (attached) FAA Approved Temporary Revision page(s) may or may not be applicable to your serial airplane. Please refer to the individual FAA Approved Temporary Revision page(s) to determine applicability status for your airplane.

U.S. Pilot's Operating Handbook and FAA Approved Airplane Flight Manual
Model 400 (LC41-550FG) with Garmin Integrated Flight Display
Airplanes 41034, 41563 thru 41650, 41652 thru 41800 and 411001 and On.

THIS IS A LIST OF ALL CURRENT FAA APPROVED TEMPORARY REVISIONS.

The following list of temporary revisions must be incorporated into this basic U.S. Pilot's Operating Handbook and FAA Approved Airplane Flight Manual until the removal instructions have been complied with.

Insert this page opposite the Log of Effective Pages in the front of this basic U.S. Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

A bar located in the margin on the left side of the page, adjacent to the list, will extend the full length of any change. No change bar will be used in the footer(s) or elsewhere. The date in the footer(s) reflects only the issue date of the most recent temporary change(s) listed on that page.

TEMPORARY REVISION NUMBER	PAGE NUMBER	ISSUE DATE	SERVICE BULLETIN, MODIFICATION KIT (IF APPLICABLE) OR SERIAL EFFECTIVITY
RC050005HTR01	2-8	6/6/08	41563 thru 41650, 41652 thru 41800, 411001 thru 411031, 411033 and 411035 thru 411037.
~~RC050005-I TR01~~	Cancelled	Cancelled	Replaced by RC050005-I TR05
RC050005-I TR02	2-5	6/2/09	Airplanes 41034, 41563 thru 41650, 41652 thru 41800 and 411001 and On.
RC050005-I TR03	2-8	6/2/09	Airplanes 41034, 41563 thru 41650, 41652 thru 41800 and 411001 and On.
RC050005-I TR04	4-27	6/2/09	Airplanes 41034, 41563 thru 41650, 41652 thru 41800 and 411001 and On.
RC050005-I TR05	2-13	7/28/09	Airplanes 41034, 41563 thru 41650, 41652 thru 41800 and 411001 and On. This temporary revision replaces RC050005-I TR01 in its entirety.
RC050005-I TR06	4-5 and 4-6	7/28/09	Airplanes 41034, 41563 thru 41650, 41652 thru 41800 and 411001 and On.
RC050005-I TR07	2-9	10/30/09	Airplanes 41034, 41563 thru 41650, 41652 thru 41800 and 411001 and On.
~~RC050005-I TR08~~	Cancelled	Cancelled	Replaced by RC050005-I TR14.
~~RC050005-I TR09~~	Cancelled	Cancelled	Replaced by RC050005-I TR16.
RC050005-I TR10	4-27	8/13/10	Airplanes 41034, 41563 thru 41650, 41652 thru 41800 and 411001 and On.

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TEMPORARY REVISION NUMBER	PAGE NUMBER	ISSUE DATE	SERVICE BULLETIN, MODIFICATION KIT (IF APPLICABLE) OR SERIAL EFFECTIVITY
RC050005-I TR11	4-28	8/13/10	Airplanes 41034, 41563 thru 41650, 41652 thru 41800 and 411001 and On.
RC050005-I TR12	2-13	8/13/10	Airplanes 41034, 41563 thru 41650, 41652 thru 41800 and 411001 and On.
RC050005-I TR13	4-28	8/13/10	Airplanes 41034, 41563 thru 41650, 41652 thru 41800 and 411001 and On.
RC050005-I TR14	2-10	11/15/10	Airplanes 41034, 41563 thru 41650, 41652 thru 41800 and 411001 and On. This temporary revision replaces RC050005-I TR08 in its entirety.
RC050005-I TR15	3-27	11/15/10	Airplanes 41034, 41563 thru 41650, 41652 thru 41800 and 411001 and On.
RC050005-I TR16	7-70	11/15/10	Airplanes 41034, 41563 thru 41650, 41652 thru 41800 and 411001 and On. This temporary revision replaces RC050005-I TR09 in its entirety.

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, 2-6, 2-11 to 2-14, 2-18, 2-19, 3-6 to 3-11, 3-21, 3-22, 3-28, 4-6, 4-13 to 4-17, 4-23, 4-30 to 4-37, 5-1, 5-7, 5-12 to 5-38, 6-A1 to 6-A8, 6-B1 to 6-B6, 7-1 to 7-5, 7-9 to 7-14, 7-17, 7-18, 7-23 to 7-72, 8-11, 8-12	See Narrative Discussion of Revisions	--
B	Title Page, iii, vii to xvi, 1-9 to 1-11, 2-4, 2-6, 2-10 to 2-14, 3-16, 3-31, 3-34, 4-2, 4-3, 4-9 to 4-11, 4-13 to 4-18, 4-26 to 4-38, 5-1 to 5-40, 7-23 to 7-29, 7-35, 7-42, 7-44, 7-45, 7-48, 7-49, and 7-56	See Narrative Discussion of Revisions	E. P. Kolano 03-31-06
C	All	See Narrative Discussion of Revisions	Shaun Ripple 21 Nov 2006
D	Title Page, iii, vii to xi, xix, xx, 1-1, 1-20, 2-9, 2-11, 3-9, 4-29, 5-1, 5-43, 5-44, 6A-3 to 6A-18, 6B-1 to 6B-10, 7-1, 7-2, 7-4, 7-7 to 7-9, 7-14, 7-15, 7-29, 7-54 to 7-56,	See Narrative Discussion of Revisions	E.P. Kolano 02-08-07
E	Title Page, iii, vii to xi, xx to xxii, 2-1, 2-17, 3-1, 3-2, 3-12, 3-13, 3-24, 3-26 to 3-28, 4-1, 4-2, 4-5 to 4-15, 4-17 to 4-32, 6A-3 to 6A-18, 6B-1 to 6B-10, 7-1 to 7-4, 7-7 to 7-72	See Narrative Discussion of Revisions	E.P. Kolano 05-31-07
F	Title Page, iii, vii to xi, xxi, xxii, 1-4, 1-5, 2-1, 2-5, 2-8 to 2-12, 2-15, 2-18, 4-1, 4-2, 4-6, 4-7, 4-9 to 4-15, 4-17 to 4-34, 5-19 to 5-32, 5-34, 5-35, 6-13, 7-2 to 7-4, 7-21, 7-27, 7-31 to 7-34, 7-37, 7-45 to 7-47, 8-4, 8-5	See Narrative Discussion of Revisions	Jeffrey A. Morfitt 09-24-07

Normal Revision No.	Revised Pages	Description of Revision or Referenced Narrative Discussion Pages	Approved By Date
G	Title Page, iv, vii to xxiv, 2-1, 2-10 to 2-24, 3-19, 3-26, 5-3, 6-1, 6-2, 6-13, 6A-3 to 6A-18, 6B-1 to 6B-10, 7-2 to 7-4, 7-21 to 7-26, 7-32 to 7-34, 7-48, 7-59, 7-61, 7-67 to 7-69, 8-4	See Narrative Discussion of Revisions	Jeffrey A. Morfitt ANM-1005 11-09-07
H	All	See Narrative Discussion of Revisions	Luann Abrams 12/07/07
I	All	See Narrative Discussion of Revisions	Shaun Ripple 11/14/07

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

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LIST OF EFFECTIVE PAGES			
Reissue		Added Pages	
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INTRODUCTION PAGES			
Title	I	xxv	I
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vii	I		
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ix	I		
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3-14	I		
3-15	I		
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4-19	I		
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Reissue		Added Pages	
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5-21	I		
5-22	I		
5-23	I		
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5-29	I		
5-30	I		
5-31	I		
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5-33	I		
5-34	I		
5-35	I		
5-36	I		
5-37	I		
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SECTION 6 (Weight & Balance)			
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Reissue		Added Pages	
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Weight & Balance (Appendix B) Installed Equipment List			
6B-1	I	6B-11	I
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SECTION 7 (Description of Airplane & Systems)			
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LIST OF EFFECTIVE PAGES			
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7-34	I		
7-35	I		
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7-37	I		
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7-41	I		
7-42	I		
7-43	I		
7-44	I		
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7-48	I		
7-49	I		
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SECTION 8 (Handling, Servicing & Maintenance)			
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SECTION 9 (Supplements)			
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NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	Page No.	Comment
-	All	Initial revision.
A	Title Page, iii, vii through xvi	Revised to indicate Revision A. Revised LOEP. Revised Narrative Discussion of Revisions.
A	2-6	Revised Figure 2-3.
A	2-11 through 2-14	Added approach operation limitation at propeller RPM of approx. 1800. Added VOR and VAPP mode limitation to the Garmin GFC 700 Automatic Flight Control System Limitations section. Repaginated pages.
A	2-18 and 2-19	Revised compass placard. Added panel light dimmer placard. Repaginated pages.
A	3-2	Revised Table of Contents.
A	3-6 through 3-12	Changed "Boost" to "Fuel" in the Engine Failure During Climb to Cruise Altitude, Engine Failure During Flight Below 15,000 Ft., Loss of Fuel Pressure or Flow, Engine Failure With Fuel Annunciation Illuminated below 15,000 Ft., and Engine Failure With Fuel Annunciation Illuminated above 15,000 Ft. checklists. Changed "boost" to "fuel", changed "too rich" to "to full rich" in 3.2, and changed "to rich" to "to full rich" and "boost" to "fuel" in the Warning, in the Procedures After an Engine Restart checklist. Changed "Boost" to "Fuel" in the Emergency Landing Without Engine Power, Emergency Landing With Throttle Stuck at Idle Power, Engine Driven Fuel Pump (EDFP) – Partial Failure, and Engine Fire on the Ground During Startup checklists. Changed "EIS" to "System" in the In-flight Cabin Fire checklist.
A	3-17	Changed "engine" to "System" in the Oxygen System Malfunction and Carbon Monoxide Detection checklists.
A	3-21 and 3-22	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.
A	3-28	Changed "engine page" to System page" in the Electrical Problems section. Changed "engine driven boost pump" to "engine driven fuel pump" in the Failure of Engine Driven Fuel Pump section.
A	4-3	Revised Table of Contents.
A	4-6	Revised Item 16 in the Area 1 Preflight Inspection checklist.
A	4-13 through 4-17	Changed "Boost" to "Fuel" in the Before Takeoff, Short Field Takeoff, Normal Climb, Maximum Performance Climb, Cruise, Descent, Before Landing, Short Field Landing, and Balked Landing checklists.
A	4-22 and 4-23	Change "EIS" to "System" in the Engine Starting section. Changed "auxiliary boost pumps are off" to "auxiliary fuel pump is off" in the Over Priming section.

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
A	4-30 through 4-37	Added paragraph directing fuel pump switch be off for descent and landing in the Descent section. Changed "boost" to "fuel" in the Balked Landings section. Added discussion of flat triangular leading edge tape on the wings and zig zag tape on bottom of horizontal tail section to the Stalls section. Revised the last sentence of the first paragraph in the Cold Weather Operations section. Changed "boost pumps" to "fuel pump" in the third paragraph of the Hot Weather Operations section.
A	5-1	Revised Table of Contents.
A	5-7	Revised Figure 5-8 to indicate speeds with flat triangular leading edge tape on the wings.
A	5-12 to 5-38	Added Figure 5-13 for maximum rate of climb with flat triangular leading edge tape on the wings. Renumbered following figures, revised cross references and repaginated pages.
A	6-A1 through 6-A8	Deleted Items 21-23 and 21-24. Deleted model #s and size from Items 34-35, 34-36, and 34-37.
A	6-B1 through 6-B6	Deleted Items 21-23 and 21-24. Deleted model #sand size from Items 34-35, 34-36, and 34-37.
A	7-1 through 7-5	Revised Table of Contents
A	7-9 through 7-14	Moved Aileron Servo Tab section if front of Elevator section. 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. Revised Figure 7-3. Revised Figure 7-4. Changed "on the left side" to "at the front" in the Front Seat Adjustment section.
A	7-17 and 7-18	Revised 2nd paragraph of the Baggage Door section. Changed "clockwise" to "inboard", and deleted "90° counterclockwise or" in the Parking Brake section.
A	7-23 through 7-72	Added Baro-correction Warning note and AHRS Warning note to the Garmin G1000 Integrated Cockpit System section. Added MFD Map Scale, MFD Holding Pattern Depiction, and VOR Frequency Display in the MFD section. 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. Added AFCS Alerts, TAWS Alerts, and TAWS System Status Annunciations

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
		and Other Annunciations sections. Revised the Backup Attitude Indicator section. Revised description of the Kollsman Window in the Backup Altimeter section. Changed "MFD EIS page" to "MFD" in the 2nd paragraph, and to "MFD System page" in the 3rd paragraph of the Fuel Quantity Indication section. Revised Figure 7-14 and renumbered it to Figure 7-15. Changed "MFD EIS page" to "MFD System page" in the Fuel Selector section. 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 paragraph of the Environmental Control System section. Revised location of the avionics master switch in the Avionics Master Switch paragraph of the Electrical System section. Revised switch operation in the Overhead Reading Lights and Instrument Flood Bar sections. Revised Lower Instruments, Circuit Breaker and Master Switches Panels section. Revised the Flaps Panel and 5 Pack Switches (Press-to-Test PTT) section and renamed it to Press-to-Test PTT Button. 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. Added Preflight Testing and changed "EIS page" to "System page" 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. Added Warnings about use of GPS autopilot mode in the terminal area and G1000 inability to command the autopilot to fly procedure turns or holding patterns automatically, revised CWS (Control Wheel Steering) Button paragraph, and added additional information to the GA (Go Around) Button paragraphs in the Garmin GFC 700 Automatic Flight Control System section. Repaginated pages and revised cross references. Added pages 7-67 through 7-72.
A	8-11 and 8-12	Revised Figure 8-4. Repaginated pages.

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
B	Title Page, iii, vii through xvi	Revised to indicate Revision B. Revised LOEP. Revised Narrative Discussion of Revisions.
B	1-9 to 1-11	Revised "Limit Load" to "Limit Load Factor", "Ultimate Load" to "Ultimate Load Factor" and revised those definitions. Repaginated pages.
B	2-1	Revised Table of Contents.
B	2-4	Revised Figure 2-2.
B	2-6	Revised Figure 2-3.
B	2-10 to 2-14	Revised software version table in No. 1, Changed "G10000" to G1000" in No. 4, changed ", flight director or manual electric trim" to "or flight director" and added "PFT" annunciation description in No. 6, and changed autopilot maximum and minimum engagement speeds from "TBD" to "210" and "80" (respectively) in No. 10 of the Garmin G1000 System Limitations section. Added explanation of automatic switching caution to no. 2 and removed paragraph no. 3 of the Approach Operation Limitations in the Garmin G1000 System Limitations section. Changed "14 CFR Part 121 or Part 135" to "14 CFR Part 135" in paragraph 2 in the GTX Mode S Transponder Limitations section. Revised the Garmin GFC 700 Automatic Flight Control System Limitations section. Changed "PA" to "(Pressure Altitude)", added oxygen system operation verification Warning, and expanded the lipstick/chapstick Warning in the Oxygen Limitations section. Expanded Leading Edge Devices paragraph under the Other Limitations section. Repaginated pages.
B	3-16	Revised Items Unavailable with a Bus Failure table.
B	3-31	Revised Figure 3-5.
B	3-34	Changed Note regarding failures in breathing stations, cannulas, masks and flow meters to a Warning.
B	4-2 and 4-3	Revised Table of Contents.
B	4-9 to 4-18	Revised the Before Starting Engine, Starting Cold Engine, Starting Hot Engine, After Engine Start, and Crosstie Operation checklists. Revised the Warning in the Autopilot Autotrim Operations checklist. Added Warning to verify oxygen system operation to the Before Takeoff checklist. Revised the Normal Takeoff checklist. Repaginated pages.
B	4-26 to 4-38	Added Oxygen System paragraph to the Before Takeoff section. Added paragraph on ILS approaches to the Approach section. Added Oxygen System paragraph to the Landings section. Added "The maximum demonstrated crosswind component for takeoff is 23 knots." to the Crosswind Takeoff paragraph under the Takeoffs section. Added maximum demonstrated crosswind component for landing is 23 knots to the Crosswind Landings paragraph under the Landings section. Repaginated pages

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
B	5-1 to 5-40	Revised Table of Contents. Revised Figure 5-11. Changed section title "Takeoff Speed Schedule" to "Short Field Takeoff Speed Schedule" and revised section. Changed title of Figure 5-12 to "Maximum rate of Climb Without Flat Triangular Leading Edge Tape On The Wings". Replaced Figure 5-14. Added Figure 5-15. Renumbered following figures and revised cross references. Added statement that cruise performance is not affected by the flat triangular leading edge tape. Added pages 5-29 and 5-30.
B	7-23 to 7-29	Changed first Warning to Note in the Garmin G1000 Integrated Cockpit System section. Revised the Alerts Window paragraph under the Annunciation and Alerts section. Changed all occurrences of "Columbia 350/400" to "Columbia 400".
B	7-35	Replaced Figure 7-14.
B	7-42	Deleted rudder hold from the Left Bus paragraph.
B	7-44 and 7-45	Revised Figure 7-17 and Figure 7-18.
B	7-48 and 7-49	Added Note to the Stall Warning System section that audio entertainment is inhibited automatically when the stall horn is active.
B	7-56	Expanded the lipstick/chapstick Warning in the Breathing Devices (Masks and Cannulas) paragraph under the Precise Flight Fixed Oxygen System section.
C	All	Reformatted entire manual to 5.5 x 8.5. Page numbers indicated for Revision Level C were made prior to reformatting of the manual; refer to Rev. B manual to compare changes.
C	Title Page, iii, vii through xx	Revised Title Page to indicate Revision C. Revised LOEP. Revised Narrative Discussion of Revisions.
C	2-6	Revised Figure 2-3.
C	2-7	Revised the Maximum Empty Weight from 2748 lbs. to 2708 lbs.
C	2-18	Revised compass placard.
C	3-1 to 3-3	Revised Table of Contents.
C	3-6 to 3-34	Revised Emergency Procedure checklists to delete excess or redundant information, and standardize terminology. Changed "Engine Failure During Flight Above 15,000 FT." to "Engine Failure During Flight" under the High Altitude Negative G Loading section. Changed "Emergency Landing Without Engine Power" to "Forced Landing (Engine Out or Partial Power)" in the Engine Does Not Restart, High Oil Temperature and Low Oil Pressure sections. Revised the 3rd and 4th paragraphs under the Emergency Backup Fuel Pump section. Changed cross reference to "page 3-4, Engine Failure During Flight" in the Failure of Turbocharger section. Revised the Under Voltage section. Revised the last sentence in the Master Switches section. Revised the Circuit Breaker Panel section. Revised the location of the static air

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
		source switch under the Static Air Source Blockage section. Revised the bullet list in the first paragraph of the Oxygen System section. Repaginated pages. Deleted pages 3-35 and 3-36.
C	4-1 to 4-3	Revised Table of Contents.
C	4-6 to 4-38	Revised Normal Procedures checklists to delete excess or redundant information, and standardize terminology. Revised the Over Priming paragraph under 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. Revised the 3rd paragraph under the Engine Runup section. Changed "is less than 35.5" to "is at or below 35.5" in the Takeoffs section. Revised the Mixture Settings paragraph under the Cruise section. Revised the Crosswind Landings section. Changed "106" to "95" in the Balked Landings section. Changed "1650" to "1625" in the Control by Turbine Inlet Temperature (TIT) section. Referenced Figure 5-11 in the Short Field Takeoff Section. Deleted the 2nd to last sentence of the first paragraph of the Power Settings paragraph and changed "rocker switch" to "switch" in the vapor Suppression paragraph under the Normal and Maximum Performance Climbs section.. Revised the first sentence in the Descent section. Revised the 3rd paragraph under the Hot Weather Operations section. Revised location of the blue dots in the Fuel Selector section. Deleted the 2nd paragraph under the Engine Starting section. Revised the first paragraph of the Glideslope Flight Procedure with Autopilot section. Repaginated pages.
C	5-10	Changed "landing performance chart" to "takeoff performance chart" in Figure 5-10.
C	5-14 and 5-15	Revised Figure 5-14 and Figure 5-15.
C	5-31	Revised the Lean of Peak Engine Operation section.
C	6-1	Revised Table of Contents.
C	6-4 to 6-20	Added Caution and example regarding specific weight of Aviation Gasoline. Revised Figure 6-3. Deleted indication of an optional restraint system from the Baggage Nets section. Revised the Maximum Empty Weight section. Revised Figure 6-20. Repaginated pages and added pages 6-19 and 6-20.
C	6A-1 to 6A-8	Changed "five through eight" to "four through seven" in the Flight Operation Requirements on the first page. Added optional Oregon Aero seats, Artex ELT ME406, electrically driven compressor, interlock assembly, and accessories alternator. Indicated IFR for Items 34-10 and 34-17.
C	6B-1 to 6B-6	Added optional Oregon Aero seats, Artex ELT ME406, electrically driven compressor, interlock assembly, and accessories alternator. Revised POH/AFM weight. Revised GTX 33 weight.
C	7-1, 7-3 to 7-6	Revised Table of Contents.
C	7-8	Revised the description of the wing cuffs in the Wings and Fuel Tanks section.

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
C	7-13	Changed "dimmer thumb-wheel" to "dimmer" in the Wing Flaps section.
C	7-15 and 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.
C	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.
C	7-30 to 7-33	Revised the description of the OXYGEN PRES message. Revised the description of the LOW MAN PRES message. Replaced chart under the AFCS Alerts section, TAWS Alerts section, and TAWS System Status Annunciations section.
C	7-39	Changed L-LOW FUEL" to "L LOW FUEL" in the Fuel Low Annunciation Messages section. Revised the first paragraph of the Backup Fuel Pump and Vapor Suppression section.
C	7-46 to 7-49	Revised the Upper Instruments, and the Lower Instruments, Circuit Breaker, and Master Switches Panels sections. Deleted the first sentence of the second paragraph of the Press-to-Test PTT Button section. Revised the first sentence of the airplane Exterior Lighting System section. Revised Figure 7-19. Repaginated pages.
C	7-52 to 7-76	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 softkey" to "reset softkey" 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. Indicated engine driven or electrically driven compressor. 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. 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 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. Repaginated pages. Added pages 73 to 76
C	8-8 and 8-9	Revised Figure 8-3. Revised the Oxygen System Servicing section.
D	Title Page, iii, vii to xi, xiii to xx	Revised administrative pages.
D	1-1	Revised Table of Contents.
D	1-20	Added atmospheric pressure relationships Figure 1-17.
D	2-9	Revised paragraph 3.b. under the Garmin G1000 System Limitations section.
D	2-11	Added A5 Flowmeters to the Oxygen Limitations section.
D	3-9	Revised step 5 in the Spin Recovery procedure.

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
D	4-29	Changed "as soon as possible" to "after the spin rotation has stopped" in the 4th paragraph and in the Warning note of the Spins section.
D	5-1	Revised Table of Contents.
D	5-43 and 5-44	Added Figure 5-38 for A5 Flowmeter and revised Figure 5-37. Revised cross references.
D	6A-3 to 6A-18	Added Item 52-01 Remote Keyless Entry System to the Equipment for Types of Operation List. Revised Item 34-36. Changed shaded blocks to check marks.
D	6B-1 to 6B-10	Added Item 52-01 Remote Keyless Entry System to the Installed Equipment List.
D	7-1, 7-2 and 7-4	Revised Table of Contents.
D	7-7 to 7-9	Added description of rudder pedal connector on some aircraft allowing two rudder pedal positions to the end of the Rudder paragraph.
D	7-14 and 7-15	Added paragraph for description of the remote keyless entry system.
D	7-29	Revised Elevator Mistrim Up and Down, and Aileron Mistrim Left and Right in the AFCS Alerts table.
D	7-54 to 7-56	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.
E	Title Page, iii, vii to xi, xx to xxii	Revised administrative pages.
E	2-1	Revised Table of Contents
E	2-17	Indicated "(when air conditioning is installed)" for the Air Conditioning System Bay Access Cover placard.
E	3-1 and 3-2	Revised Table of Contents.
E	3-12 and 3-13	Added Malfunction of Rudder Hold System emergency procedure. Changed "75" to "50" in the Carbon Monoxide Detection procedure Note.
E	3-24	Revised Figure 3-5.
E	3-26 to 3-28	Added Rudder Hold System to page 3-26. Repaginated following pages.
E	4-1 and 4-2	Revised Table of Contents.
E	4-5 to 4-15	Added item 16 Induction Heated Air to Area 1 of the Preflight Inspection procedure. Added item 7 Rudder Hold to the After Engine Start procedure. Added Rudder Hold System Operations normal procedure to page 10. Repaginated pages.
E	4-19 to 4-32	Added description of the battery charging circuit to page 4-19. Added Rudder Hold to page 4-32. Repaginated following pages. Revised cross references.
E	6-A3 to 6-A18	Revised 24-04 and added 24-05 to 24-07 Battery, 28 Volt. Added 27-05 Rudder Hold Assembly and 33-08 to 33-11 Precise Flight Landing and Taxi Lights.

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
E	6-B1 to 6-B10	Revised 24-04 and added 24-05 to 24-07 Battery, 28 Volt. Added 27-05 Rudder Hold Assembly and 33-08 to 33-11 Precise Flight Landing and Taxi Lights.
E	7-1 to 7-4	Revised Table of Contents.
E	7-7 to 7-72	Added Rudder Hold System description. Deleted The Control Lock section. Added RUDR HOLD annunciation to the Annunciation Advisory section on page 7-29. Added Battery Charging Circuit description to page 7-41. Revised Figure 7-17. Revised two occurrences of "75" to "50" in the CO Guardian Carbon Monoxide Detector section on pages 7-58 and 7-59. Added interlock assembly and pre-cooling using ground power to the general description of the Automatic Climate Control System section. Repaginated pages and added pages 7-71 and 7-72.
F	Title Page, iii, vii to xi, xxi, xxii	Revised administrative pages.
F	1-4 and 1-5	Revised Total Fuel Capacity section. Repaginated pages.
F	2-1	Revised the Table of Contents.
F	2-5	Revised the Fuel Quantity row in Figure 2-3.
F	2-8 to 2-12	Revised Total Fuel Capacity section. Added Item 12. Flight Plan WARNING note to page 2-10. Added SafeTaxi limitations to page 2-10. Revised Figure 2-7. Repaginated pages.
F	2-15	Revised the Engraved On Fuel Selector Knob and Upper Plate placard.
F	2-18	Revised the Near Fill Cap of Fuel Tank placard.
F	4-1 and 4-2	Revised the Table of Contents.
F	4-6 and 4-7	Added ", bushing in place" to Item 2 under Area 5 of the Preflight Inspection checklist. Deleted Item 3 of the Before Starting Engine checklist and renumbered the following items.
F	4-9 to 4-15	Added Item 1 and Item 14 regarding Air Conditioning to the Crosstie Operation checklist. Deleted the Rudder Hold System Operations checklist and distributed the procedures to the Before Takeoff (Runup), Normal Climb, Maximum Performance Climb, Cruise, and Before Landing checklists. Changed "65%" to "75%" in Item 3 Mixture under the Cruise procedure and renumbered it to Item 4. Repaginated pages.
F	4-17 to 4-34	Revised the Fuel Quantity section. Added a NOTE regarding the Press-to-Test button to the end of the Rudder Hold System section. Added pages 33 and 34.
F	5-19 to 5-32	Revised the Cruise Performance tables.
F	5-34 and 5-35	Changed "Full Fuel Tanks" to "Fuel Tanks Filled To" under conditions in Figure 5-31 and Figure 5-32.
F	6-13	Revised the Fuel row and footnote in Figure 6-12.

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
F	7-2 to 7-4	Revised the Table of Contents.
F	7-21, 7-27, and 7-31	Indicated reference to "the latest revision" of the Garmin G1000 Cockpit Reference Guide. Also changed "190-00567-00" to "190-00567-01". Changed "400" to "350/400".
F	7-31 to 7-34	Added SmartView, FliteCharts, and SafeTaxi descriptions.
F	7-37	Revised the Fuel Low Annunciation Messages section.
F	7-45 to 7-47	Added description of rudder hold function when the Press-to Test Button is pressed to the Press-to Test PTT Button section.
F	8-4 and 8-5	Revised the Fuel Capacities under the Fuel Servicing section.
G	Title Page, iv, vii to xxiv	Revised administrative pages.
G	2-1	Revised Table of Contents.
G	2-10 to 2-24	Added Wide Area Augmentation System (WAAS) Limitations section. Repaginated pages. Added pages 2-23 and 2-24.
G	3-19	Changed "right bus" to "essential bus" in the first sentence of the last paragraph of the Trim Tab Malfunctions section.
G	3-26	Added 90 to 110 KIAS airspeed to the Rudder Hold System section.
G	5-3	Corrected the revision level/date in the footer.
G	6-1 and 6-2	Revised the Table of Contents.
G	6-13	Corrected the revision level/date in the footer.
G	6A-3 to 6A-18	Added 34-02 GA 35 GPS Antenna, 34-03 GA 37 GPS and XM Satellite Radio Antenna, and 34-25 GDU 1044 MFD with connector. Renumbered following Item Nos. Changed "GIA 63" to "GIA 63/GIA 63W" in Item Nos. 34-23, 34-24, and 34-25, and renumbered them to 34-26, 34-27, and 34-28.
G	6B-1 to 6B-10	Added 34-02 GA 35 GPS Antenna, 34-03 GA 37 GPS and XM Satellite Radio Antenna, and 34-25 GDU 1044 MFD with connector. Renumbered following Item Nos. Changed "GIA 63" to "GIA 63/GIA 63W" in Item Nos. 34-23, 34-24, and 34-25, and renumbered them to 34-26, 34-27, and 34-28.
G	7-2 to 7-4	Revised Table of Contents.
G	7-21 to 7-26	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.
G	7-32 to 7-34	Added Wide Area Augmentation System (WAAS) section. Repaginated pages.
G	7-48, 7-59, and 7-61	Indicated reference to "the latest revision" of the Garmin G1000 Cockpit Reference Guide. Also changed "190-00567-00" to "190-00567-01".

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
G	7-67 to 7-69	Indicated reference to "the latest revision" of the Garmin G1000 Cockpit Reference Guide. Also 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.
G	8-4	Changed "190-00567-00" to "190-00567-01" in the Customer Delivery Package table.
H	All	Removed all occurrences of Columbia, Columbia Aircraft Manufacturing Corporation, etc. and replaced with Cessna as applicable. Repaginated pages.
I	All	Deleted the Cessna logo from the header of all interior pages. Distribution to customers not required.
I	Title Page, iv, vii to xxvi	Revised administrative pages.
I	1-2	Revised Figure 1-1 to indicate horizontal stabilizer span is 14.1 ft.
I	2-7	Deleted statement related to gyros under the Approved Acrobatic Maneuvers section.
I	2-19	Indicated that the Under All Seats placard is not required under Oregon Aero seats. Revised the On Bottom of Baggage Compartment Door Joggle and On Oxygen Fill Port Set into Hat Shelf placards.
I	2-23	Added Jack Point placard.
I	3-1 and 3-2	Revised the Table of Contents.
I	3-8 to 3-30	Revised the Electrical Fire in Flight and the Cabin Fire in Flight checklists. Revised the Oxygen System Malfunction checklist. Added the Starter Motor Engaged in Flight checklist. Revised Figure 3-2. Indicated "trim" actuator motor in the last paragraph under the Trim Tab Malfunctions section. Added the Starter Motor Engaged in Flight paragraph to the Amplified Emergency Procedures section. Changed the title of the Rudder Hold System section to "Rudder Hold System (Optional)". Added pages 3-29 to 3-30.
I	4-1 and 4-2	Revised the Table of Contents.
I	4-3	Revised Figure 4-1.
I	4-4	Revised item 9 under Area 1 of the Preflight Inspection checklist from "CHECK" to "CHECK ON".
I	4-9 and 4-10	Deleted item 7 under the After Engine Start checklist. Revised item 1 and 14 under the Crosstie Operation checklist. Revised the Autopilot Autotrim Operations checklist. Added item 5 Rudder Hold to the Before Taxi checklist. Revised item 3 and 4 under the Taxiing checklist.
I	4-13	Revised item 4 under the Cruise checklist.
I	4-22	Revised the first paragraph under the Taxiing section.
I	4-24	Added Climb paragraph. Revised the last sentence in the Best Rate of Climb Speeds paragraph. Deleted the last sentence in the Cruise Climb paragraph. Revised the Caution statement.

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
I	4-25	Revised the Control by Turbine Inlet Temperature (TIT) paragraph for rich of peak and lean of peak operation. Added "full power" to the first Caution paragraph.
I	4-26 to 4-34	Added paragraph discussing cylinder and cylinder head fatigue after the first paragraph in the Descent section. Added CAUTION and explanation about use of rapid forward stick movement with flaps fully extended at forward cg. Changed "problems" to "difficulties" and "problem" to "condition" in the Hot Weather Operations section. Added section Engine Operation for Maximizing Exhaust Life. Changed title of the Rudder Hold System section to "Rudder Hold System (Optional)" and added statement about the shear pin to the NOTE. Repaginated pages.
I	5-1	Revised the Table of Contents.
I	5-33	Revised the Lean of Peak Engine Operation section. Extended the lean of peak curve in Figure 5-30. Added NOTE for Figure 5-30.
I	5-43 to 5-46	Added Figure 5-38 and Figure 5-40, oxygen duration charts for aircraft S/N 411125 and on. Added pages 5-45 and 5-46.
I	6A-1	Deleted the statement on headsets as optional items.
I	6A-3 to 6A-18	Added Item No. 25-31 Rosen Sunvisor. Added Item Nos. 35-09 and 35-10 for the new O2 bottle.
I	6B-1 to 6B-12	Added Item No. 25-31 Rosen Sunvisor. Added Item Nos. 35-09 and 35-10 for the new O2 bottle. Added pages 6B-11 and 6B-12.
I	7-1, 7-2 and 7-4	Revised the Table of Contents.
I	7-16	Deleted the Step (Not Installed) paragraph. Revised the Handles paragraph. Deleted "red lettered" from the Parking Brake paragraph.
I	7-37	Deleted "with red letters" and "with "amber letters". From the Backup Fuel Pump and Vapor Suppression section.
I	7-45	Revised the last sentence in the first paragraph under the Press-to-Test PTT Button section.
I	7-54 to 7-57	Revised and repaginated section to add description of new Oxygen cylinder.
I	7-58	Deleted Item 3 Automatic Stowage Due to Stall Warning Activation from the Precise Flight Speedbrake 2000 System section.
I	7-67	Changed "Service Center" to "Service Station" in the General Hints for ACCS Operation list.
I	7-69 to 7-72	Added description of VNV Key. Revised Figure 7-32. Deleted pages 7-71 and 7-72.

NARRATIVE DISCUSSION OF REVISIONS		
Revision Level	**Page No.**	**Comment**
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.

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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 (±)	2500 lbs. (1134 kg)
Gross Weight	3600 lbs. (1633 kg)
Stall Speed	59 KIAS 60 KCAS
Maneuvering Speed	158 KIAS 162 KCAS
Cruising Speed	181 KIAS 185 KCAS
Never Exceed Speed	230 KIAS 235 KCAS
Engine	310 HP Continental TSIO-550-C
Propeller	Hartzell 78 in. (198 cm) Constant Speed
Governor	McCauley

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

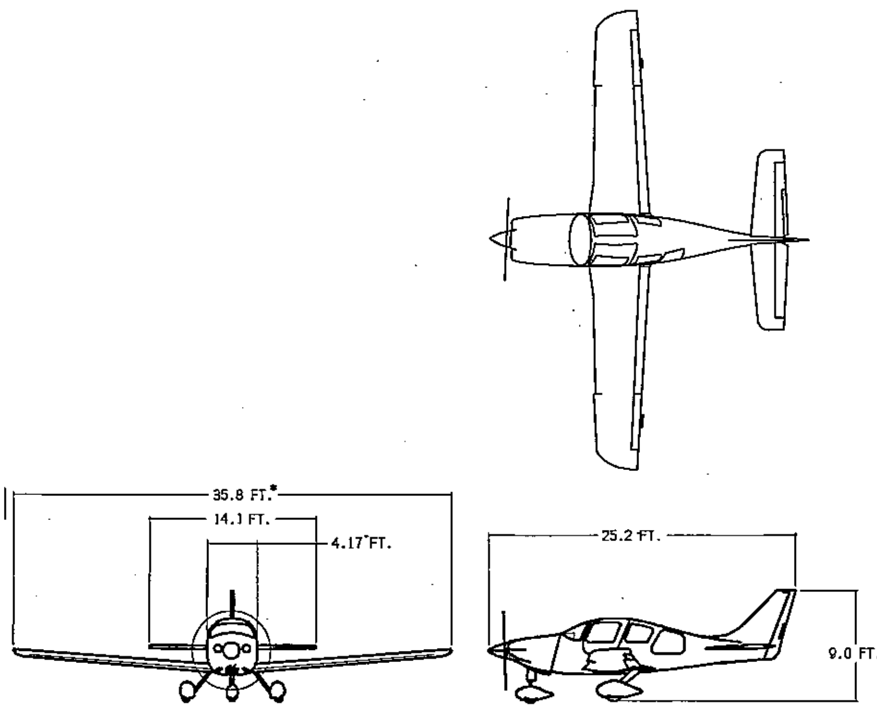

Figure I - 1

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: TSIO-550-C
Engine Type: Twin-turbocharged, direct drive, air-cooled, horizontally opposed, fuel-injected, six-cylinder engine with 552 in.^{3} (9.0 L) displacement
Takeoff Power: 310 BHP at 2600 RPM , 35.5 in of Hg
Maximum Continuous Power: 310 BHP at 2600 RPM
Maximum Normal Operating Power: 262 BHP (85%) at 2500 RPM, and 33.5 in of Hg
Maximum Climb Power: 310 BHP at 2600 RPM
Maximum Cruise Power: 262 BHP at 2550 RPM

PROPELLER

Propeller Manufacturer: Hartzell
Propeller Hub and Blade Model Number: HC-H3YF-1RF and F7693DF
Number of Blades: 3
Propeller Diameter: 77 in. (196 cm) minimum, 78 in. (198 cm) maximum
Propeller Type: Constant speed and hydraulically actuated, with a low pitch setting of 16.5° ± 0.2° and a high pitch setting of 42.0° ± 1.0° (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 US (401 L)

Total Capacity Each Tank: 53 Gallons US (201 L)
Total Usable Fuel:
S/N 41501 to 41799
49 Gallons US (186 L)/tank, 98 Gallons US (371 L) Total
S/N 41800 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) – Non-dispersant mineral oil conforming to SAE J1966 shall be used during the first 25 hours of flight operations. However, if the engine is flown less than once a week, a straight mineral oil with corrosion preventative MIL-C-6529 for the first 25 hours is recommended.

Specification or Oil Grade (after 25 engine hours) – Teledyne Continental Motors Specification MHS-24. 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, or 20W50

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:	3600 lbs. (1633 kg)
Takeoff Weight:	3600 lbs. (1633 kg)
Landing Weight:	3420 lbs. (1551 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 2500 lbs. (1134 kg).

Maximum Useful Load: 1100 lbs.* (499 kg)
*(The useful load varies for each airplane. Please see Section 6 for specific details.)

CABIN AND ENTRY DIMENSIONS

Maximum Cabin Width: 48.17 inches (122 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: 25.50 lbs./sq. ft
Power Loading: 11.61 lbs./hp

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 (59°F) 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.
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	Small triangular strips installed along the leading edge of an airplane wing to disrupt the airflow at high angles of attack in a controlled way. The strips improve stall characteristics and spin recovery.
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.
TIT Gauge	The *Turbine Inlet Temperature* indicator is the instrument used to identify the lean fuel flow mixtures for various power settings.
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 TERMINOLOGY

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.

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

Section 2
Limitations

INTRODUCTION

Section 2 contains the operating limitations of this airplane. The Federal Aviation Administration 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 3600 lbs (1633 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 2600 Pounds Gross Weight 2600 Pounds Gross Weight @ FL250 3600 Pounds Gross Weight 3600Pounds Gross Weight @ FL250. *Decrease 3 knots for each 1000 ft. above 12,000 feet (Press. Alt.)	 138* 96 162* 123	 135* 93 158* 120	Do not apply full or abrupt control movements above this speed.
V_{FE}	Maximum Flap Extended Speed (Down or 40° Flap Setting) *Decrease 2.4 knots for each 1000 ft. above 12,000 feet (Press. Alt.)	120*	117*	Do not exceed this speed with full flaps. Takeoff flaps can be extended at 130 KCAS (127 KIAS). Do not use flaps above 14,000 ft.
V_{NO}	Max. Structural Cruising Speed Max. Structural Cruising Speed @ FL250 *Decrease 3.5 knots for each 1000 ft. above 12,000 feet (Press. Alt.)	185* 140	181* 137	Do not exceed this speed except in smooth air and then only with caution.
V_{NE}	Never Exceed Speed Never Exceed Speed @ FL250 *Decrease 4.4 knots for each 1000 ft. above 12,000 feet (Press. Alt.)	235* 178	230* 174	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 backup airspeed indicator has four colored arcs on the outer circumference. The meaning and range of each band and arc is tabulated in Figure 2 - 2.

MARKING	KIAS VALUE OR RANGE	SIGNIFICANCE
White Band/Arc	60 – 117*	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 Band/Arc	73 – 181*	Normal Operating Range - Lower limit is maximum weight stalling speed with flaps retracted. Upper limit is maximum structural cruising speed.
Yellow Band/Arc	181 – 230*	Operations must be conducted with caution and only in smooth air.
Red Line	230*	Maximum speed for all operations

*Decrease the airspeed shown on the backup airspeed indicator by amount listed in Figure 2 - 1 for each 1000 ft. above 12,000 ft. (Pressure Altitude). The PFD displays corrected airspeed automatically.

Figure 2 - 2

POWERPLANT LIMITATIONS

Number of Engines: One (1)
Engine Manufacturer: Teledyne Continental
Engine Model Number: TSIO-550-C
Recommended Time Between Overhaul: 2000 Hours (Time in Service)
Maximum Power: 310 BHP at 2600 RPM
Maximum Manifold Pressure: 35.5 inches of Hg
Minimum Power Setting Above 18,000 ft.: 15 inches of Hg and 2200 RPM
Maximum Recommended Cruise: 262 BHP (85%)
Maximum Cylinder Head Temperature: 460°F (238°C)
Maximum Turbine Inlet Temperature: 1750°F (954°C)/1850°F (1010°C) for 30 sec.

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, or 20W50

Oil Temperature

Maximum Allowable: 240°F (116°C)
Recommended takeoff minimum: 100°F (38°C)
Recommended flight operations: 170°F to 220°F (76.7°C to 104.4°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

Normal Operations: 13 to 25 GPH (49 to 95 LPH)
Idle, minimum: 2 to 3 GPH (7 to 11 LPH)
Maximum allowable: 38.5 GPH (146 LPH)

Vapor Suppression

Required Usage:

- The Vapor Suppression rocker switch is required to be on above 18,000 ft.
- The Vapor Suppression rocker switch must be turned ON if TIT is rising above 1460°F at full power with the mixture full rich (at any altitude). Vapor suppression may be turned off below 18,000 ft if power has been reduced below 85% and engine temperatures have stabilized.

TEMPORARY REVISION FOR CESSNA PILOT'S OPERATING HANDBOOK
AND FAA APPROVED AIRPLANE FLIGHT MANUAL

Publication Affected:	Model 400 (LC41-550FG) basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual RC050005, Revision I, dated 22 October 2008.
Airplane Serial Numbers Affected:	Airplanes 41034, 41563 through 41650, 41652 through 41800, and 411001 and On.
Description of Change:	Section 2, Limitations, Powerplant Instrument Markings, Page 2-5, revise the Tachometer row of Figure 2-3.
Filing Instructions:	Insert this temporary revision in the Model 400 (LC41-550FG) basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual adjacent to page 2-5.
Removal Instructions:	This temporary revision must be removed and discarded when Revision J has been collated into the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

In Section 2, Limitations, Page 2-5, revise Figure 2-3 as follows:

INSTRUMENT	RED LINE Minimum Limit	YELLOW RANGE Warning	WHITE RANGE Limited Time Operations	GREEN RANGE Normal Operating	RED LINE Limit
Tachometer	N/A	N/A	2500 – 2600 RPM	2000 – 2500 RPM	2600 RPM

APPROVED BY [signature]

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

DATE OF APPROVAL 6-2-09

POWERPLANT INSTRUMENT MARKINGS

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

INSTRUMENT	RED LINE Minimum Limit	YELLOW RANGE Warning	WHITE RANGE Limited Time Operations	GREEN RANGE Normal Operating	RED LINE Limit
Tachometer	Minimum for idle 600 RPM	N/A	2500 – 2600 RPM	2000 – 2500 RPM	2600 RPM
Manifold Pressure	N/A	N/A	33.5 – 35.5 In. of Hg	15 – 33.5 In. of Hg (No Placard)	35.5 In. of Hg
Oil Temperature	Minimum for takeoff 100°F* (38°C)	220°F – 240°F (104°C – 116°C)	100°F – 170°F (38°C – 77°C)	170°F – 220°F (77°C – 104°C)	240°F (116°C)
Oil Pressure	Minimum for idle 10 psi	N/A	10 – 30 psi and 60 – 100 psi	30 – 60 psi	100 psi (Cold Oil)
Fuel Quantity	A red line at "zero" indicates the remaining four gallons (S/N 41501 to 41799), or two gallons (S/N 41800 and on), in each tank cannot be used safely in flight.	N/A	N/A	N/A	N/A
Fuel Flow				10 – 25 GPH (38 – 83 LPH)	40 GPH (151 LPH)
Cylinder Head Temperature	N/A	100°F – 240°F (38°C – 116°C) 420°F – 460°F (216°C – 238°C)	N/A	240°F – 420°F (116°C – 216°C)	460°F (238°C)
Turbine Inlet Temperature	N/A	1650°F – 1750°F (538°C – 954°C)	N/A	1000°F – 1650°F (538°C – 899°C)	1750°F (954°C) (1850°F (1010°C) for 30 sec. limit)*

* These temperatures or pressures are not marked on the gauge. However, it is important information that the pilot must be aware of.

