

# PILOT'S OPERATING HANDBOOK AND EASA APPROVED AIRPLANE FLIGHT MANUAL for the CIRRUS DESIGN SR20

Aircraft Serials 1268 and Subsequent with  
Analog or Avidyne Avionics System



FAA Approved in Normal Category based on FAR Part 23. This document must be carried in the airplane at all times and be kept within the reach of the pilot during all flight operations.

THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY FAR PART 23 AND ADDITIONAL INFORMATION PROVIDED BY CIRRUS DESIGN AND CONSTITUTES THE FAA APPROVED AIRPLANE FLIGHT MANUAL.

The EASA approved Airplane Flight Manual consists of the FAA approved Airplane Flight Manual, associated POH Supplements, and this Title Page.

Model - Serial Num. SR20-\_\_\_\_\_ Registration Num. \_\_\_\_\_

EASA Approved  Date 27 May 2004  
European Aviation Safety Agency

UNDER EASA APPROVAL No. 2004-5753

P/N 11934-003E  
Reissue A: 10-10-03



**CIRRUS**  
AIRCRAFT

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# List of Effective Pages

Use this page to determine the current effective date for each page in the POH. Supplements are issued individually and are controlled by the Log of Supplements Page in Section 9.

Dates of original issue and revised pages are:

Reissue.....A.....	10 Oct 2003	Revision.....A6.....	18 Jan 2006
Revision.....A1.....	06 Feb 2004	Revision.....A7.....	09 Aug 2006
Revision.....A2.....	03 Jul 2004	Revision.....A8.....	15 Dec 2007
Revision.....A3.....	30 Jan 2005	Revision.....A9.....	26 Aug 2009
Revision.....A4.....	18 Jul 2005	Revision.....A10.....	09 May 2011
Revision.....A5.....	12 Oct 2005		

Page	Status	Page	Status	Page	Status
Foreword-i	Reissue A	2-19	Revision A8	3-27	Revision A7
Foreword-ii	Revision A7	2-20	Revision A8	3-28	Revision A7
Foreword-iii	Revision A1	2-21	Revision A9	3A-1	Revision A5
Foreword-iv	Reissue A	2-22	Revision A5	3A-2	Revision A5
Foreword-v	Reissue A	2-23	Revision A5	3A-3	Revision A5
Foreword-vi	Reissue A	2-24	Revision A5	3A-4	Revision A5
1-1	Revision A3	2-25	Revision A9	3A-5	Revision A9
1-2	Revision A3	2-26	Revision A5	3A-6	Revision A10
1-3	Reissue A	2-27	Revision A5	3A-7	Revision A5
1-4	Revision A3	2-28	Revision A5	3A-8	Revision A5
1-5	Reissue A	3-1	Revision A10	3A-9	Revision A8
1-6	Revision A9	3-2	Revision A10	3A-10	Revision A5
1-7	Revision A1	3-3	Revision A5	3A-11	Revision A5
1-8	Revision A5	3-4	Revision A5	3A-12	Revision A5
1-9	Revision A7	3-5	Revision A5	3A-13	Revision A5
1-10	Revision A7	3-6	Revision A7	3A-14	Revision A7
1-11	Revision A7	3-7	Revision A5	4-1	Revision A7
1-12	Revision A7	3-8	Revision A5	4-2	Revision A7
2-1	Revision A7	3-9	Revision A5	4-3	Revision A5
2-2	Revision A7	3-10	Revision A5	4-4	Revision A5
2-3	Revision A5	3-11	Revision A10	4-5	Revision A5
2-4	Revision A9	3-12	Revision A5	4-6	Revision A8
2-5	Revision A5	3-13	Revision A7	4-7	Revision A8
2-6	Revision A9	3-14	Revision A5	4-8	Revision A8
2-7	Revision A9	3-15	Revision A5	4-9	Revision A8
2-8	Revision A5	3-16	Revision A10	4-10	Revision A8
2-9	Revision A8	3-17	Revision A10	4-11	Revision A5
2-10	Revision A5	3-18	Revision A8	4-12	Revision A5
2-11	Revision A5	3-19	Revision A7	4-13	Revision A6
2-12	Revision A5	3-20	Revision A7	4-14	Revision A8
2-13	Revision A8	3-21	Revision A7	4-15	Revision A9
2-14	Revision A8	3-22	Revision A7	4-16	Revision A8
2-15	Revision A8	3-23	Revision A7	4-17	Revision A7
2-16	Revision A7	3-24	Revision A7	4-18	Revision A5
2-17	Revision A8	3-25	Revision A7	4-19	Revision A5
2-18	Revision A6	3-26	Revision A7	4-20	Revision A5

FAA Approved Joseph C Miss Date Aug 12, 2011

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 SAP-No 0010011747 Federal Aviation Administration

## List of Effective Pages (Cont.)

Page	Status	Page	Status	Page	Status
4-21	Revision A5	6-18	Revision A10	7-55	Revision A5
4-22	Revision A5	7-1	Revision A10	7-56	Revision A5
4-23	Revision A5	7-2	Revision A10	7-57	Revision A5
4-24	Revision A5	7-3	Revision A10	7-58	Revision A8
4-25	Revision A5	7-4	Revision A10	7-59	Revision A5
4-26	Revision A5	7-5	Revision A5	7-60	Revision A5
4-27	Revision A5	7-6	Revision A5	7-61	Revision A5
4-28	Revision A5	7-7	Revision A5	7-62	Revision A5
4-29	Revision A5	7-8	Revision A5	7-63	Revision A5
4-30	Revision A5	7-9	Revision A5	7-64	Revision A6
5-1	Revision A10	7-10	Revision A5	7-65	Revision A5
5-2	Revision A10	7-11	Revision A5	7-66	Revision A5
5-3	Revision A10	7-12	Revision A5	7-67	Revision A5
5-4	Revision A10	7-13	Revision A5	7-68	Revision A5
5-5	Revision A10	7-14	Revision A7	7-69	Revision A7
5-6	Revision A10	7-15	Revision A5	7-70	Revision A7
5-7	Revision A10	7-16	Revision A5	7-71	Revision A7
5-8	Revision A10	7-17	Revision A5	7-72	Revision A7
5-9	Revision A10	7-18	Revision A5	7-73	Revision A7
5-10	Revision A10	7-19	Revision A5	7-74	Revision A9
5-11	Revision A10	7-20	Revision A5	7-75	Revision A10
5-12	Revision A10	7-21	Revision A5	7-76	Revision A10
5-13	Revision A10	7-22	Revision A5	7-77	Revision A10
5-14	Revision A10	7-23	Revision A5	7-78	Revision A10
5-15	Revision A10	7-24	Revision A6	7-79	Revision A10
5-16	Revision A10	7-25	Revision A8	7-80	Revision A10
5-17	Revision A10	7-26	Revision A5	7-81	Revision A10
5-18	Revision A10	7-27	Revision A5	7-82	Revision A10
5-19	Revision A10	7-28	Revision A5	7-83	Revision A10
5-20	Revision A10	7-29	Revision A5	7-84	Revision A7
5-21	Revision A10	7-30	Revision A5	7-85	Revision A7
5-22	Revision A10	7-31	Revision A5	7-86	Revision A9
5-23	Revision A10	7-32	Revision A5	7-87	Revision A7
5-24	Revision A10	7-33	Revision A5	7-88	Revision A7
5-25	Revision A10	7-34	Revision A5	7-89	Revision A7
5-26	Revision A10	7-35	Revision A5	7-90	Revision A8
5-27	Revision A10	7-36	Revision A10	7-91	Revision A7
5-28	Revision A10	7-37	Revision A5	7-92	Revision A7
6-1	Revision A10	7-38	Revision A5	7-93	Revision A8
6-2	Revision A10	7-39	Revision A5	7-94	Revision A7
6-3	Reissue A	7-40	Revision A5	7-95	Revision A7
6-4	Reissue A	7-41	Revision A5	7-96	Revision A7
6-5	Revision A2	7-42	Revision A5	7-97	Revision A7
6-6	Reissue A	7-43	Revision A5	7-98	Revision A7
6-7	Revision A3	7-44	Revision A5	7-99	Revision A7
6-8	Revision A10	7-45	Revision A5	7-100	Revision A7
6-9	Reissue A	7-46	Revision A5	7-101	Revision A7
6-10	Reissue A	7-47	Revision A8	7-102	Revision A7
6-11	Reissue A	7-48	Revision A5	7-103	Revision A7
6-12	Revision A10	7-49	Revision A5	7-104	Revision A7
6-13	Revision A10	7-50	Revision A5	7-105	Revision A7
6-14	Revision A10	7-51	Revision A7	7-106	Revision A7
6-15	Revision A10	7-52	Revision A5	8-1	Revision A10
6-16	Revision A10	7-53	Revision A5	8-2	Revision A10
6-17	Revision A10	7-54	Revision A5	8-3	Reissue A

## List of Effective Pages (Cont.)

Page	Status	Page	Status	Page	Status
8-4	Reissue A				
8-5	Reissue A				
8-6	Revision A7				
8-7	Revision A7				
8-8	Revision A5				
8-9	Revision A5				
8-10	Reissue A				
8-11	Reissue A				
8-12	Revision A3				
8-13	Reissue A				
8-14	Reissue A				
8-15	Revision A3				
8-16	Revision A10				
8-17	Revision A10				
8-18	Revision A10				
8-19	Revision A9				
8-20	Revision A9				
8-21	Revision A9				
8-22	Revision A10				
8-23	Revision A10				
8-24	Revision A10				
8-25	Revision A9				
8-26	Revision A9				
8-27	Revision A9				
8-28	Revision A9				
8-29	Revision A9				
8-30	Revision A9				
8-31	Revision A9				
8-32	Revision A9				
8-33	Revision A9				
8-34	Revision A9				
9-1	Reissue A				
9-2	Reissue A				
9-3	Revision A10				
9-4	Revision A10				
10-1	Revision A6				
10-2	Reissue A				
10-3	Revision A1				
10-4	Revision A7				
10-5	Revision A1				
10-6	Revision A1				
10-7	Revision A4				
10-8	Revision A1				
10-9	Revision A8				
10-10	Revision A6				
10-11	Revision A9				
10-12	Revision A6				



## Foreword

This Pilot's Operating Handbook (POH or Handbook) has been prepared by Cirrus Design Corporation to familiarize operators with the Cirrus Design SR20 airplane. Read this Handbook carefully. It provides operational procedures that will assure the operator obtains the performance published in the manual, data designed to allow the most efficient use of the airplane, and basic information for maintaining the airplane in a "like new" condition.

• Note •

All limitations, procedures, maintenance & servicing requirements, and performance data contained in this Handbook are mandatory for compliance with FAA operating rules and for continued airworthiness of the airplane.

This Handbook includes the material required to be furnished to the pilot by the Federal Aviation Regulations (FARs) and additional information provided by Cirrus Design Corporation and constitutes the FAA Approved Airplane Flight Manual for the Cirrus Design SR20.

### ***Optional SR20 VFR Configuration (SRV)***

An optional VFR only package is available on airplane serial numbers 1337 and subsequent. Data presented within this handbook pertinent only to the SRV model airplane is prefaced with the effectivity highlight, "*Serials 1337 and subsequent with standard SRV Configuration*".

## The Handbook

This Pilot's Operating Handbook has been prepared using GAMA Specification #1 for Pilot's Operating Handbook, Revision 2, dated 18 October 1996 as the content model and format guide. However, some deviations from this specification were made for clarity. The Handbook is presented in loose-leaf form for ease in inserting revisions and is sized for convenient storage. Tabbed dividers throughout the Handbook allow quick reference to each section. Logical and convenient Tables of Contents are located at the beginning of each section to aid in locating specific data within that section. The Handbook is divided into ten sections as follows:

Section 1.....	General
Section 2.....	Limitations
Section 3.....	Emergency Procedures
Section 3A.....	Abnormal Procedures
Section 4.....	Normal Procedures
Section 5.....	Performance Data
Section 6.....	Weight & Balance/Equipment List
Section 7.....	Airplane & Systems Description
Section 8.....	Handling, Servicing & Maintenance
Section 9.....	Supplements
Section 10.....	Safety Information

The data presented in this Handbook is the result of extensive flight tests and is approved by the Federal Aviation Administration. However, as new procedures or performance data are developed, they will be sent to the owner of record for each airplane.

• Note •

It is the responsibility of the owner to ensure that the Pilot's Operating Handbook is current at all times. Therefore, it is very important that all revisions be properly incorporated into this Handbook as soon as they are received.



## Revising the Handbook

Two types of revisions may be issued for this Handbook: Numbered and Temporary.

**Temporary revisions** are printed on yellow paper, normally cover only one topic or procedure, and are issued to provide safety related information or other time sensitive information where the rigor of providing a numbered revision is not possible in the time allowed. All the information needed to properly file a temporary revision is included on the revision itself. Typically, a temporary revision is superseded and replaced by the next numbered revision. A “Log of Temporary Revisions” following the “List of Effective Pages” is provided to log temporary revisions when they are issued. Typically, the “Log of Temporary Revisions” is replaced at the next numbered revision.

**Numbered revisions** are printed on white paper, normally cover several subjects, and are issued as general updates to the Handbook. Each numbered revision includes an “Instruction Sheet,” a “List of Effective Pages”, and a “Revision Highlights” page. The “Instruction Sheet” is intended to assist the manual holder in removing superseded pages and inserting new or superseding pages. The “List of Effective Pages” shows the issue or revision status of all pages in the Handbook. The “Revision Highlights” page gives a brief description of changes made to each page in the current revision.

## Identifying Revised Material

Each page in the Handbook has revision identification at the lower inside corner opposite the page number. Original issue pages will be identified by the words “Original Issue” at this location. In the event that the majority of pages in the Handbook are revised, Cirrus may determine that it is more effective to reissue the Handbook. Reissued pages will be identified by the word “Reissue” followed by a letter indicating the reissue level; for example, “Reissue A” Revised pages will be identified by the word “Revision” followed by the revision number at this location; for example, “Revision 2” (Original Issue, Revision 2) or “Revision B1” (Reissue B, Revision 1).

Revised material on a page can be identified by a change bar located at the outside page margin. See the outside margin of this page adjacent to this paragraph for an example. Revision bars are not used at reissues of the Handbook.

## Revision Service

Revision service for this Handbook is provided at no cost for the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual assigned to an airplane. Additional copies of the Handbook and revision service can be obtained from Customer Service at Cirrus Design at the address below.

• Note •

If at any time it is found that the Handbook is not current, temporary revisions are missing, or applicable supplements are not included, contact Customer Service at Cirrus Design immediately.

Customer Service  
Cirrus Design Corporation  
4515 Taylor Circle  
Duluth, MN 55811  
Phone: (218) 727-2737  
Fax: (218) 727-2148

## Supplements

The Supplements section (Section 9) of this Handbook contains FAA Approved Supplements necessary to safely and efficiently operate the SR20 when equipped with optional equipment not provided with the standard airplane or not included in the Handbook. Supplements are essentially "mini-handbooks" and may contain data corresponding to most sections of the Handbook. Data in a supplement either adds to, supersedes, or replaces similar data in the basic Handbook.

Section 9 includes a "Log of Supplements" page preceding all Cirrus Design Supplements produced for this airplane. The "Log of Supplements" page can be utilized as a "Table of Contents" for Section 9. If the airplane is modified at a non Cirrus Design facility through an STC or other approval method, it is the owner's responsibility to ensure that the proper supplement, if applicable, is installed in the Handbook and that the supplement is properly recorded on the "Log of Supplements" page.

## Retention of Data

In the event a new title page is issued, the weight and balance data changes, equipment list changes, or the "Log of Supplements" is replaced, the owner must ensure that all information applicable to the airplane is transferred to the new pages and the aircraft records are current. It is not a requirement that owners retain information, such as supplements, that is not applicable to their airplane.

## Warnings, Cautions, and Notes

Warnings, Cautions, and Notes are used throughout this Handbook to focus attention on special conditions or procedures as follows:

### • **WARNING** •

Warnings are used to call attention to operating procedures which, if not strictly observed, may result in personal injury or loss of life.

### • **Caution** •

Cautions are used to call attention to operating procedures which, if not strictly observed, may result in damage to equipment.

### • **Note** •

Notes are used to highlight specific operating conditions or steps of a procedure.

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# **Section 1**

## **General**

### **Table of Contents**

Introduction .....	1-3
The Airplane.....	1-6
Engine.....	1-6
Propeller .....	1-6
Fuel.....	1-7
Oil .....	1-7
Maximum Certificated Weights .....	1-7
Cabin and Entry Dimensions .....	1-7
Baggage Spaces and Entry Dimensions .....	1-7
Specific Loadings.....	1-7
Symbols, Abbreviations and Terminology.....	1-8
General Airspeed Terminology and Symbols .....	1-8
Meteorological Terminology.....	1-9
Engine Power Terminology.....	1-10
Performance and Flight Planning Terminology.....	1-10
Weight and Balance Terminology.....	1-11

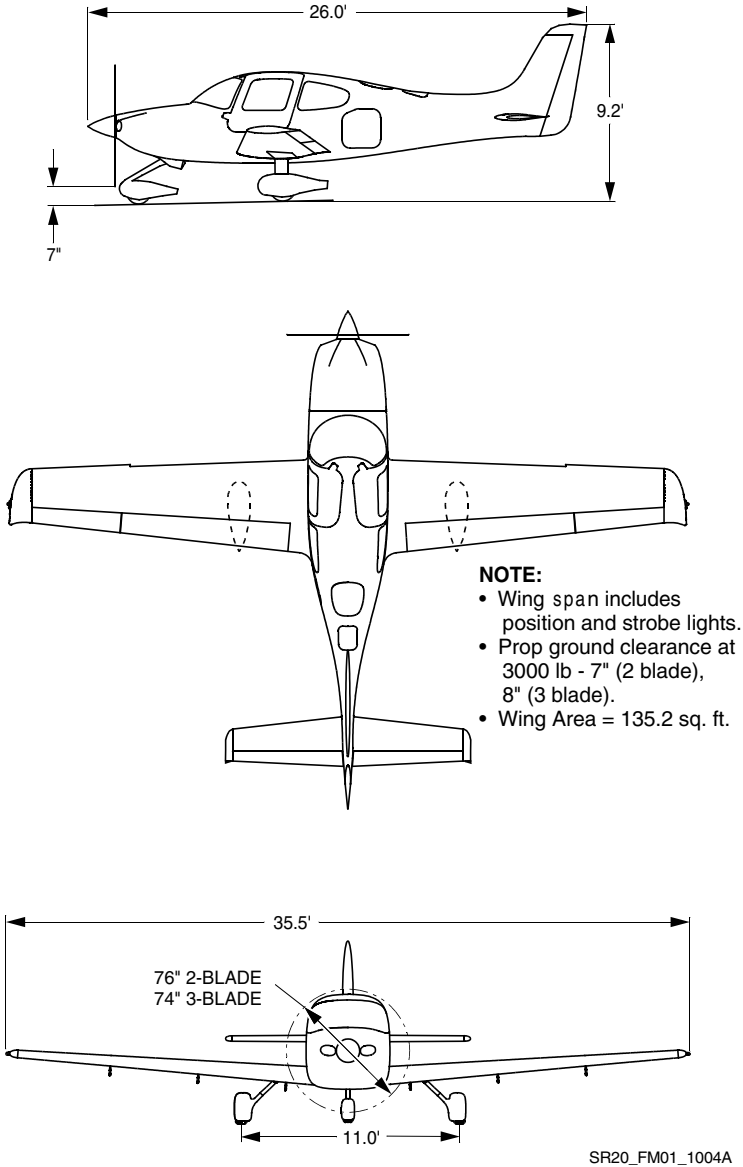
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## Introduction

This section contains information of general interest to pilots and owners. You will find the information useful in acquainting yourself with the airplane, as well as in loading, fueling, sheltering, and handling the airplane during ground operations. Additionally, this section contains definitions or explanations of symbols, abbreviations, and terminology used throughout this handbook.

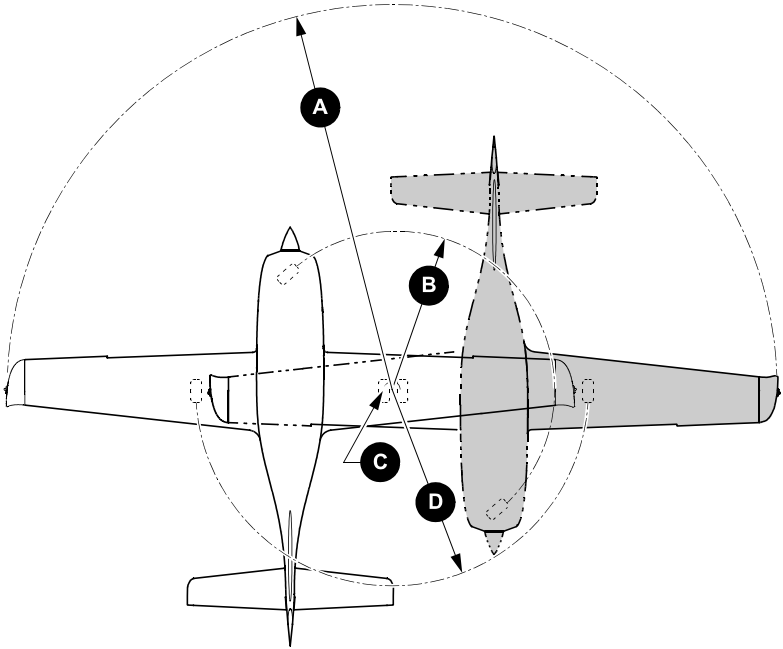
• Note •

For specific information regarding the organization of this Handbook, revisions, supplements, and procedures to be used to obtain revision service for this handbook, *refer to the "Foreword" immediately following the title page*



**Figure 1-1**  
**Airplane Three View**





**GROUND TURNING CLEARANCE**

- A** -RADIUS FOR WING TIP ..... 23' 11"
- B** -RADIUS FOR NOSE GEAR ..... 9' 11"
- C** -RADIUS FOR INSIDE GEAR ..... 6"
- D** -RADIUS FOR OUTSIDE GEAR ..... 12' 2"

TURNING RADII ARE CALCULATED USING ONE BRAKE AND PARTIAL POWER. ACTUAL TURNING RADIUS MAY VARY AS MUCH AS THREE FEET.

SR20\_FM01\_1002

**Figure 1-2**  
**Turning Radius**

# The Airplane

## Engine

Number of Engines..... 1  
Number of Cylinders.....6  
Engine Manufacturer ..... Teledyne Continental  
Engine Model..... IO-360-ES  
Fuel Metering..... Fuel Injected  
Engine Cooling ..... Air Cooled  
Engine Type.....Horizontally Opposed, Direct Drive  
Horsepower Rating.....200 hp @ 2700 rpm

## Propeller

### *Hartzell*

Propeller Type..... Constant Speed

#### *Two-Blade Propeller:*

Model Number ..... BHC-J2YF-1BF/F7694

█ Diameter .....76.0" (73.0" Minimum)

#### *Three-Blade Propeller:*

Model Number ..... PHC-J3YF-1MF/F7392-1

█ Diameter .....74.0" (72.0" Minimum)

Model Number ..... PHC-J3YF-1RF/F7392-1

█ Diameter .....74.0" (72.0" Minimum)

## Fuel

Total Capacity.....60.5 U.S. Gallons (229.0 L)

Total Usable.....56 U.S. Gallons (212.0 L)

Approved Fuel Grades:

100 LL Grade Aviation Fuel (Blue)

100 (Formerly 100/130) Grade Aviation Fuel (Green)

## Oil

Oil Capacity (Sump) ..... 8 U.S. Quarts (7.6 L)

Oil Grades:

All Temperatures ..... SAE 15W-50 or 20W-50

Below 40 °F (4° C) ..... SAE 30 or 10W-30

Above 40 °F (4° C) ..... SAE 50

## Maximum Certificated Weights

Maximum Gross for Takeoff..... 3000 lb (1361 Kg)

Maximum Landing Weight..... 2900 lb (1315 Kg)

Maximum Baggage Compartment Loading..... 130 lb (59 Kg)

Standard Empty Weight ..... 2050 lb (930 Kg)

Maximum Useful Load..... 950 lb (431 Kg)

Full Fuel Payload..... 622 lb (282 Kg)

## Cabin and Entry Dimensions

Dimensions of the cabin interior and entry door openings are illustrated in detail in Section 6.

## Baggage Spaces and Entry Dimensions

Dimensions of the baggage area and baggage door opening are illustrated in detail in Section 6.

## Specific Loadings

Wing Loading ..... 22.2 lb per square foot

Power Loading..... 15.0 lb per hp

# Symbols, Abbreviations and Terminology

## General Airspeed Terminology and Symbols

**KCAS** **Knots Calibrated Airspeed** is the indicated airspeed corrected for position and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.

**IAS** **Knots Indicated Airspeed** is the speed shown on the airspeed indicator. The IAS values published in this handbook assume no instrument error.

**KTAS** **Knots True Airspeed** is the airspeed expressed in knots relative to undisturbed air which is KCAS corrected for altitude and temperature.

**$V_G$**  **Best Glide Speed** is the speed at which the greatest flight distance is attained per unit of altitude lost with power off.

**$V_O$**  **Operating Maneuvering Speed** is the maximum speed at which application of full control movement will not overstress the airplane.

**$V_{FE}$**  **Maximum Flap Extended Speed** is the highest speed permissible with wing flaps in a prescribed extended position.

**$V_{NO}$**  **Maximum Structural Cruising Speed** is the speed that should not be exceeded except in smooth air, and then only with caution.

**$V_{NE}$**  **Never Exceed Speed** is the speed that may not be exceeded at any time.

**$V_{PD}$**  **Maximum Demonstrated Parachute Deployment Speed** is the maximum speed at which parachute deployment has been demonstrated.

**$V_S$**  **Stalling Speed** is minimum steady flight speed at which the aircraft is controllable.

**$V_{S 50\%}$**  **Stalling Speed** is minimum steady flight speed at which the aircraft is controllable with 50% flaps.

- $V_{SO}$  **Stalling Speed** is the minimum steady flight speed at which the aircraft is controllable in the landing configuration (100% flaps) at the most unfavorable weight and balance.
- $V_X$  **Best Angle of Climb Speed** is the speed at which the airplane will obtain the highest altitude in a given horizontal distance. The best angle-of-climb speed normally increases slightly with altitude.
- $V_Y$  **Best Rate of Climb Speed** is the speed at which the airplane will obtain the maximum increase in altitude per unit of time. The best rate-of-climb speed decreases slightly with altitude.

## Meteorological Terminology

- IMC** **Instrument Meteorological Conditions** are meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling less than the minima for visual flight defined in FAR 91.155.
- ISA** **International Standard Atmosphere** (standard day) is an atmosphere where (1) the air is a dry perfect gas, (2) the temperature at sea level is 15° C, (3) the pressure at sea level is 29.92 in.Hg (1013.2 millibars), and (4) the temperature gradient from sea level to the altitude at which the temperature is -56.5° C is -0.00198° C per foot and zero above that altitude.
- MSL** **Mean Sea Level** is the average height of the surface of the sea for all stages of tide. In this Handbook, altitude given as MSL is the altitude above the mean sea level. It is the altitude read from the altimeter when the altimeter's barometric adjustment has been set to the altimeter setting obtained from ground meteorological sources.
- OAT** **Outside Air Temperature** is the free air static temperature obtained from inflight temperature indications or from ground meteorological sources. It is expressed in either degrees Celsius or degrees Fahrenheit.

- **Pressure Altitude** is the altitude read from the altimeter when the altimeter's barometric adjustment has been set to 29.92 in.Hg (1013 mb) corrected for position and instrument error. In this Handbook, altimeter instrument errors are assumed to be zero.
- **Standard Temperature** is the temperature that would be found at a given pressure altitude in the standard atmosphere. It is 15° C (59° F) at sea level pressure altitude and decreases approximately 2° C (3.6° F) for each 1000 feet of altitude increase. See ISA definition.

## Engine Power Terminology

- HP **Horsepower** is the power developed by the engine.
- MCP **Maximum Continuous Power** is the maximum power that can be used continuously.
- MAP **Manifold Pressure** is the pressure measured in the engine's induction system expressed as in. Hg.
- RPM **Revolutions Per Minute** is engine rotational speed.
- **Static RPM** is RPM attained during a full-throttle engine runup when the airplane is on the ground and stationary.

## Performance and Flight Planning Terminology

- g One "g" is a quantity of acceleration equal to that of earth's gravity.
- **Demonstrated Crosswind Velocity** is the velocity of the crosswind component for which adequate control of the airplane during taxi, takeoff, and landing was actually demonstrated during certification testing. Demonstrated crosswind is not considered to be limiting.
  - **Service Ceiling** is the maximum altitude at which the aircraft at maximum weight has the capability of climbing at a rate of 100 feet per minute.
- GPH **Gallons Per Hour** is the amount of fuel (in gallons) consumed by the aircraft per hour.

- NMPG **Nautical Miles Per Gallon** is the distance (in nautical miles) which can be expected per gallon of fuel consumed at a specific engine power setting and/or flight configuration.
- **Unusable Fuel** is the quantity of fuel that cannot be safely used in flight.
  - **Usable Fuel** is the fuel available for flight planning.

## Weight and Balance Terminology

- c.g. **Center of Gravity** is the point at which an airplane would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane.
- **Arm** is the horizontal distance from the reference datum to the center of gravity (c.g.) of an item. The airplane's arm is obtained by adding the airplane's individual moments and dividing the sum by the total weight.
  - **Basic Empty Weight** is the actual weight of the airplane including all operating equipment that has a fixed location in the airplane. The basic empty weight includes the weight of unusable fuel and full oil.
- MAC **Mean Aerodynamic Chord** is the chord drawn through the centroid of the wing plan area.
- LEMAC **Leading Edge of Mean Aerodynamic Chord** is the forward edge of MAC given in inches aft of the reference datum (fuselage station).
- **Maximum Gross Weight** is the maximum permissible weight of the airplane and its contents as listed in the aircraft specifications.
  - **Moment** is the product of the weight of an item multiplied by its arm.
  - **Useful Load** is the basic empty weight subtracted from the maximum weight of the aircraft. It is the maximum allowable combined weight of pilot, passengers, fuel and baggage.

- **Station** is a location along the airplane fuselage measured in inches from the reference datum and expressed as a number. For example: A point 123 inches aft of the reference datum is Fuselage Station 123.0 (FS 123).
- **Reference Datum** is an imaginary vertical plane from which all horizontal distances are measured for balance purposes.
- **Tare** is the weight of all items used to hold or position the airplane on the scales for weighing. Tare includes blocks, shims, and chocks. Tare weight must be subtracted from the associated scale reading.



# Section 2 Limitations

## Table of Contents

Introduction .....	2-3
Certification Status .....	2-3
Airspeed Limitations .....	2-4
Airspeed Indicator Markings .....	2-5
Power Plant Limitations .....	2-6
Engine.....	2-6
Propeller .....	2-7
Weight Limits .....	2-7
Instrument Markings .....	2-8
Center of Gravity Limits .....	2-9
Maneuver Limits.....	2-10
Flight Load Factor Limits.....	2-10
Minimum Flight Crew .....	2-10
Kinds of Operation .....	2-11
Kinds of Operation Equipment List .....	2-11
Icing .....	2-15
Runway Surface .....	2-15
Instrument Procedures .....	2-16
Taxi Power.....	2-16
Fuel Limits.....	2-16
Altitude Limits.....	2-16
Environmental Conditions .....	2-16
Maximum Occupancy .....	2-16
Systems and Equipment Limits.....	2-17
Cirrus Airframe Parachute System (CAPS) .....	2-17
Primary Flight Display .....	2-17
Multi-Function Display .....	2-19
Oxygen System .....	2-20
Inflatable Restraint System.....	2-20
Flap Limitations.....	2-20
Paint.....	2-20
Other Limitations .....	2-20
Smoking.....	2-20

Placards .....2-21

## Introduction

• Note •

Limitations associated with optional equipment are not described in this section. For optional equipment limitations, *refer to Section 9, Supplements*

The limitations included in this Section of the Pilot's Operating Handbook (POH) are approved by the Federal Aviation Administration. This section provides operating limitations, instrument markings and basic placards required by regulation and necessary for the safe operation of the SR20 and its standard systems and equipment. *Refer to Section 9* of this handbook for amended operating limitations for airplanes equipped with optional equipment. Compliance with the operating limitations in this section and in Section 9 is required by Federal Aviation Regulations.

## Certification Status

The Cirrus SR20 is certificated under the requirements of Federal Aviation Regulations (FAR) Part 23 as documented by FAA Type Certificate TC A00009CH.

## Airspeed Limitations

The indicated airspeeds in the following table are based upon Section 5 Airspeed Calibrations using the normal static source. When using the alternate static source, allow for the airspeed calibration variations between the normal and alternate static sources.

Speed	KIAS	KCAS	Remarks
V <sub>NE</sub>	200	200	<b>Never Exceed Speed</b> is the speed limit that may not be exceeded at any time.
V <sub>NO</sub>	165	165	<b>Maximum Structural Cruising Speed</b> is the speed that should not be exceeded except in smooth air, and then only with caution.
V <sub>O</sub> 3000 Lb 2600 Lb 2300 Lb	131 122 114	131 123 115	<b>Operating Maneuvering Speed</b> is the maximum speed at which full control travel may be used. Below this speed the airplane stalls before limit loads are reached. Above this speed, full control movements can damage the airplane.
V <sub>FE</sub>  50% Flaps 100% Flaps	120  100	120  101	<b>Maximum Flap Extended Speed</b> is the highest speed permissible with wing flaps extended.
V <sub>PD</sub>	135	135	<b>Maximum Demonstrated Parachute Deployment Speed</b> is the maximum speed at which parachute deployment has been demonstrated.

**Figure 2-1  
Airspeed Limits**

## Airspeed Indicator Markings

The airspeed indicator markings are based upon Section 5 Airspeed Calibrations using the normal static source. When using the alternate static source, allow for the airspeed calibration variations between the normal and alternate static sources.

Marking	Value (KIAS)	Remarks
White Arc	56 - 100	Full Flap Operating Range. Lower limit is the most adverse stall speed in the landing configuration. Upper limit is the maximum speed permissible with flaps extended.
Green Arc	65 - 165	Normal Operating Range. Lower limit is the maximum weight stall at most forward C.G. with flaps retracted. Upper limit is the maximum structural cruising speed.
Yellow Arc	165 - 200	Caution Range. Operations must be conducted with caution and only in smooth air.
Red Line	200	Never exceed speed. Maximum speed for all operations.

**Figure 2-2**  
**Airspeed Indicator Markings**

## Power Plant Limitations

### Engine

Teledyne Continental ..... IO-360-ES

Power Rating ..... 200 hp @ 2700 rpm

Maximum RPM ..... 2700 rpm

Oil:

Oil Temperature ..... 240° F (115° C) maximum

Oil Pressure:

Minimum ..... 10 psi

Maximum ..... 100 psi

Approved Oils:

*Engine Break-In:* For first 25 hours of operation or until oil consumption stabilizes use straight mineral oil conforming to MIL-L-6082. If engine oil must be added to the factory installed oil, add only MIL-L-6082 straight mineral oil.

*After Engine Break-In:* Use only oils conforming to Teledyne Continental Specification MHS-24 (Ashless Dispersant Lubrication Oil) or MHS-25 (Synthetic Lubrication Oil). Refer to Section 8 - Oil Servicing. Oil viscosity range as follows:

All Temperatures ..... 15W-50 or 20W-50

Above 40 °F (4° C) ..... SAE 50 or 20W50

Below 40 °F (4° C) ..... SAE 30, 10W-30, 15W50, or 20W50

Fuel Grade ..... Aviation Grade 100 LL (Blue) or 100 (green)

• Note •

Refer to General Limitations – Fuel Limits in this section for operational limitations regarding fuel and fuel storage.

## Propeller

• Note •

Two-blade propellers are not EASA approved for use on this airplane. Airplanes registered in the European Union should ignore all references to the two-blade propeller in this POH.

### **Hartzell**

Propeller Type ..... Constant Speed

*Two-Blade Propeller:*

Model Number ..... BHC-J2YF-1BF/F7694

Diameter ..... 76.0" (73.0" Minimum) |

*Three-Blade Propeller:*

Model Number ..... PHC-J3YF-1MF/F7392-1

Diameter ..... 74.0" (72.0" Minimum) |

Model Number ..... PHC-J3YF-1RF/F7392-1

Diameter ..... 74.0" (72.0" Minimum) |

## Weight Limits

Maximum Takeoff Weight ..... 3000 lb. (1361 kg)

• Note •

All weights in excess of 2900 pounds (1315 kg) must consist of wing fuel.

Maximum Landing Weight ..... 2900 lb. (1315 kg)

Maximum Weight in Baggage Compartment..... 130 lb. (59 kg)

## Instrument Markings

Instrument (Range)	Red Line	Green Arc	Yellow Arc	Red Line
	Minimum	Normal	Caution	Maximum

Power Plant Instrumentation				
Tachometer/ Engine Speed (0 - 3500 RPM)	—	500 - 2700	—	2700
Cylinder Head Temperature (200° F - 500° F)	—	240° - 420° F	420° - 460° F	460° F
Exhaust Gas Temp. (1250° - 1650° F)	—	—	—	—
Manifold Pressure (10 - 35 Inches Hg)	—	15 - 29.5 in. Hg	29.5 - 35 in. Hg	—
Fuel Flow (0 - 18 U.S. Gal./ Hr.)	—	7 - 13 GPH	—	—
Oil Temperature (50° - 240° F)	—	100° - 240° F	—	240° F
Oil Pressure (0 - 100 PSI)	10 psi (Idle)	30 - 60 psi	10 - 30 psi 60 - 100 psi	100 psi (Cold)
Fuel Quantity (0 - 28 U.S. Gallon)	0 gal.	—	0 - 8.2 gal.	—

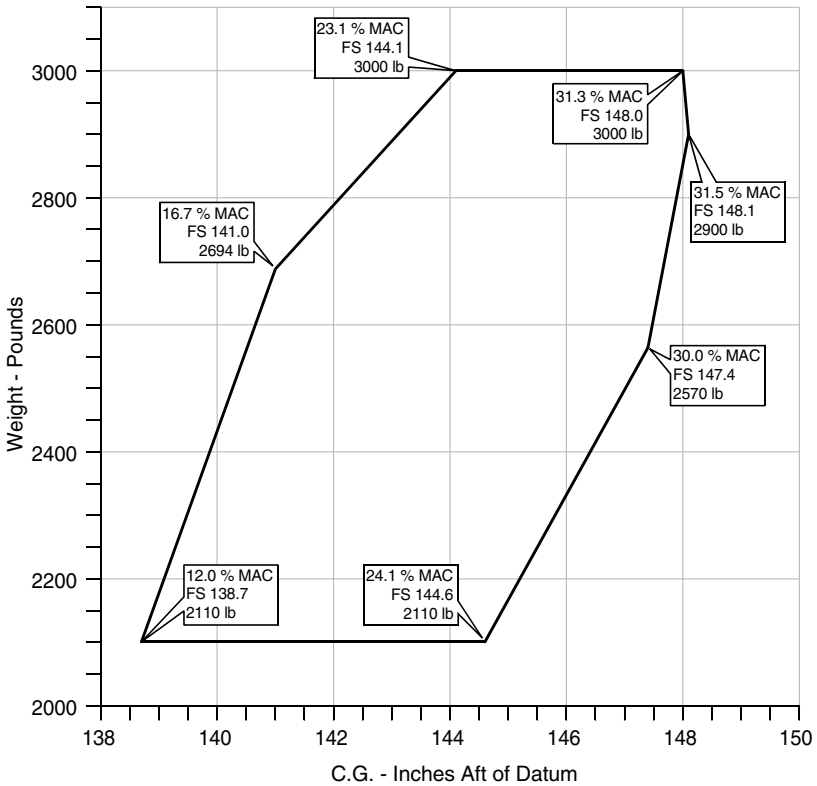
Miscellaneous Instrumentation				
Voltmeter (16 - 32 Volts)	—	24 - 30 Volts	—	32 Volts

**Figure 2-3**  
**Instrumentation Markings**



# Center of Gravity Limits

Reference Datum ..... 100 inches forward of firewall  
 Forward ..... Refer to Figure 2-4  
 Aft ..... Refer to Figure 2-4



SR20\_FM02\_1940A

**FORWARD LIMIT** - The forward limit is FS 138.7 (12.0% MAC) at 2110 lb., with straight line taper to FS 141.0 (16.7% MAC) at 2694 lb., and to FS 144.1 (23.1% MAC) at 3000 lb.  
**AFT LIMIT** - The aft limit is FS 144.6 (24.1% MAC) at 2110 lb., with straight line taper to FS 147.4 (30.0% MAC) at 2570 lb., to FS 148.1 (31.5% MAC) at 2900 lb., and to FS 148.0 (31.3% MAC) at 3000 lb.

**Figure 2-4**  
**C.G. Envelope**

## Maneuver Limits

Aerobatic maneuvers, including spins, are prohibited.

• Note •

Because the SR20 has not been certified for spin recovery, the Cirrus Airframe Parachute System (CAPS) must be deployed if the airplane departs controlled flight. *Refer to Section 3 – Emergency Procedures, Inadvertent Spiral/Spin Entry.*

This airplane is certified in the normal category and is not designed for aerobatic operations. Only those operations incidental to normal flight are approved. These operations include normal stalls, chandelles, lazy eights, and turns in which the angle of bank is limited to 60°.

## Flight Load Factor Limits

Flaps UP (0%), 3000 lb.....	+3.8g, -1.9g
Flaps 50%, 3000 lb.....	+1.9g, -0g
Flaps 100% (Down), 3000 lb.....	+1.9g, -0g

## Minimum Flight Crew

The minimum flight crew is one pilot.

## Kinds of Operation

The SR20 is equipped and approved for the following type operations:

- VFR day and night.
- IFR day and night.

*Serials 1337 and subsequent with SRV configuration:* The airplane is equipped and approved for the following type operations:

- VFR day and night.

## Kinds of Operation Equipment List

The following listing summarizes the equipment required under Federal Aviation Regulations (FAR) Part 23 for airworthiness under the listed kind of operation. Those minimum items of equipment necessary under the operating rules are defined in FAR Part 91 and FAR Part 135 as applicable.

• Note •

All references to types of flight operations on the operating limitations placards are based upon equipment installed at the time of Airworthiness Certificate issuance.

System, Instrument, and/or Equipment	Kinds of Operation				Remarks, Notes, and/or Exceptions
	VFR Day	VFR Nt.	IFR Day	IFR Nt.	
<b>Communications</b>					
VHF COM	—	—	1	1	
<b>Electrical Power</b>					
Battery 1	1	1	1	1	
Battery 2	—	—	1	1	
Alternator 1	1	1	1	1	
Alternator 2	—	—	1	1	<i>Serials 1337 &amp; subs w/ SRV standard configuration: ALT 2 not applicable.</i>

System, Instrument, and/or Equipment	Kinds of Operation				Remarks, Notes, and/or Exceptions
	VFR Day	VFR Nt.	IFR Day	IFR Nt.	
Amp Meter/Indication	1	1	1	1	<i>Serials 1337 and subsequent with SRV standard configuration: ALT 2 Annunciator not applicable.</i>
Low Volts Annunciator	1	1	1	1	
ALT 1 Annunciator	1	1	1	1	
ALT 2 Annunciator	1	1	1	1	
Circuit Breakers	A/R	A/R	A/R	A/R	As Required.
<b>Equipment &amp; Furnishings</b>					
Emergency Locator Transmitter	1	1	1	1	One Seat Belt for each occupant.
Restraint System	A/R	A/R	A/R	A/R	
<b>Fire Protection</b>					
Fire Extinguisher	1	1	1	1	
<b>Flight Controls</b>					
Flap Position Lights	3	3	3	3	
Flap System	1	1	1	1	
Pitch Trim Indicator	1	1	1	1	
Pitch Trim System	1	1	1	1	
Roll Trim Indicator	1	1	1	1	
Roll Trim System	1	1	1	1	
Stall Warning System	1	1	1	1	
<b>Fuel</b>					

System, Instrument, and/or Equipment	Kinds of Operation				Remarks, Notes, and/or Exceptions
	VFR Day	VFR Nt.	IFR Day	IFR Nt.	
Auxiliary Boost Pump	1	1	1	1	
Fuel Quantity Indicator	2	2	2	2	
Fuel Selector Valve	1	1	1	1	
<b>Ice &amp; Rain Protection</b>					
Alternate Engine Air Induction System	1	1	1	1	
Alternate Static Air Source	1	1	1	1	
Pitot Heater	—	—	1	1	
<b>Landing Gear</b>					
Wheel Pants	—	—	—	—	May be removed.
<b>Lights</b>					
Anticollision Lights	2	2	2	2	
Instrument Lights	—	❖	—	❖	❖-Must be operative.
Navigation Lights	—	4	—	4	
Landing Light	—	1	—	1	For hire operations.
<b>Navigation &amp; Pitot Static</b>					
Airspeed Indicator	1	1	1	1	
Altimeter	1	1	1	1	
Magnetic Compass	1	1	1	1	
Pitot System	1	1	1	1	
Static System, Normal	1	1	1	1	
Attitude Indicator	—	—	1	1	
Clock	—	—	1	1	

System, Instrument, and/or Equipment	Kinds of Operation				Remarks, Notes, and/or Exceptions
	VFR Day	VFR Nt.	IFR Day	IFR Nt.	
Nav Radio	—	—	1	1	
Gyroscopic Directional Indication (HSI)	—	—	1	1	<i>Serials 1005 &amp; subs w/o PFD.</i>
Turn Coordinator	—	—	1	1	<i>Serials 1005 &amp; subs w/o PFD.</i>
PFD Attitude Indication	—	—	1	1	<i>Serials 1337 &amp; subs w/ PFD.</i>
PFD Airspeed Indication	—	—	1	1	<i>Serials 1337 &amp; subs w/ PFD.</i>
PFD Altitude Indication	—	—	1	1	<i>Serials 1337 &amp; subs w/ PFD.</i>
PFD Heading Indication	—	—	1	1	<i>Serials 1337 &amp; subs w/ PFD.</i>
PFD Slip/Skid Indication	—	—	1	1	<i>Serials 1337 &amp; subs w/ PFD.</i>
Magnetometer	—	—	1	1	<i>Serials 1337 &amp; subs w/ PFD.</i>
Vertical Speed Indicator	—	—	—	—	
Multi-Function Display	❖	❖	❖	❖	❖-Serials 1582 thru 1878 before PFD Release 7.0 Software Update; Oil Temperature Indication must be operative.
<b>Engine Indicating</b>					
Cylinder Head Temperature Indication	—	—	—	—	

System, Instrument, and/or Equipment	Kinds of Operation				Remarks, Notes, and/or Exceptions
	VFR Day	VFR Nt.	IFR Day	IFR Nt.	
Exhaust Gas Temperature Indication	—	—	—	—	
Fuel Flow Indication	1	1	1	1	
Manifold Pressure Indication	1	1	1	1	
Oil Pressure Indication	1	1	1	1	
Oil Quantity Indicator (Dipstick)	1	1	1	1	
Oil Temperature Indication	1	1	1	1	
Engine Speed	1	1	1	1	
<b>Special Equipment</b>					
Cirrus Airframe Parachute (CAPS)	1	1	1	1	
Airplane Flight Manual	1	1	1	1	Included w/ POH.

## Icing

Flight into known icing conditions is prohibited.

## Runway Surface

This airplane may be operated on any smooth runway surface.

### • Caution •

Operation on unimproved runway surfaces will cause additional wear and may require additional maintenance or inspection. *Refer to the Airplane Maintenance Manual.*

## Instrument Procedures

Due to the possibility of CDI needle oscillation, in aircraft configured with a 2 blade propeller, while conducting instrument procedures that use a localizer or Simplified Directional Facility (SDF) navaid, engine speed above 2600 rpm is prohibited.

## Taxi Power

Maximum continuous engine speed for taxiing is 1000 RPM on flat, smooth, hard surfaces. Power settings slightly above 1000 RPM are permissible to start motion, for turf, soft surfaces, and on inclines. Use minimum power to maintain taxi speed.

## Fuel Limits

The maximum allowable fuel imbalance is 7.5 U.S. gallons (¼ tank).

Approved Fuel ..... Aviation Grade 100 LL (Blue) or 100 (Green)

Total Fuel Capacity ..... 60.5 U.S. gallons (229.0 L)

Total Fuel Each Tank ..... 30.3 U.S. gallons (114.5 L)

Total Usable Fuel (all flight conditions) ..... 56.0 U.S. gallons (212.0 L)

## Altitude Limits

Maximum Takeoff Altitude..... 10,000 Feet MSL

Maximum Operating Altitude ..... 17,500 ft. MSL

The operating rules (FAR Part 91 and FAR Part 135) require the use of supplemental oxygen at specified altitudes below the maximum operating altitude. *Refer to Oxygen System Limitations in this Section.*

## Environmental Conditions

For operation of the airplane below an outside air temperature of -10°F (-23° C), use of cowl inlet covers approved by Cirrus Design and listed in the Winterization Kit AFM Supplement P/N 11934-S25 is required.

## Maximum Occupancy

Occupancy of this airplane is limited to four persons (the pilot and three passengers).



## Systems and Equipment Limits

### Cirrus Airframe Parachute System (CAPS)

V<sub>PD</sub> Maximum Demonstrated Deployment Speed ..... 135 KIAS

• Note •

*Refer to Section 10 – Safety Information, for additional CAPS guidance.*

### Primary Flight Display

1. The PFD integrates with separately approved sensor installations. Adherence to limitations in appropriate installation POH supplements is mandatory.
2. The Avidyne FlightMax Entegra-Series PFD Pilot's Guide, P/N 600-00142-000, Revision 03, or latest revision, must be available to the pilot during all flight operations.
3. Flight under Instrument Flight Rules (IFR) is not permitted with the PFD or any standby indicator (attitude indicator or magnetic compass) inoperative. *Refer to Kinds of Operation Equipment List.*

• Note •

The Avidyne PFD software version is displayed on the PFD during system startup.

4. *Serials 1337 and subsequent before installation of PFD software version 530-00123-XXX-REV05 (where X can be any digit from 0 to 9):* Backcourse approaches are prohibited.

***When the PFD is coupled with Autopilot System, the following Limitations apply:***

5. Autopilot operation is prohibited above:
  - a. 185 KIAS for airplanes equipped with System 55 autopilots.
  - b. 180 KIAS for airplanes equipped with System 55SR autopilots.
6. The autopilot must not be engaged for takeoff or landing.
7. The autopilot must be disengaged for missed approach, go-around, and balked landing.

8. Flaps must be set to 50% for autopilot operation in Altitude Hold at airspeeds below 95 KIAS.
9. Flap deflection is limited to 50% during autopilot operations.
10. The autopilot must be disconnected in moderate or severe turbulence.
11. Minimum engage height for the autopilot is 400 ft AGL.

**• WARNING •**

Autopilot may not be able to maintain all selectable vertical speeds. Selecting a vertical speed that exceeds the aircraft's available performance may cause the aircraft to stall.

12. Minimum speed with the autopilot engaged is  $1.2V_s$  for the given configuration.
13. For VOR/GPS and ILS glideslope and localizer intercept, capture, and tracking, the following limitations apply:
  - a. The autopilot must be disengaged no later than 100 feet below the Minimum Descent Altitude.
  - b. The autopilot must be disconnected during approach if course deviation exceeds 50%. The approach should only be continued by "hand-flying" the airplane.
  - c. The autopilot must be disengaged at the Decision Height.
  - d. 12 knot maximum crosswind component between the missed approach point and outer marker.
  - e. The intercept of the localizer shall occur at least 5 miles outside of the outer marker.
  - f. If the crosswind component is greater than 12 knots and less than 17 knots, the intercept shall occur at least 10 miles outside of the outer marker.
  - g. The intercept angle shall be no greater than a 45-degree intercept.
  - h. The ILS is flown at normal approach speeds, and within any STC or TC speed constraints and as defined in this flight manual.

- i. The flaps should be extended in the approach configuration prior to the Outer Marker. No further changes in the flap configuration should be made throughout the autopilot-coupled approach.
- j. The glideslope is approached in such a manner to allow automatic arming of the glideslope, or if the glideslope is manually armed no more than 15% above the glideslope.

## Multi-Function Display

1. The moving map display must not be used as the primary navigation instrument. The moving map display provides visual advisory of the airplane's GPS position against a moving map. The information supplements CDI course deviation and information provided on the GPS navigator.
2. Use of Map page during IFR flight requires an IFR approved GPS receiver installation operated in accordance with applicable limitations.
3. Under no circumstances should the Map page terrain representations be used as a basis for terrain avoidance.
4. The electronic checklists display supplements the Pilot Operating Handbook checklists and is advisory only. The electronic checklists must not be used as the primary set of on-board airplane checklists.
5. The MFD interfaces with separately approved sensor installations. Adherence to limitations in the appropriate sensor installation POH Supplements is mandatory.
6. Traffic information shown on the Map page display is provided to the pilot as an aid to visually acquire traffic. Pilots should maneuver their aircraft based only on ATC guidance or positive visual acquisition of the conflicting traffic. Maneuver should be consistent with ATC instructions. No maneuvers should be made based solely on a traffic advisory.
7. *Serials with ARNAV MFD installed;* The ARNAV ICDS 2000 Pilot's Operation Handbook, P/N 572-0550 dated May 1998 or later revision, must be available to the pilot during all flight operations

8. *Serials with Avidyne MFD installed:* The Avidyne FlightMax EX5000C Pilot's Guide, P/N 600-00108-000, Revision 03 or later, must be available to the pilot during all flight operations.

## Oxygen System

Whenever the operating rules require the use of supplemental oxygen, the pilot must:

- Use an oxygen system approved by Cirrus Design and listed in the Oxygen System AFM Supplement Part Number 11934-S09.
- Secure the oxygen bottle in the right front seat as described in the AFM Supplement noted above.

## Inflatable Restraint System

*Serials 1268 thru 1540 after SB 2X-25-14 and serials 1541 and subsequent;* Use of a child safety seat with the inflatable restraint system is prohibited.

## Flap Limitations

Approved Takeoff Settings ..... UP (0%) or 50%

Approved Landing Settings ..... Up (0%), 50%, or 100%

## Paint

To ensure that the temperature of the composite structure does not exceed 150° F (66° C), the outer surface of the airplane must be painted in accordance with the paint colors and schemes as specified in the Airplane Maintenance Manual. *Refer to Airplane Maintenance Manual (AMM), Chapter 51,* for specific paint requirements.

## Other Limitations

### Smoking

Smoking is prohibited in this airplane.

# Placards

*Engine compartment, inside oil filler access:*

**ENGINE OIL GRADE**  
**ABOVE 40° F SAE 50 OR 20W50**  
**BELOW 40° F SAE 30 OR 10W30, 15W50, OR 20W50**  
**REFER TO AFM FOR APPROVED OILS**

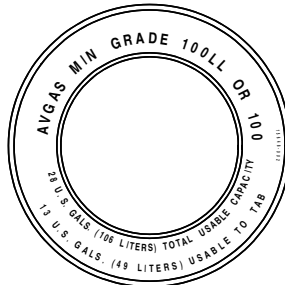
*Wing, adjacent to fuel filler caps:*

**AVGAS MIN GRADE 100LL OR 100**  
**28 U.S. GALS. TOTAL USABLE CAP**  
**13 U.S. GALS. USABLE TO TAB**

*Serials 1005 thru 1099.*

**AVGAS MIN GRADE 100LL OR 100**  
**28 U.S. GALS. (106 LITERS) TOTAL USABLE CAP**  
**13 U.S. GALS. (49 LITERS) USABLE TO TAB**

*Serials 1100 thru 1326.*



*Serials 1327 & subs.*

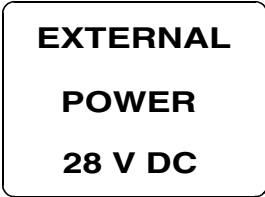
SR20\_FM02\_1220D

**Figure 2-5**  
**Placards (Sheet 1 of 7)**

Upper fuselage, either side of CAPS rocket cover:



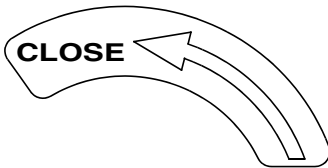
Left fuselage, on external  
power supply door:



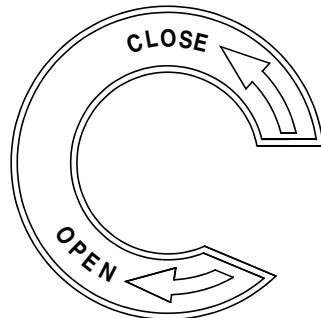
Rudder, and elevator, both sides:



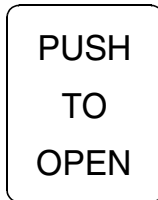
Doors, above and below latch:



Serials 1005 thru 1316.



Serials 1317 thru 1422.

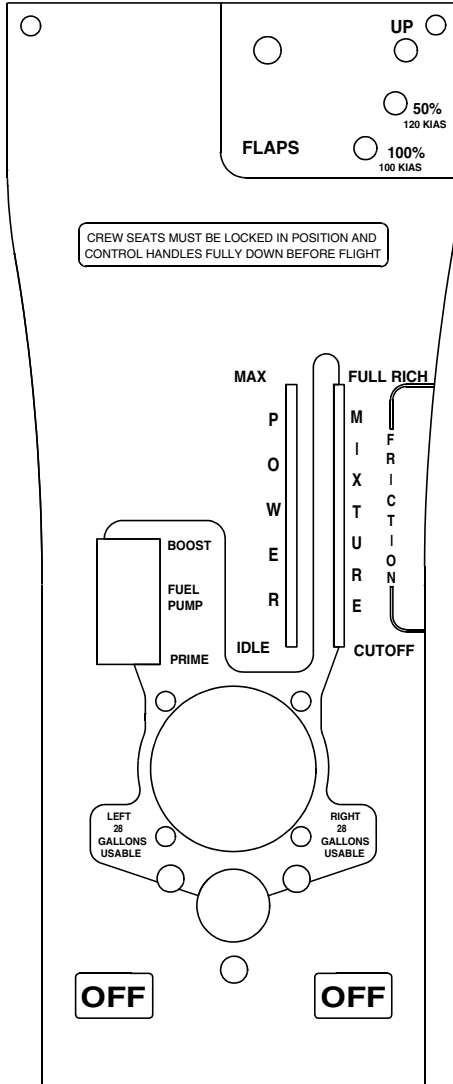


Serials 1423 & subs.

SR20\_FM02\_1221B

**Figure 2-5**  
**Placards (Sheet 2 of 7)**

Engine control panel:



SR20\_FM02\_1602A

Figure 2-5  
Placards (Sheet 3 of 7)

Wing, flap aft edge:

**NO STEP**

Cabin Door Window, lower edge, centered, applied upside down:

**RESCUE: FRACTURE AND REMOVE WINDOW**

Bolster Switch Panel, left edge:

**THIS AIRCRAFT IS CERTIFIED FOR THE  
FOLLOWING FLIGHT OPERATIONS:  
DAY - NIGHT - VFR - IFR  
(WITH REQUIRED EQUIPMENT)  
FLIGHT INTO KNOWN ICING IS PROHIBITED  
OPERATE PER AIRPLANE FLIGHT MANUAL**

Serials 1005 & subs w/o SRV option.

**THIS AIRCRAFT IS CERTIFIED FOR THE  
FOLLOWING FLIGHT OPERATIONS:  
DAY - NIGHT - VFR  
(WITH REQUIRED EQUIPMENT)  
FLIGHT INTO KNOWN ICING IS PROHIBITED  
OPERATE PER AIRPLANE FLIGHT MANUAL**

Serials 1337 & subs with SRV option.

Instrument Panel Upper left:

**MANEUVERING  
SPEED:  $V_o$  131 KIAS**

**NORMAL CATEGORY AIRPLANE  
NO ACROBATIC MANEUVERS,  
INCLUDING SPINS, APPROVED**

SR20\_FM02\_1223E

**Figure 2-5  
Placards (Sheet 4 of 7)**

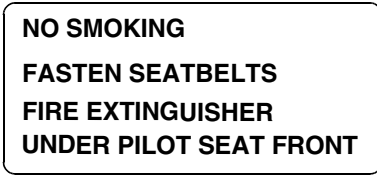


*Bolster Panel, both sides:*



*Serials 1351 & subs.*

*Instrument Panel:*

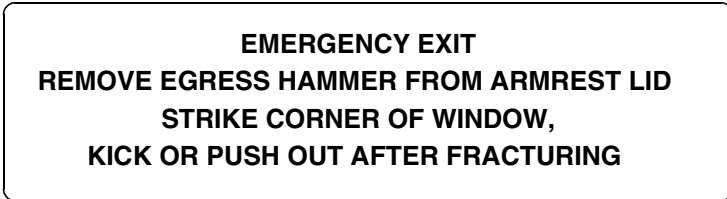


*Serials 1005 thru 1638.*

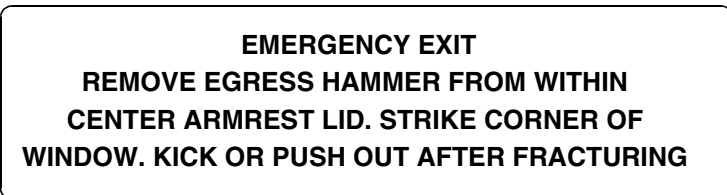


*Serials 1639 & subs.*

*Cabin Window, above door latch:*



*Serials 1005 thru 1178.*



*Serials 1179 & subs.*

SR20\_FM02\_1517E

**Figure 2-5  
Placards (Sheet 5 of 7)**

*Baggage Compartment, aft edge:*

**ELT LOCATED BEHIND BULKHEAD  
REMOVE CARPET AND ACCESS PANEL**

*Baggage Compartment Door, inside:*

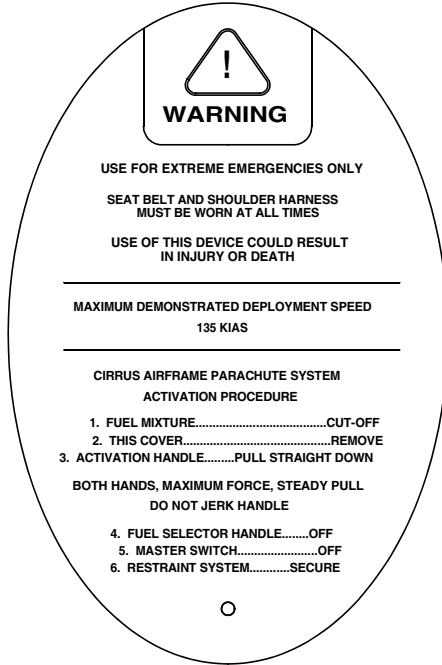
**DISTRIBUTED FLOOR LIMIT 130 LBS  
BAGGAGE STRAP CAPACITY IS 35 LBS EACH MAXIMUM  
SEE AIRPLANE FLIGHT MANUAL FOR BAGGAGE TIE-DOWN  
AND WEIGHT AND BALANCE INFORMATION**

12378-001 REV A

SR20\_FM02\_1224

**Figure 2-5  
Placards (Sheet 6 of 7)**

*CAPS Deployment Handle Cover, above pilot's right shoulder:*



SR20\_FM02\_1590

**Figure 2-5  
Placards (Sheet 7 of 7)**

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# **Section 3**

## **Emergency Procedures**

### **Table of Contents**

Introduction .....	3-3
Airspeeds for Emergency Operations .....	3-4
Emergency Procedures Guidance .....	3-5
Preflight Planning.....	3-5
Preflight Inspections/Maintenance .....	3-5
Methodology .....	3-5
Memory Items .....	3-6
Ground Emergencies .....	3-7
Engine Fire During Start .....	3-7
Emergency Engine Shutdown On Ground.....	3-7
Emergency Ground Egress .....	3-8
In-Flight Emergencies .....	3-9
Engine Failure On Takeoff (Low Altitude).....	3-9
Maximum Glide .....	3-10
Engine Failure In Flight.....	3-11
Engine Airstart .....	3-12
Engine Partial Power Loss.....	3-13
Low Oil Pressure .....	3-15
Propeller Governor Failure .....	3-15
Smoke and Fume Elimination.....	3-16
Engine Fire In Flight.....	3-16
Wing Fire In Flight.....	3-17
Cabin Fire In Flight .....	3-17
Emergency Descent .....	3-18
Inadvertent Spiral Dive During IMC Flight .....	3-19
Spins .....	3-20
CAPS Deployment.....	3-21
Landing Emergencies .....	3-24
Emergency Landing Without Engine Power .....	3-24
Ditching.....	3-25
Landing Without Elevator Control .....	3-25
System Malfunctions.....	3-26
Primary Flight Display System.....	3-26

**Section 3**  
**Emergency Procedures**

**Cirrus Design**  
**SR20**

PFD - Loss of Air Data .....3-26  
PFD - Loss of Attitude Data .....3-26  
Power Lever Linkage Failure .....3-27

## Introduction

This section provides procedures for handling emergencies and critical flight situations that may occur while operating the SR20. Although emergencies caused by airplane, systems, or engine malfunctions are extremely rare, the guidelines described in this section should be considered and applied as necessary should an emergency arise.