Figure 2 - 3

PROPELLER DATA AND LIMITATIONS

Number of Propellers: 1
Propeller Manufacture: Hartzell
Propeller Hub and Blade Model Numbers: HC-H3YF-1RF and F7693DF

Propeller Diameters
Minimum: 77 in. (196 cm)
Maximum: 78 in. (198 cm)
Propeller Blade Angle at 30 inch Station
Low: 16.5° ± 0.2°
High: 42.0° ± 1.0°

WEIGHT LIMITS

	Utility Category
Maximum Ramp Weight:	3600 lbs. (1633 kg)
Maximum Empty Weight:	2708 lbs. (1228 kg)
Maximum Takeoff Weight:	3600 lbs. (1633 kg)
Maximum Landing Weight:	3420 lbs. (1551 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 diagram 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	105 inches and 2600 lbs.	112 inches and 2900 lbs.	Straight Line
Maximum Zero Fuel Weight	107.2 inches and 3300 lbs.	112 inches and 3300 lbs.	Straight Line

Reference Datum: The reference datum is located one inch aft of 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	105 inches at 2600 to 2900 lbs. 108.8 inches at 3600 lbs.	112 inches 2900 to 3600 lbs.	Straight Line

Reference Datum: The reference datum is located one inch aft of 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).

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 intentional spinning of the aircraft is prohibited. Flight tests have shown that the aircraft will recover from a one turn spin in less than one additional turn after the application of recovery controls for all points in the weight and balance envelope, up to the maximum certified altitude. The recommended recovery inputs are: power idle, rudder full against the spin, elevator full forward and aileron full against the spin. If the flaps are extended, they should be retracted after the spin rotation is stopped to avoid exceeding the flap speed limit during pull out. When rotation stops, the aircraft will be in a steep nose down attitude. Airspeeds up to 160 KIAS are possible during a 3 g pull out. Above 126 KIAS it may be possible to pull more than 3.7 g's in light weight conditions. Care should be taken, under such conditions, to avoid overstressing the airframe. A steady state spin may be encountered if pro-spin control inputs are held for 1 ½ turns or more. Steady state spins entered above 20,000 feet at heavy weight and aft CG conditions will take the most turns to recover. If a steady state spin is entered, making and holding the recommended recovery inputs will produce the fastest recovery.

WARNING

The intentional spinning of the aircraft is prohibited.

WARNING

If a spin is entered with the flaps extended, they should be retracted after the spin rotation is stopped to avoid exceeding the flap speed limit during recovery.

WARNING

If a steady state spin is entered, holding the recommended recovery inputs of power idle, rudder full against the spin, elevator full forward and aileron full against the spin will produce the fastest recovery. When recovering from a steady state spin, the aircraft may exceed the typical one turn recovery time, and additional turns may be experienced until the aircraft recovers from the 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 Gallons US (401 L)
Total Capacity Each Tank: 53 Gallons US (201 L)
Maximum Fuel Imbalance: 10 gallons US (38 L) between left and right fuel tanks
Total Usable Fuel
- S/N 41501 to 41799
  - 49 Gallons US (186 L)/tank, 98 Gallons US (371 L) Total
- S/N 41800 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	5.01
MFD	5.01
COM	7.00
GCU	2.01
GDC	2.05
GMA	2.11
GDL	3.02.00
GMU	2.01
AHRS	2.03
ADC	2.05
GIA	4.30
GEA	2.07
GPS	3.03
GRS	2.06
GSA	3.01

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".

TEMPORARY REVISION FOR CESSNA PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL

Publication Affected:	Model 400 (LC41-550FG) serial numbers 41563 through 41650, 41652 through 41800, 411001 through 411031, 411033, and 411035 through 411037, Pilot's Operating Handbook and FAA Approved Airplane Flight Manual (RC050005), all revisions.
Airplane Serial Numbers Affected:	Airplanes 41563 through 41650, 41652 through 41800, 411001 through 411031, 411033, and 411035 through 411037.
Description of Change:	Section 2, Limitations, Garmin G1000 System Limitations, page 2-8, add TAWS-B limitations.
Filing Instructions:	Insert this temporary revision in the Model 400 (LC41-550FG) serials 41563 through 41650, 41652 through 41800, 411001 through 411031, 411033, and 411035 through 411037 Pilot's Operating Handbook and FAA Approved Airplane Flight Manual adjacent to page 2-8.
Removal Instructions:	This temporary revision must be removed and discarded when terrain database 08T2 or later is installed.

In Section 2, Limitations, Garmin G1000 System Limitations, add the following Limitations:

G1000 LIMITATIONS

TERRAIN AWARENESS AND WARNING SYSTEM (TAWS-B)

Flight operations are prohibited over large bodies of sea level water if that flight is conducted under operating regulations that require a functioning TAWS.

CAUTION

TAWS-B Forward Looking Terrain Avoidance (FLTA) is not available when flying over the open ocean/sea (specifically any body of water at sea level, more than 6nm from any terrain features) until terrain database 08T2 or later is installed. Do not use TAWS-B information for primary terrain avoidance. TAWS-B is intended only to enhance situational awareness.

TEMPORARY REVISION FOR CESSNA PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL

Publication Affected:	Model 400 (LC41-550FG) basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual RC050005, Revision I, dated 22 October 2008.
Airplane Serial Numbers Affected:	Airplanes 41034, 41563 through 41650, 41652 through 41800, and 411001 and On.
Description of Change:	Section 2, Limitations, page 2-8, Garmin G1000 System Limitations, add the limitation that the Garmin G1000 Cockpit Reference Guide for the 350/400 must be in the airplane for flight. Renumber subsequent limitations.
Filing Instructions:	Insert this temporary revision in the Model 400 (LC41-550FG) basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual adjacent to page 2-8.
Removal Instructions:	This temporary revision must be removed and discarded when Revision J has been collated into the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

In Section 2, Limitations, Garmin G1000 System Limitations, add the following limitation:

1. **Cockpit Reference Guide** – The most current revision of the Garmin G1000 Cockpit Reference Guide for the Cessna 350/400 must be in the airplane for flight.

APPROVED BY Grant Youngdahl

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

DATE OF APPROVAL 6-2-09

TEMPORARY REVISION FOR CESSNA PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL

Publication Affected:	Model 400 (LC41-550FG) with Garmin Integrated Flight Display basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, RC050005, Revision I, dated 22 October 2008.
Airplane Serial Numbers Affected:	Airplanes 41034, 41563 through 41650, 41652 through 41800, and 411001 and On.
Description of Change:	Section 2, Limitations, Garmin G1000 System Limitations, page 2-9, replace an item.
Filing Instructions:	Insert this temporary revision in the Model 400 400 (LC41-550FG) basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual adjacent to page 2-9.
Removal Instructions:	This temporary revision must be removed and discarded when Revision J has been collated into the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

In Section 2, Limitations, Garmin G1000 System Limitations, page 2-9, replace item number 5 as follows:

5. Navigation using the G1000 is not authorized North of 72° North latitude or South of 70° South latitude due to unsuitability of the magnetic fields near the Earth's poles. In addition, operations are not authorized in the following regions:

   a. North of 65° North latitude between longitude 75° W and 120° W (Northern Canada).
   b. North of 70° North latitude between longitude 70° W and 128° W (Northern Canada).
   c. North of 70° North latitude between longitude 85° E and 114° E (Northern Russia).
   d. South of 55° South latitude between longitude 120° E and 165° E (region south of Australia and New Zealand).

APPROVED BY Kevin D Campbell

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

DATE OF APPROVAL 10/30/09

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 – 210 KIAS
    Autopilot minimum engagement speed – 80 KIAS
    Electric Trim maximum operating speed – V_{NE}
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.
2. 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.

   The caution above 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.

TEMPORARY REVISION FOR CESSNA PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL

Publication Affected:	Model 400 (LC41-550FG) with Gamin Integrated Flight Display basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, RC050005, Revision I, dated 22 October 2008.
Airplane Serial Numbers Affected:	Airplanes 41034, 41563 thru 41650, 41652 thru 41800, and 411001 and On.
Description of Change:	Section 2, Limitations, Garmin G1000 System Limitations, page 2-10, add a new subheading and limitations.
Filing Instructions:	This temporary revision replaces RC050005-I TR08, in its entirety. Insert this temporary revision in the Model 400 (LC41-550FG) basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, RC050005-I, adjacent to page 2-10.
Removal Instructions:	This temporary revision must be removed and discarded when Revision J has been collated into the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

In Section 2, Limitations, Garmin G1000 System Limitations, page 2-10, add the following subheading and limitations after the Wide Area Augmentation System (WAAS) Limitations:

Synthetic Vision Technology (SVT) Limitations

1. The G1000 limitations listed in this section apply as well when using SVT due to absence of terrain data in these geographical areas.
2. Airplane maneuvering in any flight phase shall not be based solely on information from the G1000 SVT. SVT shall not be used as the primary means of terrain, obstacle or traffic avoidance.
3. The G1000 SVT shall not be used for primary flight guidance.
4. Descent below published IFR minimums shall not be predicated upon the use of G1000 SVT.
5. The G1000 SVT Pathways are not a substitute for standard course and altitude deviation information provided by the primary lateral and vertical guidance.

(Continued on Next Page)

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 the 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 210 KIAS. Reduce the autopilot maximum operating speed by 2.8 KIAS for each 1000 feet above 12,000 feet MSL. The autopilot maximum operating speed at 25,000 ft is 174 KIAS
2. Operation of the autopilot less than 400 feet above ground level is prohibited for takeoff.
3. Operation of the autopilot during takeoff and landing is prohibited.
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	50°	N/A	3 Seconds
Cruise	48°	-260 feet	3 Seconds
Descent	50°	-75 feet	3 Seconds
Maneuvering	52°	-100 feet	1 Second
Approach	17.5°	-198 feet	1 Second

Figure 2 - 7

6. VOR and VAPP autopilot/flight director modes may not provide adequate tracking guidance. In the event that VOR or VAPP modes do not track the selected course adequately, disengage the autopilot and flight director and fly the course using raw data.

OXYGEN LIMITATIONS

1. A4 and A5 Flowmeter and standard cannulas may be used for altitudes up to 18,000 ft (Pressure Altitude).
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 25,000 ft (Pressure Altitude) ONLY.
4. Oxygen masks are required above 18,000 ft (Pressure Altitude).

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 not 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.

Synthetic Vision Technology (SVT) Limitations (Continued)

The following limitation applies only to EASA registered airplanes:

The G1000 SVT Pathways shall not be used while the Flight Director is in use. Pathways guidance must be deselected to reduce PFD display clutter when the Flight Director is displayed.

APPROVED BY ____________

for Carlos Ayala, Acting Lead ODA Administrator
Cessna Aircraft Company
Organization Delegation Authorization ODA-100129-CE
FAA Approved Under 14 CFR Part 183 Subpart D

DATE OF APPROVAL 15 November 2010

TEMPORARY REVISION FOR CESSNA PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL

Publication Affected:	Model 400 (LC41-550FG) with Gamin Integrated Flight Display basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, RC050005, Revision I, dated 22 October 2008.
Airplane Serial Numbers Affected:	Airplanes 41034, 41563 thru 41650, 41652 thru 41800, and 411001 and On.
Description of Change:	Section 2, Limitations, Other Limitations, add a limitation.
Filing Instructions:	Insert this temporary revision in the Model 400 (LC41-550FG) basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, RC050005-I, adjacent to page 2-13.
Removal Instructions:	This temporary revision must be removed and discarded when Revision J has been collated into the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

In Section 2, Limitations, Other Limitations, add the following limitation:

OTHER LIMITATIONS

AFT FUSELAGE INSPECTION

If tire skidding occurs and a severe oscillatory yawing motion, "wheel walking" occurs, an Aft Fuselage Inspection must be performed in accordance with the Airplane Maintenance Manual by an appropriately rated mechanic prior to further flight.

APPROVED BY Tim Hackett
for Vasant Gondhalekar, Lead ODA Administrator
Cessna Aircraft Company
Organization Designation Authorization ODA-100129-CE
FAA Approved Under 14 CFR Part 183 Subpart D

DATE OF APPROVAL 13 AUGUST 2010

TEMPORARY REVISION FOR CESSNA PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL

APPROVED BY Jeffrey A. Moffitt

DATE OF APPROVAL 7/28/09

TEMPORARY REVISION FOR CESSNA PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL

Publication Affected:	Model 400 (LC41-550FG) with Garmin Integrated Flight Display basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, RC050005, Revision I, dated 22 October 2008.
Airplane Serial Numbers Affected:	Airplanes 41034, 41563 through 41650, 41652 through 41800, and 411001 and On.
Description of Change:	Section 2, Limitations, page 2-13, change the limitations for leading edge devices required for flight.
Filing Instructions:	Insert this temporary revision in the Model 400 400 (LC41-550FG) basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual adjacent to page 2-13.
Removal Instructions:	This temporary revision replaces RC050005-I TR01 in its entirety. This temporary revision must be removed and discarded when Revision J has been collated into the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

In Section 2, Limitations, page 2-13, change the limitations for Leading Edge Devices as follows:

Leading Edge Devices - Airplanes 41563 through 41650, 41652 through 41794, 41795 through 41800 and 411001 thru 411053 not incorporating SB08-57-01: Stall Strips must be installed and in good condition for flight. Leading edge tape, if installed, must be in good condition for flight.

Turbulator triangles and zig zag tape must be installed and in good condition for flight. Missing Turbulator triangles are permitted as long as there is a minimum of 7 triangles between any 2 that are missing. The strake (wing leading edge component next to the fuselage) may not have any missing triangles. Zig Zag tape may be replaced in its entirety by turbulator triangles which then allows the conditions governing missing turbulator triangles to apply.

NOTE

Turbulator triangles are also known as triangles, triangle tape, turbulators, turbulator tape, and flat triangular leading edge tape. Zig zag tape is also known as zig-zag tape and zipper tape. Leading edge tape is also know as anti-erosion tape or anti-chafe tape.

Leading Edge Devices – Airplanes 41034, 41795 through 41800 and 411001 through 411053 incorporating SB08-57-01, and 411054 and On: Stall strips must be installed and in good condition for flight.

Leading edge tape, turbulator triangles and/or zig zag tape, if installed, must be in good condition for flight. Missing triangles are permitted as long as there is a minimum of 7 triangles between any 2 that are missing. The strake (wing leading edge component next to the fuselage) may not have any missing triangles. Zig Zag tape may be replaced in its entirety by triangles which then allows the conditions governing missing triangles to apply.

OTHER LIMITATIONS

Altitude – The maximum flight altitude is 25,000 MSL with an FAA approved oxygen installation and 14,000 MSL without oxygen installed. See FAR Part 91 for applicable oxygen requirements.

Flap Limitations
Flaps may not be extended at altitudes above 14,000 ft PA.
Approved Takeoff Range: 12°
Approved Landing Range: 12° and 40°

Passenger Seating Capacity – The maximum passenger seating configuration is four persons (one pilot and three passengers).

Leading Edge Devices – All leading edge devices (stall strips, leading edge tape, flat triangular leading edge tape, and zig zag tape) must be installed and in good condition for flight.

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TEMPORARY REVISION FOR CESSNA PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL

Publication Affected:	Model 400 (LC41-550FG) with Gamin Integrated Flight Display basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, RC050005, Revision I, dated 22 October 2008.
Airplane Serial Numbers Affected:	Airplanes 41034, 41563 thru 41650, 41652 thru 41800, and 411001 and On.
Description of Change:	Section 2, Limitations, Other Limitations, add a limitation.
Filing Instructions:	Insert this temporary revision in the Model 400 (LC41-550FG) basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, RC050005-I, adjacent to page 2-13.
Removal Instructions:	This temporary revision must be removed and discarded when Revision J has been collated into the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

In Section 2, Limitations, Other Limitations, add the following limitation:

OTHER LIMITATIONS

AFT FUSELAGE INSPECTION

If tire skidding occurs and a severe oscillatory yawing motion, "wheel walking" occurs, an Aft Fuselage Inspection must be performed in accordance with the Airplane Maintenance Manual by an appropriately rated mechanic prior to further flight.

APPROVED BY [signature]
for Vasant Gondhalekar, Lead ODA Administrator
Cessna Aircraft Company
Organization Designation Authorization ODA-100129-CE
FAA Approved Under 14 CFR Part 183 Subpart D

DATE OF APPROVAL 13 AUGUST 2010

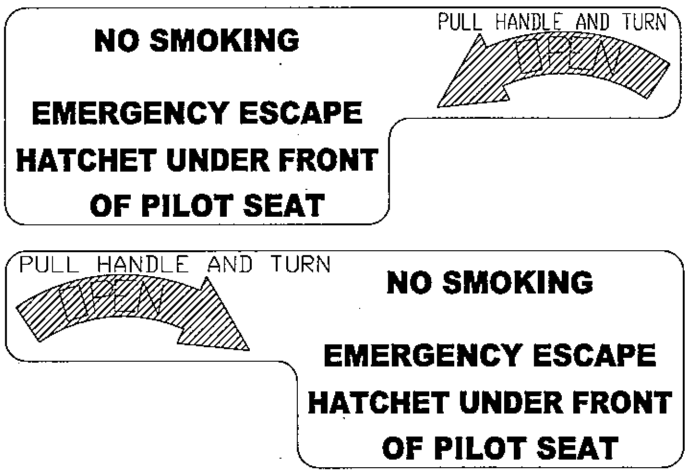
PLACARDS

GENERAL

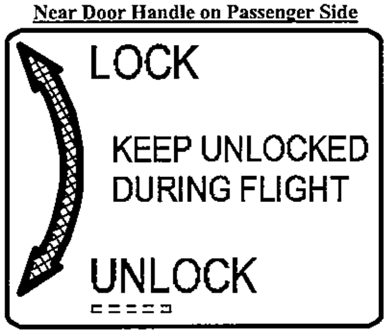
Federal Aviation Regulations require that a number of different placards be prominently displayed on the interior and exterior of the airplane. The placards contain information about the airplane and its operation that is of significant importance. The placard is placed in a location proximate to the 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



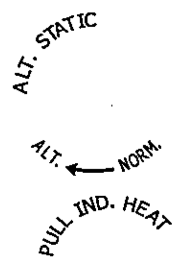
On Crash Ax

IN EMERGENCY
BREAK DOOR WINDOW

On Parking Brake Handle

BRAKE
ENGAGED

On the Upper Left Side of the Tower Assembly



On Left Panel Behind Pilot's Control Stick

FIRE EXTINGUISHER
LOCATED UNDER CO-PILOT'S SEAT

The markings and placards installed in this airplane contain operating limitations that must be complied with when operating this airplane in the Utility category. Other operating limitations that must be complied with when operating this airplane in this category are contained in the Airplane Flight Manual.

Utility Category- No acrobatic maneuvers approved, except those listed in the Pilot's Operating Handbook

FLIGHT INTO KNOWN ICING PROHIBITED.
SPINS PROHIBITED.
APPROVED FOR DAY/NIGHT- VFR/IFR

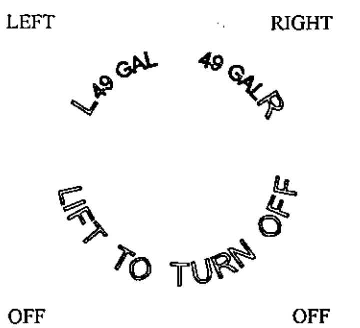
NO SMOKING

On Instrument Panel to Left of Backup Attitude Indicator

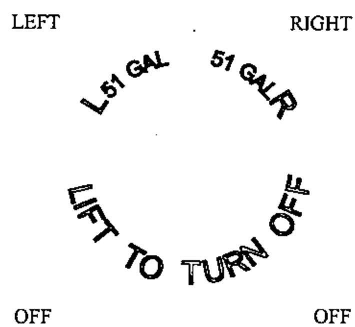
MANEUVERING SPEED
158 KIAS (3600 LBS)
135 KIAS (2600 LBS)

Engraved On Fuel Selector Knob and Upper Plate

S/N 41501 to 41799



S/N 41800 and on



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
127 KIAS

LANDING
117 KIAS

NO FLAPS OPERATION
ABOVE 14,000 FT. PA

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

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 Baggage Compartment Door Joggle

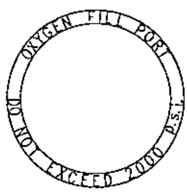
TOTAL BAGGAGE WEIGHT 120 LBS., SHELF WEIGHT 20 LBS. MAX.
SEE WEIGHT AND BALANCE DATA FOR ADDITIONAL LOADING INSTRUCTIONS

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

S/N 41001 to 411124



S/N 411125 and on

OXYGEN
2000 PSI MAX

In Aft Cabin on Aft Baggage Bulkhead

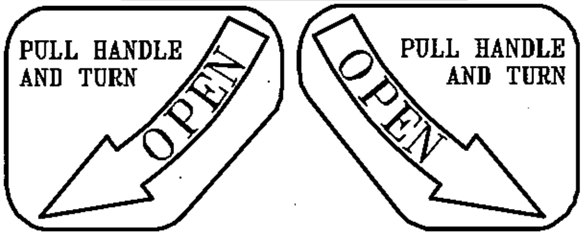
EMERGENCY LOCATION TRANSMITTER
LOCATED AFT OF THIS POINT. IT MUST
BE MAINTAINED IN ACCORDANCE WITH
THE FEDERAL AVIATION REGULATIONS

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

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 41501 to 41799	S/N 41800 and on
AVGAS ONLY MIN FUEL GRADE 100 / 100LL TOTAL USEABLE 49 GAL US / 185 LTR TOTAL CAPACITY 53 GAL US / 201 LTR	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.

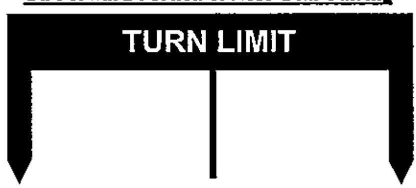
TO DRAIN WING TANKS: REFER TO MAINTENANCE MANUAL.

On Main Wheel Pants

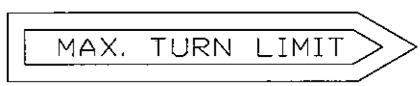
MAIN 55 psi

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

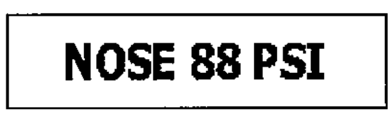
On Forward Portion of Nose Gear Fairing



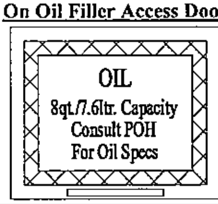
On Nose Gear Wheel Pant (if installed)



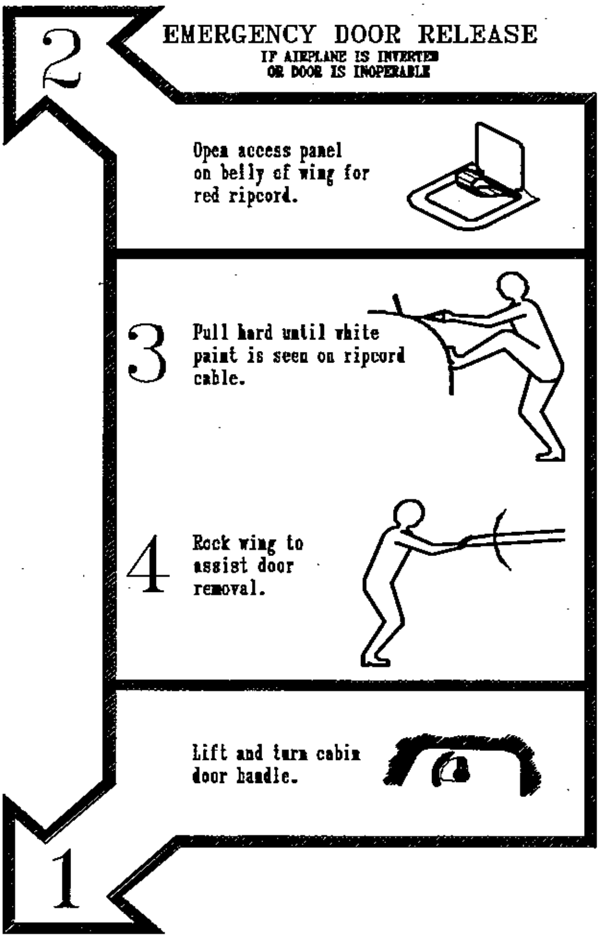
On Nose Gear Wheel Pant or
Nose Gear Fairing (if nose gear wheel pant not installed)



On Oil Filler Access Door



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



On Exterior of Gascolator Door (Underside of Fuselage)

EMERGENCY
DOOR RELEASE
PRESS BUTTONS TO OPEN

On Interior of Gascolator Door

EMERGENCY DOOR RELEASE

Lift and turn cabin door handle.

Pull red strap loop.

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 411133 and on)

JACK POINT ⬇

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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		Maximum Glide (Flaps Up)	
Wing Flaps Up (Cruise Position)	108 KIAS	3600 lbs. (1633 kg) Gross Weight	108 KIAS
Wing Flaps Takeoff Position	95 KIAS	2700 lbs. (1224 kg) Gross Weight	96 KIAS
Maneuvering Speed		Minimum Rate of Descent (Flaps Up)	
3600 lbs. (1633 kg) Gross Weight	*158 KIAS	3600 lbs. (1633 kg) Gross Weight	87 KIAS
2600 lbs. (1270 kg) Gross Weight	*135 KIAS	2700 lbs. (1224 kg) Gross Weight	82 KIAS
*Decrease 3 knots for each 1000-ft above 12,000 ft (Press. Alt.)			
Precautionary Landing		Approach Speed without Power	
(With engine power, flaps in the landing position)	80 KIAS	Wing Flaps Up (Cruise Position)	98 - 108 KIAS
		Wing Flaps Landing Position	80 - 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
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 — 108 KIAS (with flaps in the up position)*
   95 KIAS (with flaps in the takeoff position)*
2. Backup Fuel Pump — OFF
3. Mixture — CUTOFF
4. Fuel Selector — OFF
5. Ignition Switch — OFF
6. 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.)
7. 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 (108 KIAS with flaps up)
2. Vapor Suppression — ON
3. Mixture — FULL RICH
4. Fuel Selector — SWITCH TANKS
5. Heated Induction Air — ON
6. Ignition Switch — VERIFY SET TO R/L
7. Backup Fuel Pump — ARM
   - 7.1. Engine Does Not Restart
     - 7.1.1. Backup Fuel Pump — OFF
     - 7.1.2. Throttle — HALF WAY OUT
     - 7.1.3. Mixture — FULL LEAN THEN RICHEN UNTIL ENGINE STARTS
     - 7.1.4. Engine Does Not Restart — PERFORM “FORCED LANDING” CHECKLIST
8. Engine Restarts — PERFORM “PROCEDURES AFTER AN ENGINE RESTART” CHECKLIST

LOSS OF OIL PRESSURE

8. Oil Temperature — CHECK WITHIN PROPER RANGES 170° to 220°F (77° to 104 °C)
   - 8.1. If oil temperature is within operating range — LAND AS SOON AS POSSIBLE
   - 8.2. If oil temperature is above the operating range
     - 8.2.1. Throttle — REDUCE to the minimum required power
     - 8.2.2. LAND AS SOON AS POSSIBLE
     - 8.2.3. 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, 3.2, or 3.3 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 3-16.
   - 3.3. Improper Mixture Setting— If fuel management is correct and the engine driven fuel pump is working properly, it is possible the mixture is either too lean or too rich. If above 15,000 ft, it is likely the mixture is too rich and may need to be leaned. If below 15,000 ft, the mixture may be too lean and should be richened.

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 the amplified discussion on page 3-16.

FORCED LANDING (ENGINE OUT OR PARTIAL POWER)

1. Glide
   - 1.1. Airspeed — BEST GLIDE (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. Mixture — IDLE CUTOFF (If the engine is developing partial power, delay this as long as possible.)
   - 2.2. Fuel Selector — OFF
   - 2.3. Ignition Switch — OFF
   - 2.4. Wing Flaps (When landing is assured.) — AS REQUIRED (Full flaps recommended for landing.)
   - 2.5. SpeedBrake™ Switch — OFF/DOWN POSITION
   - 2.6. Left and Right Master Switches — OFF
   - 2.7. Landing Flare— INITIATE AT APPROPRIATE POINT TO ARREST DESCENT RATE, AND TOUCHDOWN AT NORMAL LANDING SPEEDS
   - 2.8. Stopping — APPLY HEAVY BRAKING

WARNING

Two special conditions associated with forced landings are specifically applicable to the Cessna 400 (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 the wind direction and survey the 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 — 80 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 — ARMED
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 87 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 3-29.
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. Backup Fuel Pump — OFF
2. Mixture — CUTOFF
3. Fuel Selector — OFF
4. Throttle — FULL OPEN
5. Ignition Switch — HOLD IN START POSITION (Until fire is extinguished.)
6. Parking Brake — RELEASE (If the parking brake is engaged.)
7. Fire Extinguisher — OBTAIN FROM CABIN AND EVACUATE AIRPLANE
8. 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 — OFF

3. Fuel Selector — OFF
4. Throttle — CLOSED
5. Ignition Switch — OFF
6. Heating System — OFF
7. Propeller Control — FULL AFT
8. Right Master Switch — OFF (Left master ON for Comm/Nav and PFD.)
9. Airspeed— 170 to 180 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 3-20.)
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 3-20.)
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. Landing and Taxi Lights — OFF
4. Flight Action — Do not perform a sideslip. A sideslip will vent fuel from the low wing or direct flames towards the fuselage. Land the airplane as soon as possible. Use wing flaps only if essential for a safe landing.

SPIN RECOVERY

1. Throttle — IDLE
2. Rudder — FULL AGAINST THE SPIN
3. Elevator — FULL FORWARD
4. Ailerons — FULL AGAINST THE SPIN
5. Wing Flaps — RETRACT (When rotation stops.)
6. Flight Action —When rotation stops, neutralize controls, then pull out of steep dive to achieve normal attitude. Pulling out of the dive will produce 2 to 3 g's and airspeeds up to 160 KIAS.

WARNING

Recovery from a spin may require up to one additional turn with normal use of controls for recovery.

WARNING

If a steady state spin is entered, holding the recommended recovery inputs of power idle, rudder full against the spin, elevator full forward and aileron full against the spin will produce the fastest recovery. When recovering from a steady state spin, the aircraft may exceed the typical one turn recovery time, and additional turns may be experienced until the aircraft recovers from the spin.

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 — (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 GEAR 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 the electrical system is restored, continue with flight. If the 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 annunciation 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 PFD annunciations window 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. Alternators 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 - 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 the 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
Position Lights	Door Seal/Power Point
Landing Light	Carbon Monoxide Detector
Left Voltage Regulator	Oxygen
Fan	Display Keypad
	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 come 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

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

1. Flight — MANUALLY CONTROL THE 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
7. Flight— TERMINATE AS SOON AS PRACTICABLE OR POSSIBLE (This depends on the magnitude of control force(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 THE AIRCRAFT
2. Autopilot Disconnect Switch on Control Stick— PRESS (If the autopilot does not disconnect proceed to step 3.)
3. Pitch Trim Switch — MOVE (If the autopilot does not disconnect proceed to step 4.)
4. A/P Trim System Switch on Overhead — OFF (If the autopilot does not disconnect proceed to step 5.)
5. Circuit Breaker — PULL BREAKER TO THE OFF POSITION

MALFUNCTION OF AUTOPILOT AUTOTRIM

1. Flight — MANUALLY CONTROL AIRCRAFT AND DISCONNECT THE AUTOPILOT
2. Manual Electric Trim (MET) – VERIFY PROPER OPERATION WITH TRIM SWITCH ON CONTROL STICK. IF MET OPERATES IMPROPERLY, PERFORM STEP 3.
3. AP Switch on MFD — SET TO OFF TO DISABLE THE SYSTEM

MALFUNCTION OF RUDDER HOLD SYSTEM

1. Rudder Hold Stuck and can't be Overridden – MAINTAIN AIRSPEED BETWEEN 90 AND 110 KIAS. APPLY APPROXIMATELY 90 LBS FORCE TO A PEDAL (RIGHT PEDAL RECOMMENDED) UNTIL THE SHEAR PIN BREAKS.
2. Flight — MANUALLY CONTROL AIRCRAFT.

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 the runway is assured.) — IDLE CUTOFF
10. Touchdown — MAIN WHEELS FIRST, GENTLY LOWER NOSE WHEEL
11. Braking — AS REQUIRED

OXYGEN SYSTEM MALFUNCTION

1. Oxygen Circuit Breaker — PULL AND RESET
2. Oxygen System — OFF THEN ON (On MFD System page.)
3. Guarded Oxygen Manual Valve — OFF THEN ON
4. Flow Meters — VERIFY FLOW TO BREATHING DEVICES
5. If no oxygen flowing:
   5.1. Descend — 12,500 ft or below (In a safe and controlled manner.)
   5.2. 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

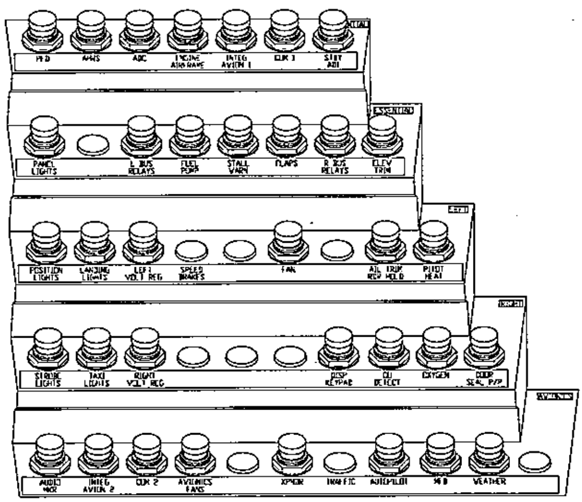
EVACUATING THE AIRPLANE

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 3-28.)
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 3-29.)
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 3-28.)
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 7-43 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 Hold	Aileron Trim/Rdr Hold	Pilot 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 momentary 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
3600 lbs. (1633 kg)	108	87
2700 lbs. (1224 kg)	96	82

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 ON". 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 relay 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 85% level, the engine will operate with a very lean mixture. At full throttle, the engine will produce approximately 100% of its rated BHP. In this situation, the fuel-air mixture is lean of peak, and higher cylinder head temperatures and TIT 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.

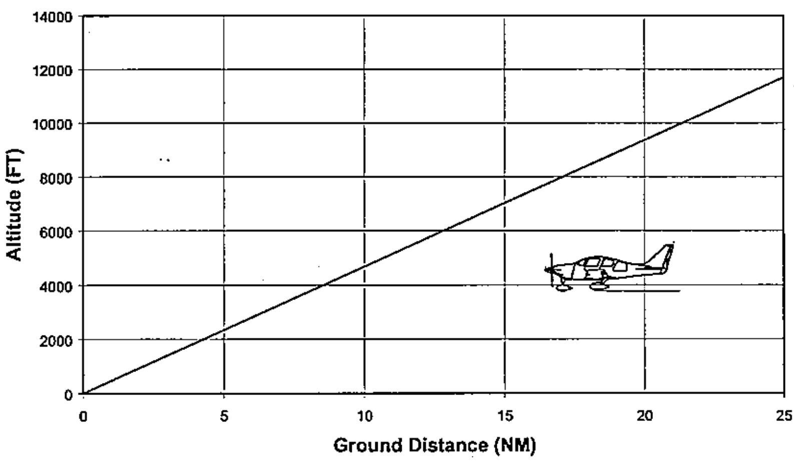
However, the FUEL PUMP message is independent of this system and will operate anytime the fuel pressure is less than 5.5 psi.

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.

Gliding Distance
(Zero Wind – Best Distance Glide)



Propeller control pulled to low rpm, flaps up, 108 KIAS, L/Dmax = 13/1

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 or 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.

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 use the propeller control to control power.

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. Power may be partially controlled with the use of the mixture control or propeller (RPM) control. 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 landing 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 240°, 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 with priority given to an airport with a long runway. 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. If possible, make a straight in approach to landing adjusting the descent with power. 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 an autopilot/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 autopilot/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 trim actuator motor, and the essential bus supplies the power to the elevator trim 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.

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 Fires – Follow the manufacturer's instructions for use of the fire extinguisher. For more information on using the fire extinguisher see the discussion on page 7-53. 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 400's electrical system. This surge protection comes from large MOVs (metal oxide varistor) soldered in behind the circuit breaker panel. The Cessna 400 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 R/L, and land as soon as possible for engine repairs.

High Altitude Negative G Loading – Per the TCM model specification, the TSIO-550 Series aircraft engines are not approved for continuous negative or zero g operations. Short duration negative g operations such as gust loading will have small or no effect on engine operation.

Sustained negative g loading at altitudes above 17,000 ft. may result in partial or total loss of engine power. Engine recovery may require pilot intervention by leaning the mixture to restart. Sustained negative g loading may cause the unporting of the oil pick-up tube. The resulting loss of oil pressure will allow the wastegate controller to move to the open position thereby rapidly decreasing manifold pressure at high altitude. This rapid decrease in manifold pressure can cause an overly rich mixture resulting in partial or total loss of engine power. If the engine stops running follow the procedures described on page 3-4, Engine Failure During Flight.

High Cylinder Head Temperatures – High cylinder head temperatures are often caused by improper leaning at high power setting or vapor formation in the fuel lines (indicated by rising TIT). Be sure the mixture is adjusted for the power setting and altitude in use and turn vapor suppression on. 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, Forced Landing (Engine Out or Partial 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 or 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 illuminate 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 Turbocharger – Turbocharger failure may be evidenced by the inability of the engine to develop manifold air pressure above the ambient pressure. The engine will revert to "normally aspirated" and can be operated but will produce less than its rated horsepower. If turbocharger failure occurs before takeoff, do not fly the aircraft. If a failure occurs in flight, readjust mixture as necessary to obtain fuel flow appropriate to manifold air pressure and RPM.

An interruption in fuel flow or manifold pressure to the engine will result in turbocharger "run-down". At high altitude, merely restoring fuel flow may not cause the engine to restart, because without turbocharger boost, the mixture will be excessively rich. If the engine does not fire, there will be insufficient mass flow through the exhaust to turn the turbine. This condition may lead one to suspect a turbocharger failure. Follow the procedures described on page 3-4, Engine Failure During Flight. Engine starting will be apparent by a surge of power. As the turbocharger begins to operate, manifold pressure will increase and mixture can be adjusted accordingly. If manifold pressure does not increase then the turbocharger has failed.

WARNING

If turbocharger failure is a result of a loose, disconnected or burned through exhaust, then a serious fire hazard exists.

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 drop in fuel flow 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, low fuel pressure, 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 3-16.

NOTE

When operating at high altitudes, 15,000 MSL or above, in hot weather, it may be necessary to set the vapor suppression switch to ON. Operation of the vapor suppression will lower engine temperatures and reduce the chance of formation of vapor in the fuel lines. Operation of the vapor suppression may be required at lower altitudes when the ambient temperature is significantly above normal. Vapor suppression must be turned on if TIT is rising above 1460°F at full power and the mixture is set to full rich (at any altitude). Vapor suppression may be turned off below 18,000 MSL if power has been reduced below 85% and engine temperatures have stabilized.

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), set the propeller control full forward. Propeller surging may be caused by one or more of the following conditions.

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	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 or Rudder Hold/Aileron Trim	2 amp
	• Pitot Heat	7.5 amp
	• SpeedBrakes	3 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	• Attitude Horizon	5 amp
	• Elevator Trim	2 amp
	• Panel Lights	7.5 amp
	• Air Data Computer	5 amp
	• PFD	5 amp
	• AHRS	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 Lights	3 amp

* 5 amp for Precise Flight taxi light, S/N 41563 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 intentional spinning of the aircraft is prohibited. Flight tests have shown that the aircraft will recover from a one turn spin in less than one additional turn after the application of recovery controls for all points in the weight and balance envelope, up to the maximum certified altitude. The recommended recovery inputs are: power idle, rudder full against the spin, elevator full forward and aileron full against the spin. If the flaps are extended, they should be retracted after the spin rotation is stopped to avoid exceeding the flap speed limit during pull out. When rotation stops, the aircraft will be in a steep nose down attitude. Airspeeds up to 160 KIAS are possible during a 3 g pull out. Above 126 KIAS it may be possible to pull more than 3.7 g's in light weight conditions. Care should be taken, under such conditions, to avoid overstressing the airframe. A steady state spin may be encountered if pro-spin control inputs are held for 1 ½ turns or more. Steady state spins entered above 20,000 feet at heavy weight and aft CG conditions will take the most turns to recover. If a steady state spin is entered, making and holding the recommended recovery inputs will produce the fastest recovery.

WARNING

The intentional spinning of the aircraft is prohibited.

WARNING

If a spin is entered with the flaps extended, they should be retracted after the spin rotation is stopped to avoid exceeding the flap speed limit during recovery.

WARNING

If a steady state spin is entered, holding the recommended recovery inputs of power idle, rudder full against the spin, elevator full forward and aileron full against the spin will produce the fastest recovery. When recovering from a steady state spin, the aircraft may exceed the typical one turn recovery time, and additional turns may be experienced until the aircraft recovers from the 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 remove and replaced with a red X in the appropriate area.

TEMPORARY REVISION FOR CESSNA PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL

Publication Affected:	Model 400 (LC41-550FG) with Gamin Integrated Flight Display basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, RC050005, Revision I, dated 22 October 2008.
Airplane Serial Numbers Affected:	Airplanes 41034, 41563 thru 41650, 41652 thru 41800, and 411001 thru 411161.
Description of Change:	Section 3, Amplified Emergency Procedures, page 3-26, Multi-Function Display, add additional information.
Filing Instructions:	Insert this temporary revision in the Model 400 (LC41-550FG) basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, RC050005-I, adjacent to page 3-26.
Removal Instructions:	This temporary revision must be removed and discarded when Revision J has been collated into the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

In Section 3, Amplified Emergency Procedures, page 3-26, Multi-Function Display, add the information on the following page after the Multi-Function Display paragraph:

APPROVED BY [signature]

for John Bouma, Lead ODA Administrator
Cessna Aircraft Company
Organization Delegation Authorization ODA-100129-CE
FAA Approved Under 14 CFR Part 183 Subpart D

DATE OF APPROVAL 18 SEPTEMBER 2013

If the MFD should completely fail with autopilot engaged, the autopilot mode selection keys on the MFD bezel will be inoperative. The A/P DISC button on the control stick will disengage the autopilot, however, the flight director bars will remain displayed on the PFD in the selected modes prior to MFD failure.

Display of the flight director bars on the PFD can be a nuisance to some pilots due to the previous selected modes not matching the current flight profile of the airplane. Pulling and resetting the GIA 1 circuit breaker will remove the flight director bars from the PFD, but will render COM 1, COM 2, NAV 1, NAV 2 and transponder inoperable during the GIA 1 initialization period.

Based on current flight conditions, (IFR, Night or Night IFR) and segment of flight (climb, approach or missed approach), the pilot may chose to ignore the flight director bars due to the increased workload and ATC coordination required by resetting the GIA 1 circuit breaker.

NOTE

Use of the standby instruments may be required when resetting the GIA 1 circuit breaker due to the loss of flight data displayed on the PFD during GIA initialization.