• Note •

Emergency procedures associated with optional systems can be found in Section 9.

*Serials 1337 and subsequent with SRV standard configuration:* The airplane is equipped with a single alternator, dual battery electrical system. References to Alternator 2 in the following section do not apply.

## Airspeeds for Emergency Operations

### Maneuvering Speed:

3000 lb .....	131 KIAS
2600 lb .....	122 KIAS
2200 lb .....	111 KIAS

### Best Glide:

3000 lb .....	96 KIAS
2500 lb .....	87 KIAS

### Emergency Landing (Engine-out):

Flaps Up.....	86 KIAS
Flaps 50%.....	81 KIAS
Flaps 100%.....	75 KIAS



## Emergency Procedures Guidance

Although this section provides procedures for handling most emergencies and critical flight situations that could arise in the SR20, it is not a substitute for thorough knowledge of the airplane and general aviation techniques. A thorough study of the information in this handbook while on the ground will help you prepare for time-critical situations in the air.

### Preflight Planning

Enroute emergencies caused by weather can be minimized or eliminated by careful flight planning and good judgment when unexpected weather is encountered.

### Preflight Inspections/Maintenance

In-flight mechanical problems in the SR20 will be extremely rare if proper preflight inspections and maintenance are practiced. Always perform a thorough walk-around preflight inspection before any flight to ensure that no damage occurred during the previous flight or while the airplane was on the ground. Pay special attention to any oil leaks or fuel stains that could indicate engine problems.

### Methodology

Aircraft emergencies are very dynamic events. Because of this, it is impossible to address every action a pilot might take to handle a situation. However, four basic actions can be applied to any emergency. They are:

***Maintain Aircraft Control*** — Many minor aircraft emergencies turn into major ones when the pilot fails to maintain aircraft control. Remember, do not panic and do not fixate on a particular problem. Over-attention to a faulty warning light during an instrument approach can lead to a pilot induced unusual attitude and possibly worse. To avoid this, even in an emergency: aviate, navigate, and communicate, in this order. Never let anything interfere with your control of the airplane. Never stop flying.

***Analyze the Situation*** — Once you are able to maintain control of the aircraft, assess the situation. Look at the engine parameters. Listen to the engine. Determine what the airplane is telling you.

**Take Appropriate Action** — In most situations, the procedures listed in this section will either correct the aircraft problem or allow safe recovery of the aircraft. Follow them and use good pilot judgment.

The Cirrus Airframe Parachute System (CAPS) should be activated in the event of a life-threatening emergency where CAPS deployment is determined to be safer than continued flight and landing. *Refer to Section 10, Safety Information*, for CAPS deployment information and landing considerations.

**Land as soon as Conditions Permit** — Once you have handled the emergency, assess your next move. Handle any non-critical “clean-up” items in the checklist and put the aircraft on the ground. Remember, even if the airplane appears to be in sound condition, it may not be.

## Memory Items

Checklist steps emphasized by underlining such as this:

1. Best Glide Speed ..... ESTABLISH  
should be memorized for accomplishment without reference to the procedure.

## Ground Emergencies

### **Engine Fire During Start**

A fire during engine start may be caused by fuel igniting in the fuel induction system. If this occurs, attempt to draw the fire back into the engine by continuing to crank the engine.

1. Mixture ..... CUTOFF
2. Fuel Pump ..... OFF
3. Fuel Selector ..... OFF
4. Power Lever ..... FORWARD
5. Starter ..... CRANK
6. If flames persist, perform *Emergency Engine Shutdown on Ground* and *Emergency Ground Egress* checklists.

### **Emergency Engine Shutdown On Ground**

1. Power Lever ..... IDLE
2. Fuel Pump (if used) ..... OFF
3. Mixture ..... CUTOFF
4. Fuel Selector ..... OFF
5. Ignition Switch ..... OFF
6. Bat-Alt Master Switches ..... OFF

## Emergency Ground Egress

• **WARNING** •

While exiting the airplane, make sure evacuation path is clear of other aircraft, spinning propellers, and other hazards.

1. Engine.....SHUTDOWN

• Note •

If the engine is left running, set the Parking Brake prior to evacuating the airplane.

2. Seat belts.....RELEASE

3. Airplane.....EXIT

• Note •

If the doors cannot be opened, break out the windows with egress hammer, located in the console between the front seats, and crawl through the opening.

## In-Flight Emergencies

### **Engine Failure On Takeoff (Low Altitude)**

If the engine fails immediately after becoming airborne, abort on the runway if possible. If altitude precludes a runway stop but is not sufficient to restart the engine, lower the nose to maintain airspeed and establish a glide attitude. In most cases, the landing should be made straight ahead, turning only to avoid obstructions. After establishing a glide for landing, perform as many of the checklist items as time permits.

**• WARNING •**

If a turn back to the runway is elected, be very careful not to stall the airplane.

1. Best Glide or Landing Speed (as appropriate) ..... ESTABLISH
2. Mixture ..... CUTOFF
3. Fuel Selector ..... OFF
4. Ignition Switch ..... OFF
5. Flaps ..... AS REQUIRED

*If time permits:*

6. Power Lever ..... IDLE
7. Fuel Pump ..... OFF
8. Bat-Alt Master Switches ..... OFF
9. Seat Belts ..... ENSURE SECURED

# Maximum Glide

**Conditions**

Power  
Propeller  
Flaps  
Wind

OFF  
Windmilling  
0% (UP)  
Zero

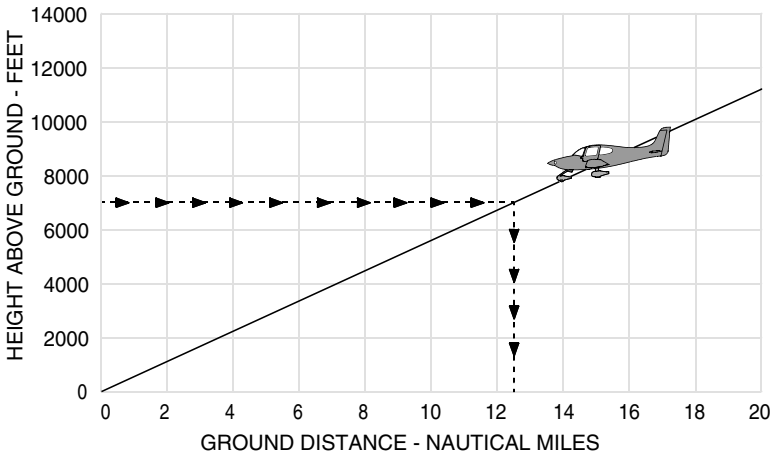
**Example:**

Altitude	7,000 ft. AGL
Airspeed	Best Glide
<hr/>	
Glide Distance	12.5 NM

**Best Glide Speed**

3000 lb	96 KIAS
2500 lb	87 KIAS

**Maximum Glide Ratio ~ 10.9 : 1**



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**Figure 3-1  
Maximum Glide**

## Engine Failure In Flight

If the engine fails at altitude, pitch as necessary to establish best glide speed. While gliding toward a suitable landing area, attempt to identify the cause of the failure and correct it. If altitude or terrain does not permit a safe landing, CAPS deployment may be required. *Refer to Section 10, Safety Information*, for CAPS deployment scenarios and landing considerations.

### • WARNING •

If engine failure is accompanied by fuel fumes in the cockpit, or if internal engine damage is suspected, move Mixture Control to CUTOFF and do not attempt a restart.

1. Best Glide Speed ..... ESTABLISH
2. Mixture ..... FULL RICH
3. Fuel Selector ..... SWITCH TANKS
4. Fuel Pump ..... BOOST
5. Alternate Induction Air ..... ON
6. Ignition Switch ..... CHECK, BOTH
7. If engine does not start, proceed to *Engine Airstart* or *Forced Landing* checklist, as required.

## Engine Airstart

The following procedures address the most common causes for engine loss. Switching tanks and turning the fuel pump on will enhance starting if fuel contamination was the cause of the failure. Leaning the mixture and then slowly enriching mixture may correct faulty mixture control.

• Note •

Engine airstarts may be performed during 1g flight anywhere within the normal operating envelope of the airplane.

1. Bat Master Switches ..... ON
2. Power Lever ..... 1/2" OPEN
3. Mixture ..... RICH, AS REQ'D
4. Fuel Selector ..... SWITCH TANKS
5. Ignition Switch ..... BOTH
6. Fuel Pump ..... BOOST
7. Alternate Induction Air ..... ON
8. Alt Master Switches ..... OFF
9. Starter (Propeller not Windmilling) ..... ENGAGE
10. Power Lever ..... slowly INCREASE
11. Alt Master Switches ..... ON
12. If engine will not start, perform *Forced Landing* checklist.



## Engine Partial Power Loss

Indications of a partial power loss include fluctuating RPM, reduced or fluctuating manifold pressure, low oil pressure, high oil temperature, and a rough-sounding or rough-running engine. Mild engine roughness in flight may be caused by one or more spark plugs becoming fouled. A sudden engine roughness or misfiring is usually evidence of a magneto malfunction.

• Note •

Low oil pressure may be indicative of an imminent engine failure – *Refer to Low Oil Pressure* procedure in this section for special procedures with low oil pressure.

• Note •

A damaged (out-of-balance) propeller may cause extremely rough operation. If an out-of-balance propeller is suspected, immediately shut down engine and perform Forced Landing checklist.

If a partial engine failure permits level flight, land at a suitable airfield as soon as conditions permit. If conditions do not permit safe level flight, use partial power as necessary to set up a forced landing pattern over a suitable landing field. Always be prepared for a complete engine failure and consider CAPS deployment if a suitable landing site is not available. *Refer to Section 10, Safety Information*, for CAPS deployment scenarios and landing considerations.

If the power loss is due to a fuel leak in the injector system, fuel sprayed over the engine may be cooled by the slipstream airflow which may prevent a fire at altitude. However, as the Power Lever is reduced during descent and approach to landing the cooling air may not be sufficient to prevent an engine fire.

• WARNING •

If there is a strong smell of fuel in the cockpit, divert to the nearest suitable landing field. Fly a forced landing pattern and shut down the engine fuel supply once a safe landing is assured.

*(Continued on following page)*

The following procedure provides guidance to isolate and correct some of the conditions contributing to a rough running engine or a partial power loss:

1. Fuel Pump..... BOOST  
Selecting BOOST on may clear the problem if vapor in the injection lines is the problem or if the engine-driven fuel pump has partially failed. The electric fuel pump will not provide sufficient fuel pressure to supply the engine if the engine-driven fuel pump completely fails.
2. Fuel Selector..... SWITCH TANKS  
Selecting the opposite fuel tank may resolve the problem if fuel starvation or contamination in one tank was the problem.
3. Mixture ..... CHECK appropriate for flight conditions
4. Power Lever ..... SWEEP  
Sweep the Power Lever through range as required to obtain smooth operation and required power.
5. Alternate Induction Air..... ON  
A gradual loss of manifold pressure and eventual engine roughness may result from the formation of intake ice. Opening the alternate engine air will provide air for engine operation if the normal source is blocked or the air filter is iced over.
6. Ignition Switch..... BOTH, L, then R  
Cycling the ignition switch momentarily from BOTH to L and then to R may help identify the problem. An obvious power loss in single ignition operation indicates magneto or spark plug trouble. Lean the mixture to the recommended cruise setting. If engine does not smooth out in several minutes, try a richer mixture setting. Return ignition switch to the BOTH position unless extreme roughness dictates the use of a single magneto.
7. Land as soon as practical.

## Low Oil Pressure

If low oil pressure is accompanied by a rise in oil temperature, the engine has probably lost a significant amount of its oil and engine failure may be imminent. Immediately reduce engine power to idle and select a suitable forced landing field.

**• WARNING •**

Prolonged use of high power settings after loss of oil pressure will lead to engine mechanical damage and total engine failure, which could be catastrophic.

**• Note •**

Full power should only be used following a loss of oil pressure when operating close to the ground and only for the time necessary to climb to an altitude permitting a safe landing or analysis of the low oil pressure indication to confirm oil pressure has actually been lost.

If low oil pressure is accompanied by normal oil temperature, it is possible that the oil pressure sensor, gage, or relief valve is malfunctioning. In any case, land as soon as practical and determine cause.

1. Power Lever ..... MINIMUM REQUIRED
2. Land as soon as possible.

## Propeller Governor Failure

If the RPM does not respond to power lever movement or overspeeds, the most likely cause is a faulty governor or an oil system malfunction. If moving the power lever is difficult or rough, suspect a power lever linkage failure and perform the *Power Lever Linkage Failure* checklist.

***Propeller RPM will not increase:***

1. Oil Pressure ..... CHECK
2. Land as soon as practical.

***Propeller overspeeds or will not decrease:***

1. Power Lever ..... ADJUST (to keep RPM in limits)
2. Airspeed.....REDUCE to 80 KIAS
3. Land as soon as practical.

## Smoke and Fume Elimination

If smoke and/or fumes are detected in the cabin, check the engine parameters for any sign of malfunction. If a fuel leak has occurred, actuation of electrical components may cause a fire. If there is a strong smell of fuel in the cockpit, divert to the nearest suitable landing field. Perform a *Forced Landing* pattern and shut down the fuel supply to the engine once a safe landing is assured.

1. Temperature Selector..... COLD
2. Vent Selector..... FEET/PANEL/DEFROST MIXTURE
3. Air Vents..... FULL OPEN
4. Airflow Selector (if installed)..... SET TO MAXIMUM

*If source of smoke and fume is firewall forward:*

- a. Airflow Selector..... OFF
5. Prepare to land as soon as possible.

*If airflow is not sufficient to clear smoke or fumes from cabin:*

- a. Cabin Doors..... PARTIALLY OPEN

Airspeed may need to be reduced to partially open door in flight.

## Engine Fire In Flight

If an engine fire occurs during flight, do not attempt to restart the engine.

1. Mixture ..... CUTOFF
2. Fuel Pump..... OFF
3. Fuel Selector..... OFF
4. Airflow Selector ..... OFF
5. Power Lever ..... IDLE
6. Ignition Switch ..... OFF
7. Cabin Doors ..... PARTIALLY OPEN

Airspeed may need to be reduced to partially open door in flight.

8. Land as soon as possible.

## Wing Fire In Flight

1. Pitot Heat Switch ..... OFF
2. Navigation Light Switch..... OFF
3. Landing Light ..... OFF
4. Strobe Light Switch..... OFF
5. If possible, side slip to keep flames away from fuel tank and cabin.

• Note •

Putting the airplane into a dive may blow out the fire. Do not exceed  $V_{NE}$  during the dive.

6. Land as soon as possible.

## Cabin Fire In Flight

If the cause of the fire is readily apparent and accessible, use the fire extinguisher to extinguish flames and land as soon as possible. Opening the vents or doors may feed the fire, but to avoid incapacitating the crew from smoke inhalation, it may be necessary to rid cabin of smoke or fire extinguishant. If the cause of fire is not readily apparent, is electrical, or is not readily accessible, proceed as follows:

• WARNING •

*Serials 1337 and subsequent:* If the airplane is in IMC conditions, turn ALT 1, ALT 2, and BAT 1 switches OFF. Power from battery 2 will keep the Primary Flight Display operational for approximately 30 minutes.

1. Bat-Alt Master Switches..... OFF, AS REQ'D

• Note •

With Bat-Alt Master Switches OFF, engine will continue to run. However, no electrical power will be available.

2. Vents/Cabin Air/Heat..... OFF
3. Air Vents..... CLOSED
4. Fire Extinguisher..... ACTIVATE

(Continued on following page)

• **WARNING** •

Halon gas used in the fire extinguisher can be toxic, especially in a closed area. After extinguishing fire, ventilate cabin by opening air vents and unlatching door (if required).

*If airflow is not sufficient to clear smoke or fumes from cabin:*

5. Cabin Doors ..... PARTIALLY OPEN  
Airspeed may need to be reduced to partially open door in flight.
6. When fire extinguished, Air Vents ..... OPEN, FULL COLD
7. Avionics Power Switch ..... OFF
8. All other switches ..... OFF
9. Land as soon as possible.

*If setting master switches off eliminated source of fire or fumes and airplane is in night, weather, or IFR conditions:*

• **WARNING** •

If airplane is in day VFR conditions and turning off the master switches eliminated the fire situation, leave the master switches OFF. Do not attempt to isolate the source of the fire by checking each individual electrical component.

10. Bat-Alt Master Switches ..... ON
11. Avionics Power Switch ..... ON
12. Activate required systems one at a time. Pause several seconds between activating each system to isolate malfunctioning system. Continue flight to earliest possible landing with malfunctioning system off. Activate only the minimum amount of equipment necessary to complete a safe landing.

## Emergency Descent

1. Power Lever ..... IDLE
2. Mixture ..... AS REQUIRED

• **Caution** •

If significant turbulence is expected do not descend at indicated airspeeds greater than  $V_{NO}$  (165 KIAS)

3. Airspeed .....  $V_{NE}$  (200 KIAS)

## Inadvertent Spiral Dive During IMC Flight

In all cases, if the aircraft enters an unusual attitude from which recovery is not assured, immediately deploy CAPS. *Refer to Section 10, Safety Information, for CAPS deployment information.*

1. Power Lever ..... IDLE
2. Stop the spiral dive by using coordinated aileron and rudder control while referring to the attitude indicator and turn coordinator to level the wings.
3. Cautiously apply elevator back pressure to bring airplane to level flight attitude.
4. Trim for level flight.
5. Set power as required.
6. Use autopilot if functional otherwise keep hands off control yoke, use rudder to hold constant heading.
7. Exit IMC conditions as soon as possible.

## Spins

The SR20 is not approved for spins, and has not been tested or certified for spin recovery characteristics. The only approved and demonstrated method of spin recovery is activation of the Cirrus Airframe Parachute System (See *CAPS Deployment*, this section). Because of this, if the aircraft “departs controlled flight”, the CAPS must be deployed.

While the stall characteristics of the SR20 make accidental entry into a spin extremely unlikely, it is possible. Spin entry can be avoided by using good airmanship: coordinated use of controls in turns, proper airspeed control following the recommendations of this Handbook, and never abusing the flight controls with accelerated inputs when close to the stall (see *Stalls*, Section 4).

If, at the stall, the controls are misapplied and abused accelerated inputs are made to the elevator, rudder and/or ailerons, an abrupt wing drop may be felt and a spiral or spin may be entered. In some cases it may be difficult to determine if the aircraft has entered a spiral or the beginning of a spin.

### • WARNING •

In all cases, if the aircraft enters an unusual attitude from which recovery is not expected before ground impact, ***immediate*** deployment of the CAPS is required.

The minimum demonstrated altitude loss for a CAPS deployment from a one-turn spin is 920 feet. Activation at higher altitudes provides enhanced safety margins for parachute recoveries. Do not waste time and altitude trying to recover from a spiral/spin before activating CAPS.

### ***Inadvertent Spin Entry***

1. CAPS ..... Activate



## CAPS Deployment

The Cirrus Airframe Parachute System (CAPS) should be activated in the event of a life-threatening emergency where CAPS deployment is determined to be safer than continued flight and landing.

**• WARNING •**

CAPS deployment is expected to result in loss of the airframe and, depending upon adverse external factors such as high deployment speed, low altitude, rough terrain or high wind conditions, may result in severe injury or death to the occupants. Because of this, CAPS should only be activated when any other means of handling the emergency would not protect the occupants from serious injury.

**• Caution •**

Expected impact in a fully stabilized deployment is equivalent to a drop from approximately 10 feet.

**• Note •**

Several possible scenarios in which the activation of the CAPS would be appropriate are discussed in Section 10 - Safety Information, of this Handbook. These include:

- Mid-air collision
- Structural failure
- Loss of control
- Landing in inhospitable terrain
- Pilot incapacitation

All pilots should carefully review the information on CAPS activation and deployment in Section 10 before operating the airplane.

Once the decision is made to deploy CAPS, the following actions should be taken:

1. Airspeed.....MINIMUM POSSIBLE

*(Continued on following page)*

The maximum demonstrated deployment speed is 135 KIAS. Reducing airspeed allows minimum parachute loads and prevents structural overload and possible parachute failure.

2. Mixture (If time and altitude permit) ..... CUTOFF

Generally, a distressed airplane will be safer for its occupants if the engine is not running.

3. Activation Handle Cover ..... REMOVE

The cover has a handle located at the forward edge. Pull cover down to expose activation T-handle.

4. Activation Handle (Both Hands) ..... PULL STRAIGHT DOWN

Pull the activation T-handle from its holder. Clasp both hands around the handle and pull straight down in a strong, steady, and continuous motion. Maintain maximum pull force until the rocket activates. Pull forces up to, or exceeding, 45 pounds may be required. Bending of the handle-housing mount is to be expected.

**• WARNING •**

Jerking or rapidly pulling the activation T-handle will greatly increase the pull forces required to activate the rocket. Use a firm and steady pulling motion – a “chin-up” type pull enhances successful activation.

*After Deployment:*

5. Mixture ..... CHECK, CUTOFF

6. Fuel Selector ..... OFF

Shutting off fuel supply to engine will reduce the chances of fire resulting from impact at touchdown.

7. Bat-Alt Master Switches ..... OFF

8. Ignition Switch ..... OFF

9. Fuel Pump ..... OFF

10. ELT ..... ON

11. Seat Belts and Harnesses ..... TIGHTEN

*(Continued on following page)*

All occupants must have seat belts and shoulder harness securely fastened.

12. Loose Items ..... SECURE

If time permits, all loose items should be secured to prevent injury from flying objects in the cabin at touchdown.

13. Assume emergency landing body position.

The emergency landing body position is assumed by placing both hands on the lap, clasping one wrist with the opposite hand, and holding the upper torso erect and against the seat backs.

14. After the airplane comes to a complete stop, evacuate quickly and move upwind.

As occupants exit the airplane, the reduced weight may allow winds to drag the airplane further. As a result of landing impact, the doors may jam. If the doors cannot be opened, break out the windows with the egress hammer, located in the console between the front seats, and crawl through the opening.

## Landing Emergencies

If all attempts to restart the engine fail and a forced landing is imminent, select a suitable field and prepare for the landing. If flight conditions or terrain does not permit a safe landing, CAPS deployment may be required. *Refer to Section 10, Safety Information, for CAPS deployment scenarios and landing considerations.*

A suitable field should be chosen as early as possible so that maximum time will be available to plan and execute the forced landing. For forced landings on unprepared surfaces, use full flaps if possible. Land on the main gear and hold the nose wheel off the ground as long as possible. If engine power is available, before attempting an “off airport” landing, fly over the landing area at a low but safe altitude to inspect the terrain for obstructions and surface conditions.

• Note •

Use of full (100%) flaps will reduce glide distance. Full flaps should not be selected until landing is assured.

## **Emergency Landing Without Engine Power**

1. Best Glide Speed ..... ESTABLISH
2. Radio..... Transmit (121.5 MHz) MAYDAY  
giving location and intentions
3. Transponder ..... SQUAWK 7700
4. If off airport, ELT ..... ACTIVATE
5. Power Lever ..... IDLE
6. Mixture ..... CUTOFF
7. Fuel Selector ..... OFF
8. Ignition Switch ..... OFF
9. Fuel Pump..... OFF
10. Flaps (when landing is assured) ..... 100%
11. Master Switches..... OFF
12. Seat Belt(s) ..... SECURED

## Ditching

1. Radio ..... Transmit (121.5 MHz) MAYDAY giving location and intentions
2. Transponder ..... SQUAWK 7700
3. CAPS ..... ACTIVATE  
If available, life preservers should be donned and life raft should be prepared for immediate evacuation upon touchdown.  
Consider unlatching a door prior to assuming the emergency landing body position in order to provide a ready escape path.
4. Airplane.....EVACUATE  
It may be necessary to allow some cabin flooding to equalize pressure on the doors. If the doors cannot be opened, break out the windows with the egress hammer and crawl through the opening.
5. Flotation Devices ..... INFLATE WHEN CLEAR OF AIRPLANE

## Landing Without Elevator Control

The pitch trim spring cartridge is attached directly to the elevator and provides a backup should you lose the primary elevator control system. Set elevator trim for a 80 KIAS approach to landing. Thereafter, do not change the trim setting until in the landing flare. During the flare, the nose-down moment resulting from a power reduction may cause the airplane to hit on the nosewheel. At touchdown, bring the power lever to idle.

1. Flaps ..... SET 50%
2. Trim ..... SET 80 KIAS
3. Power ..... AS REQUIRED FOR GLIDE ANGLE

## System Malfunctions

### Primary Flight Display System

In the unlikely event of a PFD failure, the pilot may lose the ability to control the autopilot through the PFD controls. If this malfunction occurs, the PFD circuit breakers may be pulled and the airplane flown using the mechanical standby instruments. With the PFD circuit breakers pulled, autopilot lateral control is available in GPSS steering mode through GPS 1 and autopilot vertical control is available through the Vertical Speed (VS) and Altitude (ALT) modes on the autopilot head. Dim brightness level to black if PFD is found distracting.

#### **PFD - Loss of Air Data**

In the event the PFD detects a loss of air data, the affected indicator is removed from the display and replaced with a red "X". If loss of air data occurs, refer to the mechanical standby instruments (altitude, airspeed) and perform the following procedure:

1. Land as soon as practical.
2. Standby Instruments (altitude, airspeed) ..... MONITOR  
*If failure occurs while flying in IMC:*
3. Exit IMC.

#### **PFD - Loss of Attitude Data**

In the event the PFD detects a loss of attitude data, the affected indicator is removed from the display and replaced with a red "X". If loss of attitude data occurs, refer to the mechanical standby instruments (attitude, heading) and perform the following procedure:

1. Standby Instruments (attitude, heading) ..... MONITOR  
*If failure occurs while flying in IMC:*
2. Autopilot GPSS Mode ..... ACTIVATE
3. Autopilot Altitude Hold ..... ACTIVATE
4. Exit IMC.

**• WARNING •**

*Aircraft equipped with Software Version 530-00123-000 Rev 00 or higher; Any power interruption to the PFD will result in*

loss of attitude information until the PFD can be restarted on the ground.

*Aircraft equipped with Software Version 530-00159-000 Rev 00 or higher;* When subjected to a power loss of less than 20 seconds, the PFD is capable of performing a warm start. In this event, a “PLEASE STANDBY” message will be displayed for 2 seconds followed by a “ATTEMPTING QUICK RESTART” message. In the event of a power loss greater than 20 seconds, a warm start is unlikely, and the power interruption will result in loss of attitude information until the PFD can be restarted on the ground.

### **Power Lever Linkage Failure**

If the Power Lever linkage fails in flight, the engine will not respond to power lever control movements. Use power available and flaps as required to safely land the airplane.

If the power lever is stuck at or near the full power position, proceed to a suitable airfield. Fly a forced landing pattern. With landing assured, shut down engine by moving mixture control full aft to CUTOFF. If power is needed again, return mixture control to full RICH and regain safe pattern parameters or go-around. If airspeed cannot be controlled, shut engine down and perform the *Forced Landing* checklist. After landing, bring the airplane to a stop and complete the *Emergency Engine Shutdown on Ground* checklist.

If the power lever is stuck at or near the idle position and straight and level flight cannot be maintained, establish glide to a suitable landing surface. Fly a forced landing pattern.

1. Power Lever Movement..... VERIFY
2. Power .....SET if able
3. Flaps ..... SET if needed
4. Mixture ..... AS REQUIRED (full rich to cut-off)
5. Land as soon as possible.

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# **Section 3A**

## **Abnormal Procedures**

### **Table of Contents**

Introduction .....	3A-3
Abnormal Procedures Guidance .....	3A-4
Ground Procedures.....	3A-5
Brake Failure During Taxi .....	3A-5
Aborted Takeoff .....	3A-5
In-Flight Procedures.....	3A-6
Inadvertent Icing Encounter .....	3A-6
Inadvertent IMC Encounter.....	3A-6
Door Open In Flight .....	3A-6
Landing Procedures.....	3A-7
Landing With Failed Brakes.....	3A-7
Landing With Flat Tire.....	3A-7
System Malfunctions.....	3A-9
Alternator Failure .....	3A-9
Engine Indicating System Failure .....	3A-11
LOW VOLTS Warning Light Illuminated .....	3A-11
Communications Failure .....	3A-12
Pitot Static Malfunction .....	3A-13
Electric Trim/Autopilot Failure .....	3A-14

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## **Introduction**

This section provides procedures for handling abnormal system and/or flight conditions which, if followed, will maintain an acceptable level of airworthiness or reduce operational risk. The guidelines described in this section are to be used when an abnormal condition exists and should be considered and applied as necessary.

## Abnormal Procedures Guidance

Although this section provides procedures for handling most abnormal system and/or flight conditions that could arise in the SR20, it is not a substitute for thorough knowledge of the airplane and general aviation techniques. A thorough study of the information in this handbook while on the ground will help you prepare for time-critical situations in the air.

Sound judgement as well as thorough knowledge of the aircraft, its characteristics, and the flight manual procedures are essential in the handling of any abnormal system and/or flight condition. In addition to the outlined items in the Abnormal Procedures, the following steps are considered part of all abnormal situations:

- Maintain Aircraft Control
- Analyze the Situation
- Take Appropriate Action

## Ground Procedures

### **Brake Failure During Taxi**

Ground steering is accomplished by differential braking. However, increasing power may allow some rudder control due to increased groundspeed and airflow over the rudder.

1. Engine Power..... AS REQUIRED
    - To stop airplane - REDUCE
    - If necessary for steering - INCREASE
  2. Directional Control .....MAINTAIN WITH RUDDER
  3. Brake Pedal(s) .....PUMP
- If directional control can not be maintained:*
4. Mixture .....CUTOFF

### **Aborted Takeoff**

Use as much of the remaining runway as needed to safely bring the airplane to a stop or to slow the airplane sufficiently to turn off the runway.

1. Power Lever ..... IDLE
2. Brakes..... AS REQUIRED

#### **• Caution •**

For maximum brake effectiveness, retract flaps, hold control yoke full back, and bring the airplane to a stop by smooth, even application of the brakes to avoid loss of control and/or a blown tire.

After a high-speed aborted takeoff, brake temperatures will be elevated; subsequent aborted takeoffs or other high-energy use of the brakes may cause brake overheat, failure and possibly even fire. A 25-minute cooling time is recommended following high-energy use of the brake system before attempting to conduct operations that may require further high-energy braking. Brake temperature indicator should be inspected prior to flight following a high-energy brake event (refer to Preflight Walk-Around Checklist for detail).

## In-Flight Procedures

### **Inadvertent Icing Encounter**

Flight into known icing conditions is prohibited. However, If icing is inadvertently encountered:

1. Pitot Heat ..... ON
2. Exit icing conditions. Turn back or change altitude.
3. Cabin Heat ..... MAXIMUM
4. Windshield Defrost ..... FULL OPEN
5. Alternate Induction Air ..... ON

### **Inadvertent IMC Encounter**

Upon entering IMC, a pilot who is not completely proficient in instrument flying should rely upon the autopilot to execute a 180° turn to exit the conditions. Immediate action should be made to turn back as follows:

1. Airplane Control ..... Establish Straight and Level Flight
2. Autopilot ..... Engage to hold Heading and Altitude
3. Heading ..... Reset to initiate 180° turn

### **Door Open In Flight**

The doors on the airplane will remain 1-3 inches open in flight if not latched. If this is discovered on takeoff roll, abort takeoff if practical. If already airborne do not allow efforts to close the door interfere with the primary task of maintaining control of the airplane. Do not attempt to hold door closed. Upon landing flare door may swing open - do not attempt to close door.

1. Airplane Control ..... MAINTAIN

## Landing Procedures

### Landing With Failed Brakes

#### ***One brake inoperative***

1. Land on the side of runway corresponding to the inoperative brake.
2. Maintain directional control using rudder and working brake.

#### ***Both brakes inoperative***

1. Divert to the longest, widest runway with the most direct headwind.
2. Land on downwind side of the runway.
3. Use the rudder for obstacle avoidance.

• Note •

Rudder effectiveness will decrease with decreasing airspeed.

4. Perform *Emergency Engine Shutdown on Ground* checklist.

### Landing With Flat Tire

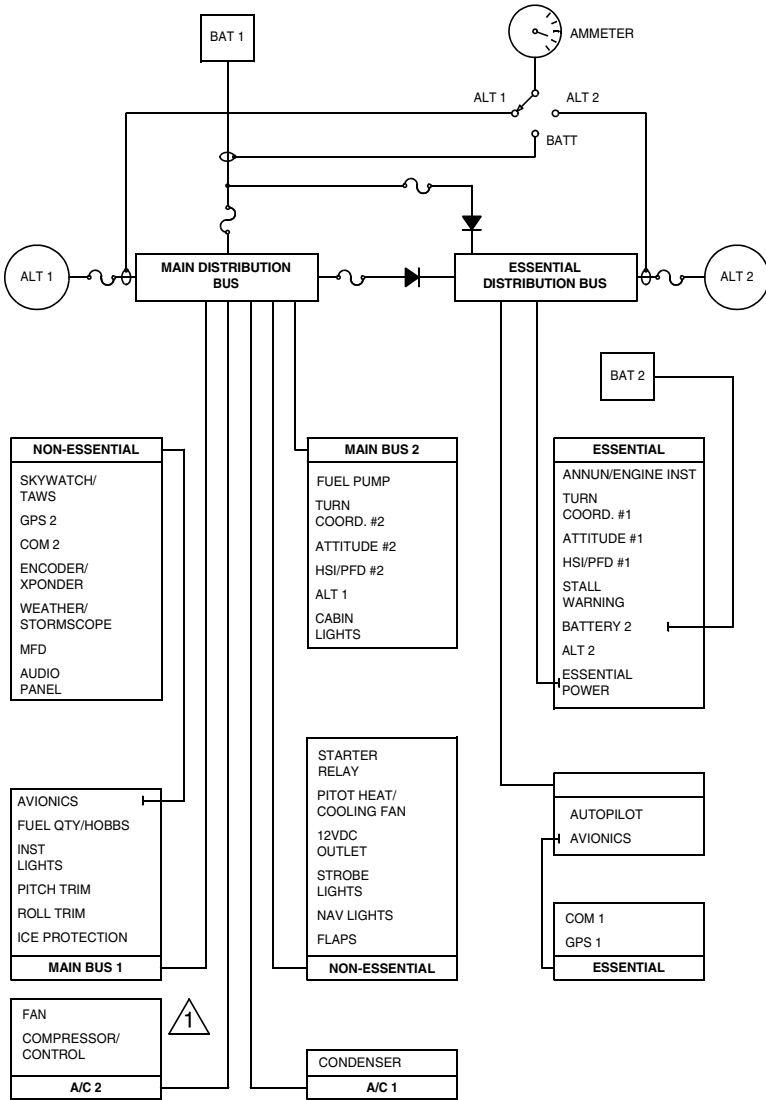
If a flat tire or tread separation occurs during takeoff and you cannot abort, land as soon as conditions permit.

#### ***Main Gear***

1. Land on the side of the runway corresponding to the good tire.
2. Maintain directional control with the brakes and rudder.
3. Do not taxi. Stop the airplane and perform a normal engine shutdown.

#### ***Nose Gear***

1. Land in the center of the runway.
2. Hold the nosewheel off the ground as long as possible.
3. Do not taxi. Stop the airplane and perform a normal engine shutdown.



**NOTE**

1 Serials 1633, 1639 & subs with optional Blower Fan installed.

SR20\_FM03\_1453E

**Figure 3A-1**  
**Electrical Power Distribution (Simplified)**



## System Malfunctions

### Alternator Failure

Steady illumination of either ALT caution light in the annunciator panel indicates a failure of the corresponding alternator. The most likely the cause of the alternator failure is a wiring fault, a malfunctioning alternator, or a malfunctioning control unit. Usually, electrical power malfunctions are accompanied by an excessive rate of charge or a discharge rate shown on the ammeter.

#### • Caution •

Alternators in this airplane are self-exciting. These alternators require battery power for alternator starting; however, once started, the alternators will provide self-generated field power to continue operation in case of a battery failure. To assure alternator restart power is available if the alternators fail, the batteries should not be turned off during flight.

*Serials 1005 thru 1581:* A flashing ALT 1 light indicates an excessive charging rate. This could occur with a very low BAT 1 and heavy equipment loads. Since the loads on ALT 2 are much lower, it is unlikely that a flashing ALT 2 light could occur, even with a very low BAT 2.

The Power Distribution Schematic shows the electrical system power distribution. Individual loads on each circuit breaker panel bus are shown in the same order as they are on the panel. Note that items on the circuit breaker panel Essential buses are powered from ALT 1, ALT 2, BAT 1, and BAT 2. The circuit breaker panel Main buses and Non-Essential buses are powered from ALT 1 and BAT 1 only.

#### • Note •

If it is necessary to reduce electrical loads due to an alternator malfunction, switch off electrical components and/or systems that are not essential for the current flight conditions rather than pulling circuit breakers. Load shedding in this manner will prevent accidental circuit breaker disconnection and loss of power to flight-critical systems. See Figure Electrical Power Distribution, for details on electrical busses and what components/systems they power.

**ALT 1 Light Steady**

Steady illumination indicates a failure of ALT 1. Attempt to bring alternator back on line. If alternator cannot be brought back, reduce loads and use Main Bus or Non-Essential loads only as necessary for flight conditions.

1. ALT 1 Master Switch .....OFF
2. Alternator 1 Circuit Breaker..... CHECK and RESET
3. ALT 1 Master Switch ..... ON

*If alternator does not reset:*

4. Switch off unnecessary equipment on Main Bus 1, Main Bus 2, and the Non-Essential Buses to reduce loads. Monitor voltage.
5. ALT 1 Master Switch .....OFF
6. Land as soon as practical.

**ALT 1 Light Flashing**

**|** *Serials 1005 thru 1581:* The most likely cause is a severely discharged battery along with heavy equipment loads. In this event, reduce loads on Main and Non-Essential buses and monitor amperage until charging rate is within normal limits. Then loads can be added as required.

1. Ammeter Switch ..... BATT
2. If charging rate is greater than 30 amps, reduce load on Main Bus 1, Main Bus 2, and Non-Essential buses.
3. Monitor ammeter until battery charge rate is less than 15 amps.
4. When battery charge rate is within limits, add loads as necessary for flight conditions.

**ALT 2 Light Steady**

Except during low RPM operations, steady illumination indicates a failure of ALT 2. If alternator cannot be brought back, Essential bus loads will be powered from ALT 1, BAT 1, and BAT 2.

• Note •

ALT 2 light will illuminate steady and ALT 2 will not come on line until 1700 - 2200 RPM.

1. ALT 2 Master Switch .....OFF

2. Alternator 2 Circuit Breaker ..... CHECK and RESET
3. ALT 2 Master Switch .....ON

*If alternator does not reset:*

4. Switch off unnecessary equipment on Main Bus 1, Main Bus 2, and Non-Essential Buses to reduce loads.
5. ALT 2 Master Switch ..... OFF
6. Land as soon as practical.

## **Engine Indicating System Failure**

*Serials 1582 and Subsequent:* In the event of an Data Acquisition Unit (DAU) failure, the engine indications displayed on the MFD and PFD will be disabled. Numeric readouts will display as three white dashes, the CHT and EGT bar graphs will be removed, and indicator needles displayed on the simulated gages will be removed.

In the event of DAU failure, pull and reset the ANNUN / ENGINE INST circuit breaker. If the engine indicating system fails to reset, land as soon as practical.

1. ANNUN / ENGINE INST Circuit Breaker ..... Cycle
2. Land as soon as practical.

## **LOW VOLTS Warning Light Illuminated**

Illumination of the LOW VOLTS light indicates that the voltage measured at the Essential Bus is 24.5 volts or less. Typically, this indicates that the airplane is operating on battery power only and both alternators have failed or are off. If both alternators have failed:

1. Land as soon as practical.

## Communications Failure

Communications failure can occur for a variety of reasons. If, after following the checklist procedure, communication is not restored, proceed with FAR/AIM lost communications procedures.

• Note •

In the event of an audio panel power failure the audio panel connects COM 1 to the pilot's headset and speakers. Setting the audio panel 'Off' will also connect COM 1 to the pilot's headsets and speakers.

1. Switches, Controls ..... CHECK
2. Frequency ..... CHANGE
3. Circuit Breakers..... CHECK
4. Headset..... CHANGE
5. Hand Held Microphone ..... CONNECT

## Pitot Static Malfunction

### ***Static Source Blocked***

If erroneous readings of the static source instruments (airspeed, altimeter and vertical speed) are suspected, the alternate static source valve, on side of console near pilot’s right ankle, should be opened to supply static pressure from the cabin to these instruments.

• Note •

If selecting the alternate static source does not work, in an emergency, cabin pressure can be supplied to the static pressure instruments by breaking the glass in the face of the vertical speed indicator. When static pressure is supplied through the vertical speed indicator, the vertical speed UP-DOWN indications will be reversed (i.e., the needle will indicate UP for descent and DOWN for climb).

With the alternate static source on, adjust indicated airspeed slightly during climb or approach according to the Airspeed Calibration (Alternate Static Source) table in Section 5 as appropriate for vent/heater configuration.

1. Pitot Heat .....ON
2. Alternate Static Source ..... OPEN

### ***Pitot Tube Blocked***

If only the airspeed indicator is providing erroneous information, and in icing conditions, the most probable cause is pitot ice. If setting Pitot Heat ON does not correct the problem, descend to warmer air. If an approach must be made with a blocked Pitot tube, use known pitch and power settings and the GPS groundspeed indicator, taking surface winds into account.

1. Pitot Heat .....ON

## Electric Trim/Autopilot Failure

Any failure or malfunction of the electric trim or autopilot can be overridden by use of the control yoke. If runaway trim is the problem, de-energize the circuit by pulling the circuit breaker (PITCH TRIM, ROLL TRIM, or AUTOPILOT) and land as soon as conditions permit.

1. Airplane Control ..... MAINTAIN MANUALLY
2. Autopilot (if engaged) ..... Disengage

*If Problem Is Not Corrected:*

3. Circuit Breakers..... PULL AS Required
  - PITCH TRIM
  - ROLL TRIM
  - AUTOPILOT
4. Power Lever ..... AS REQUIRED
5. Control Yoke ..... MANUALLY HOLD PRESSURE
6. Land as soon as practical.

# **Section 4**

## **Normal Procedures**

### **Table of Contents**

Introduction .....	4-3
Airspeeds for Normal Operation .....	4-4
Normal Procedures .....	4-5
Preflight Inspection .....	4-5
Preflight Walk-Around .....	4-6
Before Starting Engine .....	4-10
Starting Engine .....	4-11
Before Taxiing .....	4-13
Taxiing .....	4-13
Before Takeoff .....	4-14
Takeoff .....	4-16
Normal Takeoff .....	4-17
Short Field Takeoff .....	4-17
Climb .....	4-18
Cruise .....	4-19
Cruise Leaning .....	4-20
Descent .....	4-21
Before Landing .....	4-21
Landing .....	4-21
Balked Landing/Go-Around .....	4-22
After Landing .....	4-23
Shutdown .....	4-23
Stalls .....	4-24
Environmental Considerations .....	4-25
Cold Weather Operation .....	4-25
Hot Weather Operation .....	4-27
Noise Characteristics/Abatement .....	4-28
Fuel Conservation .....	4-29

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## Introduction

This section provides amplified procedures for normal operation. Normal procedures associated with optional systems can be found in Section 9.

• Note •

*Serials 1337 and subsequent with SRV standard configuration:* The airplane is equipped with a single alternator, dual battery electrical system. References to Alternator 2 in the following section do not apply.

## Airspeeds for Normal Operation

Unless otherwise noted, the following speeds are based on a maximum weight of 3000 lb. and may be used for any lesser weight. However, to achieve the performance specified in Section 5 for takeoff distance, the speed appropriate to the particular weight must be used.

### Takeoff Rotation:

- Normal, Flaps 50% .....67 KIAS
- Short Field, Flaps 50% .....65 KIAS
- Obstacle Clearance, Flaps 50% .....75 KIAS

### Enroute Climb, Flaps Up:

- Normal, SL .....105 KIAS
- Normal, 10,000' .....95 KIAS
- Best Rate of Climb, SL .....96 KIAS
- Best Rate of Climb, 10,000' .....91 KIAS
- Best Angle of Climb, SL .....81 KIAS
- Best Angle of Climb, 10,000' .....85 KIAS

### Landing Approach:

- Normal Approach, Flaps Up .....85 KIAS
- Normal Approach, Flaps 50% .....80 KIAS
- Normal Approach, Flaps 100% .....75 KIAS
- Short Field, Flaps 100% .....75 KIAS

### Go-Around, Flaps 50%:

- Full Power .....75 KIAS

### Maximum Recommended Turbulent Air Penetration:

- 3000 Lb.....131 KIAS
- 2600 Lb.....122 KIAS
- 2200 Lb.....111 KIAS

### Maximum Demonstrated Crosswind Velocity:

- Takeoff or Landing .....21 Knots

## Normal Procedures

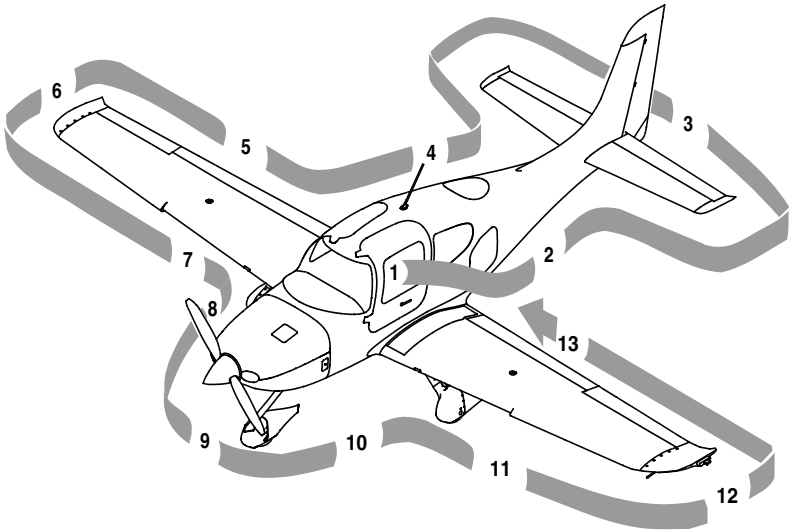
### Preflight Inspection

Before carrying out preflight inspections, ensure that all required maintenance has been accomplished. Review your flight plan and compute weight and balance.

• Note •

Throughout the walk-around: check all hinges, hinge pins, and bolts for security; check skin for damage, condition, and evidence of delamination; check all control surfaces for proper movement and excessive free play; check area around liquid reservoirs and lines for evidence of leaking.

In cold weather, remove all frost, ice, or snow from fuselage, wing, stabilizers and control surfaces. Ensure that control surfaces are free of internal ice or debris. Check that wheel fairings are free of snow and ice accumulation. Check that pitot probe warms within 30 seconds of setting Pitot Heat to ON.



SR20\_FM04\_1001

**Figure 4-1**  
**Walk-Around**

## Preflight Walk-Around

1. Cabin
  - a. Required Documents ..... On Board
  - b. Avionics Power Switch ..... OFF
  - c. Bat 2 Master Switch ..... ON
  - d. PFD - *Serials 1337 and subsequent with PFD* ..... Verify On
  - e. Avionics Cooling Fan ..... Audible
  - f. Voltmeter ..... 23-25 Volts
  - g. Flap Position Light ..... OUT
  - h. Bat 1 Master Switch ..... ON
  - i. Lights ..... Check Operation
  - j. Stall Warning ..... Test

• Note •

Test stall warning system by applying suction to the stall warning system inlet and noting the warning horn sounds.

- k. Fuel Quantity ..... Check
  - l. Fuel Selector ..... Select Fullest Tank
  - m. Flaps ..... 100%, Check Light ON
  - n. Oil Annunciator ..... On
  - o. Bat 1 and 2 Master Switches ..... OFF
  - p. Alternate Static Source ..... NORMAL
  - q. Circuit Breakers ..... IN
  - r. Fire Extinguisher ..... Charged and Available
  - s. Emergency Egress Hammer ..... Available
  - t. CAPS Handle ..... Pin Removed
2. Left Fuselage
  - a. Door Lock ..... Unlock
  - b. COM 1 Antenna (top) ..... Condition and Attachment
  - c. Wing/Fuselage Fairing ..... Check

- d. COM 2 Antenna (underside) .....Condition and Attachment
  - e. Baggage Door ..... Closed and Secure
  - f. Static Button ..... Check for Blockage
  - g. Parachute Cover ..... Sealed and Secure
3. Empennage
- a. Tiedown Rope ..... Remove
  - b. Horizontal and Vertical Stabilizers ..... Condition
- Note •
- Verify tape covering the forward and aft inspection holes located on outboard ends of horizontal stabilizer is installed and securely attached.
- c. Elevator and Tab ..... Condition and Movement
  - d. Rudder ..... Freedom of Movement
  - e. Rudder Trim Tab ..... Condition and Security
  - f. Attachment hinges, bolts and cotter pins .....Secure
4. Right Fuselage
- a. Static Button ..... Check for Blockage
  - b. Wing/Fuselage Fairings ..... Check
  - c. Door Lock ..... Unlock
5. Right Wing Trailing Edge
- a. Flap and Rub Strips (if installed) ..... Condition and Security
  - b. Aileron and Tab ..... Condition and Movement
  - c. Hinges, actuation arm, bolts, and cotter pins .....Secure
6. Right Wing Tip
- a. Tip ..... Attachment
  - b. Strobe, Nav Light and Lens ..... Condition and Security
  - c. Fuel Vent (underside) .....Unobstructed
7. Right Wing Forward and Main Gear
- a. Leading Edge and Stall Strips ..... Condition

*(Continued on following page)*

- b. Fuel Cap ..... Check Quantity and Secure
- c. Fuel Drains (2 underside) ..... Drain and Sample
- d. Wheel Fairings ..... Security, Accumulation of Debris
- e. Tire ..... Condition, Inflation, and Wear

• **Caution** •

*Serials 1005 through 1592 after Service Bulletin SB 2X-32-14 and airplane serials 1593 and subsequent:* Clean and inspect temperature indicator installed to piston housing. If indicator center is black, the brake assembly has been overheated. The brake linings must be inspected and O-rings replaced.

- f. Wheel and Brakes ..... Fluid Leaks, Evidence of Overheating, General Condition, and Security.
  - g. Chocks and Tiedown Ropes ..... Remove
  - h. Cabin Air Vent ..... Unobstructed
8. Nose, Right Side
- a. Cowling ..... Attachments Secure
  - b. Exhaust Pipe ..... Condition, Security, and Clearance
  - c. Transponder Antenna (underside) .. Condition and Attachment
  - d. Gascolator (underside) ..... Drain for 3 seconds, Sample
9. Nose gear, Propeller, and Spinner

• **WARNING** •

Keep clear of propeller rotation plane. Do not allow others to approach propeller.

- a. Tow Bar ..... Remove and Stow
- b. Strut ..... Condition

• **Note** •

*Serials 1337 and subsequent with SRV standard configuration:* The airplane is not equipped with a nose wheel fairing.

- c. Wheel Fairing ..... Security, Accumulation of Debris
- d. Wheel and Tire ..... Condition, Inflation, and Wear

- e. Propeller ..... Condition (indentations, nicks, etc.)
  - f. Spinner ..... Condition, Security, and Oil Leaks
  - g. Air Inlets ..... Unobstructed
  - h. Alternator Belt.....Condition and Tension
10. Nose, Left Side
- a. Landing Light..... Condition
  - b. Engine Oil..... Check 6-8 quarts, Leaks, Cap & Door Secure
  - c. Cowling.....Attachments Secure
  - d. External Power ..... Door Secure
  - e. Exhaust Pipe ..... Condition, Security, and Clearance
11. Left Main Gear and Forward Wing
- a. Wheel fairings..... Security, Accumulation of Debris
  - b. Tire ..... Condition, Inflation, and Wear

**• Caution •**

*Serials 1005 through 1592 after Service Bulletin SB 2X-32-14 and airplane serials 1593 and subsequent: Clean and inspect temperature indicator installed to piston housing. If indicator center is black, the brake assembly has been overheated. The brake linings must be inspected and O-rings replaced.*

- c. Wheel and Brakes ..... Fluid Leaks, Evidence of Overheating, General Condition, and Security.
  - d. Chocks and Tiedown Ropes..... Remove
  - e. Fuel Drains (2 underside) ..... Drain and Sample
  - f. Cabin Air Vent.....Unobstructed
  - g. Fuel Cap..... Check Quantity and Secure
  - h. Leading Edge and Stall Strips ..... Condition
12. Left Wing Tip
- a. Fuel Vent (underside) .....Unobstructed
  - b. Pitot Mast (underside) ..... Cover Removed, Tube Clear
  - c. Strobe, Nav Light and Lens ..... Condition and Security

*(Continued on following page)*

- d. Tip .....Attachment
13. Left Wing Trailing Edge
- a. Flap And Rub Strips (If installed).....Condition and Security
  - b. Aileron ..... Freedom of movement
  - c. Hinges, actuation arm, bolts, and cotter pins ..... Secure

### Before Starting Engine

- 1. Preflight Inspection ..... COMPLETED

**• WARNING •**

Ensure that the airplane is properly loaded and within the AFM's weight and balance limitations prior to takeoff.

- 2. Weight and Balance .....Verify within limits
- 3. Emergency Equipment.....ON BOARD
- 4. Passengers ..... BRIEFED

**• Note •**

Ensure all the passengers have been fully briefed on smoking, the use of the seat belts, doors, emergency exits, egress hammer, and CAPS.

Verify CAPS handle safety pin is removed.

- 5. Seats, Seat Belts, and Harnesses .....ADJUST & SECURE

**• Caution •**

Crew seats must be locked in position and control handles fully down before flight. Ensure seat belt harnesses are not twisted.



## Starting Engine

If the engine is warm, no priming is required. For the first start of the day and in cold conditions, prime will be necessary.

Weak intermittent firing followed by puffs of black smoke from the exhaust stack indicates over-priming or flooding. Excess fuel can be cleared from the combustion chambers by the following procedure:

- Turn fuel pump off.
- Allow fuel to drain from intake tubes.
- Set the mixture control full lean and the power lever full open.
- Crank the engine through several revolutions with the starter.
- When engine starts, release ignition switch, retard power lever, and slowly advance the mixture control to FULL RICH position.

If the engine is under-primed, especially with a cold soaked engine, it will not fire, and additional priming will be necessary. As soon as the cylinders begin to fire, open the power lever slightly to keep it running.

*Refer to Cold Weather Operation* in this section or additional information regarding cold weather operations.

### • WARNING •

If airplane will be started using external power, keep all personnel and power unit cables well clear of the propeller rotation plane.

### • Caution •

Alternators should be left OFF during engine starting to avoid high electrical loads.

After starting, if the oil gage does not begin to show pressure within 30 seconds in warm weather and about 60 seconds in very cold weather, shut down engine and investigate cause. Lack of oil pressure indicates loss of lubrication, which can cause severe engine damage.

1. External Power (If applicable) ..... CONNECT
2. Brakes ..... HOLD
3. Bat Master Switches ..... ON (Check Volts)

- 4. Strobe Lights ..... ON
- 5. Mixture ..... FULL RICH
- 6. Power Lever ..... FULL FORWARD
- 7. Fuel Pump ..... PRIME, then BOOST

• Note •

On first start of the day, especially under cool ambient conditions, holding Fuel Pump switch to PRIME for 2 seconds will improve starting.

- 8. Propeller Area ..... CLEAR
- 9. Power Lever ..... OPEN ¼ INCH
- 10. Ignition Switch ..... START (Release after engine starts)

• Caution •

Limit cranking to intervals of 20 seconds with a 20 second cooling period between cranks. This will improve battery and contactor life.

- 11. Power Lever ..... RETARD (to maintain 1000 RPM)
- 12. Oil Pressure ..... CHECK
- 13. Alt Master Switches ..... ON
- 14. Avionics Power Switch ..... ON
- 15. Engine Parameters ..... MONITOR
- 16. External Power (If applicable) ..... DISCONNECT
- 17. Amp Meter/Indication ..... CHECK

## Before Taxiing

1. Flaps ..... UP (0%)
2. Radios/Avionics ..... AS REQUIRED
3. Cabin Heat/Defrost ..... AS REQUIRED
4. Fuel Selector ..... SWITCH TANK

## Taxiing

When taxiing, directional control is accomplished with rudder deflection and intermittent braking (toe taps) as necessary. Use only as much power as is necessary to achieve forward movement. Deceleration or taxi speed control using brakes but without a reduction in power will result in increased brake temperature. Taxi over loose gravel at low engine speed to avoid damage to the propeller tips.

### • WARNING •

Maximum continuous engine speed for taxiing is 1000 RPM on flat, smooth, hard surfaces. Power settings slightly above 1000 RPM are permissible to start motion, for turf, soft surfaces, and on inclines. Use minimum power to maintain taxi speed.

If the 1000 RPM taxi power limit and proper braking procedures are not observed, the brake system may overheat and result in brake damage or brake fire.

1. Parking Brake ..... DISENGAGE
2. Brakes ..... CHECK
3. Directional Gyro/HSI Orientation ..... CHECK
4. Attitude Gyro ..... CHECK
5. Turn Coordinator ..... CHECK

## Before Takeoff

During cold weather operations, the engine should be properly warmed up before takeoff. In most cases this is accomplished when the oil temperature has reached at least 100° F (38° C). In warm or hot weather, precautions should be taken to avoid overheating during prolonged ground engine operation. Additionally, long periods of idling may cause fouled spark plugs.

### • WARNING •

Do not takeoff with frost, ice, snow, or other contamination on the fuselage, wing, stabilizers, and control surfaces.

1. Doors ..... LATCHED
  2. CAPS Handle ..... Verify Pin Removed
  3. Seat Belts and Shoulder Harness ..... SECURE
  4. Fuel Quantity ..... CONFIRM
  5. Fuel Selector ..... FULLEST TANK
  6. Fuel Pump ..... ON
  7. Flaps ..... SET 50% & CHECK
  8. Transponder ..... SET
  9. Autopilot ..... CHECK
  10. Navigation Radios/GPS ..... SET for Takeoff
  11. Cabin Heat/Defrost ..... AS REQUIRED
  12. Brakes ..... HOLD
  13. Power Lever ..... 1700 RPM
  14. Alternator ..... CHECK
    - a. Pitot Heat ..... ON
    - b. Navigation Lights ..... ON
    - c. Landing Light ..... ON
    - d. Annunciator Lights ..... CHECK
- Verify both ALT 1 and ALT 2 caution lights out and positive amps indication for each alternator. If necessary, increase RPM

to extinguish ALT 2 caution light. ALT 2 caution light should go out below 2200 RPM.

- 15. Voltage ..... CHECK
- 16. Pitot Heat ..... AS REQUIRED

• Note •

Pitot Heat should be turned ON for flight into IMC, flight into visible moisture, or whenever ambient temperatures are 41° F (5° C) or less.

- 17. Navigation Lights ..... AS REQUIRED
- 18. Landing Light ..... AS REQUIRED
- 19. Magnetos ..... CHECK Left and Right
  - a. Ignition Switch ..... R, note RPM, then BOTH
  - b. Ignition Switch ..... L, note RPM, then BOTH

• Note •

RPM drop must not exceed 150 RPM for either magneto. RPM differential must not exceed 75 RPM between magnetos. If there is a doubt concerning operation of the ignition system, RPM checks at higher engine speeds will usually confirm whether a deficiency exists.

An absence of RPM drop may indicate faulty grounding of one side of the ignition system or magneto timing set in advance of the specified setting.

- 20. Engine Parameters ..... CHECK
- 21. Power Lever ..... 1000 RPM
- 22. Flight Instruments, HSI, and Altimeter ..... CHECK & SET
- 23. Flight Controls..... FREE & CORRECT
- 24. Trim ..... SET Takeoff
- 25. Autopilot ..... DISCONNECT

## Takeoff

• Note •

The engine is equipped with an altitude compensating fuel pump that automatically provides the proper full rich mixture. Because of this, the mixture should be left full rich for takeoff, even at high altitude airfields.

**Power Check:** Check full-throttle engine operation early in takeoff run. The engine should run smoothly and turn approximately 2700 RPM. All engine parameters should read in the green. Discontinue takeoff at any sign of rough operation or sluggish acceleration. Make a thorough full-throttle static runup before attempting another takeoff.

For takeoff over a gravel surface, advance Power Lever slowly. This allows the airplane to start rolling before high RPM is developed, and gravel will be blown behind the propeller rather than pulled into it.

**Flap Settings:** Normal and short field takeoffs are accomplished with flaps set at 50%. Takeoffs using 0% are permissible, however, no performance data is available for takeoffs in the flaps up configuration. Takeoffs with 100% flaps are not approved.

Soft or rough field takeoffs are performed with 50% flaps by lifting the airplane off the ground as soon as practical in a tail-low attitude. If no obstacles are ahead, the airplane should be leveled off immediately to accelerate to a higher climb speed.

Takeoffs into strong crosswinds are normally performed with the flaps set at 50% to minimize the drift angle immediately after takeoff. With the ailerons fully deflected into the wind, accelerate the airplane to a speed slightly higher than normal while decreasing the aileron deflection as speed increases then - with authority - rotate to prevent possibly settling back to the runway while drifting. When clear of the ground, make a coordinated turn into the wind to correct for drift.

• Note •

Fuel BOOST should be left ON during takeoff and for climb as required for vapor suppression with hot or warm fuel.

### Normal Takeoff

1. Brakes..... RELEASE (Steer with Rudder Only) |
2. Power Lever ..... FULL FORWARD
3. Engine Parameters ..... CHECK |
4. Elevator Control ..... ROTATE Smoothly at 65-70 KIAS
5. At 85 KIAS, Flaps..... UP

### Short Field Takeoff

1. Flaps ..... 50%
2. Brakes ..... HOLD
3. Power Lever ..... FULL FORWARD
4. Engine Parameters ..... CHECK |
5. Brakes..... RELEASE (Steer with Rudder Only)
6. Elevator Control ..... ROTATE Smoothly at 65 KIAS
7. Airspeed at Obstacle ..... 75 KIAS

## Climb

Normal climbs are performed flaps UP (0%) and full power at speeds 5 to 10 knots higher than best rate-of-climb speeds. These higher speeds give the best combination of performance, visibility and engine cooling.

For maximum rate of climb, use the best rate-of-climb speeds shown in the rate-of-climb chart in Section 5. If an obstruction dictates the use of a steep climb angle, the best angle-of-climb speed should be used. Climbs at speeds lower than the best rate-of-climb speed should be of short duration to avoid engine-cooling problems.

• Note •

The engine is equipped with an altitude compensating fuel pump that automatically provides the proper full rich mixture for climb. The mixture for climb should be left full rich.

1. Climb Power ..... SET
2. Flaps ..... Verify UP
3. Mixture ..... FULL RICH
4. Engine Parameters ..... CHECK
5. Fuel Pump..... OFF

• Note •

Fuel BOOST should be left ON during takeoff and for climb as required for vapor suppression with hot or warm fuel.



## Cruise

Normal cruising is performed between 55% and 75% power. The engine power setting and corresponding fuel consumption for various altitudes and temperatures can be determined by using the cruise data in Section 5.

The selection of cruise altitude is made on the basis of the most favorable wind conditions and the use of low power settings. These significant factors should be considered on every trip to reduce fuel consumption.

• Note •

For engine break-in, cruise at a minimum of 75% power until the engine has been operated for at least 25 hours or until oil consumption has stabilized. Operation at this higher power will ensure proper seating of the rings, is applicable to new engines, and engines in service following cylinder replacement or top overhaul of one or more cylinders.

- 1. Fuel Pump ..... OFF

• Note •

The Fuel Pump may be used for vapor suppression during cruise.

- 2. Cruise Power..... SET
- 3. Mixture .....LEAN as required
- 4. Engine Parameters ..... MONITOR

• Note •

Fuel BOOST must be used for switching from one tank to another. Failures to activate the Fuel Pump before transfer could result in delayed restart if the engine should quit due to fuel starvation.

- 5. Fuel Flow and Balance ..... MONITOR

## Cruise Leaning

The engine is equipped with an altitude compensating fuel pump that automatically provides the proper full rich mixture. Because of this, the mixture should be set to full rich to allow the aneroid to provide auto leaning for the engine during all flight conditions. If additional cruise leaning beyond that provided by the aneroid is desired, be advised that there may not be a 75° temperature rise from full rich to peak. This is acceptable provided the airplane is at 75% power or less and engine temperatures are within limits.

### • Caution •

If moving the mixture control from the full rich position only decreases the EGT from the full rich value, place the mixture control back in the full forward position and have the fuel system serviced.

### • Note •

*Serials 1337 thru 1581 with SRV standard configuration:* The airplane is not equipped with an EGT/CHT gage. To lean the engine for cruise, pull the mixture lever towards CUTOFF until engine runs rough and then push the mixture lever towards FULL RICH until engine operation smooths out.

Exhaust gas temperature (EGT) may be used as an aid for mixture leaning in cruise flight. **For “Best Power” use 75% power or less. For “Best Economy” use 65% power or less.** To adjust the mixture, lean to establish the peak EGT as a reference point and then adjust the mixture by the desired increment based on the following table:

Mixture Description	Exhaust Gas Temperature
Best Power	75° F Rich Of Peak EGT
Best Economy	50° F Lean Of Peak EGT

Under some conditions, engine roughness may occur while operating at best economy. If this occurs, enrich mixture as required to smooth engine operation. Any change in altitude or Power Lever position will require a recheck of EGT indication.

## Descent

1. Altimeter..... SET
2. Cabin Heat/Defrost ..... AS REQUIRED
3. Landing Light .....ON
4. Fuel System..... CHECK
5. Mixture ..... AS REQUIRED
6. Brake Pressure ..... CHECK

## Before Landing

1. Seat Belt and Shoulder Harness ..... SECURE
2. Fuel Pump ..... BOOST
3. Mixture ..... FULL RICH
4. Flaps ..... AS REQUIRED
5. Autopilot..... AS REQUIRED

## Landing

### • Caution •

Landings should be made with full flaps. Landings with less than full flaps are recommended only if the flaps fail to deploy or to extend the aircraft's glide distance due to engine malfunction. Landings with flaps at 50% or 0%; power should be used to achieve a normal glidepath and low descent rate. Flare should be minimized.

### **Normal Landing**

Normal landings are made with full flaps with power on or off. Surface winds and air turbulence are usually the primary factors in determining the most comfortable approach speeds.

Actual touchdown should be made with power off and on the main wheels first to reduce the landing speed and subsequent need for braking. Gently lower the nose wheel to the runway after airplane speed has diminished. This is especially important for rough or soft field landings.

### **Short Field Landing**

For a short field landing in smooth air conditions, make an approach at 75 KIAS with full flaps using enough power to control the glide path (slightly higher approach speeds should be used under turbulent air conditions). After all approach obstacles are cleared, progressively reduce power and maintain the approach speed by lowering the nose of the airplane. Touchdown should be made power-off and on the main wheels first. Immediately after touchdown, lower the nose wheel and apply braking as required. For maximum brake effectiveness, retract the flaps, hold the control yoke full back, and apply maximum brake pressure without skidding.

### **Crosswind Landing**

Normal crosswind landings are made with full flaps. Avoid prolonged slips. After touchdown, hold a straight course with rudder and brakes as required.

The maximum allowable crosswind velocity is dependent upon pilot capability as well as aircraft limitations. Operation in direct crosswinds of 21 knots has been demonstrated.

### **Balked Landing/Go-Around**

In a balked landing (go-around) climb, disengage autopilot, apply full power, then reduce the flap setting to 50%. If obstacles must be cleared during the go-around, climb at the best angle of climb with 50% flaps. After clearing any obstacles, retract the flaps and accelerate to the normal flaps-up climb speed.

1. Autopilot .....DISENGAGE
2. Power Lever .....FULL FORWARD
3. Flaps .....50%
4. Airspeed .....BEST ANGLE OF CLIMB (81 – 83 KIAS)

*After clear of obstacles:*

5. Flaps .....UP

## After Landing

1. Power Lever ..... 1000 RPM
2. Fuel Pump ..... OFF
3. Flaps ..... UP
4. Transponder ..... STBY
5. Lights ..... AS REQUIRED
6. Pitot Heat ..... OFF

• Note •

As the airplane slows the rudder becomes less effective and taxiing is accomplished using differential braking.

## Shutdown

1. Fuel Pump (if used) ..... OFF
2. Throttle ..... IDLE
3. Ignition Switch ..... CYCLE

• Caution •

Note that the engine hesitates as the switch cycles through the "OFF" position. If the engine does not hesitate, one or both magnetos are not grounded. Prominently mark the propeller as being "Hot," and contact maintenance personnel immediately

4. Mixture ..... CUTOFF
5. All Switches ..... OFF
6. Magnetos ..... OFF
7. ELT ..... TRANSMIT LIGHT OUT

• Note •

After a hard landing, the ELT may activate. If this is suspected, press the RESET button.

8. Chocks, Tie-downs, Pitot Covers ..... AS REQUIRED

## Stalls

SR20 stall characteristics are conventional. Power-off stalls may be accompanied by a slight nose bobbing if full aft stick is held. Power-on stalls are marked by a high sink rate at full aft stick. Power-off stall speeds at maximum weight for both forward and aft C.G. positions are presented in Section 5 – Performance Data.

When practicing stalls at altitude, as the airspeed is slowly reduced, you will notice a slight airframe buffet and hear the stall speed warning horn sound between 5 and 10 knots before the stall. Normally, the stall is marked by a gentle nose drop and the wings can easily be held level or in the bank with coordinated use of the ailerons and rudder. Upon stall warning in flight, recovery is accomplished by immediately by reducing back pressure to maintain safe airspeed, adding power if necessary and rolling wings level with coordinated use of the controls.

### • WARNING •

Extreme care must be taken to avoid uncoordinated, accelerated or abused control inputs when close to the stall, especially when close to the ground.

# Environmental Considerations

## Cold Weather Operation

### *Starting*

If the engine has been cold soaked, it is recommended that the propeller be pulled through by hand several times to break loose or limber the oil. This procedure will reduce power draw on the battery if a battery start is made.

When the engine has been exposed to temperatures at or below 20° Fahrenheit (-7° C) for a period of two hours or more, the use of an external pre-heater and external power is recommended. Failure to properly preheat a cold-soaked engine may result in oil congealing within the engine, oil hoses, and oil cooler with subsequent loss of oil flow, possible internal damage to the engine, and subsequent engine failure.

If the engine does not start during the first few attempts, or if engine firing diminishes in strength, the spark plugs have probably frosted over. Preheat must be used before another start is attempted.

#### • **WARNING** •

If airplane will be started using external power, keep all personnel and power unit cables well clear of the propeller rotation plane.

#### • **Caution** •

Inadequate application of preheat to a cold soaked engine may warm the engine enough to permit starting but will not de-congeal oil in the sump, lines, cooler, filter, etc. Congealed oil in these areas will require considerable preheat.

An engine that has been superficially warmed, may start and appear to run satisfactorily, but can be damaged from lack of lubrication due to the congealed oil blocking proper oil flow through the engine. The amount of damage will vary and may not become evident for many hours. However, the engine may be severely damaged and may fail shortly following application of high power. Proper procedures require thorough application of preheat to all parts of the engine. Hot air must be applied directly to the oil sump and external oil lines as well as the

cylinders, air intake and oil cooler. Because excessively hot air can damage non-metallic components such as composite parts, seals, hoses, and drives belts, do not attempt to hasten the preheat process.

1. Ignition Switch ..... OFF

**• WARNING •**

Use extreme caution when pulling the propeller through by hand. Make sure ignition switch is OFF, keys are out of ignition, and then act as if the engine will start. A loose or broken ground wire on either magneto could cause the engine to fire.

2. Propeller ..... Hand TURN several rotations
3. External Power (If applicable) ..... CONNECT
4. Brakes ..... HOLD
5. Bat Master Switches ..... ON (check voltage)
6. Mixture ..... FULL RICH
7. Power lever ..... FULL FORWARD
8. Fuel Pump ..... PRIME, then BOOST

**• Note •**

In temperatures down to 20°F, hold Fuel (Boost) Pump switch to PRIME for 10 seconds prior to starting.

9. Propeller Area ..... CLEAR
10. Power Lever ..... OPEN ¼ INCH
11. Ignition Switch ..... START (Release after engine starts)

**• Caution •**

Limit cranking to intervals of 20 seconds with a 20 second cooling period between cranks. This will improve battery and contactor life

12. Power Lever ..... RETARD (to maintain 1000 RPM)
13. Oil Pressure ..... CHECK
14. Alt Master Switches ..... ON

*(Continued on following page)*



- 15. Avionics Power Switch .....ON
- 16. Engine Parameters ..... MONITOR
- 17. External Power (If applicable) ..... DISCONNECT
- 18. Amp Meter/Indication ..... CHECK
- 19. Strobe Lights.....ON

### Hot Weather Operation

Avoid prolonged engine operation on the ground.

• Note •

Fuel BOOST should be left ON during takeoff and for climb as required for vapor suppression with hot or warm fuel.

## Noise Characteristics/Abatement

The certificated noise levels for the Cirrus Design SR20 established in accordance with FAR 36 Appendix G are:

Configuration	Actual	Maximum Allowable
Two-blade Propeller	84.79 dB(A)	87.6 dB(A)
Three-blade Propeller	83.42 dB(A)	87.6 dB(A)

No determination has been made by the Federal Aviation Administration that the noise levels of this airplane are or should be acceptable or unacceptable for operation at, into, or out of, any airport. The above noise levels were established at 3000 pounds takeoff weight and 2700 RPM.

Recently, increased emphasis on improving environmental quality requires all pilots to minimize the effect of airplane noise on the general public. The following suggested procedures minimize environmental noise when operating the SR20.

• Note •

Do not follow these noise abatement procedures where they conflict with Air Traffic Control clearances or instructions, weather considerations, or wherever they would reduce safety.

1. When operating VFR over noise-sensitive areas, such as outdoor events, parks, and recreational areas, fly not less than 2000 feet above the surface even though flight at a lower level may be allowed.
2. For departure from or approach to an airport, avoid prolonged flight at low altitude near noise-sensitive areas.

## Fuel Conservation

Minimum fuel use at cruise will be achieved using the best economy power setting described under cruise.

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# **Section 5**

## **Performance Data**

### **Table of Contents**

Introduction .....	5-3
Associated Conditions Affecting Performance .....	5-3
Demonstrated Operating Temperature .....	5-3
Airspeed Calibration: Normal Static Source .....	5-4
Airspeed Calibration: Alternate Static Source .....	5-5
Altitude Correction: Normal Static Source .....	5-6
Altitude Correction: Alternate Static Source .....	5-7
Temperature Conversion .....	5-8
Outside Air Temperature for ISA Condition .....	5-9
Stall Speeds .....	5-10
Wind Components .....	5-11
Takeoff Distance .....	5-12
Takeoff Distance: 3000 LB .....	5-13
Takeoff Distance: 2500 LB .....	5-14
Takeoff Climb Gradient .....	5-15
Takeoff Rate of Climb .....	5-16
Enroute Climb Gradient .....	5-17
Enroute Rate of Climb .....	5-18
Enroute Rate of Climb Vs Density Altitude .....	5-19
Time, Fuel and Distance to Climb .....	5-20
Cruise Performance .....	5-21
Range / Endurance Profile .....	5-23
Range / Endurance Profile .....	5-24
Balked Landing Climb Gradient .....	5-25
Balked Landing Rate of Climb .....	5-26
Landing Distance .....	5-27
Landing Distance .....	5-28

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## Introduction

Performance data in this section are presented for operational planning so that you will know what performance to expect from the airplane under various ambient and field conditions. Performance data are presented for takeoff, climb, and cruise (including range & endurance).

### Associated Conditions Affecting Performance

Computed performance data in this section are based upon data derived from actual flight testing with the airplane and engine in good condition and using average piloting techniques. Unless specifically noted in the “Conditions” notes presented with each table, ambient conditions are for a standard day (*refer to Section 1*). Flap position as well as power setting technique is similarly noted with each table.

The charts in this section provide data for ambient temperatures from  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ) to  $40^{\circ}\text{C}$  ( $104^{\circ}\text{F}$ ). If ambient temperature is below the chart value, use the lowest temperature shown to compute performance. This will result in more conservative performance calculations. If ambient temperature is above the chart value, use extreme caution as performance degrades rapidly at higher temperatures.

All fuel flow data for cruise is based on the recommended lean mixture setting detailed in Section 4 – Normal Procedures.

*Serials 1337 and subsequent with SRV standard configuration:* Airplane performance is decreased without the nose landing gear fairing installed. Refer to performance tables for specific values.

### Demonstrated Operating Temperature

Satisfactory engine cooling has been demonstrated for this airplane with an outside air temperature  $23^{\circ}\text{C}$  above standard. The value given is not considered an operating limitation. Reference should be made to Section 2 for engine operating limitations.

# Airspeed Calibration: Normal Static Source

**Conditions:**

- Power for level flight or maximum continuous, whichever is less.
- Weight .....3000 LB

• Note •

Indicated airspeed values assume zero instrument error.

KIAS	KCAS		
	Flaps 0%	Flaps 50%	Flaps 100%
50			49
60		60	60
70	72	71	71
80	81	81	81
90	91	91	91
100	101	101	101
110	111	111	
120	120	120	
130	130		
140	140		
150	150		
160	160		
170	170		
180	180		
190	190		
200	200		

**Figure 5-1**



# Airspeed Calibration: Alternate Static Source

**Conditions:**

- Power for level flight or maximum continuous, whichever is less.
- Heater, Defroster & Vents ..... ON
- Weight ..... 3000 LB

• Note •

Indicated airspeed values assume zero instrument error.

KIAS	KCAS		
	Flaps 0%	Flaps 50%	Flaps 100%
50			45
60		59	56
70	70	69	67
80	80	79	78
90	90	89	88
100	100	99	98
110	110	109	
120	120	118	
130	130		
140	140		
150	150		
160	161		
170	171		
180	182		
190	192		
200	203		

**Figure 5-2**

## Altitude Correction: Normal Static Source

**Conditions:**

- Power for level flight or maximum continuous, whichever is less.
- Weight ..... 3000 LB

• Note •

Add correction to desired altitude to obtain indicated altitude to fly.

Indicated airspeed values assume zero instrument error.

Flaps	Press Alt	CORRECTION TO BE ADDED - FEET									
		Normal Static Source - KIAS									
		60	70	80	90	100	120	140	160	180	200
0%	S.L	-12	-11	-10	-9	-8	-5	-3	-3	-5	-10
	5000	-14	-13	-12	-11	-9	-6	-4	-3	-5	-11
	10000	-16	-15	-14	-12	-11	-7	-4	-4	-6	-13
	15000	-19	-18	-16	-14	-12	-8	-5	-4	-7	-16
50%	S.L	-2	-4	-5	-6	-5	+2				
	10000	-2	-4	-6	-7	-6	+2				
	15000	-2	-5	-7	-8	-7	+2				
100%	S.L	-1	-4	-6	-7	-5					
	10000	-1	-5	-7	-8	-6					
	15000	-1	-6	-9	-9	-6					

Figure 5-3

## Altitude Correction: Alternate Static Source

**Conditions:**

- Power for level flight or maximum continuous, whichever is less.
- Heater, Defroster & Vents ..... ON
- Weight ..... 3000 LB

• Note •

Add correction to desired altitude to obtain indicated altitude to fly.

Indicated airspeed values assume zero instrument error.

Flaps	Press Alt	CORRECTION TO BE ADDED - FEET									
		Normal Static Source - KIAS									
		60	70	80	90	100	120	140	160	180	200
0%	S.L	-9	-10	-10	-11	-10	-7	-1	11	27	51
	5000	-10	-11	-12	-12	-12	-9	-1	12	32	59
	10000	-12	-13	-14	-14	-14	-10	-1	14	37	69
	15000	-14	-15	-16	-17	-16	-12	-1	17	44	80
50%	S.L	-11	-15	-18	-21	-22	-19				
	10000	-13	-18	-21	-24	-26	-22				
	15000	-15	-20	-25	-28	-30	-26				
100%	S.L	-20	-20	-20	-20	-18					
	10000	-23	-24	-23	-23	-21					
	15000	-27	-27	-27	-26	-25					

Figure 5-4

# Temperature Conversion

To convert from Celsius (°C) to Fahrenheit (°F), find, in the shaded columns, the number representing the temperature value (°C) to be converted. The equivalent Fahrenheit temperature is read to the right.

► EXAMPLE: 38°C = 100°F.

To convert from Fahrenheit (°F) to Celsius (°C), find in the shaded columns area, the number representing the temperature value (°F) to be converted. The equivalent Celsius temperature is read to the left.

► EXAMPLE: 38°F = 3°C.

Temp to Convert °C or °F			Temp to Convert °C or °F			Temp to Convert °C or °F		
°C	◀ ▶	°F	°C	◀ ▶	°F	°C	◀ ▶	°F
-50	<b>-58</b>	-72	-17	<b>2</b>	36	17	<b>62</b>	144
-49	<b>-56</b>	-69	-16	<b>4</b>	39	18	<b>64</b>	147
-48	<b>-54</b>	-65	-14	<b>6</b>	43	19	<b>66</b>	151
-47	<b>-52</b>	-62	-13	<b>8</b>	46	20	<b>68</b>	154
-46	<b>-50</b>	-58	-12	<b>10</b>	50	21	<b>70</b>	158
-44	<b>-48</b>	-54	-11	<b>12</b>	54	22	<b>72</b>	162
-43	<b>-46</b>	-51	-10	<b>14</b>	57	23	<b>74</b>	165
-42	<b>-44</b>	-47	-9	<b>16</b>	61	24	<b>76</b>	169
-41	<b>-42</b>	-44	-8	<b>18</b>	64	26	<b>78</b>	172
-40	<b>-40</b>	-40	-7	<b>20</b>	68	27	<b>80</b>	176
-39	<b>-38</b>	-36	-6	<b>22</b>	72	28	<b>82</b>	180
-38	<b>-36</b>	-33	-4	<b>24</b>	75	29	<b>84</b>	183
-37	<b>-34</b>	-29	-3	<b>26</b>	79	30	<b>86</b>	187
-36	<b>-32</b>	-26	-2	<b>28</b>	82	31	<b>88</b>	190
-34	<b>-30</b>	-22	-1	<b>30</b>	86	32	<b>90</b>	194
-33	<b>-28</b>	-18	0	<b>32</b>	90	33	<b>92</b>	198
-32	<b>-26</b>	-15	1	<b>34</b>	93	34	<b>94</b>	201
-31	<b>-24</b>	-11	2	<b>36</b>	97	36	<b>96</b>	205
-30	<b>-22</b>	-8	3	<b>38</b>	100	37	<b>98</b>	208
-29	<b>-20</b>	-4	4	<b>40</b>	104	38	<b>100</b>	212
-28	<b>-18</b>	0	6	<b>42</b>	108	39	<b>102</b>	216
-27	<b>-16</b>	3	7	<b>44</b>	111	40	<b>104</b>	219
-26	<b>-14</b>	7	8	<b>46</b>	115	41	<b>106</b>	223
-24	<b>-12</b>	10	9	<b>48</b>	118	42	<b>108</b>	226
-23	<b>-10</b>	14	10	<b>50</b>	122	43	<b>110</b>	230
-22	<b>-8</b>	18	11	<b>52</b>	126	44	<b>112</b>	234
-21	<b>-6</b>	21	12	<b>54</b>	129	46	<b>114</b>	237
-20	<b>-4</b>	25	13	<b>56</b>	133	47	<b>116</b>	241
-19	<b>-2</b>	28	14	<b>58</b>	136	48	<b>118</b>	244
-18	<b>0</b>	32	16	<b>60</b>	140	49	<b>120</b>	248

Figure 5-5

## Outside Air Temperature for ISA Condition

Press Alt Feet	ISA-40°C		ISA-20°C		ISA		ISA+10°C		ISA+20°C	
	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
SL	-25	-13	-5	23	15	59	25	77	35	95
1000	-27	-18	-7	18	13	54	23	72	33	90
2000	-29	-20	-9	16	11	52	21	70	31	88
3000	-31	-24	-11	12	9	48	19	66	29	84
4000	-33	-27	-13	9	7	45	17	63	27	81
5000	-35	-31	-15	5	5	41	15	59	25	77
6000	-37	-34	-17	2	3	38	13	56	23	74
7000	-39	-38	-19	-2	1	34	11	52	21	70
8000	-41	-42	-21	-6	-1	30	10	48	20	66
9000	-43	-45	-23	-9	-3	27	7	45	17	63
10000	-45	-49	-25	-13	-5	23	5	41	15	59
11000	-47	-52	-27	-16	-7	20	3	38	13	56
12000	-49	-56	-29	-20	-9	16	1	34	11	52
13000	-51	-59	-31	-23	-11	13	-1	31	9	49
14000	-53	-63	-33	-27	-13	9	-3	27	7	45

Figure 5-6

# Stall Speeds

**Conditions:**

- Weight ..... 3000 LB
- CG ..... Noted
- Power ..... Idle
- Bank Angle ..... Noted

• Note •

Altitude loss during wings level stall may be 250 feet or more.

KIAS values may not be accurate at stall.

Weight  LB	Bank Angle  Deg	STALL SPEEDS					
		Flaps 0% Full Up		Flaps 50%		Flaps 100% Full Down	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
<b>3000</b>  <b>Most FWD C.G.</b>	<b>0</b>	65	67	61	63	56	59
	<b>15</b>	66	68	62	64	57	60
	<b>30</b>	70	72	65	68	61	63
	<b>45</b>	78	80	72	75	67	70
	<b>60</b>	92	95	86	89	80	83
<b>3000</b>  <b>Most AFT C.G.</b>	<b>0</b>	64	66	59	62	54	57
	<b>15</b>	65	67	60	63	55	58
	<b>30</b>	69	71	64	66	58	61
	<b>45</b>	76	78	71	73	64	68
	<b>60</b>	90	93	84	87	76	81

**Figure 5-7**

# Wind Components

**Example:**

- Runway Heading ..... 10°
- Wind Direction ..... 60°
- Wind Velocity ..... 15 Knots

• Note •

The max demonstrated crosswind is 20 knots. Value not considered limiting.

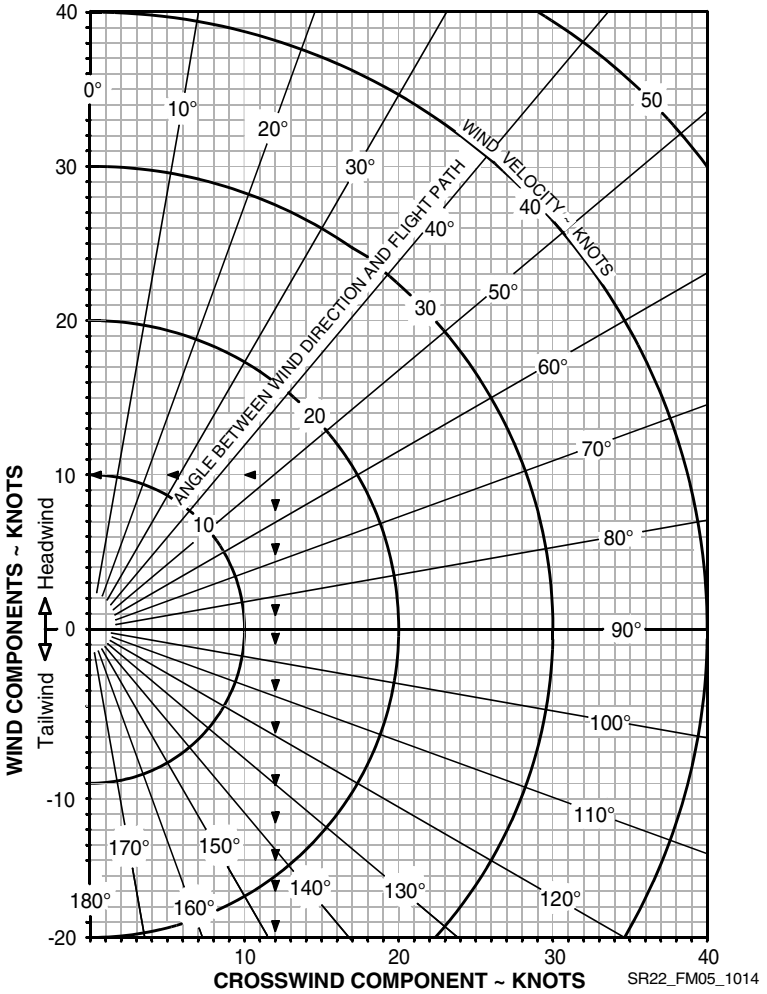


Figure 5-8

## Takeoff Distance

**Conditions:**

- Winds.....Zero
- Runway.....Dry, Level, Paved
- Flaps.....50%
- Power.....Maximum, set before brake release

The following factors are to be applied to the computed takeoff distance for the noted condition:

- Headwind - Subtract 10% from computed distance for each 12 knots headwind.
- Tailwind - Add 10% for each 2 knots tailwind up to 10 knots.
- Grass Runway, Dry - Add 20% to ground roll distance.
- Grass Runway, Wet - Add 30% to ground roll distance.
- Sloped Runway - Increase table distances by 22% of the ground roll distance at Sea Level, 30% of the ground roll distance at 5000 ft, 43% of the ground roll distance at 10,000 ft for each 1% of upslope. Decrease table distances by 7% of the ground roll distance at Sea Level, 10% of the ground roll distance at 5000 ft, and 14% of the ground roll distance at 10,000 ft for each 1% of downslope.

**• Caution •**

The above corrections for runway slope are required to be included herein. These corrections should be used with caution since published runway slope data is usually the net slope from one end of the runway to the other. Many runways will have portions of their length at greater or lesser slopes than the published slope, lengthening (or shortening) takeoff ground roll estimated from the table.

- If brakes are not held while applying power, distances apply from point where full throttle and mixture setting is complete.
- For operation in outside air temperatures colder than this table provides, use coldest data shown.
- For operation in outside air temperatures warmer than this table provides, use extreme caution.



# Takeoff Distance: 3000 LB

PRESS ALT FT		DISTANCE FT		TEMPERATURE ~ °C				ISA
		0	10	20	30	40		
<b>WEIGHT: 3000 LB</b> <b>Speed at Liftoff: 68 KIAS</b> <b>Speed over 50 Ft. Obstacle: 75 KIAS</b> <b>Flaps: 50%</b> <b>Power: Takeoff Power</b> <b>Runway: Dry, Paved</b>		<b>Headwind:</b> Subtract 10% for each 12 knots headwind. <b>Tailwind:</b> Add 10% for each 2 knots tailwind up to 10 knots. <b>Runway Slope:</b> Ref. Factors. <b>Dry Grass:</b> Add 20% to Ground Roll. <b>Wet Grass:</b> Add 30% to Ground Roll						
		<b>SL</b>	<b>Grnd Roll</b>	1287	1390	1497	1608	1724
	<b>50 ft</b>	1848	1988	2132	2282	2437	2064	
<b>1000</b>	<b>Grnd Roll</b>	1412	1526	1643	1766	1893	1564	
	<b>50 ft</b>	2022	2175	2333	2497	2666	2226	
<b>2000</b>	<b>Grnd Roll</b>	1552	1676	1805	1940	2079	1692	
	<b>50 ft</b>	2214	2381	2555	2734	2920	2402	
<b>3000</b>	<b>Grnd Roll</b>	1706	1842	1985	2132	2286	1831	
	<b>50 ft</b>	2426	2609	2799	2996	3200	2593	
<b>4000</b>	<b>Grnd Roll</b>	1877	2027	2183	2346	2515	1983	
	<b>50 ft</b>	2660	2861	3069	3285	3509	2802	
<b>5000</b>	<b>Grnd Roll</b>	2066	2231	2404	2583	2769	2149	
	<b>50 ft</b>	2919	3139	3368	3605	3850	3029	
<b>6000</b>	<b>Grnd Roll</b>	2276	2458	2648	2845	3050	2329	
	<b>50 ft</b>	3205	3447	3698	3959	4228	3276	
<b>7000</b>	<b>Grnd Roll</b>	2509	2710	2919			2528	
	<b>50 ft</b>	3522	3788	4064			3547	
<b>8000</b>	<b>Grnd Roll</b>	2768	2990	3221			2744	
	<b>50 ft</b>	3872	4165	4469			3841	
<b>9000</b>	<b>Grnd Roll</b>	3056	3301	3555			2980	
	<b>50 ft</b>	4261	4583	4917			4160	
<b>10000</b>	<b>Grnd Roll</b>	3376	3646				3241	
	<b>50 ft</b>	4691	5046				4514	

**Figure 5-9**  
**Sheet 1 of 2**

# Takeoff Distance: 2500 LB

WEIGHT: 2500 LB Speed at Liftoff: 65 KIAS Speed over 50 Ft Obstacle: 70 KIAS Flaps: 50% Power: Takeoff Power Runway: Dry, Paved		Headwind: Subtract 10% for each 12 knots headwind. Tailwind: Add 10% for each 2 knots tailwind up to 10 knots. Runway Slope: Ref. Factors. Dry Grass: Add 20% to Ground Roll. Wet Grass: Add 30% to Ground Roll.					
PRESS ALT FT	DISTANCE FT	TEMPERATURE ~ °C					ISA
		0	10	20	30	40	
SL	Grnd Roll	813	878	946	1016	1090	912
	50 ft	1212	1303	1398	1496	1597	1350
1000	Grnd Roll	892	964	1038	1116	1196	986
	50 ft	1326	1426	1529	1636	1747	1457
2000	Grnd Roll	980	1059	1141	1226	1314	1067
	50 ft	1451	1561	1674	1791	1912	1572
3000	Grnd Roll	1078	1164	1254	1348	1445	1156
	50 ft	1590	1709	1834	1962	2095	1697
4000	Grnd Roll	1185	1281	1380	1483	1590	1253
	50 ft	1743	1874	2010	2151	2297	1835
5000	Grnd Roll	1305	1410	1519	1632	1750	1358
	50 ft	1912	2056	2205	2360	2520	1985
6000	Grnd Roll	1438	1553	1673	1798	1928	1473
	50 ft	2098	2256	2421	2590	2766	2140
7000	Grnd Roll	1585	1712	1845			1599
	50 ft	2305	2479	2659			2324
8000	Grnd Roll	1749	1889	2035			1737
	50 ft	2534	2725	2923			2517
9000	Grnd Roll	1931	2085	2247			1887
	50 ft	2787	2997	3216			2727
10000	Grnd Roll	2133	2304				2050
	50 ft	3068	3299				2986

Figure 5-9  
Sheet 2 of 2

# Takeoff Climb Gradient

**Conditions:**

- Power ..... Full Throttle
- Mixture ..... Full Rich
- Flaps ..... 50%
- Airspeed ..... Best Rate of Climb

• Note •

Climb Gradients shown are the gain in altitude for the horizontal distance traversed expressed as Feet per Nautical Mile.

Cruise climbs or short duration climbs are permissible at best power as long as altitudes and temperatures remain within those specified in the table.

For operation in air colder than this table provides, use coldest data shown.

For operation in air warmer than this table provides, use extreme caution.

Weight  LB	Press Alt  FT	Climb Speed  KIAS	CLIMB GRADIENT ~ Feet per Nautical Mile				
			Temperature ~°C				
			-20	0	20	40	ISA
3000	SL	85	678	621	568	518	581
	2000	85	587	532	481	433	504
	4000	84	500	447	398	351	430
	6000	83	416	365	318	274	358
	8000	82	336	287	241	199	289
	10000	82	259	212			224
2500	SL	84	957	880	808	741	826
	2000	84	841	767	698	634	729
	4000	83	730	659	593	531	636
	6000	82	624	555	492		545
	8000	81	522	456	396		459
	10000	80	425	362			377

Figure 5-10

# Takeoff Rate of Climb

**Conditions:**

- Power..... Full Throttle
- Mixture..... Full Rich
- Flaps..... 50%
- Airspeed ..... Best Rate of Climb

• Note •

Rate-of-Climb values shown are change in altitude for unit time expended expressed in Feet per Minute.

Cruise climbs or short duration climbs are permissible at best power as long as altitudes and temperatures remain within those specified in the table.

For operation in air colder than this table provides, use coldest data shown.

For operation in air warmer than this table provides, use extreme caution.

Weight LB	Press Altitude FT	Climb Speed KIAS	RATE OF CLIMB ~ Feet per Minute				
			Temperature ~°C				
			-20	0	20	40	ISA
3000	SL	85	905	862	817	771	828
	2000	85	807	761	712	663	734
	4000	84	707	657	606	554	639
	6000	83	607	553	499	444	545
	8000	82	504	447	390	333	450
	10000	82	401	341			356
2500	SL	84	1256	1201	1144	1086	1158
	2000	84	1136	1077	1017	955	1044
	4000	83	1014	952	888	824	929
	6000	82	892	825	758		815
	8000	81	768	698	627		701
	10000	80	643	569			587

Figure 5-11

# Enroute Climb Gradient

**Conditions:**

- Power ..... Full Throttle
- Mixture ..... Full Rich
- Flaps ..... 0% (UP)
- Airspeed ..... Best Rate of Climb

• Note •

Climb Gradients shown are the gain in altitude for the horizontal distance traversed expressed as Feet per Nautical Mile.

Cruise climbs or short duration climbs are permissible at best power as long as altitudes and temperatures remain within those specified in the table.

For operation in air colder than this table provides, use coldest data shown.

For operation in air warmer than this table provides, use extreme caution.

The Maximum Operating Altitude of 17,500 feet MSL may be obtained if the airplane's gross weight does not exceed 2900 lb and the ambient temperature is -20° C or less.

Weight LB	Press Alt FT	Climb Speed KIAS	CLIMB GRADIENT - Feet per Nautical Mile				
			Temperature ~ °C				ISA
			-20	0	20	40	
3000	SL	96	650	589	533	481	549
	2000	95	560	502	448	398	474
	4000	94	474	418	367	319	402
	6000	93	392	338	289	244	332
	8000	92	313	216	214	171	265
	10000	91	237	188			200
	12000	91	164	118			139
	14000	90	95	51			80
2500	SL	93	846	777	712	652	728
	2000	92	741	674	612	554	640
	4000	92	640	576	516	461	555
	6000	91	543	482	425		473
	8000	90	451	392	337		395
	10000	89	363	306			320
	12000	88	279	224			248
	14000	88	198	147			180

Figure 5-12

# Enroute Rate of Climb

**Conditions:**

- Power..... Full Throttle
- Mixture..... Full Rich
- Flaps.....0% (UP)
- Airspeed ..... Best Rate of Climb

• Note •

Rate-of-Climb values shown are change in altitude in feet per unit time expressed in Feet per Minute.

For operation in air colder than this table provides, use coldest data shown.

For operation in air warmer than this table provides, use extreme caution.

Cruise climbs or short duration climbs are permissible at best power as long as altitudes and temperatures remain within those specified in the table.

The Maximum Operating Altitude of 17,500 feet MSL may be obtained if the airplane's gross weight does not exceed 2900 lb and the ambient temperature is -20° C or less.

Weight  LB	Press Alt  FT	Climb Speed  KIAS	RATE OF CLIMB ~ Feet per Minute				
			Temperature ~ °C				
			-20	0	20	40	ISA
3000	SL	96	979	923	866	808	880
	2000	95	868	808	748	688	775
	4000	94	756	693	630	567	671
	6000	93	642	576	510	445	566
	8000	92	527	458	389	321	462
	10000	91	411	339			357
	12000	91	294	218			252
	14000	90	175	97			148
2500	SL	93	1231	1175	1117	1058	1132
	2000	92	1109	1050	988	926	1016
	4000	92	987	923	858	793	900
	6000	91	863	796	727		785
	8000	90	738	667	595		670
	10000	89	612	537			555
	12000	88	484	405			440
	14000	88	355	273			325

Figure 5-13

# Enroute Rate of Climb Vs Density Altitude

**Conditions:**

- Power ..... Full Throttle
- Mixture ..... Full Rich
- Flaps ..... 0% (UP)
- Airspeed ..... Best Rate of Climb

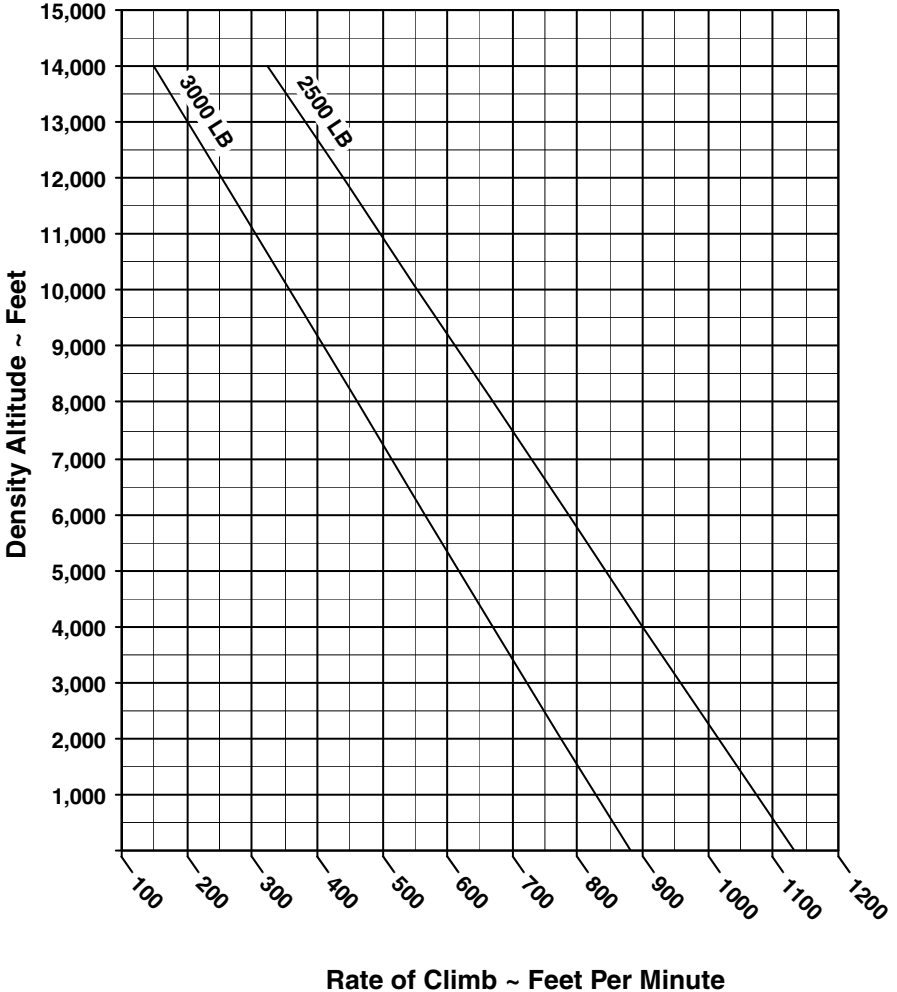


Figure 5-14

## Time, Fuel and Distance to Climb

**Conditions:**

- Power..... Full Throttle
- Mixture..... Full Rich
- Weight ..... 3000 LB
- Winds..... Zero
- Climb Airspeed ..... Noted

• Note •

Taxi Fuel - Add 1 gallon for start, taxi, and takeoff.

Temperature - Add 10% to computed values for each 10° C above standard.

Cruise climbs or short duration climbs are permissible at best power as long as altitudes and temperatures remain within those specified in the table.

Press Alt	OAT (ISA)	Climb Speed	Rate Of Climb	TIME, FUEL, DISTANCE ~ From Sea Level		
				Time Minutes	Fuel U.S. Gal	Distance NM
FT	°C	KIAS	FPM			
SL	15	96	880	0.0	0.0	0
1000	13	96	828	1.3	0.3	2
2000	11	95	775	2.4	0.6	4
3000	9	94	723	3.8	1.0	6
4000	7	94	671	5.2	1.3	8
5000	5	93	618	6.7	1.7	11
6000	3	93	566	8.4	2.0	14
7000	1	92	514	10.3	2.4	17
8000	-1	92	462	12.3	2.9	21
9000	-3	91	409	14.6	3.3	25
10000	-5	91	357	17.2	3.8	29
11000	-7	91	305	20.3	4.4	35
12000	-9	91	252	23.8	5.0	41
13000	-11	91	200	28.3	5.8	49
14000	-13	90	148	34.0	6.8	60

Figure 5-15



# Cruise Performance

**Conditions:**

- Mixture ..... Best Power
- Weight ..... 2600 LB
- Winds ..... Zero
- Shaded Cells: Cruise Pwr above 85% not recommended.

• Note •

Subtract 10 KTAS if nose wheel pant and fairing removed. Lower KTAS by 10% if nose and main wheel pants & fairings are removed.

Press Alt	ISA - 30°C					ISA			ISA + 30°C		
	RPM	MAP	PWR	KTAS	GPH	PWR	KTAS	GPH	PWR	KTAS	GPH
2000	2700	27.8	101%	160	16.0	95%	160	15.0	91%	157	14.2
	2500	27.8	90%	154	14.1	85%	154	13.4	81%	151	12.9
	2500	26.6	85%	151	13.4	80%	151	12.8	76%	148	11.7
	2500	25.4	80%	147	12.7	75%	147	11.6	72%	144	11.3
	2500	24.1	74%	143	11.5	70%	143	11.1	67%	140	10.7
	2500	22.9	69%	139	11.0	65%	139	10.6	62%	136	10.2
	2500	22.0	65%	136	10.5	62%	136	10.2	59%	133	9.9
	2500	19.7	55%	127	9.5	52%	127	9.20	50%	124	8.9
4000	2700	25.8	94%	159	14.8	89%	159	14.4	84%	157	13.4
	2500	25.8	84%	153	13.3	79%	153	12.7	75%	150	11.7
	2500	24.8	80%	150	12.7	75%	150	11.6	72%	147	11.2
	2500	23.6	75%	146	11.5	70%	146	11.1	67%	143	10.8
	2500	22.3	69%	141	10.9	65%	141	10.5	62%	138	10.2
	2500	21.0	63%	136	10.3	60%	136	10.0	57%	133	9.7
	2500	19.8	58%	131	9.8	55%	131	9.4	52%	129	9.2
6000	2700	24.0	88%	159	13.8	83%	159	13.1	79%	156	12.6
	2500	24.0	79%	152	12.0	74%	152	11.5	71%	149	11.1
	2500	23.0	74%	148	11.5	70%	148	11.1	67%	145	10.7
	2500	21.8	69%	144	11.0	65%	144	10.6	62%	141	10.2
	2500	20.8	65%	140	10.4	61%	140	10.0	58%	137	9.7
	2500	19.4	59%	134	9.8	55%	134	9.5	53%	131	9.2

Figure 5-16  
Sheet 1 of 2

Press Alt	RPM	MAP	ISA - 30°C			ISA			ISA + 30°C		
			PWR	KTAS	GPH	PWR	KTAS	GPH	PWR	KTAS	GPH
8000	2700	22.2	82%	157	12.9	77%	157	11.6	73%	154	11.4
	2500	22.2	73%	150	11.4	69%	150	11.0	65%	147	10.6
	2500	21.2	69%	146	10.9	65%	146	10.5	62%	143	10.2
	2500	20.1	64%	142	10.4	60%	142	10.0	57%	139	9.7
	2500	18.9	59%	136	9.8	55%	136	9.5	52%	134	9.2
	2500	17.7	53%	131	9.2	50%	131	8.9	48%	128	8.7
10000	2700	20.6	76%	155	11.7	72%	155	11.2	68%	152	10.9
	2500	20.6	68%	148	10.8	64%	148	10.5	61%	145	10.1
	2500	19.6	64%	144	10.4	60%	144	10.0	57%	141	9.7
	2500	18.5	59%	139	9.8	55%	139	9.5	53%	136	9.2
	2500	17.3	54%	134	9.3	50%	134	9.0	48%	131	8.7
12000	2700	19.0	70%	153	11.1	66%	153	10.7	63%	150	10.3
	2500	19.0	63%	146	10.3	59%	146	9.9	56%	143	9.6
	2500	18.0	59%	141	9.8	55%	141	9.5	52%	138	9.2
	2500	16.8	53%	136	9.2	50%	136	8.9	47%	133	8.6
14000	2700	17.6	66%	151	10.5	62%	151	10.2	58%	148	9.8
	2500	17.6	59%	144	9.8	55%	144	9.5	52%	141	9.2
	2500	16.5	54%	142	9.3	50%	142	9.0	48%	139	8.7

Figure 5-16  
Sheet 2 of 2

## Range / Endurance Profile

**Conditions:**

- Mixture ..... See Tables
- Weight ..... 3000 LB
- Temperature ..... Standard Day
- Winds ..... Zero
- Total Fuel.....56 Gallons

• Note •

Fuel Remaining For Cruise accounts for 10.1 gallons for 45 minutes IFR reserve fuel at 75% power and fuel burn for descent.

Range and endurance shown includes descent to final destination at 160 KIAS and 500 fpm.

Range is decreased by 5% if nose wheel pant and fairings removed.

Range is decreased by 15% if nose and main wheel pants and fairings removed.

75% POWER				Mixture = Best Power			
Press Alt	Climb Fuel	Fuel Remaining For Cruise	Airspeed	Fuel Flow	Endurance	Range	Specific Range
FT	Gal	Gal	KTAS	GPH	Hours	NM	Nm/Gal
0	0.0	46.3	143	11.6	4.0	576	12.3
2000	0.6	45.7	147	11.6	4.0	594	12.6
4000	1.3	45.0	150	11.6	4.0	606	12.7
6000	2.0	44.3	152	11.6	4.0	617	12.7
8000	2.9	43.4	155	11.6	4.0	627	12.8
10000	3.8	42.5					
12000	5.0	41.3					
14000	6.8	39.5					

Figure 5-17  
Sheet 1 of 2

## Range / Endurance Profile

<b>65% POWER</b>				<b>Mixture = Best Power</b>			
<b>Press Alt</b>	<b>Climb Fuel</b>	<b>Fuel Remaining For Cruise</b>	<b>Airspeed</b>	<b>Fuel Flow</b>	<b>Endurance</b>	<b>Range</b>	<b>Specific Range</b>
<b>FT</b>	<b>Gal</b>	<b>Gal</b>	<b>KTAS</b>	<b>GPH</b>	<b>Hours</b>	<b>NM</b>	<b>Nm/Gal</b>
0	0.0	46.3	137	10.5	4.4	608	13.0
2000	0.6	45.7	139	10.5	4.4	620	13.1
4000	1.3	45.0	141	10.5	4.4	628	13.2
6000	2.0	44.3	143	10.5	4.4	635	13.2
8000	2.9	43.4	145	10.5	4.4	645	13.3
10000	3.8	42.5	147	10.5	4.4	654	13.3
12000	5.0	41.3	150	10.5	4.4	666	13.4
14000	6.8	39.5					

<b>55% POWER</b>				<b>Mixture = Best Economy</b>			
<b>Press Alt</b>	<b>Climb Fuel</b>	<b>Fuel Remaining For Cruise</b>	<b>Airspeed</b>	<b>Fuel Flow</b>	<b>Endurance</b>	<b>Range</b>	<b>Specific Range</b>
<b>FT</b>	<b>Gal</b>	<b>Gal</b>	<b>KTAS</b>	<b>GPH</b>	<b>Hours</b>	<b>NM</b>	<b>Nm/Gal</b>
0	0.0	46.3	127	8.4	5.5	708	15.2
2000	0.6	45.7	130	8.4	5.5	726	15.5
4000	1.3	45.0	131	8.4	5.5	731	15.4
6000	2.0	44.3	134	8.4	5.5	745	15.6
8000	2.9	43.4	136	8.4	5.5	755	15.7
10000	3.8	42.5	139	8.4	5.4	768	15.9
12000	5.0	41.3	141	8.4	5.4	776	15.9
14000	6.8	39.5	144	8.4	5.4	785	16.0

**Figure 5-17**  
**Sheet 2 of 2**

## Balked Landing Climb Gradient

**Conditions:**

- Power ..... Full Throttle
- Mixture ..... Full Rich
- Flaps ..... 100% (DN)
- Climb Airspeed..... Best Rate of Climb

• Note •

Balked Landing Climb Gradients shown are the gain in altitude for the horizontal distance traversed expressed as Feet per Nautical Mile.

Dashed cells in the table represent performance below the minimum balked landing climb requirements.

For operation in air colder than this table provides, use coldest data shown.

For operation in air warmer than this table provides, use extreme caution.

This chart is required data for certification. However, significantly better performance can be achieved by climbing at Best Rate of Climb speeds shown with flaps down or following the Go-Around / Balked Landing procedure in Section 4.

Weight	Press Alt	Climb Speed	CLIMB GRADIENT ~ Feet per Nautical Mile				
			Temperature ~ °C				
LB	FT	KIAS	-20	0	20	40	ISA
2900	SL	75	779	699	626	558	644
	2000	74	664	585	515	449	547
	4000	73	548	475	408	346	451
	6000	72	440	369	305	-	359
	8000	71	335	268	206	-	271
	10000	70	235	170	-	-	186
2500	SL	75	987	894	807	728	829
	2000	74	851	762	679	603	716
	4000	73	721	635	557	484	608
	6000	72	596	514	439	-	502
	8000	71	477	398	327	-	401
	10000	70	362	287	-	-	305

Figure 5-18

## Balked Landing Rate of Climb

**Conditions:**

- Power..... Full Throttle
- Mixture..... Full Rich
- Flaps..... 100% (DN)
- Climb Airspeed .....Noted

• Note •

Balked Landing Rate of Climb values shown are the full flaps change in altitude for unit time expended expressed in Feet per Minute.

Dashed cells in the table represent performance below the minimum balked landing climb requirements.

For operation in air colder than this table provides, use coldest data shown.

For operation in air warmer than this table provides, use extreme caution.

This chart is required data for certification. However, significantly better performance can be achieved by climbing at Best Rate of Climb speeds shown with flaps down or following the Go-Around / Balked Landing procedure in Section 4.

Weight	Press Alt	Climb Speed	RATE OF CLIMB - Feet per Minute				
			Temperature ~ °C				
LB	FT	KIAS	-20	0	20	40	ISA
2900	SL	75	905	845	785	724	800
	2000	74	789	726	662	598	691
	4000	73	671	604	538	471	581
	6000	72	552	482	412	-	471
	8000	71	432	359	286	-	362
	10000	70	310	234	-	-	252
2500	SL	75	1142	1076	1009	942	1026
	2000	74	1011	942	872	801	904
	4000	73	880	807	733	660	781
	6000	72	747	670	593	-	658
	8000	71	613	533	453	-	537
	10000	70	478	394	-	-	414

**Figure 5-19**

# Landing Distance

**Conditions:**

- Technique ..... Normal
- Winds ..... Zero
- Runway ..... Dry, Level, Paved
- Flaps ..... 100%
- Power ..... 3° Power Approach

to 50 FT obstacle, then reduce power passing the estimated 50 foot point and smoothly continue power reduction to reach idle just prior to touchdown.

**• Note •**

The following factors are to be applied to the computed landing distance for the noted condition:

- Headwind - Subtract 10% from table distances for each 13 knots headwind.
- Tailwind - Add 10% to table distances for each 2 knots tailwind up to 10 knots.
- Grass Runway, Dry - Add 20% to ground roll distance.
- Grass Runway, Wet - Add 60% to ground roll distance.
- Sloped Runway - Increase table distances by 27% of the ground roll distance for each 1% of downslope. Decrease table distances by 9% of the ground roll distance for each 1% of upslope.

**• Caution •**

The above corrections for runway slope are required to be included herein. These corrections should be used with caution since published runway slope data is usually the net slope from one end of the runway to the other. Many runways will have portions of their length at greater or lesser slopes than the published slope, lengthening (or shortening) landing ground roll estimated from the table.

- For operation in outside air temperatures colder than this table provides, use coldest data shown.
- For operation in outside air temperatures warmer than this table provides, use extreme caution.

# Landing Distance

<b>WEIGHT: 2900 LB</b> <b>Speed over 50 Ft Obstacle: 75 KIAS</b> <b>Flaps: 100%</b> <b>Power: Idle</b> <b>Runway: Dry, Level Paved Surface</b>		<b>Headwind:</b> Subtract 10% per each 13 knots headwind. <b>Tailwind:</b> Add 10% for each 2 knots tailwind up to 10 knots. <b>Runway Slope:</b> Ref. Factors. <b>Dry Grass:</b> Add 20% to Ground Roll <b>Wet Grass:</b> Add 60% to Ground Roll					
PRESS ALT FT	DISTANCE FT	TEMPERATURE ~ °C					ISA
		0	10	20	30	40	
SL	Grnd Roll	962	997	1032	1067	1102	1014
	Total	1972	2017	2063	2109	2156	2040
1000	Grnd Roll	997	1034	1070	1067	1143	1045
	Total	2018	2065	2113	2161	2210	2079
2000	Grnd Roll	1034	1072	1110	1148	1186	1076
	Total	2066	2116	2166	2217	2268	2121
3000	Grnd Roll	1073	1112	1151	1191	1230	1108
	Total	2117	2169	2222	2275	2329	2164
4000	Grnd Roll	1113	1154	1195	1236		1142
	Total	2170	2225	2281	2337		2209
5000	Grnd Roll	1156	1198	1240	1283		1177
	Total	2227	2285	2343	2402		2256
6000	Grnd Roll	1200	1244	1288	1332		1214
	Total	2287	2348	2409	2471		2306
7000	Grnd Roll	1246	1292	1337			1251
	Total	2351	2415	2479			2358
8000	Grnd Roll	1295	1342	1389			1291
	Total	2418	2485	2553			2412
9000	Grnd Roll	1345	1394	1444			1331
	Total	2490	2560	2631			2470
10000	Grnd Roll	1398	1449				1373
	Total	2565	2639				2529

Figure 5-20



# ***Section 6***

## ***Weight and Balance***

### **Table of Contents**

Introduction .....	6-3
Airplane Weighing Form .....	6-6
Airplane Weighing Procedures .....	6-7
Weight & Balance Record .....	6-10
Loading Instructions .....	6-12
Weight & Balance Loading Form .....	6-14
Loading Data .....	6-15
Moment Limits .....	6-16
Equipment List .....	6-17

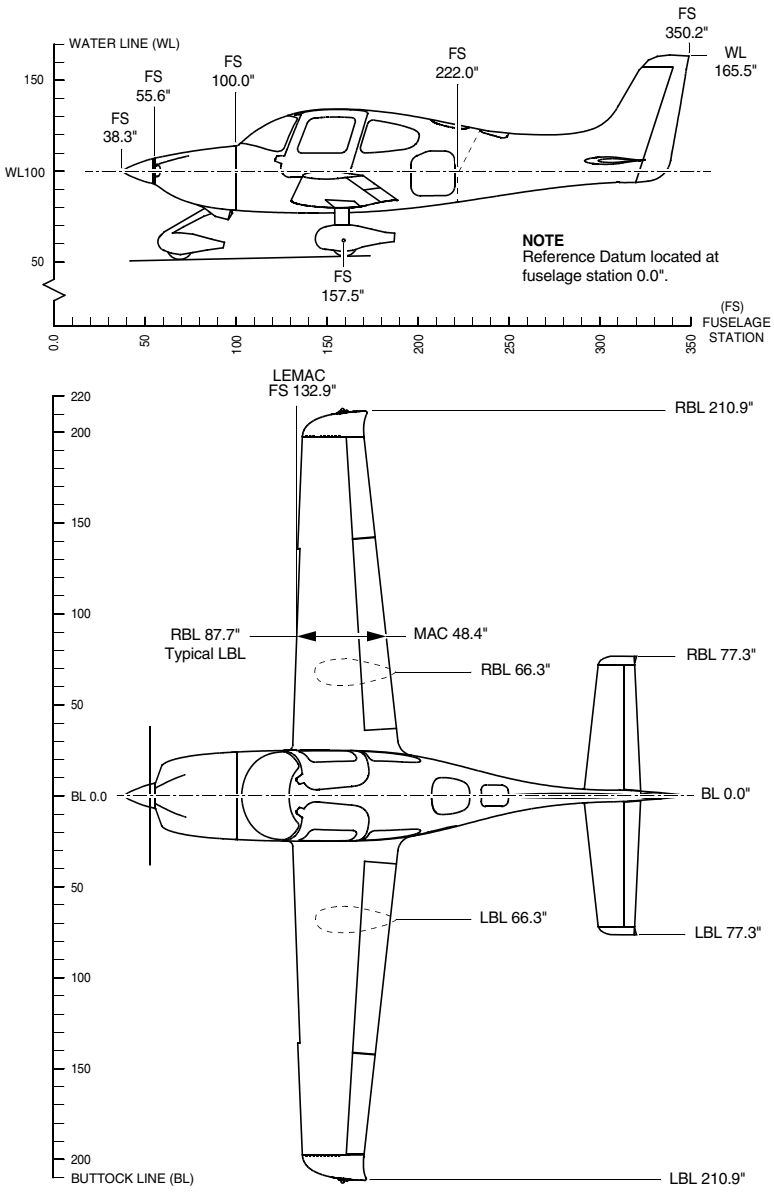
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## Introduction

This section describes the procedure for establishing the basic empty weight and moment of the airplane. Sample forms are provided for reference. Procedures for calculating the weight and moment for various operations are also provided. A comprehensive list of all equipment available for this airplane is included at the back of this section.

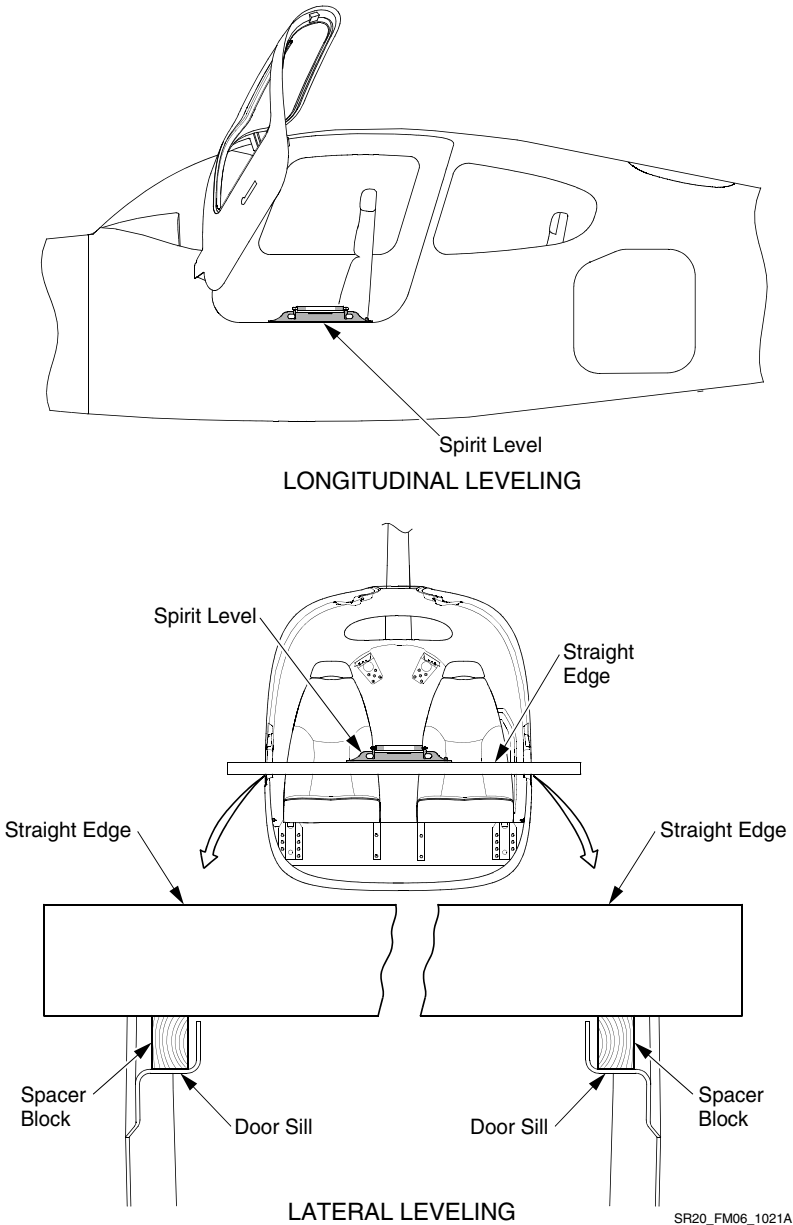
It should be noted that specific information regarding the weight, arm, moment, and installed equipment for this airplane as delivered from the factory can only be found in the plastic envelope carried in the back of this handbook.