TEMPORARY REVISION FOR CESSNA PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL

Publication Affected:	Model 400 (LC41-550FG) with Gamin Integrated Flight Display basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, RC050005, Revision I, dated 22 October 2008.
Airplane Serial Numbers Affected:	Airplanes 41034, 41563 thru 41650, 41652 thru 41800, and 411001 and On.
Description of Change:	Section 3, Amplified Emergency Procedures, page 3-27, add a new subheading and procedure.
Filing Instructions:	Insert this temporary revision in the Model 400 (LC41-550FG) basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, RC050005-I, adjacent to page 3-27.
Removal Instructions:	This temporary revision must be removed and discarded when Revision J has been collated into the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

In Section 3, Amplified Emergency Procedures, page 3-27, add the following subheading and procedure after the Primary Flight Display Amplified Emergency Procedure:

G1000 SVT Pathways Malfunction or Erroneous Lateral and/or Vertical Guidance

If G1000 SVT Pathways malfunctions or provides an erroneous indication contrary to the primary lateral and vertical guidance, use the following procedure to turn off SVT Pathways:

1. PFD Softkey - PRESS (located on PFD bezel)
2. SYN VIS Softkey - PRESS (located on PFD bezel)
3. PATHWAY Softkey - PRESS (located on PFD bezel)
   (verify SVT Pathway guidance is removed from the PFD display)

APPROVED BY [signature]

for Carlos Ayala, Acting Lead ODA Administrator
Cessna Aircraft Company
Organization Delegation Authorization ODA-100129-CE
FAA Approved Under 14 CFR Part 183 Subpart D

DATE OF APPROVAL 15 November 2010

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 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.

RUDDER HOLD SYSTEM (OPTIONAL)

If there is a malfunction of the rudder hold system and none of the normal methods to disengage it work, perform the following to regain rudder control:

1. Maintain airspeed between 90 and 110 KIAS.
2. Push a rudder pedal until the brake surface held by friction slips (about 50 to 70 lbs with no air loads). The Rudder should move into a new position and be held until the pedal is pushed again
3. If the braking surface is not slipping, a shear pin in the rudder hold mechanism can be broken by applying force (100 to 110 lbs with no air loads) to a rudder pedal (right pedal recommended). Once the shear pin breaks the capstan will move freely allowing full rudder deflection

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.

WARNING

Failures in the breathing stations, cannulas, masks, and flow meters are not indicated on the display panel or annunciations 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 3-20 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 7-14, 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 3-29.

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 3-29.
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 cabin door 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 3600 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	110 KIAS
Short Field Takeoff to 50 feet	Takeoff Position	80 KIAS
Climb To Altitude	**Flaps Setting**	**Airspeed**
Normal (Best Engine Cooling)	Up Position	110 KIAS
Best Rate of Climb at Sea Level	Up Position	110 KIAS
Best Rate of Climb at 10,000 Feet	Up Position	110 KIAS
Best Angle of Climb at Sea Level	Up Position	82 KIAS
Best Angle of Climb at 10,000 Feet	Up Position	86 KIAS
Approach To Landing	**Flaps Setting**	**Airspeed**
Normal Approach	Up Position	105-110 KIAS
Normal Approach	Down Position	85-90 KIAS
Short Field Landing	Down Position	80 KIAS
Balked Landing (Go Around)	**Flaps Setting**	**Airspeed**
Apply Maximum Power	Takeoff Position	90 KIAS
Apply Maximum Power	Landing Position	82 KIAS
Maximum Recommended Turbulent Air Penetration Speed	**Flaps Setting**	**Airspeed**
3600 lbs. (1633 kg)	Up Position	162 KIAS
2600 lbs. (1179 kg)	Up Position	138 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, 4-23, 4-28, and 5-9 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.

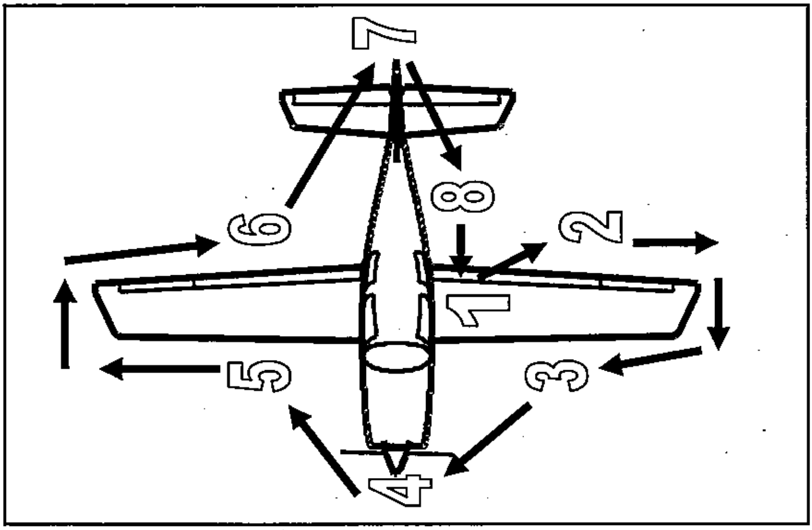


Figure 4 - 2

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. Flaps — TAKEOFF THEN LANDING POSITION
11. Trim Tabs — NEUTRAL
12. Fuel Quantity Indicators — CHECK FUEL QUANTITY
13. Fuel Annunciation — NOT DISPLAYED
14. Oxygen System — CHECK IF REQUIRED
    - 14.1. Avionics Switch — ON
    - 14.2. Oxygen System — ON, CHECK QUANTITY, ENSURE SYSTEM RETAINS PRESSURE, VERIFY PROPER OXYGEN FLOW AT ALL BREATHING DEVICES
    - 14.3. Oxygen System — OFF

TEMPORARY REVISION FOR CESSNA PILOT'S OPERATING HANDBOOK
AND FAA APPROVED AIRPLANE FLIGHT MANUAL

Publication Affected:	Model 400 (LC41-550FG) with Garmin Integrated Flight Display basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, RC050005, Revision I, dated 22 October 2008.
Airplane Serial Numbers Affected:	Airplanes 41034, 41563 through 41650, 41652 through 41800, and 411001 and On.
Description of Change:	Section 4, Normal Procedures, pages 4-5 and 4-6, add a note about leading edge devices to the preflight inspection procedures for Areas 3, 5, and 7.
Filing Instructions:	Insert this temporary revision in the Model 400 400 (LC41-550FG) basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual adjacent to page 4-5.
Removal Instructions:	This temporary revision must be removed and discarded when Revision J has been collated into the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

In Section 4, Normal Procedures, page 4-5, add the following note after Step 1 of the Area 3 Preflight Inspection procedure.

NOTE

Refer to Section 2, Limitations, heading OTHER LIMITATIONS, subheading LEADING EDGE DEVICES, for additional inspection information.

In Section 4, Normal Procedures, page 4-6, add the following note after Step 3 of the Area 5 Preflight Inspection procedure.

NOTE

Refer to Section 2, Limitations, heading OTHER LIMITATIONS, subheading LEADING EDGE DEVICES, for additional inspection information.

In Section 4, Normal Procedures, page 4-6, add the following note after Step 2 of the Area 7 Preflight Inspection procedure.

NOTE

Refer to Section 2, Limitations, heading OTHER LIMITATIONS, subheading LEADING EDGE DEVICES, for additional inspection information.

APPROVED BY

DATE OF APPROVAL 7/28/09

14.4. Avionics Switch — OFF

15. Pitot Heat, Propeller Heat, and Exterior Lights— ON AS REQUIRED, CHECK OPERATION (See Note and Warning that follows.)
16. Induction Heated Air — CYCLE THEN OFF
17. Stall Warning Vane— CHECK WARNING HORN
18. Pitot Heat, Propeller Heat, and Exterior Lights — OFF
19. Left and Right Battery Switches — OFF
20. 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, Triangular Shaped 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, and 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 (Approximately 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, air inlet duct connected, 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, Triangular Shaped 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 and Zig Zag 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 AT FULL DEFLECTION
7. Elevator Surface — CHECK (Freedom of movement.)
8. Elevator Trim Tab — CHECK FOR NEUTRAL POSITION
9. Ventral Fin — CHECK FOR SECURITY AND LOWER EDGE DAMAGE
10. Static Wicks (5) — CHECK FOR INSTALLATION AND CONDITION
11. 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 — SET TO 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 1/8 INCH to 1/4 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 1/4 INCH
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.

NOTE

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 any 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 1/8 INCH TO 1/4 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 the 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.)

AFTER ENGINE START

1. Avionics Master Switch — ON
2. Engine Indication Systems — CHECK
3. Ammeters — CHECK (Ensure 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
6. Oxygen Quantity — NOTE

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 the 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 the 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. SPEED BRAKES Annunciation — DISPLAYED
3. SpeedBrake™ Switch — OFF/DOWN POSITION (Ensure both SpeedBrakes™ are retracted.)
4. 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, this 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 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. Rudder Hold — ON, VERIFY OVERRIDE BY FORCE TO PEDAL, THEN OFF
6. Radio Clearance — AS REQUIRED
7. Taxi Light — AS REQUIRED
8. Brakes — RELEASE

TAXIING

1. Brakes — CHECK FOR PROPER OPERATION
2. PFD and Backup 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 (Runup)

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 100°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. Rudder Hold System — DISENGAGED
29. SpeedBrake™ Switch — VERIFY OFF/DOWN POSITION
30. Doors — LATCHED AND DETENTED
31. PFD Annunciation Window — ALL MESSAGES ADDRESSED
32. Door Seals — ON
33. Backup Fuel Pump — ARMED
34. Oxygen System — ON
35. Mask or Cannula — DON
36. Flowmeters — CHECK AND ADJUST TO PLANNED CRUISE ALTITUDE (Ensure that the internal metering ball moves freely and oxygen is flowing to the delivery devices.)
37. Time — NOTE
38. 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. Wing Flaps — TAKEOFF POSITION
3. Mixture — FULL RICH
4. Backup Fuel Pump — ARMED
5. Pitot Heat and Propeller Heat — AS REQUIRED
6. Throttle — ADVANCE SLOWLY TO FULL POWER (2600 RPM) (Watch manifold pressure for indication of overboost.)
7. Elevator Control — LIFT NOSE AT 75 KIAS
8. Climb Speed — ACCELERATE TO BEST RATE OF CLIMB SPEED OF 110 KIAS
9. 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 — FULL RICH
5. Backup Fuel Pump — ARMED
6. Throttle— ADVANCE SLOWLY TO FULL POWER (2600 RPM)
7. Brakes — RELEASE
8. Elevator Control — MAINTAIN LEVEL NOSE ATTITUDE
9. Rotate Speed — 64 to 75 KIAS (Speed per Figure 5 - 11. 5° nose up pitch attitude.)
10. Climb Speed — 74 to 84 KIAS (Speed per Figure 5 - 11. Until clear of obstacles.)
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 4-23 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 — ACCELERATE TO BEST RATE OF CLIMB SPEED OF 110 KIAS (See cruise climb discussion of page 4-24.)
2. Power Settings — ADJUST AS NECESSARY
3. Fuel Selector — SET TO RIGHT OR LEFT TANK (As appropriate.)

4. Mixture — FULL RICH ABOVE 85% POWER
5. Backup Fuel Pump — ARMED
6. Vapor Suppression — ON (Above 18,000 ft.)
7. Rudder Hold System — SET RUDDER TO DESIRED POSITION AND ENGAGE RUDDER HOLD SYSTEM
8. Landing/Taxi Lights — AS REQUIRED

MAXIMUM PERFORMANCE CLIMB

1. Airspeed — 110 KIAS (All altitudes.)
2. Power Settings — 2600 RPM AND FULL THROTTLE
3. Fuel Selector — SET TO RIGHT OR LEFT TANK (As appropriate.)
4. Mixture — FULL RICH
5. Backup Fuel Pump — ARMED
6. Vapor Suppression — ON (Above 18,000 ft.)
7. Rudder Hold System — SET RUDDER TO DESIRED POSITION AND ENGAGE RUDDER HOLD SYSTEM

CRUISE

1. Rudder Hold System — AS REQUIRED
2. Throttle — SET AS APPROPRIATE TO ACHIEVE 85% POWER OR LESS (Refer to the cruise performance charts.)
3. Propeller — SET AS APPROPRIATE TO ACHIEVE 85% POWER OR LESS (Refer to the cruise performance charts.)
4. Mixture — LEAN AS REQUIRED (Use TIT gauge to set 1625°F or performance charts in Section 5. To achieve 75% power or more, operate rich of peak.)
5. Backup Fuel Pump — OFF
6. Changing Fuel Tanks — PERFORM STEPS 6.1 AND 6.2.
   6.1. Vapor Suppression — SET TO ON DURING FUEL TANK CHANGEOVERS
   6.2. Fuel Selector— CHANGE AS REQUIRED (The maximum permitted fuel imbalance is 10 gallons (38 L).)
7. Landing/Taxi Lights— AS REQUIRED
8. Oxygen Quantity — CHECK PERIODICALLY (Approximately every 20 minutes.)
9. Oxygen Outlet Pressure — CHECK PERIODICALLY (Approximately every 20 minutes.)
10. Flowmeter or Flow Indicator — CHECK PERIODICALLY FOR OXYGEN FLOW (Approximately every 10 minutes.)
11. Altitude Change — ADJUST FLOW DEVICES TO NEW ALTITUDE
12. Physiological Requirement — ADJUST FLOW DEVICE TO HIGHER ALTITUDE

NOTE

Do not pull the throttle back to idle without leaning the mixture appropriately above 18,000 ft (Critical altitude, the engine does not produce full manifold pressure above the critical altitude). The reduced air density is causing an over-rich condition at idle, which floods the engine and can make it quit. If it does quit, it is possible to restart the engine at any altitude by leaning the mixture. Above 18,000 ft. the minimum manifold pressure is 15 in. Hg; minimum RPM is 2,200.

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 (except above 18,000 ft. when the pump stays on).

When changing power, the sequence control usage is important. Monitor the TIT gauge to avoid exceeding 1750°F limit. To increase power, first

increase the 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. When engine temperatures have stabilized, lean mixture to desired TIT.

WARNING

Continuous overboost operation may damage the engine and require engine inspection.

DESCENT

1. Fuel Selector — RIGHT OR LEFT TANK (As appropriate.)
2. Power Settings — AS REQUIRED
3. Mixture — AS REQUIRED
4. Backup Fuel Pump — OFF
5. Vapor Suppression — OFF (Below 18,000 ft.)
6. PFD and Backup Altimeters — SET
7. Altitude Bug — SET
8. Landing/Taxi Lights — AS REQUIRED

EXPEDITED DESCENT

1. Power Setting — 2400 RPM and approximately 25 INCHES of MANIFOLD PRESSURE
2. SpeedBrake™ Switch — ON/UP POSITION
3. Airspeed — 165 KIAS
4. SpeedBrake™ Switch — OFF/DOWN POSITION (To retract SpeedBrakes™.)

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 Button — SELECT NAV SOURCE
6. Nav Aids —TUNED AND IDENTIFIED
7. Approach Course — SET
8. PFD and Backup Altimeters — SET
9. Mixture — FULL RICH

NOTE

Passing FAF, new course may be needed.

BEFORE LANDING

1. Seat Belts and Shoulder Harnesses — SECURE (Both pilot and passengers.)
2. Mixture — FULL RICH
3. Fuel Selector— RIGHT OR LEFT TANK (As appropriate.)
4. Backup Fuel Pump — OFF
5. Propeller — HIGH RPM
6. Rudder Hold System — DISENGAGED
7. 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 — 73 to 82 KIAS (Per Figure 5 - 35.)
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 2600 RPM.)
2. SpeedBrakes™ Switch — OFF/DOWN POSITION
3. Wing Flaps — TAKEOFF POSITION
4. Airspeed — 82 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. SpeedBrakes™ 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 RPM)
3. Oxygen System — OFF
4. ELT — CHECK NOT ACTIVATED
5. Trim Tabs — SET TO NEUTRAL
6. Time — COOLDOWN COMPLETE
7. Avionics Master Switch — OFF (Ensure shutdown.)
8. Electrical/Environmental Equipment — OFF
9. Mixture — IDLE CUTOFF
10. Left and Right Master Switches — OFF
11. Ignition Switch — OFF (After engine stops.)
12. Anti-Collision/Position Lights — OFF

CAUTION

Allow the engine to idle at 900 RPM for 5 minutes before shutdown in order to cool the turbochargers. Taxi time can be counted as cooling time.

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.

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.

Stall Warning Vane – The stall warning vane located on the leading edge of the left wing should be checked to ensure freedom of movement and that the vane is not bent or otherwise damaged.

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 400 fuel quantity measuring system described on page 7-35 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 41501 to 41799, the top of the tab corresponds to a fuel quantity in the tank of approximately 25 gallons US (95 L). For S/N 41800 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 400 (LC41-550FG) 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.

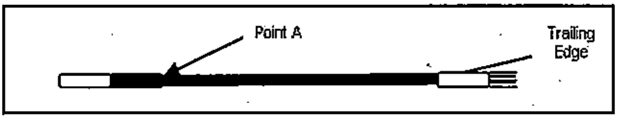


Figure 4 - 3

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 7-54 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 7-13 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 excessively 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 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 <u>will</u> <u>not</u> 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 <u>will</u> 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 withy 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 is 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** – 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. 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 100°F (38°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 illuminated 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 2600 RPM and the manifold pressure should be near anticipated output. Ensure that the engine is not over-boosting (manifold pressure is at or below 35.5 in. of Hg).

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 speed per Figure 5 - 11 until the airplane is clear of all obstacles. Once past all obstacles, accelerate to the best rate of climb speed (110 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 (82 to 86 KIAS) until the airplane is clear of all obstacles. Once past all obstacles, accelerate to the best rate of climb speed (110 KIAS);

at or above 400 feet AGL, raise the flaps. The maximum demonstrated crosswind component for takeoff is 23 knots.

NORMAL AND MAXIMUM PERFORMANCE CLIMBS

Climb – The engine can be operated leaned or lean of peak during climb if the power setting is 85% or less. The airspeed has to be increased to a cruise climb speed (higher than Vy) to provide additional cooling air. The pilot should monitor CHT's carefully and increase airspeed, reduce engine power, or enrichen mixture if the CHT's are becoming too high.

Best Rate of Climb Speeds – The normal climb speed of the airplane, 110 KIAS, produces the most altitude gain in a given time period while allowing for proper engine cooling and good forward visibility. 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 always be full rich in this case.

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.

CAUTION

Do not lean the engine during full power climb.

Best Angle of Climb Speeds – The best angle of climb airspeed (V_X) for the airplane is 82 KIAS at sea level to 86 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 speeds from sea level to 10,000 feet are more or less linear, assuming ISA conditions.

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. It is recommended to use full throttle and 2600 RPM in climb because this setting provides the engine with extra fuel for cooling at the slower airspeeds. 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 engine's turbochargers keep manifold pressure constant from MSL to approximately 18,000 ft.

NOTE

During normal climb operations above 18,000 feet, a minimum engine condition of 2,200 RPM and 15 in.Hg of manifold air pressure are required to insure proper turbocharger operation is maintained. If engine operation below 15 in.Hg of manifold air pressure is necessary, the fuel mixture must be properly leaned or engine stoppage will result.

WARNING

Continuous overboost operation may damage the engine and require engine inspection.

Vapor Suppression – The vapor suppression switch must be turned on in the following situations:

- Operations above 18,000 ft.
- If TIT is rising above 1460°F at full power with the mixture full rich (at any altitude).

Once engine temperatures have stabilized and if the aircraft is below 18,000 ft, the vapor suppression switch may be turned off.

The vapor suppression switch should also be turned on any time the engine is not running smooth or it is suspected there is vapor in the lines. Vapor in the lines is most likely to happen in hot weather or at high altitudes.

NORMAL OPERATIONS ABOVE 18,000 FT

During normal climb, cruise and descent operations above 18,000 ft., a minimum engine condition of 2200 RPM and 15 in.Hg of manifold air pressure are required to insure proper turbocharger operation is maintained. If engine operation below 15 in.Hg of manifold air pressure is necessary, the fuel mixture must be properly leaned or engine stoppage will result.

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 50% to 85% of available power. The maximum recommended cruise power setting is 85%. The minimum cruise power setting is 40%, but higher power settings may be required in colder weather to maintain minimum engine temperatures.

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. The engine driven fuel pump references deck pressure and adjusts mixture automatically for deck pressure and altitude effects. The pilot is responsible to lean the mixture in cruise for lower fuel flow.

Control by Turbine Inlet Temperature (TIT) – When leaning the mixture using TIT, the pilot should use the TIT gauge on the MFD. At power settings below 85% power, starting at full rich mixture, lean slowly while observing the TIT. When changing the mixture to lean of peak, it is acceptable to have TIT indications temporarily in the yellow range, but indications must return to the normal range upon leaning completion. Best power is obtained at 1625°F. Below 85% power the engine can be leaned past peak and be operated 50°F lean of peak TIT. Lean of peak operation improves the efficiency of the airplane and provides about 30°F lower CHT at the same RPM/MAP combination. Fuel flow can be used as a reference to judge the resulting power setting, but should not be used for leaning.

CAUTION

Do not lean the engine when operating above 85% power. At power settings above 85%, the mixture must be full rich. Do not lean the engine during full power climb.

CAUTION

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.

CAUTION

When leaning the mixture, it is acceptable to have TIT indications temporarily in the yellow range to detect peak. Once leaning is complete, the temperatures are in the normal range.

WARNING

Continuous overboost operation may damage the engine and require engine inspection.

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 7-15.

DESCENT

The primary considerations during the descent phase of the flight are to maintain the engine temperatures within normal indications. 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. If long, rapid descents are made, the speed brakes (if installed) should be deployed rather than reducing the power significantly.

The cylinders and cylinder heads are stressed by thermal and mechanical cycles; every cycle fatigues them slightly. If cracks form, the part must be replaced. High temperatures and high power settings increase wear and fatigue. To enhance the life of cylinder heads and cylinders, the engine should be run at low temperatures (within the engine operating range) as often as possible. Rapid temperature changes (shock heating and shock cooling) should be avoided. Large, rapid, power reductions should be avoided, especially in flight, because shock cooling of the cylinders will occur.

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.

TEMPORARY REVISION FOR CESSNA PILOT'S OPERATING HANDBOOK
AND FAA APPROVED AIRPLANE FLIGHT MANUAL

Publication Affected:	Model 400 (LC41-550FG) basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual RC050005, Revision I, dated 22 October 2008.
Airplane Serial Numbers Affected:	Airplanes 41034, 41563 through 41650, 41652 through 41800, and 411001 and On.
Description of Change:	Section 4, Normal Procedures, page 4-27, Add a new subheading and caution for VOR Approach to the end of the Approach paragraph.
Filing Instructions:	Insert this temporary revision in the Model 400 (LC41-550FG) basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual adjacent to page 4-27.
Removal Instructions:	This temporary revision must be removed and discarded when Revision J has been collated into the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

In Section 4, Normal Procedures, Approach, page 4-27, add the following subheading and caution:

VOR Approach with Garmin Software V9.03 (or later) installed

CAUTION

If a VOR approach is included in the flight plan, the VOR course pointer automatically slews to the published final approach course when VOR is selected as the navigation source for the CDI, regardless of the position of the airplane to the approach. The pilot must verify if this is appropriate and manually reset the CDI to the required course if the airplane is not yet on the final approach leg.

APPROVED BY Grant Youngdahl
for Margaret Kline, Manager
Aircraft Certification Office
Federal Aviation Administration
Wichita, Kansas

DATE OF APPROVAL 6-2-09

TEMPORARY REVISION FOR CESSNA PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL

Publication Affected:	Model 400 (LC41-550FG) with Gamin Integrated Flight Display basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, RC050005, Revision I, dated 22 October 2008.
Airplane Serial Numbers Affected:	Airplanes 41034, 41563 thru 41650, 41652 thru 41800, and 411001 and On.
Description of Change:	Section 4, Normal Procedures (Amplified Procedures), Landings, Normal Landings, add a warning.
Filing Instructions:	Insert this temporary revision in the Model 400 (LC41-550FG) basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, RC050005-I, adjacent to page 4-27.
Removal Instructions:	This temporary revision must be removed and discarded when Revision J has been collated into the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

In Section 4, Normal Procedures (Amplified Procedures), Landings, Normal Landings, add warning after the last paragraph:

LANDINGS
Normal Landings –

WARNING

IF TIRE SKIDDING OCCURS, IMMEDIATELY REDUCE BRAKE PEDAL PRESSURE. IF TIRE SKIDDING IS ALLOWED TO CONTINUE, A SEVERE OSCILLATORY YAWING MOTION, "WHEEL WALKING", COULD DEVELOP. IF THIS SEVERE OSCILLATORY YAWING MOTION OCCURS, AN AFT FUSELAGE INSPECTION MUST BE PERFORMED IN ACCORDANCE WITH THE AIRPLANE MAINTENANCE MANUAL BY AN APPROPRIATELY RATED MECHANIC PRIOR TO FURTHER FLIGHT.

APPROVED BY Jim Hackett
for Vasant Gondhalekar, Lead ODA Administrator
Cessna Aircraft Company
Organization Designation Authorization ODA-100129-CE
FAA Approved Under 14 CFR Part 183 Subpart D

DATE OF APPROVAL 13 AUGUST 2010

TEMPORARY REVISION FOR CESSNA PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL

Publication Affected:	Model 400 (LC41-550FG) with Gamin Integrated Flight Display basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, RC050005, Revision I, dated 22 October 2008.
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Description of Change:	Section 4, Normal Procedures (Amplified Procedures), Landings, Short Field Landings, replace existing information.
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In Section 4, Normal Procedures (Amplified Procedures), Landings, Short Field Landings, replace existing information with the information on the opposite page:

APPROVED BY [signature]

for Vasant Gondhalekar, Lead ODA Administrator
Cessna Aircraft Company
Organization Designation Authorization ODA-100129-CE
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DATE OF APPROVAL 13 AUGUST 2010

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LANDINGS

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 the speed indicated in the landing schedule in Figure 5-36 on page 5-41. Maintain 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 nosewheel smoothly and quickly, and initiate braking immediately.

Braking should be initiated with light brake pedal pressure immediately after nosewheel touchdown. The pressure should then be increased at a rate that does not skid the tires but reaches maximum pressure on the brakes around 55 KIAS depending on airplane weight. Maximum pressure can continue until the airplane comes to a stop or runway exit is made. The achievement of maximum pressure may have to be delayed until a lower speed for landings at lighter weights. As the airplane decelerates into the lower speed range, a shudder may be felt in the landing gear. This response is normal and decreases in magnitude as the airplane slows.

Any indication of a skidding tire (audible 'chirp' from the main wheel area) should cause the pilot to immediately reduce the brake pedal pressure, after which the brake pedal pressure may be slowly increased again to maximum pressure. Braking response is improved if the flaps are retracted after nosewheel touchdown and back pressure is maintained on the stick throughout the landing roll.

WARNING

- **CAREFUL ADHERENCE TO SHORT FIELD LANDING PROCEDURE MUST BE ESTABLISHED EARLY IN THE APPROACH TO ASSURE ACHIEVING THE PUBLISHED LANDING DISTANCE. THE PROPER LANDING SPEED SHOULD BE ESTABLISHED EARLY DURING FINAL APPROACH AND STABILIZED DOWN TO 50 FT. HEIGHT. CARRYING EXTRA AIRSPEED, EVEN 3-4 KIAS, WILL RESULT IN SIGNIFICANTLY LONGER LANDING DISTANCES.**
- **IF TIRE SKIDDING OCCURS, IMMEDIATELY REDUCE BRAKE PEDAL PRESSURE. IF TIRE SKIDDING IS ALLOWED TO CONTINUE, A SEVERE OSCILLATORY YAWING MOTION, "WHEEL WALKING", COULD DEVELOP. IF THIS SEVERE OSCILLATORY YAWING MOTION OCCURS, AN AFT FUSELAGE INSPECTION MUST BE PERFORMED IN ACCORDANCE WITH THE AIRPLANE MAINTENANCE MANUAL BY AN APPROPRIATELY RATED MECHANIC PRIOR TO FURTHER FLIGHT.**

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APPROVED BY [signature]

for Vasant Gondhalekar, Lead ODA Administrator
Cessna Aircraft Company
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FAA Approved Under 14 CFR Part 183 Subpart D

DATE OF APPROVAL 13 AUGUST 2010

LANDINGS

Braking – Normal braking should begin with light pressure evenly applied to both pedals. The brake pedal pressure should be increased until the desired deceleration rate is achieved. Care should be taken to avoid a sharp instantaneous increase in brake pressure as this may result in a skidding tire.

Heavy braking, as would be used for short field landings, should be initiated with light brake pedal pressure immediately after nosewheel touchdown. The pressure should then be increased at a rate that does not skid the tires, but reaches maximum pressure on the brakes around 55 KIAS (or slightly slower at lighter landing weights). The maximum pressure can then continue until the airplane comes to a stop or runway exit is made.

Any indication of a skidding tire (audible 'chirp' from the main wheel area) should cause the pilot to immediately reduce the brake pedal pressure, after which the brake pedal pressure may be slowly increased again to maximum pressure. Braking response is improved if the flaps are retracted after nosewheel touchdown and back pressure is maintained on the control stick throughout the landing roll.

After heavy braking, especially when the airplane is near maximum gross weight; allow the brakes to cool for a minimum of 20 minutes before additional heavy braking. The brakes may overheat if there is repeated heavy braking without adequate cooling time.

NOTE

During brake application, as the airplane slows, a slight shudder or vibration may be felt in the landing gear. This shudder is considered normal and decreases in magnitude as the airplane decelerates and should not be taken as an indication of the more severe "wheel walking" condition. The pilot should continue normal braking or reduce brake pedal pressure slightly to decrease the shudder. The pilot should only release brake pedal pressure in the event of a tire skid.

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.

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.

Glideslope Flight Procedure with Autopilot – Approach the 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 200 feet AGL disconnect the autopilot and continue to manually fly the aircraft to the missed approach point or the decision height (See Limitations Section). 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.

When making ILS approaches in the Cessna aircraft the pilot should plan to intercept the approach between 100 to 115 KTS. Once established and the glideslope intercept is achieved, the flaps should be placed in the T.O. position and the aircraft slowed to 100 KTS. 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. Power settings resulting in approximately 1800-1850 RPM should be avoided as this propeller speed may intermodulate with the glideslope reception resulting in continuous minor control stick motion during coupled approaches and continuous minor glideslope deviation indications during coupled and non-coupled, or hand-flown, ILS approaches.

LANDINGS

Normal Landings – Landings under normal conditions are performed with the flaps set to the landing position. The landing approach speed is 85 to 90 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.

CAUTION

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

CAUTION

Avoid rapid throttle movement in order to reduce manifold pressure overboost. Smooth throttle movements allow the turbochargers to keep pace with the engine operating conditions.

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

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 the speed indicated in the landing schedule in Figure 5 - 36 on page 5-41. 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 forward slip (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. The maximum demonstrated crosswind component for landing is 23 knots.

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 Landings – 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 V_Y. When the airplane is a safe distance above the surface and at 106 KIAS or higher, arm the backup fuel pump and retract the flaps to the up position.

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.

SHUTDOWN

The engine should be idled at 900 RPM for five minutes minimum after landing (part of this may be taxi time) in order to give the turbochargers time to cool down while oil is still circulated to the bearings. If the engine is shutdown hot, the oil left in the turbochargers will be heated to the temperature of the turbochargers (in excess of 1000°F) and cannot properly lubricate. If engine RPM

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APPROVED BY *[signature]*

for **Vasant Gondhalekar, Lead ODA Administrator**
Cessna Aircraft Company
Organization Designation Authorization ODA-100129-CE
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DATE OF APPROVAL 13 AUGUST 2010

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Braking should be initiated with light brake pedal pressure immediately after nosewheel touchdown. The pressure should then be increased at a rate that does not skid the tires but reaches maximum pressure on the brakes around 55 KIAS depending on airplane weight. Maximum pressure can continue until the airplane comes to a stop or runway exit is made. The achievement of maximum pressure may have to be delayed until a lower speed for landings at lighter weights. As the airplane decelerates into the lower speed range, a shudder may be felt in the landing gear. This response is normal and decreases in magnitude as the airplane slows.

Any indication of a skidding tire (audible 'chirp' from the main wheel area) should cause the pilot to immediately reduce the brake pedal pressure, after which the brake pedal pressure may be slowly increased again to maximum pressure. Braking response is improved if the flaps are retracted after nosewheel touchdown and back pressure is maintained on the stick throughout the landing roll.

WARNING

- **CAREFUL ADHERENCE TO SHORT FIELD LANDING PROCEDURE MUST BE ESTABLISHED EARLY IN THE APPROACH TO ASSURE ACHIEVING THE PUBLISHED LANDING DISTANCE. THE PROPER LANDING SPEED SHOULD BE ESTABLISHED EARLY DURING FINAL APPROACH AND STABILIZED DOWN TO 50 FT. HEIGHT. CARRYING EXTRA AIRSPEED, EVEN 3-4 KIAS, WILL RESULT IN SIGNIFICANTLY LONGER LANDING DISTANCES.**
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APPROVED BY *[signature]*

for **Vasant Gondhalekar, Lead ODA Administrator**
Cessna Aircraft Company
Organization Designation Authorization ODA-100129-CE
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DATE OF APPROVAL 13 AUGUST 2010

LANDINGS

Braking – Normal braking should begin with light pressure evenly applied to both pedals. The brake pedal pressure should be increased until the desired deceleration rate is achieved. Care should be taken to avoid a sharp instantaneous increase in brake pressure as this may result in a skidding tire.

Heavy braking, as would be used for short field landings, should be initiated with light brake pedal pressure immediately after nosewheel touchdown. The pressure should then be increased at a rate that does not skid the tires, but reaches maximum pressure on the brakes around 55 KIAS (or slightly slower at lighter landing weights). The maximum pressure can then continue until the airplane comes to a stop or runway exit is made.

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After heavy braking, especially when the airplane is near maximum gross weight; allow the brakes to cool for a minimum of 20 minutes before additional heavy braking. The brakes may overheat if there is repeated heavy braking without adequate cooling time.

NOTE

During brake application, as the airplane slows, a slight shudder or vibration may be felt in the landing gear. This shudder is considered normal and decreases in magnitude as the airplane decelerates and should not be taken as an indication of the more severe "wheel walking" condition. The pilot should continue normal braking or reduce brake pedal pressure slightly to decrease the shudder. The pilot should only release brake pedal pressure in the event of a tire skid.

must be raised above 1200 RPM during the cool down period, the five minute cool down period must be restarted.

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.

Airplanes equipped with flat triangular leading edge tape on the wings and/or zig zag tape on the bottom surface of the horizontal tail will have improved stall characteristics at all flap settings. The triangular tape influences the boundary layer at high angles of attack. The zig zag tape influences elevator authority at large elevator up deflections.

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. The maximum altitude loss during power off stalls is approximately 300 ft. to 400 ft.

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-expected 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 5-7.

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 400, 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 400 (LC41-550FG), 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

Spins may be dangerous and are prohibited in Cessna aircraft.

Spins are preceded by a stall. A prompt and decisive stall recovery protects against inadvertent spins. Should a spin be encountered inadvertently, spin recovery should be initiated immediately.

This airplane is equipped with a stall warning device which gives advance aural warning of impending stalls. Do not operate this airplane with this system and device not in full operational condition.

The airplane, as certified by the Federal Aviation Administration, will recover from a one-turn spin at all weight and CG combinations in the approved weight and balance envelope. Recovery may require up to one additional turn with normal use of controls for recovery: power idle, rudder against the spin, elevator forward, and ailerons against the spin. If the flaps are extended, they should be retracted after the spin rotation has stopped to avoid exceeding the flap speed limit during recovery. When rotation stops, the airplane will be in a steep nose down attitude. Pulling out of the dive will produce 2 to 3 g's and airspeeds up to 160 KIAS.

WARNING

Recovery from a spin may require up to one additional turn with normal use of controls for recovery: power idle, rudder against the spin, elevator forward, and ailerons against the spin. If the flaps are extended, they should be retracted after the spin rotation is stopped to avoid exceeding the flap speed limit during recovery.

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 batteries. 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. False starting (failure to continue running after starting) often results in the formation of moisture on spark plugs due to condensation. This moisture can freeze and must be eliminated either by applying heat to the engine or removing and cleaning the spark plugs. Cold starting can be improved if the primer switch is kept depressed during engine start or by arming the backup fuel pump, which turns on high boost until the engine is running.

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 20°F (-7°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. Occasionally transfer the source of heat from the sump to the upper part of the engine. Start the engine immediately after completing the preheating process. Since the engine is warm, use the normal starting procedures.

WARNING

Failure to properly pre-heat a cold soaked engine could result in oil congealing within the engine, oil hoses, and oil cooler with subsequent loss of oil pressure, possible internal damage to the engine and subsequent engine failure.

CAUTION

Do not leave engine mounted preheaters on for more than 24 hours prior to flight. Continuous operation of engine mounted preheaters may result in aggressive corrosive attack to the engine internally.

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. Since the oil in the oil pressure gauge line may be congealed, as much as 30 seconds may elapse before oil pressure is indicated. If pressure is not indicated within one minute, shut the engine down and determine the cause. 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 60 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.

HOT WEATHER OPERATIONS

Flight operations during hot weather usually present few difficulties. It is unlikely that ambient temperatures at the selected cruising altitude will be high enough to cause difficulties. 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 condition, 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 and turn the vapor suppression on. Be sure the mixture is set properly to full rich, 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.

ENGINE OPERATION FOR MAXIMIZING EXHAUST LIFE

The exhaust is a thermally stressed component that endures frequent and rapid temperature changes. Every temperature change can be counted as a fatigue cycle and with each cycle having a cumulative effect may eventually result in the component cracking. When mechanical stress is added to thermal stress, cracking may occur even earlier. At normal operating temperature, 1625°F TIT for example, stainless steel loses >50% of its room temperature strength. The turbocharger and its attachment flange are thicker and the adjoining exhaust components. Therefore, the hot turbocharger flange will cool much slower than the adjoining components resulting in internal stresses. If an exhaust has become cracked, it should be replaced. Repair by welding is not an approved process as it is only a temporary solution that will not prevent the exhaust from cracking further.

The pilot can help prolong the life of the exhaust by running the engine at low EGT's/TIT's and by avoiding rapid exhaust gas temperature changes. The following information is provided as guidance:

- Low exhaust gas temperature corresponds to low power settings (<50%) or rich mixtures.
- Every throttle or mixture adjustment affects the exhaust gas temperature. Slower and less frequently adjustments will prolong the life of the exhaust system.
- During climb with rich mixture, the TIT's will generally be below 1400°F (760°C). When the mixture is leaned in cruise, the TIT increases by >300°F (149°C). Pulling the power back reduces EGT regardless of mixture setting.
- For small power changes (approximately 5%) the mixture can be adjusted to keep the exhaust temperature nearly constant.
- During descent, the power should be pulled back in small increments (1-2 in.Hg per 1000 ft. or per minute) to let the exhaust system components cool evenly.

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 400 (LC41-550FG) at 3600 lbs. (1633 kg) gross weight is 81.5 dB(A). The FAA has made no determination that these noise levels are acceptable or unacceptable for operations at any airport.

RUDDER HOLD SYSTEM (OPTIONAL)

The rudder hold system allows the pilot to hold the rudder at a set deflection. Initially, the pilot provides rudder pedal force required for proper trim, and then activates the rudder hold system. Once active, the pilot can remove pedal pressure, and the system will hold the rudder at the set deflection. When inactive, the rudder hold device will be undetectable by the pilot.

The system is activated by supplying electrical current through a pushbutton switch on the flaps panel. The switch, labeled "RUDDER HOLD ENGAGE", will only be active with the trim system on. Once activated, a blue indicator light shows that the system is engaged. The system is turned off by either pushing the autopilot disconnect button on the control stick or by pushing the rudder hold engage switch again. The system is automatically disengaged if the circuit breaker is opened, the master trim switch is turned off, the flaps are lowered, or the stall warning signal is activated.

With the system active, the pilot can resume manual control of the rudder by exerting a force exceeding 40 to 50 lbs to the rudder pedals. This activates a microswitch which disengages the rudder hold. If the microswitch fails, the clutch in the rudder hold assembly will supply only a limited torque before slipping. In the unlikely event of a rudder hold assembly brake seizure, a shear pin can be broken, thus disengaging the capstan from the brake, and allowing free movement of the rudder.

NOTE

The rudder hold assembly brake will engage while the Press-to-Test button is pressed and disengage when the button is released. The shear pin can be broken if pressure is applied to the rudder pedals while the Press-to-Test button is pressed.

Section 5
Performance

TABLE OF CONTENTS

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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.