It is the responsibility of the pilot to ensure that the airplane is loaded properly.



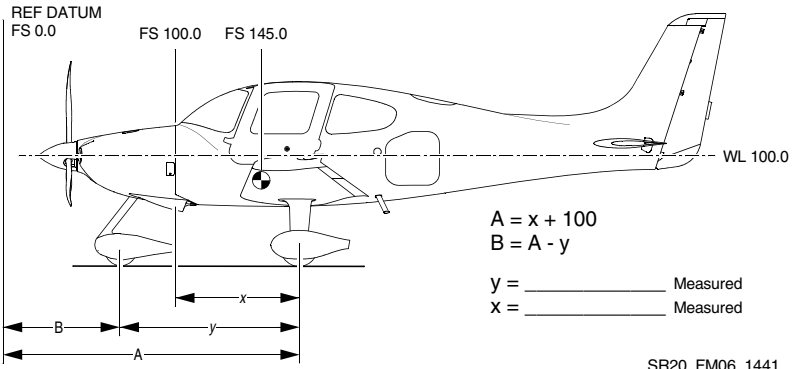
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**Figure 6-1**  
**Airplane Dimensional Data**



**Figure 6-2**  
**Airplane Leveling**

# Airplane Weighing Form



Weighing Point	Scale Reading	- Tare	= Net Weight	X Arm	= Moment
L Main				A=	
R Main				A=	
Nose				B=	
<b>Total As Weighed</b>				CG=	
<b>CG = Total Moment / Total Weight</b>					
<i>Space below provided for additions or subtractions to as weighed condition</i>					
<b>Empty Weight</b>				CG=	
<b>Engine Oil (if oil drained)</b> <i>15 lb at FS 78.4, moment = 1176</i>					
Unusable Fuel			26.4	153.95	4064
Basic Empty Weight				CG=	

**Figure 6-3**  
**Airplane Weighing Form**

## Airplane Weighing Procedures

A basic empty weight and center of gravity were established for this airplane when the airplane was weighed just prior to initial delivery. However, major modifications, loss of records, addition or relocation of equipment, accomplishment of service bulletins, and weight gain over time may require re-weighing to keep the basic empty weight and center of gravity current. The frequency of weighing is determined by the operator. All changes to the basic empty weight and center of gravity are the responsibility of the operator. *Refer to Section 8 for specific servicing procedures.*

1. Preparation:
  - a. Inflate tires to recommended operating pressures.
  - b. Service brake reservoir.
  - c. Drain fuel system.
  - d. Service engine oil.
  - e. Move crew seats to the most forward position.
  - f. Raise flaps to the fully retracted position.
  - g. Place all control surfaces in neutral position.
  - h. Verify equipment installation and location by comparison to equipment list.
2. Leveling (Figure 6-2):
  - a. Level longitudinally with a spirit level placed on the pilot door sill and laterally with of a spirit level placed across the door sills. (See Figure 6-2) Alternately, level airplane by sighting the forward and aft tool holes along waterline 95.9.
  - b. Place scales under each wheel (minimum scale capacity, 500 pounds nose, 1000 pounds each main).
  - c. Deflate the nose tire and/or shim underneath scales as required to properly center the bubble in the level.
3. Weighing (Figure 6-3):
  - a. With the airplane level, doors closed, and brakes released, record the weight shown on each scale. Deduct the tare, if any, from each reading.

4. Measuring (Figure 6-3):
  - a. Obtain measurement 'x' by measuring horizontally along the airplane center line (BL 0) from a line stretched between the main wheel centers to a plumb bob dropped from the forward side of the firewall (FS 100). Add 100 to this measurement to obtain left and right weighing point arm (dimension 'A'). Typically, dimension 'A' will be in the neighborhood of 157.5.
  - b. Obtain measurement 'y' by measuring horizontally and parallel to the airplane centerline (BL 0), from center of nosewheel axle, left side, to a plumb bob dropped from the line stretched between the main wheel centers. Repeat on right side and average the measurements. Subtract this measurement from dimension 'A' to obtain the nosewheel weighing point arm (dimension 'B').
5. Determine and record the moment for each of the main and nose gear weighing points using the following formula:

$$\text{Moment} = \text{Net Weight} \times \text{Arm}$$

6. Calculate and record the as-weighed weight and moment by totaling the appropriate columns.
7. Determine and record the as-weighed C.G. in inches aft of datum using the following formula:

$$\text{C.G.} = \text{Total Moment} / \text{Total Weight}$$

8. Add or subtract any items not included in the as-weighed condition to determine the empty condition. Application of the above C.G. formula will determine the C.G. for this condition.
9. Add the correction for engine oil (15 lb at FS 78.4), if the airplane was weighed with oil drained. Add the correction for unusable fuel (26.4 lb at FS 153.95) to determine the Basic Empty Weight and Moment. Calculate and record the Basic Empty Weight C.G. by applying the above C.G. formula.
10. Record the new weight and C.G. values on the Weight and Balance Record.



The above procedure determines the airplane Basic Empty Weight, moment, and center of gravity in inches aft of datum. C.G. can also be expressed in terms of its location as a percentage of the airplane Mean Aerodynamic Cord (MAC) using the following formula:

$$C.G. \% MAC = 100 \times (C.G. \text{ Inches} - LEMAC) / MAC$$

Where:

$$LEMAC = 132.9$$

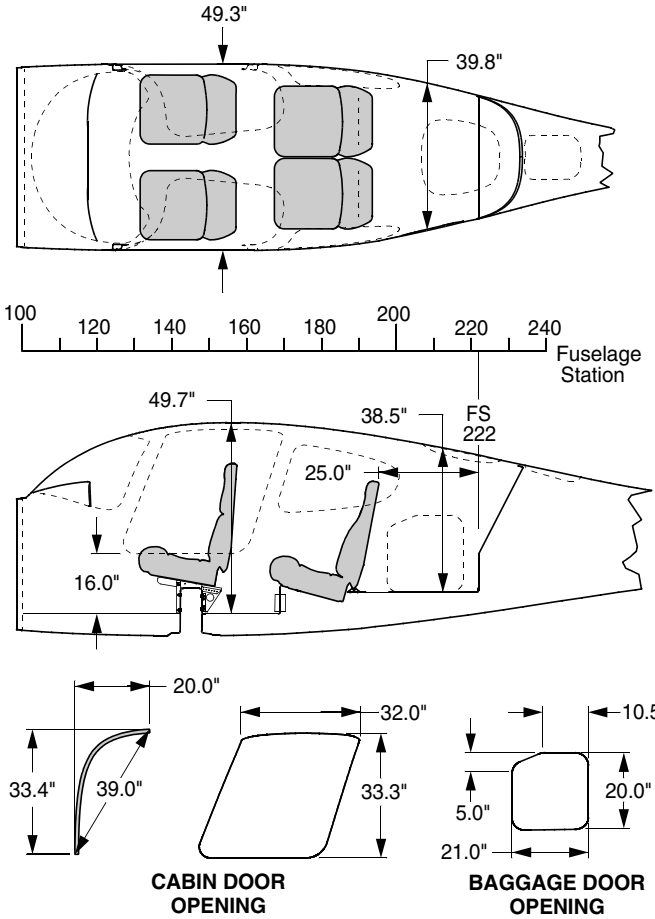
$$MAC = 48.4$$

## Weight & Balance Record

Use this form to maintain a continuous history of changes and modifications to airplane structure or equipment affecting weight and balance:

Serial Num:			Reg. Num:			Page of		
Date	Item No.		Description of Article or Modification	Weight Change Added (+) or Removed (-)			Running Basic Empty Weight	
	In	Out		WT LB	ARM IN.	MOM/1000	WT LB	MOM/1000
			As Delivered					

**Figure 6-4  
Weight and Balance Record**



SR20\_FM06\_1019

Location	Length	Width	Height	Volume
Cabin	122"	49.3"	49.7	137 cu ft
Baggage Compartment	36"	39.8"	38.5"	32 cu ft

**Figure 6-5**  
**Airplane Interior Dimensions**

## Loading Instructions

It is the responsibility of the pilot to ensure that the airplane is properly loaded and operated within the prescribed weight and center of gravity limits. The following information enables the pilot to calculate the total weight and moment for the loading. The calculated moment is then compared to the Moment Limits chart or table for a determination of proper loading.

Airplane loading determinations are calculated using the Weight & Balance Loading Form (Figure 6-6), the Loading Data chart and table (Figure 6-7), and the Moment Limits chart and table (Figure 6-8).

1. **Basic Empty Weight** – Enter the current Basic Empty Weight and Moment from the Weight & Balance Record.
2. **Front Seat Occupants** – Enter the total weight and moment/1000 for the front seat occupants from the Loading Data.
3. **Rear Seat Occupants** – Enter the total weight and moment/1000 for the rear seat occupants from the Loading Data.
4. **Baggage** – Enter weight and moment for the baggage from the Loading Data.
  - If desired, subtotal the weights and moment/1000 from steps 1 through 4. This is the *Zero Fuel Condition*. It includes all useful load items excluding fuel.
5. **Fuel Loading** – Enter the weight and moment of usable fuel loaded on the airplane from the Loading Data.
  - Subtotal the weight and moment/1000. This is the *Ramp Condition* or the weight and moment of the aircraft before taxi.
6. **Fuel for start, taxi, and runup** – This value is pre-entered on the form. Normally, fuel used for start, taxi, and runup is approximately 6 pounds at an average moment/1000 of 0.92.
7. **Takeoff Condition** – Subtract the weight and moment/1000 for step 8 (start, taxi, and runup) from the Ramp Condition values (step 7) to determine the Takeoff Condition weight and moment/1000.
  - The total weight at takeoff must not exceed the maximum weight limit of 3000 pounds.

- The total moment/1000 must not be above the maximum or below the minimum moment/1000 for the *Takeoff Condition Weight* as determined from the Moment Limits chart or table. |

# Weight & Balance Loading Form

Serial Num: \_\_\_\_\_ Date: \_\_\_\_\_

Reg. Num: \_\_\_\_\_ Initials: \_\_\_\_\_

Item	Description	Weight LB	Moment/ 1000
1.	<b>Basic Empty Weight</b> <i>Includes unusable fuel &amp; full oil</i>		
2.	Front Seat Occupants <i>Pilot &amp; Passenger (total)</i>		
3.	Rear Seat Occupants		
4.	Baggage Area <i>130 lb maximum</i>		
5.	<b>Zero Fuel Condition Weight</b> <i>Sub total item 1 thru 4</i>		
6.	Fuel Loading <i>56 Gallon @ 6.0 lb/gal. Maximum</i>		
7.	<b>Ramp Condition Weight</b> <i>Sub total item 5 and 6</i>		
8.	Fuel for start, taxi, and runup <i>Normally 6 lb at average moment of 922.8</i>	-	-
9.	<b>Takeoff Condition Weight</b> <i>Subtract item 8 from item 7</i>		

• Note •

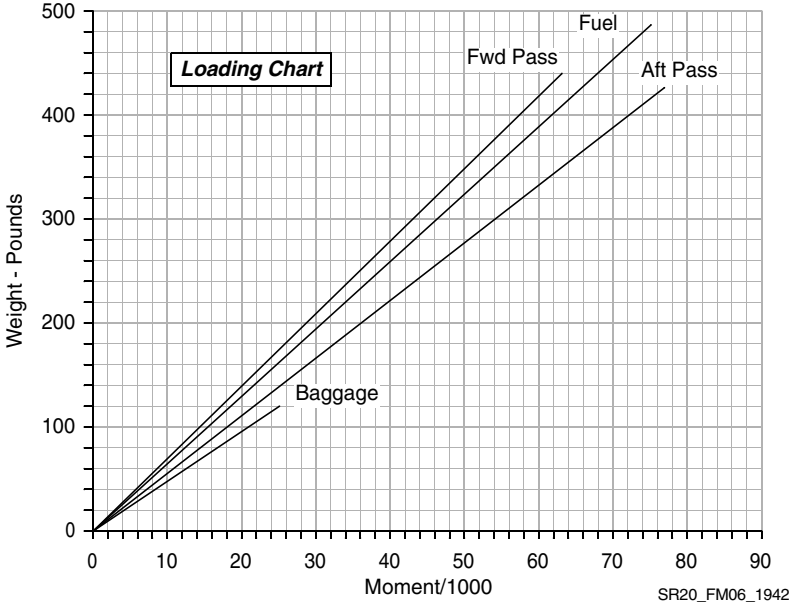
The Takeoff Condition Weight must not exceed 3000 lb. **All weights above 2900 lb must consist of fuel.**

The Takeoff Condition Moment must be within the Minimum Moment to Maximum Moment range at the Takeoff Condition Weight. (Refer to Figure 6-8, Moment Limits).

**Figure 6-6**  
**Weight and Balance Loading Form**

# Loading Data

Use the following chart or table to determine the moment/1000 for fuel and payload items to complete the Loading Form.



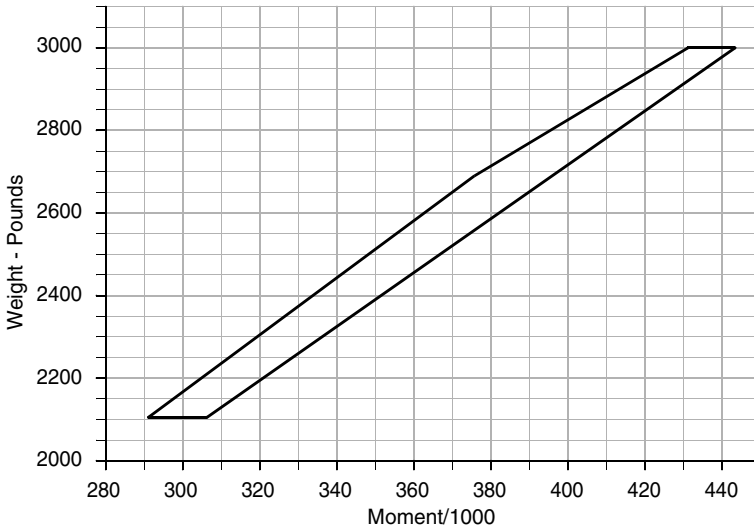
Weight LB	Fwd Pass FS 143.5	Aft Pass FS 180.0	Baggage FS 208.0	Fuel FS 153.8	Weight LB	Fwd Pass FS 143.5	Aft Pass FS 180.0	Fuel FS 153.8
20	2.87	3.60	4.16	3.08	220	31.57	39.60	33.83
40	5.74	7.20	8.32	6.15	240	34.44	43.20	36.90
60	8.61	10.80	12.48	9.23	260	37.31	46.80	39.98
80	11.48	14.40	16.64	12.30	280	40.18	50.40	43.05
100	14.35	18.00	20.80	15.38	300	43.05	54.00	46.13
120	17.22	21.60	24.96	18.45	320	45.92	57.60	49.20
140	20.09	25.20	(27.04)*	21.53	340	48.79	61.20	52.28
160	22.96	28.80		24.60	360	51.66	64.80	55.35
180	25.83	32.40		27.68	380	54.53	68.40	
200	28.70	36.00		30.75	400	57.40	72.00	

\*130 lb Maximum

**Figure 6-7**  
**Loading Data**

# Moment Limits

Use the following chart or table to determine if the weight and moment from the completed Weight and Balance Loading Form are within limits.



SR20\_FM06\_1943A

Weight LB	Moment/1000		Weight LB	Moment/1000	
	Minimum	Maximum		Minimum	Maximum
2110	293	305	2600	366	383
2150	299	311	2650	374	391
2200	306	320	2700	381	399
2250	314	328	2750	390	406
2300	321	336	2800	398	414
2350	329	344	2850	407	422
2400	336	352	2900	415	429
2450	344	360	2950	424	437
2500	351	368	3000	432	444
2550	359	376			

**Figure 6-8**  
**Moment Limits**



## **Equipment List**

This list will be determined after the final equipment has been installed in the aircraft.

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# **Section 7**

## ***Airplane and Systems Description***

### **Table of Contents**

Introduction .....	7-5
Airframe .....	7-6
Fuselage .....	7-6
Wings .....	7-6
Empennage .....	7-7
Flight Controls .....	7-8
Elevator System .....	7-8
Aileron System .....	7-10
Rudder System .....	7-12
Trim Systems .....	7-14
Pitch Trim Control System .....	7-14
Roll Trim Control System .....	7-14
Yaw Trim System .....	7-15
Flight Deck Arrangement .....	7-16
Instrument Panel .....	7-16
Center Console .....	7-17
Flight Instruments .....	7-21
Primary Flight Display - Serials 1337 and Subsequent .....	7-21
Attitude Indicator .....	7-26
Airspeed Indicator .....	7-27
Vertical Speed Indicator .....	7-27
Altimeter .....	7-28
Turn Coordinator .....	7-28
Directional Gyro .....	7-29
Course Deviation Indicator .....	7-30
Horizontal Situation Indicator .....	7-31
Magnetic Compass .....	7-33
Wing Flaps .....	7-34
Flap Control Switch .....	7-34
Landing Gear .....	7-36
Main Gear .....	7-36
Nose Gear .....	7-36
Airplane Cabin .....	7-36

Cabin Doors ..... 7-36

Baggage Compartment..... 7-38

Seats..... 7-38

Windshield and Windows ..... 7-39

Cabin Safety Equipment ..... 7-40

Engine ..... 7-43

    Engine Oil System ..... 7-43

    Engine Cooling..... 7-43

    Engine Fuel Injection ..... 7-44

    Engine Air Induction System..... 7-44

    Engine Fuel Ignition ..... 7-44

    Engine Exhaust..... 7-45

    Engine Controls ..... 7-45

    Alternate Air Control..... 7-46

    Engine Indicating ..... 7-46

Propeller..... 7-55

Fuel System ..... 7-56

    Fuel Selector Valve ..... 7-58

    Fuel Quantity Indicator..... 7-59

    Fuel Flow Indication ..... 7-62

    Fuel Caution Light..... 7-62

    Boost Pump Switch..... 7-63

    Brake System..... 7-64

Electrical System..... 7-67

    Power Generation ..... 7-67

    Power Distribution..... 7-68

    BAT & ALT Master Switches..... 7-70

    Avionics Power Switch..... 7-71

    Volts and Ampere Meter/Indication..... 7-71

    Ammeter Select Switch..... 7-73

    Low-Volts Warning Light ..... 7-73

    ALT Fail Caution Lights..... 7-73

    Circuit Breakers and Fuses..... 7-74

    Ground Service Receptacle ..... 7-75

    Convenience Outlet ..... 7-75

Exterior Lighting ..... 7-75

    Navigation Lights ..... 7-75

    Strobe Light..... 7-75

    Landing Light ..... 7-76

Recognition Lights - Serials 1886 & subsequent .....	7-76
Interior Lighting .....	7-76
Instrument Lights .....	7-76
Panel Flood Lights .....	7-76
Reading Lights .....	7-77
Overhead Dome Light.....	7-77
Environmental System .....	7-77
Description and Operation - Serials 1005 thru 1638.....	7-78
Description and Operation - Serials 1639 and Subs.....	7-79
Pitot-Static System.....	7-84
Pitot Heat Switch .....	7-84
Pitot Heat Light .....	7-84
Alternate Static Source .....	7-86
Stall Warning System.....	7-86
Standard Avionics .....	7-87
Multi-Function Display .....	7-89
Autopilot.....	7-90
GPS Navigation .....	7-93
Communication (COM) Transceivers .....	7-95
Navigation (Nav) Receiver.....	7-96
Transponder .....	7-98
Audio System.....	7-98
Emergency Locator Transmitter .....	7-99
Hour Meter(s).....	7-100
Digital Clock.....	7-101
Cirrus Airplane Parachute System.....	7-103
System Description.....	7-103
Activation Handle.....	7-104
Deployment Characteristics.....	7-105

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## Introduction

This section provides a basic description and operation of the standard airplane and its systems. Optional equipment described within this section is identified as optional.

• Note •

Some optional equipment, primarily avionics, may not be described in this section. For description and operation of optional equipment not described in this section, *refer to Section 9, Supplements*

## Airframe

### Fuselage

The SR20 monocoque fuselage is constructed primarily of composite materials and is designed to be aerodynamically efficient. The cabin area is bounded on the forward side by the firewall at fuselage station 100, and on the rear by the aft baggage compartment bulkhead at fuselage station 222. Comfortable seating is provided for four adults. A composite roll cage within the fuselage structure provides roll protection for the cabin occupants. The cabin and baggage compartment floors are constructed of a foam core composite with access to under-floor components.

All flight and static loads are transferred to the fuselage structure from the wings and control surfaces through four wing attach points in two locations under the front seats and two locations on the sidewall just aft of the rear seats.

*Serials 1423 and subsequent:* The lower firewall employs a 20° bevel to improve crashworthiness. In addition, an avionics bay is located aft of bulkhead 222 and accessible through an access panel installed on the RH side of the aft fuselage.

• Note •

*Refer to Airplane Cabin description* in this section for a complete description of doors, windows, baggage compartment, seats, and safety equipment.

### Wings

The wing structure is constructed of composite materials producing wing surfaces that are smooth and seamless. The wing cross section is a blend of several high performance airfoils. A high aspect ratio results in low drag. Each wing provides attach structure for the main landing gear and contains a 30.25-gallon fuel tank.

The wing is constructed in a conventional spar, rib, and shear section arrangement. The upper and lower skins are bonded to the spar, ribs, and shear sections (rear spars) forming a torsion box that carries all of the wing bending and torsion loads. The wing spar is manufactured in one piece and is continuous from wing tip to wing tip. The shear webs (rear spars) are similar in construction but do not carry through the



fuselage. The main wing spar passes under the fuselage below the two front seats and is attached to the fuselage in two locations. The rear shear webs are attached to the fuselage sidewalls just aft of the rear seats.

## **Empennage**

The empennage consists of a horizontal stabilizer, a two-piece elevator, a vertical fin and a rudder. All of the empennage components are conventional spar (shear web), rib, and skin construction.

The horizontal stabilizer is a single composite structure from tip to tip. The two-piece elevator, attached to the horizontal stabilizer, is aluminum.

The vertical stabilizer is composite structure integral to the main fuselage shell for smooth transfer of flight loads. The rudder is aluminum and is attached to the vertical stabilizer rear shear web at three hinge points.

## Flight Controls

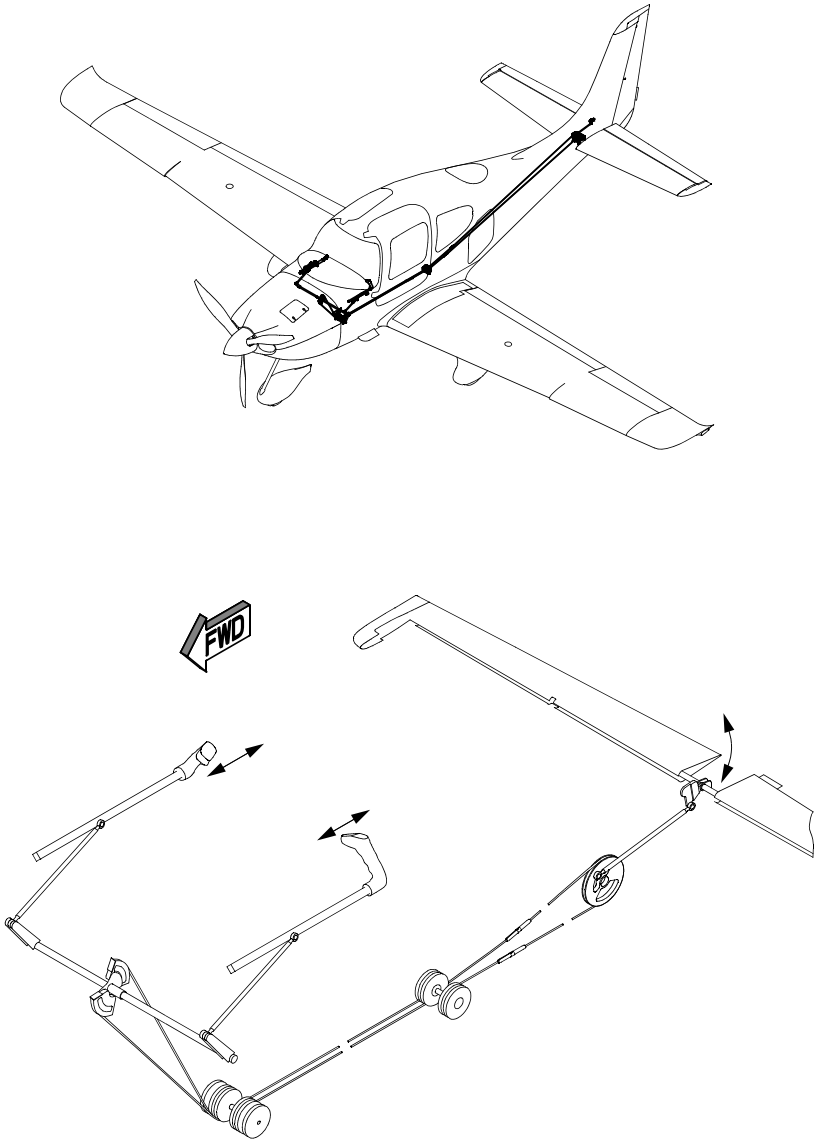
The SR20 uses conventional flight controls for ailerons, elevator and rudder. The control surfaces are pilot controlled through either of two single-handed side control yokes mounted beneath the instrument panel. The location and design of the control yokes allow easy, natural use by the pilot. The control system uses a combination of push rods, cables and bell cranks for control of the surfaces.

Roll trim and pitch trim are available through an electric button on the top of each control yoke.

### Elevator System

The two-piece elevator provides airplane pitch control. The elevator is of conventional design with skin, spar and ribs manufactured of aluminum. Each elevator half is attached to the horizontal stabilizer at two hinge points and to the fuselage tailcone at the elevator control sector.

Elevator motion is generated through the pilot's control yokes by sliding the yoke tubes forward or aft in a bearing carriage. A push-pull linkage is connected to a cable sector mounted on a torque tube. A single cable system runs from the forward elevator sector under the cabin floor to the aft elevator sector pulley. A push-pull tube connected to the aft elevator sector pulley transmits motion to the elevator bellcrank attached to the elevators.



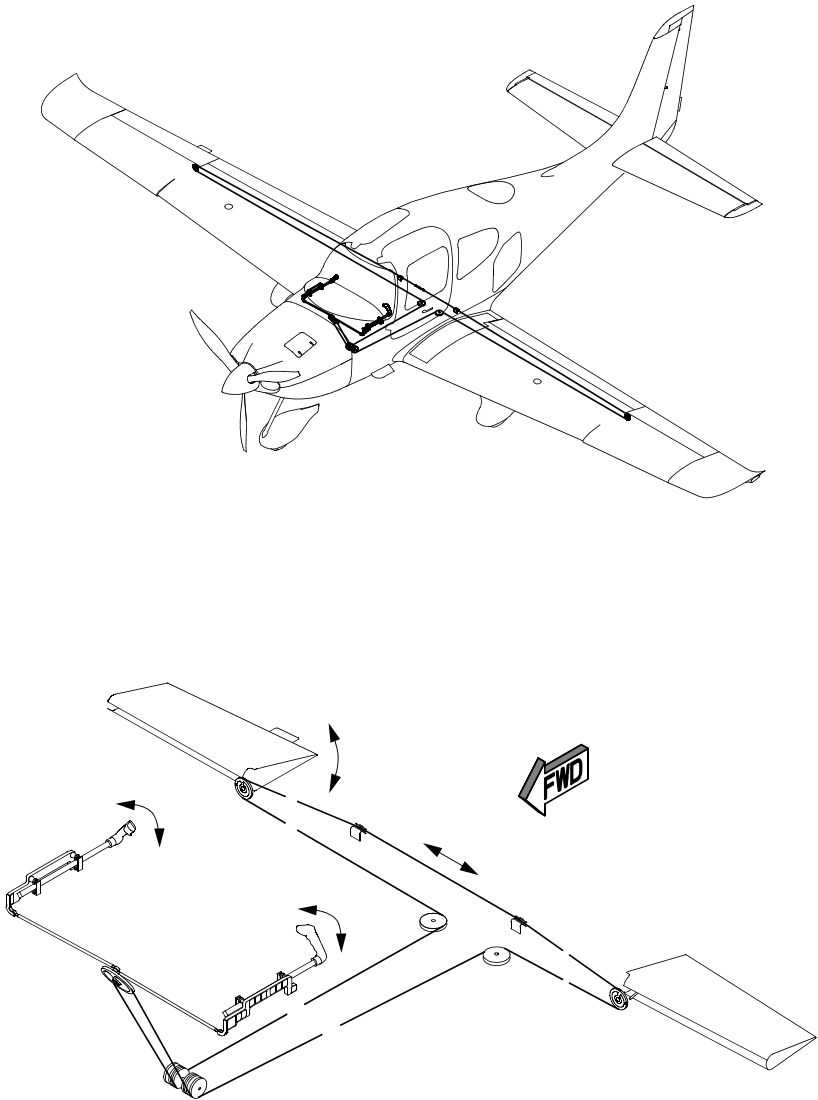
SR20\_FM07\_1461

**Figure 7-1**  
**Elevator Control System**

## **Aileron System**

The ailerons provide airplane roll control. The ailerons are of conventional design with skin, spar and ribs manufactured of aluminum. Each aileron is attached to the wing shear web at two hinge points.

Aileron control motion is generated through the pilot's control yokes by rotating the yokes in pivoting bearing carriages. Push rods link the pivoting carriages to a centrally located pulley sector. A single cable system runs from the sector to beneath the cabin floor and aft of the rear spar. From there, the cables are routed in each wing to a vertical sector/crank arm that rotates the aileron through a right angle conical drive arm.



SR20\_FM07\_1462

**Figure 7-2**  
**Aileron Control System**

## Rudder System

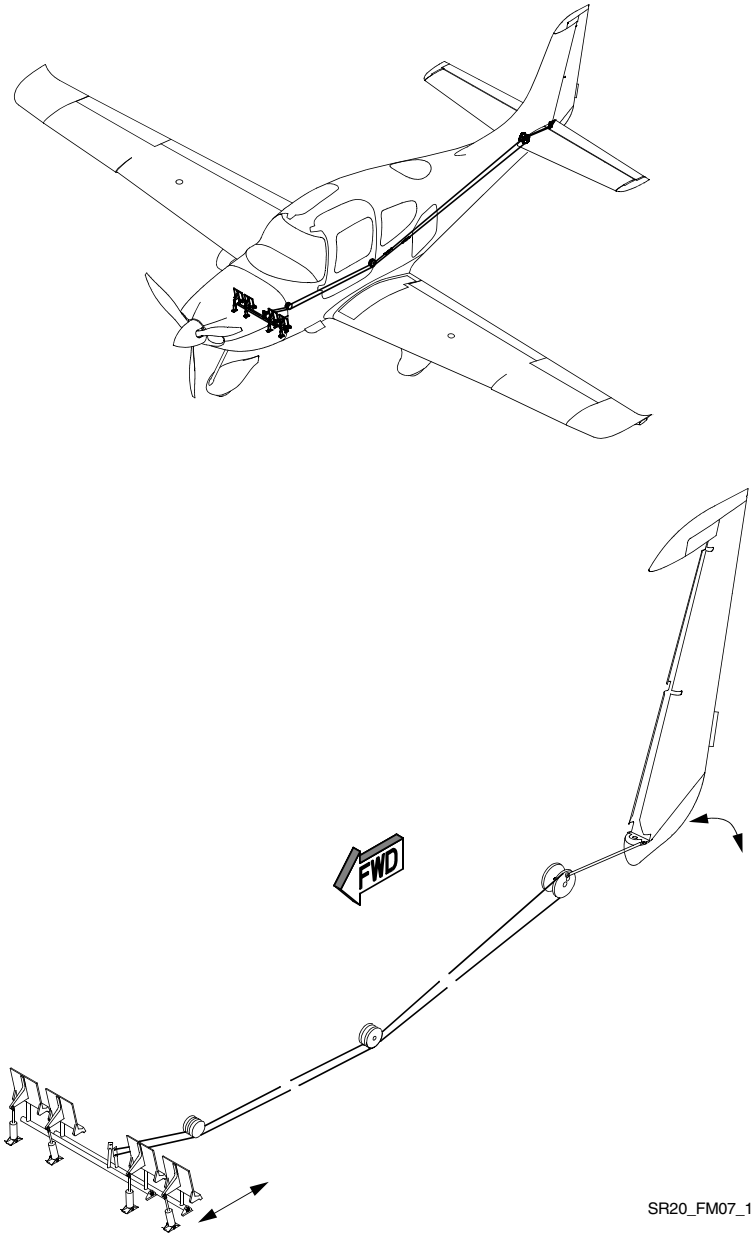
The rudder provides airplane directional (yaw) control. The rudder is of conventional design with skin, spar and ribs manufactured of aluminum. The rudder is attached to the aft vertical stabilizer shear web at three hinge points and to the fuselage tailcone at the rudder control bell crank.

Rudder motion is transferred from the rudder pedals to the rudder by a single cable system under the cabin floor to a sector next to the elevator sector pulley in the aft fuselage. A push-pull tube from the sector to the rudder bell crank translates cable motion to the rudder. Springs and a ground adjustable spring cartridge connected to the rudder pedal assembly tension the cables and provide centering force.

A rudder-aileron interconnect is installed to provide a maximum of 8° down aileron with full rudder deflection. Right rudder input will cause right roll input and left rudder input will cause left roll input. With neutral aileron trim, aileron inputs will not cause rudder deflection.

### ***Control Locks***

The Cirrus SR20 control system is not equipped with gust locks. The trim spring cartridges have sufficient power to act as a gust damper without rigidly locking the position.



SR20\_FM07\_1463

**Figure 7-3**  
**Rudder Control System**

## Trim Systems

Roll and pitch trim are provided by adjusting the neutral position of a compression spring cartridge in each control system by means of an electric motor. The electric roll trim is also used by the autopilot to position the ailerons. It is possible to easily override full trim or autopilot inputs by using normal control inputs.

Ground adjustable trim tabs are installed on the rudder, elevator and right aileron to provide small adjustments in neutral trim. These tabs are factory set and do not normally require adjustment.

### Pitch Trim Control System

An electric motor changes the neutral position of the spring cartridge attached to the elevator control horn. A conical trim button located on top of each control yoke controls the motor. Moving the switch forward will initiate nose-down trim and moving the switch aft will initiate nose-up trim. Neutral (takeoff) trim is indicated by the alignment of a reference mark on the yoke tube with a tab attached to the instrument panel bolster. The elevator trim also provides a secondary means of aircraft pitch control in the event of a failure in the primary pitch control system not involving a jammed elevator. Elevator (pitch) trim operates on 28 VDC supplied through the 2-amp PITCH circuit breaker on Main Bus 1.

### Roll Trim Control System

An electric motor changes the neutral position of a spring cartridge attached to the left actuation pulley in the wing. A conical trim button located on top of each control yoke controls the motor. Moving the switch left will initiate left-wing-down trim and moving the switch right will initiate right-wing-down trim. Neutral trim is indicated by the alignment of the line etched on the control yoke with the centering indication marked on the instrument panel. The aileron trim also provides a secondary means of aircraft roll control in the event of a failure in the primary roll control system not involving jammed ailerons. Aileron trim operates on 28 VDC supplied through the 2-amp ROLL TRIM circuit breaker on Main Bus 1.



## Yaw Trim System

Yaw trim is provided by spring cartridge attached to the rudder pedal torque tube and console structure. The spring cartridge provides a centering force regardless of the direction of rudder deflection. The yaw trim is ground adjustable only.

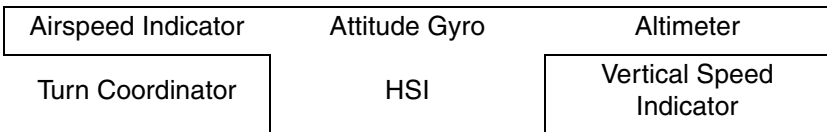
## Flight Deck Arrangement

The following paragraphs are a general description of the flight deck, instrumentation, and controls. The instrument panel is designed for glare-free use in all flight conditions. The instrument panel is arranged primarily for use by the pilot in the left seat; however, it can be viewed from either seat. For details relating to the instrumentation, switches, circuit breakers, and controls on the instrument panel, bolster, and center console, refer to the related topics in this section.

### Instrument Panel

*Serials 1268 through 1336:* Flight instruments and annunciators are located on the left side of the panel and engine instruments are located on the right side of the instrument panel. A large color multifunction display is located between the flight instruments and the engine instruments. Temperature controls are located on the right side below the engine instruments.

The SR20 uses standard flight instruments arranged in the 'basic-six' pattern. They include:



*Serials 1268 through 1337,* an electronic clock is located immediately to the left of the flight instruments on the instrument panel.

A switch panel located in the “dash board” bolster below the flight instruments contains the master and ignition switches, avionics power switch, pitot heat switch, and lighting switches.

*Serials 1337 and subsequent:* The airplane is equipped with an Avidyne FlightMax Entegra-Series Primary Flight Display (PFD). The PFD is a 10.4" landscape-oriented display intended to be the primary display of primary flight parameter information (attitude, airspeed, heading, and altitude) to the pilot. The PFD accepts data from a variety of sources, including the GPS sensors, the System 55X Autopilot, and is the primary heading source for the Multifunction Display.

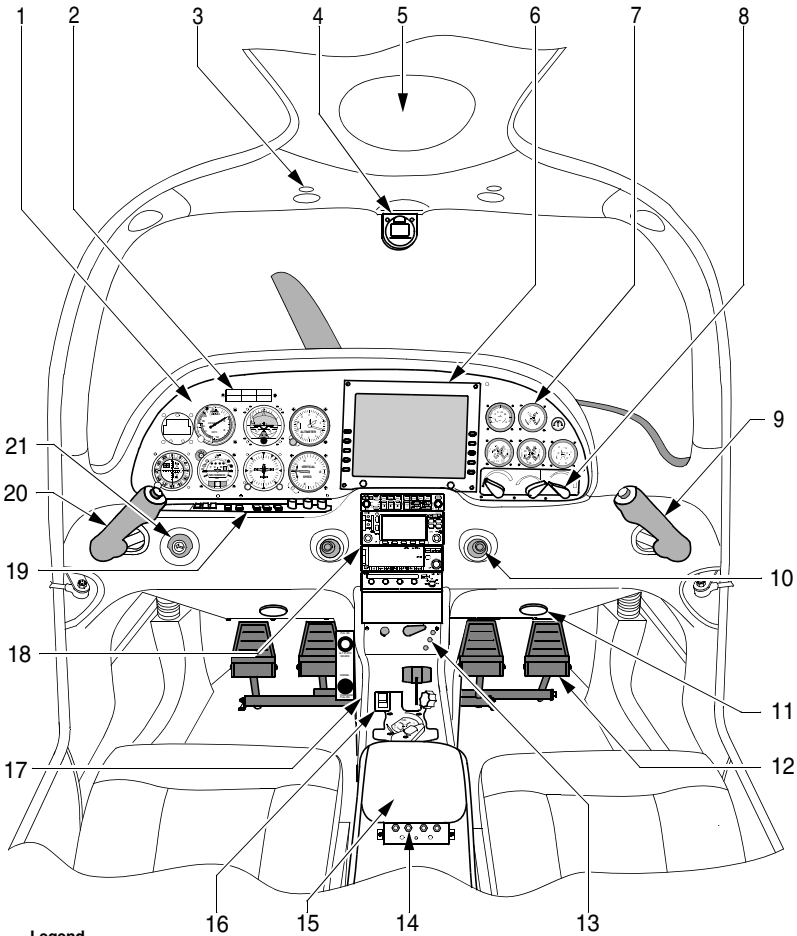
Standby altimeter, airspeed, and attitude indicators are mounted on the bolster panel in case of total or partial PFD failure. To provide roll data to the autopilot system, a Turn Coordinator is mounted behind the RH bolster panel.

Annunciators and the ignition switch are located on the left side of the panel and a large color multifunction display is located adjacent to the primary flight display. Temperature controls are located on the right side below the glove compartment.

A switch panel located in the "dash board" bolster below the flight instruments contains the master switch, avionics power switch, pitot heat switch, and lighting switches.

## **Center Console**

A center console contains the avionics, flap control and position lights, power lever and mixture controls, fuel system indicator and controls, and audio controls. System circuit breakers, the alternate static source valve, alternate induction air control, and ELT panel switch are located on the left side of the console for easy access by the pilot. A friction knob for adjusting throttle and mixture control feel and position stability is located on the right side of the console. An accessory outlet, map compartment, audio jacks, hour meter, emergency egress hammer, and headset jacks are installed inside the console armrest.

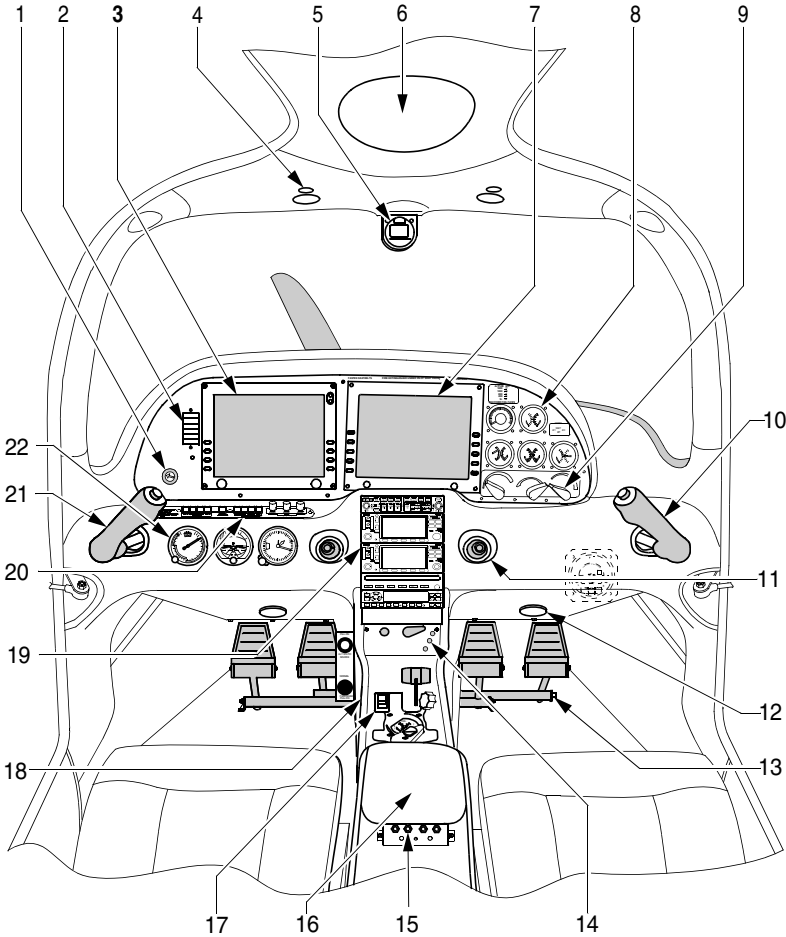


**Legend**

- |  |  |                               |
|--|--|-------------------------------|
| 1. Flight Instrument Panel   | 11. Conditioned Air Outlet             | 18. Avionics Panel            |
| 2. Annunciator Panel   | 12. Rudder Pedals                      | 19. Bolster Switch Panel      |
| 3. Overhead Light & Switch   | 13. Flap Control & Position Indicators | 20. Control Yoke              |
| 4. Magnetic Compass  | 14. Passenger Audio Jacks              | 21. Start/Ignition Key Switch |
| 5. Cirrus Airframe Parachute System (CAPS) Activation T-Handle Cover | 15. Armrest                            |                               |
| 6. Multifunction Display   | 16. Engine & Fuel System Controls      |                               |
| 7. Engine Instruments  | 17. Left Side Console                  |                               |
| 8. Temperature/Ventilation Controls                                  | - Circuit Breaker Panel                |                               |
| 9. Control Yoke  | - Alternate Engine Air                 |                               |
| 10. Fresh Air "Eyeball" Outlet                                       | - Parking Brake                        |                               |
|  | - Alternate Static Source              |                               |

SR20\_FM07\_1059E

**Figure 7-4**  
**Instrument Panel and Console (Sheet 1 of 3)**

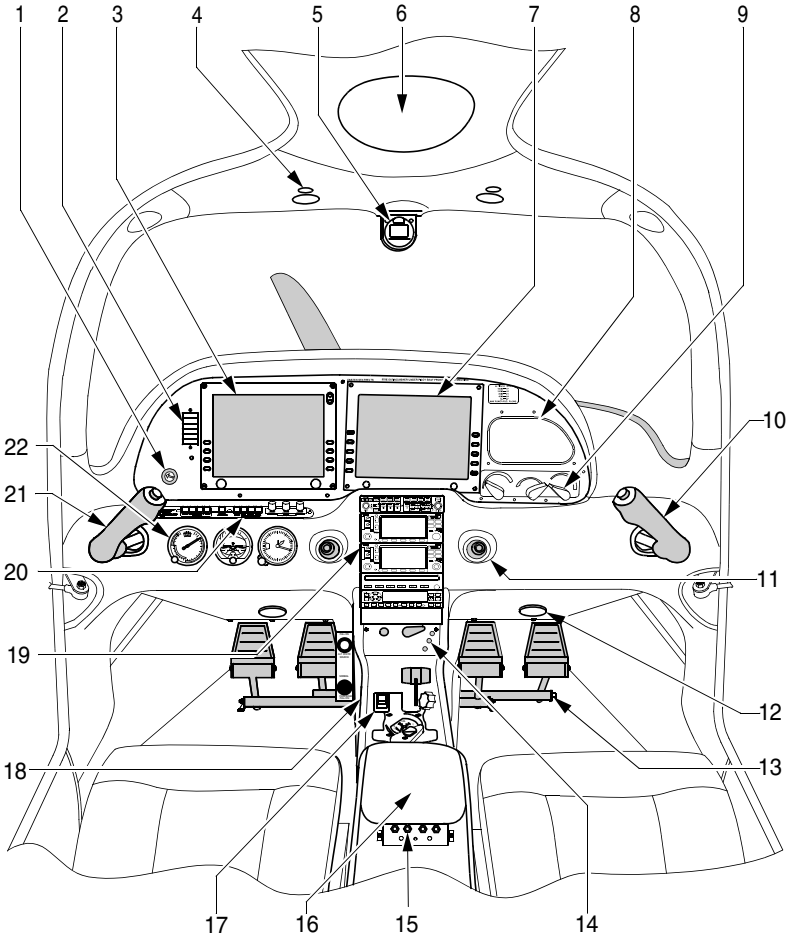


**Legend**

- |  |  |                             |
|--|--|-----------------------------|
| 1. Start/Ignition Key Switch   | 9. Temperature/Ventilation Controls    | 18. Left Side Console       |
| 2. Annunciator Panel   | 10. Control Yoke                       | · Circuit Breaker Panel     |
| 3. Primary Flight Display  | 11. Fresh Air "Eyeball" Outlet         | · Alternate Engine Air      |
| 4. Overhead Light & Switch   | 12. Conditioned Air Outlet             | · Parking Brake             |
| 5. Magnetic Compass  | 13. Rudder Pedals                      | · Alternate Static Source   |
| 6. Cirrus Airframe Parachute System (CAPS) Activation T-Handle Cover | 14. Flap Control & Position Indicators | 19. Avionics Panel          |
| 7. Multifunction Display   | 15. Passenger Audio Jacks              | 20. Bolster Switch Panel    |
| 8. Engine Instruments  | 16. Armrest                            | 21. Control Yoke            |
|  | 17. Engine & Fuel System Controls      | 22. Flight Instrument Panel |

SR20\_FM07\_2027

**Figure 7-4**  
**Instrument Panel and Console (Sheet 2 of 3)**



**Legend**

- |  |  |                             |
|--|--|-----------------------------|
| 1. Start/Ignition Key Switch   | 9. Temperature/Ventilation Controls    | 18. Left Side Console       |
| 2. Annunciator Panel   | 10. Control Yoke                       | - Circuit Breaker Panel     |
| 3. Primary Flight Display  | 11. Fresh Air "Eyeball" Outlet         | - Alternate Engine Air      |
| 4. Overhead Light & Switch   | 12. Conditioned Air Outlet             | - Parking Brake             |
| 5. Magnetic Compass  | 13. Rudder Pedals                      | - Alternate Static Source   |
| 6. Cirrus Airframe Parachute System (CAPS) Activation T-Handle Cover | 14. Flap Control & Position Indicators | 19. Avionics Panel          |
| 7. Multifunction Display   | 15. Passenger Audio Jacks              | 20. Bolster Switch Panel    |
| 8. Glove Box   | 16. Armrest                            | 21. Control Yoke            |
|  | 17. Engine & Fuel System Controls      | 22. Flight Instrument Panel |

SR20\_FM07\_2215

**Figure 7-4**  
**Instrument Panel and Console (Sheet 3 of 3)**

## Flight Instruments

• Note •

For additional information on instrument limit markings, refer to *Section 2, Limitations*.

### Primary Flight Display - *Serials 1337 and Subsequent*

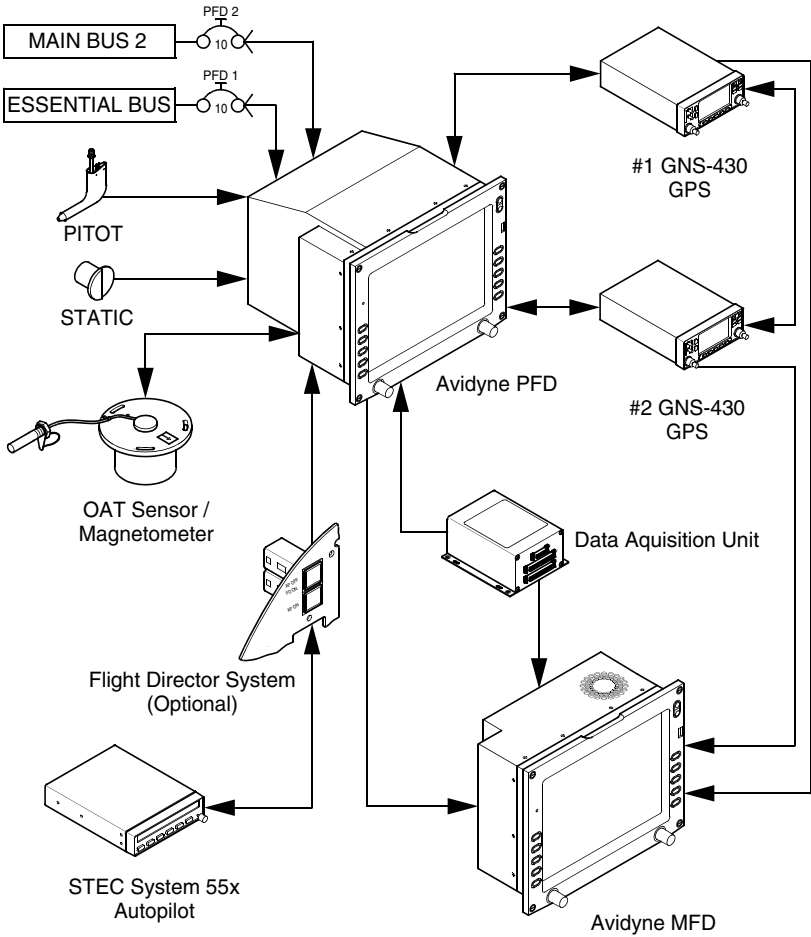
The Primary Flight Display (PFD) provides the functions of the attitude indicator, heading indicator, airspeed indicator, altimeter, vertical speed indicator, directional gyro, course deviation indicator, and altitude pre-select controller onto a single electronic display. In addition, the PFD communicates with GPS1, GPS2, NAV1, NAV2, the Multifunction Display, and Autopilot System.

An integral air data/attitude and heading reference system (ADAHRS) uses a 3-axis solid state gyro and accelerometer system combined with a magnetometer to replace the vertical and directional gyros. ADAHRS also provides roll, pitch, heading data and continually updates the winds aloft and true airspeed (TAS) indications on the PFD. The magnetometer assembly mounted in the wing also provides outside air temperature (OAT) data.

The airplane's Pitot-Static system is connected to the PFD to provide airspeed, altitude, and vertical speed.

Standby instruments for airspeed, attitude and altitude are mounted on the LH bolster panel and are on separate power sources than the PFD.

Redundant power sources provide 28 VDC for system operation. Power is supplied through the 10-amp PFD1 circuit breaker on the Essential Bus and the 10-amp PFD2 circuit breaker on Main Bus 2. Either circuit is capable of powering the PFD. System start-up is automatic once power is applied. The display presents the Initialization Display immediately after power is applied. Power-on default is 75% brightness. Typical alignment times are 3 minutes from battery turn on.



SR20\_FM07\_1607B

**Figure 7-5**  
**PFD System - Simplified Schematic**



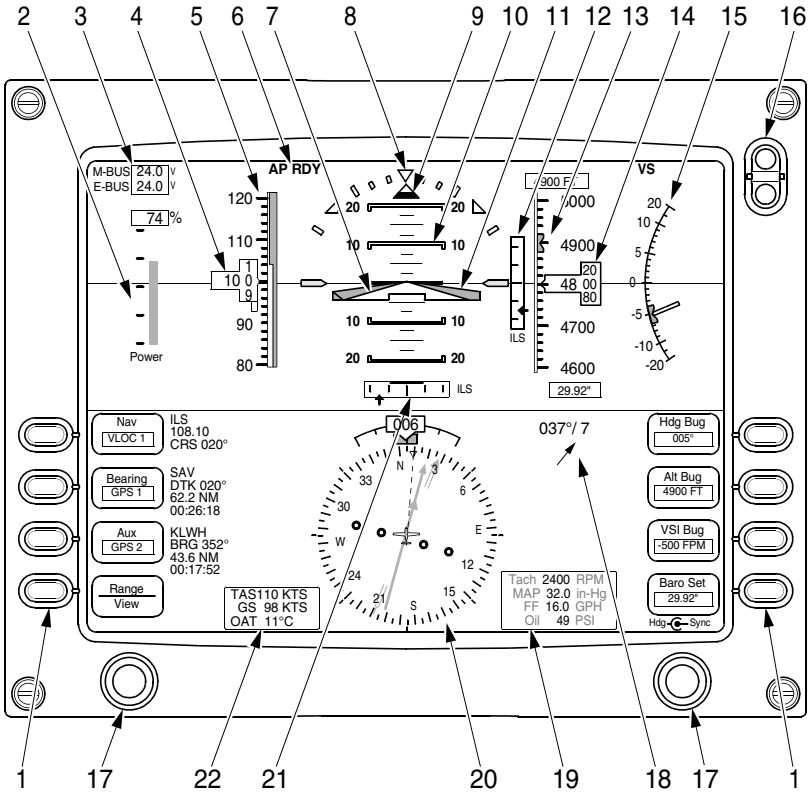
## ***Attitude Direction Indicator (ADI)***

### *Air Data*

The airspeed tape to the left of the main ADI begins indicating at 20 Knots Indicated Airspeed (KIAS) and is color-coded to correspond with airspeeds for  $V_{SO}$ ,  $V_{FE}$ ,  $V_S$ ,  $V_{NO}$ , and  $V_{NE}$ . An altitude tape is provided to the right of the main ADI and also displays a symbol for the Altitude preselect (Altitude bug). The Vertical Speed Indicator (VSI) is displayed to the right of the altitude tape. The displayed scale of the VSI is +/- 2000 FPM and for rates above 2000 FPM, the needle will peg just outside the scale and a digital readout of actual VSI up to 4000 FPM is then displayed. An additional data block is provided for display of outside air temperature (OAT), true airspeed (TAS), and groundspeed (GS). Controls for selecting bug and barometric correction values are along the right side of the PFD. A wind indicator is also provided beneath the altitude tape.

### *Attitude Data*

Attitude is depicted on the main ADI using an aircraft reference symbol against a background of labeled pitch ladders and an arced scale along the top of the ADI to indicate bank angle. A skid/slip indicator is attached to the bottom edge of the bank angle pointer.



**LEGEND**

- |  |  |
|--|--|
| 1. Navigation & Avionics Configuration Buttons | 12. Vertical Deviation Indicator (VDI)   |
| 2. Percent Power                               | 13. Altitude Tape                        |
| 3. Bus Voltages                                | 14. Altitude Window                      |
| 4. Airspeed Window                             | 15. Vertical Speed Indicator (VSI)       |
| 5. Airspeed Tape                               | 16. Brightness Control (BRT/DIM)         |
| 6. Autopilot Annunciations                     | 17. Mode and Display Selection           |
| 7. Aircraft Reference Symbol                   | 18. Wind Vector                          |
| 8. Bank Angle Indicator                        | 19. Engine Information Data Block        |
| 9. Skid/Slip Indicator                         | 20. Horizontal Situation Indicator (HSI) |
| 10. Pitch Ladder                               | 21. Horizontal Deviation Indicator (HDI) |
| 11. Flight Director Steering Command Bars      | 22. Air Data Block                       |

SR20\_FM07\_2220A

**Figure 7-6**  
**Primary Flight Display**

## ***Horizontal Situation Indicator (HSI)***

### *Heading Data*

Magnetic heading is represented in boxed numeric form at the top of the compass rose. Heading rate (Rate of Turn Indicator) takes the form of a blue arcing arrow that begins behind the magnetic heading indicator and moves left or right accordingly. Graduations are provided on the rate-of-turn indicator scale to indicate half and full standard-rate turns. A heading bug is also provided on the compass rose.

### *Navigation Data*

Navigation data on the PFD takes several forms. A course deviation indicator (CDI) is always provided on the HSI and a bearing pointer can be optionally selected for display on the HSI by the pilot. Controls for selecting the source of navigation data, selecting the display format of the navigation data, and for selecting the type of compass rose and moving map to be displayed are along the left side of the PFD. The active flight plan contained in the GPS Nav/Com unit selected as the primary navigation source (Nav) can be optionally selected for display on the HSI as well as the desired range of the optionally selectable moving map display. If a localizer or ILS frequency is tuned and captured in the GPS Nav/Com selected as the Nav source, a vertical deviation indicator (VDI) and horizontal deviation indicator (HDI) are automatically displayed on the ADI.

- Note •

In the event glide slope or localizer signals are lost, the HDI and/or VDI will be displayed as red-“X”s to indicate loss of signal. The red-“X”ed indicator will only be removed if the signal is regained, the Nav Source is changed on the PFD, or if the GPS Nav/Com is retuned to another frequency. Appropriate action must be taken by the pilot if on an approach.

For a detailed description of the PFD, refer to the *Avidyne FlightMax Entegra-Series PFD Pilot's Guide*.

## Attitude Indicator

• Note •

*Serials 1337 and subsequent with SRV standard configuration:* The airplane is not equipped with a standby attitude indicator.

*Serials 1337 and subsequent without SRV configuration:* The standby attitude indicator is mounted on the LH bolster panel.

The attitude indicator gives a visual indication of flight attitude. Bank attitude is indicated by a pointer at the top of the indicator relative to the bank scale with index marks at 10°, 20°, 30°, 60°, and 90° either side of the center mark. A fixed miniature airplane superimposed over a movable mask containing a white symbolic horizon bar, which divides the mask into two sections, indicates pitch and roll attitudes. The upper “blue sky” section and the lower “earth” sections have pitch reference lines useful for pitch attitude control. The indicator can follow maneuvers through 360° in roll and 360° in pitch. A knob at the bottom of the instrument allows adjustment of the miniature airplane to the horizon bar for a more accurate flight attitude indication.

A PULL TO CAGE knob on the indicator is used for quick erection of the gyro. When the caging knob is pulled, the pitch and roll indications will align to within 2° of their respective fixed references.

The instrument is electrically driven and a red GYRO flag indicates loss of electrical power. Redundant circuits paralleled through diodes at the indicator supply DC electrical power for gyro operation. 28 VDC for attitude gyro operation is supplied through the 3-amp Attitude #1 circuit breaker on the Essential Bus and the 3-amp Attitude #2 circuit breaker on the Main Bus 2.

## Airspeed Indicator

• Note •

*Serials 1337 and subsequent:* The standby airspeed indicator is mounted on the LH bolster panel and shows only indicated airspeed.

Indicated and true airspeeds are indicated on a dual-scale, internally lit precision airspeed indicator installed in the pilot's instrument panel. The instrument senses difference in static and Pitot pressures and displays the result in knots on an airspeed scale. A single pointer sweeps an indicated airspeed scale calibrated from 40 to 220 knots. The 'zero' index is at the 12 o'clock position. A sub-scale aligns true airspeed with the corresponding indicated airspeed when the altitude/temperature correction is set in the correction window. A knob in the lower left corner of the instrument is used to rotate the pressure altitude scale in the correction window to align the current pressure altitude with the outside air temperature.

## Vertical Speed Indicator

• Note •

*Serials 1337 and subsequent:* The Vertical Speed Indicator is integrated into the PFD.

Airplane rate of climb or descent in feet per minute is displayed on the internally lit Vertical Speed indicator installed in the pilot's instrument panel. The instrument senses rate of change in static pressure from a reference pressure and displays the result in climb or descent feet per minute (FPM). Climb is indicated by clockwise rotation of the pointer from zero and descent is indicated by counter clockwise rotation. The '0' (zero) reference point is at the 9 o'clock position. The scale is calibrated from 0 to 2000 FPM in 100-FPM increments in both the 'UP' and 'DOWN' directions.

## Altimeter

• Note •

*Serials 1337 and subsequent:* The standby altimeter is mounted on the LH bolster panel.

Airplane altitude is depicted on a conventional, three-pointer, internally lit barometric altimeter installed in the pilot's instrument panel. The instrument senses the local barometric pressure adjusted for altimeter setting and displays the result on the instrument in feet. The altimeter is calibrated for operation between -1000 and 20,000 feet altitude. The scale is marked from 0 to 10 in increments of 2. The long pointer indicates hundreds of feet and sweeps the scale every 1000 feet (each increment equals 20 feet). The short, wide pointer indicates thousands of feet and sweeps the scale every 10,000 feet (each increment equals 200 feet). The short narrow pointer indicates tens of thousands feet and sweeps from 0 (zero) to 2 (20,000 feet with each increment equal to 2000 feet). Barometric windows on the instrument's face allow barometric calibrations in either inches of mercury (in.Hg) or millibars (mb). The barometric altimeter settings are input through the barometric adjustment knob at the lower left of the instrument.

## Turn Coordinator

• Note •

*Serials 1337 and subsequent:* Turn Coordinator function and roll data display is integrated into the PFD.

### **Avionics Configuration 2.0 and 2.1:**

The electric turn coordinator displays roll information and provides roll data to the integral autopilot system (System 20 or System 30) Roll rate is sensed by a single-gimbal, electric-powered gyro and displayed on the face of the instrument. The display consists of a symbolic airplane rotates to indicate turn rate and a standard glass tube and ball inclinometer. Markings, labeled L & R, indicate roll for a standard rate turn in the direction indicated. Redundant circuits paralleled through diodes at the indicator supply DC electrical power. 28 VDC for roll rate gyro operation is supplied through the 2-amp TURN COORD 1 circuit breaker on the Essential Bus and the 2-amp TURN COORD 2 circuit breaker on the Main Bus 2.

### ***Avionics Configuration 2.2:***

The electric turn coordinator, installed in the instrument panel, displays roll information and provides roll data to the System 55X autopilot. The instrument and power supplies are as described above.

## **Directional Gyro**

### ***Avionics Configuration 2.0:***

The airplane is equipped with a directional gyro in the standard configuration. If a directional gyro is not installed the airplane will be equipped with an HSI.

The directional gyro, in the left instrument panel, displays airplane heading by rotating a compass dial in relation to a fixed simulated airplane image and lubber line. The compass dial rotates counter clockwise for right turns. The compass dial should be set in agreement with the magnetic compass just prior to takeoff. As the gyro will precess slightly over a period of time, the directional gyro compass dial should be readjusted occasionally on extended flights. 28 VDC for lighting is supplied through the 2-amp INST LIGHTS circuit breaker on Main Bus 1.

To adjust compass card:

1. Push and hold knob at lower left corner of instrument.
2. While holding knob in, rotate knob to adjust gyro compass dial with current magnetic heading.
3. Release knob.

## Course Deviation Indicator

• Note •

*Serials 1337 and subsequent:* The Course Deviation Indicator is integrated into the PFD.

### **Avionics Configuration 2.0 and 2.1:**

The Course Deviation Indicator (CDI) displays navigation information from the GPS navigator. The CDI displays GPS track deviation on a single deviation bar instrument. A vertical line displays GPS track deviation against a 5-dot scale. The indicator incorporates TO/FROM annunciation and NAV flag. An OBS knob is used to manually rotate the azimuth card to the desired bearing. 28 VDC for lighting is supplied through the 2-amp INST LIGHTS circuit breaker on Main Bus 1.

### **Avionics Configuration 2.2:**

The Course Deviation Indicator (CDI) displays navigation information from GPS 2 (Garmin GNS 430). Navigation source selection is made using the CDI button on the GPS 2 control. The CDI displays course deviation from a VOR or Localizer (LOC) and Glideslope when 'VLOC' is the selected navigation source and displays GPS track deviation when 'GPS' is the selected navigation source. The instrument has two deviation bars. The vertical line displays VOR/LOC or GPS track deviation against a 5-dot scale. The horizontal line displays glideslope deviation against a 5-dot scale. The indicator incorporates TO/FROM annunciation, NAV flag, and GS flag. An OBS knob is used to manually rotate the azimuth card to the desired bearing. 28 VDC for instrument lighting is supplied through the 2-amp INST LIGHTS circuit breaker on Main Bus 1.



## Horizontal Situation Indicator

• Note •

*Serials 1337 and subsequent:* The Horizontal Situation Indicator is integrated into the PFD.

### **Avionics Configuration 2.1:**

The Century NSD-1000 is a conventional HSI that provides gyro stabilized, magnetically slaved, heading information, a pictorial VOR/LOC display with a conventional course arrow, and glideslope presentation. The instrument displays airplane heading by rotating a compass dial in relation to a fixed simulated airplane image and lubber line. The HSI directional gyro, which drives the compass dial, is slaved to a flux detector in the right wing through an amplifier under the copilot's floor. A FREE GYRO-SLAVE switch, below the display, allows the pilot to select either Free Gyro mode or Slave mode. In Slave mode, the gyro is slaved to the flux detector. In Free Gyro mode, the gyro must be manually set to the airplane's magnetic compass using the PUSH-SET-CARD knob in the lower right corner of the instrument. The course is set using the Course (Arrow) knob in the lower left corner of the instrument. The HSI course and heading outputs provided to the autopilot to allow NAV/LOC/GPS course tracking or to track a preset heading.

The HSI incorporates conventional warning flags. The HDG (Heading) flag will be out of view whenever the instrument is receiving sufficient electrical power for operation. The NAV (Navigation) flag will be out of view when a VOR or LOC frequency is tuned in the NAV1 receiver and a reliable signal is present. The GS (Glideslope) flag will be out of view when an ILS frequency is tuned on the Nav 1 receiver and a reliable GS signal is present.

The NSD-1000 HSI is electrically driven and a red GYRO flag indicates loss of electrical power. Redundant circuits paralleled through diodes at the indicator supply DC electrical power for gyro operation. 28 VDC for the redundant power circuits is supplied through the 5-amp HSI/PFD 1 circuit breaker on the Essential Bus and 5-amp HSI/PFD 2 circuit breaker on Main Bus 2.

### ***Avionics Configuration 2.2:***

The Sandel SN3308 combines the functions of an HSI, an RMI, a full color moving map, a Stormscope display, GPS annunciator, and 3-light marker beacon indicators. Compass information is derived from a remote directional gyro and a flux detector. Redundant power sources provide 28 VDC for system operation. Power is supplied through the 5-amp HSI/PFD 1 circuit breaker on the Essential Bus and the 5-amp HSI/PFD 2 circuit breaker on Main Bus 2. Either circuit is capable of powering the Navigation Display.

The full-color display uses a rear-projection system driven by an active matrix LCD display. The unit uses a halogen lamp as the singular primary display projection light source. A separate dimming knob for the display brightness is provided immediately below the display.

The HSI display shows heading and navigation information in a 360° view similar to a conventional mechanical HSI, or in an EFIS 90° ARC view. This includes compass card, heading bug, course pointer, course deviation bar, TO/FROM indicator, glideslope indicator, and flags. Heading bug and course pointer settings include digital readouts that make it easy to set precise headings and courses. One button operation allows primary navigation to be selected from up to four different sources: two VOR/ILS receivers and two GPS receivers. Either GPS1 or NAV1 may be selected as primary navigation sources. Up to two bearing pointers can be displayed and switched to any NAV receiver including GPS1, GPS2, NAV1, or NAV2. GPS2 and NAV2 can only be displayed as bearing pointers, not as a primary navigation source. The display is color-coded to indicate which navigation source is selected: green for NAV1, yellow for NAV2, and red for GPS.

Auto Slew automatically turns the course pointer in response to waypoint sequencing or Direct-To navigation from the GPS receiver eliminating manual course changes at waypoints and reducing pilot workload.

Heading and Course Sync allows the pilot, with one button, to automatically set the heading bug directly to his current heading, or to set the course pointer directly to a VOR station, simultaneously centering course deviation. Course and heading command outputs for autopilot operations are also provided.

The SN3308 detects and warns of abnormal conditions such as flagged navigation receivers and failed directional gyro or flux detector. It also monitors its own internal temperature and provides warnings for over-temperature or loss of cooling conditions.

Redundant circuits paralleled through diodes at the indicator supply DC electrical power for gyro operation. 28 VDC for the redundant power circuits is supplied through the 5-amp HSI/PFD 1 circuit breaker on the Essential Bus and 5-amp HSI/PFD 2 circuit breaker on Main Bus 2.

## **Magnetic Compass**

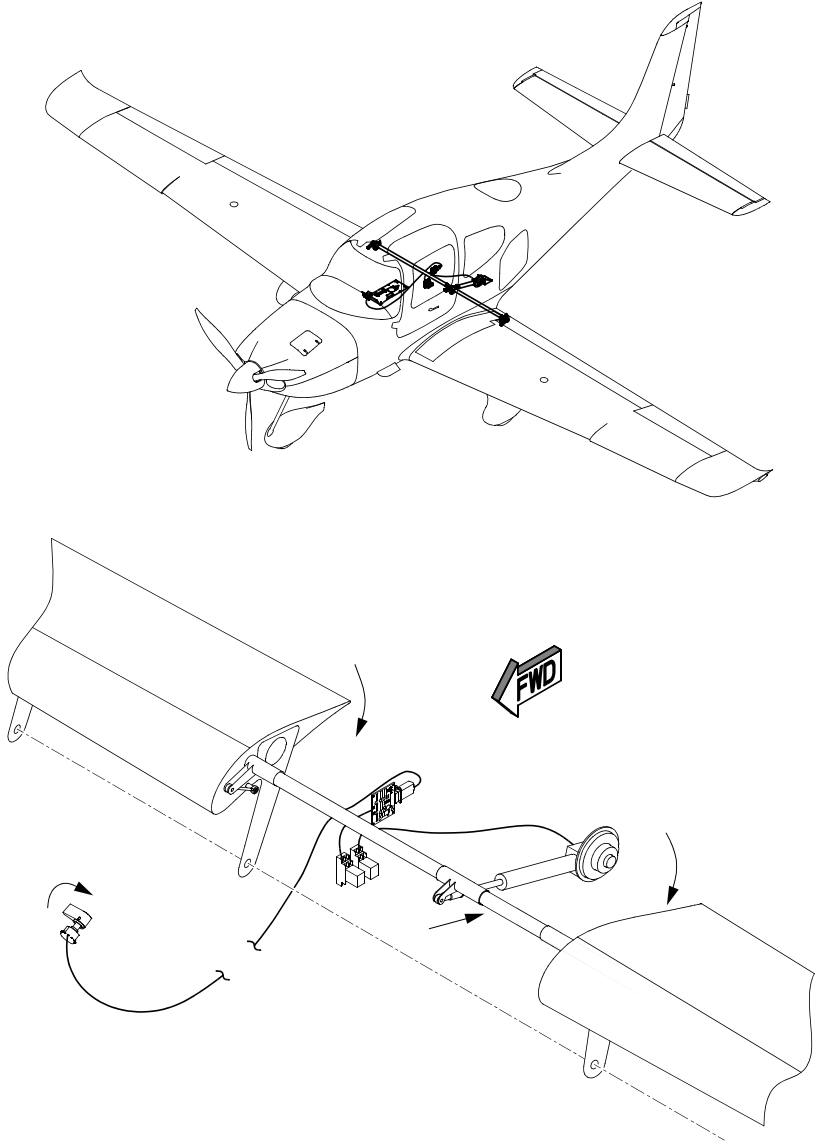
A conventional, internally lighted, liquid filled, magnetic compass is installed on the cabin headliner immediately above the windshield. A compass correction card is installed with the compass.

## Wing Flaps

The electrically controlled, single-slotted flaps provide low-speed lift enhancement. Each flap is manufactured of aluminium and connected to the wing structure at three hinge points. Rub strips are installed on the top leading edge of each flap to prevent contact between the flap and wing flap cove. The flaps are selectively set to three positions: 0%, 50% (16°) and 100% (32°) by operating the FLAP control switch. The FLAP control switch positions the flaps through a motorized linear actuator mechanically connected to both flaps by a torque tube. Proximity switches in the actuator limit flap travel to the selected position and provide position indication. The wing flaps and control circuits are powered by 28 VDC through the 15-amp FLAPS circuit breaker on the Non-Essential Bus.

### Flap Control Switch

An airfoil-shaped FLAPS control switch is located at the bottom of the vertical section of the center console. The control switch is marked and has detents at three positions: UP (0%), 50% and 100% (Down). The appropriate  $V_{FE}$  speed is marked at the Flap 50% and 100% switch positions. Setting the switch to the desired position will cause the flaps to extend or retract to the appropriate setting. An indicator light at each control switch position illuminates when the flaps reach the selected position. The UP (0%) light is green and the 50% and FULL (100%) lights are yellow.



SR20\_FM07\_1460

**Figure 7-7**  
**Wing Flaps**

## Landing Gear

### Main Gear

The main landing gear are bolted to composite wing structure between the wing spar and shear web. The landing gear struts are constructed of composite material for fatigue resistance. The composite construction is both rugged and maintenance free. The main wheels and wheel pants are bolted to the struts. Each main gear wheel has a 15 x 6.00 x 6 tire with inner-tube installed. Standard wheel pants are easily removable to provide access to tires and brakes. Access plugs in the wheel pants can be removed to allow tire inflation and pressure checking. Each main gear wheel is equipped with an independent, hydraulically operated, single-disc type brake.

### Nose Gear

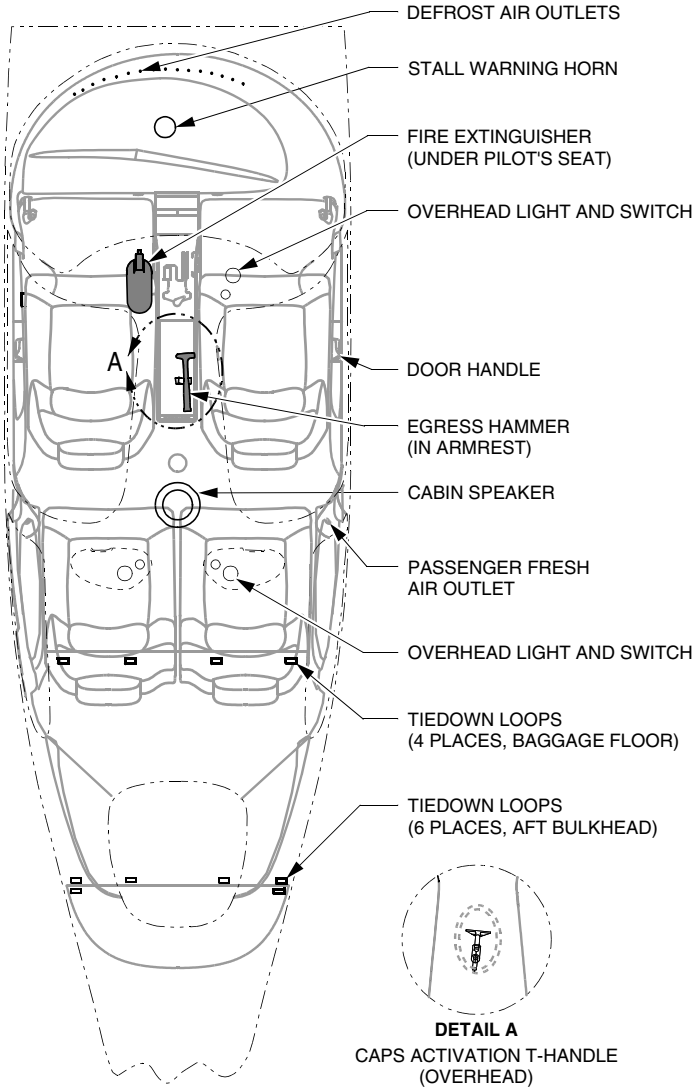
The nose gear strut is of tubular steel construction and is attached to the steel engine mount structure. The nose wheel is free casting and can turn through an arc of approximately, Serials 1005 thru 1885, 216 degrees (108 degrees either side of center) or, Serials 1886 thru 2064, 170 degrees (85 degrees either side of center). Nose gear shock absorption is provided by polymer shock absorbing pucks. Steering is accomplished by differential application of individual main gear brakes. The tube-type nosewheel tire measures 5.00 x 5.

## Airplane Cabin

### Cabin Doors

Two large forward hinged doors allow crew and passengers to enter and exit the cabin. The door handles engage latching pins in the door frame receptacles at the upper aft and lower aft door perimeter. Gas charged struts provide assistance in opening the doors and hold the doors open against gusts. Front seat armrests are integrated with the doors. A key lock in each door provides security. The cabin door keys also fit the baggage compartment door lock.

*Serials 1423 and subsequent:* The seat back must be in the fully upright or the fully reclined position before closing the cabin door. Seat backs in the forward or break-over position can cause damage to the door handle or interior panel.



SR20\_FM07\_1064

**Figure 7-8**  
**Cabin Arrangement**

## Baggage Compartment

The baggage compartment door, located on the left side of the fuselage aft of the wing, allows entry to the baggage compartment. The baggage door is hinged on the forward edge and latched on the rear edge. The door is locked from the outside with a key lock. The baggage compartment key will also open the cabin doors.

The baggage compartment extends from behind the rear passenger seat to the aft cabin bulkhead. The rear seats can be folded forward to provide additional baggage area for long or bulky items.

Four baggage tie-down straps are provided to secure baggage and other items loaded in the baggage compartment. Each strap assembly has a hook at each end and a cam-lock buckle in the middle. The hook ends clip over loop fittings installed in the baggage floor and in the aft bulkhead. The tie-down straps should be stowed attached and tightened to the fittings. If not adequately restrained, baggage compartment items may pose a projectile hazard to cabin occupants in the event of rapid deceleration. Secure all baggage items with tie-down straps.

To install tie-down strap:

1. Position straps over baggage. Thread straps through luggage handles if possible.
2. Clip hook ends of straps over loop fittings.
3. Grasp the buckle and pull the loose strap end of each strap to tighten straps over contents of baggage compartment.

To loosen tie-down straps:

1. Lift buckle release and pull on buckle to loosen strap.
2. Lift hook ends free of loop fittings.

## Seats

The seating arrangement consists of two individually adjustable seats for the pilot and front seat passenger and two individual seats with fold down seat backs for the rear seat passengers.

The front seats are adjustable fore and aft and the seat backs can be reclined for passenger comfort or folded forward for rear seat access. Integral headrests are provided. The fore and aft travel path is



adjusted through the seat position control located below the forward edge of the seat cushion. The seat track is angled upward for forward travel so that shorter people will be positioned slightly higher as they adjust the seat forward. Recline position is controlled through levers located on each side of the seat backs. Depressing the recline release control while there is no pressure on the seat back will return the seat back to the full up position.

• **Caution** •

The seat bottoms have an integral aluminum honeycomb core designed to crush under impact to absorb downward loads. To avoid crushing this core, do not kneel or stand on the seats.

To position front seat fore and aft:

1. Lift the position control handle.
2. Slide the seat into position.
3. Release the handle and check that the seat is locked in place.

To adjust recline position:

1. Actuate and hold the seat back control lever.
2. Position the seat back to the desired angle.
3. Release the control lever.

Each rear seat consists of a fixed seat bottom, a folding seat back, and a headrest. The seat backs can be unlatched from inside the baggage compartment and folded forward to provide a semi-flat surface for bulky cargo extending forward from the baggage compartment.

To fold seat back forward:

1. From the baggage access, lift the carpet panel at lower aft edge of seat to reveal the seat back locking pins (attached to lanyards).
2. Remove the locking pins and fold seat forward.

## Windshield and Windows

The windshield and side windows are manufactured of acrylic. Use only clean soft cloths and mild detergent to clean acrylic surfaces. *Refer to Section 8* for detailed cleaning instructions.

## Cabin Safety Equipment

### *Passenger Restraints*

Integrated seat belt and shoulder harness assemblies with inertia reels are provided for the pilot and each passenger. The rear seat belts are attached to fittings on the floorboard and the forward seat belts are attached to the seat frame. The shoulder harnesses are attached to inertia reels mounted in the seat back for the front seats and on the baggage compartment rear bulkhead for the rear seats. Each harness is attached to the seat belt. The buckle half of each assembly is on the left-hand side and the link half is on the right-hand side. The inertia reels allow complete freedom of movement of the occupant's upper torso. In the event of a sudden deceleration, the reels lock automatically to protect the occupants. It is recommended that the seat belts be stowed in the latched position when not in use.

*Serials 1268 through 1540 after SB 2X-25-14 and serials 1541 and subsequent;* An inflatable shoulder harness is integral to each crew seat harness. The electronic module assembly, mounted below the cabin floor, contains a crash sensor, battery, and related circuitry to monitor the deceleration rate of the airplane. In the event of a crash, the sensor evaluates the crash pulse and sends a signal to an inflator assembly mounted to the aft seat frame. This signal releases the gas in the inflator and rapidly inflates the airbag within the shoulder harness cover. After airbag deployment, the airbag deflates to enable the pilot/co-pilot to egress the aircraft without obstruction.

The crash sensor's predetermined deployment threshold does not allow inadvertent deployment during normal operations, such as hard landings, strikes on the seat, or random vibration.

#### • Caution •

No slack may exist between the occupant's shoulder and restraint harness shoulder strap.

Stow the seat belts in the latched position when not in use.

*To use the restraints:*

1. Slip arms behind the harness so that the harness extends over shoulders.
2. Hold the buckle and firmly insert the link.

3. Grasp the seat belt tabs outboard of the link and buckle and pull to tighten. Buckle should be centered over hips for maximum comfort and safety.
4. Restraint harnesses should fit snug against the shoulder with the lap buckle centered and tightened around the hips.

To release the restraints:

1. Grasp the top of the buckle opposite the link and pull outward. The link will slip free of buckle.
2. Slip arms from behind the harness.

### ***Emergency Egress Hammer***

An eight-ounce ball-peen type hammer is located in the center armrest accessible to either front seat occupant. In the event of a mishap where the cabin doors are jammed or inoperable, the hammer may be used to break through the acrylic windows to provide an escape path for the cabin occupants.

### ***Fire Extinguisher***

A liquefied-gas-type fire extinguisher, containing Halon 1211/1301 extinguishing agent, is mounted on the forward inboard side of the pilot's seat base. The extinguisher is approved for use on class B (liquid, grease) and class C (electrical equipment) fires. The Halon 1211/1301 blend provides the best fire extinguishing capability with low toxicity. A pin is installed through the discharge mechanism to prevent inadvertent discharge of extinguishing agent. The fire extinguisher must be replaced after each use.

To operate the extinguisher:

1. Loosen retaining clamp and remove the extinguisher from its mounting bracket.
2. Hold the extinguisher upright and pull the pin.
3. Get back from the fire and aim nozzle at base of fire at the nearest edge.
4. Press red lever and sweep side to side.

### **• WARNING •**

Halon gas used in the fire extinguisher can be toxic, especially in a closed area. After discharging fire extinguisher, ventilate

cabin by opening air vents and unlatching door. Close vents and door after fumes clear.

The extinguisher must be visually inspected before each flight to assure that it is available, charged, and operable. The preflight inspection consists of ensuring that the nozzle is unobstructed, the pin has not been pulled, and the canister has not been damaged. Additionally, the unit should weigh approximately 1.5 lb (0.7 kg). For preflight, charge can be determined by 'hefting' the unit.

## Engine

The SR20 is powered by a Teledyne Continental IO-360-ES, six-cylinder, normally aspirated, fuel-injected engine de-rated to 200 hp at 2,700 RPM. The engine has a 2000-hour Time Between Overhaul (TBO). Dual, conventional magnetos provide ignition.

The engine is attached to the firewall by a four-point steel mount structure. The firewall attach points are structurally reinforced with gusset-type attachments that transfer thrust and bending loads into the fuselage shell.

## Engine Oil System

The engine is provided with a wet-sump, high-pressure oil system for engine lubrication and cooling. Oil for engine lubrication is drawn from an eight-quart capacity sump through an oil suction strainer screen and directed to the engine-mounted oil cooler. The oil cooler is equipped with a pressure relief and temperature control valve set to bypass oil if the temperature is below 170° F or the pressure drop is greater than 18 psi. Bypass or cooled oil is then directed through the one-quart, full-flow oil filter, a pressure relief valve, and then through oil galleries to the engine rotating parts and piston inner domes. Oil is also directed to the propeller governor to regulate propeller pitch. The complete oil system is contained in the engine. An oil filler cap and dipstick are located at the left rear of the engine. The filler cap and dipstick are accessed through a door on the top left side of the engine cowling.

### • Caution •

The engine should not be operated with less than six quarts of oil. Seven quarts (dipstick indication) is recommended for extended flights.

## Engine Cooling

Engine cooling is accomplished by discharging heat to the oil and then to the air passing through the oil cooler, and by discharging heat directly to the air flowing past the engine. Cooling air enters the engine compartment through the two inlets in the cowling. Aluminum baffles direct the incoming air to the engine and over the engine cylinder cooling fins where the heat transfer takes place. The heated air exits

the engine compartment through two vents in the aft portion of the cowling. No movable cowl flaps are used.

## **Engine Fuel Injection**

The multi-nozzle, continuous-flow fuel injection system supplies fuel for engine operation. An engine driven fuel pump draws fuel from the selected wing tank and passes it to the mixture control valve integral to the pump. The mixture control valve proportions fuel in response to the pilot operated mixture control lever position and automatically provides altitude compensation to supply the proper full rich mixture at any altitude. From the mixture control, fuel is routed to the fuel-metering valve on the air-induction system throttle body. The fuel-metering valve adjusts fuel flow in response to the pilot controlled Power Lever position. From the metering valve, fuel is directed to the fuel manifold valve (spider) and then to the individual injector nozzles. The system meters fuel flow in proportion to engine RPM, throttle angle, and ambient altitude pressure. Manual mixture control and idle cut-off are provided. An electric fuel pump provides fuel boost for vapor suppression and for priming.

## **Engine Air Induction System**

Induction air enters the engine compartment through the two inlets in the forward cowling. The air passes through a dry-foam induction filter, through the throttle butterfly, into the six-tube engine manifold, and finally through the cylinder intake ports into the combustion chambers. Should the dry induction filter become clogged, a pilot controlled alternate induction air door can be opened, allowing engine operation to continue. *Refer to Engine Controls, Alternate Air Control.*

## **Engine Fuel Ignition**

Two engine-driven magnetos and two spark plugs in each cylinder provide fuel ignition. The right magneto fires the lower right and upper left spark plugs, and the left magneto fires the lower left and upper right spark plugs. Normal operation is conducted with both magnetos, as more complete burning of the fuel-air mixture occurs with dual ignition.

## Engine Exhaust

Engine exhaust gases are routed through a dual tuned exhaust system. After leaving the cylinders, exhaust gases are routed through the exhaust manifold, through mufflers located on either side of the engine, and then overboard through exhaust pipes exiting through the lower cowling. A muff type heat exchanger, located around the right muffler, provides cabin heat.

## Engine Controls

Engine controls are easily accessible to the pilot on a center console. They consist of a single-lever power (throttle) control and a mixture control lever. A friction control wheel, labeled FRICTION, on the right side of the console is used to adjust control lever resistance to rotation for feel and control setting stability. An alternate induction air source control is also provided.

### ***Power (Throttle) Lever***

The single-lever throttle control, labeled MAX-POWER-IDLE, on the console adjusts the engine throttle setting in addition to automatically adjusting propeller speed. The lever is mechanically linked by cables to the air throttle body/fuel-metering valve and to the propeller governor. Moving the lever towards MAX opens the air throttle butterfly and meters more fuel to the fuel manifold. A separate cable to the propeller governor adjusts the governor oil pressure to increase propeller pitch to maintain engine RPM. The system is set to maintain approximately 2500 RPM throughout the cruise power settings and 2700 RPM at full power.

### ***Mixture Control***

The mixture control lever, labeled RICH-MIXTURE-CUTOFF, on the console adjusts the proportion of fuel to air for combustion. The Mixture Control Lever is mechanically linked to the mixture control valve in the engine-driven fuel pump. Moving the lever forward (towards RICH) repositions the valve allowing greater proportions of fuel and moving the lever aft (towards CUTOFF) reduces the proportion of fuel. The full aft position (CUTOFF) closes the control valve.

## **Start/Ignition Switch**

• Note •

*Serials 1337 and subsequent:* The Start/Ignition Switch is located on the instrument panel.

A rotary-type key switch, located on the left bolster, controls ignition and starter operation. The switch is labeled OFF-R-L- BOTH-START. In the OFF position, the starter is electrically isolated, the magnetos are grounded and will not operate. Normally, the engine is operated on both magnetos (switch in BOTH position) except for magneto checks and emergency operations. The R and L positions are used for individual magneto checks and for single magneto operation when required. When the BAT 1 master switch is ON, rotating the switch to the spring-loaded START position energizes the starter and activates both magnetos. The switch automatically returns to the BOTH position when released.

## **Alternate Air Control**

An Alternate Induction Air Control knob, labeled ALT AIR – PULL, is installed on the left console near the pilot's right ankle. To operate the control, depress the center lock button, pull the knob to the open position, and then release the lock button. Pulling the knob opens the alternate air induction door on the engine induction air manifold, bypasses the air filter, and allows warm unfiltered air to enter the engine. Alternate induction air should be used if blocking of the normal air source is suspected. Operation using alternate induction air should be minimized and the cause of filter blocking corrected as soon as practical.

## **Engine Indicating**

The SR20 is equipped with engine instrumentation and warning lights to monitor the engine performance.

• Note •

For additional information on instrument limit markings, *refer to Section 2, Limitations.*



*Serials 1268 through 1581:* The engine instruments are located on the right side of the instrument panel and the oil temperature/pressure warning light is located in the annunciator panel immediately in front of the pilot.

*Serials 1582 and subsequent:* The engine instrumentation is displayed on the MFD's Engine Page. A separate Data Acquisition Unit (DAU), mounted above the right hand kickplate, converts analog signals from the CHT, EGT, MAP, oil pressure, oil temperature, and tachometer sensors to digital format, which are then transmitted to the MFD and/or PFD for display. 28 VDC for Data Acquisition Unit operation is supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus

The PFD presents percent power in the upper left area of the display in vertical tape format and as text immediately above. Engine RPM, manifold pressure, fuel flow and oil pressure are continuously displayed in the engine data block located in the lower right corner of the PFD.

System health, caution, and warning messages are displayed in color-coded advisory boxes in the lower right corner of the MFD. In addition, the text of the engine parameters displayed on the PFD change to the corresponding color of advisory box during an annunciation event.

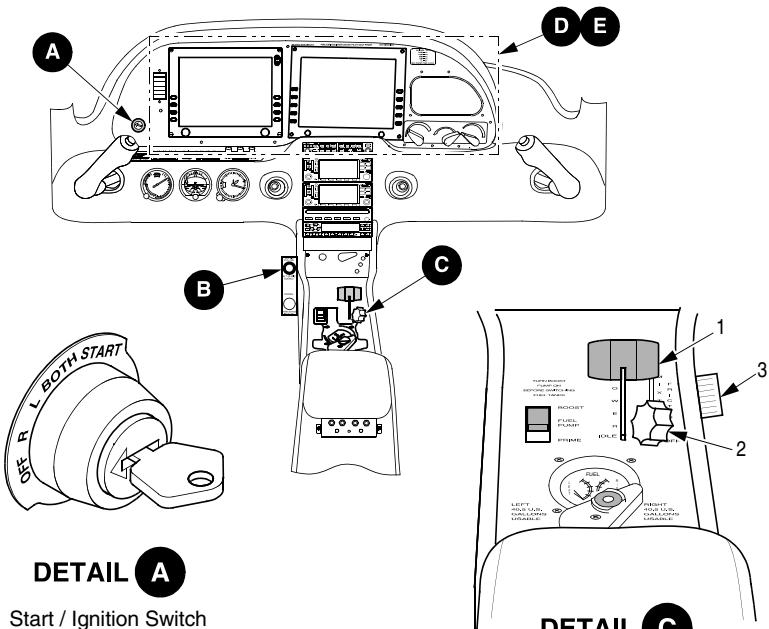
The oil temperature/pressure warning light is located in the annunciator panel immediately in front of the pilot.

• Note •

*Serials 1268 and subsequent with optional EMax Engine Monitoring after factory installation or after Service Bulletin SB 22-77-01:* The following engine instrument component descriptions are the same as those listed for airplane serials 1582 and subsequent except:

- EGT and CHT probes are installed to each exhaust pipe and cylinder head respectively. MFD functionality is enhanced by displaying six channels of EGT and CHT data.

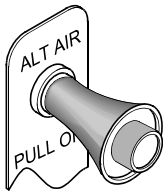
*Refer to Avidyne FlightMax EX5000C Pilot's Guide,* for a more complete description of the MFD, its operating modes, and additional detailed operating procedures for the EMax option.



**DETAIL A**

Start / Ignition Switch

Serials 1005 thru 1336:  
Switch is located on the left bolster panel.

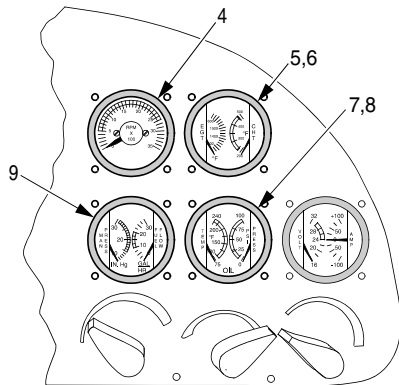


**DETAIL B**

Alternate Air Control

**DETAIL C**

Controls



Serials 1005 thru 1581.

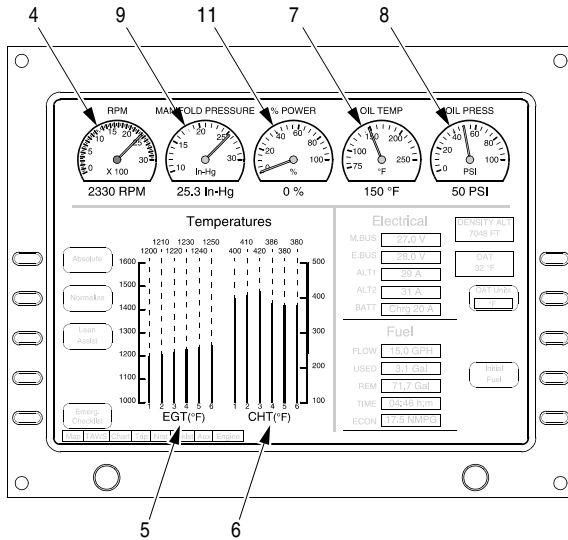
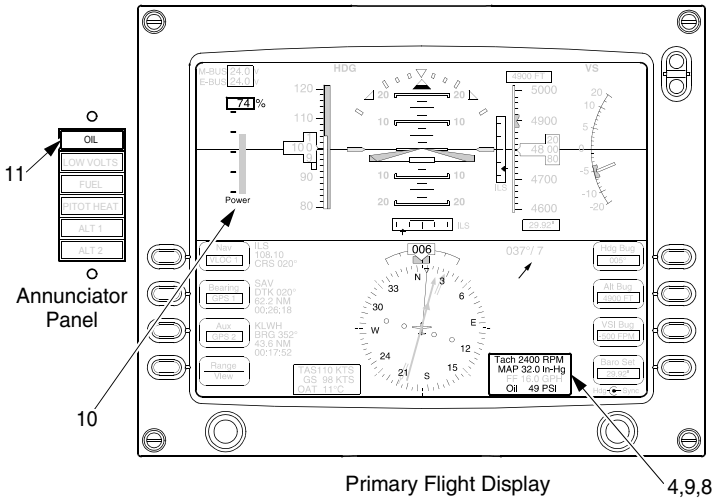
**DETAIL D**

Engine Instruments

- LEGEND**
- |                     |                      |
|---------------------|----------------------|
| 1. Power Lever      | 6. CHT               |
| 2. Mixture Control  | 7. Oil Temperature   |
| 3. Friction Control | 8. Oil Pressure      |
| 4. Tachometer       | 9. Manifold Pressure |
| 5. EGT              |                      |

SR20\_FM07\_1603A

**Figure 7-9**  
**Engine Controls and Indicating (Sheet 1 of 2)**



- LEGEND**
- 4. Tachometer
  - 5. EGT (shown with EMax)
  - 6. CHT (shown with EMax)
  - 7. Oil Temperature
  - 8. Oil Pressure
  - 9. Manifold Pressure
  - 10. Percent Power
  - 11. Oil Warning Light

**DETAIL E**  
Engine Instruments  
Serials 1582 & subs.

SR20\_FM07\_2217

**Figure 7-9**  
**Engine Controls and Indicating (Sheet 2 of 2)**  
P/N 11934-003  
Revision A5 7-49

### ***Tachometer***

*Serials 1268 through 1581:* A 2¼” tachometer is mounted on the right instrument panel adjacent to the other engine instruments. The tachometer pointer sweeps a scale marked from 0 to 3500 RPM in 100 RPM increments.

The electrically operated tachometer receives a speed signal from a magnetic pickup on the right hand magneto. 28 VDC for instrument operation is supplied through the 5-amp ENGINE INST circuit breaker on Main Bus 1.

*Serials 1582 and subsequent:* Engine RPM is shown in the upper left-most corner of the MFD as both a simulated tachometer and as text. The simulated tachometer receives a speed signal from a magnetic pickup on the right hand magneto via the DAU and sweeps a scale marked from 0 to 3000 RPM in 50 RPM increments.

Engine RPM is also continuously displayed in the engine data block located in the lower right corner of the PFD.

In the event engine speed exceeds 2710 RPM for five seconds, the MFD will display “Check RPM” in a red advisory box in the lower right corner of the MFD.

28 VDC for the digital instrument operation is supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.

### ***Exhaust Gas Temp / Cylinder Head Temp Gage/Bar Graphs***

*Serials 0002 through 1601, 1603 through 1643 and 1645 through 1662 without EMax Engine Monitoring:* A 2¼” combination Exhaust Gas Temperature (EGT) and Cylinder Head Temperature (CHT) indicator is mounted in the right instrument panel. 28 VDC for instrument operation is supplied through the 5-amp ENGINE INST circuit breaker on Main Bus 1.

The EGT pointer sweeps a scale marked from 1250°F to 1650°F in 25°F increments. The EGT scale has no limit markings. The electrically operated EGT indicator receives a temperature signal from a thermocouple mounted in the exhaust stream of the #4 cylinder exhaust pipe. The CHT pointer sweeps a scale marked from 200°F to 500°F. The electrically operated CHT indicator receives a temperature

signal from a temperature sensor mounted in the #6 cylinder head on the left side of the engine.

*Serials 1582 and subsequent:* Exhaust Gas Temperature (EGT) and Cylinder Head Temperature (CHT) readings are displayed on the MFD as vertical bars that ascend and descend respective to increasing and decreasing temperatures.

The EGT indicator receives a temperature signal via the DAU from a sensor mounted in the exhaust stream of the #4 cylinder exhaust pipe. The EGT bar and graph is marked from 1000°F to 1600°F in 100°F increments. The EGT of the cylinder is displayed above the bar in text and an up or down trend arrow appears below the temperature to indicate whether EGT is rising or falling.

The CHT indicator receives a temperature signal via the DAU from a sensor mounted in the #6 cylinder head. The CHT bar and graph is marked from 100°F to 500°F in 100°F increments. The CHT of the cylinder is displayed above the bar in text and an up or down trend arrow appears below the temperature to indicate whether CHT is rising or falling.

In the event CHT exceeds 420°F, the MFD will display “Check CHT” in a yellow advisory box in the lower right corner of the MFD. In the event CHT exceeds 460°F, the MFD will display “Check CHT” in a red advisory box in the lower right corner of the MFD.

28 VDC for the digital instrument operation is supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.

### ***Oil Temperature / Oil Pressure Gage(s)***

*Serials 1268 through 1581:* A 2¼” combination Oil Temperature and Oil Pressure indicator is mounted on the right instrument panel below the EGT/CHT indicator. The instrument is internally lighted. 28 VDC for instrument operation is supplied through the 5-amp ENGINE INST circuit breaker on Main Bus 1.

The Oil Temperature pointer sweeps a scale marked from 50°F to 250°F in 25°F increments. The Oil Temperature indicator receives a temperature signal from a temperature sending unit mounted at the lower left side of the engine below the oil cooler.

The Oil Pressure pointer sweeps a scale marked from 0 psi to 100 psi. The Oil Pressure indicator receives a pressure signal from an oil pressure sensor mounted at the aft end of the engine below the oil cooler. Normally, oil pressure may drop to 10 psi at idle but will be in the 30 - 60 psi range at higher RPM.

*Serials 1582 and subsequent:* Oil temperature is shown in the upper right corner of the MFD as both a simulated temperature gage and as text. The simulated gage receives a temperature signal from a sensor mounted below the oil cooler via the DAU and sweeps a scale marked from 75°F to 250°F in 10°F increments.

In the event oil temperature reaches 235°F, the MFD will display "Monitor Oil Temperature" in a red advisory box in the lower right corner of the MFD.

In the event oil temperature exceeds 240°F, the MFD will display "Check Oil Temp" in a red advisory box in the lower right corner of the MFD.

Oil pressure is shown in the upper right-most corner of the MFD as both a simulated pressure gage and as text. The simulated gage receives a pressure signal from a sensor mounted below the oil cooler via the DAU and sweeps a scale marked from 0 psi to 100 psi in 5 psi increments.

Oil pressure is also continuously displayed in the engine data block located in the lower right corner of the PFD.

In the event oil pressure falls below 10 psi or exceeds 99 psi, the MFD will display "Check Oil Press" in a red advisory box in the lower right corner of the MFD.

In the event oil pressure falls below 30 psi or exceeds 75 psi, the MFD will display "Check Oil Press" in a yellow advisory box in the lower right corner of the MFD.

28 VDC for the digital instrument operation is supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus

### ***Fuel Flow and/or Manifold Pressure Gage***

*Serials 1268 through 1581:* A 2¼" combination Fuel Flow and Manifold Pressure indicator is mounted on the right instrument panel immediately below the tachometer. The indicator is internally lighted.

28 VDC for instrument operation is supplied through the 5-amp ENGINE INST circuit breaker on Main Bus #1.

The Fuel Flow pointer sweeps a scale marked from 0 to 30 Gal/Hr. The electrically operated Fuel Flow indicator receives a fuel-flow rate signal from a fuel-flow transducer on the right side of the engine in the fuel line between the engine driven fuel pump and throttle body metering valve.

The Manifold Pressure pointer sweeps a scale marked from 10 to 30 inches Hg in one-inch Hg increments. The electrically operated manifold pressure indicator receives a pressure signal from a pressure sensor mounted in the induction airstream on the left side of the induction air manifold near the throttle body.

*Serials 1582 and subsequent:* Manifold pressure is shown in the upper left corner of the MFD as both a simulated temperature gage and as text.

The simulated gage receives a pressure signal from a pressure sensor mounted in the induction air manifold near the throttle body via the DAU and sweeps a scale marked from 10 to 30 inches Hg in one-inch Hg increments.

Manifold pressure is also continuously displayed in the engine data block located in the lower right corner of the PFD.

28 VDC for the digital instrument operation is supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.

### ***Percent Power Gage***

*Serials 1582 and subsequent:* Percent power is shown in the upper middle section of the MFD as both a simulated gage and as text.

The simulated gage displays calculated percent of maximum engine power produced by the engine based on an algorithm employing manifold pressure, indicated air speed, outside air temperature, pressure altitude, engine speed and fuel flow. The percent power gage sweeps a scale marked from 0 to 100 percent in 5 percent increments.

Percent power is also continuously displayed in the upper left area of the PFD in vertical tape format and as text immediately above.

28 VDC for the digital instrument operation is supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.

***Oil Warning Light***

The red OIL warning light in the annunciator panel comes on to indicate either high oil temperature or low oil pressure. The light is illuminated by a switch in the oil temperature gage/DAU if the oil temperature reaches 240°F or if the oil pressure drops to 10 psi or less. If the OIL warning light comes on in flight, refer to the oil temperature and pressure gages to determine the cause. Typically, low oil pressure will be accompanied by a high oil temperature indication. The light is powered by 28 VDC through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.



## Propeller

The airplane is equipped with a constant-speed, aluminum-alloy propeller with a governor. The airplane is available with the standard two-blade (76" diameter) propeller or an optional three-blade (74" diameter) propeller.

The propeller governor automatically adjusts propeller pitch to regulate propeller and engine RPM. The propeller governor senses engine speed by means of flyweights and senses throttle setting through a cable connected to the power (throttle) control lever in the cockpit. The propeller governor boosts oil pressure in order to regulate propeller pitch position. Moving the throttle lever forward causes the governor to meter less high-pressure oil to the propeller hub allowing centrifugal force acting on the blades to lower the propeller pitch for higher RPM operation. Reducing the power (throttle) lever position causes the governor to meter more high-pressure oil to the propeller hub forcing the blades to a higher pitch, lower RPM, position. During stabilized flight, the governor automatically adjusts propeller pitch in order to maintain an RPM setting (throttle position). Any change in airspeed or load on the propeller results in a change in propeller pitch.

## Fuel System

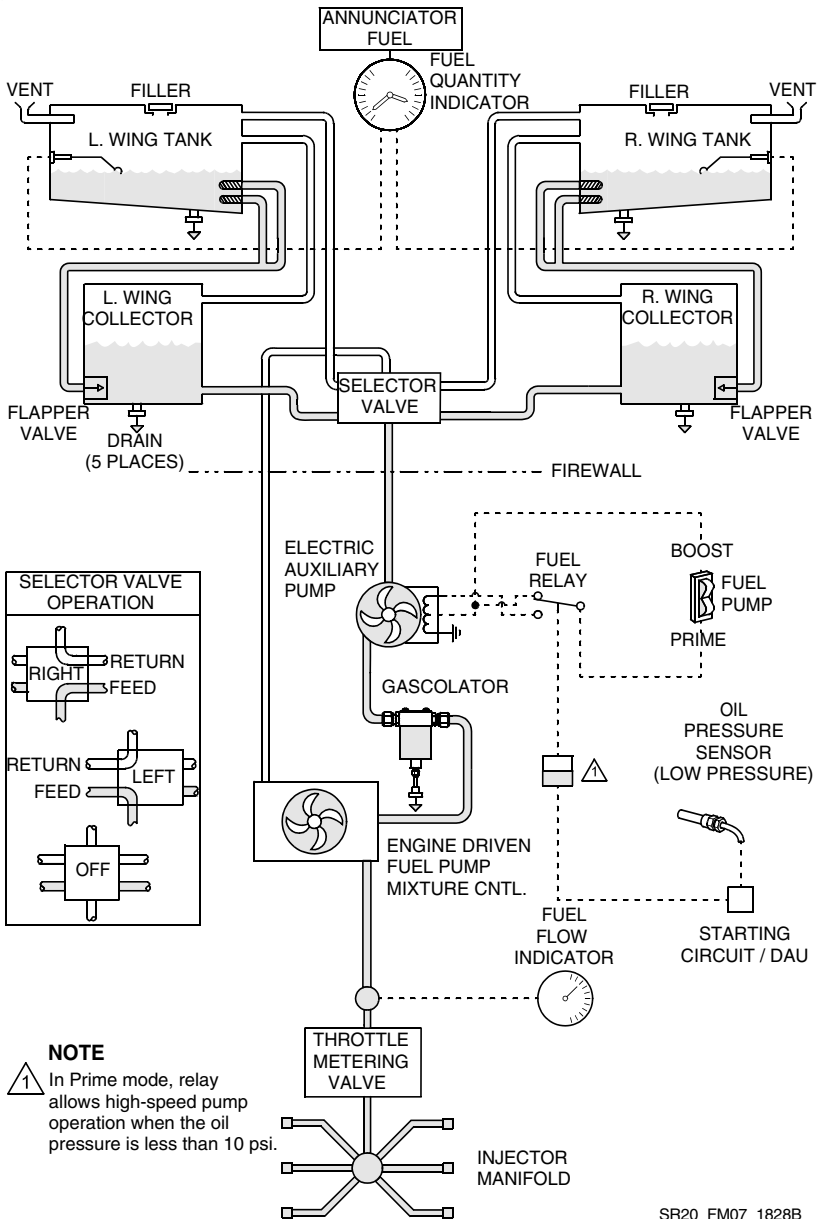
A 56-gallon usable wet-wing fuel storage system provides fuel for engine operation. The system consists of a 30.3-gallon capacity (28-gallon usable) vented integral fuel tank in each wing, a fuel collector/sump in each wing, a three-position selector valve, an electric boost pump, and an engine-driven fuel pump. Fuel is gravity fed from each tank to the associated collector sumps where the engine-driven fuel pump draws fuel through a filter and selector valve to pressure feed the engine fuel injection system. The electric boost pump is provided for engine priming and vapor suppression.

Each integral wing fuel tank has a filler cap in the upper surface of each wing for fuel servicing. An access panel in the lower surface of each wing provides access to the associated wet compartment (tank) for general inspection and maintenance. Float-type fuel quantity sensors in each wing tank provide fuel level information to the fuel quantity indicators. Positive pressure in the tank is maintained through a vent line from each wing tank. Fuel, from each wing tank, gravity feeds through strainers and a check valve to the associated collector tank/sump in each wing. Each collector tank/sump incorporates a flush mounted fuel drain and a vent to the associated fuel tank.

The engine-driven fuel pump pulls filtered fuel from the two collector tanks through a three-position (LEFT-RIGHT-OFF) selector valve. The selector valve allows tank selection. From the fuel pump, the fuel is proportioned to the induction airflow, metered to a flow divider, and delivered to the individual cylinders. Excess fuel is returned to the selected tank.

Fuel quantity indicators for each tank are located in the center console next to the fuel selector in plain view of the pilot. Fuel shutoff and tank selection is positioned nearby for easy access.

Fuel system venting is Essential to system operation. Blockage of the system will result in decreasing fuel flow and eventual engine fuel starvation and stoppage. Venting is accomplished independently from each tank by a vent line leading to a NACA-type vent mounted in an access panel underneath the wing near each wing tip.



**Figure 7-10**  
**Fuel System Schematic**

The airplane may be serviced to a reduced capacity to permit heavier cabin loadings. This is accomplished by filling each tank to a tab visible below the fuel filler, giving a reduced fuel load of 13 gallons usable in each tank (26 gallons total usable in all flight conditions).

Drain valves at the system low points allow draining the system for maintenance and for examination of fuel in the system for contamination and grade. The fuel must be sampled prior to each flight. A sampler cup is provided to drain a small amount of fuel from the wing tank drains, the collector tank drains, and the gascolator drain. If takeoff weight limitations for the next flight permit, the fuel tanks should be filled after each flight to prevent condensation.

• Note •

*Serials 1268 and subsequent with optional EMax Engine Monitoring after factory installation or after Service Bulletin SB 22-77-01:* The following fuel system component descriptions are the same as those listed for airplane serials 1582 and subsequent except:

- MFD functionality is enhanced by displaying fuel used, fuel remaining, time remaining, fuel economy, and the addition of Initial Usable Fuel page.

Refer to *Avidyne FlightMax EX5000C Pilot's Guide* for a more complete description of the MFD, its operating modes, and additional detailed operating procedures for the EMax option.

## Fuel Selector Valve

A fuel selector valve, located at the rear of the center console, provides the following functions:

- LEFT .....Allows fuel to flow from the left tank
- RIGHT ..... Allows fuel to flow from the right tank
- OFF .....Cuts off fuel flow from both tanks

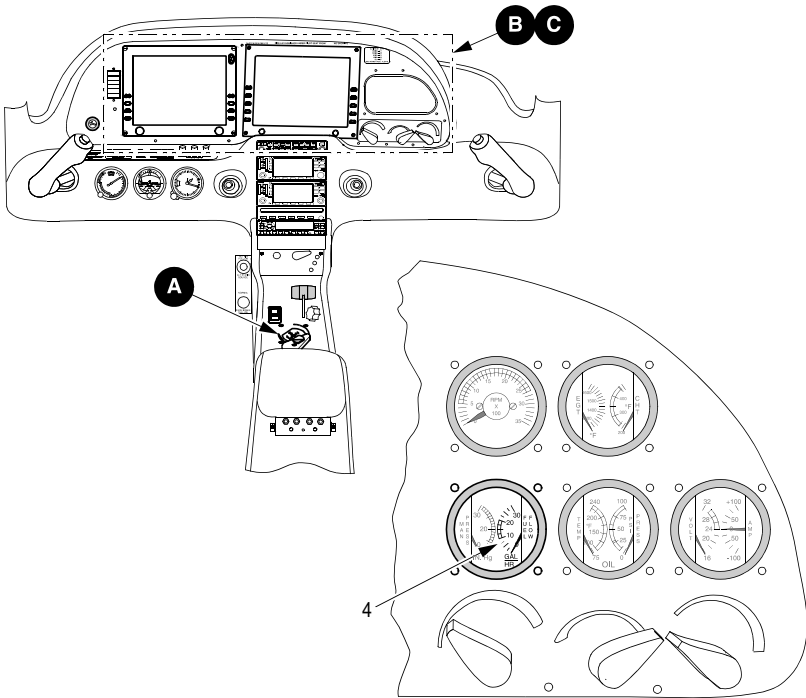
The valve is arranged so that to feed off a particular tank the valve should be pointed to the fuel indicator for that tank. To select RIGHT or LEFT, rotate the selector to the desired position. To select Off, first raise the fuel selector knob release and then rotate the knob to OFF.

## Fuel Quantity Indicator

A dual reading 2¼" fuel quantity indicator is installed on the console immediately forward of the fuel selector valve. The LEFT pointer indicates left tank fuel quantity and sweeps a scale marked from 0 to 28 U.S. gallons in 2½-gallon increments. The RIGHT pointer sweeps an identical scale for the right tank. Each scale is marked with a yellow arc from 0 to 8.2 gallon. The indicators are calibrated to read '0' when no usable fuel remains. Each indicator also provides an output signal to illuminate the FUEL caution light when the fuel quantity goes below approximately 8-9 gallons in each tank. The indicator is internally lighted. *Serials 1268 through 1581:* 28 VDC for fuel quantity system operation is supplied through the 5-amp ENGINE INST circuit breaker on Main Bus 1. *Serials 1582 and subsequent:* 28 VDC for fuel quantity system operation is supplied through the 5-amp FUEL QTY / HOBBS circuit breaker on Main Bus 1.

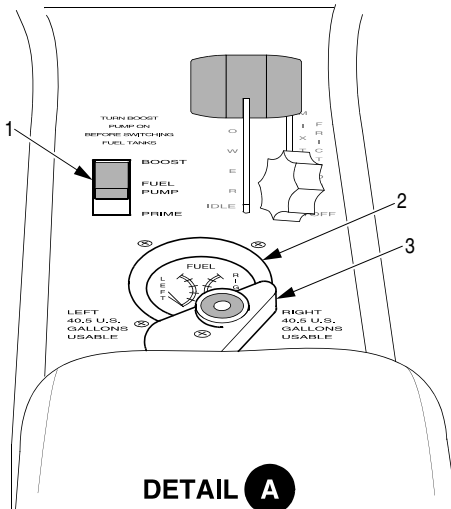
• Note •

When the fuel tanks are 1/4 full or less, prolonged uncoordinated flight such as slips or skids can uncover the fuel tank outlets. Therefore, if operating with one fuel tank dry or if operating on LEFT or RIGHT tank when 1/4 full or less, do not allow the airplane to remain in uncoordinated flight for periods in excess of 30 seconds.



Serials 1005 thru 1581.

**DETAIL B**



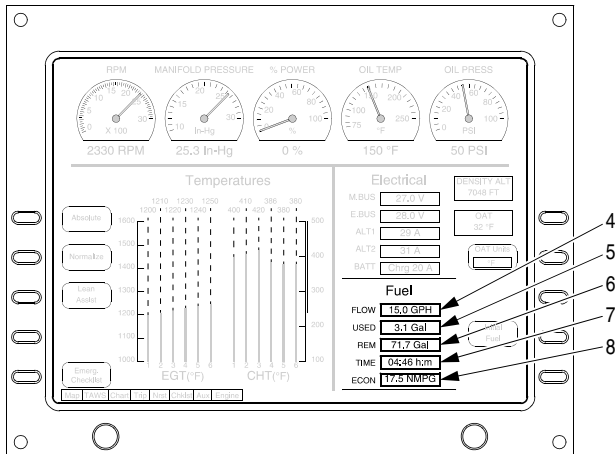
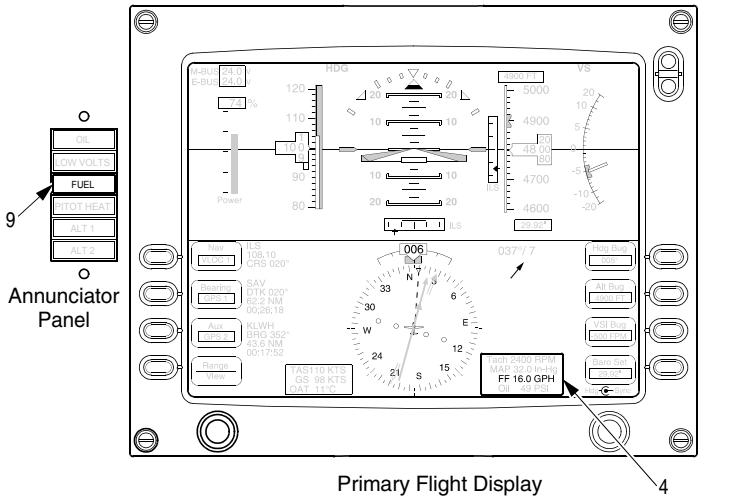
**DETAIL A**

**LEGEND**

1. Fuel Pump Switch
2. Fuel Quantity Gage
3. Fuel Selector Valve
4. Fuel Flow

SR20\_FM07\_2225

**Figure 7-11**  
**Fuel System Controls and Indicating (Sheet 1 of 2)**



**LEGEND**

4. Fuel Flow
5. Fuel Used (EMax only)
6. Fuel Remaining (EMax only)
7. Time Remaining (EMax only)
8. Fuel Economy (EMax only)
9. Fuel Caution Light

**Multifunction Display**



Serials 1582 & subs.

SR20\_FM07\_2227

**Figure 7-11**

**Fuel System Controls and Indicating (Sheet 2 of 2)**

## Fuel Flow Indication

*Serials 1268 through 1581:* Fuel flow indication is integral to the combination Fuel Flow/Manifold Pressure Gage. Refer to preceding discussion on Fuel Flow and Manifold Pressure Gage for complete description of fuel flow indication.

*Serials 1582 and subsequent:* Fuel flow is shown as text in the fuel data block located in the lower right section of the MFD and is also continuously displayed in The MFD and PFD receives a fuel-flow rate signal via the DAU from a fuel-flow transducer on the right side of the engine in the fuel line between the engine driven fuel pump and throttle body metering valve.

In the event fuel flow exceeds 18.0 gallons per hour, the MFD will display "Check Fuel Flow" in a red advisory box in the lower right corner of the MFD.

28 VDC for the digital instrument operation is supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.

## Fuel Caution Light

The amber FUEL caution light in the annunciator panel comes on to indicate a low fuel condition. The light is illuminated by switches in the fuel quantity indicator if the fuel quantity in both tanks drops below approximately 8.5 gallons (17 gallons total with tanks balanced in level flight). Since both tanks must be below 8.5 gallons to illuminate the light, the light could illuminate with as little as 8.5 gallons in one tank during level flight if the other tank is allowed to run dry. If the FUEL caution light comes on in flight, refer to the Fuel Quantity gages to determine fuel quantity. The light is powered by 28 VDC through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.



## Boost Pump Switch

Boost pump operation and engine prime is controlled through the Fuel Pump BOOST-PRIME switch located adjacent to the fuel selector valve. The PRIME position is momentary and the BOOST position is selectable. A two-speed prime allows the fuel pressure to rapidly achieve proper starting pressure.

An oil pressure based system is used to control boost pump operation. The oil pressure/oil temperature sensor provides a signal to the starting circuit/DAU to generate a ground for the oil annunciator and the fuel system. This system allows the fuel pump to run at high speed (PRIME) when the engine oil pressure is less than 10 PSI. Whenever the engine oil pressure exceeds 10 PSI, pressing PRIME will have no effect. Selecting BOOST energizes the boost pump in low-speed mode regardless of oil pressure to deliver a continuous 4-6 psi boost to the fuel flow for vapor suppression in a hot fuel condition.

The boost pump operates on 28 VDC supplied through the 7.5-amp FUEL PUMP circuit breaker on Main Bus 2.

## Brake System

The main wheels have hydraulically operated, single-disc type brakes, individually activated by floor mounted toe pedals at both pilot stations. A parking brake mechanism holds induced hydraulic pressure on the disc brake for parking.

The brake system consists of a master cylinder for each rudder pedal, a hydraulic fluid reservoir, a parking brake valve, a single disc brake assembly on each main landing gear wheel, and associated hydraulic plumbing. Braking pressure is initiated by depressing the top half of a rudder pedal (toe brake). The brakes are plumbed so that depressing either the pilot's or copilot's left or right toe brake will apply the respective (left or right) main wheel brake. The reservoir is serviced with Mil-H-5606 hydraulic fluid.

Brake system malfunction or impending brake failure may be indicated by a gradual decrease in braking action after brake application, noisy or dragging brakes, soft or spongy pedals, excessive travel, and/or weak braking action. Should any of these symptoms occur, immediate maintenance is required. If, during taxi or landing roll, braking action decreases, let up on the pedals and then reapply the brakes with heavy pressure. If the brakes are spongy or pedal travel increases, pumping the pedals may build braking pressure.

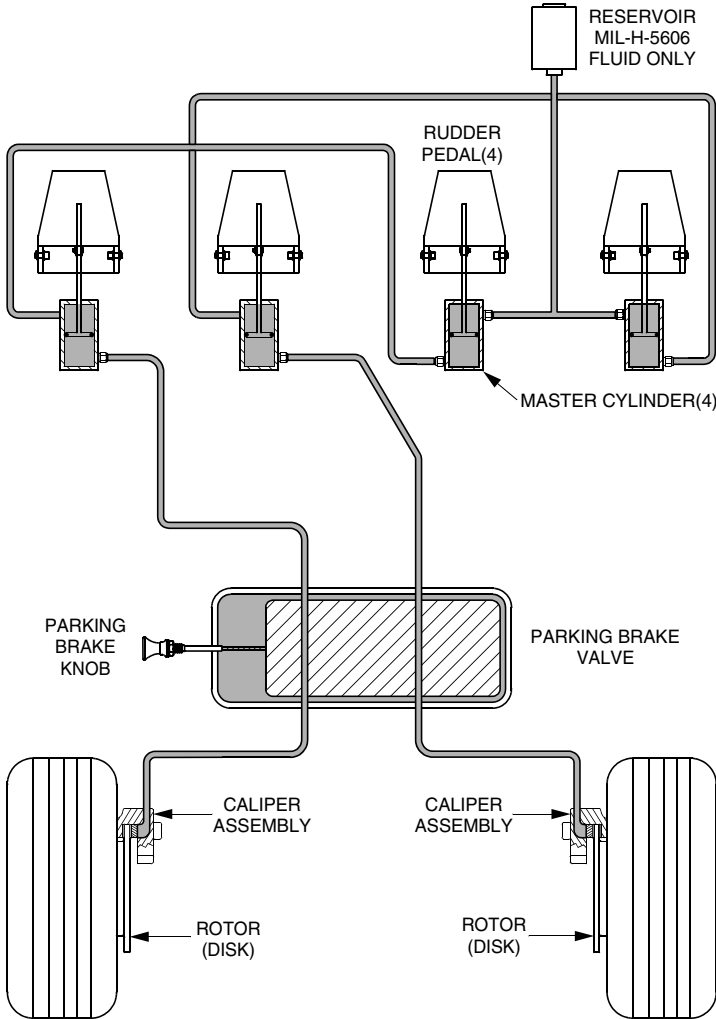
*Refer to Section 10, Safety Information, for Brake System operational considerations.*

## ***Parking Brake***

### **• Caution •**

Do not pull the PARK BRAKE knob in flight. If a landing is made with the parking brake valve set, the brakes will maintain any pressure applied after touchdown.