AIRSPEED CALIBRATION

KIAS	ERROR	KCAS
Less than 70	+1	Less than 71
71 to 112	+2	73 to 114
113 to 154	+3	116 to 157
155 to 200	+4	159 to 204
Greater than 200	+5	Greater than 205

Figure 5 - 1

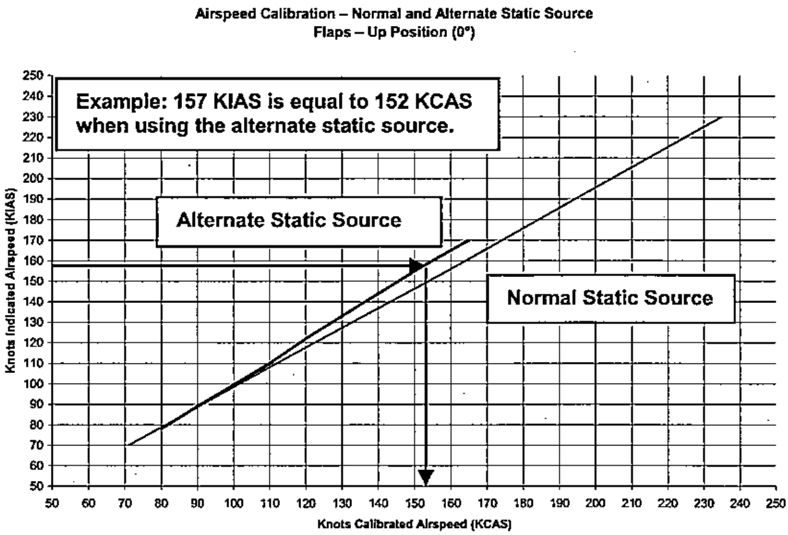

Figure 5 - 2

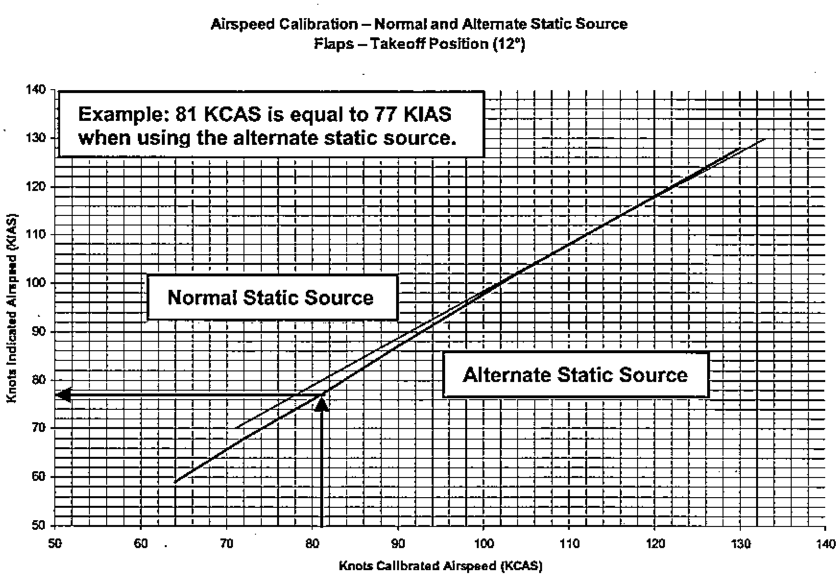

Figure 5 - 3

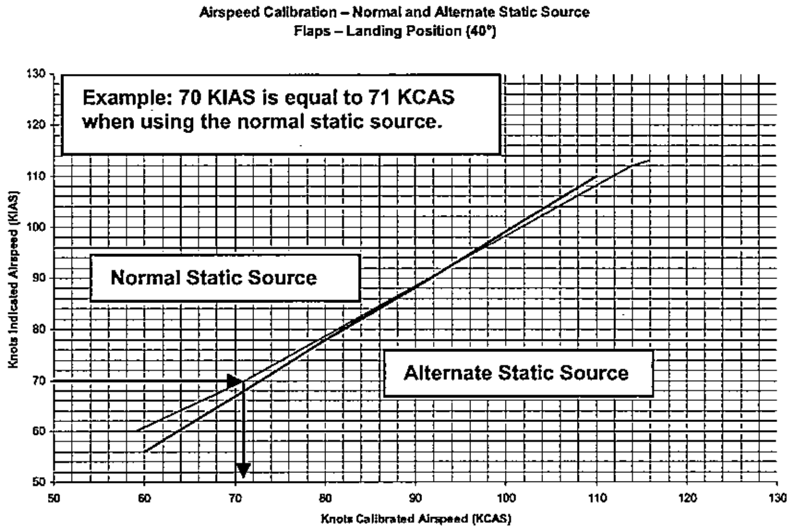

Figure 5 - 4

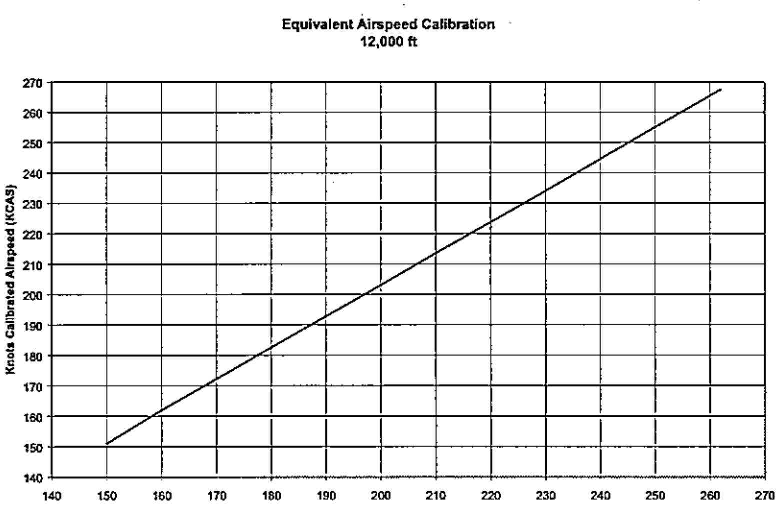

Figure 5 - 5

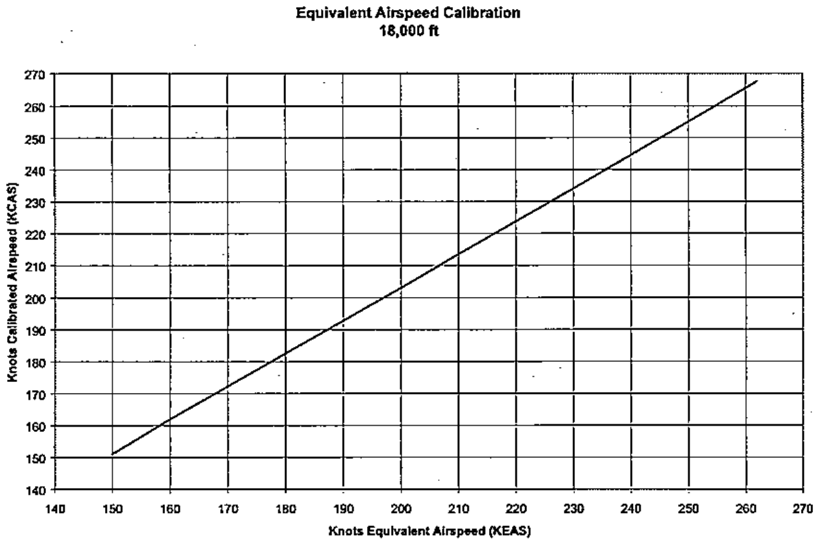
Equivalent Airspeed Calibration
18,000 ft
Knots Calibrated Airspeed (KCAS)
Knots Equivalent Airspeed (KEAS)
140
150
160
170
180
190
200
210
220
230
240
250
260
270

Figure 5 - 6

TEMPERATURE CONVERSION

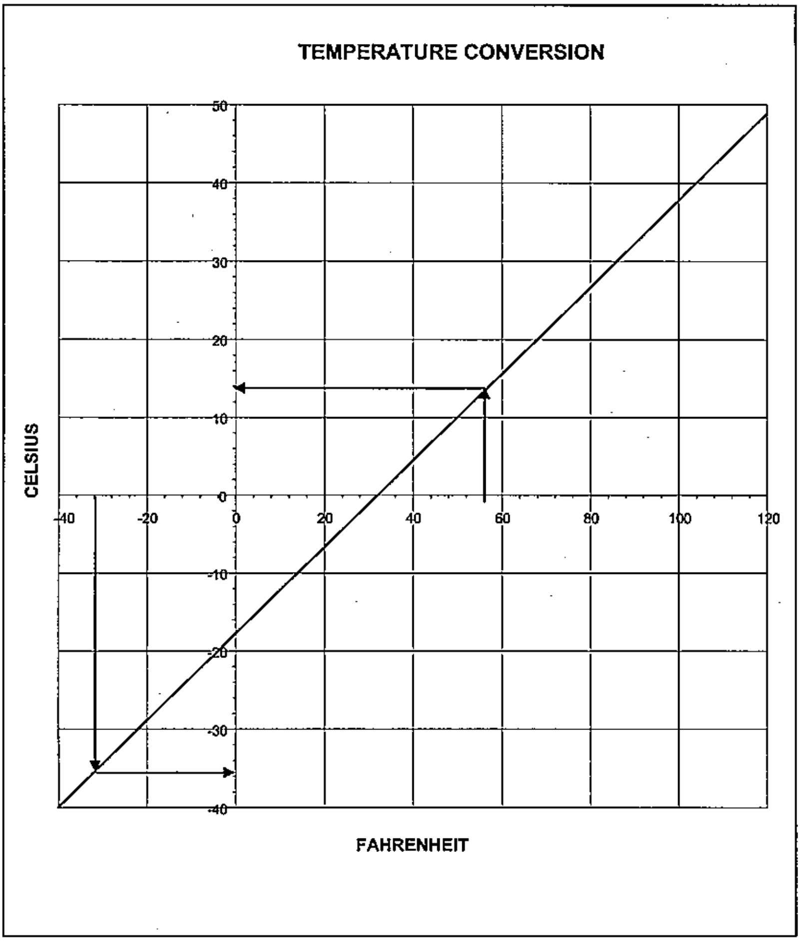

Figure 5 - 7

STALL SPEEDS

Figure 5 - 8 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., 3600 pounds with the CG located 108.8 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 4-29. The maximum altitude loss during power off stalls is about 500 feet. Nose down attitude change during stall recovery is

generally less than 5° but may be up to 15°. **Example**: Using the table below, stall speeds of 64 KIAS and 65 KCAS are indicated for 30° 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	
3600 lbs. (1633 kg)	Flaps - Cruise	72	73*	73	74*	76	77*	78	79*	85	85*	87	87*	101	102*	103	104*
	Flaps - Takeoff	65	67*	66	68*	70	72*	71	73*	77	79*	79	81*	92	95*	94	97*
	Flaps - Landing	59	60*	60	61*	64	65*	65	66*	70	71*	72	73*	83	84*	85	86*

* Flat Triangular leading edge tape applied to the wings.

Figure 5 - 8

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 deploying 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.
4. Deployed SpeedBrakes™ have minor to no effect on stall speed and stall characteristics.

CROSSWIND, HEADWIND, AND TAILWIND COMPONENT

Degrees Wind Off Runway Centerline		10°		20°		30°		40°		50°		60°		70°		80°	
		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, 60° off the downwind runway centerline, has a tailwind component of 10 knots and a crosswind component of 17 knots.

Figure 5 - 9

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SHORT FIELD TAKEOFF DISTANCE (12° - TAKEOFF FLAPS)

ASSOCIATED CONDITIONS		EXAMPLE	
Power	Takeoff Power Set Before Brake Release	OAT	25°C
Flaps	12° (Takeoff position)	Pressure Altitude (PA)	4000 ft
Runway	Paved, Level, Dry Surface	Takeoff Weight	3500 lbs
Takeoff Speed	See Speed Schedule in Figure 5 - 11.	Headwind Component	10 Knots
		Ground Roll = 1400 ft (427 m) **50 ft Obstacle = 2050 ft (625 m)**	

Runway Slope Correction: Add 1% to ground roll for every 0.1° (0.2%) of uphill slope. 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 1.3 x 1400 ft = 1820 ft (555 m). The total distance to clear a 50-ft obstacle would be 2470 ft (753 m) in this instance.

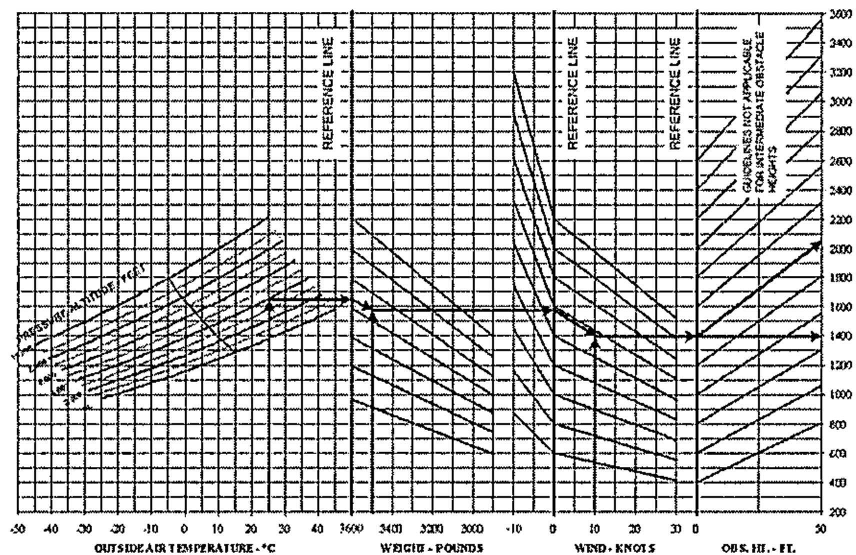

Figure 5 - 10

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SHORT FIELD TAKEOFF SPEED SCHEDULE

The following chart should be used in conjunction with the takeoff distance chart in Figure 5 - 10 to determine the proper takeoff speed based on aircraft weight.

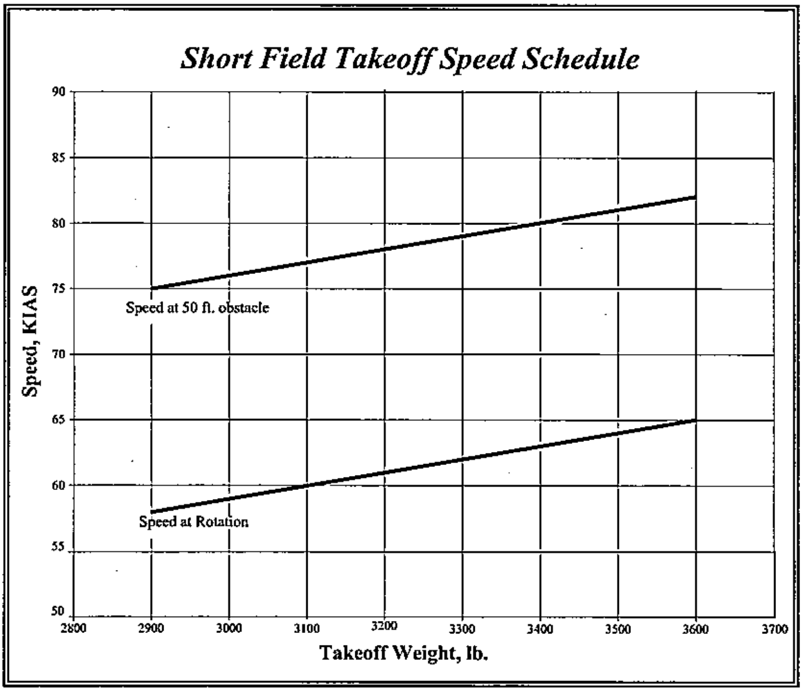


Figure 5 - 11

MAXIMUM RATE OF CLIMB (Without Flat Triangular Leading Edge Tape On The Wings

Pressure Altitude (Feet)	RATE OF CLIMB (FT/MIN) 3000 lb (1361 kg) 106 KIAS			RATE OF CLIMB (FT/MIN) 3300 lb (1497 kg) 108 KIAS			RATE OF CLIMB (FT/MIN) 3600 lb (1633 kg) 110 KIAS		
	ISA -20 C	ISA	ISA +30 C	ISA -20 C	ISA	ISA +30 C	ISA -20 C	ISA	ISA +30 C
0	1920	1635	1230	1780	1515	1145	1645	1400	1055
1000	1920	1635	1230	1785	1515	1145	1645	1400	1055
2000	1925	1635	1235	1785	1515	1150	1650	1400	1060
3000	1925	1635	1235	1785	1515	1150	1650	1400	1060
4000	1925	1635	1230	1785	1515	1147	1650	1400	1060
5000	1930	1635	1230	1790	1515	1145	1650	1400	1055
6000	1930	1635	1225	1790	1515	1143	1652	1400	1055
7000	1930	1635	1225	1790	1515	1141	1655	1400	1055
8000	1935	1635	1220	1795	1515	1140	1655	1400	1050
9000	1935	1635	1220	1795	1515	1140	1655	1400	1050
10000	1935	1635	1220	1795	1515	1135	1655	1400	1050
11000	1940	1635	1215	1800	1515	1135	1660	1400	1045
12000	1940	1635	1215	1800	1517	1132	1660	1400	1045
13000	1940	1635	1210	1790	1506	1120	1650	1390	1035
14000	1945	1635	1210	1780	1495	1110	1640	1380	1025
15000	1945	1635	1210	1770	1485	1095	1630	1370	1015
16000	1905	1594	1170	1740	1460	1070	1610	1345	990
17000	1865	1555	1135	1715	1435	1050	1585	1325	970
18000	1825	1515	1100	1690	1410	1025	1560	1300	945
19000	1770	1465	1050	1640	1360	980	1515	1255	905
20000	1715	1415	1005	1590	1315	935	1470	1215	865
21000	1665	1365	955	1545	1270	895	1425	1170	825
22000	1590	1295	895	1475	1205	835	1360	1110	770
23000	1515	1225	830	1405	1140	775	1295	1050	715
24000	1420	1140	750	1315	1055	700	1215	975	645
25000	1325	1050	670	1230	975	625	1135	900	580

Figure 5 - 12

MAXIMUM RATE OF CLIMB (With Flat Triangular Leading Edge Tape On The Wings)

Pressure Altitude (Feet)	RATE OF CLIMB (FT/MIN) 3000 lb (1361 kg) 106 KIAS			RATE OF CLIMB (FT/MIN) 3300 lb (1497 kg) 108 KIAS			RATE OF CLIMB (FT/MIN) 3600 lb (1633 kg) 110 KIAS		
	ISA -20 C	ISA	ISA +30 C	ISA -20 C	ISA	ISA +30 C	ISA -20 C	ISA	ISA +30 C
0	1805	1520	1115	1665	1400	1030	1530	1285	940
1000	1805	1520	1115	1670	1400	1030	1530	1285	940
2000	1810	1520	1120	1670	1400	1035	1535	1285	945
3000	1810	1520	1120	1670	1400	1035	1535	1285	945
4000	1810	1520	1115	1670	1400	1032	1535	1285	945
5000	1815	1520	1115	1675	1400	1030	1535	1285	940
6000	1815	1520	1110	1675	1400	1028	1537	1285	940
7000	1815	1520	1110	1675	1400	1026	1540	1285	940
8000	1820	1520	1105	1680	1400	1025	1540	1285	935
9000	1820	1520	1105	1680	1400	1025	1540	1285	935
10000	1820	1520	1105	1680	1400	1020	1540	1285	935
11000	1825	1520	1100	1685	1400	1020	1545	1285	930
12000	1825	1520	1100	1685	1402	1017	1545	1285	930
13000	1825	1520	1095	1675	1391	1005	1535	1275	920
14000	1830	1520	1095	1665	1380	995	1525	1265	910
15000	1830	1520	1095	1655	1370	980	1515	1255	900
16000	1790	1479	1055	1625	1345	955	1495	1230	875
17000	1750	1440	1020	1600	1320	935	1470	1210	855
18000	1710	1400	985	1575	1295	910	1445	1185	830
19000	1655	1350	935	1525	1245	865	1400	1140	790
20000	1600	1300	890	1475	1200	820	1355	1100	750
21000	1550	1250	840	1430	1155	780	1310	1055	710
22000	1475	1180	780	1360	1090	720	1245	995	655
23000	1400	1110	715	1290	1025	660	1180	935	600
24000	1305	1025	635	1200	940	585	1100	860	530
25000	1210	935	555	1115	860	510	1020	785	465

Figure 5 - 13

TIME, FUEL, AND DISTANCE TO CLIMB (No Flat Triangular Leading Edge Tape)

Pressure Altitude	Climb Speed KIAS	Rate of Climb FPM	Time Min	Fuel Used Gal. (L)	Distance NM
0	110	1400	0.0	0.0 (0.0)	0
1000	110	1400	0.7	0.5 (1.8)	1
2000	110	1400	1.4	0.9 (3.5)	3
3000	110	1400	2.1	1.4 (5.3)	4
4000	110	1400	2.9	1.9 (7.0)	5
5000	110	1400	3.6	2.3 (8.8)	7
6000	110	1400	4.3	2.8 (10.5)	8
7000	110	1400	5.0	3.3 (12.3)	10
8000	110	1400	5.7	3.7 (14.1)	11
9000	110	1400	6.4	4.2 (15.8)	13
10000	110	1400	7.1	4.6 (17.6)	14
11000	110	1400	7.9	5.1 (19.3)	16
12000	110	1400	8.6	5.6 (21.1)	17
13000	110	1390	9.3	6.0 (22.9)	19
14000	110	1380	10.0	6.5 (24.6)	21
15000	110	1370	10.7	7.0 (26.4)	22
16000	110	1345	11.5	7.5 (28.3)	24
17000	110	1325	12.2	8.0 (30.1)	26
18000	110	1300	13.0	8.5 (32.0)	28
19000	110	1255	13.8	9.0 (34.0)	30
20000	110	1215	14.6	9.5 (36.0)	32
21000	110	1170	15.5	10.1 (38.2)	34
22000	110	1110	16.4	10.7 (40.3)	36
23000	110	1050	17.3	11.3 (42.7)	39
24000	110	975	18.4	11.9 (45.2)	42
25000	110	900	19.5	12.7 (47.9)	45

Associated Conditions

Power .... 2600 RPM
Flaps .... Cruise
Mixture .... At recommended leaning schedule
Temp. .... Standard Day (ISA)
Wind .... Zero Wind
Time .... Include 45 seconds for takeoff and acceleration to V_Y.

Figure 5 - 14

TIME, FUEL, AND DISTANCE TO CLIMB (With Flat Triangular Leading Edge Tape)

Pressure Altitude	Climb Speed KIAS	Rate of Climb FPM	Time Min	Fuel Used Gal. (L)	Distance NM
0	110	1285	0.0	0.0 (0.0)	0
1000	110	1285	0.8	0.5 (1.9)	1
2000	110	1285	1.6	1.0 (3.8)	3
3000	110	1285	2.3	1.5 (5.7)	4
4000	110	1285	3.1	2.0 (7.7)	6
5000	110	1285	3.9	2.5 (9.6)	7
6000	110	1285	4.7	3.0 (11.5)	9
7000	110	1285	5.4	3.5 (13.4)	11
8000	110	1285	6.2	4.0 (15.3)	12
9000	110	1285	7.0	4.6 (17.2)	14
10000	110	1285	7.8	5.1 (19.1)	16
11000	110	1285	8.6	5.6 (21.1)	17
12000	110	1285	9.3	6.1 (23.0)	19
13000	110	1275	10.1	6.6 (24.9)	21
14000	110	1265	10.9	7.1 (26.8)	22
15000	110	1255	11.7	7.6 (28.8)	24
16000	110	1230	12.5	8.1 (30.8)	26
17000	110	1210	13.3	8.7 (32.8)	28
18000	110	1185	14.2	9.2 (34.9)	30
19000	110	1140	15.1	9.8 (37.1)	32
20000	110	1100	16.0	10.4 (39.3)	35
21000	110	1055	16.9	11.0 (41.6)	37
22000	110	995	17.9	11.7 (44.1)	40
23000	110	935	19.0	12.4 (46.8)	43
24000	110	860	20.2	13.1 (49.6)	46
25000	110	785	21.4	13.9 (52.7)	49

Associated Conditions

Power .... 2600 RPM
Flaps .... Cruise
Mixture .... At recommended leaning schedule
Temp. .... Standard Day (ISA)
Wind .... Zero Wind
Time .... Include 45 seconds for takeoff and acceleration to V_Y.

Figure 5 - 15

CRUISE PERFORMANCE OVERVIEW

The tables on pages 5-19 through 5-32 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 25,000 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 85% of brake horsepower, the mixtures should be leaned through use of the turbine inlet temperature (TIT) gauge. Please refer to page 4-25 in this handbook for proper leaning techniques.

KTAS values in the tables are valid without the nose wheel pant installed. If the nose wheel pant is installed add 4 kts to the KTAS values.

The maximum recommended cruise setting is 85% of brake horsepower. The mixture must not be leaned above settings that produce more than 85% of brake horsepower. During cruise power settings above 65%, ambient temperature conditions need to be considered. In hot weather and high altitudes, it may be necessary to set the fuel flow to a lower TIT to maintain cylinder head temperatures within the recommended range for cruise.

The cruise performance is not affected by the flat triangular leading edge tape.

CRUISE PERFORMANCE SEA LEVEL PRESSURE ALTITUDE

INITIAL SETTINGS			-5° C (20° C BELOW STANDARD TEMP)				15° C (STANDARD TEMPERATURE)				45° C (30° C ABOVE STANDARD TEMP)			
RPM	MAP	MAP	% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)	
	BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP
2500	31.5		91	182	26 (97)		85	182	23 (87)		76	180	20 (75)	
2500	30.0		86	179	24 (90)	19 (72)	80	178	21 (81)	18 (66)	71	176	18 (69)	16 (60)
2500	29.0	32.0	83	177	23 (85)	18 (68)	77	176	20 (77)	17 (64)	68	173	17 (66)	15 (58)
2500	27.0	29.5	77	172	20 (77)	17 (64)	71	170	18 (69)	16 (60)	62	167	16 (60)	14 (54)
2500	25.0	27.5	71	166	18 (69)	16 (60)	65	164	16 (62)	15 (56)	56	160	14 (54)	13 (49)
2500	24.0	26.0	68	163	17 (65)	15 (58)	62	161	16 (59)	14 (53)	53	156	13 (51)	12 (47)
2500	22.0	23.5	61	157	15 (58)	14 (53)	55	154	14 (53)	13 (48)	46	148	12 (45)	11 (41)
2500	20.0	21.0	54	150	14 (52)	13 (48)	48	146	12 (47)	11 (43)	39	140	10 (40)	9 (36)
2400	33.0		90	182	26 (97)		84	182	23 (87)		75	179	20 (74)	
2400	31.0		85	178	23 (88)		79	177	21 (79)		70	174	18 (68)	
2400	30.0		82	176	22 (84)	18 (68)	76	175	20 (75)	17 (64)	67	172	17 (65)	15 (57)
2400	28.0	30.5	77	171	20 (76)	17 (64)	71	170	18 (68)	16 (60)	62	166	16 (59)	14 (53)
2400	26.0	28.5	70	166	18 (68)	16 (60)	64	164	16 (62)	15 (55)	55	159	14 (53)	13 (49)
2400	25.0	27.0	67	163	17 (65)	15 (57)	61	161	15 (59)	14 (53)	52	156	13 (51)	12 (46)
2400	23.0	25.0	61	157	15 (58)	14 (53)	55	154	14 (53)	13 (48)	46	148	12 (45)	11 (41)
2400	20.0	21.0	51	146	13 (49)	12 (45)	45	143	12 (44)	11 (41)	36	136	10 (37)	9 (33)
2300	34.0		88	180	25 (93)		82	180	22 (83)		73	177	19 (71)	
2300	33.0		86	178	23 (89)		80	178	21 (80)		71	175	18 (68)	
2300	31.0		81	174	21 (81)	18 (67)	75	173	19 (73)	17 (63)	66	170	17 (63)	15 (56)
2300	29.0	31.5	75	170	20 (74)	17 (63)	69	168	18 (67)	16 (59)	60	165	15 (58)	14 (52)
2300	27.0	29.5	70	165	18 (67)	16 (59)	64	163	16 (61)	14 (55)	55	158	14 (53)	13 (48)
2300	26.0	28.5	67	162	17 (64)	15 (57)	61	160	15 (58)	14 (53)	52	155	13 (50)	12 (46)
2300	24.0	26.5	61	157	15 (58)	14 (53)	55	154	14 (53)	13 (48)	46	148	12 (45)	11 (41)
2300	21.0	23.5	51	147	13 (50)	12 (46)	45	143	12 (45)	11 (41)	36	136	10 (38)	9 (34)

3600 lbs. (1633 kg) Gross Weight. Flaps Up. Recommended Mixture Setting. Data in these charts are based on this leaning schedule discussed on page 4-25. Best Power or Lean of Peak. * As a rule, always round to the more conservative number when using the performance tables in this handbook.

EXAMPLE PROBLEM AND SOLUTION

Conditions: Cruise Altitude = 1000 ft.; Temperature = 13° C; Manifold Pressure = 25 in. Hg.; RPM = 2500, Best Power	Determine: % of BHP; Fuel Consumption (GPH); True Airspeed	Solution: % of BHP = 65%; Fuel Consumption = 16 GPH (62 LPH); True Airspeed = 165 Knots*

Figure 5 - 16

CRUISE PERFORMANCE 2000 FEET PRESSURE ALTITUDE

INITIAL SETTINGS			-9° C (20° C BELOW STANDARD TEMP)				11° C (STANDARD TEMPERATURE)				41° C (30° C ABOVE STANDARD TEMP)			
RPM	MAP	MAP	% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)	
	BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP
2500	31.5		91	185	26 (97)		85	185	23 (87)		76	183	20 (75)	
2500	30.0		86	182	24 (90)	19 (70)	80	182	21 (81)	18 (66)	71	179	18 (69)	16 (60)
2500	29.0	32.0	83	180	23 (85)	18 (68)	77	179	20 (77)	17(64)	68	176	17 (66)	15 (58)
2500	27.0	29.5	77	175	20 (77)	17 (64)	71	173	18 (69)	16 (60)	62	170	16 (60)	14 (54)
2500	25.0	27.5	71	169	18 (69)	16 (60)	65	167	16 (62)	15 (56)	56	163	14 (54)	13 (49)
2500	24.0	26.0	68	166	17 (65)	15 (58)	62	164	16 (59)	14 (53)	53	159	13 (51)	12 (47)
2500	22.0	23.5	61	160	15 (58)	14 (53)	55	157	14 (53)	13 (48)	46	151	12 (45)	11 (41)
2500	20.0	21.0	54	152	14 (52)	13 (48)	48	149	12 (47)	11 (43)	39	143	10 (40)	9 (36)
2400	33.0		90	185	26 (97)		84	185	23 (87)		75	183	20 (74)	
2400	31.0		85	181	23 (88)		79	180	21 (79)		70	178	18 (68)	
2400	30.0		82	179	22 (84)	18 (68)	76	178	20 (75)	17 (64)	67	175	17 (65)	15 (57)
2400	28.0	30.5	77	174	20 (76)	17 (64)	71	173	18 (68)	16 (60)	62	169	16 (59)	14 (53)
2400	26.0	28.5	70	169	18 (68)	16 (60)	64	167	16 (62)	15 (55)	55	162	14 (53)	13 (49)
2400	25.0	27.0	67	166	17 (65)	15 (57)	61	164	15 (59)	14 (53)	52	159	13 (51)	12 (46)
2400	23.0	25.0	61	160	15 (58)	14 (53)	55	157	14 (53)	13 (48)	46	151	12 (45)	11 (41)
2400	20.0	21.0	51	149	13 (49)	12 (45)	45	145	12 (44)	11 (41)	36	139	10 (37)	9 (33)
2300	34.0		88	184	25 (93)		82	183	22 (83)		73	181	19 (71)	
2300	33.0		86	182	23 (89)		80	181	21 (80)		71	178	18 (68)	
2300	31.0		81	178	21 (81)	18 (67)	75	176	19 (73)	17 (63)	66	173	17 (63)	15 (56)
2300	29.0	31.5	75	173	20 (74)	17 (63)	69	172	18 (67)	16 (59)	60	168	15 (58)	14 (52)
2300	27.0	29.5	70	168	18 (67)	16 (59)	64	166	16 (61)	14 (55)	55	161	14 (53)	13 (48)
2300	26.0	28.5	67	165	17 (64)	15 (57)	61	163	15 (58)	14 (53)	52	158	13 (50)	12 (46)
2300	24.0	26.5	61	159	15 (58)	14 (53)	55	157	14 (53)	13 (48)	46	151	12 (45)	11 (41)
2300	21.0	23.5	51	149	13 (50)	12 (46)	45	146	12 (45)	11 (41)	36	139	10 (38)	9 (34)

3600 lbs. (1633 kg) Gross Weight. Flaps Up. Recommended Mixture Setting. Data in these charts are based on this leaning schedule discussed on page 4-25. Best Power or Lean of Peak.

EXAMPLE PROBLEM AND SOLUTION

Conditions: Cruise Altitude = 2000 ft.; Temperature = 22° C; Manifold Pressure = 29 in. Hg.; RPM = 2500, Best Power	Determine: % of BHP; Fuel Consumption (GPH); True Airspeed	Solution: % of BHP = 73%; Fuel Consumption = 19 GPH (72 LPH); True Airspeed = 178 Knots.

Figure 5 - 17

CRUISE PERFORMANCE 4000 FT PRESSURE ALTITUDE

INITIAL SETTINGS			-13° C (20° C BELOW STANDARD TEMP)				7° C (STANDARD TEMPERATURE)				37° C (30° C ABOVE STANDARD TEMP)			
RPM	MAP	MAP	% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)	
	BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP
2500	31.5		91	189	26 (97)		85	189	23 (87)		76	187	20 (75)	
2500	30.0		86	186	24 (90)	19 (70)	80	185	21 (81)	18 (66)	71	182	18 (69)	16 (60)
2500	29.0	32.0	83	183	23 (85)	18 (68)	77	182	20 (77)	17 (64)	68	179	17 (66)	15 (58)
2500	27.0	29.5	77	178	20 (77)	17 (64)	71	177	18 (69)	16 (60)	62	173	16 (60)	14 (54)
2500	25.0	27.5	71	172	18 (69)	16 (60)	65	170	16 (62)	15 (56)	56	166	14 (54)	13 (49)
2500	24.0	26.0	68	169	17 (65)	15 (58)	62	167	16 (59)	14 (53)	53	162	13 (51)	12 (47)
2500	22.0	23.5	61	162	15 (58)	14 (53)	55	160	14 (53)	13 (48)	46	154	12 (45)	11 (41)
2500	20.0	21.0	54	155	14 (52)	13 (48)	48	152	12 (47)	11 (43)	39	146	10 (40)	9 (36)
2400	33.0		90	189	26 (97)		84	188	23 (87)		75	186	20 (74)	
2400	31.0		85	185	23 (88)		79	184	21 (79)		70	181	18 (68)	
2400	30.0		82	182	22 (84)	18 (68)	76	181	20 (75)	17 (64)	67	178	17 (65)	15 (57)
2400	28.0	30.5	77	177	20 (76)	17 (64)	71	176	18 (68)	16 (60)	62	172	16 (59)	14 (53)
2400	26.0	28.5	70	172	18 (68)	16 (60)	64	170	16 (62)	15 (55)	55	165	14 (53)	13 (49)
2400	25.0	27.0	67	169	17 (65)	15 (57)	61	167	15 (59)	14 (53)	52	162	13 (51)	12 (46)
2400	23.0	25.0	61	162	15 (58)	14 (53)	55	160	14 (53)	13 (48)	46	154	12 (45)	11 (41)
2400	20.0	21.0	51	152	13 (49)	12 (45)	45	148	12 (44)	11 (41)	36	141	10 (37)	9 (33)
2300	34.0		88	187	25 (93)		82	186	22 (83)		73	184	19 (71)	
2300	33.0		86	185	23 (89)		80	184	21 (80)		71	182	18 (68)	
2300	31.0		81	181	21 (81)	18 (67)	75	180	19 (73)	17 (63)	66	176	17 (63)	15 (56)
2300	29.0	31.5	75	176	20 (74)	17 (63)	69	175	18 (67)	16 (59)	60	171	15 (58)	14 (52)
2300	27.0	29.5	70	171	18 (67)	16 (59)	64	169	16 (61)	14 (55)	55	165	14 (53)	13 (48)
2300	26.0	28.5	67	168	17 (64)	15 (57)	61	166	15 (58)	14 (53)	52	161	13 (50)	12 (46)
2300	24.0	26.5	61	162	15 (58)	14 (53)	55	160	14 (53)	13 (48)	46	154	12 (45)	11 (41)
2300	21.0	23.5	51	152	13 (50)	12 (46)	45	149	12 (45)	11 (41)	36	142	10 (38)	9 (34)

3600 lbs. (1633 kg) Gross Weight. Flaps Up. Recommended Mixture Setting. Data in these charts are based on this leaning schedule discussed on page 4-25. Best Power or Lean of Peak. *89% is above the maximum recommended cruise setting of 85% and does not represent a recommended mixture setting

EXAMPLE PROBLEM AND SOLUTION

Conditions: Cruise Altitude = 4000 ft.; Temperature = -9° C; Manifold Pressure = 33 in. Hg.; RPM = 2400, Best Power	Determine: % of BHP; Fuel Consumption (GPH); True Airspeed	Solution: % of BHP = 89%;* Fuel Consumption = 25 GPH (96 LPH); True Airspeed = 189 Knots.

Figure 5 - 18

CRUISE PERFORMANCE 6000 FT PRESSURE ALTITUDE

INITIAL SETTINGS			-17° C (20° C BELOW STANDARD TEMP)				3° C (STANDARD TEMPERATURE)				33° C (30° C ABOVE STANDARD TEMP)			
RPM	MAP	MAP	% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)	
	BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP
2500	31.5		91	193	26 (97)		85	192	23 (87)		76	190	20 (75)	
2500	30.0		86	189	24 (90)	19 (70)	80	188	21 (81)	18 (66)	71	186	18 (69)	16 (60)
2500	29.0	32.0	83	187	23 (85)	18 (68)	77	186	20 (77)	17 (64)	68	183	17 (66)	15 (58)
2500	27.0	29.5	77	181	20 (77)	17(64)	71	180	18 (69)	16 (60)	62	176	16 (60)	14 (54)
2500	25.0	27.5	71	175	18 (69)	16 (60)	65	173	16 (62)	15 (56)	56	169	14 (54)	13 (49)
2500	24.0	26.0	68	172	17 (65)	15 (58	62	170	16 (59)	14 (53)	53	165	13 (51)	12 (47)
2500	22.0	23.5	61	165	15 (58)	14 (53)	55	163	14 (53)	13 (48)	46	157	12 (45)	11 (41)
2500	20.0	21.0	54	158	14 (52)	13 (48)	48	155	12 (47)	11 (43)	39	149	10 (40)	9 (36)
2400	33.0		90	192	26 (97)		84	192	23 (87)		75	190	20 (74)	
2400	31.0		85	188	23 (88)		79	187	21 (79)		70	184	18 (68)	
2400	30.0		82	186	22 (84)	18 (68)	76	185	20 (75)	17 (64)	67	182	17 (65)	15 (57)
2400	28.0	30.5	77	181	20 (76)	17 (64)	71	179	18 (68)	16 (60)	62	175	16 (59)	14 (53)
2400	26.0	28.5	70	175	18 (68)	16 (60)	64	173	16 (62)	15 (55)	55	169	14 (53)	13 (49)
2400	25.0	27.0	67	172	17 (65)	15 (57)	61	170	15 (59)	14 (53)	52	165	13 (51)	12 (46)
2400	23.0	25.0	61	165	15 (58)	14 (53)	55	163	14 (53)	13 (48)	46	157	12 (45)	11 (41)
2400	20.0	21.0	51	154	13 (49)	12 (45)	45	151	12 (44)	11 (41)	36	144	10 (37)	9 (33)
2300	34.0		88	191	25 (93)		82	190	22 (83)		73	187	19 (71)	
2300	33.0		86	189	23 (89)		80	188	21 (80)		71	185	18 (68)	
2300	31.0		81	184	21 (81)	18 (67)	75	183	19 (73)	17 (63)	66	180	17 (63)	15 (56)
2300	29.0	31.5	75	180	20 (74)	17 (63)	69	178	18 (67)	16 (59)	60	174	15 (58)	14 (52)
2300	27.0	29.5	70	174	18 (67)	16 (59)	64	172	16 (61)	14 (55)	55	168	14 (53)	13 (48)
2300	26.0	28.5	67	171	17 (64)	15 (57)	61	169	15 (58)	14 (53)	52	164	13 (50)	12 (46)
2300	24.0	26.5	61	165	15 (58)	14 (53)	55	163	14 (53)	13 (48)	46	157	12 (45)	11 (41)
2300	21.0	23.5	51	155	13 (50)	12 (46)	45	151	12 (45)	11 (41)	36	145	10 (38)	9 (34)

3600 lbs. (1633 kg) Gross Weight. Flaps Up. Recommended Mixture Setting. Data in these charts are based on this leaning schedule discussed on page 4-25. Best Power or Lean of Peak.

EXAMPLE PROBLEM AND SOLUTION

Conditions: Cruise Altitude = 6000 ft.; Temperature = 33° C; Manifold Pressure = 23 in. Hg.; RPM = 2500, Best Power	Determine: % of BHP; Fuel Consumption (GPH); True Airspeed	Solution: % of BHP = 49%; Fuel Consumption = 13 GPH (48 LPH); True Airspeed = 161 Knots.

Figure 5 - 19

CRUISE PERFORMANCE 8000 FT PRESSURE ALTITUDE

INITIAL SETTINGS			-21° C (20° C BELOW STANDARD TEMP)				-1° C (STANDARD TEMPERATURE)				29° C (30° C ABOVE STANDARD TEMP)			
					FUEL FLOW GAL/HR (L/HR)				FUEL FLOW GAL/HR (L/HR)				FUEL FLOW GAL/HR (L/HR)	
RPM	MAP BEST POWER	MAP -50 LOP	% BHP	KTAS	BEST POWER	-50 LOP	% BHP	KTAS	BEST POWER	-50 LOP	% BHP	KTAS	BEST POWER	-50 LOP
2500	31.5		91	200	27 (101)		85	199	24 (90)		76	196	20 (77)	
2500	30.0		86	196	25 (93)	19 (70)	80	195	22 (83)	18 (66)	71	192	19 (71)	16 (60)
2500	29.0	32.0	83	193	23 (88)	18 (68)	77	192	21 (79)	17 (64)	68	189	18 (68)	15 (58)
2500	27.0	29.5	77	188	21 (79)	17 (64)	71	186	19 (71)	16 (60)	62	182	16 (61)	14 (54)
2500	25.0	27.5	71	181	19 (71)	16 (60)	65	179	17 (64)	15 (56)	56	174	14 (55)	13 (49)
2500	24.0	26.0	68	178	18 (67)	15 (58)	62	175	16 (60)	14 (53)	53	170	14 (52)	12 (47)
2500	22.0	23.5	61	171	16 (60)	14 (53)	55	168	14 (54)	13 (48)	46	162	12 (46)	11 (41)
2500	20.0	21.0	54	163	14 (53)	13 (48)	48	159	13 (48)	11 (43)	39	153	11 (40)	9 (36)
2400	33.0		90	200	26 (100)		84	199	24 (90)		75	196	20 (77)	
2400	31.0		85	195	24 (91)		79	194	22 (82)		70	190	18 (70)	
2400	30.0		82	192	23 (86)	18 (68)	76	191	21 (78)	17 (64)	67	187	18 (66)	15 (57)
2400	28.0	30.5	77	187	21 (78)	17 (64)	71	185	19 (70)	16 (60)	62	181	16 (60)	14 (53)
2400	26.0	28.5	70	181	19 (70)	16 (60)	64	178	17 (63)	15 (55)	55	174	14 (54)	13 (49)
2400	25.0	27.0	67	177	18 (67)	15 (57)	61	175	16 (60)	14 (53)	52	170	14 (52)	12 (46)
2400	23.0	25.0	61	171	16 (60)	14 (53)	55	168	14 (54)	13 (48)	46	162	12 (46)	11 (41)
2400	20.0	21.0	51	159	13 (50)	12 (45)	45	155	12 (45)	11 (41)	36	148	10 (38)	9 (33)
2300	34.0		88	197	25 (96)		82	197	23 (86)		73	194	19 (73)	
2300	33.0		86	195	24 (92)		80	194	22 (82)		71	191	19 (70)	
2300	31.0		81	191	22 (84)	18 (67)	75	189	20 (75)	17 (63)	66	185	17 (65)	15 (56)
2300	29.0	31.5	75	186	20 (76)	17 (63)	69	184	18 (69)	16 (59)	60	179	16 (59)	14 (52)
2300	27.0	29.5	70	180	18 (69)	16 (59)	64	178	17 (63)	14 (55)	55	173	14 (54)	13 (48)
2300	26.0	28.5	67	177	17 (66)	15 (57)	61	174	16 (60)	14 (53)	52	169	13 (51)	12 (46)
2300	24.0	26.5	61	170	16 (60)	14 (53)	55	167	14 (54)	13 (48)	46	162	12 (46)	11 (41)
2300	21.0	23.5	51	159	13 (51)	12 (46)	45	156	12 (45)	11 (41)	36	149	10 (38)	9 (34)

3600 lbs. (1633 kg) Gross Weight. Flaps Up. Recommended Mixture Setting. Data in these charts are based on this leaning schedule discussed on page 4-25. Best Power or Lean of Peak.

EXAMPLE PROBLEM AND SOLUTION

Conditions: Cruise Altitude = 8000 ft.; Temperature = -2° C; Manifold Pressure = 29 in. Hg.; RPM = 2500	Determine: % of BHP; Fuel Consumption (GPH); True Airspeed	Solution: % of BHP = 86%; Fuel Consumption = 25 GPH (93 LPH); True Airspeed = 196 Knots.

Figure 5 - 20

CRUISE PERFORMANCE 10000 FT PRESSURE ALTITUDE

INITIAL SETTINGS			-25° C (20° C BELOW STANDARD TEMP)				-5° C (STANDARD TEMPERATURE)				25° C (30° C ABOVE STANDARD TEMP)			
					FUEL FLOW				FUEL FLOW				FUEL FLOW	
RPM	MAP	MAP	% BHP	KTAS	GAL/HR (L/HR)		% BHP	KTAS	GAL/HR (L/HR)		% BHP	KTAS	GAL/HR (L/HR)	
	BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP
2500	31.5		91	205	27 (101)	19 (73)	85	204	24 (90)	18 (69)	76	200	20 (77)	17 (53)
2500	30.0		86	201	25 (93)	19 (70)	80	199	22 (83)	18 (66)	71	195	19 (71)	16 (60)
2500	29.0	32.0	83	198	23 (88)	18 (68)	77	196	21 (79)	17 (64)	68	192	18 (68)	15 (58)
2500	27.0	29.5	77	191	21 (79)	17 (64)	71	189	19 (71)	16 (60)	62	185	16 (61)	14 (54)
2500	25.0	27.5	71	185	19 (71)	16 (60)	65	182	17 (64)	15 (56)	56	178	14 (55)	13 (49)
2500	24.0	26.0	68	181	18 (67)	15 (58)	62	178	16 (60)	14 (53)	53	174	14 (52)	12 (47)
2500	22.0	23.5	61	174	16 (60)	14 (53)	55	171	14 (54)	13 (48)	46	166	12 (46)	11 (41)
2500	20.0	21.0	54	166	14 (53)	13 (48)	48	163	13 (48)	11 (43)	39	157	11 (40)	9 (36)
2400	33.0		90	205	26 (100)	19 (73)	84	203	24 (90)	18 (69)	75	200	20 (77)	17 (63)
2400	31.0		85	200	24 (91)	18 (70)	79	198	22 (82)	17 (66)	70	194	18 (70)	16 (59)
2400	30.0		82	197	23 (86)	18 (68)	76	195	21 (78)	17 (64)	67	191	18 (66)	15 (57)
2400	28.0	30.5	77	191	21 (78)	17 (64)	71	188	19 (70)	16 (60)	62	184	16 (60)	14 (53)
2400	26.0	28.5	70	184	19 (70)	16 (60)	64	182	17 (63)	15(55)	55	177	14 (54)	13 (49)
2400	25.0	27.0	67	181	18 (67)	15 (57)	61	178	16 (60)	14 (53)	52	174	14 (52)	12 (46)
2400	23.0	25.0	61	174	16 (60)	14 (53)	55	171	14 (54)	13 (48)	46	166	12 (46)	11 (41)
2400	20.0	21.0	51	162	13 (50)	12 (45)	45	159	12 (45)	11 (41)	36	154	10 (38)	9 (33)
2300	34.0		88	203	25 (96)	19 (71)	82	201	23 (86)	18 (68)	73	197	19 (73)	16 (61)
2300	33.0		86	200	24 (92)	18 (70)	80	198	22 (82)	17 (66)	71	195	19 (70)	16 (60)
2300	31.0		81	195	22 (84)	18 (67)	75	193	20 (75)	17 (63)	66	189	17 (65)	15 (56)
2300	29.0	31.5	75	189	20 (76)	17 (63)	69	187	18 (69)	16 (59)	60	183	16 (59)	14 (52)
2300	27.0	29.5	70	183	18 (69)	16 (59)	64	181	17 (63)	14 (55)	55	176	14 (54)	13 (48)
2300	26.0	28.5	67	180	17 (66)	15 (57)	61	178	16 (60)	14 (53)	52	173	13 (51)	12 (46)
2300	24.0	26.5	61	173	16 (60)	14 (53)	55	171	14 (54)	13 (48)	46	166	12 (46)	11 (41)
2300	21.0	23.5	51	163	13 (51)	12 (46)	45	159	12 (45)	11 (41)	36	154	10 (38)	9 (34)

3600 lbs. (1633 kg) Gross Weight. Flaps Up. Recommended Mixture Setting. Data in these charts are based on this leaning schedule discussed on page 4-25. Best Power or Lean of Peak.