The main wheel brakes are set for parking by using the PARK BRAKE knob on the left side of the console near the pilot's right ankle. Brake lines from the toe brakes to the main wheel brake calipers are plumbed through a parking brake valve. For normal operation, the knob is pushed in. With the knob pushed in, poppets in the valve are mechanically held open allowing normal brake operation. When the handle is pulled out, the parking brake valve holds applied brake pressure, locking the brakes. To apply the parking brake, set the brakes with the rudder-pedal toe brakes, and then pull the PARK BRAKE knob aft.



SR20\_FM07\_1015

**Figure 7-12**  
**Brake System**

## Electrical System

The airplane is equipped with a two-alternator, two-battery, 28-volt direct current (VDC) electrical system designed to reduce the risk of electrical system faults. The system provides uninterrupted power for avionics, flight instruments, lighting, and other electrically operated and controlled systems during normal operation.

• Note •

*Serials 1337 and subsequent with SRV standard configuration:* The airplane is equipped with a single alternator, dual battery electrical system. This configuration is identical to the dual alternator system described below except components used in conjunction with the secondary alternator are removed.

## Power Generation

Primary power for the SR20 is supplied by a 28-VDC, negative-ground electrical system. The electrical power generation system consists of two alternators controlled by a Master Control Unit (MCU) mounted on the left side of the firewall and two batteries for starting and electrical power storage.

Alternator 1 (ALT 1) is a belt-driven, internally rectified, 75-amp alternator mounted on the right front of the engine. Alternator 2 (ALT 2) is a gear-driven, internally rectified, 20-amp alternator mounted on the accessory drive at the rear of the engine. ALT 1 is regulated to 28 volts and ALT 2 is regulated to 28.75 volts. The output from ALT 1 is connected to the Main Distribution Bus in the MCU through an 80-amp fuse. The output from ALT 2 is connected to the Essential Distribution Bus in the MCU through a 40-amp fuse. Both alternators are self-exciting (not self-starting) and require battery voltage for field excitation in order to start up - for this reason, the batteries and alternators should not be turned off in flight.

Battery 1 (BAT 1) is an aviation grade 12-cell, lead-acid, 24-volt, 10-amp-hour battery mounted on the right firewall. BAT 1 is charged from the Main Distribution Bus in the MCU. Battery 2 (BAT 2) is composed of two 12-volt, 7-amp-hour, sealed, lead-acid batteries connected in series to provide 24 volts. Both BAT 2 units are located in a vented, acid-resistant container mounted behind the aft cabin bulkhead (FS

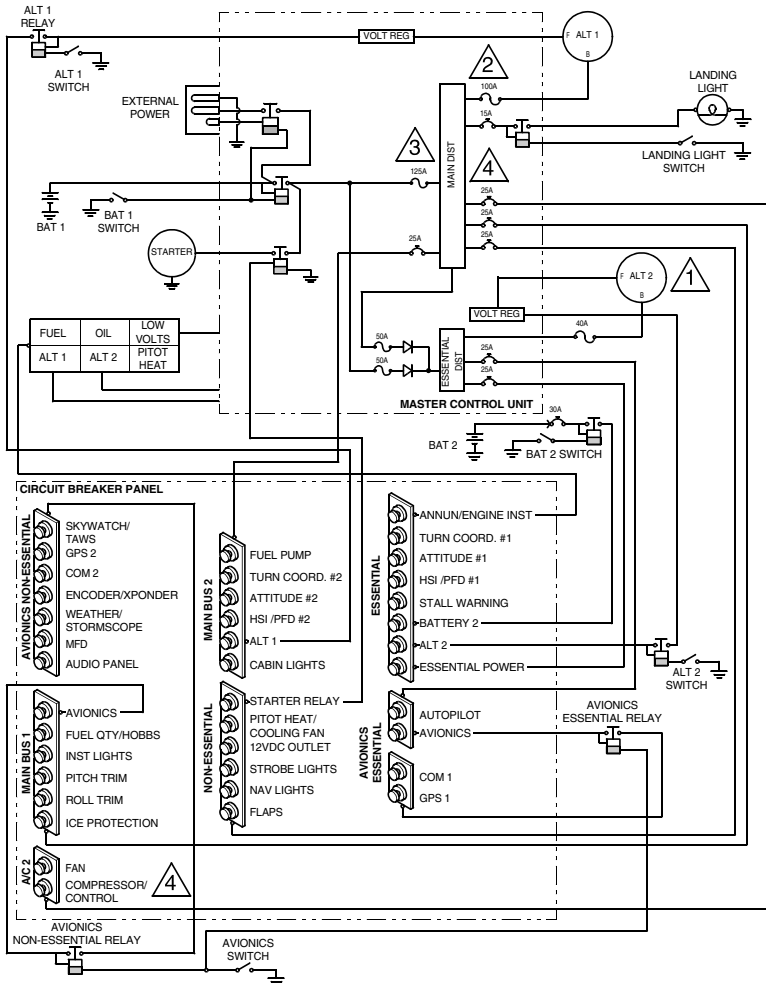
222) below the parachute canister. BAT 2 is charged from the circuit breaker panel Essential Bus.

The Master Control Unit (MCU) is located on the left firewall. The MCU controls ALT 1, ALT 2, starter, landing light, external power, and power generation functions. In addition to ALT 1 and ALT 2 voltage regulation, the MCU also provides external power reverse polarity protection, alternator overvoltage protection, as well as alternator fail and overcurrent annunciations. Power is distributed to the airplane circuit panel buses through Main and Essential Buses in the MCU. During normal operation, the alternators feed their respective Distribution Bus independently (ALT 1 feeds Main Distribution Bus and ALT 2 feeds the Essential Distribution Bus). The distribution buses are interconnected by two 50-amp fuses and a diode. The diode prevents ALT 2 from feeding the Main Distribution Bus. Additionally, since ALT 2 / Essential Distribution Bus voltage is slightly higher than ALT 1 / Main Distribution Bus voltage, ALT 1 will not feed the Essential Distribution Bus unless ALT 2 fails.

## **Power Distribution**

The power distribution system for the SR20 consists of the Main Distribution Bus and the Essential Distribution Bus in the MCU and associated buses in the Circuit Breaker panel. The circuit breaker panel is located on the left side of the console next to the pilots right knee.

For normal operation, the Essential Buses in the circuit breaker panel are powered from the Essential Distribution Bus in the MCU through 25-amp circuit breakers. BAT 2 is connected directly to the Essential Bus in the circuit breaker panel and will power the bus should the voltage coming from the MCU distribution buses drop below the battery voltage. Additionally, in the event of an ALT 2 failure, the circuit breaker panel Essential Bus will be powered from ALT 1 through the Main distribution and Essential distribution buses in the MCU. Main Bus 1, Main Bus 2, and the equipment Non-Essential Bus in the circuit breaker panel are powered from ALT 1 through the Main Distribution Bus in the MCU. The Avionics Non-Essential Bus in the circuit breaker panel is powered from Main Bus 1.



**NOTE**

- ① *Serials 1359 and subsequent with SRV option:* The airplane is equipped with a single alternator, dual battery electrical system. This configuration is identical to the dual alternator system except components used in conjunction with the secondary alternator are removed.
- ② *Serials 1005 thru 1581:* 80A fuse.
- ③ *Serials 1005 thru 1581:* 100A fuse.
- ④ *Serials 1633, 1639 & subs with optional Blower Fan installed.*

SR20\_FM07\_1722D

**Figure 7-13**  
**Electrical System Schematic**

## **BAT & ALT Master Switches**

The rocker type electrical system MASTER switches are ON in the up position and OFF in the down position. The switches, labeled BAT 2, BAT 1, ALT 1, ALT 2 are located in the bolster switch panel immediately below the instrument panel. These switches, along with the AVIONICS power switch, control all electrical power to the airplane.

### ***Battery Switches***

The BAT 1 and BAT 2 switches control the respective battery. Setting the BAT 1 switch 'on' energizes a relay connecting BAT 1 to the MCU Distribution Buses (also energizing the circuit breaker panel buses) and the open contacts of the starter relay. Setting the BAT 2 switch 'on' energizes a relay connecting BAT 2 to the circuit breaker panel Essential Buses. Normally, for flight operations, all master switches will be 'on.' However, the BAT 1 and BAT 2 switches can be turned 'on' separately to check equipment while on the ground. Setting only the BAT 2 switch 'on' will energize those systems connected to the circuit breaker panel Essential Bus. If any system on the other buses is energized, a failure of the Distribution Bus interconnect isolation diode is indicated. When the BAT 1 switch is set to 'on,' the remaining systems will be energized. To check or use avionics equipment or radios while on the ground, the AVIONICS power switch must also be turned on.



### **Alternator Switches**

The ALT 1 and ALT 2 switches control field power to the respective alternator. For ALT 1 to start, the BAT 1 switch must be 'on.' Setting the ALT 1 switch 'on' energizes a relay allowing 28 VDC from the ALT 1 circuit breaker (Main Bus 2) to be applied to voltage regulator for ALT 1. For ALT 2 to start, either the BAT 1 switch or the BAT 2 switch must be 'on.' Setting the ALT 2 switch 'on' energizes a relay allowing 28 VDC from the ALT 2 circuit breaker (Essential Bus) to be applied to voltage regulator for ALT 2. Positioning either ALT switch to the OFF position removes the affected alternator from the electrical system.

• Note •

Continued operation with the alternators switched off will reduce battery power low enough to open the battery relay, remove power from the alternator field, and prevent alternator restart.

### **Avionics Power Switch**

A rocker switch, labeled AVIONICS, controls electrical power from the circuit breaker panel bus to the Avionics Bus. The switch is located next to the ALT and BAT Master switches. Typically, the switch is used to energize or de-energize all avionics on the Avionics Non-Essential and Essential Buses simultaneously. With the switch in the OFF position, no electrical power will be applied to the avionics equipment, regardless of the position of the master switch or the individual equipment switches. For normal operations, the AVIONICS switch should be placed in the OFF position prior to activating the MASTER switches, starting the engine, or applying an external power source.

### **Volts and Ampere Meter/Indication**

*Serials 1268 through 1581:* A 2¼" combination Volts and Ampere meter is mounted on the right instrument panel outboard of the oil temperature and pressure indicator. The indicator is internally lighted. 28 VDC for instrument lighting is supplied through the 2-amp INST LIGHTS circuit breaker on Main Bus 1.

The VOLT pointer sweeps a scale from 16 to 32 volts. *Refer to Section 2, Limitations,* in basic POH for instrument limit markings. The voltage indication is measured off the Essential Bus.

The AMP pointer sweeps a scale from -100 to +100 amps with zero at the 9 o'clock position. The amps indication is derived from current transducers located in the MCU. Output from each alternator and BAT 1 is measured. The panel mounted AMMETER SELECT switch is used to select the desired indication. When the engine is operating and the ALT 1 and ALT 2 Master switches are 'on,' the ammeter indicates the charging rate applied to the batteries. In the event the alternators are not functioning or the electrical load exceeds the output of the alternators, the ammeter indicates BAT 1 discharge rate. Alternator ammeter indications are positive only.

*Serials 1582 and subsequent:* Main and Essential Bus voltages are shown as text in the electrical data block located in the mid-right section of the MFD and are also displayed in the voltage parameters block located in the upper left corner of the PFD when voltages fall outside typical operating parameters. The MFD and PFD receive the voltage signals via the DAU as measured directly off the Main and Essential Buses.

In the event Main Bus voltage is less than 24.5v or exceeds 32.0v the MFD will display "Check Main Bus" in a yellow advisory box in the lower right corner of the MFD.

In the event Essential Bus voltage is less than 24.5v or exceeds 32.0v the MFD will display "Check Main Bus" in a red advisory box in the lower right corner of the MFD.

Alternator 1 and Alternator 2 ampere output are shown as text in the electrical data block located in the mid-right section of the MFD. The MFD and PFD receive the amp signals via the DAU as derived from current transducers located in the MCU.

In the event Alternator 1 or Alternator 2 ampere output is less than 2 amps for 20 seconds or more, the MFD will display "Check ALT 1" or "Check ALT 2" respectively, in a yellow advisory box in the lower right corner of the MFD.

28 VDC for the digital instrument operation is supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.

## Ammeter Select Switch

*Serials 1268 through 1581:* The AMMETER SELECT switch on the instrument panel is used to select the desired source of electrical current flow to be indicated on the ammeter. The switch has three positions: ALT 1, BATT, and ALT 2. The BATT position indicates BAT 1 current flow only. Selecting one of the switch positions will cause the amperage output from that device to be displayed on the ammeter.

*Serials 1582 and subsequent:* Main and Essential Bus voltages are displayed on the MFD and PFD, therefore, no ammeter select switch is necessary.

## Low-Volts Warning Light

The airplane is equipped with a red LOW VOLTS warning light in the annunciator panel located on the left side of the instrument panel. A voltage sensor in the (MCU) monitors voltage on the Essential Bus and illuminates the warning light when the voltage is less than approximately 24.5 volts.

• Note •

The LOW VOLTS warning light may come on during extended low RPM operation with heavy electrical loads. Under these conditions, the light will go out at higher RPM.

## ALT Fail Caution Lights

Two ALT Fail caution lights are installed in the annunciator panel. The ALT 1 and ALT 2 caution lights in the annunciator panel provide annunciation of alternator failure or overcurrent conditions at the respective alternator. The lights are operated by circuits in the MCU and current sensors on the ALT 1 and ALT 2 output lines. Steady illumination of either light indicates an alternator failure. *Serials 1268 through 1581:* A flashing ALT light indicates an overcurrent condition.

## Circuit Breakers and Fuses

Individual electrical circuits connected to the Main, Essential, and Non-Essential Buses in the airplane are protected by re-settable circuit breakers mounted in the circuit breaker panel on the left side of the center console.

### ***Essential Buses***

The circuit breaker panel Essential Bus is powered by ALT 2 from the MCU Essential Distribution Bus through the 25-amp ESSENTIAL POWER circuit breaker and from BAT 2 through the 30-amp BATTERY 2 circuit breaker. The Essential Bus is also powered by ALT 1 and BAT 1 through an isolation diode connecting the Main and Essential Distribution Buses in the MCU. The autopilot and Essential avionics equipment are powered directly from the Essential Distribution Bus in the MCU through a 25-amp circuit breaker on the Distribution Bus. Power from the 15-amp AVIONICS circuit breaker is also controlled through the AVIONICS master switch on the bolster switch panel.

### ***Main Buses***

The circuit breaker panel Main Bus 1 and Main Bus 2 are powered by ALT 1 and BAT 1 from the MCU Main Distribution Bus through 25-amp circuit breakers on the Distribution Bus. ALT 2 and BAT 2 are prevented from powering the Main Buses by the isolation diode interconnecting the MCU distribution buses. Loads on circuit breaker panel Main Buses are shed by pulling the individual circuit breakers. The 15-amp AVIONICS circuit breaker on Main Bus 1 powers all loads on the Non-Essential Avionics Bus. Power from the 15-amp AVIONICS circuit breaker is also controlled through the AVIONICS master switch on the bolster switch panel.

### ***Non-Essential Buses***

The circuit breaker panel contains two Non-Essential Buses, the Non-Essential Equipment Bus and the Avionics Non-Essential Bus. The Avionics Non-Essential Bus is powered through the 15-amp AVIONICS circuit breaker on Main Bus 1 and is discussed above. The Non-Essential Equipment Bus is powered by ALT 1 and BAT 1 from the MCU Main Distribution Bus through a 25-amp circuit breaker. ALT 2 and BAT 2 are prevented from powering the Non-Essential Equipment Bus by the isolation diode interconnecting the MCU

distribution buses. Loads on the Non-Essential Equipment Bus are shed by pulling the individual circuit breakers.

## Ground Service Receptacle

A ground service receptacle is located just aft of the cowl on the left side of the airplane. This receptacle is installed to permit the use of an external power source for cold weather starting and maintenance procedures requiring reliable power for an extended period. The external power source must be regulated to 28 VDC. The external power control contactor is wired through the BAT 1 MASTER switch so that the BAT 1 switch must be 'on' to apply external power.

*Refer to Section 8, Ground Handling, Servicing, and Maintenance, for use of external power and special precautions to be followed.*

## Convenience Outlet

A 12-volt convenience outlet is installed in the center console. The receptacle accepts a standard cigarette-lighter plug. The outlet may be used to power portable entertainment equipment such as CD players, cassette players, and portable radios. 28 VDC power for the convenience outlet is supplied through the 3-amp 12VDC OUTLET circuit breaker on the Non-Essential Bus.

## Exterior Lighting

The airplane is equipped with standard wing tip navigation lights with integral anti-collision strobe lights and *Serials 1886 & subs*; recognition lights (optional). The separately controlled landing light is located in the lower cowl.

## Navigation Lights

The airplane is equipped with standard wing tip navigation lights. The lights are controlled through the NAV light switch on the instrument panel bolster. 28 VDC for navigation light operation is supplied through the 5-amp NAV LIGHTS circuit breaker on Non-Essential Bus.

## Strobe Light

Anti-collision strobe lights are installed integral with the standard navigation lights. Each strobe is flashed by a separate power supply. The strobe power supplies are controlled through the STROBE light

switch on the instrument panel bolster. 28 VDC for strobe light and control circuits is supplied through the 5-amp STROBE LIGHTS circuit breaker on Non-Essential Bus.

## Landing Light

*Serials 1337 and subsequent with SRV standard configuration:* The airplane is equipped with a Halogen landing light.

A High Intensity Discharge (HID) landing light is mounted in the lower engine cowl. The landing light is controlled through the LAND light switch on the instrument panel bolster. Setting the LAND light switch 'on' energizes the landing light control relay in the Master Control Unit (MCU) completing a 28 VDC circuit from the airplane Main Distribution Bus to the light's ballast located on the firewall. The ballast provides boosted voltage to illuminate the HID lamp. A 15-amp breaker on the Main Distribution Bus in the MCU protects the circuit.

## Recognition Lights (Optional) - *Serials 1886 & subs*

The airplane is equipped with recognition lights on the leading edge of the wing tips. The lights are controlled through the landing light switch on the instrument panel bolster. 28 VDC for recognition light operation is supplied through the 5-amp RECOG LIGHTS circuit breaker on the NON ESS BUS.

## Interior Lighting

Interior lighting for the airplane consists of separately controlled incandescent overhead lights for general cabin lighting, individual lights for the pilots and passengers, and dimmable panel floodlights. The flight instrumentation and avionics equipment lights are dimmable.

## Instrument Lights

Instrument lighting for the airplane consists of dimmable incandescent lights in the instrument bezels. The lights are controlled through the INST lights control on the instrument panel bolster. Rotating the knob clockwise energizes the lights and increases brightness. The instrument light circuits operate on 28 VDC supplied through the 2-amp INST LIGHTS circuit breaker on Main Bus 1.

## Panel Flood Lights

A string of red LEDs mounted under the instrument panel glareshield provide flood lighting for the instrument panel. The lights are controlled through the PANEL lights control on the instrument panel bolster. Rotating the knob clockwise energizes the lights and increases brightness. The panel lights operate on 28 VDC supplied through the 3-amp CABIN LIGHTS circuit breaker on Main Bus 2.

## Reading Lights

• Note •

*Serials 1337 and subsequent with SRV standard configuration:*  
Reading lights are not installed on this airplane.

Individual eyeball-type reading lights are installed in the headliner above each passenger position. Each light is aimed by positioning the lens in the socket and is controlled by a push-button switch located next to the light. The pilot and copilot reading lights are also dimmable through the PANEL lights control on the instrument panel bolster. The lights are powered by 28 VDC supplied through the 3-amp CABIN LIGHTS circuit breaker on Main Bus 2.

## Overhead Dome Light

General cabin lighting is provided by a dome light located in the headliner at the approximate center of the cabin. The dome light is controlled through the OVERHEAD light control on the instrument panel bolster. Rotating the knob clockwise from the off position will illuminate the light and control its intensity. The lights are powered by 28 VDC supplied through the 3-amp CABIN LIGHTS circuit breaker on Main Bus 2.

## Environmental System

Cabin heating and ventilation is accomplished by supplying conditioned air for heating and windshield defrost and fresh air for ventilation. Ventilation air is provided by ducting ram air from air inlets to eyeball outlets for each occupant. Each occupant can direct the fresh air flow by positioning the nozzle or control flow rate from 'off' to maximum by rotating the nozzle.

Heating is accomplished by mixing ram air from the fresh air inlets with heated air from the heat exchanger and then distributing the 'conditioned' air to the occupants and/or the windshield diffuser. Air for heating is supplied by an inlet in the engine compartment to a muff-type heat exchanger surrounding the right engine exhaust muffler.

Conditioned air outlets for the forward occupants are directionally controllable and are located beneath the instrument panel at each position at knee level. Outlets for the rear occupants are at floor level.

The temperature, volume, and flow selection are regulated by manipulation of the cabin temperature and cabin air selector knobs on the lower right side of the instrument panel.

*Serials 1639 and subsequent.* An optional 3-speed blower fan is available to supplement airflow when ram air may be inadequate such as during ground operation. The optional blower fan is powered by 28 VDC supplied through 15-amp Fan breaker on Main A/C Bus 2.

### **Description and Operation - Serials 1005 thru 1638**

The environmental system consists of an air inlet in the upper RH cowl, a heat exchanger around the RH engine exhaust muffler, two fresh air inlets, located in each wing root leading edge, a hot air valve located on the firewall, an air mixing plenum located behind the instrument panel, a windshield diffuser, air ducting for distribution, crew and passenger air vents, and required actuators for selecting temperature and flow

#### ***Cabin Air Selector***

“Conditioned” air from the mixing plenum can be proportioned and directed to the windshield or passengers by manipulating the cabin air selector. The control is linked to a door at the outlet end of the mixing plenum. Rotating the control full counterclockwise shuts off airflow to the passenger air distribution system and allows maximum airflow to the windshield diffuser. Rotating the knob full clockwise shuts off airflow to the windshield diffuser and allows maximum airflow to the passenger air distribution system. The control can be positioned to allow any proportion of windshield and passenger air. Conditioned air for the forward seats is routed to outlets under the instrument panel at knee level. Conditioned air for the aft seats is routed to outlets beneath the forward seats near the door posts and exits at floor level.



### ***Cabin Heat Control***

The amount of heated air allowed into the air mixing plenum is controlled by rotating the Cabin Heat Control. The control is mechanically linked to a door in a heater box between the heater muff and the mixing plenum. Rotating the control full counterclockwise (HEAT OFF) bypasses heated air from the heater muff into the engine compartment. Rotating the control clockwise opens the door in the heater box allowing heated air to enter the mixing plenum.

### ***Cabin Cooling Control***

The amount of cooling air allowed into the air mixing plenum is controlled by rotating the cabin cool control, located outboard of the cabin air selector. The control is mechanically linked to a butterfly valve at the fresh air entrance to the mixing plenum. Rotating the control full counterclockwise shuts down cooling airflow to the mixing plenum from the fresh air inlet in the right wing root. Rotating the control clockwise opens the butterfly allowing fresh cooling air to enter the mixing plenum. Rotating the knob to the full clockwise (COLD) position provides maximum cooling airflow to the mixing plenum.

## **Description and Operation - *Serials 1639 and Subs***

*Serials 1639 thru 1885:* The environmental system consists of a fresh air inlet in the RH upper cowl, a heat exchanger around the RH engine exhaust muffler, one fresh air inlet located in the RH wing root leading edge, a hot air valve located on the firewall, an air mixing chamber located under the RH crew seat, a distribution manifold behind the instrument pannel, a windshield diffuser, air ducting for distribution, crew and passenger air vents, and required actuators for selecting temperature and flow.

*Serials 1886 and subs:* The environmental system consists of a fresh air inlet in the RH upper cowl, a heat exchanger around the RH engine exhaust muffler, a fresh air inlet in the RH lower cowl, an air mixing chamber located on the firewall, a distribution manifold behind the instrument pannel, a windshield diffuser, air ducting for distribution, crew and passenger air vents, and required actuators for selecting temperature and flow.

### ***Airflow Selection***

*Serials 1639 thru 1885:* The airflow selector regulates the volume of airflow allowed into the cabin distribution system through mechanical linkage to a butterfly valve in the distribution manifold. If option installed, the blower fan is turned on when the selector dial exceeds the full open position. *Serials 1886 and subs:* The airflow selector on the system control panel regulates the volume of airflow allowed into the cabin distribution system. When the airflow selector is moved past the OFF position an electro-mechanical linkage actuates a valve in the mixing chamber on the forward firewall to the full open position. The air is then distributed by either ram air or by an optional blower fan to the distribution manifold mounted to the center, aft side of the firewall. The optional blower fan system includes 0 (ram air), 1 (low fan), 2 (med fan), and 3 (high fan) airflow settings.

### ***Vent Selection***

“Conditioned” air from the distribution manifold can be proportioned and directed to passengers and/or the windshield by manipulating the cabin vent selector. The selector is mechanically linked to butterfly valves at the entrances to the windshield diffuser and the cabin floor ducting. There is continuous airflow to the panel and armrest eyeball outlets. Each occupant can control the flow rate from 'off' to maximum by rotating the nozzle. When the selector is in the far left position, both butterfly valves are closed providing maximum airflow to the panel and armrest eyeball outlets. Rotating the selector a quarter-turn clockwise opens the cabin floor butterfly valve allowing airflow to the rear seat foot warmer diffusers and the front seat outlets mounted to the underside of each kickplate. Rotating the selector another quarter-turn clockwise opens the windshield diffuser butterfly valve which permits shared airflow to the defrosting mechanism and cabin floor outlets.

When the selector is in the far right position, the cabin floor butterfly valve is closed providing maximum airflow to the windshield diffuser.

### ***Temperature Selection***

The temperature selector is mechanically linked to the hot air valve and fresh air intake valve. Rotating the selector simultaneously opens and closes the two valves, permitting hot and cold air to mix and enter the distribution system. Rotating the selector clockwise, permits warmer air to enter the system - counterclockwise, cooler air.

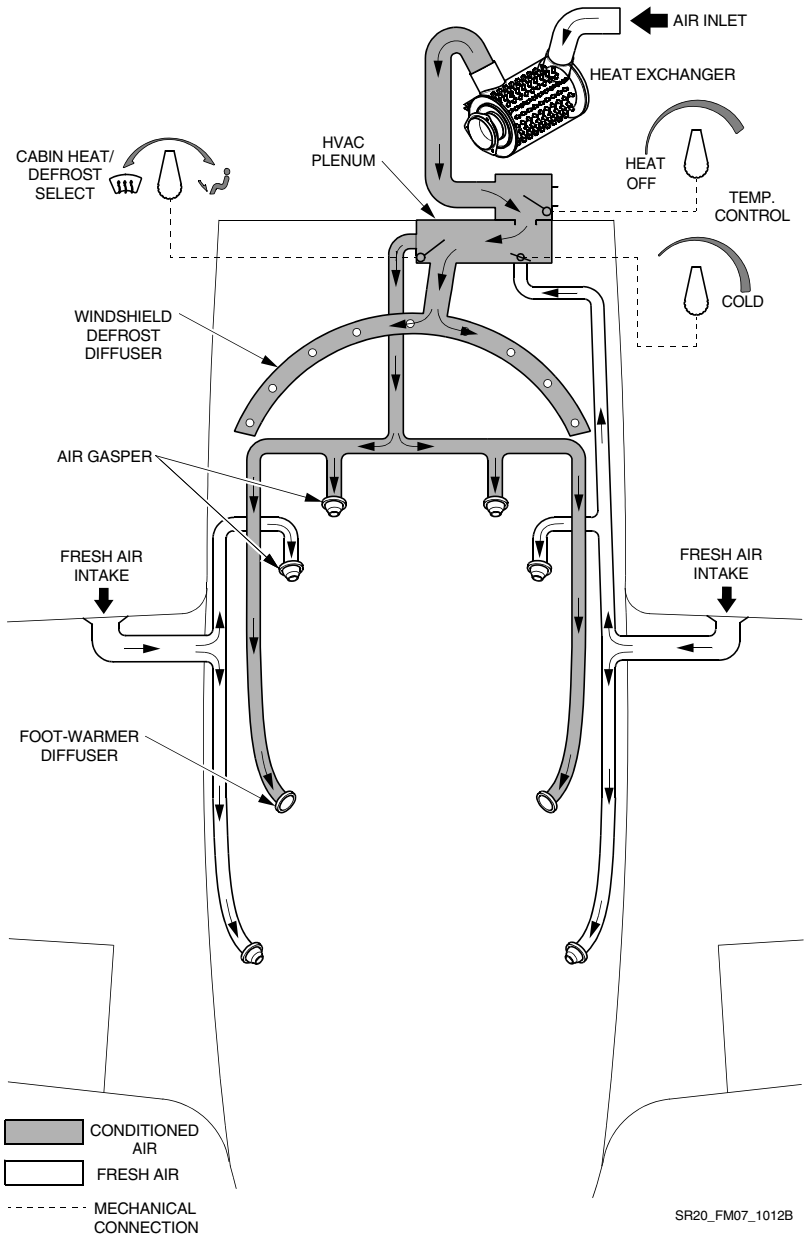
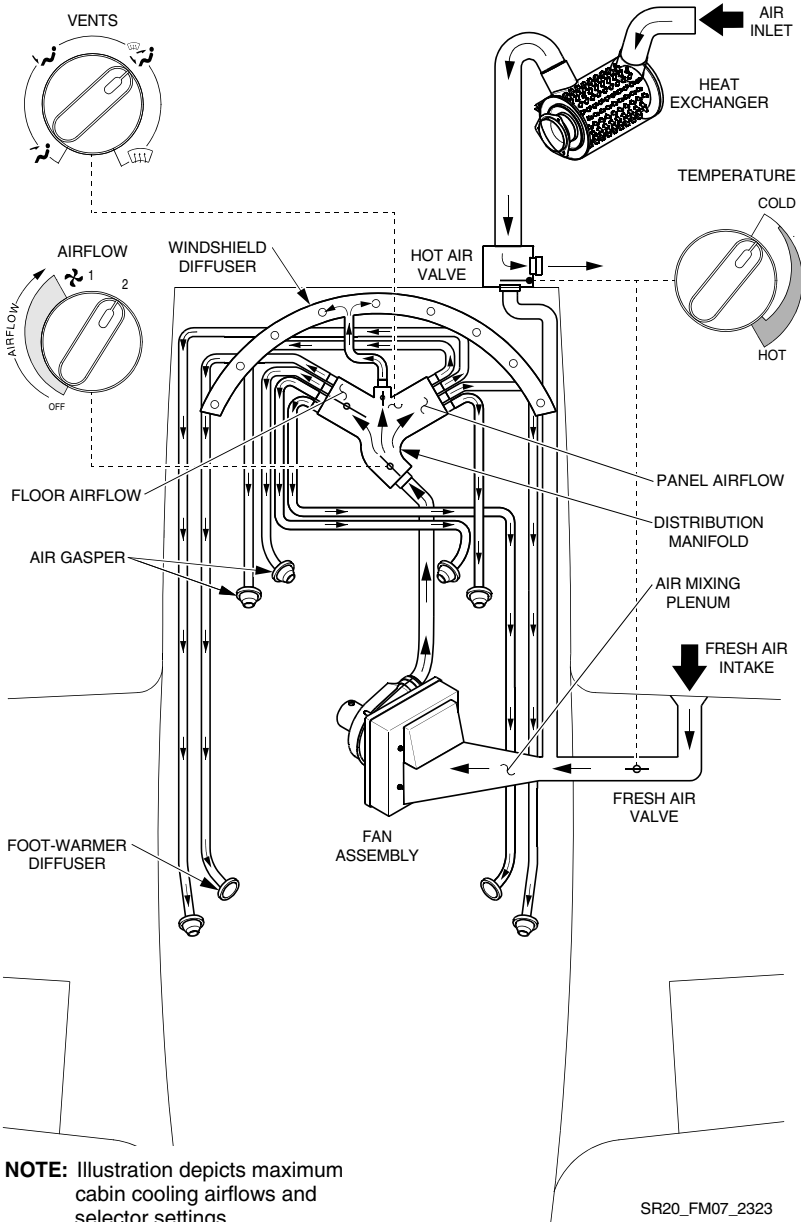


Figure 7-14

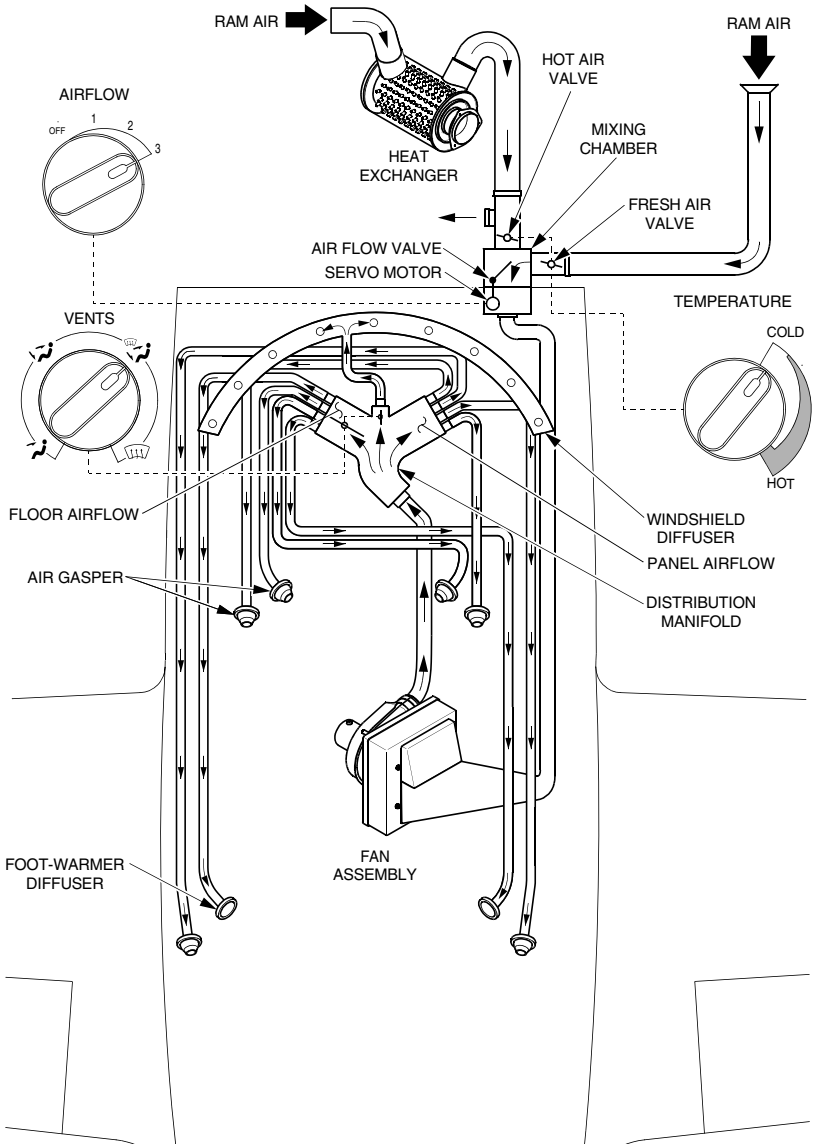
Environmental System - Serials 1005 through 1638



**NOTE:** Illustration depicts maximum cabin cooling airflows and selector settings.

SR20\_FM07\_2323

**Figure 7-14**  
**Environmental System - Serials 1639 thru 1885**



**NOTE:** Illustration depicts maximum cabin cooling airflows and selector settings.

SR20\_FM09\_2735

**Figure 7-14**  
**Environmental System - Serials 1886 and Subs**

## **Pitot-Static System**

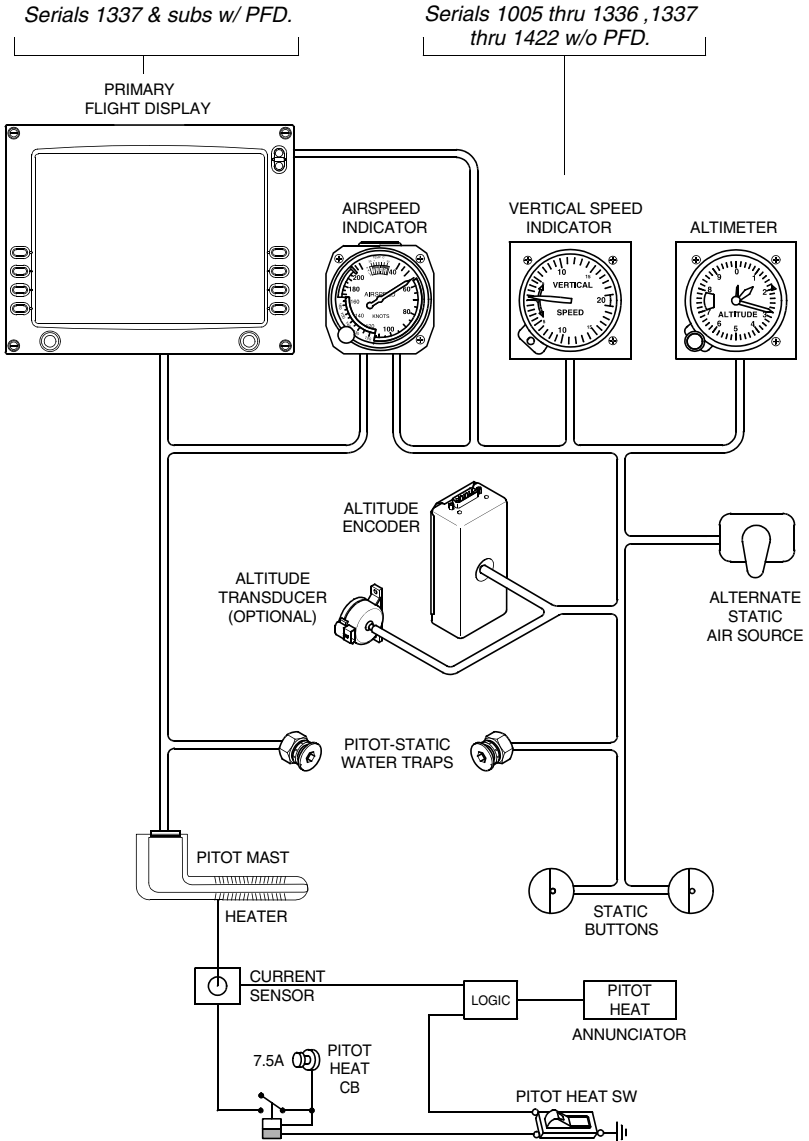
The Pitot-Static system consists of a single heated Pitot tube mounted on the left wing and dual static ports mounted in the fuselage. The Pitot heat is pilot controlled through a panel-mounted switch. An internally mounted alternate static pressure source provides backup static pressure should that the primary static source becomes blocked. Water traps with drains, under the floor in the cabin, are installed at each Pitot and static line low point to collect any moisture that enters the system. The traps should be drained at the annual inspection and when water in the system is known or suspected.

### **Pitot Heat Switch**

The heated Pitot system consists of a heating element in the pitot tube, a rocker switch labeled PITOT HEAT, and associated wiring. The switch and circuit breaker are located on the left side of the switch and control panel. When the pitot heat switch is turned on, the element in the Pitot tube is heated electrically to maintain proper operation in possible icing conditions. Pitot heat should be used only when required. The Pitot heat system operates on 28 VDC supplied through the 7.5-amp PITOT HEAT/COOLING FAN circuit breaker on the Non-Essential Bus.

### **Pitot Heat Light**

Illumination of the amber PITOT HEAT caution light indicates that the Pitot Heat switch is in the 'on' position and the Pitot heater is not receiving electrical current. A current sensor on the Pitot heater power supply wire provides current sensing. The PITOT HEAT warning light operates on 28 VDC supplied through the 2-amp ANNUN / ENGINE INST circuit breaker on the Essential Bus.



SR20\_FM07\_1013D

**Figure 7-16**  
**Pitot-Static System Schematic**

## Alternate Static Source

An alternate static pressure source valve is installed on the switch and control panel to the right of the pilot's leg. This valve supplies static pressure from inside the cabin instead of the external static port. If erroneous instrument readings are suspected due to water or ice in the pressure line going to the standard external static pressure source, the alternate static source valve should be turned on. Pressures within the cabin will vary with open heater/vents. Whenever the alternate static pressure source is selected, *refer to Section 5 airspeed calibration and altitude* for corrections to be applied.

## Stall Warning System

The airplane is equipped with an electro-pneumatic stall warning system to provide audible warning of an approach to aerodynamic stall. The system consists of an inlet in the leading edge of the right wing, a pressure switch and associated plumbing, and a piezo-ceramic horn behind the instrument panel. As the airplane approaches a stall, the low pressure on the upper surface of the wings moves forward around the leading edge of the wings. As the low pressure area passes over the stall warning sense inlet, a slight negative pressure is sensed by the pressure switch. The pressure switch completes a ground circuit causing the warning horn to sound, and *Serials 1706 and subsequent*; the autopilot system to disconnect. The warning horn provides a 94dB continuous 2800 Hz tone. The warning sounds at approximately 5 knots above stall with full flaps and power off in wings level flight and at slightly greater margins in turning and accelerated flight. The system operates on 28 VDC supplied though the 2-amp STALL WARNING circuit breaker on the Essential Bus.

With battery power on, the stall warning system preflight check is accomplished as follows:

Stall warning system preflight check:

1. Use small suction cup and apply suction. A sound from the warning horn will confirm that the system is operative.



## Standard Avionics

The following paragraphs and equipment descriptions describe all standard avionic installations offered for the SR20. The avionics navigation and communication equipment are mounted in the center console and are easily accessible from either pilot seat.

For detailed descriptions of specific avionic equipment, operating procedures, or data for optional avionic equipment, *refer to the equipment manufacturer's pilot's guide and the FAA Approved Airplane Flight Manual Supplement in Section 9* for specific information regarding the SR20 installation.

Standard avionics suites are available in the following configurations:

### **Avionics Configuration 2.0 - Serials 1268 through 1336:**

- Single-Axis Autopilot (S-Tec System 20)
- Integrated Audio System with Intercom (Garmin GMA 340)
- Marker Beacon Receiver (Garmin GMA 340)
- One IFR Approach-Certified GPS (Garmin GNS 430) and One VFR GPS (Garmin GNC 250XL)
- Two VHF Communications (Garmin GNS 430 and Garmin GNC 250XL)
- Single Navigation (VOR/LOC/GS) Receiver (GNS 430)
- Mode C Transponder with Altitude Encoder (Garmin GTX 327)
- Directional Gyro
- Course Deviation Indicator

### **Avionics Configuration 2.1 - Serials 1268 through 1336:**

- Moving Map Display (Avidyne MFD)
- Two-Axis Autopilot (S-Tec System 30)
- Integrated Audio System with Intercom (Garmin GMA 340)
- Marker Beacon Receiver (Garmin GMA 340)
- Two IFR Approach-Certified GPS (Garmin GNS 430 and Garmin GNS 420)
- Two VHF Communications Transceivers (Garmin GNS 430 and Garmin GNS 420)

- Single Navigation (VOR/LOC/GS) Receiver (GNS 430)
- Mode C Transponder with Altitude Encoder (Garmin GTX 327)
- Horizontal Situation Indicator
- Course Deviation Indicator

***Avionics Configuration 2.2 - Serials 1268 through 1336:***

- Moving Map Display (Avidyne MFD)
- Two-Axis Autopilot (S-Tec System 55X)
- Integrated Audio System with Intercom (Garmin GMA 340)
- Marker Beacon Receiver (Garmin GMA 340)
- Two IFR Approach-Certified GPS (Garmin GNS 430)
- Two VHF Communications Transceivers (Garmin GNS 430)
- Two Navigation (VOR/LOC/GS) Receiver (GNS 430)
- Mode C Transponder with Altitude Encoder (Garmin GTX 327)
- Electronic Navigation Display (Sandel SN3308)
- Course Deviation Indicator

***Avionics Configuration PFD - Serials 1337 and subsequent:***

- Moving Map Display (Avidyne MFD)
- Primary Flight Display (Avidyne PFD)
- Two-Axis Autopilot (S-Tec System 55SR)
- Integrated Audio System with Intercom (Garmin GMA 340)
- Marker Beacon Receiver (Garmin GMA 340)
- One IFR Approach-Certified GPS (Garmin GNS 430) and One VFR GPS (Garmin GNC 250XL)
- Two VHF Communications (Garmin GNS 430 and Garmin GNC 250XL)
- Single Navigation (VOR/LOC/GS) Receiver (GNS 430)
- Mode C Transponder with Altitude Encoder (Garmin GTX 327)

***Avionics Configuration SRV - Serials 1337 and subsequent:***

- Primary Flight Display (Avidyne PFD)
- Moving Map Display (Avidyne MFD)

- Integrated Audio System with Intercom (Garmin GMA 340)
- Marker Beacon Receiver (Garmin GMA 340)
- One IFR Certified GPS (Garmin GNC 420)
- One VHF Communications (Garmin GNC 420)
- Mode C Transponder with Altitude Encoder (Garmin GTX 327)

## Multi-Function Display

This airplane is equipped with an Avidyne FlightMax EX5000C 700-00004-XXX-() Multi-Function Flight Display (MFD). The MFD is a 10.4-inch landscape-oriented display mounted in the instrument panel. The MFD provides supplemental display of situational and navigation information to the pilot. This is accomplished by showing an icon representing the airplane against a moving map. The MFD accepts data from a variety of sources, including the GPS sensors, the WX-500 Stormscope, and the SkyWatch Traffic Advisory System. The unit is organized around logical grouping of information presented on “Pages.”

The Avidyne FlightMax EX-Series MFD is 10.4-inch diagonal color Active Matrix Liquid Crystal Display (AMLCD) integrated into a Control Display Unit (CDU), which displays the airplane current position and track against a moving map. The EX-Series MFD can perform the following functions:

- Generate and display a moving map based on GPS position data with obstacle and terrain data.
- Display Stormscope® lightning strike bearing and distance.
- Display Skywatch® traffic advisory information. (EX5000C only)
- Display a GPS flight plan based on pilot inputs.
- Display Normal and Emergency checklists as well as performance data.
- Display navigation data, such as groundspeed and track.

The pilot can configure the moving map display. Some of its configuration features are:

- Select Track-up or North-up modes.
- Select map scale.

- Select terrain features, such as airports and special use airspace and select color enhanced terrain.
- Select and view trip data from GPS.

Power for the MCU is 28 VDC supplied through the 5-amp MFD circuit breaker on the Avionics Non-Essential Bus.

• Note •

*Serials 1005 through 1472 before MFD software version 530-00162-000 Revision 02; Do not use the Garmin 420 or 430 Navigators to display Stormscope lightning data when the Avidyne MFD's Lightning mode is set to either DATALINK or OFF. For the Garmin 420 or 430 Navigators to accurately display lightning strikes, the Lightning mode selected on the MFD's MAP Page, must be set to either STRIKE or CELL.*

*Refer to Avidyne FlightMax EX5000C Pilot's Guide, for a more complete description of the MFD, its operating modes, and additional detailed operating procedures.*

## Autopilot

### **Avionics Configuration 2.0:**

The standard SR20 is equipped with an S-TEC System Twenty Autopilot. This single-axis autopilot system is a rate-based system, deriving roll axis control inputs from its electric turn coordinator. The programmer, computer, annunciators, and servo amplifier are contained entirely within the turn coordinator case. Pilot inputs to the autopilot are made through the multi-function control knob at the upper left corner of the turn coordinator. The control knob provides mode selection, disengage, and turn command functions. A button on each control yoke handle may be used to disengage the autopilot. The turn coordinator instrument annunciates system modes. The autopilot drives the aileron trim motor and spring cartridge to control airplane roll. The autopilot operates on 28 VDC supplied through the 5-amp AUTOPILOT circuit breaker on the Essential Bus.

The S-Tec System Twenty Autopilot features:

- Roll Stabilization.
- Turn Command.
- Heading Hold interfaced with DG coupled heading bug.
- NAV/LOC/GPS tracking, HI and LO sensitivity.

### ***Avionics Configuration 2.1:***

These airplanes are equipped with an S-TEC System Thirty Autopilot. This two-axis autopilot system receives roll axis control inputs from an integral electric turn coordinator and altitude information from an altitude transducer plumbed into the Pitot-Static system. The programmer, roll computer/amplifier, and annunciators are contained entirely within the turn coordinator case. The Multi-function Control Knob at the upper left of the turn coordinator provides mode selection, disengage, and turn command functions. A button on each control yoke handle may be used to disengage the autopilot. A separate pitch computer provides the ALT hold function. Roll axis steering is accomplished by autopilot steering commands to the aileron trim motor and spring cartridge. Pitch axis command for altitude hold is accomplished by pitch computer commands to the elevator servo. The autopilot operates on 28 VDC supplied through the 5-amp AUTOPILOT circuit breaker on the Essential Bus. The S-Tec System Thirty Autopilot features:

- Roll Stabilization;
- Turn Command;
- NAV/LOC/GPS tracking; HI and LO sensitivity;
- Altitude Hold; and
- GPS Steering (GPSS) for smoother turns onto a course or during course tracking.

A separate GPSS converter provides GPS roll steering to the autopilot. A GPSS/HDG button allows the operator to switch between HDG and Roll Steering modes. In the HDG mode the autopilot responds to the HDG bug on the HSI. In the GPSS mode, the autopilot responds to roll steering inputs from the GPS navigator.

*Refer to S-TEC System Thirty Autopilot Pilot's Operating Handbook (P/N 8777) dated Feb 1999 or later and the applicable POH*

supplement for a more complete description of the autopilot, its operating modes, and additional detailed operating procedures.

*Refer to S-TEC-Meggitt Global Positioning System Steering (GPSS) Converter Pilot's Operating Handbook (P/N 8799) dated 8 Feb 2001 or later and applicable POH supplement for a more complete description of the GPSS converter, its modes, and additional operating procedures.*

### **Avionics Configuration 2.2:**

These airplanes are equipped with an S-TEC System 55X Autopilot with Altitude Selector / Alerter. The System 55X autopilot is a two-axis autopilot system. The system consists of a flight guidance programmer/computer, altitude selector/alerter, altitude transducer, turn coordinator, and HSI. Mode selection and vertical speed selection are made on the programmer/computer panel. The altitude selector/alerter allows the pilot to pre-select altitudes and rates of climb or descent to be used by the autopilot. A button on each control yoke handle may be used to disengage the autopilot. The autopilot makes roll changes through the aileron trim motor and spring cartridge and makes pitch changes for altitude preselect and hold through the elevator trim motor. The autopilot operates on 28 VDC supplied through the 5-amp AUTOPILOT circuit breaker on the Essential Bus. The S-Tec System 55X Autopilot features:

- Heading Hold and Command;
- NAV/LOC/GPS/GS tracking, high and low sensitivity, and automatic 45° -course intercept;
- Altitude and Climb/Descent Rate Preselect
- Altitude Hold and Command;
- Vertical Speed Hold and Command; and
- GPS Steering (GPSS) for smoother turns onto a course or during course tracking.

*Refer to S-Tec System Fifty-Five X Autopilot Pilot's Operating Handbook (POH), P/N 87109 dated 8 November 2000 or later revision for full operational procedures and description of implemented modes. The System 55X POH also contains detailed procedures for accomplishing GPS & VOR course tracking, front course and back course localizer approaches, and glideslope tracking.*

Refer to *S-Tec Altitude Selector / Alerter Pilot's Operating Handbook (POH)* P/N 8716 or P/N 87110 (no revision or later) for full operational procedures and detailed description of operational modes of the Altitude Selector / Alerter.

### **Avionics Configuration PFD:**

This airplane is equipped with an S-TEC System 55SR Autopilot. The System 55SR autopilot is a two-axis autopilot system. The system consists of a flight guidance programmer/computer, altitude transducer, turn coordinator, and primary flight display (PFD). Mode selection is made on the programmer/computer panel. A button on each control yoke handle may be used to disengage the autopilot. The autopilot makes roll changes through the aileron trim motor and spring cartridge and makes pitch changes for altitude hold through the elevator trim motor. The autopilot operates on 28 VDC supplied through the 5-amp AUTOPILOT circuit breaker on the Essential Bus. The S-Tec System 55SR Autopilot features:

- Heading Hold and Command;
- NAV/LOC/GPS tracking;
- Altitude Hold and Command;
- GPS Steering (GPSS) for smoother turns onto a course or during course tracking.

## **GPS Navigation**

The Jeppesen Navigation Database provides access to data on Airports, Approaches, Standard Instrument Departures (SIDs), Standard Terminal Arrivals (STARs), VORs, NDBs, Intersections, Minimum Safe Altitudes, Controlled Airspace Advisories and Frequencies. North American and International databases are available. Database information is provided on a card that can be inserted into the card slot on the GPS unit. Subscription information is provided in a subscription packet provided with each system.

### **Avionics Configuration 2.0 and PFD:**

The airplane is equipped with two GPS navigators. The Garmin GNS 430 navigator is designated GPS 1, IFR certified, and is coupled to the airplane's CDI and Multi-Function display. The Garmin GNC 250XL provides backup, is approved for VFR use only, and is not coupled to the Multi-Function or Primary Flight Displays. The primary GPS

navigator is powered by 28 VDC through the 5-amp GPS 1 and 7.5-amp COM 1 circuit breakers on the Avionics Essential Bus. The secondary GPS navigator is powered by 28 VDC through the 7.5-amp COM 2 circuit breaker on the Avionics Non-Essential Bus.

***Avionics Configuration 2.1 and 2.2:***

The airplane is equipped with two GPS navigators. The Garmin GNS 430 is designated GPS 1 and the Garmin GNS 420 (Configuration 2.1) or an additional GNS 430 (Configuration 2.2) is designated GPS 2. Both Garmin GPS navigators are IFR certified. The primary unit, designated GPS 1, is coupled to the airplane's HSI, Autopilot, and multifunction display. The secondary unit, designated GPS 2, is coupled to the airplane's CDI.

The GPS navigators are capable of providing IFR enroute, terminal, and approach navigation with position accuracies better than 15 meters. Each GPS navigator utilizes the Global Positioning System (GPS) satellite network to derive the airplane's position (latitude, longitude, and altitude) and the altitude encoder to enhance the altitude calculation.

The GPS1 antenna is located above the headliner along the airplane centerline. The GPS2 antenna is located below the glareshield and behind the MFD. All GPS navigator controls and functions are accessible through the GPS receiver units' front control panels located in the center console. The panels include function keys, power switches, MSG and NAV status annunciators, a color LCD display (GNS 430), two concentric selector knobs on each panel, and a Jeppesen NavData card slot in each panel. The displays are daylight readable and automatically dimmed for low-light operation. The primary GPS navigator is powered by 28 VDC through the 5-amp GPS 1 and 7.5-amp COM 1 circuit breakers on the Avionics Essential Bus. The secondary GPS navigator is powered by 28 VDC through the 5-amp GPS 2 and the 7.5-amp COM 2 circuit breaker on the Avionics Non-Essential Bus.

***Avionics Configuration SRV:***

*Optional SRV configuration:* An optional Garmin GNS 430 GPS transceiver is available as an upgrade to the Garmin GNS 420. The system description is identical to the Garmin GNS 420 described below.



*Standard SRV configuration:* The airplane is equipped with one GPS navigator. The Garmin GNS 420 navigator is designated GPS 1, and is coupled to the airplane's Multi-Function display. The GPS navigator is powered by 28 VDC through the 5-amp GPS 1 and 7.5-amp COM 1 circuit breakers on the Avionics Essential Bus.

## **Communication (COM) Transceivers**

### ***Avionics Configuration 2.0, 2.1, 2.2, and PFD:***

Two VHF communications (COM) transceivers are installed to provide VHF communication. The transceivers and integrated controls are mounted in the Garmin GNS 430, GNS 420 or GNC 250 XL units. The transceivers receive all narrow- and wide-band VHF communication transmissions transmitted within range of the selected frequency. The antennas pick up the signals and route the communication signals to the transceivers, which digitize the audible communication signal. The digitized audio is then routed to the audio control unit for distribution to the speakers or headphones.

COM 1 – The upper Garmin GNS 430 is designated COM 1. The Garmin GNS 430 control panel provides COM 1 transceiver active and standby frequency indication, frequency memory storage, and knob-operated frequency selection. The COM 1 transceiver provides either 720-channel (25 kHz spacing) or 2280-channel (8.33 kHz spacing) operation in a frequency range from 118.000 to 136.975 MHz. The COM 1 antenna is located above the cabin on the airplane centerline. 28 VDC for COM 1 transceiver operation is controlled through the Avionics Master Switch on the bolster switch panel and supplied through the 7.5-amp COM 1 circuit breaker on the Essential Avionics Bus.

COM 2 – The lower Garmin GNS 420 or GNC 250 XL is designated COM 2. The Garmin GNS control panel provides COM 2 transceiver active and standby frequency indication, frequency memory storage, and knob-operated frequency selection. The COM 2 transceiver provides either 720-channel (25 kHz spacing) or 2280-channel (8.33 kHz spacing) operation in a frequency range from 118.000 to 136.975 MHz. The COM 2 antenna is located on the underside of the cabin on the airplane centerline. 28 VDC for COM 2 transceiver operation is controlled through the Avionics Master Switch on the bolster switch

panel and supplied through the 7.5-amp COM 2 circuit breaker on the Non-Essential Avionics Bus.

***Avionics Configuration SRV:***

*Optional SRV configuration:* An optional Garmin GNS 430 GPS transceiver is available as an upgrade to the Garmin GNS 420. The system description is identical to the Garmin GNS 420 described below.

One VHF communications (COM) transceiver is installed to provide VHF communication. The transceiver and integrated controls are mounted in the Garmin GNS 420 unit. The transceiver receives all narrow- and wide-band VHF communication transmissions transmitted within range of the selected frequency. The antenna picks up the signals and routes the communication signals to the transceiver, which digitize the audible communication signal. The digitized audio is then routed to the audio control unit for distribution to the speakers or headphones.

COM 1 – The Garmin GNS 420 is designated COM 1. The Garmin GNS 420 control panel provides COM 1 transceiver active and standby frequency indication, frequency memory storage, and knob-operated frequency selection. The transceiver provides either 720-channel (25 kHz spacing) or 2280-channel (8.33 kHz spacing) operation in a frequency range from 118.000 to 136.975 MHz. The COM 1 antenna is located above the cabin on the airplane centerline. 28 VDC for COM 1 transceiver operation is controlled through the Avionics Master Switch on the bolster switch panel and supplied through the 7.5-amp COM 1 circuit breaker on the Essential Avionics Bus.

**Navigation (Nav) Receiver**

***Avionics Configuration 2.0, 2.1, 2.2, and PFD:***

The airplane is equipped with one NAV receiver integrated into the Garmin GNS 430 GPS Navigators (the GNS 420 or GNC 250XL do not incorporate a NAV receiver). Mounted in the upper radio rack slot, this unit is designated NAV 1. The GNS 430 has VHF Omnidirectional/Localizer (VOR/LOC) capability. The VOR/LOC receiver receives VOR/LOC on a frequency range from 108.000 Mhz to 117.950 Mhz with 50 kHz spacing. The GNS 430 has glideslope capability. Glideslope is received from 329.150 to 335.000 in 150 kHz steps. The

receivers and integrated controls are mounted in the Garmin GNS 430 control display. The receiver controls provide active and standby frequency indication, frequency memory storage, and knob-operated frequency selection. IDENT audio output for VOR and LOC is provided to the audio system. The Nav antenna, mounted on top of the vertical tail, provides VOR/LOC input for both Nav receivers.

NAV 1 – The upper GARMIN GNS 430 is designated NAV 1. 28 VDC for navigation receiver operation is controlled through the Avionics Master Switch on the bolster switch panel and supplied through the 5-amp GPS1 circuit breaker on the Avionics Essential Bus row.

### ***Avionics Configuration 2.2:***

The airplane is equipped with two NAV receivers integrated into the Garmin GNS 430 GPS Navigators. The upper unit is designated NAV 1 and the lower unit is designated NAV 2. The Nav receiver controls are integrated into the Garmin GNS control mounted in the center console. Each unit has VHF Omnitrange/Localizer (VOR/LOC) capability. The VOR/LOC receiver receives VOR/LOC on a frequency range from 108.000 Mhz to 117.950 Mhz with 50 kHz spacing. The GNS 430 has glideslope capability. Glideslope is received from 329.150 to 335.000 in 150 kHz steps. The receiver control provides active and standby frequency indication, frequency memory storage, and knob-operated frequency selection. IDENT audio output for VOR and LOC is provided to the audio system. The Nav antenna, mounted on top of the vertical tail, provides VOR/LOC input for both Nav receivers.

NAV 1 – The upper GARMIN GNS 430 is designated NAV 1. 28 VDC for navigation receiver operation is controlled through the Avionics Master Switch on the bolster switch panel and supplied through the 5-amp GPS1 circuit breaker on the Avionics Essential Bus row.

NAV 2 – The lower GARMIN GNS 430 is designated NAV 2. 28 VDC for navigation receiver operation is controlled through the Avionics Master Switch on the bolster switch panel and supplied through the 5-amp GPS 2 circuit breaker on the Avionics Non-Essential Bus row.

## Transponder

The airplane is equipped with a single Garmin GTX 327 ATC Mode C (identification and altitude) transponder with squawk capability. The transponder system consists of the integrated receiver/transmitter control unit, an antenna, and an altitude encoder. The receiver/transmitter receives interrogations from a ground-based secondary radar transmitter and then transmits to the interrogating Air Traffic Control Center. Digitized altitude information, provided by the altitude encoder, is plumbed into the airplane static system. The transponder and integrated controls are mounted in the center console. The transponder control provides active code display, code selection, IDENT button, and test functions. A FUNC (function) key allows for selection of pressure altitude, flight time, count-up timer and countdown timer modes. The display is daylight readable and dimming is operator controlled through the INST lights control on the instrument panel bolster. The transponder antenna is mounted on the underside of the fuselage just aft of the firewall. 28 VDC for transponder operation is controlled through the Avionics Master Switch on the bolster switch panel. 28 VDC for receiver, transmitter, and altitude encoder operation is supplied through the 2-amp ENCODER/XPONDER circuit breaker on the Avionics Non-Essential Bus.

## Audio System

The airplane is equipped with a Garmin GMA 340 Audio Panel.

*Refer to the Garmin GMA 340 Audio Panel Pilot's Operating Handbook, P/N 190-00149-10 Rev C or later, and the applicable POH supplement for a more complete description of the autopilot, its operating modes, and additional detailed operating procedures.*

### **Headset/Microphone Installation**

The airplane is equipped with provisions for four noise-canceling headsets with integrated microphones. The forward microphone-headsets use remote Push-To-Talk (PTT) switches located on the top of the associated control yoke grip. The rear headsets do not have COM transmit capabilities and do not require PTT switches. The microphone (MIC), headset, and automatic noise reduction (ANR) power jacks for the pilot and front seat passenger are located in the map case and similar jacks for the aft passengers are located on the aft portion of the center console. Audio to all four

headsets is controlled by the individual audio selector switches on the audio control panel and adjusted for volume level by using the selected receiver volume controls.