EXAMPLE PROBLEM AND SOLUTION

Conditions: Cruise Altitude = 9000 ft.; Temperature = -9° C; Manifold Pressure = 29 in. Hg.; RPM = 2500	Determine: % of BHP; Fuel Consumption (GPH); True Airspeed	Solution: % of BHP = 77%; Fuel Consumption = 21 GPH (79 LPH); True Airspeed = 194 Knots.

Figure 5 - 21

CRUISE PERFORMANCE 12000 FT PRESSURE ALTITUDE

INITIAL SETTINGS			-29° C (20° C BELOW STANDARD TEMP)				-9° C (STANDARD TEMPERATURE)				21° C (30° C ABOVE STANDARD TEMP)			
RPM	MAP	MAP	% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)	
	BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP
2500	31.5		91	209	27 (101)		85	207	24 (90)		76	204	20 (77)	
2500	30.0		86	204	25 (93)	19 (70)	80	203	22 (83)	18 (66)	71	199	19 (71)	16 (60)
2500	29.0	32.0	83	201	23 (88)	18 (68)	77	199	21 (79)	17 (64)	68	196	18 (68)	15 (58)
2500	27.0	29.5	77	195	21 (79)	17 (64)	71	193	19 (71)	16 (60)	62	189	16 (61)	14 (54)
2500	25.0	27.5	71	188	19 (71)	16 (60)	65	186	17 (64)	15 (56)	56	181	14 (55)	13 (49)
2500	24.0	26.0	68	184	18 (67)	15 (58)	62	182	16 (60)	14 (53)	53	178	14 (52)	12 (47)
2500	22.0	23.5	61	177	16 (60)	14 (53)	55	174	14 (54)	13 (48)	46	170	12 (46)	11 (41)
2500	20.0	21.0	54	169	14 (53)	13 (48)	48	166	13 (48)	11 (43)	39	161	11 (40)	9 (36)
2400	33.0		90	209	26 (100)		84	207	24 (90)		75	204	20 (77)	
2400	31.0		85	203	24 (91)		79	201	22 (82)		70	198	18 (70)	
2400	30.0		82	200	23 (86)	18 (68)	76	198	21 (78)	17 (64)	67	195	18 (66)	15 (57)
2400	28.0	30.5	77	194	21 (78)	17 (64)	71	192	19 (70)	16 (60)	62	188	16 (60)	14 (53)
2400	26.0	28.5	70	187	19 (70)	16 (60)	64	185	17 (63)	15 (55)	55	181	14 (54)	13 (49)
2400	25.0	27.0	67	184	18 (67)	15 (57)	61	182	16 (60)	14 (53)	52	177	14 (52)	12 (46)
2400	23.0	25.0	61	177	16 (60)	14 (53)	55	174	14 (54)	13 (48)	46	170	12 (46)	11 (41)
2400	20.0	21.0	51	165	13 (50)	12 (45)	45	162	12 (45)	11 (40)	36	157	10 (38)	9 (33)
2300	34.0		88	206	25 (96)		82	204	23 (86)		73	201	19 (73)	
2300	33.0		86	204	24 (92)		80	202	22 (82)		71	198	19 (70)	
2300	31.0		81	198	22 (84)	18 (67)	75	196	20 (75)	17 (63)	66	193	17 (65)	15 (56)
2300	29.0	31.5	75	193	20 (76)	17 (63)	69	191	18 (69)	16 (59)	60	187	16 (59)	14 (52)
2300	27.0	29.5	70	187	18 (69)	16 (59)	64	184	17 (63)	14 (55)	55	180	14 (54)	13 (48)
2300	26.0	28.5	67	183	17 (66)	15 (57)	61	181	16 (60)	14 (53)	52	177	13 (51)	12 (46)
2300	24.0	26.5	61	177	16 (60)	14 (53)	55	174	14 (54)	13 (48)	46	169	12 (46)	11 (41)
2300	21.0	23.5	51	166	13 (51)	12 (46)	45	163	12 (45)	11 (41)	36	158	10 (38)	9 (34)

3600 lbs. (1633 kg) Gross Weight. Flaps Up. Recommended Mixture Setting. Data in these charts are based on this leaning schedule discussed on page 4-25. Best Power or Lean of Peak.

EXAMPLE PROBLEM AND SOLUTION

Conditions: Cruise Altitude = 12000 ft.; Temperature = -9° C; Manifold Pressure = 26 in. Hg.; RPM = 2300	Determine: % of BHP; Fuel Consumption (GPH); True Airspeed	Solution: % of BHP = 61%; Fuel Consumption = 16 GPH (60 LPH); True Airspeed = 181 Knots.

Figure 5 - 22

CRUISE PERFORMANCE 14000 FT PRESSURE ALTITUDE

INITIAL SETTINGS			-33° C (20° C BELOW STANDARD TEMP)				-13° C (STANDARD TEMPERATURE)				17° C (30° C ABOVE STANDARD TEMP)			
RPM	MAP	MAP	% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)	
	BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP
2500	31.5		91	211	27 (101)		85	212	24 (91)		76	210	21 (78)	
2500	30.0		86	208	25 (94)	19 (70)	80	208	22 (85)	18 (66)	71	205	19 (72)	16 (60)
2500	29.0	32.0	83	205	24 (89)	18 (68)	77	205	21 (80)	17 (64)	68	202	18 (69)	15 (58)
2500	27.0	29.5	77	199	21 (80)	17 (64)	71	198	19 (72)	16 (60)	62	194	16 (62)	14 (54)
2500	25.0	27.5	71	193	19 (72)	16 (60)	65	191	17 (65)	15 (56)	56	186	15 (55)	13 (49)
2500	24.0	26.0	68	190	18 (68)	15 (58)	62	187	16 (61)	14 (53)	53	181	14 (52)	12 (47)
2500	22.0	23.5	61	182	16 (60)	14 (53)	55	179	14 (54)	13 (48)	46	172	12 (46)	11 (41)
2500	20.0	21.0	54	173	14 (53)	13 (48)	48	169	13 (48)	11 (43)	39	161	10 (40)	9 (36)
2400	33.0		90	211	27 (101)		84	211	24 (91)		75	210	21 (78)	
2400	31.0		85	206	24 (92)		79	206	22 (83)		70	204	19 (71)	
2400	30.0		82	204	23 (87)	18 (68)	76	204	21 (79)	17 (64)	67	200	18 (67)	15 (57)
2400	28.0	30.5	77	199	21 (79)	17 (64)	71	197	19 (71)	16 (60)	62	193	16 (61)	14 (53)
2400	26.0	28.5	70	193	19 (71)	16 (60)	64	191	17 (64)	15 (55)	55	185	14 (55)	13 (49)
2400	25.0	27.0	67	189	18 (68)	15 (57)	61	187	16 (61)	14 (53)	52	181	14 (52)	12 (46)
2400	23.0	25.0	61	182	16 (60)	14 (53)	55	179	14 (54)	13 (48)	46	172	12 (46)	11 (41)
2400	20.0	21.0	51	169	13 (50)	12 (45)	45	165	12 (45)	11 (41)	36	156	10 (37)	9 (33)
2300	34.0		88	209	25 (97)		82	209	23 (87)		73	207	20 (75)	
2300	33.0		86	207	24 (93)		80	207	22 (84)		71	204	19 (72)	
2300	31.0		81	203	22 (85)	18 (67)	75	202	20 (77)	17 (63)	66	198	17 (66)	15 (56)
2300	29.0	31.5	75	198	20 (78)	17 (63)	69	196	18 (70)	16 (59)	60	192	16 (60)	14 (52)
2300	27.0	29.5	70	192	19 (70)	16 (59)	64	190	17 (63)	14 (55)	55	184	14 (54)	13 (48)
2300	26.0	28.5	67	189	18 (67)	15 (57)	61	186	16 (60)	14 (53)	52	180	14 (51)	12 (46)
2300	24.0	26.5	61	182	16 (60)	14 (53)	55	178	14 (54)	13 (48)	46	171	12 (46)	11 (41)
2300	21.0	23.5	51	170	13 (51)	12 (46)	45	165	12 (45)	11 (41)	36	157	10 (37)	9 (34)

3600 lbs. (1633 kg) Gross Weight. Flaps Up. Recommended Mixture Setting. Data in these charts are based on this leaning schedule discussed on page 4-25. Best Power or Lean of Peak.

Figure 5 - 23

CRUISE PERFORMANCE 16000 FT PRESSURE ALTITUDE

INITIAL SETTINGS			-37° C (20° C BELOW STANDARD TEMP)				-17° C (STANDARD TEMPERATURE)				13° C (30° C ABOVE STANDARD TEMP)			
RPM	MAP	MAP	% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)	
	BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP
2500	31.5		91	216	27 (101)		85	216	24 (91)		76	215	21 (78)	
2500	30.0		86	212	25 (94)	19 (70)	80	212	22 (85)	18 (66)	71	210	19 (72)	16 (60)
2500	29.0	32.0	83	210	24 (89)	18 (68)	77	209	21 (80)	17 (64)	68	207	18 (69)	15 (58)
2500	27.0	29.5	77	204	21 (80)	17 (64)	71	203	19 (72)	16 (60)	62	200	16 (62)	14 (54)
2500	25.0	27.5	71	198	19 (72)	16 (60)	65	196	17 (65)	15 (56)	56	192	15 (55)	13 (49)
2500	24.0	26.0	68	194	18 (68)	15 (58)	62	192	16 (61)	14 (53)	53	188	14 (52)	12 (47)
2500	22.0	23.5	61	187	16 (60)	14 (53)	55	184	14 (54)	13 (48)	46	178	12 (46)	11 (41)
2500	20.0	21.0	54	178	14 (53)	13 (48)	48	175	13 (48)	11 (43)	39	168	10 (40)	9 (36)
2400	33.0		90	215	27 (101)		84	216	24 (91)		75	215	21 (78)	
2400	31.0		85	211	24 (92)		79	211	22 (83)		70	209	19 (71)	
2400	30.0		82	209	23 (87)	18 (68)	76	208	21 (79)	17 (64)	67	206	18 (67)	15 (57)
2400	28.0	30.5	77	203	21 (79)	17 (64)	71	202	19 (71)	16 (60)	62	199	16 (61)	14 (53)
2400	26.0	28.5	70	197	19 (71)	16 (60)	64	196	17 (64)	15 (55)	55	191	14 (55)	13 (49)
2400	25.0	27.0	67	194	18 (68)	15 (57)	61	192	16 (61)	14 (53)	52	187	14 (52)	12 (46)
2400	23.0	25.0	61	187	16 (60)	14 (53)	55	184	14 (54)	13 (48)	46	178	12 (46)	11 (41)
2400	20.0	21.0	51	174	13 (50)	12 (45)	45	171	12 (45)	11 (41)	36	164	10 (37)	9 (33)
2300	34.0		88	213	25 (97)		82	214	23 (87)		73	212	20 (75)	
2300	33.0		86	212	24 (93)		80	212	22 (84)		71	210	19 (72)	
2300	31.0		81	207	22 (85)	18 (67)	75	207	20 (77)	17 (63)	66	204	17 (66)	15 (56)
2300	29.0	31.5	75	202	20 (78)	17 (63)	69	201	18 (70)	16 (59)	60	197	16 (60)	14 (52)
2300	27.0	29.5	70	196	19 (70)	16 (59)	64	195	17 (63)	14 (55)	55	190	14 (54)	13 (48)
2300	26.0	28.5	67	193	18 (67)	15 (57)	61	191	16 (60)	14 (53)	52	186	14 (51)	12 (46)
2300	24.0	26.5	61	187	16 (60)	14 (53)	55	184	14 (54)	13 (48)	46	178	12 (46)	11 (41)
2300	21.0	23.5	51	175	13 (51)	12 (46)	45	171	12 (45)	11 (41)	36	164	10 (37)	9 (34)

3600 lbs. (1633 kg) Gross Weight. Flaps Up. Recommended Mixture Setting. Data in these charts are based on this leaning schedule discussed on page 4-25. Best Power or Lean of Peak.

Figure 5 - 24

CRUISE PERFORMANCE 18000 FT PRESSURE ALTITUDE

INITIAL SETTINGS			-41° C (20° C BELOW STANDARD TEMP)				-21° C (STANDARD TEMPERATURE)				9° C (30° C ABOVE STANDARD TEMP)			
RPM	MAP	MAP	% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)	
	BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP
2500	31.5		91	217	27 (103)		85	219	25 (93)		76	220	21 (80)	
2500	30.0		86	214	25 (96)	19 (70)	80	216	23 (86)	18 (66)	71	216	20 (74)	16 (60)
2500	29.0	32.0	83	212	24 (91)	18 (68)	77	213	22 (82)	17 (64)	68	213	19 (71)	15 (58)
2500	27.0	29.5	77	207	22 (82)	17 (64)	71	208	20 (74)	16 (60)	62	207	17 (64)	14 (54)
2500	25.0	27.5	71	201	19 (74)	16 (60)	65	202	18 (67)	15 (56)	56	200	15 (58)	13 (49)
2500	24.0	26.0	68	198	18 (70)	15 (58)	62	198	17 (64)	14 (53)	53	196	15 (55)	12 (47)
2500	22.0	23.5	61	192	17 (63)	14 (53)	55	191	15 (57)	13 (48)	46	189	13 (49)	11 (41)
2500	20.0	21.0	54	185	15 (56)	13 (48)	48	184	14 (51)	11 (43)	39	180	12 (44)	9 (36)
2400	33.0		90	217	27 (103)		84	219	24 (92)		75	220	21 (79)	
2400	31.0		85	213	25 (93)		79	214	22 (84)		70	215	19 (73)	
2400	30.0		82	211	24 (89)	18 (68)	76	212	21 (80)	17 (64)	67	212	18 (69)	15 (57)
2400	28.0	30.5	77	206	21 (81)	17 (64)	71	207	19 (73)	16 (60)	62	206	17 (63)	14 (53)
2400	26.0	28.5	70	201	19 (73)	16 (60)	64	201	18 (66)	15 (55)	55	199	15 (58)	13 (49)
2400	25.0	27.0	67	198	18 (70)	15 (57)	61	198	17 (63)	14 (53)	52	196	15 (55)	12 (46)
2400	23.0	25.0	61	192	17 (63)	14 (53)	55	191	15 (57)	13 (48)	46	189	13 (49)	11 (41)
2400	20.0	21.0	51	182	14 (54)	12 (45)	45	180	13 (49)	11 (41)	36	176	11 (41)	9 (33)
2300	34.0		88	215	26 (98)		82	217	23 (89)		73	217	20 (76)	
2300	33.0		86	214	25 (94)		80	215	22 (85)		71	215	19 (73)	
2300	31.0		81	210	23 (87)	18 (67)	75	211	21 (78)	17 (63)	66	210	18 (68)	15 (56)
2300	29.0	31.5	75	205	21 (79)	17 (63)	69	206	19 (72)	16 (59)	60	205	16 (62)	14 (52)
2300	27.0	29.5	70	200	19 (72)	16 (59)	64	200	17 (66)	14 (55)	55	199	15 (57)	13 (48)
2300	26.0	28.5	67	198	18 (69)	15 (57)	61	197	17 (63)	14 (53)	52	195	14 (54)	12 (46)
2300	24.0	26.5	61	192	17 (63)	14 (53)	55	191	15 (57)	13 (48)	46	188	13 (49)	11 (41)
2300	21.0	23.5	51	182	14 (54)	12 (46)	45	180	13 (49)	11 (41)	36	177	11 (41)	9 (34)

3600 lbs. (1633 kg) Gross Weight. Flaps Up. Recommended Mixture Setting. Data in these charts are based on this leaning schedule discussed on page 4-25. Best Power or Lean of Peak.

Figure 5 - 25

CRUISE PERFORMANCE 20000 FT PRESSURE ALTITUDE

INITIAL SETTINGS			-45° C (20° C BELOW STANDARD TEMP)				-25° C (STANDARD TEMPERATURE)				5° C (30° C ABOVE STANDARD TEMP)			
RPM	MAP	MAP	% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)	
	BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP
2500	31.5		91	221	27 (103)		85	222	25 (93)		76	223	21 (80)	
2500	30.0		86	217	25 (96)	19 (70)	80	219	23 (86)	18 (66)	71	219	20 (74)	16 (60)
2500	29.0	32.0	83	215	24 (91)	18 (68)	77	216	22 (82)	17 (64)	68	216	19 (71)	15 (58)
2500	27.0	29.5	77	210	22 (82)	17 (64)	71	211	20 (74)	16 (60)	62	210	17 (64)	14 (54)
2500	25.0	27.5	71	204	19 (74)	16 (60)	65	205	18 (67)	15 (56)	56	204	15 (58)	13 (49)
2500	24.0	26.0	68	201	18 (70)	15 (58)	62	201	17 (64)	14 (53)	53	201	15 (55)	12 (47)
2500	22.0	23.5	61	195	17 (63)	14 (53)	55	195	15 (57)	13 (48)	46	194	13 (49)	11 (41)
2500	20.0	21.0	54	188	15 (56)	13 (48)	48	188	14 (51)	11 (43)	39	186	12 (44)	9 (36)
2400	33.0		90	221	27 (103)		84	222	24 (92)		75	223	21 (79)	
2400	31.0		85	216	25 (93)		79	218	22 (84)		70	218	19 (73)	
2400	30.0		82	214	24 (89)	18 (68)	76	215	21 (80)	17 (64)	67	215	18 (69)	15 (57)
2400	28.0	30.5	77	209	21 (81)	17 (64)	71	210	19 (73)	16 (60)	62	210	17 (63)	14 (53)
2400	26.0	28.5	70	204	19 (73)	16 (60)	64	204	18 (66)	15 (55)	55	204	15 (58)	13 (49)
2400	25.0	27.0	67	201	18 (70)	15 (57)	61	201	17 (63)	14 (53)	52	200	15 (55)	12 (46)
2400	23.0	25.0	61	195	17 (63)	14 (53)	55	195	15 (57)	13 (48)	46	194	13 (49)	11 (41)
2400	20.0	21.0	51	185	14 (54)	12 (45)	45	184	13 (49)	11 (41)	36	182	11 (41)	9 (33)
2300	34.0		88	219	26 (98)		82	220	23 (89)		73	221	20 (76)	
2300	33.0		86	217	25 (94)		80	218	22 (85)		71	218	19 (73)	
2300	31.0		81	213	23 (87)	18 (67)	75	214	21 (78)	17 (63)	66	214	18 (68)	15 (56)
2300	29.0	31.5	75	208	21 (79)	17 (63)	69	209	19 (72)	16 (59)	60	208	16 (62)	14 (52)
2300	27.0	29.5	70	203	19 (72)	16 (59)	64	203	17 (66)	14 (55)	55	203	15 (57)	13 (48)
2300	26.0	28.5	67	201	18 (69)	15 (57)	61	201	17 (63)	14 (53)	52	200	14 (54)	12 (46)
2300	24.0	26.5	61	195	17 (63)	14 (53)	55	195	15 (57)	13 (48)	46	193	13 (49)	11 (41)
2300	21.0	23.5	51	185	14 (54)	12 (46)	45	185	13 (49)	11 (41)	36	183	11 (41)	9 (34)

3600 lbs. (1633 kg) Gross Weight. Flaps Up. Recommended Mixture Setting. Data in these charts are based on this leaning schedule discussed on page 4-25. Best Power or Lean of Peak.

Figure 5 - 26

CRUISE PERFORMANCE 22000 FT PRESSURE ALTITUDE

INITIAL SETTINGS			-49° C (20° C BELOW STANDARD TEMP)				-29° C (STANDARD TEMPERATURE)				1° C (30° C ABOVE STANDARD TEMP)			
RPM	MAP	MAP	% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)	
	BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP
2500	31.5		91	226	27 (103)		85	228	25 (93)		76	229	21 (80)	
2500	30.0		86	222	25 (96)	19 (70)	80	224	23 (86)	18 (66)	71	225	20 (74)	16 (60)
2500	29.0	32.0	83	220	24 (91)	18 (68)	77	221	22 (82)	17 (64)	68	222	19 (71)	15 (58)
2500	27.0	29.5	77	215	22 (82)	17 (64)	71	216	20 (74)	16 (60)	62	216	17 (64)	14 (54)
2500	25.0	27.5	71	209	19 (74)	16 (60)	65	210	18 (67)	15 (56)	56	209	15 (58)	13 (49)
2500	24.0	26.0	68	206	18 (70)	15 (58)	62	206	17 (64)	14 (53)	53	206	15 (55)	12 (47)
2500	22.0	23.5	61	200	17 (63)	14 (53)	55	200	15 (57)	13 (48)	46	199	13 (49)	11 (41)
2500	20.0	21.0	54	193	15 (56)	13 (48)	48	193	14 (51)	11 (43)	39	191	12 (44)	9 (36)
2400	33.0		90	226	27 (103)		84	227	24 (92)		75	228	21 (79)	
2400	31.0		85	221	25 (93)		79	223	22 (84)		70	223	19 (73)	
2400	30.0		82	219	24 (89)	18 (68)	76	220	21 (80)	17 (64)	67	221	18 (69)	15 (57)
2400	28.0	30.5	77	214	21 (81)	17 (64)	71	215	19 (73)	16 (60)	62	215	17 (63)	14 (53)
2400	26.0	28.5	70	209	19 (73)	16 (60)	64	209	18 (66)	15 (55)	55	209	15 (58)	13 (49)
2400	25.0	27.0	67	206	18 (70)	15 (57)	61	206	17 (63)	14 (53)	52	206	15 (55)	12 (46)
2400	23.0	25.0	61	200	17 (63)	14 (53)	55	200	15 (57)	13 (48)	46	199	13 (49)	11 (41)
2400	20.0	21.0	51	190	14 (54)	12 (45)	45	189	13 (49)	11 (41)	36	188	11 (41)	9 (33)
2300	34.0		88	224	26 (98)		82	225	23 (89)		73	226	20 (76)	
2300	33.0		86	222	25 (94)		80	223	22 (85)		71	224	19 (73)	
2300	31.0		81	218	23 (87)	18 (67)	75	219	21 (78)	17 (63)	66	219	18 (68)	15 (56)
2300	29.0	31.5	75	213	21 (79)	17 (63)	69	214	19 (72)	16 (59)	60	214	16 (62)	14 (52)
2300	27.0	29.5	70	208	19 (72)	16 (59)	64	208	17 (66)	14 (55)	55	208	15 (57)	13 (48)
2300	26.0	28.5	67	205	18 (69)	15 (57)	61	206	17 (63)	14 (53)	52	205	14 (54)	12 (46)
2300	24.0	26.5	61	199	17 (63)	14 (53)	55	200	15 (57)	13 (48)	46	199	13 (49)	11 (41)
2300	21.0	23.5	51	190	14 (54)	12 (46)	45	190	13 (49)	11 (41)	36	188	11 (41)	9 (34)

3600 lbs. (1633 kg) Gross Weight. Flaps Up. Recommended Mixture Setting. Data in these charts are based on this leaning schedule discussed on page 4-25. Best Power or Lean of Peak.

Figure 5 - 27

CRUISE PERFORMANCE 24000 FT PRESSURE ALTITUDE

INITIAL SETTINGS			-53° C (20° C BELOW STANDARD TEMP)				-33° C (STANDARD TEMPERATURE)				-3° C (30° C ABOVE STANDARD TEMP)			
RPM	MAP	MAP	% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)	
	BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP
2500	31.5		91	228	27 (103)		85	232	25 (93)		76	235	21 (80)	
2500	30.0		86	225	25 (96)	19 (70)	80	229	23 (86)	18 (66)	71	231	20 (74)	16 (60)
2500	29.0	32.0	83	223	24 (91)	18 (68)	77	226	22 (82)	17 (64)	68	228	19 (71)	15 (58)
2500	27.0	29.5	77	219	22 (82)	17 (64)	71	221	20 (74)	16 (60)	62	222	17 (64)	14 (54)
2500	25.0	27.5	71	214	19 (74)	16 (60)	65	216	18 (67)	15 (56)	56	215	15 (58)	13 (49)
2500	24.0	26.0	68	211	18 (70)	15 (58)	62	212	17 (64)	14 (53)	53	212	15 (55)	12 (47)
2500	22.0	23.5	61	205	17 (63)	14 (53)	55	206	15 (57)	13 (48)	46	204	13 (49)	11 (41)
2500	20.0	21.0	54	198	15 (56)	13 (48)	48	198	14 (51)	11 (43)	39	195	12 (44)	9 (36)
2400	33.0		90	228	27 (103)		84	232	24 (92)		75	235	21 (79)	
2400	31.0		85	224	25 (93)		79	228	22 (84)		70	230	19 (73)	
2400	30.0		82	223	24 (89)	18 (68)	76	226	21 (80)	17 (64)	67	227	18 (69)	15 (57)
2400	28.0	30.5	77	219	21 (81)	17 (64)	71	221	19 (73)	16 (60)	62	221	17 (63)	14 (53)
2400	26.0	28.5	70	214	19 (73)	16 (60)	64	215	18 (66)	15 (55)	55	215	15 (58)	13 (49)
2400	25.0	27.0	67	211	18 (70)	15 (57)	61	212	17 (63)	14 (53)	52	211	15 (55)	12 (46)
2400	23.0	25.0	61	205	17 (63)	14 (53)	55	206	15 (57)	13 (48)	46	204	13 (49)	11 (41)
2400	20.0	21.0	51	195	14 (54)	12 (45)	45	194	13 (49)	11 (41)	36	190	11 (41)	9 (33)
2300	34.0		88	226	26 (98)		82	230	23 (89)		73	233	20 (76)	
2300	33.0		86	225	25 (94)		80	228	22 (85)		71	230	19 (73)	
2300	31.0		81	222	23 (87)	18 (67)	75	224	21 (78)	17 (63)	66	226	18 (68)	15 (56)
2300	29.0	31.5	75	218	21 (79)	17 (63)	69	220	19 (72)	16 (59)	60	220	16 (62)	14 (52)
2300	27.0	29.5	70	213	19 (72)	16 (59)	64	215	17 (66)	14 (55)	55	214	15 (57)	13 (48)
2300	26.0	28.5	67	211	18 (69)	15 (57)	61	212	17 (63)	14 (53)	52	211	14 (54)	12 (46)
2300	24.0	26.5	61	205	17 (63)	14 (53)	55	205	15 (57)	13 (48)	46	203	13 (49)	11 (41)
2300	21.0	23.5	51	195	14 (54)	12 (46)	45	194	13 (49)	11 (41)	36	191	11 (41)	9 (34)

3600 lbs. (1633 kg) Gross Weight. Flaps Up. Recommended Mixture Setting. Data in these charts are based on this leaning schedule discussed on page 4-25. Best Power or Lean of Peak.

Figure 5 - 28

CRUISE PERFORMANCE 25000 FT PRESSURE ALTITUDE

INITIAL SETTINGS			-55° C (20° C BELOW STANDARD TEMP)				-35° C (STANDARD TEMPERATURE)				-5° C (30° C ABOVE STANDARD TEMP)			
RPM	MAP	MAP	% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)		% BHP	KTAS	FUEL FLOW GAL/HR (L/HR)	
	BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP			BEST POWER	-50 LOP
2500	31.5		91	231	27 (103)		85	235	25 (93)		76	238	21 (80)	
2500	30.0		86	228	25 (96)	19 (70)	80	232	23 (86)	18 (66)	71	234	20 (74)	16 (60)
2500	29.0	32.0	83	226	24 (91)	18 (68)	77	229	22 (82)	17 (64)	68	231	19 (71)	15 (58)
2500	27.0	29.5	77	222	22 (82)	17 (64)	71	224	20 (74)	16 (60)	62	225	17 (64)	14 (54)
2500	25.0	27.5	71	217	19 (74)	16 (60)	65	218	18 (67)	15 (56)	56	218	15 (58)	13 (49)
2500	24.0	26.0	68	214	18 (70)	15 (58)	62	215	17 (64)	14 (53)	53	214	15 (55)	12 (47)
2500	22.0	23.5	61	208	17 (63)	14 (53)	55	208	15 (57)	13 (48)	46	206	13 (49)	11 (41)
2500	20.0	21.0	54	201	15 (56)	13 (48)	48	200	14 (51)	11 (43)	39	197	12 (44)	9 (36)
2400	33.0		90	231	27 (103)		84	235	24 (92)		75	238	21 (79)	
2400	31.0		85	227	25 (93)		79	231	22 (84)		70	233	19 (73)	
2400	30.0		82	226	24 (89)	18 (68)	76	228	21 (80)	17 (64)	67	230	18 (69)	15 (57)
2400	28.0	30.5	77	221	21 (81)	17 (64)	71	224	19 (73)	16 (60)	62	224	17 (63)	14 (53)
2400	26.0	28.5	70	217	19 (73)	16 (60)	64	218	18 (66)	15 (55)	55	218	15 (58)	13 (49)
2400	25.0	27.0	67	214	18 (70)	15 (57)	61	215	17 (63)	14 (53)	52	214	15 (55)	12 (46)
2400	23.0	25.0	61	208	17 (63)	14 (53)	55	208	15 (57)	13 (48)	46	206	13 (49)	11 (41)
2400	20.0	21.0	51	197	14 (54)	12 (45)	45	196	13 (49)	11 (41)	36	193	11 (41)	9 (33)
2300	34.0		88	229	26 (98)		82	233	23 (89)		73	236	20 (76)	
2300	33.0		86	228	25 (94)		80	231	22 (85)		71	233	19 (73)	
2300	31.0		81	224	23 (87)	18 (67)	75	227	21 (78)	17 (63)	66	228	18 (68)	15 (56)
2300	29.0	31.5	75	221	21 (79)	17 (63)	69	222	19 (72)	16 (59)	60	223	16 (62)	14 (52)
2300	27.0	29.5	70	216	19 (72)	16 (59)	64	217	17 (66)	14 (55)	55	217	15 (57)	13 (48)
2300	26.0	28.5	67	213	18 (69)	15 (57)	61	214	17 (63)	14 (53)	52	213	14 (54)	12 (46)
2300	24.0	26.5	61	208	17 (63)	14 (53)	55	208	15 (57)	13 (48)	46	206	13 (49)	11 (41)
2300	21.0	23.5	51	198	14 (54)	12 (46)	45	197	13 (49)	11 (41)	36	194	11 (41)	9 (34)

Figure 5 - 29

3600 lbs. (1633 kg) Gross Weight. Flaps Up. Recommended Mixture Setting. Data in these charts are based on this leaning schedule discussed on page 4-25. Best Power or Lean of Peak.

LEAN OF PEAK ENGINE OPERATION

The TSIO-550C engine can be operated lean of peak. Starting from full rich, the power increases about 1% as "Best Power" mixture is reached. For cruise operation, best power is at or near 1625°F TIT rich of peak. If the mixture is leaned further past peak TIT, the power drops 8-12% when rpm and manifold pressure are held constant. "Best Economy" is reached at about 50°F lean of peak. If the leaning process was initiated at 85% power, the power will have dropped to about 75% when 50°F lean of peak is reached. The engine will not run smoothly if a higher power setting is attempted lean of peak. Because of the drop in power, speed will be reduced. For continuous operation, the highest TIT should be at or below 1625°F.

There are two different methods of leaning past peak TIT (or EGT). One method is to rapidly pull the mixture control from rich of peak to lean of peak, which can be performed at any power setting at or below 85%. The disadvantage of this method is that peak TIT is not observed, the pilot has to determine by other means how far he is operating on the lean side. The advantage of this method is that Peak TIT, which at high power settings can exceed the TIT limit, is reached only very briefly.

The other method is to lean slowly (for example by using the lean-assist function) and observe peak TIT, then lean the desired degrees past it. The advantage of this method is that the engine operating condition is well defined at the end of the leaning process. The disadvantage of leaning past peak TIT with this method is that it is only possible with a starting point at or below about 65% power (varies with ambient conditions); Otherwise the TIT limit may be exceeded. Once a lean of peak mixture setting is reached, the RPM and manifold pressure can be increased carefully to obtain a higher than 65% power setting.

Figure 5 - 31 below shows a comparison of fuel flows for best power and best economy and is valid for one RPM (about 2400 RPM). At higher RPM the fuel flow is slightly higher or slightly lower at lower RPM respectively. The power setting in Figure 5 - 31 is actual power.

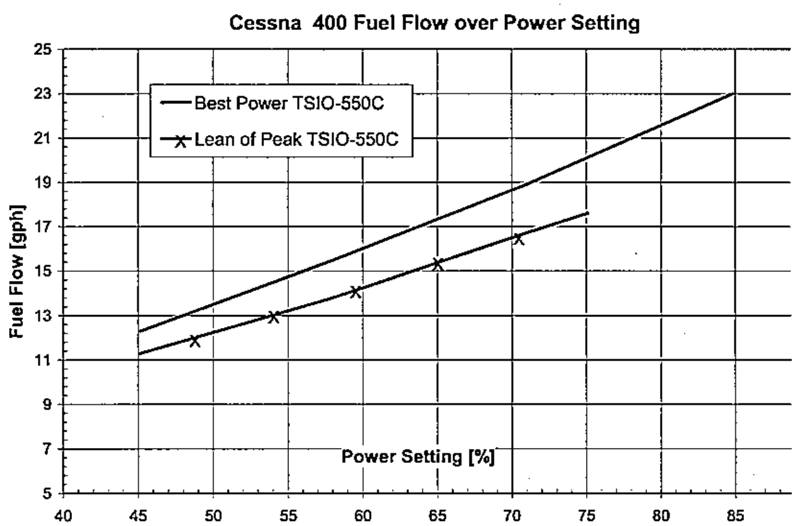
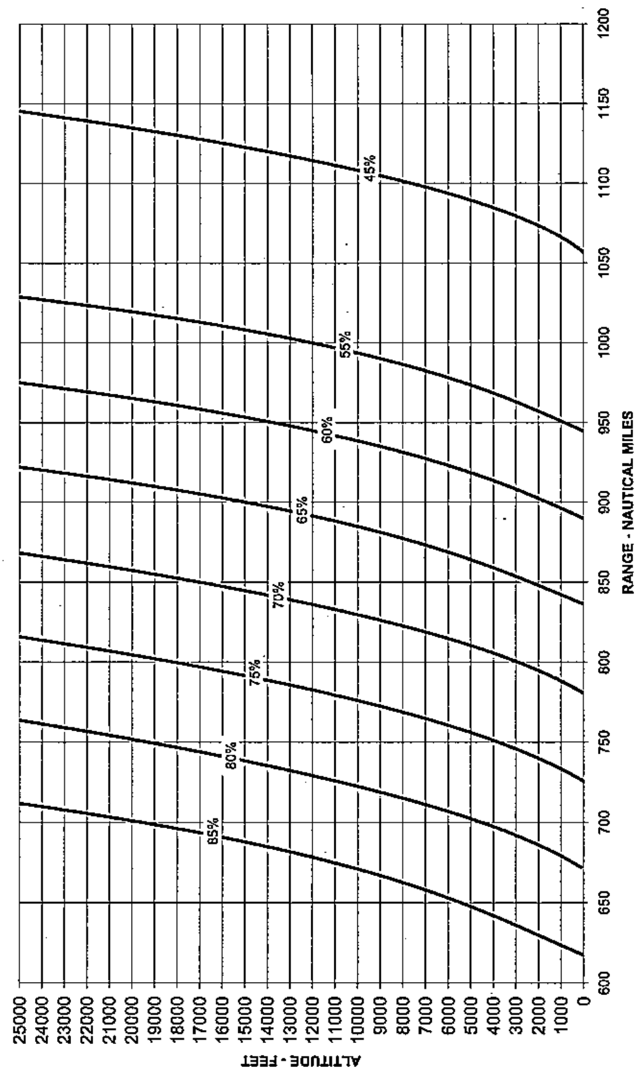


Figure 5 - 30

NOTE

Figure 5 - 30 shows the relationship between fuel flow for rich of peak and lean of peak operation. The fuel flow values are for reference only and will vary with ambient conditions and differing rpm's.

RANGE PROFILE



Conditions

3600 lbs. (1633 kg) Max. Gross Weight
Standard Temperature
Proper Leaning
Fuel Tanks Filled To 98 Gallons (371 L)

Assumptions

Chart assumes applicable BHP is maintained to maximum flight altitude

Note

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 pressure altitude of 11,000 feet, with an 85% BHP best power setting, the range is approximately 675 nm.

Figure 5 - 31

ENDURANCE PROFILE

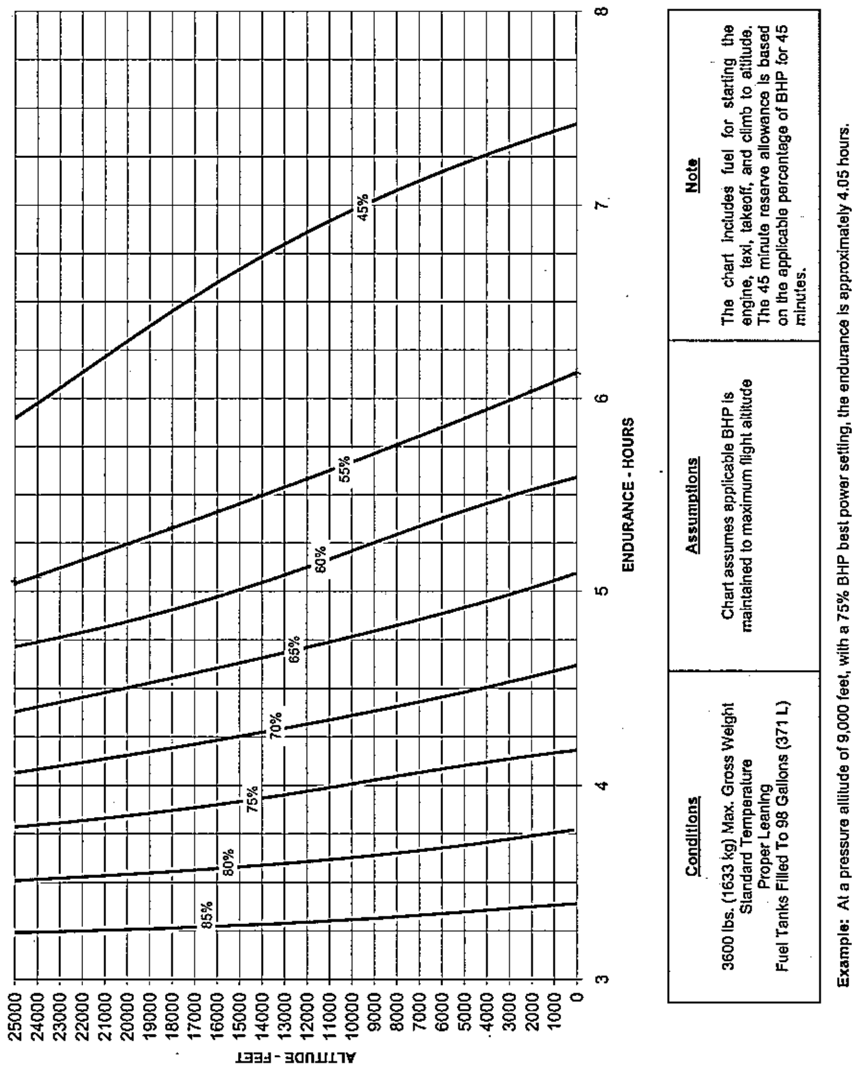


Figure 5 - 32

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 - 33, 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.

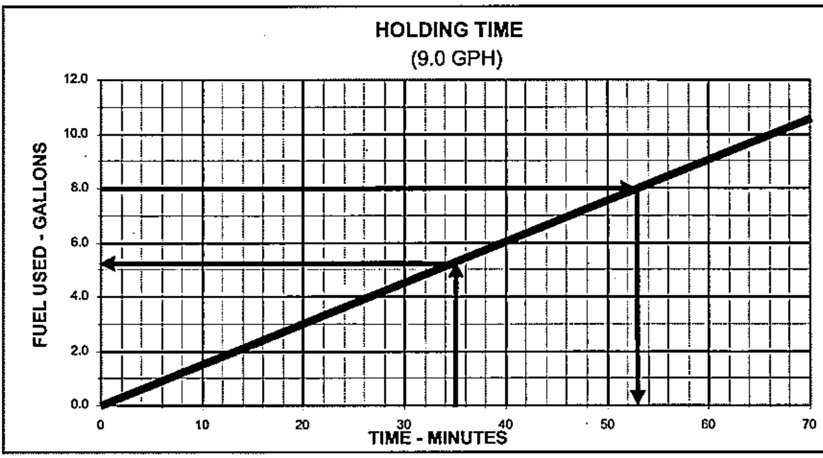


Figure 5 - 33

TIME, FUEL, AND DISTANCE FOR CRUISE DESCENT

The table below, Figure 5 - 34, 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 3600 lb. (1633 kg), flaps up, 2600 RPM, standard temperature, and zero winds.

For example, a descent at 500 FPM from 9000 feet to sea level will take approximately 18 minutes (50 – 32 = 18), consume 5 gallons of fuel (14 - 9 = 5), and 57 miles (175 – 118 = 57) will be traveled over the ground under no wind conditions. For descent from cruise altitude to a field elevation above seal level, subtract the performance data numbers for the field elevation data from the cruise altitude.

Pressure Altitude	Descent Speed KIAS	Rate of Descent FPM	Fuel Flow GPH (LPH)	Time Min	Fuel Used Gal. (L)	Distance NM
25000	159	500	19.0 (72.0)	0.0	0 (0)	0
24000	160	500	18.8 (71.2)	2.0	1 (4)	8
23000	161	500	18.6 (70.4)	4.0	1 (4)	16
22000	161	500	18.3 (69.3)	6.0	2 (8)	24
21000	162	500	18.1 (68.5)	8.0	2 (8)	32
20000	163	500	17.9 (67.8)	10.0	3 (11)	39
19000	164	500	17.7 (67.0)	12.0	4 (15)	47
18000	164	500	17.4 (65.9)	14.0	4 (15)	54
17000	165	500	17.2 (65.1)	16.0	5 (19)	62
16000	166	500	17.0 (64.3)	18.0	5 (19)	69
15000	167	500	17.0 (64.3)	20.0	6 (23)	76
14000	167	500	17.0 (64.3)	22.0	7 (26)	83
13000	168	500	17.0 (64.3)	24.0	7 (26)	90
12000	169	500	17.0 (64.3)	26.0	8 (30)	97
11000	170	500	17.0 (64.3)	28.0	8 (30)	104
10000	170	500	17.0 (64.3)	30.0	9 (34)	111
9000	171	500	16.8 (63.6)	32.0	9 (34)	118
8000	172	500	16.7 (63.2)	34.0	10 (38)	124
7000	173	500	16.5 (62.5)	36.0	10 (38)	131
6000	173	500	16.3 (61.7)	38.0	11 (42)	137
5000	174	500	16.2 (61.3)	40.0	12 (45)	144
4000	175	500	16.0 (60.6)	42.0	12 (45)	150
3000	176	500	16.0 (60.6)	44.0	13 (49)	157
2000	177	500	16.0 (60.6)	46.0	13 (49)	163
1000	178	500	16.0 (60.6)	48.0	14 (53)	169
0	179	500	16.0 (60.6)	50.0	14 (53)	175

Figure 5 - 34

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SHORT FIELD LANDING DISTANCE (40° - LANDING FLAPS)

ASSOCIATED CONDITIONS		EXAMPLE	
Power	As required to maintain 3° approach	OAT	25°C
Flaps	40°	Pressure Altitude (PA)	4000 ft
Runway	Paved, Level, Dry Surface	Takeoff Weight	3200 lb.
Approach Speed	See Speed Schedule	Headwind Component	10
Braking	Maximum	**Ground Roll = 1240 ft (378 m)** **50 ft Obstacle = 2600 ft (793 m)**	

Runway Slope Correction: Add 1% to ground roll for every 0.1° (0.2%) of downhill slope.
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 1.6 x 1240 ft = 1984 ft (605 m). The total distance to clear a 50-ft obstacle would be 3344 ft (1020 m) in this instance.

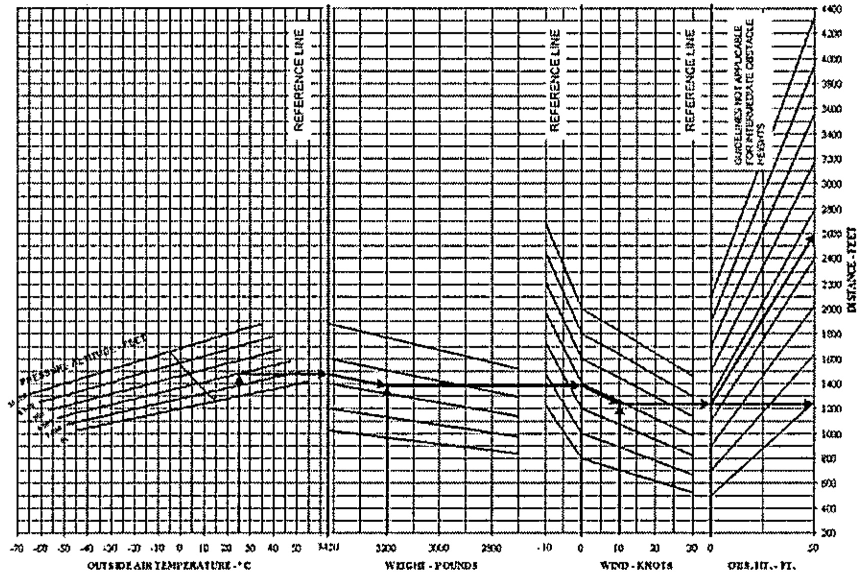

Figure 5 - 35

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LANDING SPEED SCHEDULE

The following chart should be used in conjunction with the landing distance chart in Figure 5 - 35 to determine the proper landing speed based on aircraft weight.

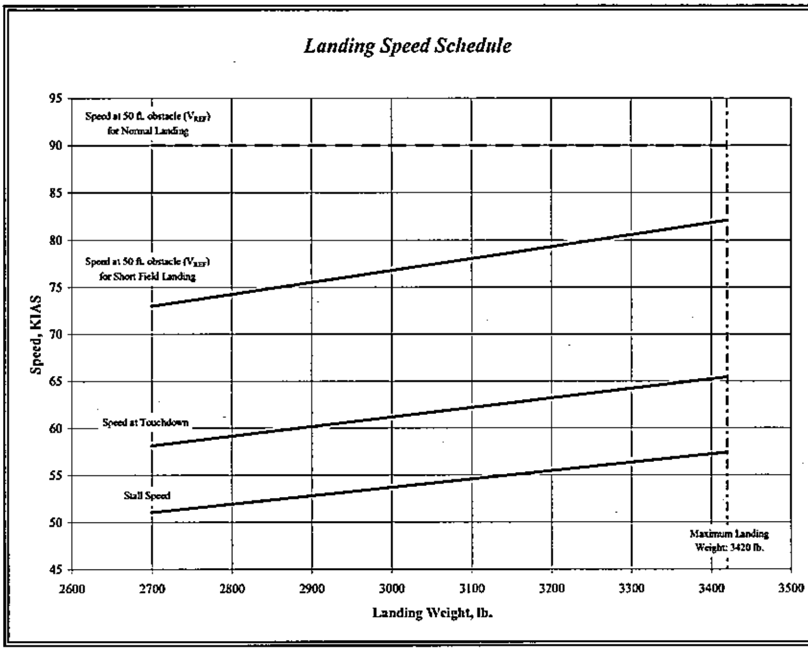

Figure 5 - 36

SAMPLE PROBLEM

Airplane Configuration

Takeoff Weight ... 3600 lbs. (1633 kg) Maximum Gross Weight
Usable Fuel ... 98 Gallons (371 L)

Cruise Environment

Distance of Trip ... 412 Nautical Miles
Pressure Cruise Altitude ... 8000 Feet
Cruise Power ... 80% BHP/2500 RPM
Ambient Air Temperature ... -1°C (Standard)
En Route Winds ... 30 Knot Headwind

Takeoff 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

Landing Environment

Airport Pressure Altitude ... 2000 Feet
Ambient Air Temperature ... 30°C (16.5°C above standard)
Landing Runway Number ... 36
Wind Direction & Velocity ... 040° 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?	1150± Feet	Problem is different than example arrows, i.e., takeoff weight - 3600 lbs. and headwind - 30 knots.
2.	What is the total takeoff distance at the departure airport (ground run and obstacle clearance)?	1750± Feet	Major indices are 200 feet and minor indices (not printed on the graph) are 100 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?	1.7 Gallons (6.4 L)	The fuel required to reach a pressure altitude of 4000 and 8000 feet is 1.7 and 3.4 gallons, respectively. The difference between these two altitudes yields 1.7 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?	6 NM 2.9 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?	22 GPH (83 LPH)	Taken directly from chart.
6.	What is the true airspeed at the 8000 foot cruise altitude (to the nearest whole knot)?	195 knots	Taken directly from chart.
7.	Using the cruise and range profiles, what are the approximate miles covered and time aloft at 80% BHP?	715 NM 3.6 Hours	Notice that range and endurance are significantly reduced when operating at higher power settings.
8.	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?	33 NM	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 5-37 for descents to airports above sea level.
9.	What are the crosswind and headwind components at the destination airport?	16 kts xwind 19 kts hdwnd	The wind is 40° off the runway centerline. See Figure 5 - 9 for a detailed explanation.
10.	What is the landing distance required at the destination airport, with landing flaps, at maximum landing weight?	1100± Feet	In No. 10 above, the headwind component is 19 knots. Insert this information along with the airport elevation and temperature into Figure 5 - 35.

OXYGEN SYSTEM DURATION CHARTS

The charts shown in Figure 5 - 37 or Figure 5 - 39 should be used to determine the amount of oxygen available when using the A4 or A5 Flowmeter with cannulas or masks.

A4 FLOWMETER WITH CANNULA OR MASKS (S/N 41001 to 411124)

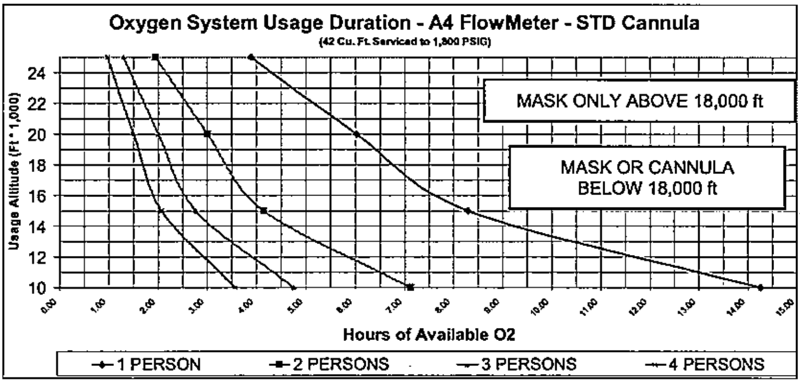

Figure 5 - 37

A4 FLOWMETER WITH CANNULA OR MASKS (S/N 411125 and on)

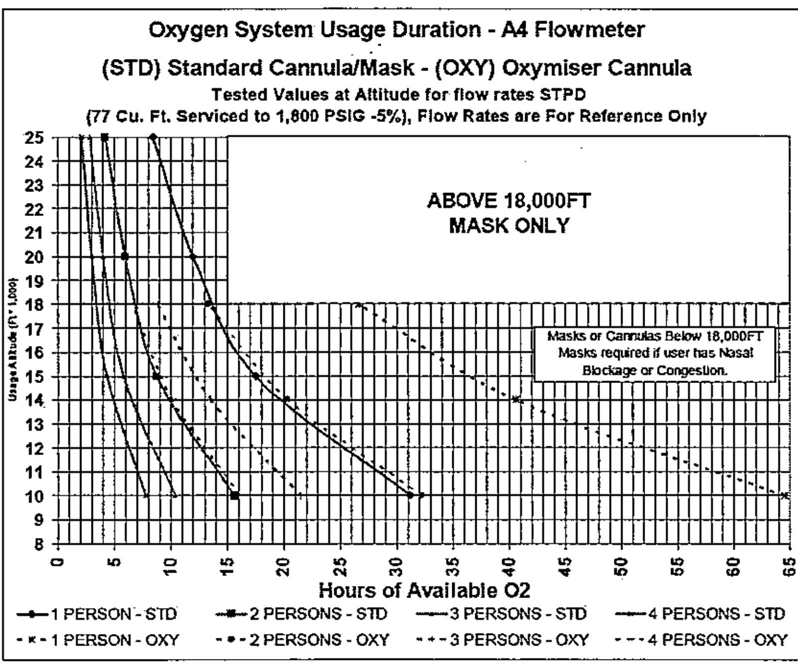

Figure 5 - 38

A5 FLOWMETER WITH CANNULA OR MASKS (S/N 41001 to 411124)

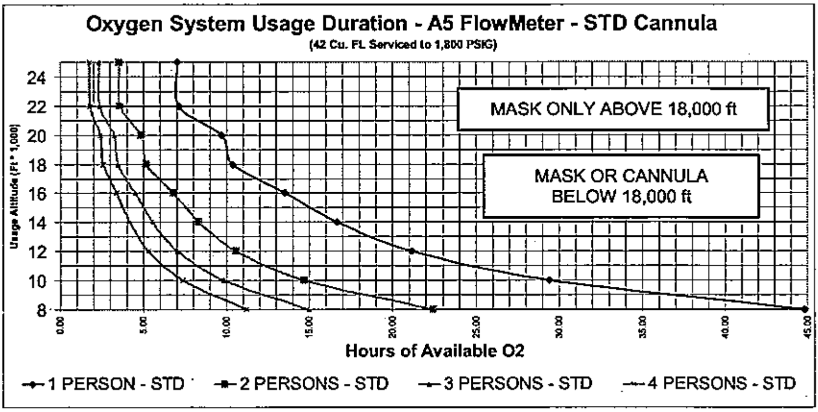

Figure 5 - 39

A5 FLOWMETER WITH CANNULA OR MASKS (S/N 411125 and on)

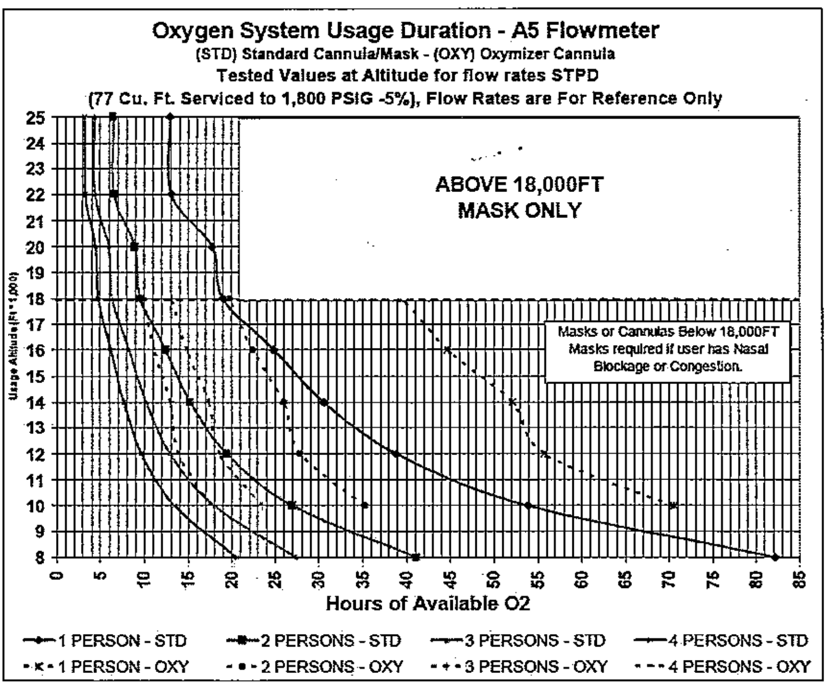

Figure 5 - 40

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.

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Section 6
Weight & Balance
and
Equipment List

TABLE OF CONTENTS

Section 6
Weight & Balance and 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 this manual 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 400 (LC41-550FG), the zero datum point is one inch aft of the tip of the propeller spinner. All measurements from this point are positive or aft of the datum point and are expressed in inches. The tip of the propeller is at -1 inch. 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

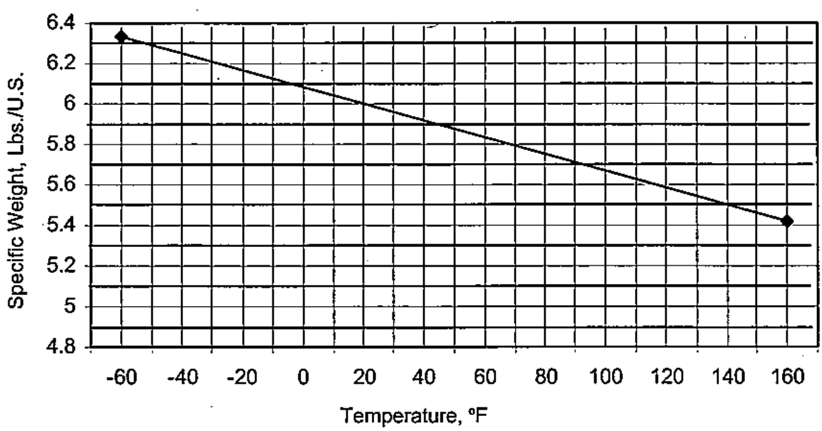
To determine the empty weight and center of gravity of the airplane, the airplane must be in a level area and in a particular configuration.

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 the airplane per instructions 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 pilot's 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 does not 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 °F (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

Because 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.

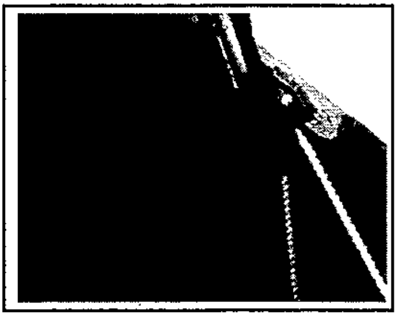


Figure 6 - 1

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 Figure 6 - 2. 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.

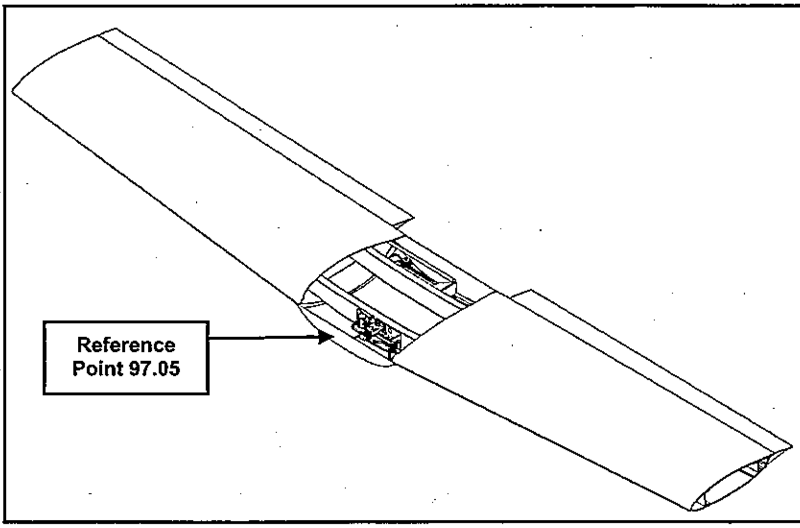


Figure 6 - 2

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.

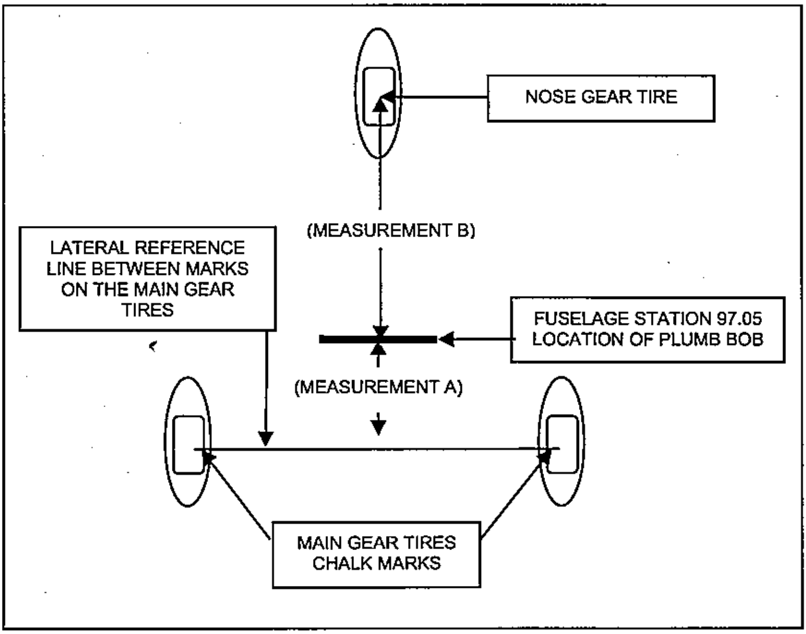


Figure 6 - 3

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.

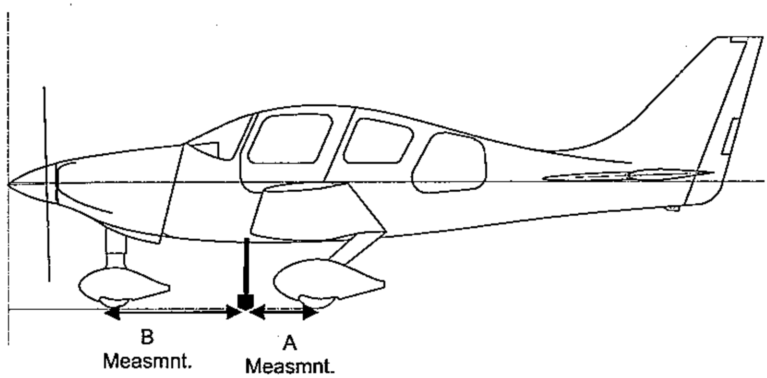


Figure 6 - 4

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** - 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 – 992 pounds
   b. Left Main Gear – 991 pounds
   c. Nose Gear – 502 pounds
2. Scale Error (Tare)
   a. Right Main Gear Scale is –1 pounds
   b. Left Main Gear Scale is –2 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 991, 989, and 505 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 992 and 991 pounds are then multiplied with the 121.1 inch main gear arm, which produces total moments of 120,010.1 lbs.-inches and 119,767.9 lbs.-inches, respectively. It is not uncommon for the right and left gear weights to vary a few pounds.
7. Next, the corrected 502 pound nose gear weight is multiplied times its 40.9 inch arm, which produces a moment value of 20,654.5 lbs.-inches.
8. Finally, the total moments and corrected weights are summed. In the example below, the total weight is 2,485 pounds and the total moments are 260,432.5 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	992	-1	991	X	121.1	=	120,010.1
Left Main Gear	991	-2	989	X	121.1	=	119,767.9
Nose Gear	502	+3	+505	X	40.9	=	+20,654.5
Total Empty Weight and Empty Moments			2485.0				260,432.5

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) 104.8.

$$\frac{\textit{Total Moments}}{\textit{Empty Weight}} = \textit{Center of Gravity} \quad \textit{or} \quad \frac{\textit{260,432.5 lbs.-inches}}{\textit{2695}} = \textit{104.8}$$

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 3600 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.

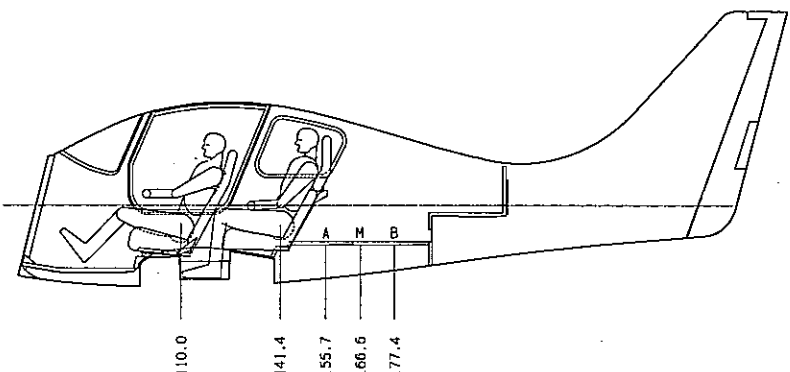


Figure 6 - 10

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 41501 to 41799: 588 Lbs. (98 Gallons)* S/N 41800 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 3,450 pounds and 377,788 moments. The loaded center of gravity of 109.5 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.**	2,485		260,433	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	3,450		377,788	Totals			

$$\frac{377{,}788\ lbs.-in.}{3{,}450\ lbs.} = 109.5\ inches \qquad \frac{\quad lbs.-in.}{lbs.} = \quad inches$$

*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 6-76 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 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 and 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.	**2,485**	**260.4 (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	**3,450**	377.7 x 1000 = 377,700

$$\frac{377{,}700\ lbs.-in.}{3{,}450\ lbs.} = 109.5\ inches$$

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 3600 pounds. This is the first limitation that must be considered in weight and balance preflight planning. If the gross weight is more than 3600 pounds, then fuel, baggage, and/or passenger weight must be reduced. Once the gross weight is at or below 3600 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 400 (LC41-550FG). Using data from the sample problem in Figure 6 - 14, a CG of 109.5 inches at 3450 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 3600 lbs. maximum gross weight, the range of the envelope is 108.8 inches to 112 inches, a range of 3.2 inches. At 2900 lb. gross weight, the range increases to 7 inches.

OTHER WEIGHT LIMITATIONS

TYPE OF WEIGHT LIMITATION	FORWARD DATUM POINT AND WEIGHT	AFT DATUM POINT AND WEIGHT	VARIATION
Minimum Flying Weight	105 inches and 2600 lbs.	112 inches and 2900 lbs.	Straight Line
Maximum Zero Fuel Weight	107.2 inches and 3300 lbs.	112 inches and 3300 lbs.	Straight Line
Reference Datum: The reference datum is located one inch aft of 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 400 (LC41-550FG) is 2708 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 132 pounds of fuel and 760 pounds of passenger weight for a total of 892 pounds. For the purpose of this discussion, the 892 pounds is referred to as the minimum useful load. Subtracting the minimum useful load from the maximum gross weight of 3600 pounds produces the maximum empty weight of 2708 pounds.

The maximum empty weight is not an abstract concept as it has practical applications. For example, assuming an empty weight of 2485 pounds, the 223 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.

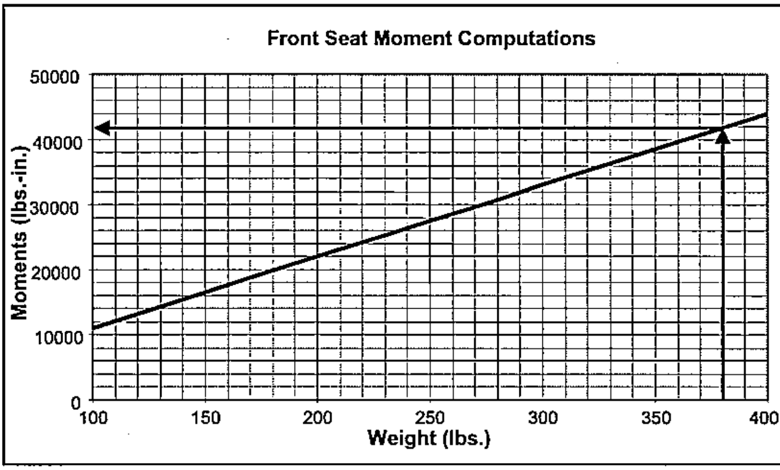


Figure 6 - 16

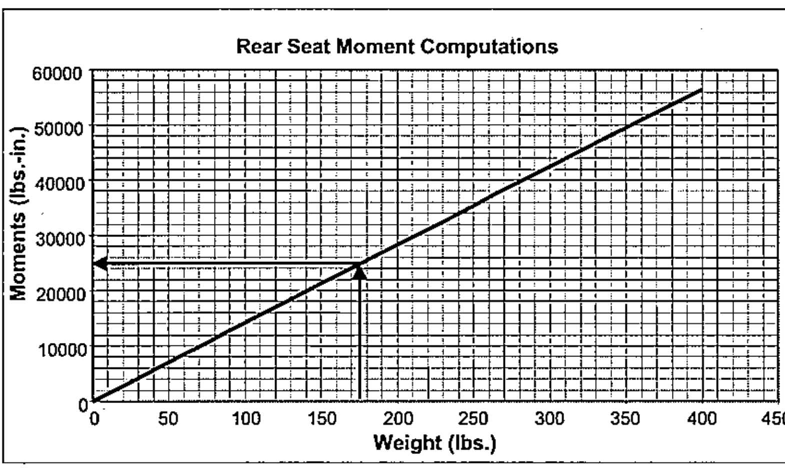


Figure 6 - 17

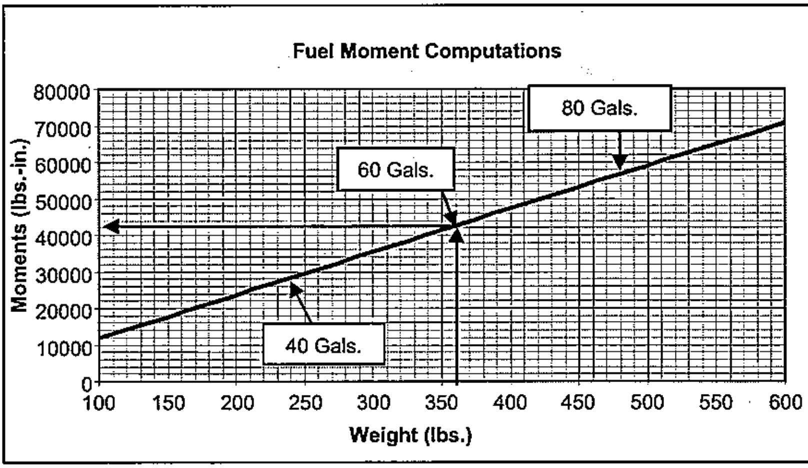


Figure 6 - 18

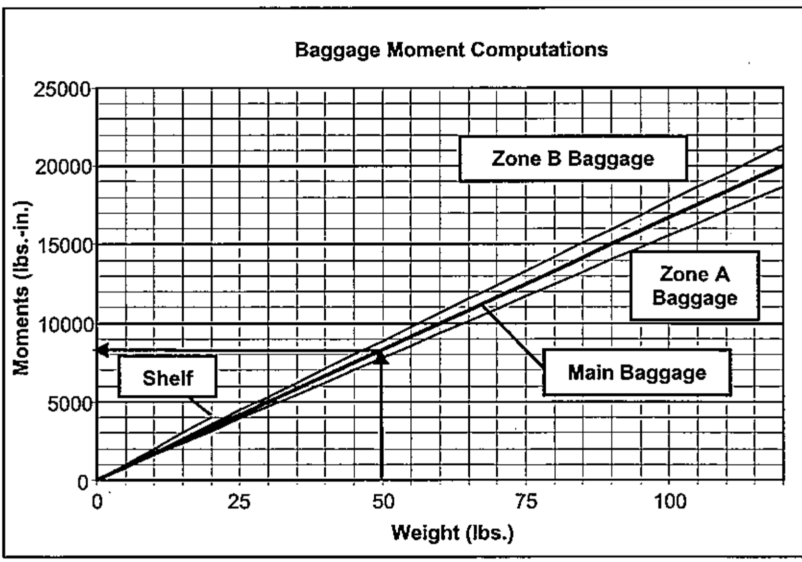


Figure 6 - 19

CESSNA 400 (LC41-550FG) WEIGHT AND BALANCE ENVELOPE

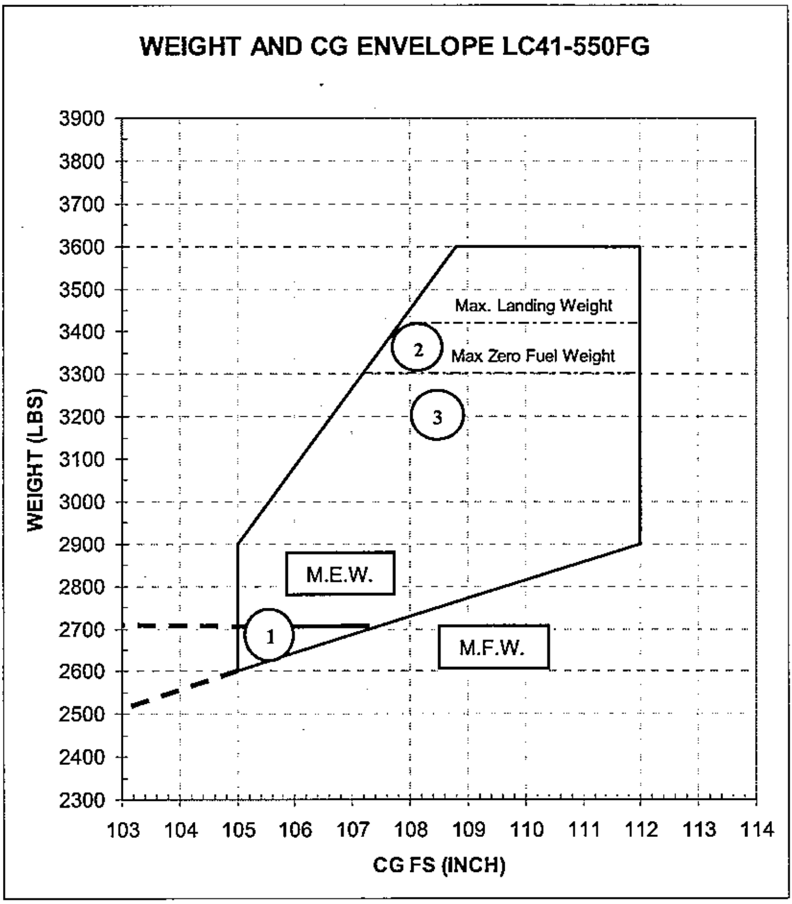


Figure 6 - 20

1. Airplane basic empty weight must be below Maximum Empty Weight (M.E.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 for a listing of weight limitations.

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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.

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EQUIPMENT FOR TYPES OF OPERATION LIST

Cessna 400

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 Servomotor	√			
21-06	O	Automatic Climate Control System Control Panel/ECS Control Panel				√
21-07	O	Compressor Belt Guard				√
21-08	O	Compressor to Firewall Refrigerant Hoses				√
21-09	O	Compressor Assembly (Engine Driven)				√
21-10	O	Compressor Assembly (Electrically Driven)				√
21-11	O	Fuselage Wire Harness				√

EQUIPMENT FOR TYPES OF OPERATION LIST

Cessna 400

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						
21-12	O	Evaporator Assembly				√
21-13	O	A/C Bay Access Panel				√
21-14	O	Firewall to Condenser and Evaporator Hoses				√
21-15	O	Condenser to Expansion Valve Hoses				√
21-16	O	Condenser Assembly and Seals				√
21-17	O	ECU/Blower Module				√
21-18	O	Rear Mounted Relays				√
21-19	O	Interlock Assembly				√
21-20	O	Receiver Dryer and Associated Hoses				√
21-21	O	Cabin Temperature Sensor and Wiring				√
21-22	O	Outside Temperature Sensor				√
21-23	O	Defog/Floor Vent Valve Assembly				√

EQUIPMENT FOR TYPES OF OPERATION LIST

Cessna 400

All – Required for all flight operations	**IFR** – Required for IFR flight operations
Night – Required for night flight operations	**Opt.** – Optional, not required for flight operations

√ — A check mark in one of the four Flight Operation Requirements columns indicates the requirement for that item.

Item No.	Install Code	Item	Flight Operation Requirements: All	Night	IFR	Opt.
		CHAPTERS 21-24				
21-24	O	ECS Shut-off Valve Assembly				√
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				√
23-01	B	Static Wicks Ailerons/Wings (4)			√	
23-02	B	Static Wicks Elevator/Horizontal Stabilizer (4)			√	
23-03	B	Static Wick Rudder (1)			√	

EQUIPMENT FOR TYPES OF OPERATION LIST

Cessna 400

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.
23-04	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	√			
24-02	B	Gear-driven Alternator 52 Amp 28 Volt	√			
24-03	O	Accessories Alternator				√
24-04	O	Battery, 28 Volt, 6.5 Amp-hour, Lead-acid (2) (Each)	√			
24-05	O	Battery, 28 Volt, 8.5 Amp-hour, Lead-acid (2) (Each)	√			
24-06	O	Battery, 28 Volt, 13.0 Amp-hour, Lead-acid (2) (Each)	√			

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 400

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.
24-07	O	Battery, 28 Volt, 13.6 Amp-hour, Lead-acid (2) (Each)	√			
24-08	B	Voltage Regulators, 28 Volt (2) (Each)	√			
24-09	B	Ground Power Plug Relay				√
24-10	B	Ground Power Plug Socket				√
24-11	B	Ground Power Plug Wiring				√
24-12	B	Power Grid Panel	√			
		CHAPTERS 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	√			
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		√		

EQUIPMENT FOR TYPES OF OPERATION LIST

Cessna 400

All – Required for all flight operations	**IFR** – Required for IFR flight operations
Night – Required for night flight operations	**Opt.** – Optional, not required for flight operations

√ — A check mark in one of the four Flight Operation Requirements columns indicates the requirement for that item.

Item No.	Install Code	Item	Flight Operation Requirements: All	Night	IFR	Opt.
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]	√			
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]	√			

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 400

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.**
25-19	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	√			
25-28	B	G1000 System Racks (2) (Each)	√			
25-29	B	CHIPS Harness Assembly (2) (Each)	√			
25-30	B	Sandia Relay	√			

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 400

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.	
25-31	O	Rosen Sunvisor (Must be installed Via STC SA01838SE.)				√	
CHAPTER 26-31							
27-01	B	Pilot's Control Stick	√				
27-02	B	Pilot's Rudder Pedals (2) (Each)	√				
27-03	B	Copilot's Control Stick	See [4]				
27-04	B	Copilot's Rudder Pedals (2) (Each)	See [4]				
27-05	O	Rudder Hold Assembly				√	
30-01	O	Propeller Heat Module with Harness				√	
30-02	O	Brush Block Assembly				√	
30-03	O	Blade Heaters and Hardware				√	

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 400

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.
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)	√			
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				√

EQUIPMENT FOR TYPES OF OPERATION LIST

Cessna 400

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.
33-03	B	Overhead Reading Lights (4)				√
33-04	B	Strobe Lights/ Position Lights	√	√		
33-05	O	Whelen Landing Light		See [5]		
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				√

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

EQUIPMENT FOR TYPES OF OPERATION LIST

Cessna 400

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.**
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]
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	√			

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

EQUIPMENT FOR TYPES OF OPERATION LIST

Cessna 400

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.
34-11	B	Stall Warning Horn	√			
34-12	B	Heated Pitot Tube			√	
34-13	B	Precise Flight Speed Brake 2000 System – Wing Units (2) (Each)				√
34-14	B	Precise Flight Speed Brake 2000 System – Computer				√
34-15	O	TCAD Processor				√
34-16	O	TCAD Transponder Coupler				√
34-17	O	TCAD Top Antenna				√
34-18	O	TCAD Bottom Antenna				√
34-19	B	GTP 59 OAT Probe			√	
34-20	B	GRS 77 Mounting Rack and Connectors	√			
34-21	B	GRS 77 AHRS	√			
34-22	B	GMU 44 Magnetometer with Mounting and Connectors	√			
34-23	B	GDU 1040 PFD with Connector	√			

EQUIPMENT FOR TYPES OF OPERATION LIST

Cessna 400

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.
34-24	B	GDU 1042 MFD with Connector	√			
34-25	B	GDU 1044 MFD with Connector	√			
34-26	B	GIA 63/GIA 63W Mounting Rack with Connectors (2) (Each)	√			
34-27	B	GIA 63/GIA 63W No. 1 Comm/Nav/GPS/AP Computer	See [7]	See [7]		
34-28	B	GIA 63/GIA 63W No. 2 Comm/Nav/GPS/AP Computer	See [7]	See [7]		
34-29	B	GDC 74A Mounting Rack with Connectors	√			
34-30	B	GDC 74A Air Data Computer	√			
34-31	B	GEA 71 Mounting Rack with Connectors	√			
34-32	B	GEA 71 Engine Airframe Unit	√			
34-33	B	GDL 69A Mounting Rack with Connectors				√
34-34	B	GDL 69A Data Link				√

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 400

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.**
34-35	B	GA 55 XM Antenna				√
34-36	B	GTX 33 Mounting Rack with Connectors	√			
34-37	B	GTX 33 Transponder	√			
34-38	B	Standby Airspeed Indicator	See [8]		√	
34-39	B	Standby Altimeter	See [8]		√	
34-40	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 400

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.
		CHAPTER 35				
35-01	B	Regulator Valve Assembly	See [9]	See [9]	See [9]	See [9]
35-02	B	Cabin Distribution Manifold Assembly	See [9]	See [9]	See [9]	See [9]
35-03	B	Face Mask (Rear Passengers) (2)	See [9]	See [9]	See [9]	See [9]
35-04	B	Face Mask with Microphone (1)	See [9]	See [9]	See [9]	See [9]
35-05	B	Face Mask (Front Passenger) (1)	See [9]	See [9]	See [9]	See [9]
35-06	B	Bottle 1 with Manifold	See [9]	See [9]	See [9]	See [9]
35-07	B	Bottle 2 with Manifold	See [9]	See [9]	See [9]	See [9]
35-08	B	Bottle 3 with Manifold	See [9]	See [9]	See [9]	See [9]
35-09	B	Bottle (P/N 026N2003-3) with Regulator Valve Assembly – or –	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.

EQUIPMENT FOR TYPES OF OPERATION LIST

Cessna 400

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.**
35-10	B	Bottle (P/N 026N2001-3SCI) with Regulator Valve Assembly	See [9]	See [9]	See [9]	See [9]
CHAPTER 52-77						
52-01	O	Remote Keyless Entry System				√
53-01	B	Cabin Entry Steps (Each) [10]				√
53-02	O	Cabin Entry Handles (Each)				√
61-01	B	Propeller	√			
61-02	B	Propeller Spinner	√			
61-03	B	Propeller Governor	√			
71-02	B	Engine Intake Filter	√			
77-01	B	TSIO-550-C TCM Engine Complete	√			

10 The step is included in the basic package; however, some owners/operators elect to not have it installed since it lowers cruise speed slightly.