### ***Audio Input Jack***

Two audio input jacks are provided on the aft portion of the center console. One jack is located near the convenience outlet for use by the pilot and forward passenger, and another is located further aft by the rear passenger ANR power jacks. These jacks can be used to plug in personal entertainment devices such as portable radios, cassette players, or CD players. Audio volume through these jacks is controlled by connected individual entertainment device.

## **Emergency Locator Transmitter**

The airplane is equipped with a self-contained emergency locator transmitter (ELT). The transmitter and antenna are installed immediately behind the aft cabin bulkhead to the right of the airplane centerline. The main transmitter control switch, labeled ON-OFF-ARMED, on the transmitter is in the armed position for normal operations. A remote switch and indicator panel is installed immediately below the circuit breaker panel. The transmitter unit is mounted longitudinally in the airplane in order to detect deceleration greater than 3.5 ft/sec. If rapid deceleration is detected, the transmitter will repeatedly transmit VHF band audio sweeps at 121.5 MHz and 243.0 MHz approximately 0.5 seconds apart. The transmitter and portable antenna are accessible through an access at the base of the baggage compartment bulkhead. The ELT can be removed from the airplane and used as a personal locating device if it is necessary to leave the airplane after an accident. Eight dated "D" cell alkaline batteries contained within the transmitter unit power the ELT transmitter. The batteries must be replaced at specified intervals based upon the date appearing on the battery (*refer to Airplane Maintenance Manual*).

### ***ELT Remote Switch and Indicator Panel***

The ELT remote switch and indicator panel located immediately below the circuit breaker panel, provides test and monitoring functions for the ELT. The panel contains a button labeled ON, a button labeled RESET, and a red LED (light). The red light flashes when the ELT is transmitting. The ON button is used to test the unit in accordance with

the maintenance manual procedures. The RESET button can be used to cancel an inadvertent transmission. A 6-volt Lithium battery mounted in the panel powers the LED. The battery must be replaced at regular intervals (*refer to Airplane Maintenance Manual*).

In the event of an accident:

1. Verify ELT operation by noting that the ELT indicator light on the remote panel is flashing.
2. If possible, access the unit as described below and set the ELT main transmitter control switch ON.

Portable use of ELT:

- a. Remove access at lower aft center of baggage compartment.
- b. Disconnect fixed antenna lead from front of unit.
- c. Disconnect lead from remote switch and indicator unit.
- d. Loosen attach straps and remove transmitter unit and portable antenna.
- e. Attach portable antenna to antenna jack on front of unit.
- f. Set main control switch to ON.
- g. Hold antenna upright as much as possible.

## **Hour Meter(s)**

*Serials 1268 through 1632 and 1634 through 1638:* The airplane is equipped with an hour meter located inside the armrest storage compartment between the pilot and copilot seats. Recording begins when the BAT 1 switch is ON and either the ALT 1 or ALT 2 switch is ON.

*Serials 1268 through 1581:* 28 VDC for hour meter operation is supplied through the 5-amp ENGINE INST circuit breaker.

*Serials 1582 through 1632 and 1634 through 1638:* 28 VDC for hour meter operation is supplied through the 5-amp FUEL QTY / HOBBS circuit breaker on Main Bus 1.

*Serials 1633, 1639 and subsequent:* The airplane is equipped with two hour meters located inside the armrest storage compartment between the pilot and copilot seats. The #1 hour meter, labeled HOBBS begins recording when the BAT 1 switch is ON and either the ALT 1 or ALT 2 switch is ON. The #2 hour meter records flight time and is labeled

FLIGHT. Recording begins when the airplane reaches a speed of approximately 35 KIAS and is controlled by a differential pressure switch connected to the Pitot-static system. 28 VDC for hour meter operation is supplied through the 5-amp FUEL QTY / HOBBS circuit breaker on Main Bus 1.

## Digital Clock

*Serials 1268 through 1337;* The airplane is equipped with a 2¼" Davtron M803 digital clock located on the left instrument panel immediately outboard of the airspeed indicator. The clock provides Universal Time (UT), Local Time (LT), Elapsed Time (ET), Outside Air Temperature (OAT) in °C or °F, and Voltmeter functions. All features and functions are selectable from control buttons on the clock face. The clock receives the OAT signal from a temperature sensor installed immediately forward of the pilots door. The clock operates on 28 VDC supplied through the 5-amp ENGINE INST circuit breaker on Main Bus 1. Keep-alive power is supplied through a 5-amp fuse connected to the airplane Main Distribution Bus in the Master Control Unit (MCU). A replaceable AA battery is installed to provide up to three years battery back up.

### ***SEL and CTL Buttons***

All time keeping and set functions are addressable using the Select and Control buttons below the time display. Upon power up the clock will display Universal Time (UT). Pressing the Select button 3 times will display Local Time (LT), and Elapsed Time (ET) sequentially. Pressing the button again will return the display to UT.

#### *Set UT or LT:*

Use the Select button to select UT or LT as desired. Simultaneously press Select and Control buttons (tens of hours LED will flash). Press Control button repeatedly as required to increment digit to desired value. Press Select button to select the next digit to be set. After all digits have been set, press the Select button again to return to the normal mode.

*Flight Time (FT):*

The flight time (FT) option is not available in this installation. If FT is selected the display will 'zero.'

*Elapsed Time (ET):*

The ET mode may be used either in 'count-up' or in 'count-down' modes.

To set the count-up mode:

1. Select ET using the Select button; and
2. Press Control to activate count-up timer. Elapsed time counts up to 59 minutes, 59 seconds, and then switches to hours and minutes. Pressing the Control button again will reset the timer to zero.

To set the count-down mode:

1. Select ET using the Select button;
2. Input a 'count-down' time using the same technique as setting UT or LT (a maximum of 59 minutes, 59 seconds may be entered);
3. Press the Select button to exit the set mode; and
4. Press Control to start the count down. At zero, the alarm activates and the display flashes. Pressing either Select or Control deactivates the alarm.

*Test Mode:*

To enter the self-test mode, hold the Select button for 3 seconds. The display will indicate "88:88" and all four (UT, LT, FT, ET) annunciators will come on.

**OAT – VOLTS Button**

*Serials 1268 through 1337;* The red OAT-VOLTS button is used to display Outside Air Temperature and airplane Main Bus voltage. When the airplane is powered down, the upper display will display the clock's back-up battery voltage. Upon power up, the display will show the airplane's Main Bus voltage. Pressing the button displays OAT in °F. Pressing the button again displays OAT in °C.

*Serials 1337 and subsequent with Avionics Configuration PFD;* Outside Air Temperature annunciation is integrated into the MFD or PFD.



## Cirrus Airplane Parachute System

The SR20 is equipped with a Cirrus Airplane Parachute System (CAPS) designed to bring the aircraft and its occupants to the ground in the event of a life-threatening emergency. The system is intended to save the lives of the occupants but will most likely destroy the aircraft and may, in adverse circumstances, cause serious injury or death to the occupants. Because of this it is important to carefully read the CAPS descriptions in this section, section 3 Emergency Procedures and Section 10, Safety and consider when and how you would use the system.

### • WARNING •

The parachute system does not require electrical power for activation and can be activated at any time. The solid-propellant rocket flight path is upward from the parachute cover. Stay clear of parachute canister area when aircraft is occupied. Do not allow children in the aircraft unattended.

### System Description

The CAPS consists of a parachute, a solid-propellant rocket to deploy the parachute, a rocket activation handle, and a harness imbedded within the fuselage structure.

A composite box containing the parachute and solid-propellant rocket is mounted to the airplane structure immediately aft of the baggage compartment bulkhead. The box is covered and protected from the elements by a thin composite cover.

The parachute is enclosed within a deployment bag that stages the deployment and inflation sequence. The deployment bag creates an orderly deployment process by allowing the canopy to inflate only after the rocket motor has pulled the parachute lines taut.

The parachute itself is a 2400-square-foot round canopy equipped with a slider, an annular-shaped fabric panel with a diameter significantly less than the open diameter of the canopy. The slider has grommets spaced around its perimeter. The canopy suspension lines are routed through these grommets so that the slider is free to move along the suspension lines. Since the slider is positioned at the top of the suspension lines near the canopy, at the beginning of the

deployment sequence the slider limits the initial diameter of the parachute and the rate at which the parachute inflates. As the slider moves down the suspension lines the canopy inflates.

A three-point harness connects the airplane fuselage structure to the parachute. The aft harness strap is stowed in the parachute canister and attached to the structure at the aft baggage compartment bulkhead. The forward harness straps are routed from the canister to firewall attach points just under the surface of the fuselage skin. When the parachute deploys, the forward harness straps pull through the fuselage skin covering from the canister to the forward attach points.

## **Activation Handle**

CAPS is initiated by pulling the CAPS Activation T-handle installed in the cabin ceiling on the airplane centerline just above the pilot's right shoulder. A placarded cover, held in place with hook and loop fasteners, covers the T-handle and prevents tampering with the control. The cover is be removed by pulling the black tab at the forward edge of the cover.

Pulling the activation T-handle will activate the rocket and initiate the CAPS deployment sequence. To activate the rocket, two separate events must occur:

1. Pull the activation T-handle from its receptacle. Pulling the T-handle removes it from the o-ring seal that holds it in place and takes out the slack in the cable (approximately two inches (5 cm) of cable will be exposed). Once the slack is removed, the T-handle motion will stop and greater force will be required to activate the rocket.
2. Clasp both hands around activation T-handle and pull straight downward with a strong, steady, and continuous force until the rocket activates. A chin-up type pull works best. Up to 45.0 pounds (20.4 Kg) force, or greater, may be required to activate the rocket. The greater force required occurs as the cable arms and then releases the rocket igniter firing pin. When the firing pin releases, two primers discharge and ignite the rocket fuel.

**• Note •**

Jerking or rapidly pulling on the activation T-handle greatly increases the pull forces required to activate the rocket.

Attempting to activate the rocket by pushing the activation T-handle forward and down limits the force that can be applied. Pulling the activation T-handle straight down generates the greatest force.

A maintenance safety pin is provided to ensure that the activation handle is not pulled during maintenance. However, there may be some circumstances where an operator may wish to safety the CAPS system; for example, the presence of unattended children in the airplane, the presence of people who are not familiar with the CAPS activation system in the airplane, or during display of the airplane.

The pin is inserted through the handle retainer and barrel locking the handle in the “safe” position. A “Remove Before Flight” streamer is attached to the pin.

• **WARNING** •

After maintenance has been performed or any other time the system has been safetied, operators must verify that the pin has been removed before further flight.

## Deployment Characteristics

When the rocket launches, the parachute assembly is extracted outward due to rocket thrust and rearward due to relative wind. In approximately two seconds the parachute will begin to inflate.

When air begins to fill the canopy, forward motion of the airplane will dramatically be slowed. This deceleration increases with airspeed but in all cases within the parachute envelope should be less than 3 g's. During this deceleration a slight nose-up may be experienced, particularly at high speed; however, the rear riser is intentionally snubbed short to preclude excessive nose-up pitch. Following any nose-up pitching, the nose will gradually drop until the aircraft is hanging nose-low beneath the canopy.

Eight seconds after deployment, the rear riser snub line will be cut and the aircraft tail will drop down into its final approximately level attitude. Once stabilized in this attitude, the aircraft may yaw slowly back and forth or oscillate slightly as it hangs from the parachute. Descent rate is expected to be less than 1500 feet per minute with a lateral speed

equal to the velocity of the surface wind. In addition, surface winds may continue to drag the aircraft after ground impact.

**• Caution •**

Ground impact is expected to be equivalent to touchdown from a height of approximately 10 feet. While the airframe, seats and landing gear are designed to accommodate this stress, occupants must prepare for it in accordance with the CAPS Deployment procedure in Section 3 - Emergency Procedures.

**• Note •**

The CAPS is designed to work in a variety of aircraft attitudes, including spins. However, deployment in an attitude other than level flight may yield deployment characteristics other than those described above.

# **Section 8**

## **Handling, Servicing, Maintenance**

### **Table of Contents**

Introduction .....	8-3
Operator's Publications .....	8-3
Service Publications .....	8-3
Ordering Publications .....	8-4
Airplane Records and Certificates .....	8-5
Airworthiness Directives .....	8-6
Airplane Inspection Periods .....	8-6
Annual Inspection .....	8-6
100-Hour Inspection .....	8-7
Cirrus Design Progressive Inspection Program .....	8-7
Pilot Performed Preventative Maintenance .....	8-8
Ground Handling .....	8-10
Application of External Power .....	8-10
Towing .....	8-11
Taxiing .....	8-12
Parking .....	8-13
Tiedown .....	8-14
Leveling .....	8-14
Jacking .....	8-15
Servicing .....	8-16
Landing Gear Servicing .....	8-16
Brake Servicing .....	8-16
Tire Inflation .....	8-18
Propeller Servicing .....	8-18
Oil Servicing .....	8-19
Fuel System Servicing .....	8-22
Fuel Contamination and Sampling .....	8-24
Draining Fuel System .....	8-25
Battery Service .....	8-25
Cleaning and Care .....	8-26
Cleaning Exterior Surfaces .....	8-26
Cleaning Interior Surfaces .....	8-30

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## Introduction

This section provides general guidelines for handling, servicing and maintaining your Cirrus Design SR20. In order to ensure continued safe and efficient operation of your airplane, keep in contact with your Authorized Cirrus Service Center to obtain the latest information pertaining to your aircraft.

## Operator's Publications

The FAA Approved Airplane Flight Manual and Pilot's Operating Handbook (POH) is provided at delivery. Additional or replacement copies may be obtained from Cirrus Design by contacting the Customer Service Department.

## Service Publications

The following service publications are available for purchase from Cirrus Design for the SR20:

- Airplane Maintenance Manual (AMM) – GAMA-type Maintenance Manual divided into chapters as specified by GAMA and ATA covering inspection, servicing, maintenance, troubleshooting, and repair of the airplane structure, systems, and wiring. Revision Service for this manual is also available. A current copy of the AMM is provided at delivery.
- Engine Operators and Maintenance Manual – Cirrus Design provides a Teledyne Continental Engine Operator's and Maintenance Manual at the time of delivery. Engine and engine accessory overhaul manuals can be obtained from the original equipment manufacturer.
- Avionics Component Operator and Maintenance Manuals – Cirrus Design provides all available operator's manuals at the time of delivery. Maintenance manuals, if available, may be obtained from the original equipment manufacturer.

Cirrus Design offers a Subscription Service for the Service Bulletins, Service Letters and Options Letters issued from the factory. This service is offered to interested persons such as owners, pilots and mechanics at a nominal fee. Interested parties may obtain copies and subscription service for these documents by contacting Customer Service at Cirrus Design.

- Service Bulletins – -are of special importance. When you receive a Service Bulletin, comply with it promptly.
- Service Advisory Notices – are used to notify you of optional Service Bulletins, supplier Service Bulletins or Service Letters affecting your airplane, and maintenance data or corrections not requiring a Service Bulletin. Give careful attention to the Service Advisory Notice information.

## **Ordering Publications**

SR20 publications, revision service, and service publication subscription service may be obtained by contacting Customer Service at Cirrus Design as follows:

Cirrus Design Corporation  
Customer Service  
4515 Taylor Circle  
Duluth, MN 55811  
Phone: 218 727-2737  
FAX: 218 727-2148

Make sure to include airplane serial number and owner's name in all correspondence for accurate processing of your documentation needs.



## Airplane Records and Certificates

The Federal Aviation Administration (FAA) requires that certain data, certificates, and licenses be displayed or carried aboard the airplane at all times. Additionally, other documents must be made available upon request. The mnemonic acronym “ARROW” is often used to help remember the required documents.

• Note •

Owners of aircraft not registered in the United States should check with the registering authority for additional requirements.

Required Documents		Note
<b>A</b>	Airworthiness Certificate <i>FAA Form 8100-2</i>	Must be displayed at all times
<b>R</b>	Registration Certificate <i>FAA Form 8050-3</i>	Must be in the aircraft for all operations.
<b>R</b>	Radio Station License <i>FCC Form 556</i>	Required only for flight operations outside the United States
<b>O</b>	Operating Instructions	FAA Approved Flight Manual and Pilot's Operating Handbook fulfills this requirement
<b>W</b>	Weight & Balance Data	Included in FAA Approved Airplane Flight Manual and Pilot's Operating Handbook. Data must include current empty weight, CG, and equipment list.

Other Documents		Note
Airplane Logbook		Must be made available upon request
Engine Logbook		Must be made available upon request
Pilot's Checklist		Available in cockpit at all times.

## Airworthiness Directives

The Federal Aviation Administration (FAA) publishes Airworthiness Directives (AD's) that apply to specific aircraft and aircraft appliances or accessories. AD's are mandatory changes and must be complied with within a time limit set forth in the AD. Operators should periodically check with Cirrus Service Centers or A&P mechanic to verify receipt of the latest issued AD for their airplane.

## Airplane Inspection Periods

- Note •

FAR 1.1 defines time in service, with respect to maintenance time records, as "the time from the moment an aircraft leaves the surface of the earth until it touches it at the next point of landing."

*Serials 1633, 1639 and subsequent:* The #2 Hour Meter, located in the center console and labeled FLIGHT, begins recording when the airplane reaches approximately 35 KIAS and should be used to track maintenance time intervals as it more accurately records time in service than the #1 Hour Meter which begins recording when the BAT 1 switch is ON and either the ALT 1 or ALT 2 switch is ON.

The inspection items specified in the Annual/100 Inspection have been determined by the average aircraft use rate of the typical owner. Non-commercially operated aircraft that are flown significantly more than 100 hours per year should consider additional inspections commensurate with the hours flown. 100-Hour Inspection or enrollment in a Progressive Inspection Program should be considered in addition to the normally required Annual Inspection. The Annual Inspection interval may also be shortened to accommodate high utilization rate.

## Annual Inspection

Unless enrolled in a Progressive Inspection Program, The U.S. Federal Aviation Regulations require all civil aircraft must undergo a thorough Annual Inspection each twelve calendar months. Annual Inspections are due on the last day of the twelfth month following the

last Annual Inspection. For example: If an Annual Inspection were performed on 19 November 1998, the next Annual Inspection will be due 30 November 1999. Annual Inspections must be accomplished regardless of the number of hours flown the previous year and can only be performed by a licensed Airframe and Powerplant (A&P) mechanic holding an Inspection Authorization (IA). All Cirrus Authorized Service Centers can perform Annual Inspections. The inspection is listed, in detail, in Chapter 5 of the Aircraft Maintenance Manual.

## **100-Hour Inspection**

If the airplane is used commercially, in addition to the Annual Inspection requirement, the Federal Aviation Regulations requires that the airplane undergo a 100-Hour Inspection each 100 hours of flight operation. The scope of the 100-Hour Inspection is identical to the Annual Inspection except that it can be accomplished by a licensed A&P mechanic. The 100-hour interval may be exceeded by not more than 10 flight hours in order to reach a place where the inspection can be accomplished. Any flight hours used to reach an inspection station must be deducted from the next 100-Hour Inspection interval. The inspection is listed, in detail, in Chapter 5 of the Aircraft Maintenance Manual.

## **Cirrus Design Progressive Inspection Program**

In lieu of the above requirements, an airplane may be inspected using a Progressive Inspection Program in accordance with the Federal Aviation Regulation Part 91.409.

The Cirrus Design Progressive Inspection Program provides for the complete inspection of the airplane utilizing a five-phase cyclic inspection program. A total of eight inspections are accomplished over the course of 400 flight hours, with an inspection occurring every 50 flight hours. The inspection items to be covered in the Progressive Inspection are very similar to the Annual Inspection items. The Progressive Inspection will accomplish a full Inspection of the airplane at 400 flight hours or at 12 calendar months. The inspection is listed, in detail, in Chapter 5 of the Aircraft Maintenance Manual.

## Pilot Performed Preventative Maintenance

The holder of a Pilot Certificate issued under FAR Part 61 may perform certain preventive maintenance described in FAR Part 43, Appendix A. This maintenance may be performed only on an aircraft that the pilot owns or operates and which is not used in air carrier service. The regulation also stipulates that the pilot must also complete the appropriate logbook entries. The following is a list of the maintenance that the pilot may perform:

• Note •

The pilot should have the ability and manual procedures for the work to be accomplished.

The pilot may not accomplish any work involving the removal or disassembly of primary structure or operating system, or interfere with an operating system, or affect the primary structure.

- Remove, install, and repair tires.
- Clean, grease, or replace wheel bearings
- Replace defective safety wire or cotter pins.
- Lubrication not requiring disassembly other than removal of nonstructural items such as access covers, cowlings, or fairings.

• Caution •

Do not use unapproved lubricants. Unapproved lubricants may damage control system components, including but not limited to engine and flight controls. *Refer to the Airplane Maintenance Manual* for approved lubricants.

- Replenish hydraulic fluid in the hydraulic and brake reservoirs.
- Refinish the airplane interior or exterior (excluding balanced control surfaces) with protective coatings.
- Repair interior upholstery and furnishings.
- Replace side windows.
- Replace bulbs, reflectors and lenses of position and landing lights.
- Replace cowling not requiring removal of the propeller.
- Replace, clean or set spark plug gap clearance.

- Replace any hose connection, except hydraulic connections, with replacement hoses.
- Clean or replace fuel and oil strainers, as well as replace or clean filter elements.
- Replace prefabricated fuel lines.
- Replace the battery and check fluid level and specific gravity.

### ***Logbook Entry***

After any of the above work is accomplished, appropriate logbook entries must be made. Logbook entries should contain:

- The date the work was accomplished.
- Description of the work.
- Number of hours on the aircraft.
- The certificate number of pilot performing the work.
- Signature of the individual doing the work.

Logbooks should be complete and up to date. Good records reduce maintenance cost by giving the mechanic information about what has or has not been accomplished.

## Ground Handling

### Application of External Power

A ground service receptacle, located just aft of the cowl on the left side of the airplane, permits the use of an external power source for cold weather starting and maintenance procedures.

#### • WARNING •

If external power will be used to start engine, keep yourself, others, and power unit cables well clear of the propeller rotation plane.

#### *To apply external power to the airplane:*

##### • Caution •

Do not use external power to start the airplane with a 'dead' battery or to charge a dead or weak battery in the airplane. The battery must be removed from the airplane and battery maintenance performed in accordance with the appropriate Airplane Maintenance Manual procedures.

1. Ensure that external power source is regulated to 28 VDC.
2. Check BAT and AVIONICS power switches are 'off.'
3. Plug external power source into the receptacle.
4. Set BAT 1 switch to ON. 28 VDC from the external power unit will energize the main distribution and essential distribution buses. The airplane may now be started or electrical equipment operated.
5. If avionics are required, set AVIONICS power switch ON.

##### • Caution •

If maintenance on avionics systems is to be performed, it is recommended that external power be used. Do not start or crank the engine with the AVIONICS power switch 'on.'

#### *To remove external power from airplane:*

1. If battery power is no longer required, set BAT 1 switch 'off.'
2. Pull external power source plug.

## Towing

The airplane may be moved on the ground by the use of the nose wheel steering bar that is stowed in the rear baggage compartment or by power equipment that will not damage or excessively strain the nose gear assembly. The steering bar is engaged by inserting it into lugs just forward of the nose wheel axle.

### • Caution •

While pushing the aircraft backward, the tow bar must be installed to keep the nose wheel from turning abruptly.

Do not use the vertical or horizontal control surfaces or stabilizers to move the airplane. If a tow bar is not available, use the wing roots as push points.

Do not push or pull on control surfaces or propeller to maneuver the airplane.

Do not tow the airplane when the main gear is obstructed with mud or snow.

If the airplane is to be towed by vehicle, do not turn the nose wheel more than 90 degrees either side of center or structural damage to the nose gear could result.

1. Refer to *Airplane Three View (Section 1, Figure 1-1)* and *Turning Radius (Section 1, Figure 1-2)* or clearances. Be especially cognizant of hangar door clearances.
2. Insert tow bar into the lugs just forward of the nose wheel axle.
3. Release parking brake and remove chocks
4. Move airplane to desired location.
5. Install chocks
6. Remove tow bar.

To obtain a minimum radius turn during ground handling, the airplane may be rotated around either main landing gear by pressing down on a fuselage just forward of the horizontal stabilizer to raise the nosewheel off the ground.

## Taxiing

Before attempting to taxi the airplane, ground personnel should be instructed and authorized by the owner to taxi the airplane. Instruction should include engine starting and shutdown procedures in addition to taxi and steering techniques.

### • Caution •

Verify that taxi and propeller wash areas are clear before beginning taxi.

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

Taxi with minimum power needed for forward movement. Excessive braking may result in overheated or damaged brakes.

1. Remove chocks.
2. Start engine in accordance with Starting Engine procedure (Section 4).
3. Release parking brake.
4. Advance throttle to initiate taxi. Immediately after initiating taxi, apply the brakes to determine their effectiveness. During taxiing, use differential braking to make slight turns to ascertain steering effectiveness.

### • Caution •

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

Avoid holes and ruts when taxiing over uneven ground.

5. Taxi airplane to desired location.
6. Shut down airplane and install chocks and tie-downs in accordance with Shutdown procedure (Section 4).



## Parking

The airplane should be parked to protect the airplane from weather and to prevent it from becoming a hazard to other aircraft. The parking brake may release or exert excessive pressure because of heat buildup after heavy braking or during wide temperature swings. Therefore, if the airplane is to be left unattended or is to be left overnight, chock and tie down the airplane.

1. For parking, head airplane into the wind if possible.
2. Retract flaps.
3. Set parking brake by first applying brake pressure using the toe brakes and then pulling the PARK BRAKE knob aft.

### • Caution •

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

4. Chock both main gear wheels.
5. Tie down airplane in accordance with tiedown procedure in this section.
6. Install a pitot head cover. Be sure to remove the pitot head cover before flight.
7. Cabin and baggage doors should be locked when the airplane is unattended.

## Tiedown

The airplane should be moored for immovability, security and protection. FAA Advisory Circular AC 20-35C, Tiedown Sense, contains additional information regarding preparation for severe weather, tiedown, and related information. The following procedures should be used for the proper mooring of the airplane:

1. Head the airplane into the wind if possible.
2. Retract the flaps.
3. Chock the wheels.
4. Secure tie-down ropes to the wing tie-down rings and to the tail ring at approximately 45-degree angles to the ground. When using rope or non-synthetic material, leave sufficient slack to avoid damage to the airplane should the ropes contract.

### • Caution •

Anchor points for wing tiedowns should not be more than 18 feet apart to prevent eyebolt damage in heavy winds.

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

## Leveling

The airplane is leveled longitudinally by means of a spirit level placed on the pilot door sill and laterally by means of a spirit level placed across the door sills. Alternately, sight the forward and aft tool holes along waterline 95.9 to level airplane. *Refer to Section 6, Airplane Weighing Procedures and Section 6, Figure 6-2, for illustration.*

## Jacking

Two jacking points are provided: one at each wing tiedown. Jack points (pads) are stowed in the baggage compartment. The airplane may be jacked using two standard aircraft hydraulic jacks at the wing jacking points and a weighted tailstand attached to the tail tiedown.

### ***Raise Airplane***

#### **• Caution •**

Do not jack the aircraft outside or in open hangar with winds in excess of 10 mph.

The empty CG is forward of the wing jacking points. To prevent airplane from tipping forward during maintenance or jacking, use a weighted tailstand (300-lb minimum) attached to the tail tiedown.

1. Position airplane on a hard, flat, level surface.
2. Remove tiedown rings from wings. Stow tie-down rings in baggage compartment.
3. Attach a weighted tailstand to the tail tiedown ring.
4. Position jacks and jack points (pads) for jacking. Insert jack point (pad) into wing tiedown receptacle. Holding the jack point (pad) in place, position the jack under the point and raise the jack to firmly contact the jack point. Repeat for opposite jacking point.
5. Raise the airplane keeping the airplane as level as possible.
6. Secure jack locks.

### ***Lower Airplane***

1. Release pressure on all jacks as simultaneously as necessary to keep airplane as level as possible.
2. Remove jacks, jack points (pads), and tailstand. Stow points in baggage compartment. Install tiedown rings in wings.

## Servicing

### Landing Gear Servicing

The main landing gear wheel assemblies use 15 x 6.00 x 6, six-ply rating tires and tubes. The nose wheel assembly uses a 5.00 x 5 four-ply rating, type III tire and tube. Always keep tires inflated to the rated pressure to obtain optimum performance and maximum service. The landing gear struts do not require servicing. With the exception of replenishing brake fluid, wheel and brake servicing must be accomplished in accordance with Airplane Maintenance Manual (AMM) procedures.

### Brake Servicing

#### *Brake Replenishing*

The brake system is filled with MIL-H-5606 hydraulic brake fluid. The fluid level should be checked at every oil change and at the annual/100-hour inspection, replenishing the system when necessary. The brake reservoir is located on the right side of the battery support frame. If the entire system must be refilled, *refer to the Airplane Maintenance Manual (AMM)*.

To replenish brake fluid:

1. Chock tires and release parking brake.
2. Remove top engine cowling to gain access to hydraulic fluid reservoir.
3. Clean reservoir cap and area around cap before opening reservoir cap.
4. Remove cap and add MIL-H-5606 hydraulic fluid as necessary to fill reservoir.
5. Install cap, inspect area for leaks, and then install and secure engine cowling.

### ***Brake Inspection***

The brake assemblies and linings should be checked at every oil change (50 hours) for general condition, evidence of overheating, and deterioration. *Serials 1268 thru 2030 before SB 2X-05-01*: At every annual/100-hour inspection the brakes should be disassembled, the brake linings should be checked and the O-rings replaced.

The aircraft should not be operated with overheated, damaged, or leaking brakes. Conditions include, but are not limited to:

- Leaking brake fluid at the caliper. This can be observed by checking for evidence of fluid on the ground or deposited on the underside of the wheel fairing. Wipe the underside of the fairing with a clean, white cloth and inspect for red colored fluid residue.
- Overheated components, indicated by discoloration or warping of the disk rotor. Excessive heat can cause the caliper components to discolor or cause yellowing of the part identification label.

To inspect the brake assemblies:

1. Remove main gear fairing. (Refer to AMM 32-10)
2. Wipe off any debris from brake caliper assembly that may obstruct inspection.
3. Check brake linings for deterioration and maximum permissible wear. Replace lining when worn to 0.100 inch (2.54 mm).
4. Inspect temperature indicator(s):
  - a. Clean and inspect temperature indicators installed to brake caliper assembly.
  - b. Verify temperature indicators are firmly adhered to piston housing.
  - c. If either temperature indicator is black, the brake assembly has overheated. The brake linings must be inspected and the O-rings replaced.
5. Check brake assemblies for evidence of overheating and/or deterioration.
6. Install main gear fairing. (Refer to AMM 32-10)

## Tire Inflation

For maximum service from the tires, keep them inflated to the proper pressure. When checking tire pressure, examine the tires for wear, cuts, nicks, bruises and excessive wear.

To inflate tires:

1. Remove inspection buttons on wheel pants to gain access to valve stems. It may be necessary to move airplane to get valve stem aligned with the access hole.
2. Remove valve stem cap and verify tire pressure with a dial-type tire pressure gage.
3. Inflate nose tire to 40 +2/-0 psi (276 +15/-0 kPa) and main wheel tires to 53 +2/-0 psi (365 +15/-0 kPa).
4. Replace valve stem cap and inspection buttons.

All wheels and tires are balanced before original installation and the relationship of tire, tube, and wheel should be maintained upon reinstallation. In the installation of new components, it may be necessary to rebalance the wheels with the tires mounted. Unbalanced wheels can cause extreme vibration in the landing gear.

## Propeller Servicing

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

## Oil Servicing

The oil capacity of the Teledyne Continental IO-360-ES engine is 8 quarts. It is recommended that the oil be changed every 50 hours and sooner under unfavorable operating conditions. The following grades are recommended for the specified temperatures at sea level (SL):

Ambient Air Temperature (SL)	Single Viscosity	Multi-Viscosity
All Temperatures	—	20W-50 15W-50
Below 40° F	SAE 30	10W-30 20W-50 15W-50
Above 40° F	SAE 50	20W-50 15W-50

An oil filler cap and dipstick are located at the left rear of the engine and are accessible through an access door on the top left side of the engine cowling. The engine should not be operated with less than six quarts of oil. Seven quarts (dipstick indication) is recommended for extended flights.

To check and add oil:

1. Open access door on upper left-hand side of cowl. Pull dipstick and verify oil level.
2. If oil level is below 6 quarts (5.7 liters), remove filler cap and add oil through filler as required to reach 6-8 quarts (5.7-7.6 liters).
3. Verify oil level and install dipstick and filler cap.

• Note •

Installation of dipstick can be difficult. To aid in inserting dipstick, point the loop of the dipstick towards the closest spark plug (left rear, #2 cylinder), and use both hands to guide, route, and insert dipstick.

4. Close and secure access panel.

### ***Approved Oils***

For the first 25 hours of operation (on a new or rebuilt engine) or until oil consumption stabilizes, use only straight mineral oil conforming to Mil-L-6082. If engine oil must be added to the factory installed oil, add only MIL-L-6082 straight mineral oil.

#### **• Caution •**

MIL-C-6529, Type II straight mineral oil with corrosion preventive can cause coking with extended use and is not recommended by Cirrus Design for break-in or post break-in use.

After 25 hours of operation and after oil consumption has stabilized, use only aviation lubricating oils conforming to Teledyne Continental Motors (TCM) Specification MHS24, Lubricating Oil, Ashless Dispersant, or TCM Specification MHS25, Synthetic Lubrication Oil. The following products have supplied data to TCM indicating that these oils conform to all the requirements of the above listed TCM specifications:



<b>Product</b>	<b>Supplier</b>
Aeroshell (R) W	Shell Australia
Aeroshell Oil W Aeroshell Oil W 15W-50 Anti-Wear Formulation Aeroshell 15W50	Shell Canada Ltd.
Aeroshell Oil W Aeroshell Oil W 15W-50 Anti-Wear Formulation Aeroshell 15W50	Shell Oil Company
Aviation Oil Type A	Phillips 66 Company
BP Aero Oil	BP Oil Corporation
Castrolaero AD Oil	Castrol Ltd. (Australia)
Chevron Aero Oil	Chevron U.S.A. Inc.
Conoco Aero S	Continental Oil
Delta Avoil	Delta Petroleum Co.
Exxon Aviation Oil EE	Exxon Company, U.S.A.
Mobil Aero Oil	Mobil Oil Company
Pennzoil Aircraft Engine Oil	Pennzoil Company
Quaker State AD Aviation Engine Oil	Quaker State Oil & Refining Co.
Red Ram Aviation Oil 20W-50	Red Ram Ltd. (Canada)
Sinclair Avoil	Sinclair Oil Company
Texaco Aircraft Engine Oil – Premium AD	Texaco Inc.
Total Aero DW 15W50	Total France
Turbonycoil 3570	NYCO S.A.
Union Aircraft Engine Oil HD	Union Oil Company of California

**Figure 8-1  
Approved Oils**

## Fuel System Servicing

**I** *Airplane serials 1005 thru 1877, 1879 thru 1885, 2032 & subsequent;* After the first 25 hours of operation, then every 50-hours or as conditions dictate, the fuel filtration screen in the gascolator must be cleaned. After cleaning, a small amount of grease applied to the gascolator bowl gasket will facilitate reassembly.

**I** *Airplane Serials 1878, 1886 thru 2031;* After the first 25 hours of operation, then every 100-hours or as conditions dictate, the fuel filter element in the gascolator must be replaced. At every oil change, Verify red pop-up tab on gascolator is not visible. If tab is visible, the fuel filter element must be replaced and the pop-up tab manually reset.

Refer to the Airplane Maintenance Manual for Fuel Screen/Element servicing information.

### **Fuel Requirements**

Aviation grade 100 LL (blue) or 100 (green) fuel is the minimum octane approved for use in this airplane.

#### **• Caution •**

Use of lower grades can cause serious engine damage in a short period. The engine warranty is invalidated by the use of lower octane fuels.

### **Filling Fuel Tanks**

Observe all safety precautions required when handling gasoline. Fuel fillers are located on the forward slope of the wing. Each wing holds a maximum of 30.3 U.S. gallons. When using less than the standard 60.5-gallon capacity, fuel should be distributed equally between each side.

#### **• WARNING •**

Have a fire extinguisher available.

Ground fuel nozzle and fuel truck to airplane exhaust pipe and ground fuel truck or cart to suitable earth ground.

Do not fill tank within 100 feet (30.5 meters) of any energized electrical equipment capable of producing a spark.

Permit no smoking or open flame within 100 feet (30.5 meters) of airplane or refuel vehicle.

Do not operate radios or electrical equipment during refuel operations. Do not operate any electrical switches.

To refuel airplane:

1. Place fire extinguisher near fuel tank being filled.
2. Connect ground wire from refuel nozzle to airplane exhaust, from airplane exhaust to fuel truck or cart, and from fuel truck or cart to a suitable earth ground.
3. Place rubber protective cover over wing around fuel filler.

• Note •

Do not permit fuel nozzle to come in contact with bottom of fuel tanks. Keep fuel tanks at least half full at all times to minimize condensation and moisture accumulation in tanks. In extremely humid areas, the fuel supply should be checked frequently and drained of condensation to prevent possible distribution problems.

4. Remove fuel filler cap and fuel airplane to desired level.

• Note •

If fuel is going to be added to only one tank, the tank being serviced should be filled to the same level as the opposite tank. This will aid in keeping fuel loads balanced.

5. Remove nozzle, install filler cap, and remove protective cover.
6. Repeat refuel procedure for opposite wing.
7. Remove ground wires.
8. Remove fire extinguisher.

## Fuel Contamination and Sampling

Typically, fuel contamination results from foreign material such as water, dirt, rust, and fungal or bacterial growth. Additionally, chemicals and additives that are incompatible with fuel or fuel system components are also a source of fuel contamination. To assure that the proper grade of fuel is used and that contamination is not present, the ***fuel must be sampled prior to each flight.***

Each fuel system drain must be sampled by draining a cupful of fuel into a clear sample cup. Fuel drains are provided for the fuel gascolator, wing tanks, and collector tank drains. The gascolator drain exits the lower engine cowl just forward of the firewall near the airplane centerline. Fuel tank and collector tank drains are located at the low spot in the respective tank.

If sampling reveals contamination, the gascolator and tank drains must be sampled again repeatedly until all contamination is removed. It is helpful to gently rock the wings and lower the tail slightly to move contaminants to the drain points for sampling. If after repeated samplings (three or more), evidence of significant contamination remains, do not fly the airplane until a mechanic is consulted, the fuel system is drained and purged, and the source of contamination is determined and corrected.

If sampling reveals the airplane has been serviced with an improper fuel grade, do not fly the airplane until the fuel system is drained and refueled with an approved fuel grade.

To help reduce the occurrence of contaminated fuel coming from the supplier or fixed based operator, pilots should assure that the fuel supply has been checked for contamination and that the fuel is properly filtered. Also, between flights, the fuel tanks should be kept as full as operational conditions permit to reduce condensation on the inside of fuel tanks.

■ *Airplane Serials 1878, 1886 thru 2031*; The gascolator incorporates a filter bypass that activates a red, pop-up tab when pressure drop across the gascolator reaches  $0.8 \pm 0.2$  PSI. The filter is bypassed when the pressure drop reaches  $1.20 \pm 0.2$  PSI. Once the pop-up tab is activated, the fuel filter element must be replaced and the pop-up tab manually reset. Do not attempt to clean the filter element.

## Draining Fuel System

The bulk of the fuel may be drained from the wing fuel tanks by the use of a siphon hose placed in the cell or tank through the filler neck. The remainder of the fuel may be drained by opening the drain valves. Use the same precautions as when refueling airplane. *Refer to the Airplane Maintenance Manual* for specific procedures.

## Battery Service

Access to the 24 volt Battery 1 is gained by removing the upper cowl. It is mounted to the forward right side of the firewall. The battery vent is connected to an acid resistant plastic tube that vents gases and electrolyte overflow overboard.

The battery fluid level must not be brought above the baffle plates. Until experience indicates a longer interval is justified, the battery should be checked every 30 days to determine that the fluid level is proper and the connections are tight and free of corrosion. Do not fill the battery with acid use distilled water only.

If the battery is not properly charged, recharge it starting with a rate of four amperes and finishing with a rate of two amperes in accordance with Airplane Maintenance Manual (AMM) procedures. The battery should be removed from the airplane for charging, and quick charges are not recommended.

Battery 2 is a maintenance free, rechargeable, sealed, lead acid batter. Mounted in the empennage just aft of bulkhead 222, there is no need to check the specific gravity of the electrolyte or add water to these batteries during their service life. *Refer to the Airplane Maintenance Manual (AMM)* for Overhaul and Replacement Schedule.

The external power receptacle is located on the left side of the fuselage just aft of the firewall. *Refer to the Airplane Maintenance Manual (AMM)* for battery servicing procedures.

## Cleaning and Care

### Cleaning Exterior Surfaces

• Note •

Prior to cleaning, place the airplane in a shaded area to allow the surfaces to cool.

The airplane should be washed with a mild soap and water. Harsh abrasives or alkaline soaps or detergents could make scratches on painted or plastic surfaces or could cause corrosion of metal. Cover static ports and other areas where cleaning solution could cause damage. Be sure to remove the static port covers before flight. To wash the airplane, use the following procedure:

1. Flush away loose dirt with water.
2. Apply cleaning solution with a soft cloth, a sponge or a soft bristle brush.
3. To remove exhaust stains, allow the solution to remain on the surface longer.
4. To remove stubborn oil and grease, use a cloth dampened with naphtha.
5. Rinse all surfaces thoroughly.

Any good silicone free automotive wax may be used to preserve painted surfaces. Soft cleaning cloths or a chamois should be used to prevent scratches when cleaning or polishing. A heavier coating of wax on the leading surfaces will reduce the abrasion problems in these areas.

<b>Cleaning Product</b>	<b>Cleaning Application</b>	<b>Supplier</b>
Mild Dishwasher Soap (abrasive free)	Fuselage Exterior and Landing Gear	Any Source
Pure Carnauba Wax	Fuselage Exterior	Any Source
Mothers California Gold Pure Carnauba Wax	Fuselage Exterior	Wal-Mart Stores
RejeX	Fuselage Exterior	Corrosion Technologies
WX/Block System	Fuselage Exterior	Wings and Wheels
AeroShell Flight Jacket Plexicoat	Fuselage Exterior	ShellStore Online
XL-100 Heavy-Duty Cleaner/Degreaser	Fuselage Exterior and Landing Gear	Buckeye International
Stoddard Solvent PD-680 Type II	Engine Compartment	Any Source
Kerosene	Exterior Windscreen and Windows	Any Source
Klear-To-Land	Exterior Windscreen and Windows	D.W. Davies & Co
Prist	Exterior Windscreen and Windows	Prist Aerospace
LP Aero Plastics Acrylic Polish & Sealant	Exterior Windscreen and Windows	Aircraft Spruce & Specialty

**Figure 8-2**  
**Recommended Exterior Cleaning Products**

### ***Windscreen and Windows***

Before cleaning an acrylic window, rinse away all dirt particles before applying cloth or chamois. Never rub dry acrylic. Dull or scratched window coverings may be polished using a special acrylic polishing paste.

• **Caution** •

Clean acrylic windows with a solvent free, none abrasive, antistatic acrylic cleaner. Do not use gasoline, alcohol, benzene, carbon tetrachloride, thinner, acetone, or glass window cleaning sprays.

Use only a nonabrasive cotton cloth or genuine chamois to clean acrylic windows. Paper towel or newspaper are highly abrasive and will cause hairline scratches.

1. Remove grease or oil using a soft cloth saturated with kerosene then rinse with clean, fresh water.

• **Note** •

Wiping with a circular motion can cause glare rings. Use an up and down wiping motion to prevent this.

To prevent scratching from dirt that has accumulated on the cloth, fold cloth to expose a clean area after each pass.

2. Using a moist cloth or chamois, gently wipe the windows clean of all contaminates.
3. Apply acrylic cleaner to one area at a time, then wipe away with a soft, cotton cloth.
4. Dry the windows using a dry nonabrasive cotton cloth or chamois.



### ***Engine Compartment***

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

1. Place a large pan under the engine to catch waste.
2. Remove induction air filter and seal off induction system inlet.
3. With the engine cowling removed, spray or brush the engine with solvent or a mixture of solvent and degreaser. In order to remove especially heavy dirt and grease deposits, it may be necessary to brush areas that were sprayed.

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

4. Allow the solvent to remain on the engine from 5 to 10 minutes. Then rinse engine clean with additional solvent and allow it to dry.

#### **• Caution •**

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

5. Remove the protective tape from the magnetos.
6. Open induction system air inlet and install filter.
7. Lubricate the controls, bearing surfaces, etc., in accordance with the Lubrication Chart.

### ***Landing Gear***

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

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

## Cleaning Interior Surfaces

Seats, carpet, upholstery panels, and headliners should be vacuumed at regular intervals to remove surface dirt and dust. While vacuuming, use a fine bristle nylon brush to help loosen particles.

### • Caution •

Remove any sharp objects from pockets or clothing to avoid damaging interior panels or upholstery.

### ***Windshield and Windows***

Never rub dry acrylic. Dull or scratched window coverings may be polished using a special acrylic polishing paste.

### • Caution •

Clean acrylic windows with a solvent free, none abrasive, antistatic acrylic cleaner. Do not use gasoline, alcohol, benzene, carbon tetrachloride, thinner, acetone, or glass window cleaning sprays.

Use only a nonabrasive cotton cloth or genuine chamois to clean acrylic windows. Paper towel or newspaper are highly abrasive and will cause hairline scratches.

### • Note •

Wiping with a circular motion can cause glare rings. Use an up and down wiping motion to prevent this.

To prevent scratching from dirt that has accumulated on the cloth, fold cloth to expose a clean area after each pass.

1. Using a moist cloth or chamois, gently wipe the windows clean of all contaminants.
2. Apply acrylic cleaner to one area at a time, then wipe away with a soft, cotton cloth.
3. Dry the windows using a dry nonabrasive cotton cloth or chamois.

Cleaning Product	Cleaning Application	Supplier
Prist	Interior Windscreen and Windows	Prist Aerospace
Optimax	Display Screens	PhotoDon
Mild Dishwasher Soap (abrasive free)	Cabin Interior	Any Source
Leather Care Kit 50689-001	Leather Upholstery	Cirrus Design
Leather Cleaner 50684-001	Leather Upholstery	Cirrus Design
Ink Remover 50685-001	Leather Upholstery	Cirrus Design
Leather Conditioner 50686-001	Leather Upholstery	Cirrus Design
Spot and Stain Remover 50687-001	Leather Upholstery	Cirrus Design
Vinyl Finish Cleaner 50688-001	Vinyl Panels	Cirrus Design
Vinyl & Leather Cleaner 51479-001	Vinyl and Leather Upholstery	Cirrus Design

**Figure 8-3**  
**Recommended Interior Cleaning Products**

### ***Instrument Panel and Electronic Display Screens***

The instrument panel, control knobs, and plastic trim need only to be wiped clean with a soft damp cloth. The multifunction display, primary flight display, and other electronic display screens should be cleaned with Optimax - LCD Screen Cleaning Solution as follows:

**• Caution •**

To avoid solution dripping onto display and possibly migrating into component, apply the cleaning solution to cloth first, not directly to the display screen.

Use only a lens cloth or nonabrasive cotton cloth to clean display screens. Paper towels, tissue, or camera lens paper may scratch the display screen.

Clean display screen with power OFF.

1. Gently wipe the display with a clean, dry, cotton cloth.
2. Moisten clean, cotton cloth with cleaning solution.
3. Wipe the soft cotton cloth across the display in one direction, moving from the top of the display to the bottom. Do not rub harshly.
4. Gently wipe the display with a clean, dry, cotton cloth.

### ***Headliner and Trim Panels***

The airplane interior can be cleaned with a mild detergent or soap and water. Harsh abrasives or alkaline soaps or detergents should be avoided. Solvents and alcohols may damage or discolor vinyl or urethane parts. Cover areas where cleaning solution could cause damage. Use the following procedure:

**• Caution •**

Solvent cleaners and alcohol should not be used on interior parts. If cleaning solvents are used on cloth, cover areas where cleaning solvents could cause damage.

1. Clean headliner, and side panels, with a stiff bristle brush, and vacuum where necessary.

2. Soiled upholstery, may be cleaned with a good upholstery cleaner suitable for the material. Carefully follow the manufacturer's instructions. Avoid soaking or harsh rubbing.

### ***Leather Upholstery and Seats***

For routine maintenance, occasionally wipe leather upholstery with a soft, damp cloth. For deeper cleaning, start with mix of mild detergent and water then, if necessary, work your way up to the products available from Cirrus for more stubborn marks and stains. Do not use soaps as they contain alkaline which will alter the leather's pH balance and cause the leather to age prematurely. Cover areas where cleaning solution could cause damage. Use the following procedure:

#### **• Caution •**

Solvent cleaners and alcohol should not be used on leather upholstery.

1. Clean leather upholstery with a soft bristle brush, and vacuum where necessary.
2. Wipe leather upholstery with a soft, damp cloth.
3. Soiled upholstery, may be cleaned with the approved products available from Cirrus Design. Avoid soaking or harsh rubbing.

### ***Carpets***

To clean carpets, first remove loose dirt with a whiskbroom or vacuum. For soiled spots and stubborn stains use a non-flammable, dry cleaning fluid. Floor carpets may be cleaned like any household carpet.

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# Section 9

## Supplements

This section of the handbook contains FAA Approved Supplements necessary to safely and to efficiently operate the SR20 when equipped with optional systems or equipment not provided with the standard airplane or for special operations or not included in the handbook. Basically, supplements are mini-handbooks and will contain data corresponding to most sections of the handbook. Data in a supplement adds to, supersedes, or replaces similar data in the basic handbook.

A *Log of Supplements* page immediately follows this page and precedes all Cirrus Design Supplements produced for this airplane. The *Log of Supplements* page can be utilized as a “Table of Contents” for this section. In the event the airplane is modified at a non Cirrus Design facility through an STC or other approval method, it is the owners responsibility to assure that the proper supplement, if applicable, is installed in the handbook and the supplement is properly recorded on the *Log of Supplements* page.

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# *Section 9*

## *Log of Supplements*

Part Number	Title	Date
___ 11934-S01 R2	Garmin GMA 340 Audio System	07-18-05
___ 11934-S05	Garmin GNC 250XL GPS Navigator w/ VHF COM	03-31-99
___ 11934-S06 R1	S-Tec System Twenty Autopilot	12-07-04
___ 11934-S09 R1	Approved Oxygen Systems	01-07-03
___ 11934-S11 R1	L-3 Avionics Systems WX500 Stormscope Sensor	07-18-05
___ 11934-S12	Garmin GTX 327 Transponder	12-26-00
___ 11934-S15 R1	L-3 Avionics Systems SkyWatch Traffic Advisory System	10-12-05
___ 11934-S17	SR20 Airplanes Registered in Canada	10-10-01
___ 11934-S19 R1	S-Tec System Thirty Autopilot with GPSS	12-07-04
___ 11934-S20 R4	S-Tec System 55X Autopilot w/ Altitude Selector/Alerter	08-15-07
___ 11934-S22 R2	Garmin GNS 430 GPS Navigator	08-15-07
___ 11934-S23 R2	Garmin GNC 420 GPS Navigator	08-15-07
___ 11934-S24	Sandel Avionics SN3308 Navigation Display	01-07-03
___ 11934-S25 R1	Winterization Kit	12-07-04
___ 11934-S27 R2	S-Tec System 55SR Autopilot	07-18-05
___ 11934-S28	Garmin GTX 330 Mode S Transponder	07-03-04
___ 11934-S29	SR20 Airplanes Registered in the European Union	05-27-04
___ 11934-S30 R1	Honeywell KGP 560 Terrain/Awareness Warning System	12-15-07
___ 11934-S31 R1	Avidyne EMax™ Engine Instrumentation	12-15-07
___ 11934-S32 R1	Avidyne CMax™ Electronic Approach Charts	12-15-07
___ 11934-S33 R1	XM Satellite Weather System	12-15-07
___ 11934-S34 R2	Avidyne Flight Director	12-15-07
___ 11934-S36 R1	Artex ME406 406 MHz ELT System	12-18-08
___ 11934-S37 R2	SR20 Airplanes Equipped with the “G3 Wing”	05-09-11
___ 11934-S38 R1	Garmin 400W-Series GPS Navigator	11-11-07
___ 11934-S43	SR20 Airplanes Registered in Russia	10/14/09
___ 11934-S44	Part 135 Operation Electrical Loading Shedding	06-13-09
___ 11934-S45	SR20 Airplanes Registered in Argentina	09-30-09

I    \_\_\_ 11934-S51    SR20 Airplanes Registered in Colombia

12-07-10

FAA Approved POH Supplements must be in the airplane for flight operations when the subject optional equipment is installed or the special operations are to be performed.

This Log of Supplements shows all Cirrus Design Supplements available for the aircraft at the corresponding date of the revision level shown in the lower left corner. A mark (x) in the Part Number column indicates that the supplement is installed in the POH.

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

# **Garmin GMA 340 Audio System**

## **Includes Optional XM Radio System**

When the Garmin GMA 340 Audio Panel and the optional XM Radio System are installed in the Cirrus Design SR20, this Supplement is applicable and must be inserted in the Supplements Section (Section 9) of the Cirrus Design SR20 Pilot's Operating Handbook (Handbook). Information in this supplement either adds to, supersedes, or deletes information in the basic Handbook.

• Note •

This POH Supplement Revision dated Revision 02: 07-18-05 supersedes and replaces Revision 01 of this supplement dated 07-03-04. This revision adds required data for the optional XM Radio System available for the Garmin GMA 340.

FAA Approved

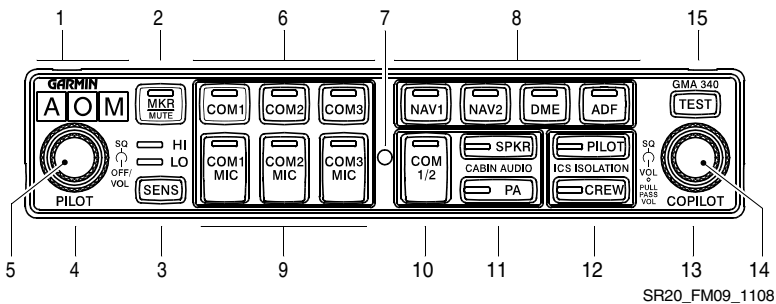
*Joseph C Mies*  
Date May 9, 2011

for Charles Smalley, Manager  
Chicago Aircraft Certification Office, ACE-115C  
Federal Aviation Administration

## Section 1 - General

This supplement provides detailed operating instructions for the Garmin GMA 340 Audio Selector Panel/Intercom System with internal Marker Beacon. This supplement covers the basic operating areas of the Audio Control Panel.

- Power On / Fail-safe Operation
- Audio / Transceiver Selection
- Speaker Output
- Public Address (PA) Function
- Personal Music Inputs
- Intercom (ICS)
- Marker Beacon



SR20\_FM09\_1108

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. Marker Beacon Annunciators</li> <li>2. Marker Audio Select Button / LED</li> <li>3. Marker Sensitivity Select Button                     <ol style="list-style-type: none"> <li>a. HI Sensitivity LED</li> <li>b. LO Sensitivity LED</li> </ol> </li> <li>4. Pilot Intercom Squelch (outer knob)</li> <li>5. Power / Intercom Volume (inner knob)</li> <li>6. Transceiver Audio Select Buttons/ LEDs</li> <li>7. Photocell</li> <li>8. Receiver Audio Select Buttons / LEDs</li> <li>9. Transceiver Audio/Transmit Select Buttons / LEDs</li> </ol> | <ol style="list-style-type: none"> <li>10. Split COM Button / LED</li> <li>11. Cabin Audio Select Buttons / LEDs                     <ol style="list-style-type: none"> <li>a. SPKR, Cabin Speaker</li> <li>b. PA, Public Address</li> </ol> </li> <li>12. Intercom Isolation Buttons / LEDs                     <ol style="list-style-type: none"> <li>a. PILOT Intercom Mode</li> <li>b. CREW Intercom Mode</li> </ol> </li> <li>13. Copilot / Passenger Intercom Squelch (outer knob)</li> <li>14. Copilot (IN) / Passenger (OUT) Intercom Volume (inner knob)</li> <li>15. Indicator Test Button</li> </ol> |
|---|---|

**Figure - 1**  
**Audio Control Panel**

## Section 2 - Limitations

Use of auxiliary AUDIO IN entertainment input and the optionally installed XM Radio System is prohibited during takeoff and landing.

## Section 3 - Emergency Procedures

In the event of an audio panel power failure, the audio system will revert to COM 1 for the pilot's mic and headphones and the pilot will have transmit and receive capability.

## Section 4 - Normal Procedures

Refer to Section 7 - System Description in this supplement for a complete description and operation of the Audio Control Panel.

## Section 5 - Performance

No change from basic Handbook.

## Section 6 - Weight & Balance

Garmin GMA 340 Audio System: No change from basic Handbook.

Installation of the optional XM Radio System adds the following optional (Sym = O) equipment at the weight and arm shown in the following table.

ATA / Item	Description	Sym	Qty	Part Number	Unit Wt	Arm
22-01	XM Receiver	O	1	16665-001	1.7	114.0

## Section 7 - System Description

### Power On and Fail-safe Operation

The Audio Control Panel is powered 'OFF' when the left inner knob (PILOT) is at the full CCW (counter-clockwise) position. Rotating the knob CW (clockwise) activates the unit. CW rotation of knob beyond the 'on' detent increases pilot ICS (intercom system) volume.

A fail-safe circuit connects the pilot's headset directly to the COM1 transceiver in the event of a power failure to the audio control panel or the panel is switched 'OFF.'

## Test

Pressing the TEST button illuminates all Panel LEDs and the Marker Beacon Annunciators full bright. During normal operation, a photocell mounted at the approximate center of the control panel senses ambient light to allow automatic LED and annunciator intensity adjustment. Nomenclature dimming is controlled by the INST lights control on the instrument panel bolster.

## Audio/Transceiver Selection

Audio selection is performed through the eight selector push buttons in the center of the Audio Control Panel. All audio selector push buttons are push-on, push-off. Selecting an audio source supplies audio to the headphones or cabin speaker. Selected audio sources are indicated by illumination of the push-button switch.

Navigation receiver audio source is selected by depressing NAV1, NAV2 (if installed), MKR, DME (if installed), or ADF (if installed) will select that radio or device as the audio source. Audio level of navigation receivers is controlled through the selected radio volume control.

Transceiver audio is selected by depressing COM1, COM2, or COM3 (if installed). When the audio source is selected using the COM1, COM2, and COM3 buttons, the audio source will remain active regardless of which transceiver is selected as the active MIC source.

Both transceiver audio and MIC (microphone) can be selected by depressing COM1 MIC, COM2 MIC, or COM3 MIC (if installed). Both pilot and copilot are connected to the selected transceiver and both have transmit and receive capabilities. Pilot and copilot must use their respective Push-To-Talk (PTT) switch to transmit. The intercom will function normally. During transmissions the active transmitter's COM MIC button LED blinks at a 1 Hz rate indicating active transmission.

### ***Split COM Function***

Pressing the COM 1/2 button activates the split COM function. When split COM is active, COM 1 is the pilot mic/audio source and COM2 is

the copilot mic/audio source. The pilot has receive and transmit capabilities on COM1 and the copilot has receive and transmit capabilities on COM2. While split COM is active, simultaneous transmission from COM1 and COM2 is not possible. The pilot and copilot can still listen to COM3, NAV1, NAV2, DME, ADF, and MKR. Pressing the COM 1/2 button a second time will deactivate the split COM function. While split COM is active, the copilot is able to make PA announcements over the cabin speaker allowing the pilot to continue using COM1 independently. This is accomplished by depressing the PA button while split COM is active. Pressing the PA button a second time deactivates this feature and returns the system to normal split COM as described above.

### **COM Swap Mode**

COM swap mode is not available in this installation.

## **Speaker Output**

Pressing the SPKR button will cause the selected airplane radios to be heard over the cabin speaker. Speaker output is muted when a COM microphone is keyed. Speaker level is adjustable through an access hole in the top of the unit (*refer to Garmin installation manual or AMM*).

## **Public Address (PA) Function**

Pressing the PA button on the audio control panel activates the PA function. When PA is activated and either the pilot's or copilot's microphone is keyed (PTT pressed), the corresponding mic audio is output over the cabin speaker. If the SPKR button is also active, any previously active speaker audio will be muted while the microphone is keyed. Pilot and copilot PA microphone speaker levels are adjustable through an access hole in the top of the unit (*refer to Garmin installation manual or AMM*).

## **Personal Music Inputs**

• Note •

*Serials 1005 thru 1532 and serials before SB 2X-34-14; Audio from AUDIO INPUT jacks Music1 and Music2 is muted during intercom activity.*

The Audio Control Panel has provisions for up to two separate personal entertainment input (music) devices. These devices are plugged into the AUDIO INPUT jacks in the center console jack panels. Music1 is connected at the AUDIO INPUT jack near the convenience outlet. Music2 is connected to the jack on the aft console. Music1 is soft-muted during all airplane radio activity. Music1 and Music2 have characteristics affected by the active ICS isolation mode.

- Pressing the PILOT ICS Isolation button isolates the pilot from the copilot and passengers. Music1 is available to copilot and passengers.
- Pressing the CREW ICS Isolation button isolates the crew from the passengers and allows the pilot and copilot to listen to Music1 and the passengers to listen to Music2. Radio activity, MKR activity, and pilot or copilot ICS activity will mute Music1. Music2 is not muted.
- When both the PILOT and CREW ICS Isolation mode are **not** selected, Music1 is available to crew and passengers. Radio activity and MKR activity will mute Music1.

## Intercom

Intercom controls are located towards the left side of the Audio Control Panel. The controls consist of a Volume control for the pilot and copilot, a Squelch control for all occupants, and an Intercom Mode Selector switch.

### ***Volume & Squelch Control***

ICS volume and voice operated relay (VOX) squelch control is controlled through the left (PILOT) and right (COPILOT) control knobs on the Audio Control Panel Control. Knob control is as follows:

- **Left Inner Knob** – On/Off power control and pilot ICS volume. Full CCW is 'OFF' position (click).
- **Left Outer Knob** – Pilot ICS mic VOX level. CW rotation increases the amount of mic audio (VOX level) required to break squelch. Full CCW is the 'hot mic' position.
- **Right Inner Knob** – When pushed in, rotation controls copilot ICS volume. When out, rotation controls passenger ICS volume.



- **Right Outer Knob** – Copilot and passenger mic VOX level. CW rotation increases the amount of mic audio (VOX level) required to break squelch. Full CCW is the ‘hot mic’ position.

Each microphone input has a dedicated VOX circuit to assure that only the active microphone(s) is/are heard when squelch is broken. After the operator has stopped talking, the intercom channel remains momentarily open to avoid closure between words or normal pauses.