INSTALLED EQUIPMENT LIST (IEL)

Equipment List N1133G — S/N 411126— Date A/C was weighed — January 8, 2009

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 Servomotor	0.26	63.43
21-06	✓	Automatic Climate Control System Control Panel	0.30	84.0
21-07	✓	Compressor Belt Guard	0.33	60.0
21-08	✓	Compressor to Firewall Refrigerant Hoses	2.26	60.0
21-09	✓	Compressor Assembly (Engine Driven)	14.92	56.5
21-10		Compressor Assembly (Electrically Driven)	14.2	194.02
21-11	✓	Fuselage Wire Harness	3.52	109.48
21-12	✓	Evaporator Assembly	10.68	186.0
21-13	✓	A/C Bay Access Panel	2.04	174.0
21-14	✓	Firewall to Condenser and Evaporator Hoses	3.69	125.56
21-15	✓	Condenser to Expansion Valve Hoses	0.62	164.2
21-16	✓	Condenser Assembly and Seals	11.14	174.0
21-17	✓	ECU/Blower Module	0.44	188.0

INSTALLED EQUIPMENT LIST (IEL)
Equipment List N1133G – S/N 411126– Date A/C was weighed – January 8, 2009

Item No	Installed	Item	Weight	Arm
21-18	✓	Rear Mounted Relays	0.28	188.0
21-19		Interlock Assembly	8.1	195.44
21-20	✓	Receiver Dryer and Associated Hoses	1.7	149.0
21-21	✓	Cabin Temperature Sensor and Wiring	0.08	82.0
21-22	✓	Outside Temperature Sensor	0.2	168.0
21-23	✓	Defog/Floor Vent Valve Assembly	0.83	69.0
21-24	✓	ECS Shut-off Valve Assembly	0.93	68.0
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

INSTALLED EQUIPMENT LIST (IEL)

Equipment List N1133G — S/N 411126— Date A/C was weighed — January 8, 2009

Item No	Installed	Item	Weight	Arm
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	13.02	22.6
24-02	✓	Gear-driven Alternator 52 Amp 28 Volt	12.8	28.0
24-03		Accessories Alternator	18.16	57.87
24-04		Battery, 28 Volt, 6.5 Amp-hour, Lead-acid (2) (Each)	18.0	204.5
24-05	✓	Battery, 28 Volt, 8.5 Amp-hour, Lead-acid (2) (Each)	22.0	204.5
24-06		Battery, 28 Volt, 13.0 Amp-hour, Lead-acid (2) (Each)	29.55	204.5
24-07		Battery, 28 Volt, 13.6 Amp-hour, Lead-acid (2) (Each)	29.5	204.5
24-08	✓	Voltage Regulator, 28 Volt (2) (Each)	3.0	70.0
24-09	✓	Ground Power Plug Relay	0.9	159.0
24-10	✓	Ground Power Plug Socket	0.8	153.0
24-11	✓	Ground Power Plug Wiring	1.2	156.0
24-12	✓	Power Grid Panel	10.6	159.20
25-01		Artex ELT-200 Emergency Locator Transmitter Unit	2.47	215
25-02	✓	Artex ELT-ME406 Emergency Locator Transmitter Unit	2.46	215

INSTALLED EQUIPMENT LIST (IEL)

Equipment List N1133G – S/N 411126– Date A/C was weighed – January 8, 2009

Item No	Installed	Item	Weight	Arm
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
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

INSTALLED EQUIPMENT LIST (IEL)

Equipment List N1133G – S/N 411126– Date A/C was weighed – January 8, 2009

Item No	Installed	Item	Weight	Arm
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
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 (Must be installed via STC SA01838SE.)	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

INSTALLED EQUIPMENT LIST (IEL)

Equipment List N1133G – S/N 411126– Date A/C was weighed – January 8, 2009

Item No	Installed	Item	Weight	Arm
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
27-05	✓	Rudder Hold Assembly	2.5	68
30-01	✓	Propeller Heat Module with Harness	0.97	75.0
30-02	✓	Brush Block Assembly	0.25	22.6
30-03	✓	Blade Heaters and Hardware	1.0	14.0
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	12.0	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

INSTALLED EQUIPMENT LIST (IEL)

Equipment List N1133G – S/N 411126– Date A/C was weighed – January 8, 2009

Item No	Installed	Item	Weight	Arm
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
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

INSTALLED EQUIPMENT LIST (IEL)

Equipment List N1133G – S/N 411126– Date A/C was weighed – January 8, 2009

Item No	Installed	Item	Weight	Arm
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	✓	Heated Pitot Tube	0.39	117.7
34-13	✓	Precise Flight SpeedBrake™ 2000 System - Wing Units (2) (Each)	4.0	124.0
34-14	✓	Precise Flight SpeedBrake™ 2000 System – Computer	0.5	147.0
34-15	✓	TCAD Processor	6.8	153.42
34-16	✓	TCAD Transponder Coupler	0.5	75.0
34-17	✓	TCAD Top Antenna	0.66	142.87
34-18	✓	TCAD Bottom Antenna	0.75	129.74
34-19	✓	GTP 59 OAT Probe	0.23	119.5
34-20	✓	GRS 77 Mounting Rack and Connectors	0.63	70.0
34-21	✓	GRS 77 AHRS	2.40	70.0
34-22	✓	GMU 44 Magnetometer with Mounting and Connectors	0.50	118.0
34-23	✓	GDU 1040 PFD with Connector	6.70	83.82

INSTALLED EQUIPMENT LIST (IEL)

Equipment List N1133G — S/N 411126— Date A/C was weighed — January 8, 2009

Item No	Installed	Item	Weight	Arm
34-24		GDU 1042 MFD with Connector	6.70	83.82
34-25	✓	GDU 1044 MFD with Connector	6.70	83.82
34-26	✓	GIA 63/GIA 63W Mounting Rack with Connectors (2) (Each)	1.80	77.92
34-27	✓	GIA 63/GIA 63W No. 1 Comm/Nav/GPS/AP Computer	4.90	77.92
34-28	✓	GIA 63/ GIA 63W No. 2 Comm/Nav/GPS/AP Computer	4.90	77.92
34-29	✓	GDC 74A Mounting Rack with Connectors	0.35	78.25
34-30	✓	GDC 74A Air Data Computer	1.69	78.25
34-31	✓	GEA 71 Mounting Rack with Connectors	0.78	78.38
34-32	✓	GEA 71 Engine Airframe Unit	1.75	78.38
34-33	✓	GDL 69A Mounting Rack with Connectors	0.97	78.38
34-34	✓	GDL 69A Data Link	1.86	78.38
34-35		GA 55 XM Antenna	0.36	226.4
34-36	✓	GTX 33 Mounting Rack with Connectors	0.8	77.73
34-37	✓	GTX 33 Transponder	3.10	77.73
34-38	✓	Standby Airspeed Indicator	1.00	82.55
34-39	✓	Standby Altimeter	0.81	82.40
34-40	✓	Standby Electric Attitude Indicator	1.75	78.38

INSTALLED EQUIPMENT LIST (IEL)

Equipment List N1133G – S/N 411126– Date A/C was weighed – January 8, 2009

Item No	Installed	Item	Weight	Arm
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
35-08		Bottle 3 (Aft) with Manifold	7.2	122.0
35-09	✓	Bottle (P/N 026N2003-3) with Regulator Valve Assembly – or –	22.1	235.25
35-10		Bottle (P/N 026N2001-3SCI) with Regulator Valve Assembly	22.1	235.25
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	✓	Propeller	70.0	15.0
61-02	✓	Propeller Spinner	7.3	14.0
61-03	✓	Propeller Governor	2.80	28.0
71-01	✓	Starter Motor	6.4	58.0

INSTALLED EQUIPMENT LIST (IEL)

Equipment List N1133G — S/N 411126— Date A/C was weighed — January 8, 2009

Item No	Installed	Item	Weight	Arm
71-02	✓	Engine Intake Filter	0.80	28.0
77-01	✓	TSIO-550-C TCM Engine Complete	565.5	44.45

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WEIGHT & BALANCE RECORD

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

AIRPLANE MODEL: CESSNA 400 (LC41-550FG)				SERIAL NUMBER: 411126 Date Airplane Weighed – January 8, 2009 (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	2560.61	272110.09
11-6-09	X		TKS ICE SYS	37.75	125.9	4752.7				2598.36	276868.75
1-6-10	X		TANKS ENG HEATER	1.34	40.9	54.8				2599.7	276923.56
3-28-18		X	TCM 24V STARTER				-6.4	58.0	371.20		
3-28-18	X		SKYTEC STARTER	9.3	58.0	539.4				2602.6	277091.76

Aircraft Weight and Balance Revision

Tail Number: **N1133G**			Date: 03-28-18	
Prepared by: CHAUTAUQUA AIRCRAFT SALES INC 3163 Airport Dr, ste 11 Jamestown, NY 14701 CRS# IC1R213K			Work Order No: 9567 Type Certificate Data No:	
Aircraft Make: Cessna	Model: LC41-550FG	Serial No: 411126	Time: 1352.1	
Registered Owner: FRALICK CHAD		Address: 23884 STAR CT AUBURN, CA 95602-8272		
Maximum Weight	CG Range FWD AFT			
As Received; Date of Previous Weight and Balance: 01/06/10	**Useful Load:** 1000.30	**EW:** 2599.70	**EWCG:** 106.52	**Moment:** 276923.56

Notes: Found skytec starter P/N C24ST5 installed without weight and balance revison on Nov 24, 2014

	Weight	Arm	Moment
Lightweight starter P/N C24ST5 installed	9.3	58.00	539.40
TCM OEM 24V Starter P/N 657596 Removed (Item No. 71-10 in IEL)	-6.4	58.00	-371.20
	0.00	0.00	0.00
	0.00	0.00	0.00
	0.00	0.00	0.00
	0.00	0.00	0.00
	0.00	0.00	0.00
	0.00	0.00	0.00
	0.00	0.00	0.00
	0.00	0.00	0.00

[X] As Calculated [ ] As Weighed	Moment 277091.76 Weight 2602.60	**New Empty Weight CG** **106.47**	**New Useful Load** **997.40**

Signature [signature]

Repair Agency or License No: CRS# IC1R213K

WEIGHT & BALANCE AND EQUIPMENT LIST REVISION

FORM 507

Dunkirk Aviation
3389 MIDDLE ROAD
DUNKIRK, NY 14048
716-366-6938
FAA CRS# IC1r213K

Work Order
7179
Date
1/6/10

Aircraft Make	CESSNA
Aircraft Model	LC41-550FG
Aircraft S/N	411126
Reg Number	1133G

Customer: BUFFALO SPINE SURGERY LLC **Address:** 46 DAVISON CT LOCKPORT, NY 14094-5370

Gross Wt	Supercedes W&B Dated	Empty Wt	CG	Moment
3600	11/6/09	2598.36	106.56	276868.75

REMOVED EQUIPMENT

Manufacturer	Description	Part Number	Serial#	Weight	Arm	Moment
N/A						

INSTALLED EQUIPMENT

Manufacturer	Description	Part Number	Serial#	Weight	Arm	Moment
TANIS AIRCRAFT PRODUCTS	TAS ENGINE PRE-HEATER SYSTEM	TAS100-12 W/ OPTIONAL TAS107 ELEMENTS	43454	1.34	40.90	54.81

Revised 03-28-14

New Useful Load	New Empty	Total Change	New CG	New Moment
1000.30	2599.70	1.34	106.52	276923.56

% of MAC= NEW CG - MAC CG \
DIVISOR 0

% MAC #N/A

Completed By: KERBY MCCALL **Date** 1/6/10

Revision to Weight and Balance dated: 11/6/09

WEIGHT AND BALANCE REVISION

MAKE: Cessna
MODEL: LC41-550FG
SERIAL# : 411126
REGISTRATION: 1134G

EQUIPMENT CHANGE

Computing New C.G.			
Item, Make and Model *	**Weight**	**Arm**	**Moment**
Previous information from W&B dated	2560.61	106.27	272116.02
EQUIPMENT ADDED			
TKS ice protection system (dry)	37.75	125.90	4752.73
NEW TOTALS	2598.36	106.56	276868.75

* ITEM NUMBERS WHEN LISTED IN THE PERTINENT AIRCRAFT SPECIFICATION MAY BE USED IN LIEU OF "ITEM, MAKE, AND MODEL"

Superceded on 01/06/2010

Gross Weight: 3600
New empty weight: 2598.36
New Center of gravity: 106.56
Moment: 276868.75
Useful load: 1001.64

Prepared By Stephen Cordrey AP3167359 **Date** 11/6/2009

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: 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 400 (LC41-550FG) 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 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 (specially shaped pieces of composite material) are bonded to the outboard leading edge of the wing to 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 bonded 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 – The ailerons 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 control system is operated through a series of actuating rods and bellcranks that run between the control surface and the control stick in the cockpit. See Figure 7 – 1 for an illustration of the flight control systems.

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.

Elevator – The elevator is a two part control surface with each half connected by a torque tube. Like the ailerons, most of the stresses are carried by the control surface. The end caps and drive rib used to mount the control's actuating hardware provide additional structural support. The elevator control system is operated through a series of actuating rods and bellcranks that run between the control surface and the control stick in the cockpit. See Figure 7 – 1 for an illustration of the flight control systems.

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. A rudder pedal to rudder cable connector that allows positioning of the rudder pedals in a forward or aft position (approximately 1 inch difference) may be installed on the aircraft: if installed re-rigging of the rudder is required to alter the pedal position. Contact Cessna for applicability.

Rudder Hold System – The rudder hold system is standard on aircraft built mid 2007 or is available for retrofit. The rudder hold system is comprised of an activation switch, a rudder hold mechanism, and a blue indicator light. The rudder hold mechanism is an electrically actuated rotary brake, affixed to a capstan winch drum; an intermediate friction clutch allows the rotary brake to be over-ridden if necessary. When activated via an instrument panel control switch, the brake engages and the clutch provides a limited torque resistance to the capstan, which is linked to the rudder control cables via the rudder pedal interconnect cable. Once set, the rudder hold mechanism can be manually over-ridden through application of force to the rudder pedals. Under normal conditions, a microswitch will disengage the rudder hold when the pilot tries to overpower it. If the microswitch fails, the friction clutch will slip instead of disengage. The clutch on the rotary brake supplies only a limited torque before slipping. In the unlikely event of a rotary brake seizure, a shear pin in the mechanism can be broken with applied force to the rudder pedals; thus disengaging the capstan from the brake allowing free movement of the rudder.

After trimming the airplane, the rudder hold system may be activated by pushing the Rudder Hold button. Application of force to the pedals can then be ceased and the system will hold the rudder at the set deflection. A blue light illuminates indicating the system is in operation. The rudder hold button will only be active with the trim system on. The rudder hold system is turned off by either pushing the rudder hold button or by pushing the autopilot disconnect button on the control stick. The system is automatically disengaged if the circuit breaker is opened, the master trim switch is turned off, the flaps are lowered, or the stall warning signal activates.

Flight Control System Diagram

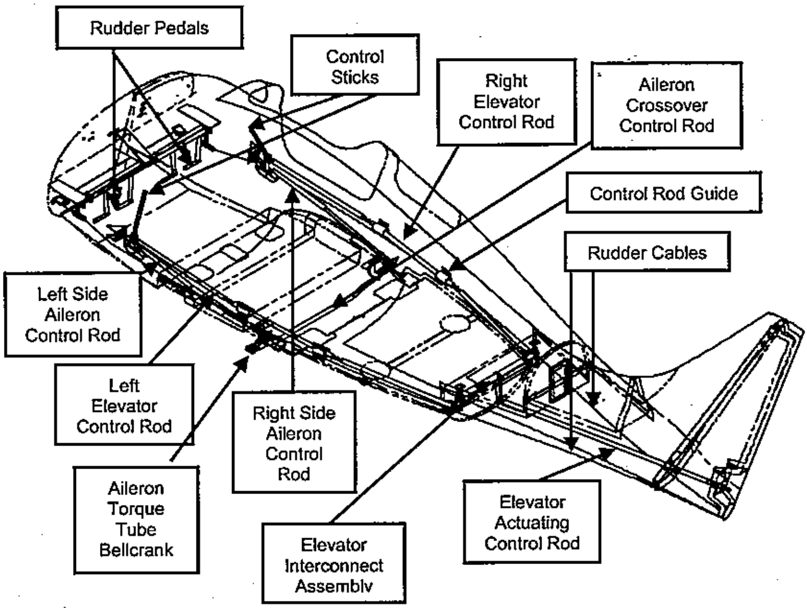


Figure 7 – 1

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

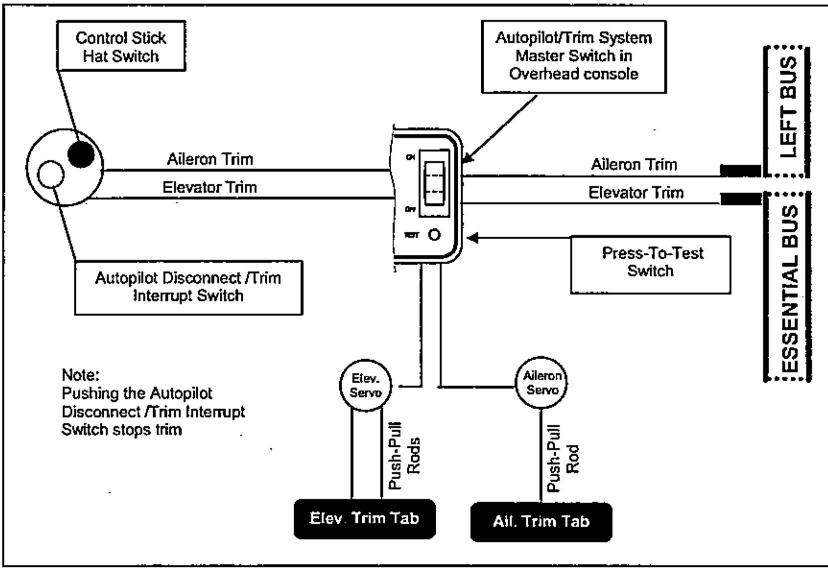


Figure 7 – 2

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.

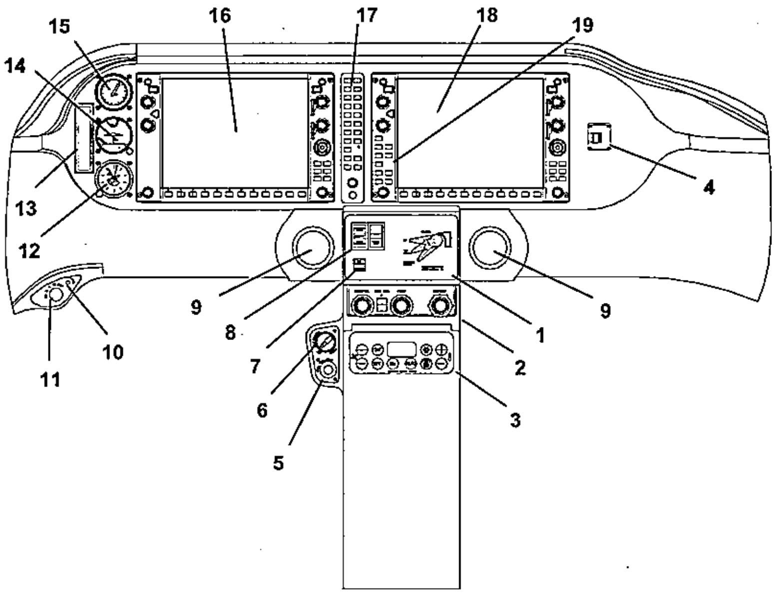
Autopilot/Trim Master Switch (A/P Trim) – The autopilot/trim master switch, to the right of the avionics master switch in the overhead console, turns off power on all the trim tabs. This switch is used if a runaway trim condition is encountered. The switch can be cycled to reset or restore normal trim 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 typical cruise altitude and power settings. 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 400 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 *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 thus the load on the flaps is reduced. The illumination of the flaps switch does not change with adjustments to the dimmer switch. Controlling light intensity and testing of the lights is discussed later in this section on page 7-45. 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.

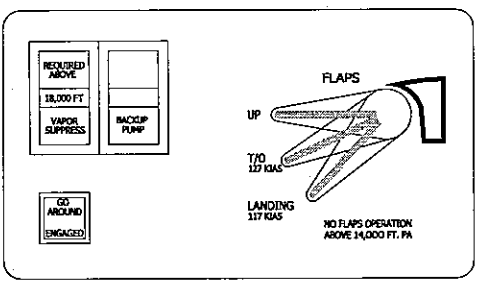


Figure 7 – 4

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 120°, 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.

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 the 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 on the PFD will not be displayed. If the "DOOR OPEN" annunciation 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 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 cleared for the door seal system to operate.

The cabin door latching mechanism also controls the dump door seal 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 90° 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 "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 TSIO-550-C. It is a twin-turbocharged, 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, a gear driven alternator, and a belt driven alternator. Rear engine accessories include a starter, gear-driven oil pump, gear-driven fuel pump, and dual gear-driven magnetos.

TURBOCHARGERS

The TSIO-550-C has twin turbochargers, which use exhaust gas flow to provide high pressure air to the engine for increased power. There is one turbocharger on each side of the engine. The hot gas flow from the left side exhaust drives the left turbocharger and the hot gas flow from the right side exhaust drives the turbocharger on the right side. The turbocharger compresses and raises the temperature of the incoming air before going to the intercoolers. The compressed air is then run through the intercoolers where it is cooled down before entering the throttle body and cylinders. The dual turbochargers are lubricated from external oil lines supplied from a source at the bottom of the oil cooler. There is one mechanical wastegate on the left side of the engine. The wastegate controls the amount of high pressure air to the engine by automatically sensing manifold pressure. An overboost valve in the induction system provides protection from too much pressure.

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 by the pilot's left knee, 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 Slick 6320, pressurized 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 16.5°, further reductions in power will result in decreased RPM. There is a theoretical high angle position, approximately 42.0°, 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.

Induction – The induction system routes outside air through an air filter to the left and right side turbocharger 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 the air filter and the left and right heated induction air valves. Ram air enters through both the left and right intake holes in the front of the cowling and passes through the air filter where it is sent on to the compressors and then 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 heated induction air valves are located next to the right and left side turbochargers. When the induction heat control is pulled out, it moves a butterfly inside the valves that opens the airflow for heated air from the lower engine area. 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. If the filter is not clogged, alternate induction air can be used any time. If the filter is clogged and alternate induction air is selected, the engine is drawing hot air into the induction system. This increases the chance for engine detonation. To limit the chance for engine detonation, set the mixture to full rich and do not use more than 85% power if the outside air temperature is greater than 32°F.

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 TSIO-550-C 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 should 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 the manifolds is connected to three cylinders. The manifolds are connected to a turbocharger and tail pipe that extend out the bottom of the engine cowling. A crossover pipe allows the exhaust gas from the right side to flow to the left side wastegate.

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 fight 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 airplanes' groundspeed. The G1000 will calculate the appropriate size of the hold to provide 1 minutes legs in the hold. Changes in the airplanes' groundspeed will cause the size of the holding pattern to change in size.

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.

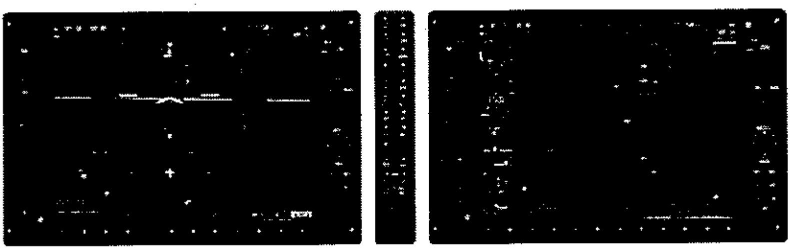


Figure 7 – 5

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.

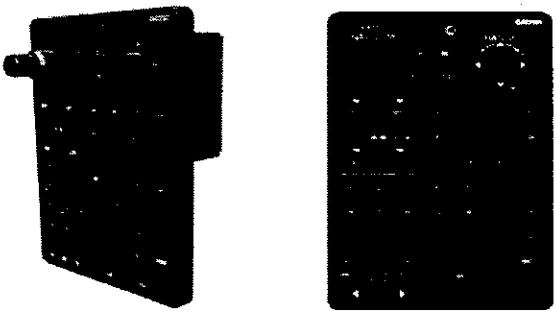


Figure 7 – 6

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.

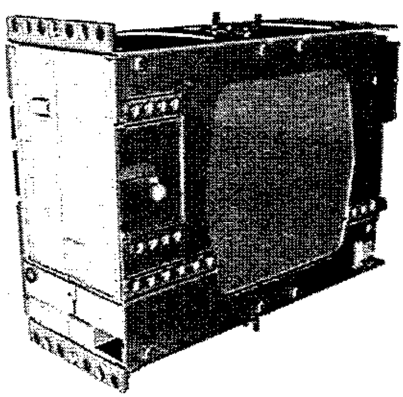


Figure 7 – 7

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.

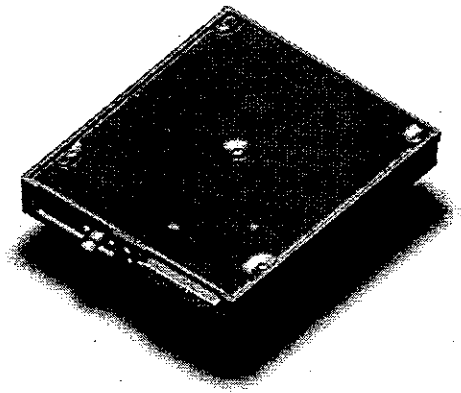


Figure 7 – 8

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.

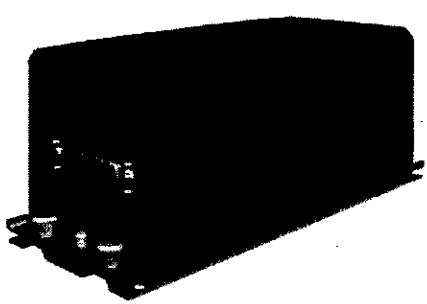


Figure 7 – 9

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.

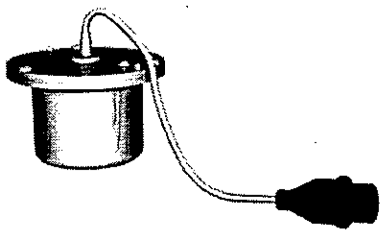


Figure 7 – 10

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.

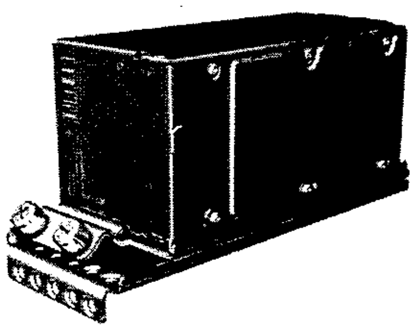


Figure 7 – 11

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.

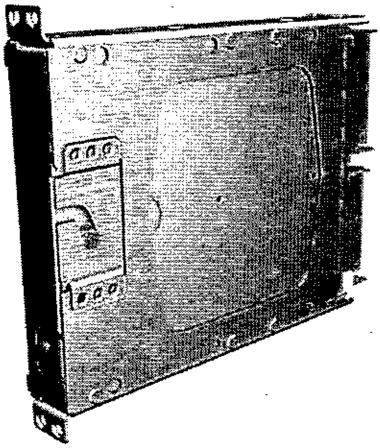


Figure 7 – 12

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.

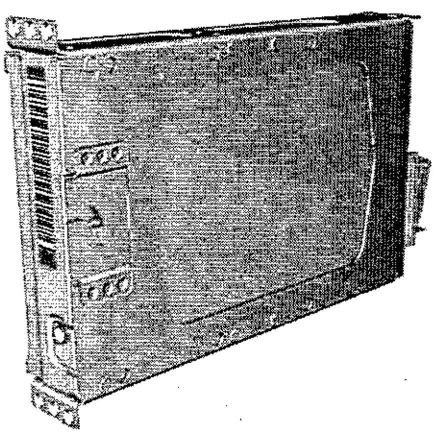


Figure 7 – 13

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 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 400 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 annunciation 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 engine driven fuel pump has malfunctioned and the fuel pressure is less than about 5.5 psi.
   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. The **STARTER ENGD** message is displayed, when the starter is activated.
   e. 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.
   f. The **OXYGEN QTY** message is displayed when the oxygen quantity is below 250 psi.
   g. If the **OXYGEN PRES** message is displayed, pressure altitude is above 12,000 ft and the oxygen system is off.

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	Fuel pump is operating	Single Chime/ "Fuel Pump On"
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
OXYGEN PRES	Pressure above 12000 ft and oxygen system off	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.
    c. If the **RUDR HOLD** message is displayed, the rudder hold system is active.

Annunciation Window Text	Alerts Window Message	Audio Alert/Voice Message
OXYGEN ON	Reminder: Turn off oxygen	None
SPEED BRAKES	Speed brakes are active	None
RUDR HOLD	None	None

4. **Message Advisory Alerts**
    d. If the **PFD FAN FAIL** message is displayed, the cooling fan for the PFD is inoperative.
    a. If the **MFD FAN FAIL** message is displayed, the cooling fan for the MFD is inoperative.
    b. If the **AVIONICS FAN** message is displayed, the cooling fan for the remote avionics is inoperative.
    c. If the **TIMER ZERO** message is displayed, the timer has counted down to zero.
    d. If the **FUEL IMBAL** message is displayed, fuel imbalance is greater than 10 gallons.
    e. If the **LOW MAN PRES** message is displayed, pressure altitude is above 18,000 ft and the manifold pressure is below 15 in.
    f. 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 Open – this warning is activated when any of the doors are unlatched <u>and</u> 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 On – this warning is activated when the fuel pressure is less than 5.5 psi.
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 7-61 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.
Pitch Trim Axis Control Failure	PTRM	If annunciated when AP is engaged, take control of the aircraft and disengage the autopilot.
System Failure	AFCS	AP is 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 7-11.

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 the top 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 7-34. The instrument measures the difference between total 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 – 60 to 117 knots; green arc – 73 to 181 knots; yellow arc – 181 to 230 knots; and red line – 230 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 the airplane-like bar in the foreground and horizon-like display in the background. The background 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 20° 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 7-34. 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. 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 7-33 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

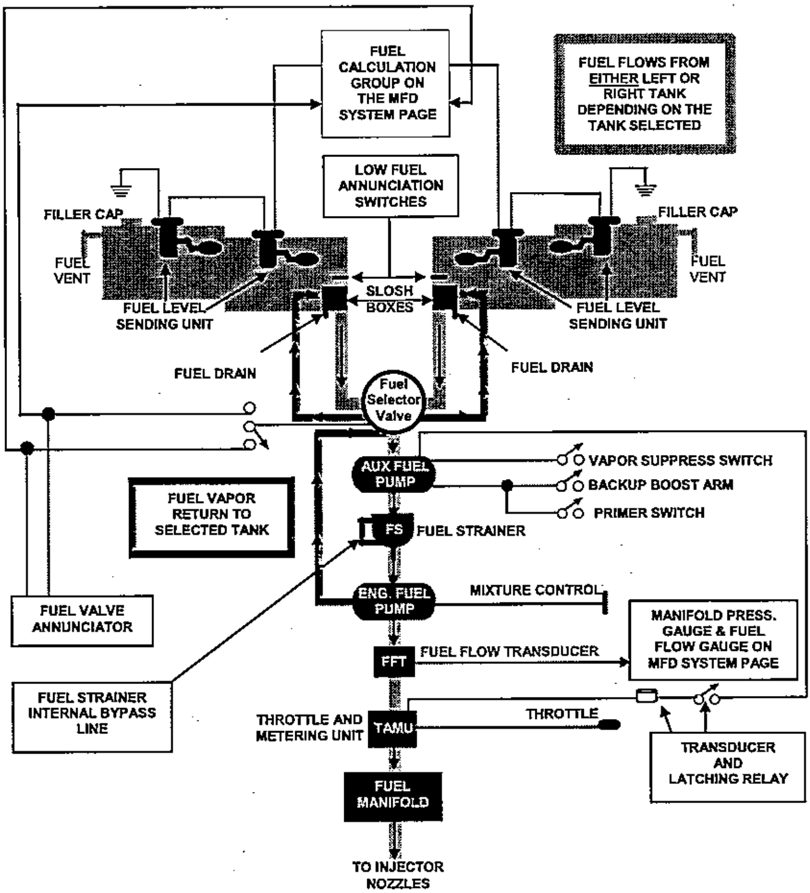


Figure 7 - 15

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 US (30 L) (S/N 41501 to 41799), or 10 gallons US (38 L) (S/N 41800 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 the 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 3-16.

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 pressurized, continuous flow nozzles at individual intake ports. The engine is equipped with a speed-sensing fuel pump. The continuous-flow system uses a rotary vane pump.

ENVIRONMENTAL CONTROL SYSTEM (ECS)

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 7-62.

The ECS incorporates the use of bleed air, 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 the 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 – Ram air enters through a duct on the right side of the engine cowling and flows to the fresh air manifold. Cabin heat is produced using heated air off the bleed air valves (sonic nozzles) located on the back of each intercooler. Heated air next passes through the ECS valve and onto a fan unit before entering the distribution system. Operating the fan will increase the airflow through the system (not including the eyeball vents). Fresh air flows directly from the manifold to 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

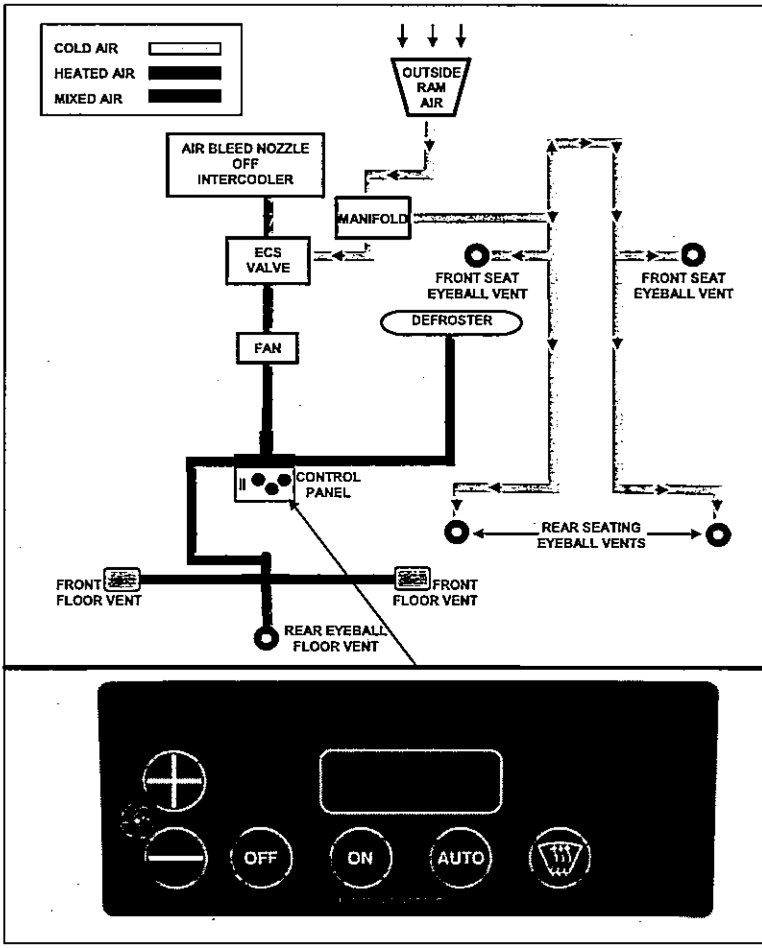


Figure 7 - 16

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 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 buses 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 at the aft end of the avionics bay. 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, 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 3-23.

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 right side in the master switch panel. 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 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

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 or Rudder Hold/Aileron Trim	2 amp
	• Pitot Heat	7.5 amp
	• SpeedBrakes	3 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	• Attitude Horizon	5 amp
	• Elevator Trim	2 amp
	• Panel Lights	7.5 amp
	• Air Data Computer	5 amp
	• PFD	5 amp
	• AHRS	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 Lights	3 amp

* 5 amp for Precise Flight taxi light, S/N 41563 and on.

Figure 7 – 17

Electrical System Diagram

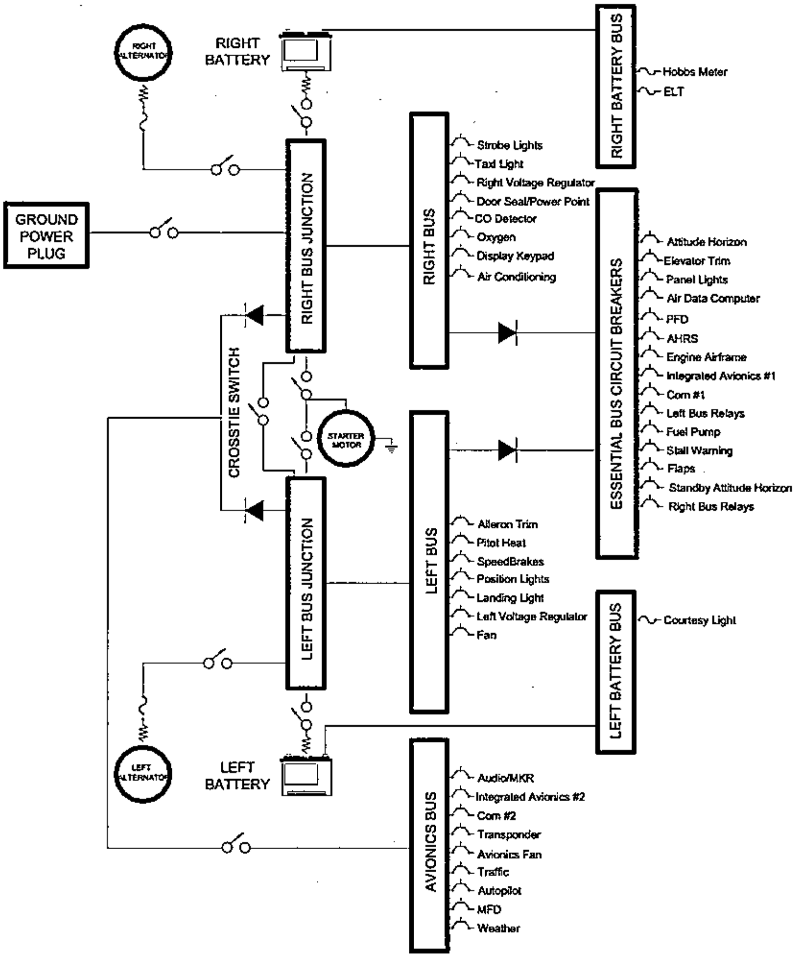


Figure 7 – 18

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 7-44.

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 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, rudder hold switch, 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 rudder hold assembly brake will engage while the button is pressed and disengage when the button is released.

When the position lights are on, these 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 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.

Stall Warning System (Electrical) – Operation of the stall warning system requires the master switch to be on since the stall warning is connected to the left and right buses. Breakers in the circuit breaker panel protect the stall warning indicator. The stall warning is protected by a 2-amp circuit breaker.

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 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 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.

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 7-9, 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.

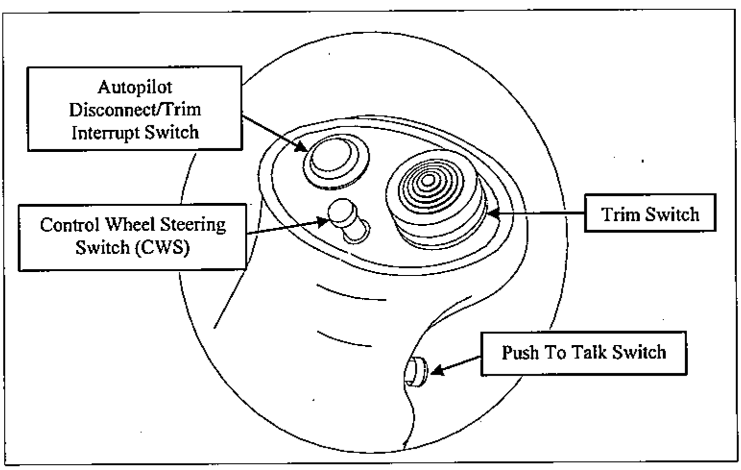


Figure 7 – 20

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 7-21 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 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	-40°F (-40°C)
Highest Cabin Temperature	120°F (49°C)

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 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 400 LC41-550FG 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 the 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 4-17 in Section 4 for more information about the static wicks.

PRECISE FLIGHT FIXED OXYGEN SYSTEM

The Precise Flight fixed oxygen system is installed to provide supplemental oxygen for the pilot and passengers. 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 above 14,000 ft. 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.

S/N 41001 thru 411124 – The system consists of three, 14 cu ft oxygen bottles located in the right wing, a regulator/valve assembly, a filler port, 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 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.

S/N 411125 and on – The system consists of one lightweight carbon or kevlar wrapped oxygen bottle with an axially-mounted regulator/valve assembly at the outlet port, associated lines, fittings, valves, sensors, filler port with an integrated pressure gage, oxygen distribution manifold, and flow meters. The oxygen bottle has a 77 cu ft. capacity at a service pressure of 1850 psig and is mounted on a cylindrical channel located between the baggage bulkhead and the vertical shear web approximately between FS213 and FS253, and WL96 and WL113. The filler port is located in the baggage compartment. The regulator/valve assembly contains an over-pressure burst disc on the high pressure manifold that opens at 2800 psig and a low pressure safety valve on the low pressure manifold that opens at 100 psig. In case of an emergency or failure of the regulator/valve assembly, the flow of low-pressure oxygen can be turned off by a manual turn-off switch next to the distribution manifold.

The maximum oxygen cylinder pressure is 2000 psi. However, a typical fill volume would be 1850 psig, the service pressure of the bottle. The low pressure operating pressure is 22 to 27 psig. This assembly also includes a valve, on the low-pressure side, that is activated by a latching solenoid that is connected electronically to the display/logic controller to turn on and off the flow of oxygen to the cabin distribution (low-pressure) manifold. The cabin distribution manifold is connected to the low-pressure manifold on the regulator/valve assembly on the bottle with low-pressure aluminum lines, a non-conductive line for lightning protection, and a conductive flexible hose assembly with a quick disconnect fitting, all routed behind the overhead interior panels.

Also attached to the low-pressure distribution manifold and the high-pressure manifold on the regulator/valve assembly are pressure transducers to measure the oxygen pressure at the respective locations. These pressure transducers are connected electronically to the instrument panel and the pressure values are sent to the Oxygen Quantity Gage and the Oxygen Outlet Pressure Gage displayed on the MFD system. The value of the high pressure (bottle pressure) directly relates to the quantity of oxygen in the system.

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 one of the following:

- A4 and A5 Flowmeters and Oxygen Conserving Cannulas – Up to 18,000 ft
- A4 and A5 Flowmeters and Masks (Standard and Microphone) – Up to 25,000 ft.

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 four annunciation messages that may be displayed on the PFD. 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.

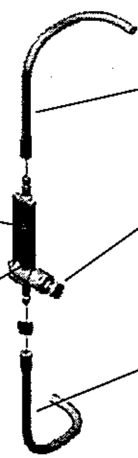


Figure 7 – 23

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." (S/N 41001 thru 411124) or "Oxygen 2000 psi Max" (S/N 411125 and on). 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.

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 annunciations 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.

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

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 7-24. 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.

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.

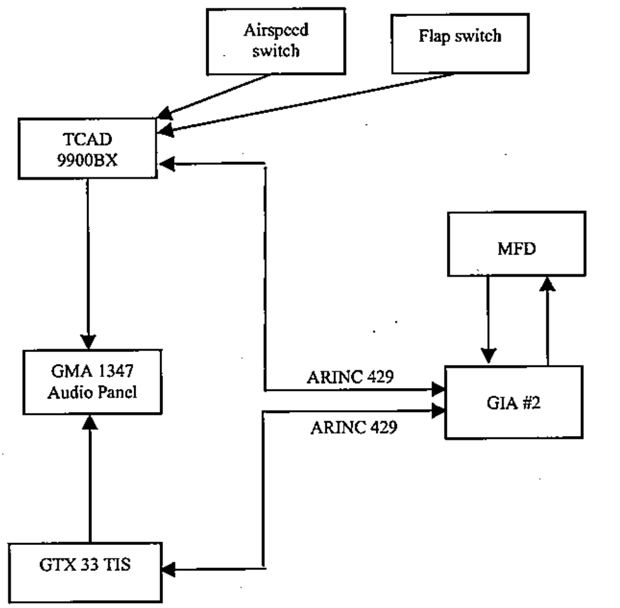
Maneuver your aircraft based only on ATC guidance or positive acquisition of conflicting traffic. It is your duty as pilot in command to See and Avoid.

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 1013 mb). 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 ADC). 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 Garmin 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 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.

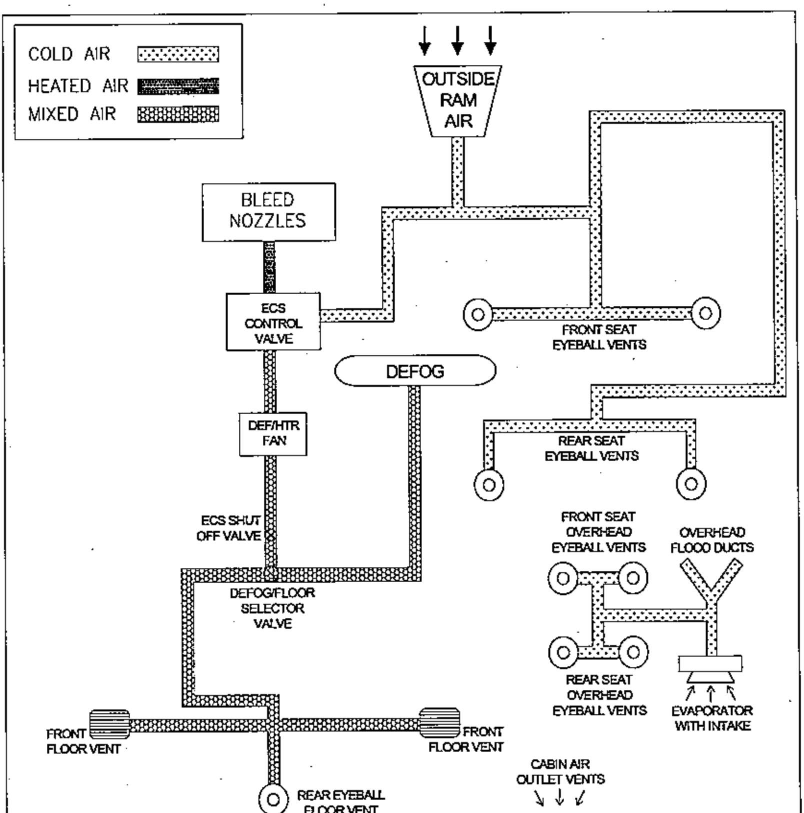


Figure 7 – 27

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 clears.

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.

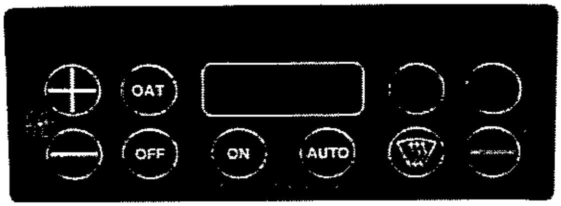


Figure 7 – 28

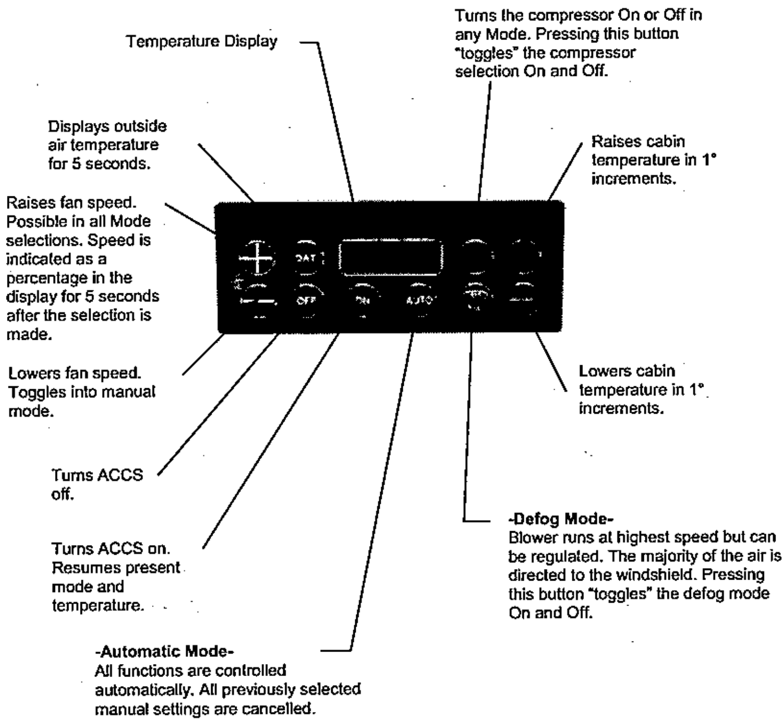


Figure 7 – 29

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 Station.
- 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 Station.
- Repairs or maintenance to the air conditioning system requires trained personnel and special tools. If there should be any malfunction in the system, contact your nearest authorized Cessna Service Station.

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 airplanes 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.

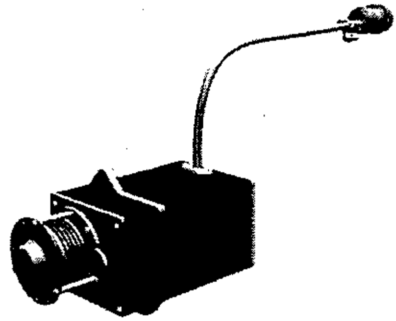


Figure 7 – 30

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.

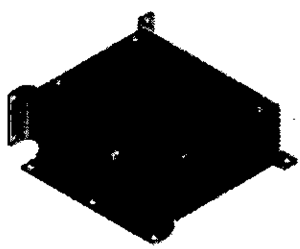


Figure 7 – 31

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
- **VNV Key** – Selects/deselects the Vertical Navigation mode (if present)

- **NOSE UP/NOSE DN Keys** – Controls the active pitch reference for the Pitch Hold, Vertical Speed, and Flight Level Change modes

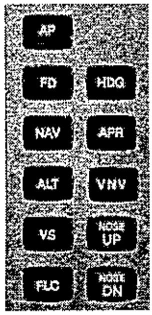


Figure 7 - 32

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 the 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 Go Around 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.

Go Around 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.

TEMPORARY REVISION FOR CESSNA PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL

Publication Affected:	Model 400 (LC41-550FG) with Gamin Integrated Flight Display basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, RC050005, Revision I, dated 22 October 2008.
Airplane Serial Numbers Affected:	Airplanes 41034, 41563 thru 41650, 41652 thru 41800, and 411001 and On.
Description of Change:	Section 7, Description of Airplane and Systems, Optional Equipment, page 7-70, add a new subheading and description.
Filing Instructions:	This temporary revision replaces RC050005-I TR09, in its entirety. Insert this temporary revision in the Model 400 (LC41-550FG) basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, RC050005-I, adjacent to page 7-70.
Removal Instructions:	This temporary revision must be removed and discarded when Revision J has been collated into the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

In Section 7, Description of Airplane and Systems, Optional Equipment, page 7-70, add the following subheading and description after the Garmin GFC 700 Automatic Flight Control System (AFCS) description:

Synthetic Vision Technology (SVT)

The Garmin G1000 Synthetic Vision Technology (SVT) is primarily composed of a computer-generated, forward looking attitude aligned view of the topography immediately in front of the airplane from the pilot's perspective. The SVT information is shown on the Primary Flight Display (PFD) and offers a three dimensional view of potentially hazardous terrain, obstacles and traffic complete with the requisite red or yellow shading overlaid. For complete system description and operation, refer to the latest revision of the Garmin G1000 Cockpit Reference Guide (CRG) document number 190-00567-01.

(Continued on Next Page)

Synthetic Vision Technology (SVT) (Continued)

See G1000 Limitations contained in Section 2 of this manual for additional limitations associated with SVT operation.

NOTE

- Not all airport runways are depicted with SVT.
- All G1000 SVT pathways are disabled prior to system software build 534.15. Software 534.15 supports WAAS G1000 installations only.

APPROVED BY ______________

for Carlos Ayala, Acting Lead ODA Administrator
Cessna Aircraft Company
Organization Delegation Authorization ODA-100129-CE
FAA Approved Under 14 CFR Part 183 Subpart D

DATE OF APPROVAL 15 November 2010

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 Gallons US (401 L)
- Total Capacity Each Tank: 53 Gallons US (201 L)
- Total Usable Fuel:
  - S/N 41501 to 41799
    - 49 Gallons US (186 L)/tank, 98 Gallons US (371 L) Total
  - S/N 41800 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 400 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 400 (LC41-550FG), 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-24 can be used.

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 90° 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, or 20W50

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	N/A	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 400 (LC41-550FG) Maintenance Manual* with MIL-H-5606 hydraulic fluid.

BATTERY REPLACEMENT CYCLES

The Cessna 400 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 7-50 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)	Under the left side of the hat rack in the baggage compartment.	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 display 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 400 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, Non-dispersant mineral oil conforming to SAE J1966 shall be used. However, if the engine is flown less than once a week, a straight mineral oil with corrosion preventative MIL-C-6529 for the first 25 hours is recommended. 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 50 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. Chock the main gear tires with chocks on both sides of each tire.
2. 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.
3. 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 (5 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 45° to 90° 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 at room temperature through the upper spark plug hole of each cylinder with the piston in approximately the bottom dead center position. Rotate the crankshaft as opposite cylinders are sprayed. Stop the crankshaft with none of the pistons at top dead center.
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 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 inserting a dehydrator plug, M527215-2, in the breather hose and clamping in place.
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.

NOTE

The dehydrator plugs must be visually checked every 15 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.

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. Apply Champion® thread lubricant to spark plugs in accordance with the manufacturer's instructions. Install and torque the spark plugs 300 to 360 in-lbs.
5. Rotate the propeller by hand through the compression strokes of all the cylinders to check for possible liquid lock.
6. 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.
7. Stop the engine and inspect the entire airplane before test flying.
8. Test fly the airplane.

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 90° 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 batteries and store in a cool, dry location. The batteries 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 batteries. If the batteries are still serviceable, reinstall them in the airplane; otherwise, install new batteries.

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 15 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 and Leading Edge Tape – The anti-erosion tape is located on the leading edges of the wings, horizontal tail, vertical tail, and gear fairings. Leading edge tape is located on the leading edges of the wings and horizontal tail only. 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. Never use 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 replaced at every 100 hours of time in service or if the filter element is more than 50% covered with dirt and debris; 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 400 (LC41-550FG) 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.

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Section 9
Supplements

GENERAL

This section contains information about optional equipment that is installed in the airplane as a Supplemental Type Certificate (STC). A log for STC equipment is provided on page 9-2. Each 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).

Each Supplement is designed as a self-contained miniature AFM/POH and contains the same first five sections as the primary AFM/POH. Each supplement has its own table of contents and series of unique page numbers. This arrangement makes locating a particular supplement somewhat more difficult since the page numbers are restarted for each supplement.

In the *Cessna Information Manual* for the Cessna 400, the actual supplements provided by the holder of the STC are not included. However, to assist the reader in understanding the special equipment that is installed through an STC, a discussion of these components is included on the following pages. A generic format is used for each supplemental section, since this will provide a consistent form of presentation for the reader. The formats of each supplement in the airplane's AFM/POH may differ significantly.

The intent of the AFM/POH is to be a self-contained document. That is, the goal was to provide enough information about operating the airplane and its special equipment in a single publication. Detailed and advanced techniques are not included in the supplements since this information is available in the respective pilot/owner operating publications. The instructions in the various supplements, for the most part, are copied directly from the manufacturer's documentation. However, the format was changed, and a few spelling, grammatical, and typographical errors were corrected.

LOG OF SUPPLEMENTS

The table below is for tabulating the installation of equipment and/or devices that are installed as supplemental equipment. Such equipment and/or devices must have their own Supplemental Type Certificate (STC) number. Some 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 <u>totally</u> 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.

This log is provided as a service to the owner or operator of the airplane so that after-market supplemental installations are documented in a consistent format. It is suggested that when an after-market product is installed in the airplane, the appropriate information be entered in the log below, and the supporting documentation inserted at the end of the *Pilot's Operating Handbook*.

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.			

Supplement to Pilot's Operating Handbook and FAA Approved Airplane Flight Manual

For the Cessna 300, 350, and 400 Aircraft (LC40-550FG, LC42-550FG, LC41-550FG)

Equipped With TKS Ice Protection

Serial Number: 41761

Registration Number: N1565$

This supplement must be attached to the FAA Approved Airplane Flight Manual when the TKS Ice Protection System is installed in accordance with STC SA01435-WI. The information contained in this document supplements or supercedes the basic manual only in those areas listed. For limitations, procedures, performance, and loading information not contained in this supplement, consult the basic Airplane Flight Manual.

FAA Approved: [signature]

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

FAA Approval Date: June 15, 2007

CAV AEROSPACE

2734 Arnold Court
Salina, Kansas 67401 U.S.A.

Log of Revisions - Effective Pages

Date	Page(s)	Description of Revision	FAA Approval*
15 June 07	All	Original	[illegible]
2/18/09	All	Manual reformatted and re-written. Added models 300 and 350	[illegible]

* for Manager, Wichita Aircraft Certification Office

Table of Contents

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Section 1

General

No change.

This supplement provides information as required and approved by the FAA to supplement the Aircraft Flight Manual. The content of this supplement includes appropriate information for the proper operation of TKS Ice Protection on the Cessna 300, 350, and 400 aircraft.

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Section 2

Limitations

1. There is no change to the basic airplane limitations when the TKS ice protection system is installed.

   INTENTIONAL FLIGHT INTO KNOWN ICING IS PROHIBITED.

   If icing is inadvertently encountered, exit icing conditions immediately.

   Warning

   No determination has been made as to the capability of this system to remove or prevent ice accumulation.

2. Approved Ice Protection Fluid

   The TKS Ice Protection System tank must be serviced with the following fluid:

   Specification DTD-406B

   Trade names for DTD-406B include, TKS 406B (Kilfrost Ltd.), "AL-5", "TKS Fluid" (D.W. Davies), "AVL" (Aviation Laboratories), and Aeroshell Compound 07 (Shell).

Fluids conforming to this specification may be mixed in the ice protection fluid tank in any proportions.

Warning

Under no circumstances are fluids other than those listed to be used in the TKS System. Some fluids currently used for ground de-icing purposes contain thickening agents which may block the porous panels. If it is known or suspected that such a fluid has been placed in the tank, do not operate the system.

3. Placard to be fitted on the top inboard surface of the left wing around the fluid filler cap:

4. Placard to be fitted on the top inboard surface of each wing and horizontal stabilizer (4 locations) :

T.K.S. ICE PROTECTION
CAUTION
POROUS DE-ICING PANELS MAY
BE DAMAGED BY CERTAIN SOLVENTS.
REFER TO SECTION 8 OF
T.K.S. SUPPLEMENT TO
PILOT'S OPERATING HANDBOOK

5. **Propellers**

The aircraft, when equipped with TKS Ice Protection, must be equipped with one of the following propellor/ice protection combinations:

Table 2-1 Applicable Propellers

Model Number	Propeller Model Number	Description	Ice Protection
300	PHC-J3YF-1RF/ F7691D-1	Propeller with Spinner	Requires installation of TKS wet prop system, part number 122PP-01
350	PHC-J3YF-1RF/ F7691D-1	Propeller with Spinner	Requires installation of TKS wet prop system, part number 122PP-01
	PHC-J3YF-1RF/ F7691D-1 [1]	Propeller with Spinner (with Generation 1 SMR 2263 Kit)	Cessna Installed Electro-Thermal boots
	PHC-J3YF-1RF/ F7691DK-1 [2]	Propeller Assembly (with Second Generation SMR)	Hartzel Installed Electro-Thermal boots
400	HC-H3YF-1RF/ F7693DF	Propeller with Spinner	Requires installation of TKS wet prop system, part number 122PP-01
	HC-H3YF-1RF/ F7693DF [1]	Propeller with Spinner (with Generation 1 SMR 2263 Kit)	Cessna Installed Electro-Thermal boots
	HC-H3YF-1RF/ F7693DFK [2]	Propeller Assembly (with Third Generation SMR or HPI)	Hartzel Installed Electro-Thermal boots

1 Cessna Installation of Generation 1 SMR 2263 Kit may be verified by checking the aircraft maintenance records.
   a. Electro-Thermal boots (hot prop) may be retained in lieu of TKS Wet Prop.
   b. Electro-Thermal boots may be removed, and replaced with TKS Propeller Kit 122PP-01.

2 Hartzel Installation of Second and Third Generation SMR or HPI are identified by unique propeller model numbers.
   a. Electro-Thermal boots (hot prop) may be retained in lieu of TKS Wet Prop.
   b. Electro-Thermal boots may be removed, and replaced with TKS Propeller Kit 122PP-01.

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Section 3.

Emergency Procedures

Note

During examination of this section, the pilot is advised to identify the ice protection controls (See Section 7, System Description).

Inadvertent Icing Encounter

Warning

If ice accretions are permitted to form with the ice protection system off, the ice protection system may not remove significant accumulations of ice. The system must be turned on immediately upon detecting ice.

Aircraft stall speed and performance will change with ice accumulation on the unprotected surfaces of the aircraft. Increase aircraft operating speeds by 15 KIAS (if performance allows) with ice accretions on the airframe. If performance is limited, consider descent as an option if the hazard of descent is less than ice accumulation.

Stall warning indications should not be relied upon during or following icing conditions, as operation of the wing mounted sensors is likely to be impaired.

Flight into known icing conditions is prohibited. However, if unexpected icing conditions are encountered:

1.	Ice Protection Switch	-	Select MAX
2.	Pitot Heat	-	Verify ON
3.	Time		Note

Note

MAX *mode operating time is limited to approximately 30 minutes with a full tank of fluid.*

4.	Exit icing conditions		Turn back and/or change altitude
5.	Cabin Heat	-	Select Maximum
6.	Windshield Defrost	-	Select Open
7.	Alternate Induction Air	-	As Required
8.	Ice Protection Switch	-	Select Mode (MAX or NORM/NORMAL) as required by icing condition
9.	Autopilot (if applicable)	-	Monitor for excessive control and/or trim movement.
10.	Icing Condition Exited, Ice Protection System	-	OFF

If icing conditions have been encountered and icing is known or suspected on aircraft for landing:

Warning

Use extreme caution during approach and landing, being alert to the first signs of pre-stall buffet and an impending stall. Retract flaps to the next lowest deflection if uncommanded elevator oscillations with flap deflection are experienced.

1. Maximum flap deflection - Approach setting or less recommended when aircraft has encountered icing conditions
2. Landing Distance (Approach Flaps) - Increase full flap landing distance by 40%
3. Airspeed (Approach flaps) - Full flap approach speed + 15 KIAS
4. Switches - OFF after landing

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Section 4.

Normal Procedures

Pre-Flight Inspection

1. Battery Master Switch - ON
2. TKS System - Select MAX
3. Airframe Inspection
   a) Fluid Tank - Check full
      - Verify proper weight and balance with indicated fluid quantity (See Section 6, Weight and Balance)
      - Check cap secure
   b) Porous Panels - Check condition and security
      - Check for evidence of ice protection fluid over full span of ice protection panels.
   c) Slinger Ring (if equipped) - Check for evidence of ice protection fluid
   d) Fluid Vent (underside) - Assure unobstructed
      - Check evidence of fluid from all panels and propeller
4. TKS System - NORM/NORMAL
5. Airframe/System Inspection - Verify pump is running
6. TKS System - OFF

7. Battery Master Switch - Select OFF

In Flight

FLIGHT INTO KNOWN ICING CONDITIONS IS PROHIBITED.

Note

During examination of this section, the pilot is advised to identify the ice protection controls (See Section 7, System Description).

Section 5.

Performance

No change from the basic airplane.

Warning

Aircraft stall speed and performance will change with ice accumulation on the unprotected surfaces of the aircraft. Increase aircraft operating speeds by 15 KIAS (if performance allows) with ice accretions on the airframe. If performance is limited, consider descent as an option if the hazard of descent is less than ice accumulation.

Increase approach and landing speeds by 15 KIAS and increase landing distance by at least 40% when landing with any residual ice accretion.

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Section 6.

Weight and Balance

The fluid density is 9.2 pounds per U.S. gallon.

There are no changes in the weight and balance limits with the system fitted.

The contents indicator provides an estimate of the quantity of fluid on board. For the purposes of weight and balance, determine the true weight of fluid from the table below.

Table 6-1 Ice Protection Fluid Weight and Balance (Aircraft in level attitude on ground)

Gauge Reading	Volume (gal)	Weight (lb)	Moment (in-lb)
E	0	0	946
1/2	1.5	13.8	1628.4
F	3.0	27.6	3256.8

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Section 7

System Description

Ice protection with a TKS system is achieved by mounting laser-drilled titanium panels to the leading edges of the wings and horizontal stabilizer. The propeller is protected with a fluid slinger ring.

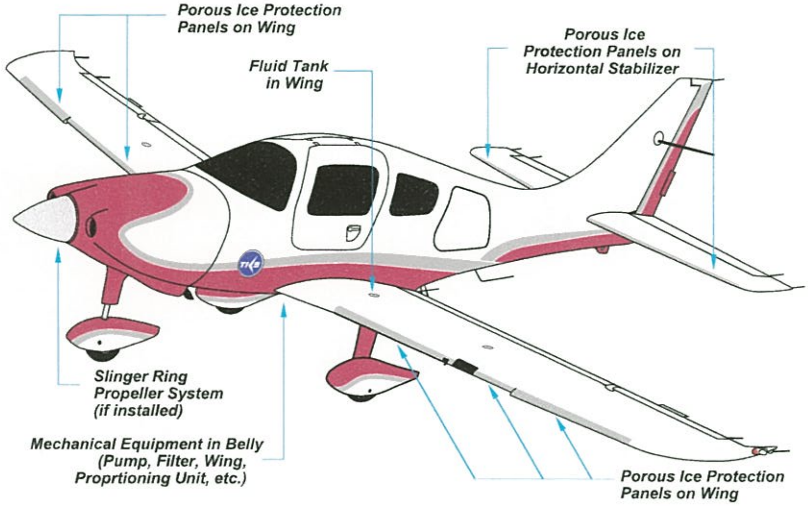


Figure 7-1 General Location of TKS Equipment

The outer skin of the ice protection panels are manufactured with 0.9 mm thick titanium. The panel skin is perforated by laser drilling holes, 0.0025 inches in diameter, 800 per square inch. The porous area of the titanium panels is designed to assure fluid coverage from best rate of climb speed to maximum operational speed.

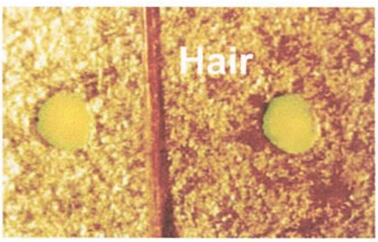


Figure 7-2 Magnified View of Holes Laser-Drilled Through Titanium

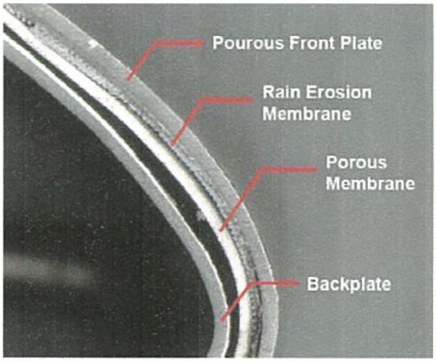


Figure 7-3 TKS Porous Panel Cross Section

The back plate of a typical panel is manufactured titanium. It is formed to create a reservoir for the ice protection fluid, allowing fluid supply to the entire porous area. A porous membrane between the outer skin and the reservoir is designed to assure even flow and distribution through the entire porous area of the panel.

The porous panels are bonded to the leading edges of the protected surfaces with a two-part adhesive. Porous panels cover a majority of the leading edges of the wings. Likewise, the horizontal stabilizer is completely protected with porous panels.

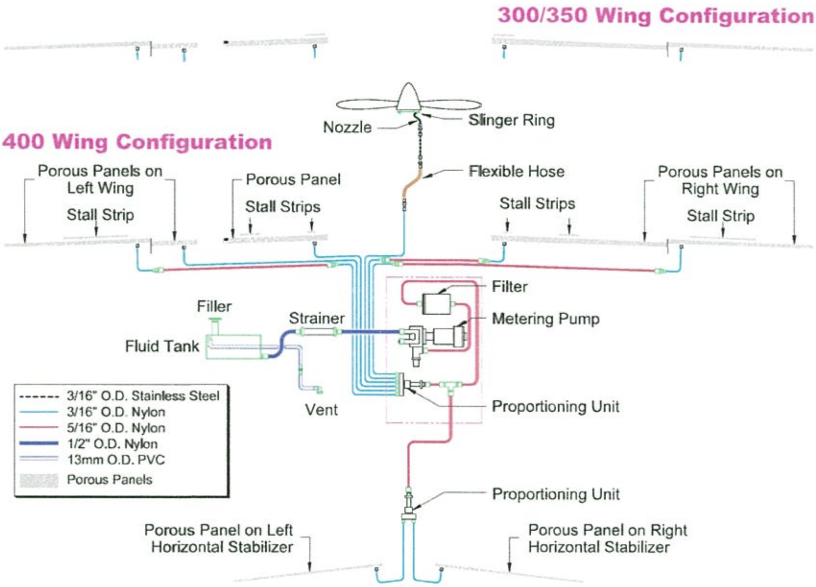


Figure 7-4 System Fluid Schematic

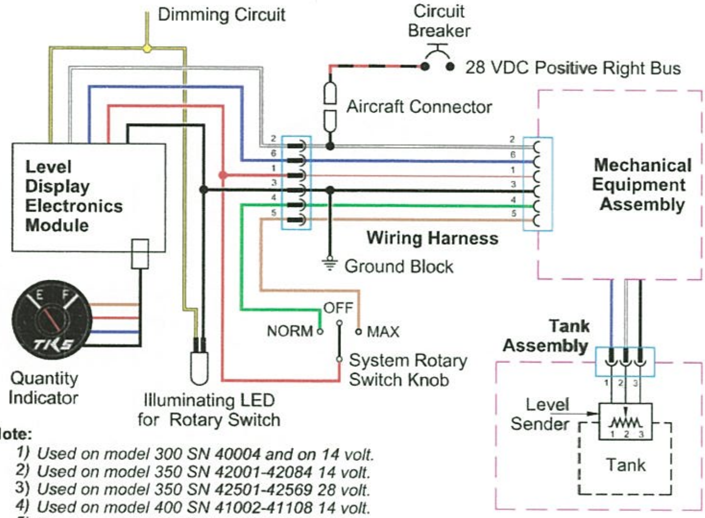
Fluid is supplied to the panels and propeller by a positive displacement, constant volume metering pump. Continuous pump operation and timed pumping provide a range of flow rates for different icing conditions.

The fluid passes through a microfilter prior to distribution to the porous panels and propeller. The filter is designed to assure all contaminants are removed from the fluid to prevent panel blockage.

A system of nylon tubing carries the fluid to proportioning units typically located in the wings and tail of the aircraft. The proportioning units divide the flow into the volumetric requirements of each panel or device supplied through the unit.

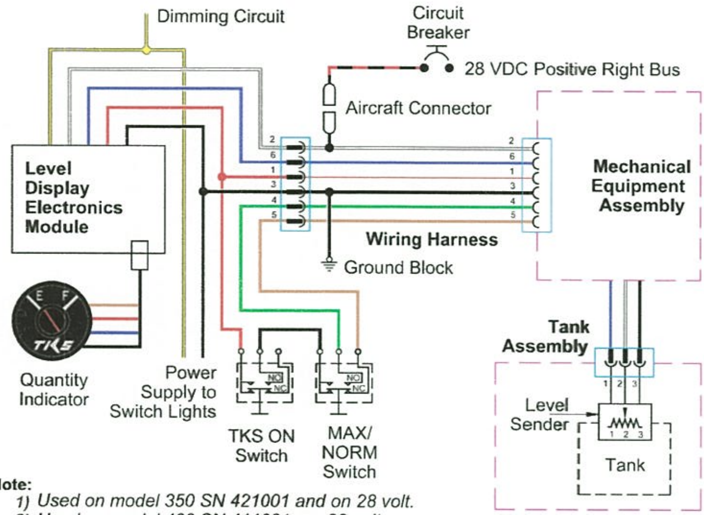
This ice protection fluid tank is serviced through a single filler located on the top of the left inboard wing. The tank has a capacity of 3.0 gallons. It is the pilot's responsibility to ensure that an adequate quantity of fluid is carried. The tank must be filled before takeoff if the system is to be considered operational. Fluid quantity is measured by a sensor which transmits an electrical signal to the level indicator.

Depending on the model and configuration of the aircraft, the TKS system can be powered by either a 14 or 28 volt power supply. All model 300 aircraft are powered by 14 volt electrical systems. Model 350 and 400 aircraft, equipped with Avidyne avionics, can be either 14 or 28 volt. All G1000-equipped aircraft utilize 28 Volt power. See the accompanying electrical schematics for the serial number applicability of the specific aircraft and system voltage, along with the basic electrical layout of the TKS system.



Note:
1) *Used on model 300 SN 40004 and on 14 volt.*
2) *Used on model 350 SN 42001-42084 14 volt.*
3) *Used on model 350 SN 42501-42569 28 volt.*
4) *Used on model 400 SN 41002-41108 14 volt.*
5) *Used on model 400 SN 41501-41800 28 volt.*

Figure 7-5 Avidyne & Analog-Equipped System Electrical Schematic



Note:
1) *Used on model 350 SN 421001 and on 28 volt.*
2) *Used on model 400 SN 411001- on 28 volt.*

Figure 7-6 G1000-Equipped Aircraft System Electrical Schematic

TKS System Operation, Indication and Annunciation

All configurations of the TKS Ice Protection System for the 300, 350, and 400 aircraft operate on the same principles. Normal mode (NORM or NORMAL) is the lowest fluid flow rate of the system. Economy of fluid usage may be achieved by using the NORM position of the airframe/propeller switch. The flow rate is achieved by running the metering pump of the system on a continuous repeat cycle of operation. The pump will run for approximately 30 seconds, then deactivate. After 30 seconds of inactivity, the pumps will again activate for the 30 second operation period. This on-off cycle of operation will continue until the system is deactivated or the mode of operation is changed.

Maximum mode (MAX) is achieved by running the metering pump continuously. Continuous operation of the pump consumes twice the fluid as Normal mode. MAX should initially be selected if ice has accreted on flight surfaces or until the severity of the icing condition has been determined.

Note

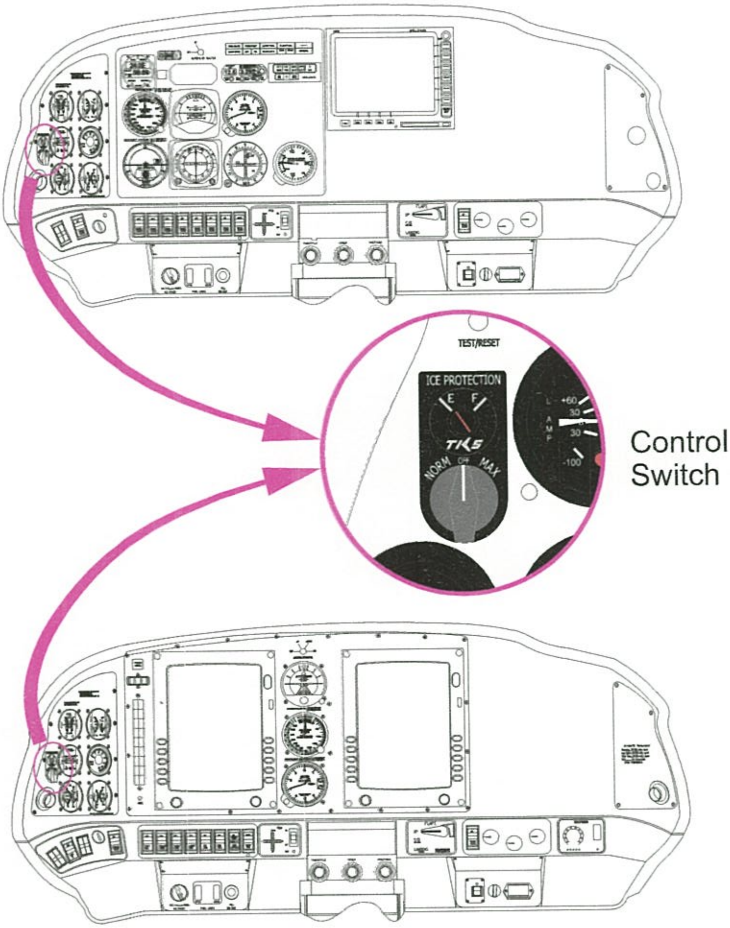
Accumulation of fluid mist from the propeller may obstruct vision through the center of the windshield.

Operation and annunciation of the system is dependent on the installed configuration of the TKS Ice Protection System. The configurations may be categorized as 1) Model 300 and aircraft equipped with Avidyne avionics, and 2) aircraft equipped with G1000 Avionics.

Model 300 and Aircraft Equipped with Avidyne Avionics

The system is operated with a rotary switch. The switch is located on the instrument panel, left of the primary flight instruments or primary flight display (see Figure 7-7), along with the fluid quantity gauge for the system.

Model 300 Aircraft



Avidyne-Equipped Model 350 and 400 Aircraft

Figure 7-7 TKS System Controls for Model 300 and Avidyne-Equipped Aircraft

Normal mode may be activated by turning the rotary knob left to the NORM position of the switch. Likewise, Maximum mode may by activated by turning the knob right to the MAX position. The system is deactivated by turning the knob to the center, OFF position. As indicated, the operational mode of the system may be determined by the position of the switch.

The knob is illuminated with an LED for night operation. The LED is tied to the ship dimming system for adjustment of light level.

Aircraft Equipped with G1000 Avionics

The system is operated with two latching, pushbutton switches (see Figure 7-8). The top switch activates or deactivates the system. When the system is inactive, the top switch is illuminated with TKS SYSTEM. Pressing the switch to the "in" position activates the system and illuminates the switch with an ON indication in the lower half. Pressing the switch again returns the switch to the "out" position, deactivates the system, and extinguishes the ON annunciation.

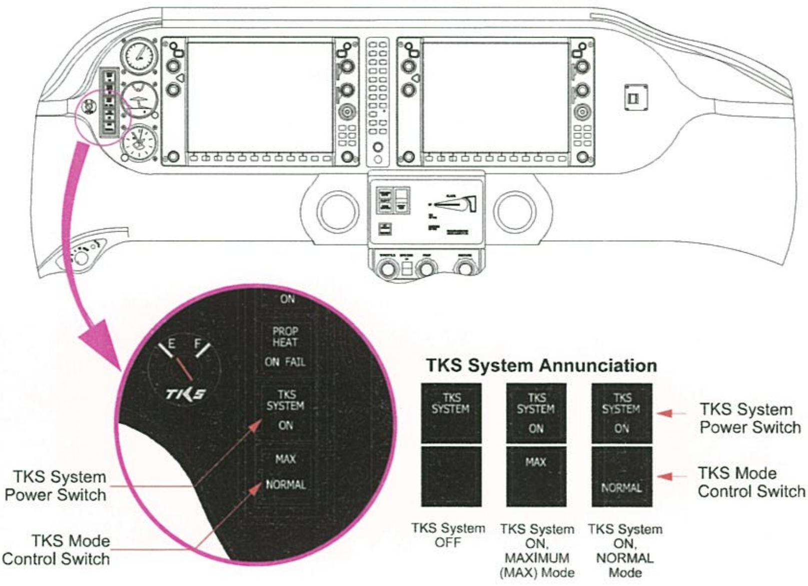


Figure 7-8 TKS System Controls for G1000-Equipped Aircraft

The mode of operation is controlled by the lower switch and is dependent on the position of the switch. If the switch is in the "in" position, the switch will annunciate NORMAL when the system is activated and the Normal mode will operate.

If the mode control switch is in the "out" position, MAX will annunciate and the system will operate in the Maximum mode.

The mode of operation may be switched simply by pressing the switch to the alternate position. When accomplished, the opposite mode annunciation will illuminate. Annunciation on the mode control switch, as well as mode operation, will only occur if the system is activated and the power switch is annunciating ON.

Both configurations of TKS systems are provided with an analog fluid quantity gauge, displaying the available fluid quantity for the system. The gauge is lit for night operation and tied to the ship's dimming system. The fluid capacity provides the following endurance (see Figure 7-9):

Figure 7-9 Contents Indicator

Maximum Fluid Endurance:

NORM selected - 1 hour
MAX selected - 30 Minutes

Inactive TKS System

A common occurrence with all TKS porous ice protection panels is "leaking" when not in use. Specifically, panels will stream very small quantities in flight or drip while parked. This is a normal characteristic of the a TKS system because of the porous panel design.

Every panel contains a reservoir for fluid and a porous membrane. The reservoir and membrane work together to provide an even distribution of fluid over the entire porous area of a panel. The

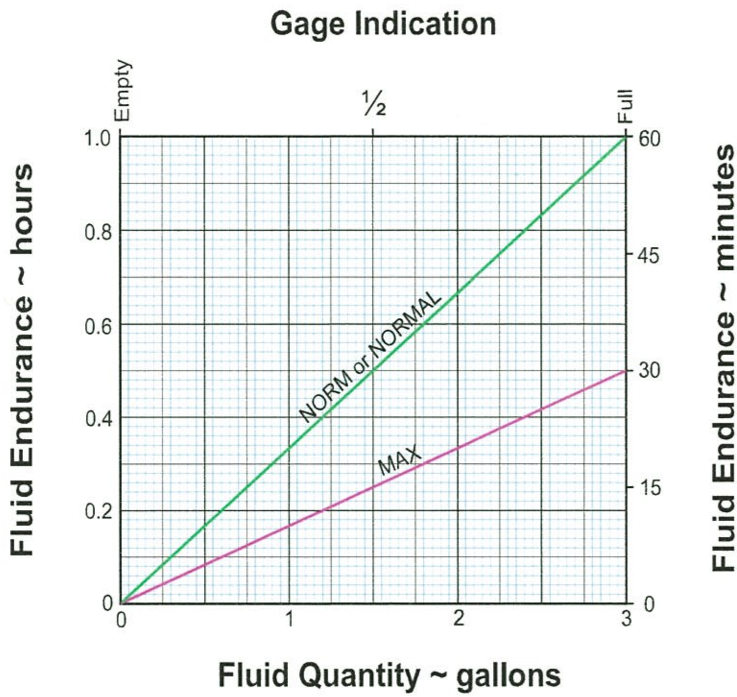


Figure 7-10 TKS System Endurance

membrane is the key element, but it would not work properly unless fluid is supplied and distributed evenly to the membrane. The reservoir provides that supply.

The porosity of the membrane is designed and tuned to create a 3 psi pressure drop when ice protection fluid is forced through it. For general aviation class aircraft, the 3 psi value is far higher than any aerodynamic pressures encountered on the aircraft leading edges. The 3 psi mark assures that a uniform distribution of fluid will pass through the porous panel regardless of airspeed and air flow (angle of attack) angle.

The reservoir also assures that, when properly prepared, a relatively instantaneous supply of fluid is available at the panels for delivery.

The combination of the membrane and reservoir are designed to retain the internal fluid volume as long as possible so startup time is kept to a minimum. The panel is able to retain the fluid when the fluid viscosity is maintained at a 32°F value or colder.

As the temperature of the fluid warms beyond 32°F, the viscosity drops. As an example, the viscosity of ice protection fluid at 70° has roughly 1/3 the viscosity of 32°F fluid. With much thinner fluid, the membrane cannot resist and fluid will start to pass through the membrane .

This characteristic will be seen on the lower edge of the drilled active area of a panel, typically near the inboard end of the panel. The wing dihedral creates a small pressure head in the panel, the highest value being at this point. Fluid will slowly flow downhill in the panel reservoir, then weep from the lowest point.

This type of fluid loss from the panel is very low volume, but it can be deceptive to the user. In flight, the weeping can look very similar to normal operation on the inboard section of a panel. The thing to remember, however, is the fluid loss is only from the panel reservoir, and it happens in warmer conditions, far warmer than temperatures associated with icing conditions. It is difficult to quantify exact ranges, but the 60 to 70°F temperature range is typically where this type of weeping occurs.

This is a normal characteristic for a TKS system. It is not a maintenance issue or a concern for normal operation. It does, however, point out the need to observe proper preparation of the system prior to flights where icing conditions may occur. If the panels have drained their fluid, it can take up to 5 to 10 minutes to fill the entire porous panel system. Proper observation of TKS pre-flight steps assure that the system will be ready and available when the pilot activates the system.

Section 8

Handling, Servicing and Maintenance

Prolonged out of Service Care

During Flyable Storage

Ensure that the de-icing fluid tank contains at least one gallon of fluid, and that all system components are filled with fluid. If necessary, operate the pump until all air is dispelled from components and pipelines (see Pump Priming in this section). Recheck tank contents.

It is also advisable to run the system at least once a month during flight for at least 15 minutes. Running the system assures that it is operational, flushes any dirt or debris from the porous panels, and exercises the pump. This activity will assure the system is functional and available for use.

Servicing

1. Ice Protection Fluid Tank

   See Section 2, Limitations, for specified ice protection fluids. The filler cap is located on the upper surface of the left wing. The tank has a total capacity of 3.0 gallons.

   To preclude the possibility of contaminated fluid, always clean the top of fluid containers before dispensing, and if required maintain a clean measuring vessel solely for de-icing fluid. Secure the filler cap immediately after filling.

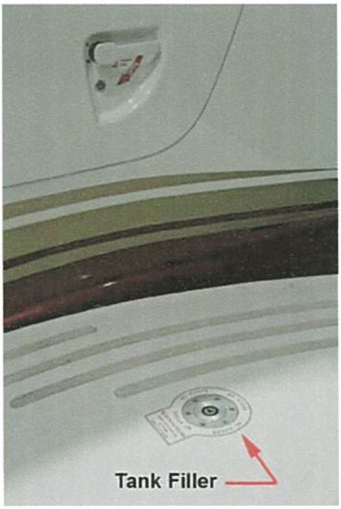


Figure 7-11 Fluid Tank Filler Location

Caution

Always lock the TKS filler cap between fluid fills. Monitor aircraft fueling to assure no fuel is pumped into the TKS fluid tank.

If fuel has been inadvertently pumped into the TKS tank, the tank must be serviced. Do not operate the system with fuel in the tank. The contaminated fluid must be drained completely from the tank, and the tank should be flushed with clean water. At least two complete tanks of water should be drained through the system. After the system has been thoroughly flushed, it must be filled and primed (see Pump Priming in this section).

2. Ice Protection Fluid Strainer

The in-line ice protection fluid strainer should not require cleaning unless there is a definite indication of foreign matter in the tank. If foreign matter is found in the tank, flush the tank with clean water until all evidence of the material is removed.

3. System Fluid Filter

Replace every 3 years or 1500 hours of aircraft use, whichever occurs first.

4. Pump Priming

If allowed to run dry, the metering pump may fail to prime because of air trapped in the system. If no ice protection fluid is evident during the Pre-Flight Inspection, perform the following maintenance procedure:

a) Remove the Fuel System Access Panel on the lower fuselage just below the forward cabin area (figure 7-12).

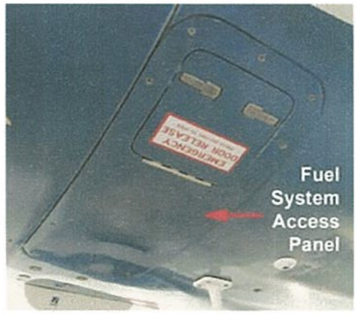


Figure 7-12 Fuel System Access Panel

b) Near the right side of the opening locate the capped fitting attached to the metering pump (Figure 7-13).

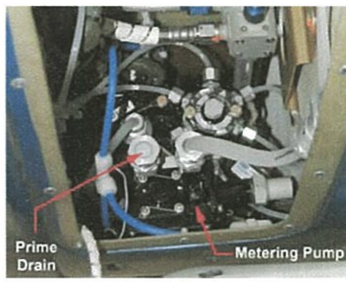


Figure 7-13 Metering Pump Drain Fitting

Caution

Use a dedicated ice protection fluid sample cup for the following step. Do not use the fuel sampling cup.

c) Remove the safety wire and the blanking ball from the fitting.

d) Sample the fluid until the stream shows no evidence of air bubbles for a least three seconds.

e) Replace the blanking fitting and safety the wire as required.

f) Perform the Pre-Flight Inspection verifying evidence of fluid from all porous panels and the slinger ring.

g) If necessary, repeat steps c through f.

h) Replace the Fuel System Access Panel.

5. Porous Leading Edge Panels

Caution

Porous panels contain a plastic membrane which may be damaged by certain solvents, particularly Methyl Ethyl Ketone (MEK), Lacquer thinner, and other types of thinners and solvents. Mask panels when painting the aircraft or when using solvents for other purposes in proximity of the porous panels.

Only the following solvents are permitted for use on porous panels, but refer to recommended procedures for cleaning exterior painted surfaces for aircraft:

Water (with soaps or detergents)

Approved Ice Protection Fluid (see **Limitations**, paragraph 2)

Aircraft fuels (Gasoline or Kerosene)

Isopropyl or Ethyl alcohol

The porous panels may be washed with mild soap and water using a brush or lint free cloth.

Cleaning of the porous panels will be greatly facilitated if the system is activated prior to each flight, especially if flight at low altitudes or in insect infested areas is anticipated.

6. Component Overhaul or Replacement

Detailed and approved instructions for continued airworthiness may be found in document 12253-01, *Installation and Service Manual for the Cessna 300/350/400 Ice Protection System*

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Section 9

Supplemental Information

Not applicable.

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Section 10

Safety Information

Flight in Unexpected Icing Conditions

1. The airframe ice protection system is not intended to remove ice from the aircraft on the ground. Do not attempt to take off with frost, ice or snow on flying surfaces.

2. No airplane or combination of de-icing and anti-icing equipment can be designed for the worst possible icing encounter - this condition cannot even be defined. As competent pilots know, there appear to be no predictable limits for the most severe weather conditions. For essentially the same reasons that airplanes, however designed or equipped for IFR flight, cannot be flown safely into conditions such as severe thunderstorms, tornadoes, hurricanes or other phenomena likely to produce extreme turbulence, airplanes cannot be expected to cope with the worst icing conditions that nature can produce.

   The prudent pilot must remain alert to the possibility that icing conditions may become so severe that his equipment cannot cope with them. At the first indication that such conditions may have been encountered, or may be ahead, he or she should react by deciding the most expeditious and safe course of action. The decision should be based on weather briefing, recent pilot reports and ATC observations. Alternatives could be course changes, altitude changes or even continuance on the same course.

3. The ice protection system is not designed to permit flight in icing conditions for an indefinite period of time. Its purpose is to provide some protection from the effects of ice, should an unexpected or inadvertent encounter with ice occur. At the first observation of airframe ice, the pilot should immediately take action to find a flight condition that will minimize the time in icing and provide a safe exit from the icing conditions. If the possibility of icing exits, the prudent pilot will always plan the flight such that at least one alternative exists (altitude, course, or landing site) that will offer a safe exit from the icing conditions.

4. Aircraft stall speed and performance will change with ice accumulation on the unprotected surfaces of the aircraft. Simulated ice accumulations have produced stall speed increases of 5 knots for all configurations, a loss of 15-20 knots cruise speed, and a loss of 100 fpm of climb performance.

   Stall warning indications should not be relied upon during or following icing conditions, as operation of the wing mounted sensors is likely to be impaired.

   Because of ice accumulation on the unprotected surfaces of the aircraft, it is advisable to increase approach and landing speeds, and landing distance. It is also advisable to reduce flap deflection during approach and landing.

   The amount of the performance and stall degradation cannot be accurately predicted. The pilot must use extreme caution during approach and landing, being alert to the first signs of pre-stall buffet and an impending stall.

Cessna - Bend
22550 Nelson Road
Bend, OR 97701

FAA approved

Supplemental Airplane Flight Manual
and
Operation Manual

Oregon Aero High-G® Seats

Cessna 350 (LC42-550FG)
Cessna 400 (LC41-550FG)

Airplane Registration No. N11336

Airplane Serial No. 411126

This supplement must be attached to the FAA-approved Cessna Pilot Operating Handbook when replacement seats are installed per STC SA01597SE and in accordance with Oregon Aero Installation drawing 6I-0001 Rev G. The information contained in this document supplements or supersedes the basic manual only in those areas listed or adds to that of the basic markings and placards, only where covered in the items contained herein. For limitations, procedures, performance and loading information not contained in this supplement, consult the basic airplane flight manual.

The Oregon Aero crew seats consist of the 6A-0001-1 and -2 Seat Assemblies, which will include 6A-0006, 6A-0007, or 6A-0008 Seat Cushion Bottom Assemblies. The Oregon Aero rear seats consist of 6A-0009 Rear Seat Cushion Bottom Assemblies and the 6A-0010 Rear Seat Cushion Back Assembly.

FAA Approved [signature]

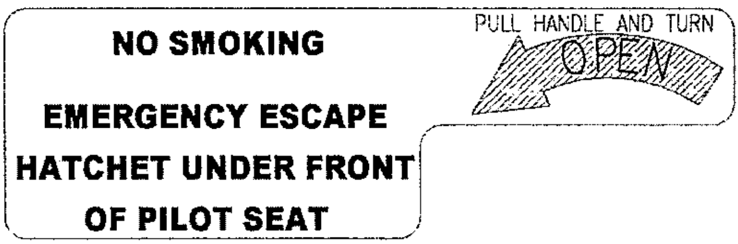
for Manager
Aircraft Certification Office
Federal Aviation Administration
Seattle, WA

TABLE OF CONTENTS

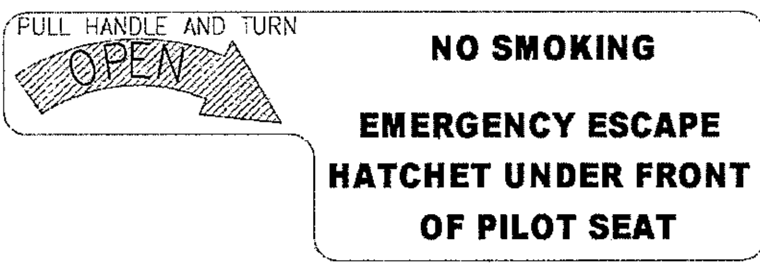
SECTION II: PLACARD UPGRADE

Section 2: Limitations - Placards

Install the placards, shown below, if they are not already installed adjacent to the door handles.



Adjacent to Left-Side Handle (Ref. Cessna drawing LA 53112001)



Adjacent to Right-Side Handle (Ref. Cessna drawing LA 53112002)