### ***Control***

The Audio Control Panel provides an adjustable Voice Operated Relay (VOX) Squelch Control for the pilot, copilot, and passengers. Since the VOX circuits reduce the number of microphones active at any one time, the amount of unwanted background noise in the headphones is diminished. This also allows the use of dissimilar headsets with the same intercom. Because the user can adjust the trip level of the VOX squelch to fit the individual voice and microphone, this helps eliminate the frustration of clipping the first syllables. There is a slight delay after a person stops talking before the channel closes. This prevents closure between words and eliminates choppy communications.

To adjust squelch:

1. With the engine running, set the VOX trip level by slowly rotating the SQL control knob clockwise until you no longer hear the engine noise in the headphones.
2. Position microphone near your lips and speak into microphone. Verify that normal speech levels open the channel.

### ***Intercom Modes***

The GMA 340 provides three intercom (ICS) modes to further simplify workload and minimize distractions during all phases of flight: PILOT, CREW, and ALL. The mode selection is accomplished using the PILOT and CREW push-buttons. Pressing a button activates the corresponding ICS mode and pressing the button a second time deactivates the mode. The operator can switch modes (PILOT to CREW or CREW to PILOT) by pressing the desired modes push-

button. ALL mode is active when neither PILOT or CREW have been selected.

- PILOT** The pilot is isolated from the intercom. The pilot can hear radio and sidetone only during radio transmissions. Copilot and passengers can hear the intercom and music but not the airplane radio receptions or pilot transmissions.
- CREW** Pilot and copilot are connected on one intercom channel and have exclusive access to the aircraft radios. They may also listen to Music1. Passengers can continue to communicate with themselves without interrupting the Crew and also may listen to Music2.
- ALL** All parties will hear the aircraft radio, intercom, and Music1. The music volume increases gradually back to the original level after communications have been completed. Both pilot and copilot have access to the COM transceivers.

The following table shows, in abbreviated form, what each occupant hears in each of the selectable Intercom modes:

<b>Mode</b>	<b>Pilot Hears</b>	<b>Copilot Hears</b>	<b>Passenger Hears</b>
PILOT	A/C Radios Pilot	Passengers Copilot Music1	Passengers Copilot Music1
CREW	A/C Radios Pilot/Copilot Music1	A/C Radios Copilot/Pilot Music1	Passengers Music2
ALL	A/C Radio Pilot/Copilot Passengers Music1	A/C Radio Pilot/ Copilot Passengers Music1	A/C Radio Pilot/Copilot Passengers Music1

## **Marker Beacon**

The Marker Beacon Receiver provides visual and audio indicators to alert the pilot when the airplane passes over a 75 MHz transmitter. Marker beacon controls and lights are located at the extreme left of the Audio Control Panel.

Marker beacon audio is selected by pressing the MKR push-button. If no marker beacon signal is being received, pressing the MKR push-button a second time deselects marker beacon audio. However, if marker beacon is being received, pressing the MKR push-button a second time will mute the audio but the light will continue to flash. Pressing the MKR push-button a third time (while marker beacon audio is muted) deselects marker beacon audio. Marker beacon audio muting automatically disables when the current signal is no longer received.

• Note •

The marker beacon lamps (O, M, A) operate independently of the audio and cannot be disabled.

Marker beacon light and audio keying for ILS approach are summarized below:

- O (Blue)* Outer Marker light and associated 400 Hertz tone. The light and tone are keyed at a rate of two tones/flashes per second.
- M (Amber)* Middle Marker light and associated 1300 Hertz tone. The light and tone are keyed alternately with short and long bursts.
- A (White)* Airway/Inner Marker light and associated 3000 Hertz tone. The light and tone are keyed at a rate of six times per second.

**Marker Beacon Sensitivity**

The SENS push-button on the left side of the panel is used to set the marker beacon receiver sensitivity. The selected sensitivity level is indicated by illumination of the HIGH or LOW LED. When HIGH sensitivity is selected, the outer marker beacon tone will sound farther out. Selecting LOW sensitivity at this point allows more accurate location of the Outer Marker. Typically, HIGH sensitivity is selected until the outer marker tone is heard, and then LOW sensitivity is selected for more accurate outer marker location.

## XM Radio System (Optional Installation)

• Note •

For a detailed operating instructions, *refer to the XM Radio Wireless Controller User Instructions, Document No. XMC050-4, original release or later.* MFD software partnumber 530-00162-000 or later is required for installation of XM Radio System.

Subscription to a XM Radio System Service Package is required for operation. Contact XM Satellite Radio at 800.985.9200 for subscription information.

The optional XM Radio System provides satellite broadcast audio entertainment and information to aircraft occupants via the Garmin GMA 340 Audio System while traveling anywhere within the contiguous United States of America.

The XM receiver, installed in the co-pilot side of the center console, receives audio information via its integral antenna from two geosynchronous XM broadcast satellites. The audio signal is then sent by wire to the Audio Control Panel's Music1 and Music2 AUDIO INPUT jacks. System operation is provided by a hand held, wireless controller.

- When initially powered, the XM radio volume is set to mute and will remain muted until the XM radio establishes communication with the wireless controller.
- System volume for both AUDIO INPUT jacks is controlled simultaneously via the wireless controller.
- In the event of wireless controller failure during flight, cycling the Weather/Stormscope circuit breaker will reset the volume to mute.
- XM radio is the default audio heard on the AUDIO INPUT jacks. If a personal entertainment device such as a CD player is plugged into either AUDIO INPUT jacks, the external source will override the XM audio signal. Refer to the Intercom Modes Table presented above for a description of intercom modes.

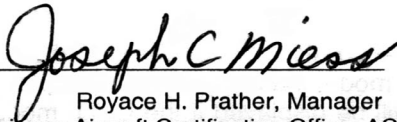
The XM Radio System is powered by 28 VDC supplied through the 3-amp Weather/Stormscope breaker on the Non-Essential Bus.

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

# **Garmin GTX 327 Transponder**

When a Garmin GTX 327 Transponder is installed in the Cirrus Design SR20, this Supplement is applicable and must be inserted in the Supplements Section (Section 9) of the Cirrus Design SR20 Pilot's Operating Handbook. This document must be carried in the airplane at all times. Information in this supplement adds to, supersedes, or deletes information in the basic SR20 Pilot's Operating Handbook.

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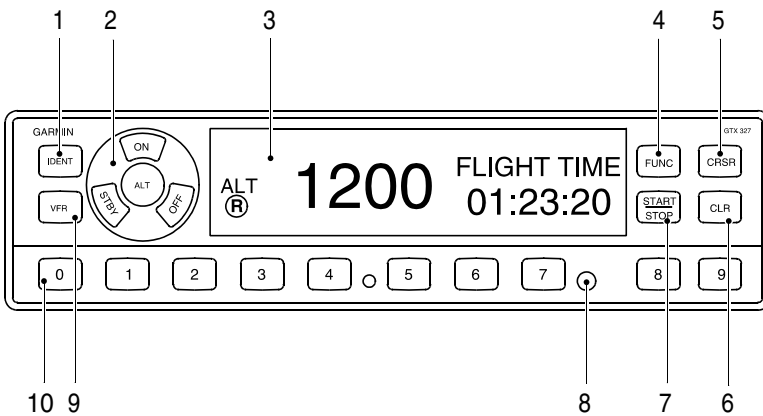


Date 26 Dec 2000

Royace H. Prather, Manager  
Chicago Aircraft Certification Office, ACE-115C  
Federal Aviation Administration

## Section 1 - General

The airplane is equipped with a single Garmin GTX 327 ATC Mode A/C (identification and altitude) transponder with squawk capability. This supplement provides complete operating instructions for the GTX 327 and does not require any additional data be carried in the airplane.



1. Identification Key
2. Mode Selector Keys
  - a. OFF
  - b. STBY (Standby)
  - c. ON
  - d. ALT
3. Display Window
4. FUNC (Function) Key
5. CRSR (Cursor)
6. CLR (Clear) Key
7. START/STOP Key
8. Photocell
9. VFR Key
10. Selector Keys
  - a. 0-7 - Code Selection
  - b. 8-9 - Display Brightness/Contrast

SR20\_FM09\_1501

## Section 2 - Limitations

No Change

## Section 3 - Emergency Procedures

No Change

## Section 4 - Normal Procedures

• Note •

Expected coverage from the GTX 327 is limited to “line of sight.” Low altitude or aircraft antenna shielding by the airplane itself may result in reduced range. Range can be improved by climbing to a higher altitude.

### After Engine Start

1. Avionics Power Switch .....ON

The transponder will turn on in the STBY mode. The transponder is “on” but will not respond to interrogations from ATC secondary surveillance radar.

### Before Takeoff

1. Transponder Mode Selector Keys .....ALT

If the transponder is in the STBY mode, it will automatically switch to ALT during takeoff when the groundspeed increases through approximately 35 knots. The transponder will respond to ATC Mode C (altitude and identification) interrogations.

• Note •

Selecting ON puts the transponder in Mode A (identification) only. The transponder will respond to Mode C (altitude) interrogations with signals that contain no altitude information.

### After Landing

1. Transponder Mode Selector Keys ..... STBY or OFF

If the transponder is in the ALT mode for landing, it will automatically switch to STBY during landing rollout when the groundspeed decreases through approximately 35 knots.

## Section 5 - Performance

No Change

## Section 6 - Weight & Balance

No Change

## Section 7 - Systems Description

• Note •

This supplement provides specific procedures for use of the GTX 327 Transponder in the SR20 and a general description of the unit. For a detailed description of the GTX 327, *refer to GARMIN GTX 327 Mode A/C Transponder Pilots Guide, p/n 190-00187-00 Revision A (Feb 2000) or later revision.*

The Garmin GTX 327 transponder system consists of the integrated receiver/transmitter control unit, an antenna, and an altitude digitizer. The receiver/transmitter receives interrogations from a ground-based secondary surveillance radar transmitter and then transmits to the interrogating Air Traffic Control Center. Digitized altitude information is provided by the altitude digitizer (encoder) plumbed into the airplane static system. The transponder and integrated controls are mounted in the center console. The transponder control provides active code display, code selection, IDENT button, and test functions. The display is daylight readable and is automatically dimmed through a photocell. The controller buttons are dimmed through the INST lights control on the instrument panel bolster. The transponder antenna is mounted on the underside of the fuselage just aft of the firewall. 28 vdc for transponder operation is controlled through the Avionics Master Switch on the bolster switch panel. 28 VDC for receiver, transmitter, and altitude encoder operation is supplied through the 2-amp ENCODER/XPONDER circuit breaker on the Avionics Essential Bus.



## Mode Selector Keys

The mode selector keys are located in a circular arrangement immediately to the left of the display window. The selected mode is annunciated at the left side of the display immediately adjacent to the selector keys. The five positions are:

**OFF** - Turns off all power to the GTX 327 transponder. The transponder should be off until the engine is started. Normally, the transponder can be left in the STBY position and allow the Avionics Power Switch to control system power.

**STBY** - Powers the transponder in standby mode. The last active identification code will be selected. In STBY, the transponder will not reply to any interrogations from an ATC secondary ground surveillance radar system. This is the normal position for ground operations in the SR20.

• Note •

STBY mode is automatically entered from ALT mode during landing ground roll as the groundspeed decreases through 35 knots.

**ON** - Powers on the GTX 327 in Mode A (identification mode.). The last active identification code will be selected. In addition to the airplane's identification code, the transponder will also reply to altitude (Mode C) interrogations with signals that do not contain altitude information.

**ALT** - Places the transponder in Mode A and Mode C, identification and altitude respectively. The transponder will respond to interrogations with the airplane's identification code and standard pressure altitude (29.92 inches Hg).

• Note •

ALT mode is automatically entered from STBY mode during takeoff ground roll as the groundspeed increases through 35 knots.

## Code Selector Keys

Code selection is accomplished by depressing the eight selector keys (numbered 0 - 7) located immediately below the display. Any of 4096 active identification codes can be selected. The selected code must be in accordance with instructions for IFR flight or rules applicable to transponder utilization for VFR flight.

The airplane's transponder code is used to enhance tracking capability by ATC. Therefore, do not switch the transponder to STBY when making routine code changes.

### ***Input a New Code***

1. Use CLR key to remove the current code.
2. Use "0 - 7" keys to input the new code. The new code will not be activated until the last (fourth) digit is entered. Pressing the CLR key will move the cursor back to the previous digit. Pressing the CRSR key during code entry will remove the cursor and cancel the entry.

• Note •

When making routine code changes, avoid inadvertent selection of code 7500 and all codes within the 7600 series (7600 – 7677) and 7700 series (7700 – 7777). These codes trigger special indicators in automated facilities. 7500 will be decoded as the hijack code.

### ***Important Codes***

- 1200 – VFR code for any altitude in U.S.
- 7000 – VFR code commonly used in Europe
- 7500 – Hijacking
- 7600 – Loss of communications
- 7700 – Emergency
- 7777 – Military interceptor operations (Never squawk this code)
- 0000 – Military use only (not enterable)

## Reply Light

The reply light is the small reverse video “R” immediately below the mode annunciation in the display window. The reply light will blink each time the transponder replies to ground interrogations. The light will remain on during the 18-second IDENT time interval.

## IDENT Key

Pressing the IDENT button activates the Special Position Identification (SPI) pulse for approximately 18 seconds allowing ATC to identify your transponder return from other returns on the controller's scope. The Reply annunciator in the display will illuminate during the SPI pulse. Momentarily press the IDENT key when the controller requests, “SQUAWK IDENT.”

## VFR Key

Pressing the VFR key sets the transponder to the pre-programmed VFR code selected in the configuration mode (factory set to 1200). Pressing the VFR key a second time will restore the previous identification code.

## FUNC Key

Pressing the FUNC key changes the data shown on the right side of the display. Pressing the FUNC key a second time will cycle the display to the next data. Displayed data includes Pressure Altitude, Flight Time, Count Up Timer, Count Down Timer, Contrast, and Display Brightness.

**PRESSURE ALT** - Displays pressure altitude in feet. An arrow to the right of the altitude indicates that the airplane is climbing or descending.

**FLIGHT TIME** - Displays the flight time. The timer receives groundspeed from GPS1. Flight time starts when the groundspeed reaches 35 knots on takeoff and pauses when the groundspeed descends below 35 knots on landing.

**COUNT UP TIMER** - The count up timer is controlled by the START / STOP key. Pressing the CLR key zeros the display.

**COUNT DOWN TIMER** - The count down timer is controlled by the START / STOP key. The CRSR and “0 - 9” keys are used to set the initial time. Pressing the CLR key resets the timer to the initial value.

**CONTRAST** - Allows adjustment of display contrast. When CONTRAST is selected, pressing the “8” key reduces contrast and pressing “9” increases contrast.

**DISPLAY** - The display function is not available in this installation. Display brightness is automatically controlled through a photocell in the front panel.

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


# S-Tec System 55X Autopilot w/ Altitude Selector/Alerter

When the S-Tec System Fifty Five X (55X) Autopilot with Altitude Selector/Alerter is installed in the Cirrus Design SR20, serials 1268 and subsequent, this Supplement is applicable and must be inserted in the Supplements Section (Section 9) of the Cirrus Design SR20 Pilot's Operating Handbook. This document must be carried in the airplane at all times. Information in this supplement adds to, supersedes, or deletes information in the basic SR20 Pilot's Operating Handbook.

• Note •

This POH Supplement Revision dated Revision 04: 08-15-07, supersedes and replaces Revision 03 of this supplement dated 07-18-05.

FAA Approved



Date Aug 15 2007

for Royace H. Prather, Manager  
Chicago Aircraft Certification Office, ACE-115C  
Federal Aviation Administration

## ***Section 1 - General***

This airplane is equipped with an S-TEC System 55X Autopilot. The System 55X autopilot is a two-axis autopilot system. The system consists of a flight guidance programmer/computer, altitude encoder, altitude selector / alerter, turn coordinator, and HSI. Mode selection and vertical speed selection is made on the programmer/computer panel. A button on each control yoke handle may be used to disengage the autopilot. The autopilot makes roll changes through the aileron trim motor and spring cartridge and makes pitch changes for altitude hold through the elevator trim motor. The SR20 installation of the S-Tec System 55X Autopilot features:

- Heading Hold and Command;
- NAV/LOC/GPS/GS tracking, high and low sensitivity, and automatic 45° course intercept;
- GPS Steering (GPSS);
- Altitude Pre-select, Hold and Command, Altitude display, and baro correction;
- Altitude and Decision Height (DH) alert; and
- Vertical Speed Hold and Command.

*Refer to S-Tec System Fifty-Five X Autopilot Pilot's Operating Handbook (POH): Serials 1005 thru 1336; P/N 87109 dated 8 November 2000 or later OR Serials 1337 and subsequent; P/N 87247 original release or later for full operational procedures and description of implemented modes. The System 55X POH also contains detailed procedures for accomplishing GPS & VOR course tracking, front course and back course localizer approaches, and glideslope tracking.*

*Refer to S-Tec Altitude Selector / Alerter Pilot's Operating Handbook (POH) P/N 8716 or P/N 87110 (original issue or later) for full operational procedures and detailed description of operational modes of the Altitude Selector / Alerter.*

**• Note •**

The SR20 implementation of the System 55X Autopilot does not utilize the optional remote annunciator, roll servo, and optional trim servo. Therefore, all references to these items in the S-Tec System 55X POH shall be disregarded. Additionally,

this installation does not utilize a CWS (Control Wheel Steering) switch or an AUTOPILOT MASTER switch.

• Note •

This installation utilizes the airplane's roll trim actuator to affect steering changes. Therefore, the automatic trim function of the System 55X is not implemented. Disregard all references in the S-Tec System 55X POH to this feature.

Roll information is displayed on the HSI. Autopilot Flight Director is not implemented in this installation.

## Section 2 - Limitations

1. Autopilot operation is prohibited above 185 KIAS.
2. The autopilot must not be engaged for takeoff or landing.
3. The autopilot must be disengaged for missed approach, go-around, and bailed landing.
4. Flaps must be set to 50% for autopilot operation in Altitude Hold at airspeeds below 95 KIAS.
5. Flap deflection is limited to 50% during autopilot operations.
6. The autopilot must be disconnected in moderate or severe turbulence.
7. Minimum engage height for the autopilot is 400 ft AGL.

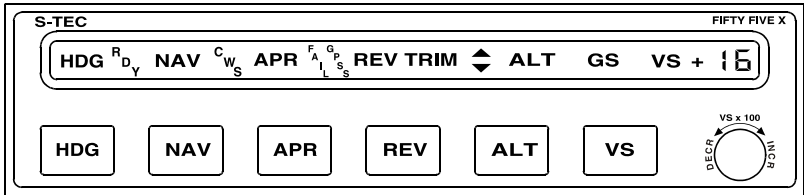
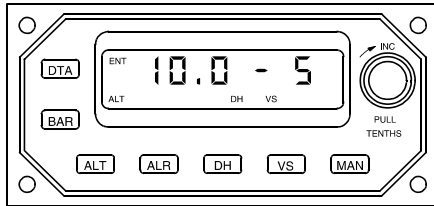
• **WARNING** •

Autopilot may not be able to maintain all selectable vertical speeds. Selecting a vertical speed that exceeds the aircraft's available performance may cause the aircraft to stall.

8. Minimum speed with the autopilot engaged is  $1.2V_S$  for the given configuration.
9. For VOR/GPS and ILS glideslope and localizer intercept, capture, and tracking, the following limitations apply:
  - a. The autopilot must be disengaged no later than 100 feet below the Minimum Descent Altitude.

- b. The autopilot must be disconnect during approach if course deviation exceeds 50%. The approach should only be continued by “hand-flying” the airplane.
  - c. The autopilot must be disengaged at the Decision Height.
  - d. 12 knot maximum crosswind component between the missed approach point and outer marker.
  - e. The intercept of the localizer shall occur at least 5 miles outside of the outer marker.
  - f. If the crosswind component is greater than 12 knots and less than 17 knots, the intercept shall occur at least 10 miles outside of the outer marker.
  - g. The intercept angle shall be no greater than a 45-degree intercept.
  - h. The ILS is flown at normal approach speeds, and within any STC or TC speed constraints and as defined in this flight manual.
  - i. The flaps should be extended in the approach configuration prior to the Outer Marker. No further changes in the flap configuration should be made throughout the autopilot-coupled approach.
  - j. The glideslope is approached in such a manner to allow automatic arming of the glideslope, or if the glideslope is manually armed no more than 15% above the glideslope.
10. The S-TEC System Fifty Five X Pilot’s Operating Handbook: *Serials 1005 thru 1336*; P/N 87109 dated 8 November 2000 or later OR *Serials 1337 and subsequent*; P/N 87247 original release or later, must be carried in the airplane at all times and must be available to the pilot while in flight.





SR20\_FM09\_1502A

**Figure - 1**  
**System 55X Altitude Selector/Alerter & Autopilot Computer**  
P/N 11934-S20  
Revision 04: 08-15-07 5 of 24

## Section 3 - Emergency Procedures

### Autopilot Malfunction

Refer to *Electric Trim/Autopilot Failure procedure* in the SR20 POH. Do not reengage the autopilot until the malfunction has been identified and corrected. The autopilot may be disconnected by:

1. Pressing the A/P DISC/Trim switch on the control yoke handle.
2. Pulling the AUTOPILOT circuit breaker on Essential Bus.

Altitude lost during a roll axis autopilot malfunction and recovery:

Flight Phase	Bank Angle	Altitude Loss
Climb	30°	None
Cruise	55°	100 ft
Descent	55°	120 ft
Maneuvering	10°	None
Approach	0°	20 ft

Altitude lost during a pitch axis autopilot malfunction and recovery:

Flight Phase	Altitude Loss
Cruise	200 ft
ILS	25 ft

## System Failure and Caution Annunciations

If any of the following failure annunciations occur at low altitude or during an actual instrument approach, disengage the autopilot, execute a go-around or missed approach as appropriate. Inform ATC of problem. Do not try to troubleshoot until a safe altitude and maneuvering area are reached or a safe landing is completed.

Annunciation	Condition	Action
Flashing RDY for 5 seconds with audible tone.	Autopilot disconnect. All annunciations except RDY are cleared.	None.
Flashing RDY with audible tone then goes out.	Turn coordinator gyro speed low. Autopilot disengages and cannot be re-engaged.	Check power to turn coordinator.
Flashing NAV, REV, or APR.	Off navigation course by 50% needle deviation or more.	Use HDG mode until problem is identified. Crosscheck raw NAV data, compass heading, and radio operation.
Flashing NAV, REV, or APR with steady FAIL	Invalid radio navigation signal.	Check Nav radio for proper reception. Use HDG mode until problem is corrected.
Flashing VS	Excessive vertical speed error over selected vertical speed. Usually occurs in climb.	Reduce VS command and/or adjust power as appropriate.
Flashing GS	Off glideslope centerline by 50% needle deviation or more.	Check attitude and power. Adjust power as appropriate.
Flashing GS with steady FAIL	Invalid glideslope radio navigation signal.	Disconnect autopilot and initiate go-around or missed approach procedure. Inform ATC.
Flashing GS plus ALT.	Manual glideslope disabled.	Re-enable by pressing NAV mode button.

## Section 4 - Normal Procedures

Refer to Section 7 – Systems Description for a description of the autopilot and altitude selector and their respective modes.

The Autopilot is integrated with the Altitude Selector/Alerter and can be operated with or without data inputs from the Altitude Selector/Alerter. The autopilot ALT and VS modes are coupled to the Altitude Selector/Alerter ALT and VS outputs by pressing and holding the Autopilot Programmer/Computer VS button and then pressing the ALT button. Altitude Selector Vertical Speed output can be individually coupled to the autopilot through the autopilot VS mode by pressing the autopilot VS button.

### • WARNING •

The pilot must properly monitor and control the engine power to avoid stalling the airplane in autopilot altitude hold or vertical speed modes.

### • Note •

Any coupled Altitude Selector / Alerter mode can be disabled by disconnecting the autopilot.

## Autopilot and Altitude Selector Pre-Flight Tests

1. Battery Master Switch ..... ON
2. Transponder ..... ON
3. Avionics Power Switch ..... ON

Note that all autopilot annunciators, except CWS, and TRIM illuminate. After about 5 seconds, all lights will go out. When the turn coordinator gyro has reached operational RPM, the RDY annunciator will come on.

4. Altitude Selector Tests:
  - a. Altimeter ..... Set Field Elevation.
  - b. Self-Test – On power up, all annunciators come on for approximately 5 seconds and then sounds an audio tone. After the self-test is complete, press the DTA and then BAR buttons on the altitude selector.

- c. Rotate altitude selector input knob to set BARO to the nearest 0.1 inch Hg.
  - d. Push ALT button to display ALT SEL. With a flashing SEL annunciator, rotate the selector knob to input an altitude 300 to 400 feet lower or higher than the indicated altitude.
  - e. Push the VS button. Rotate the selector input knob to input the desired climb (+) or descent (-) vertical speed.
  - f. Push ALT button, ALT SEL annunciator will illuminate.
  - g. Engage autopilot HDG mode.
  - h. Press and hold the VS button and then press the ALT button. Autopilot VS and ALT annunciators will illuminate.
  - i. Rotate altitude selector knob to change selected altitude to match field elevation. VS annunciator on autopilot programmer should go out when the ALT SEL setting on the altitude selector is within 100 feet of indicated altitude on altimeter. Autopilot ALT mode should remain illuminated, indicating autopilot altitude hold is engaged. If ALT engagement does not occur within 100 feet of indicated altitude, readjust BARO setting on altitude selector.
5. Autopilot Tests
- a. Heading Mode ..... TEST
    - 1.) Center the HDG bug under the lubber line on the HSI.
    - 2.) Momentarily press HDG button on autopilot Mode Selector. Note that HDG light illuminates.
    - 3.) Then rotate HDG knob on the HSI to the left then right. Note that control yokes follow movement of knob. Then return HDG bug to lubber line.
  - b. Vertical Speed ..... TEST
    - 1.) Press VS button on autopilot programmer/computer. Note that VS light illuminates VS+0.
    - 2.) Rotate the VS control knob to 500 FPM up (+5). After a short delay, the control yoke will move aft.
    - 3.) Rotate the VS control knob to 500 FPM down (-5). After a short delay, the control yoke will move forward.

- c. Altitude Hold .....TEST
  - 1.) Depress ALT button on autopilot programmer/computer. Note that ALT annunciator comes on, VS annunciator goes out, and yoke does not move.
- d. Overpower Test:
  - 1.) Grasp control yoke and input left aileron, right aileron, nose up, and nose down to overpower autopilot. Overpower action should be smooth in each direction with no noise or jerky feel.
- e. Radio Check:
  - 1.) Turn on NAV1 radio, with a valid NAV signal, and select VLOC for display on the HSI.
  - 2.) Use autopilot programmer/computer to engage NAV mode and move OBS so that VOR deviation needle moves left or right. Note that control yokes follow direction of needle movement.
- f. Autopilot Disconnect Tests:
  - 1.) Press Pilot A/P DISC/Trim Switch (control yoke). Note that the autopilot disengages. Move control yoke to confirm that pitch and roll control is free with no control restriction or binding.
  - 2.) Repeat step using Copilot A/P DISC/Trim Switch.

## In-Flight Procedures

- 1. Autopilot RDY Light .....CHECK ON
- 2. Trim airplane for existing flight conditions.
- 3. Engage desired mode by pressing mode selector button on autopilot programmer/computer.

### *Heading Mode*

- 1. Begin by selecting a heading on HSI within 10° of the current airplane heading.
- 2. Press HDG button on autopilot programmer/computer. The HDG annunciator will illuminate and the airplane will turn to the selected heading.

3. Use HSI HDG bug to make heading changes as desired.

### ***Autopilot Altitude Hold Mode***

1. Manually fly the airplane to the desired altitude and level off.

• Note •

For smoothest transition to altitude hold, the airplane rate of climb or descent should be less than 100 FPM when Altitude Hold is selected.

2. Press HDG or NAV to engage a roll mode. The associated annunciator will illuminate.

• Note •

A roll mode must be engaged prior to engaging a pitch mode.

3. Press the ALT button on the autopilot programmer/computer. The ALT annunciator will illuminate indicating that the mode is engaged and the autopilot will hold the present altitude.

• Note •

Manually flying the airplane off the selected altitude will not disengage altitude hold and the autopilot will command a pitch change to recapture the altitude when the control input is released.

4. Altitude can be synchronized to another altitude by rotating the VS knob on the programmer/computer. Clockwise rotation will increase and counterclockwise rotation will decrease altitude 20 feet for each 'click.' The maximum adjustment is  $\pm 360$  feet. Adjustments greater than 360 feet can be made by selecting VS mode and flying the airplane to the new altitude and then re-engaging ALT mode.

### ***Autopilot Vertical Speed Mode***

1. Begin by manually establishing the desired vertical speed.
2. Press HDG or NAV to engage a roll mode. The associated annunciator will illuminate.

• Note •

A roll mode must be engaged prior to engaging a pitch mode.

3. Press the VS button on the autopilot programmer/computer to engage the vertical speed mode. When the mode is engaged, the autopilot will synchronize to and hold the vertical speed at the time the mode was engaged.

• Note •

The vertical speed is displayed in 100-foot increments at the far right of the programmer/computer window next to the VS annunciation. A plus (+) value indicates climb and a negative or minus (-) value indicates descent.

4. Vertical speed can be adjusted by rotating the VS knob on the programmer/computer. Clockwise rotation increases and counterclockwise rotation decreases rate of climb (or descent) 100 FPM for each 'click.' The maximum adjustment is  $\pm 1600$  FPM.

• Note •

A flashing VS mode annunciator indicates excessive error between actual vertical speed and the selected vertical speed (usually in climb). The pilot should adjust power or reduce the commanded vertical speed as appropriate to remove the error.

### ***Altitude Pre-Select***

The altitude selector may be used to set up an altitude and vertical speed for intercept and capture. The altitude can be above or below the current altitude and the vertical speed chosen should be appropriate (climb or descent) for the altitude. Once selected, the altitude and vertical speed can be coupled to the autopilot by pressing and holding the VS button and then pressing the ALT button.

1. Press altitude selector DTA button to enter the data entry (ENT) mode.
2. Press altitude selector BARO button and adjust baro setting as necessary.
3. Press the ALT button to enter altitude select mode. The SEL annunciator will flash. Use the altitude selector knob to input the desired altitude in thousands of feet; for example, 5500 feet is entered as 5.5 and 10,500 is entered as 10.5.



4. Press DTA again to accept altitude entry, the ENT annunciator will go out and the SEL annunciator will stop flashing and illuminate steady indicating that the system is in the 'operate' mode.

• Note •

When the system is in the 'operate' mode, pressing the ALT button will cause the system to extinguish the SEL annunciator and display the baro corrected encoded altitude. Pressing the ALT button again will return the display to the selected altitude and the SEL annunciator will come on again.

5. Press altitude selector VS button and use altitude selector knob to input the desired vertical speed in 100 FPM increments. Turn the knob clockwise to increase vertical speed and CCW to decrease vertical speed. Positive (+) vertical speed indicates climb and negative (-) vertical speeds indicates descent. Any vertical speed from  $\pm 1$  (100 FPM) to  $\pm 16$  (1600 FPM) is selectable.

• Note •

If an altitude is selected that requires an opposite vertical speed from that selected, the system will automatically select the correct sign ('+' for climb, '-' for descent) and a vertical speed of 500 FPM.

6. After takeoff, press and hold the VS button and then press the ALT button to engage the autopilot VS mode and arm the autopilot altitude hold mode to capture and hold the selected altitude. If the ALR button is pressed, the system will provide alarms at 1000 feet and 300 feet from the selected altitude. As the airplane's altitude nears the selected altitude, the system automatically reduces vertical speed command in 100 FPM increments to provide a 300 FPM vertical speed at altitude capture. The system will make a smooth transition to the selected altitude and hold the selected altitude.

### ***BARO Selection***

Upon initial start-up, the altitude selector enters BARO select immediately after the self-test if it is receiving a valid altitude signal. The setting can easily be entered at this time. At other times, it is necessary to select the DTA entry and BARO modes in order to adjust the BARO setting. After initial start-up, the Baro setting can be changed at any time using the following procedure:

1. Press DTA button on altitude selector to enter the data entry mode. ENT will be annunciated.
2. Press BAR button to display the BARO setting. Repeated presses of the BAR button will toggle the display between millibars and inches Hg.

• Note •

The BARO setting can also be displayed by pressing the ALT button while in the 'operate mode' (i.e. SEL annunciator illuminated).

3. Rotate the selector knob (CW to increase setting or CCW to decrease setting). Only three digits are displayed for millibars: for a BARO setting of 952.8 mb, the display will indicate 952; and for a BARO setting of 1003.8 mb, the display will read 003. For inches Hg, the 1/100 decimal position will not be selectable or displayed; for example, a 29.92 inch Hg setting is input and displayed as 29.9.
4. Press DTA again to accept the entry.

### ***Set Decision Height (DH)***

1. Press altitude selector DTA button to enter the data entry (ENT) mode.
2. Press DH button to enter decision height with the display reading 0.0. Use the altitude selector knob to set the desired decision height to the nearest 100 ft above the desired decision height. For example, for a DH of 1160 feet, set 1200 feet.
3. Press altitude DTA button again to enter the selected DH. The display will show the selected decision height for approximately 5 seconds and then revert to ALT mode and display the altitude. The DH annunciator will remain illuminated indicating a decision height

is set. As the airplane approaches within approximately 50 feet of the decision height, the alert will sound and the DH light will flash. As the airplane passes through approximately 50 feet beyond the decision height, the alert will sound and the light will flash again.

• Note •

Pressing the DH button again will disable the DH function causing the DH annunciation to go out. Repeated activation of the DH button alternately activates and deactivates the DH mode.

***Set Altitude Alert (ALR)***

1. Press altitude selector ALR button to arm alert mode. The ALR annunciator will come on. Upon entering within 1000 feet of the altitude selected in ALT SEL, the altitude alert chime will sound in the cabin speaker and headphones and the ALR annunciator will flash. The chime will sound and the ALR annunciator will flash again as the airplane approaches within 300 feet of the selected altitude. If the airplane's altitude deviates  $\pm 300$  feet from the selected altitude, the chime will sound and the ALR annunciator will flash to indicate the condition.
2. To disable ALR, press the altitude selector ALR button again. The ALR annunciator will go out.

***GPS Tracking and GPS Approach***

1. Begin with a reliable GPS signal selected on the NAV receiver.
2. Select desired course on HSI and establish a desired intercept heading.
3. Press the NAV button on the autopilot programmer/computer twice. The NAV and GPSS mode annunciators will illuminate.

• Note •

If the course needle is at full-scale deviation, the autopilot will establish the airplane on a heading for a 45° intercept with the selected course. As the airplane approaches the course, the autopilot will smoothly shallow the intercept angle. The pilot may select an intercept angle less than the standard 45° by setting the desired intercept heading with the HSI HDG bug, pressing and holding HDG, and then pressing NAV once to

intercept course in NAV mode or twice to intercept course in GPSS mode on the autopilot programmer/computer. When the on-course intercept turn begins the HDG mode will disengage and the annunciator will go out.

During the intercept sequence, the autopilot operates at maximum gain and sensitivity (90% of standard rate turn). When the selected course is intercepted, course deviation needle centered, the course-tracking program is activated. The system will remain at maximum sensitivity for approximately 15 seconds while the wind correction angle is established. The maximum turn rate is then reduced to 45% standard rate. Approximately 60 seconds later, the maximum turn rate is reduced to 15% standard rate.

4. For increased sensitivity during GPS approach or if desired for enroute tracking, press the APR button on the autopilot programmer/computer. The NAV, GPSS, and APR annunciators will be illuminated. Use HDG to accomplish a procedure turn. Engage GPSS again to complete the approach.

#### ***VOR Tracking and VOR-LOC Approach***

1. Begin with a reliable VOR or VOR-LOC signal selected on the NAV receiver.
2. Select desired course on HSI and establish a desired intercept heading.
3. Press the NAV button on the autopilot programmer/computer. The NAV mode will illuminate. Course interception and tracking will be as described under GPS Tracking and GPS Approach above.
4. For station passage, set HDG bug to within 5° of selected course.

• Note •

If the HDG bug is within 5° of center and the course deviation is less than 10%, the autopilot will immediately establish the lowest level of sensitivity and limit the turn rate to a maximum of 15% of a standard rate turn.

5. For increased sensitivity during approach or if desired for enroute tracking, press the APR button on the autopilot programmer/computer. Both NAV and APR annunciators will be illuminated.

### ***Glideslope Intercept and Tracking***

1. Begin with a reliable ILS signal selected on the NAV receiver.
2. Select autopilot NAV and APR. Airplane must be within 50% needle deviation of localizer centerline.
3. Select ALT mode. Airplane must be 60% or more below the glideslope centerline during the approach to the intercept point. If the above conditions have existed for 10 seconds, GS mode will arm, the GS annunciator will come on and the ALT annunciator will remain illuminated. When glideslope intercept occurs, the ALT annunciator will go out and the system will track the glideslope.

• Note •

If approach vectoring locates the airplane too near the glideslope at the intercept point (usually the outer marker), the GS mode can be manually armed by pressing the ALT button once. Once capture is achieved, GS annunciator will come on and ALT annunciator will go out.

## **Section 5 - Performance**

There is no change to the airplane performance when the S-Tec System 55X autopilot is installed.

## **Section 6 - Weight & Balance**

There is no change to the airplane weight & balance when the S-Tec System 55X autopilot is installed.

## **Section 7 - Systems Description**

### **Autopilot**

The airplane is equipped with an S-Tec System 55X two-axis Automatic Flight Control System (Autopilot). The autopilot programmer/computer is installed in the center console radio stack.

The autopilot roll axis uses an inclined gyro in the turn coordinator case as the primary turn and roll rate sensor. In addition to the turn coordinator instrument, the roll axis computer receives signals from the HSI and the #1 NAV/GPS radio. The roll computer computes roll steering commands for turns, radio intercepts, and tracking. Roll axis

steering is accomplished by autopilot steering commands to the aileron trim motor and spring cartridge.

The pitch computer receives altitude data from the altitude encoder pressure transducer plumbed into the static system, an accelerometer, and glideslope information from the HSI and #1 NAV radio. Pitch axis command for altitude hold, vertical speed hold, and glideslope tracking is accomplished by pitch computer commands to the elevator trim motor.

The altitude selector provides altitude and vertical speed pre-select capability for the autopilot. A pre-programmed altitude and vertical speed can be input into the altitude selector/alerter and then coupled to the autopilot. The autopilot will then follow the selected vertical speed until the selected altitude is reached. Then the altitude selector will signal the autopilot to hold the selected altitude. The altitude selector/alerter receives uncorrected altitude data from the same altitude encoder used by the transponder. In addition to the preselect functions, the altitude selector provides altitude alert, decision height, and altitude readout.

28 VDC for autopilot and altitude selector/alerter is supplied through the 5-amp AUTOPILOT circuit breaker on the Essential Bus.

All Autopilot mode selection is performed by using the mode select buttons and VS knob on the autopilot programmer/computer in the center console. Annunciators in the programmer/computer display window annunciate modes. *Refer to Figure 1* for an illustration of the programmer/computer.

**RDY (Ready)**– Illuminates when autopilot is ready for engagement. When the airplane's Battery Master switch is turned on and the rate gyro RPM is correct, the RDY annunciator will come on indicating the autopilot is ready for the functional check and operation. The autopilot cannot be engaged unless the RDY light is illuminated.

**HDG (Heading) Mode** – When HDG is selected, the autopilot will engage the HDG mode, fly the airplane to, and hold the heading set on the HSI. Subsequent heading changes are made using the HDG knob on the HSI. For smoothest transition to HDG mode, it is recommended that the airplane be aligned to within 10° of the selected heading before engaging HDG. The HDG mode is also used in combination with the NAV mode to set up a pilot selected intercept angle to a course.

**GPSS (GPS Steering)** – Pressing NAV twice will cause the autopilot to go to GPSS for smoother tracking and transitions. When GPSS is selected, the autopilot can be switched between heading and GPSS modes of operation. In the heading mode, the converter receives a heading error signal from the heading bug on the Horizontal Situation Indicator. GPSS converts this information and sends this heading error directly to the autopilot.

In the GPSS mode, the converter receives ground speed and bank angle digital signals that are calculated and converted to a commanded turn rate. The turn rate is then scaled and converted to a DC heading error signal that is compatible with the autopilot. The end result is an autopilot that can be directly coupled to the roll steering commands produced by the GPS Navigator, eliminating the need for the pilot to make any further adjustments to the HSI course arrow.

**REV (Reverse Course)** – When REV is selected, the autopilot will automatically execute high sensitivity gain for an approach where tracking the front course outbound or tracking the back course inbound is required. The APR and REV annunciators will illuminate when REV is selected.

**APR (Approach)** – When APR is selected, the autopilot provides increased sensitivity for VOR or GPS approaches. APR may also be used to provide increased sensitivity for enroute course tracking.

**GS (Glideslope)** – The autopilot GS function will capture and track an ILS glideslope. To arm the GS function, the following conditions must be met: (1) the NAV receiver must be tuned to the appropriate ILS frequency; (2) The glideslope signal must be valid – no flag; (3) the autopilot must be in NAV/APR/ALT modes; and (4) the airplane must be 60% or more below the glideslope centerline during the approach to the intercept point, and within 50% needle deviation of the localizer centerline at the point of intercept – usually the outer marker. When the above conditions have existed for 10 seconds, the GS annunciator will illuminate indicating GS arming has occurred (ALT annunciator will remain on). When the glideslope is intercepted and captured, the ALT annunciator will go out.

**ALT (Altitude Hold), Mode** – When ALT is selected, the autopilot will hold the altitude at the time the mode was selected. Altitude hold will not engage if an autopilot roll mode is not engaged. Altitude correction for enroute barometric pressure changes may be made by rotation of the VS knob on the autopilot programmer/computer. Clockwise rotation will increase and counterclockwise rotation will decrease altitude 20 feet for each 'click.' The maximum adjustment is  $\pm 360$  feet. Adjustments greater than 360 feet can be made by selecting VS mode and flying the airplane to the new altitude and then re-engaging ALT mode.

**VS (Vertical Speed) Mode** – When VS is selected, the autopilot will synchronize to and hold the vertical speed at the time the mode was selected. Altitude hold will not engage if an autopilot roll mode is not engaged. The vertical speed is displayed in 100-foot increments at the far right of the programmer/computer window next to the VS annunciation. A plus (+) value indicates climb and a negative or minus (-) value indicates descent. Vertical speed can be adjusted by rotating the VS knob on the programmer/computer. Clockwise rotation increases and counterclockwise rotation decreases rate of climb (or descent) 100 FPM for each 'click.' The maximum adjustment is  $\pm 1600$  FPM.



## Altitude Selector / Alerter

The altitude selector / alerter provides the autopilot with an altitude preselect function, a programmable vertical speed function, as well as provides altitude alert, decision height alert, and baro corrected altitude display. The altitude selector reads and decodes altitude information from the same altitude encoder that provides altitude information to the transponder. The decoded altitude is baro corrected and then compared to the selected altitude setting. When the decoded and baro corrected altitude matches the selected altitude, the altitude selector signals the autopilot to engage the ALT hold mode. The altitude select (ALT SEL) function is operable only when the transponder and encoder are operating and then both the autopilot ALT and VS modes are selected.

The altitude selector also provides a vertical speed signal to the autopilot pitch computer that is proportional to the amplitude and direction of the selected or computed vertical speed. This signal is not used by the autopilot until the autopilot VS mode is engaged. When VS is engaged, the autopilot compares the selected vertical speed signal with the existing vertical speed derived from the autopilot's altitude transducer and maneuvers the airplane to attain the selected vertical speed. The Vertical Speed (VS) select portion of the altitude selector / alerter is showing a selected vertical speed (VS annunciator on) and the autopilot Vertical speed (VS) mode is engaged.

The altitude selector / alerter also provides Decision Height (DH) and Altitude Alert (ALR) selection. All selector function selection is made through the altitude selector/alerter. Available functions are as follows:

**DTA (Data)** – The data entry button is used to select data entry mode. The first time the DTA button is pressed the selector will enter the data entry mode, the ENT annunciator will come on, and the SEL annunciator will flash to indicate the system is ready to accept an altitude entry. To change baro (BAR) correction, Decision Height (DH), or Vertical Speed (VS), press the appropriate button on the selector and rotate the input knob at the right of the display CW to increase the displayed numbers and CCW to decrease the displayed numbers. Pull the knob out and rotate as required to change the decimal numbers.

When the system is in the ENT mode, it is not coupled to the autopilot. In this mode, the autopilot will hold the last vertical speed selected.

• Note •

It is not necessary to enter the DTA mode to change the vertical speed, if vertical speed is coupled to the autopilot. If this is the case, vertical speed changes can be made by rotating the input knob as required to obtain the new vertical speed.

While in this mode, pressing DTA a second time will toggle the system to 'operate' mode. Repeatedly pressing the DTA button will toggle the system between ENT and 'operate' mode.

**BAR (baro)** – In this mode, the baro setting used by the altitude selector may be changed. When the Altitude Selector / Alerter is initially powered, the BARO mode is displayed automatically at the completion of the self-test. At other times, it is necessary to enter the data entry mode by pressing the DTA button and then inputting a new baro correction. Pressing the DTA button a second time will return the system to the 'operate' mode.

**ALT (Altitude)** – The ALT button has two functions: Altitude Pre-select and Altitude readout.

Pre-select - When the ALT button is pressed while the system is in the Data Entry (DTA) mode the SEL annunciator will flash and a new altitude can be selected by rotating the input knob CW to increase altitude and CCW to decrease altitude in thousands of feet. Pull the knob to input altitude in hundreds of feet. For example: 5500 feet is input as 5.5. Pressing DTA again will return the system to 'operate' mode and the SEL annunciator will stop flashing with the ALT annunciator remaining on. When a preselect altitude is coupled to the autopilot by pressing and holding the VS button and then pressing the ALT button, the airplane will fly at the selected vertical speed until the selected altitude is intercepted. At that time the altitude selector will command the autopilot to engage altitude hold.

Readout – When the ALT button is pressed in the 'operate' mode, the SEL annunciator will go out and the display will show the baro corrected encoder altitude. Repeated pushes of the ALT button will alternately display baro corrected encoder altitude and pre-selected altitude.

**ALR (Alert Mode)** – The ALR button enables the altitude alert system in conjunction with the ALT SEL mode. Pressing the ALR switch illuminates the ALR annunciator indicating arming of the alert mode. Upon entering within 1000 feet of the altitude selected in ALT SEL, the altitude alert chime will sound in the cabin speaker and headphones and the ALR annunciator will flash. The chime will sound and the ALR annunciator will flash again as the airplane approaches within 300 feet of the selected altitude. If the airplane's altitude deviates  $\pm 300$  feet from the selected altitude, the chime will sound and the ALR annunciator will flash to indicate the condition. The ALR function can be alternately enabled and disabled by repeatedly pressing the ALR button.

**DH (Decision Height)** – The DH button allows entry and arming of altitude alerting at a set decision height. To set a DH, first enter the data (DTA) entry (ENT) mode, press the DH button, and rotate the selector knob to input the desired decision height to the nearest 100 feet above the specified decision height. For example, for a DH of 1160 feet set 1.2 (1200 feet). After setting the desired decision height, press the DTA button again to accept the entered DH. The display will show the selected DH for approximately 5 seconds and then revert to Alt mode until the selected DH is reached during descent. The DH annunciator will remain illuminated indicating a decision height is set. As the airplane approaches within approximately 50 feet of the decision height, the alert will sound and the DH light will flash. As the airplane passes through approximately 50 feet beyond the decision height, the alert will sound and the light will flash again. Pressing the DH button again will disable the DH function causing the DH annunciation to go out. Repeated activation of the DH button alternately activates and deactivates the DH mode.

**VS (Vertical Speed)** – At initial start up, after self-test, pressing the Altitude Selector / Alerter VS button enables vertical speed selector mode. The initial vertical speed will be set at + 2 indicating a climb at 200 feet per minute. Rotating the selector input knob will change the selected vertical speed in 100 FPM increments. Rotate CW to increase vertical speed or CCW to Decrease vertical speed. The maximum vertical speed is  $\pm 1600$  FPM ( $\pm 16$ ). Zero vertical speed is not selectable.

The vertical speed display is the only Altitude Selector / Alerter function available in the 'operate' mode. Therefore, vertical speed changes can be commanded by rotating the selector input knob. Vertical speeds can also be entered in the data (DTA) entry (ENT) mode by pressing the VS button and using the selector input knob to enter a new vertical speed. The DTA button must be pressed again to accept the new vertical speed and enter the 'operate' mode.

The Altitude Selector / Alerter VS mode can be disabled by pressing the Altitude Selector / Alerter MAN button.

**MAN (Manual)** – Vertical Speed selection can be completely decoupled from the autopilot system by depressing the Altitude Selector / Alerter MAN button.

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

# **S-Tec System 55SR Autopilot**

When the S-Tec System Fifty Five SR (55SR) Autopilot is installed in the Cirrus Design SR20, serials 1337 and subsequent, this Supplement is applicable and must be inserted in the Supplements Section (Section 9) of the Cirrus Design SR20 Pilot's Operating Handbook. This document must be carried in the airplane at all times. Information in this supplement adds to, supersedes, or deletes information in the basic SR20 Pilot's Operating Handbook.

• Note •

This POH Supplement Revision dated Revision 02: 07-18-05 supersedes and replaces Revision 01 of this supplement dated 12-07-04.

FAA Approved Joseph C. Mieser Date 18 JUL 2005  
for Royace H. Prather, Manager  
Chicago Aircraft Certification Office, ACE-115C  
Federal Aviation Administration

## ***Section 1 - General***

This airplane is equipped with an S-TEC System 55SR Autopilot. The System 55SR autopilot is a two-axis autopilot system. The system consists of a flight guidance programmer/computer, altitude transducer, turn coordinator, and primary flight display (PFD). Mode selection is made on the programmer/computer panel. A button on each control yoke handle may be used to disengage the autopilot. The autopilot makes roll changes through the aileron trim motor and spring cartridge and makes pitch changes for altitude hold through the elevator trim motor. The autopilot operates on 28 VDC supplied through the 5-amp AUTOPILOT circuit breaker on the Essential Bus. The S-Tec System 55SR Autopilot features:

- Heading Hold and Command.
- NAV/LOC/GPS tracking; HI and LO sensitivity.
- Altitude Hold and Command.
- Vertical Speed Hold and Command.
- GPS Steering (GPSS) for smoother turns onto a course or during course tracking.

*Refer to S-Tec System Fifty-Five SR Autopilot Pilot's Operating Handbook (POH), P/N 87127 dated 01 September 2003 or later revision for full operational procedures and description of implemented modes.*

• Note •

The SR20 implementation of the System 55SR Autopilot does not utilize the optional remote annunciator, roll servo, yaw servo. Therefore, all references to these items in the S-Tec System 55SR POH shall be disregarded. Additionally, this installation does not utilize a CWS (Control Wheel Steering) switch or an AUTOPILOT MASTER switch.

This installation utilizes the airplane's roll trim actuator to affect steering changes. Therefore, the automatic trim function of the System 55SR is not implemented. Disregard all references in the S-Tec System 55SR POH to this feature.

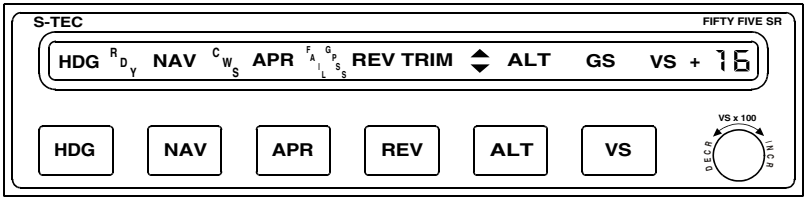
Roll information is displayed on the PFD. Autopilot Flight Director is not implemented in this installation.

## Section 2 - Limitations

1. Autopilot operation is prohibited above 180 KIAS.
2. The autopilot must not be engaged for takeoff or landing.
3. The autopilot must be disengaged for missed approach, go-around, and balked landing.
4. Flaps must be set to 50% for autopilot operation in Altitude Hold at airspeeds below 95 KIAS.
5. Flap deflection is limited to 50% during autopilot operations.
6. The autopilot must be disconnected in moderate or severe turbulence.
7. Minimum engage height for the autopilot is 400 ft AGL.
8. Minimum speed with the autopilot engaged is  $1.2V_S$  for the given configuration.
9. For VOR/GPS and ILS glideslope and localizer intercept, capture, and tracking, the following limitations apply:
  - a. The autopilot must be disengaged no later than 100 feet below the Minimum Descent Altitude.
  - b. The autopilot must be disconnect during approach if course deviation exceeds 50%. The approach should only be continued by “hand-flying” the airplane.
  - c. The autopilot must be disengaged at the decision height.
  - d. 12 knot maximum crosswind component between the missed approach point and outer marker.
  - e. The intercept of the localizer shall occur at least 5 miles outside of the outer marker.
  - f. If the crosswind component is greater than 12 knots and less than 17 knots, the intercept shall occur at least 10 miles outside of the outer marker.
  - g. The intercept angle shall be no greater than a 45-degree intercept.
  - h. The ILS is flown at normal approach speeds, and within any STC or TC speed constraints and as defined in this flight manual.

- i. The flaps should be extended in the approach configuration prior to the Outer Marker. No further changes in the flap configuration should be made throughout the autopilot-coupled approach.
10. The S-Tec System 55SR Autopilot Pilot's Operating Handbook (POH), P/N 87127 dated 01 September 2003 or later, must be carried in the airplane and available to the pilot while in flight.





SR20\_FM09\_1996

**Figure - 1**  
**System Fifty-Five SR Autopilot**

## Section 3 - Emergency Procedures

### Autopilot Malfunction

Refer to *Electric Trim/Autopilot Failure procedure* in the SR20 POH. Do not reengage the autopilot until the malfunction has been identified and corrected. The autopilot may be disconnected by:

1. Pressing the A/P DISC/Trim switch on the control yoke handle.
2. Pulling the AUTOPILOT circuit breaker on Essential Bus.

Altitude lost during a roll axis autopilot malfunction and recovery:

Flight Phase	Bank Angle	Altitude Loss
Climb	30°	None
Cruise	55°	100 ft
Descent	55°	120 ft
Maneuvering	10°	None
Approach	0°	20 ft

Altitude lost during a pitch axis autopilot malfunction and recovery:

Flight Phase	Altitude Loss
Cruise	200 ft

## System Failure and Caution Annunciations

If any of the following failure annunciations occur at low altitude or during an actual instrument approach, disengage the autopilot, execute a go-around or missed approach as appropriate. Inform ATC of problem. Do not try to troubleshoot until a safe altitude and maneuvering area are reached or a safe landing is completed.

Annunciation	Condition	Action
Flashing RDY for 5 seconds with audible tone.	Autopilot disconnect. All annunciations except RDY are cleared.	None.
Flashing RDY with audible tone then goes out.	Turn coordinator gyro speed low. Autopilot disengages and cannot be re-engaged.	Check power to turn coordinator.
Flashing NAV, REV, or APR.	Off navigation course by 50% needle deviation or more.	Use HDG mode until problem is identified. Crosscheck raw NAV data, compass heading, and radio operation.
Flashing NAV, REV, or APR with steady FAIL	Invalid radio navigation signal.	Check Nav radio for proper reception. Use HDG mode until problem is corrected.
Flashing VS	Excessive vertical speed error over selected vertical speed. Usually occurs in climb.	Reduce VS command and/or adjust power as appropriate.

## Section 4 - Normal Procedures

Refer to Section 7 – Systems Description for a description of the autopilot modes.

### • WARNING •

The pilot must properly monitor and control the engine power to avoid stalling the airplane in autopilot altitude hold or vertical speed modes.

### Autopilot Pre-Flight Test

1. Battery 1 Master Switch ..... ON
2. Transponder ..... ON
3. Avionics Power Switch ..... ON

Note that all autopilot annunciator illuminate. After about 5 seconds, all lights will go out. When the turn coordinator gyro has reached operational RPM, the RDY annunciator will come on.

4. Autopilot Tests
  - a. Heading Mode .....TEST
    - 1.) Momentarily press HDG button on autopilot Mode Selector. Note that HDG light illuminates.
    - 2.) Select and rotate the HDG bug knob on the PFD to the left then right. Note that control yokes follow movement of knob.
  - b. Activate a GPS flight plan or waypoint on the GPS navigator (GPS 1).
  - c. Press and release the GPSS/HDG switch. HDG will go out and GPSS will flash. Note that the HDG bug will no longer move the control yokes.

### • Note •

The GPSS requires a ground speed component to function, therefore the GPSS function cannot be ground tested.

- d. Press and release the GPSS/HDG switch. GPSS will go out and HDG will come on.

- e. Altitude Hold ..... TEST
  - 1.) Depress ALT button on autopilot programmer/computer. Note that ALT annunciator comes on, VS annunciator goes out, and yoke does not move.
- f. Overpower Test:
  - 1.) Grasp control yoke and input left aileron, right aileron, nose up, and nose down to overpower autopilot. Overpower action should be smooth in each direction with no noise or jerky feel.
- g. Radio Check:
  - 1.) Turn on NAV1 radio, with a valid NAV signal, and select VLOC for display on the PFD.
  - 2.) Use autopilot programmer/computer to engage NAV mode and move Course Select knob so that VOR deviation needle moves left or right. Note that control yokes follow direction of needle movement.
- h. Autopilot Disconnect Tests:
  - 1.) Press Pilot A/P DISC/Trim Switch (control yoke). Note that the autopilot disengages. Move control yoke to confirm that pitch and roll control is free with no control restriction or binding.
  - 2.) Repeat step using Copilot A/P DISC/Trim Switch.

## **In-Flight Procedures**

- 1. Autopilot RDY Light ..... CHECK ON
- 2. Trim airplane for existing flight conditions.
- 3. Engage desired mode by pressing mode selector button on autopilot programmer/computer.

### **Heading Mode**

- 1. Begin by selecting a heading on PFD within 10° of the current airplane heading.
- 2. Press HDG button on autopilot programmer/computer. The HDG annunciator will illuminate and the airplane will turn to the selected heading.

3. Use the HDG bug to make heading changes as desired.

### ***Autopilot Altitude Hold Mode***

1. Manually fly the airplane to the desired altitude and level off.

• Note •

For smoothest transition to altitude hold, the airplane rate of climb or descent should be less than 100 FPM when Altitude Hold is selected.

2. Press HDG or NAV to engage a roll mode. The associated annunciator will illuminate.

• Note •

A roll mode must be engaged prior to engaging a pitch mode.

3. Press the ALT button on the autopilot programmer/computer. The ALT annunciator will illuminate indicating that the mode is engaged and the autopilot will hold the present altitude.

• Note •

Manually flying the airplane off the selected altitude will not disengage altitude hold and the autopilot will command a pitch change to recapture the altitude when the control input is released.

4. Altitude can be synchronized to another altitude by rotating the VS knob on the programmer/computer. Clockwise rotation will increase and counterclockwise rotation will decrease altitude 20 feet for each 'click.' The maximum adjustment is  $\pm 360$  feet. Adjustments greater than 360 feet can be made by selecting VS mode and flying the airplane to the new altitude and then re-engaging ALT mode.

### ***Autopilot Vertical Speed Mode***

1. Begin by manually establishing the desired vertical speed.
2. Press HDG or NAV to engage a roll mode. The associated annunciator will illuminate.

• Note •

A roll mode must be engaged prior to engaging a pitch mode.

3. Press the VS button on the autopilot programmer/computer to engage the vertical speed mode. When the mode is engaged, the autopilot will synchronize to and hold the vertical speed at the time the mode was engaged.

• Note •

The vertical speed is displayed in 100-foot increments at the far right of the programmer/computer window next to the VS annunciation. A plus (+) value indicates climb and a negative or minus (-) value indicates descent.

4. Vertical speed can be adjusted by rotating the VS knob on the programmer/computer. Clockwise rotation increases and counterclockwise rotation decreases rate of climb (or descent) 100 FPM for each 'click.' The maximum adjustment is  $\pm 1600$  FPM.

• Note •

A flashing VS mode annunciator indicates excessive error between actual vertical speed and the selected vertical speed (usually in climb). The pilot should adjust power or reduce the commanded vertical speed as appropriate to remove the error.

### ***GPS Tracking and GPS Approach***

1. Begin with a reliable GPS signal selected on the NAV receiver.
2. Select desired course on the PFD and establish a desired intercept heading.
3. Press the NAV button on the autopilot programmer/computer twice. The NAV and GPSS mode annunciators will illuminate.

• Note •

If the course needle is at full-scale deviation, the autopilot will establish the airplane on a heading for a 45° intercept with the selected course. As the airplane approaches the course, the autopilot will smoothly shallow the intercept angle. The pilot may select an intercept angle less than the standard 45° by setting the desired intercept heading with the HSI HDG bug, pressing and holding HDG, and then pressing NAV once to intercept course in NAV mode or twice to intercept course in GPSS mode on the autopilot programmer/computer. When the on-course intercept turn begins the HDG mode will disengage and the annunciator will go out.

During the intercept sequence, the autopilot operates at maximum gain and sensitivity (90% of standard rate turn). When the selected course is intercepted, course deviation needle centered, the course-tracking program is activated. The system will remain at maximum sensitivity for approximately 15 seconds while the wind correction angle is established. The maximum turn rate is then reduced to 45% standard rate. Approximately 60 seconds later, the maximum turn rate is reduced to 25% standard rate.

4. For increased sensitivity during GPS approach or if desired for enroute tracking, press the APR button on the autopilot programmer/computer. The NAV, GPSS, and APR annunciators will be illuminated. Use HDG to accomplish a procedure turn. Engage GPSS again to complete the approach.

***VOR Tracking and VOR-LOC Approach***

1. Begin with a reliable VOR or VOR-LOC signal selected on the NAV receiver.
2. Select desired course on the PFD and establish a desired intercept heading.
3. Press the NAV button on the autopilot programmer/computer. The NAV mode will illuminate. Course interception and tracking will be as described under GPS Tracking and GPS Approach above.
4. For station passage, set HDG bug to within 5° of selected course.



• Note •

If the HDG bug is within 5° of center and the course deviation is less than 10%, the autopilot will immediately establish the lowest level of sensitivity and limit the turn rate to a maximum of 25% of a standard rate turn.

5. For increased sensitivity during approach or if desired for enroute tracking, press the APR button on the autopilot programmer/computer. Both NAV and APR annunciators will be illuminated.

## Section 5 - Performance

There is no change to the airplane performance when the S-Tec System 55SR autopilot is installed.

## Section 6 - Weight & Balance

There is no change to the airplane weight & balance when the S-Tec System 55SR autopilot is installed.

## Section 7 - Systems Description

### Autopilot

The airplane is equipped with an S-Tec System 55SR two-axis Automatic Flight Control System (Autopilot). The autopilot programmer/computer is installed in the center console radio stack.

The autopilot roll axis uses an inclined gyro in the turn coordinator case as the primary turn and roll rate sensor. In addition to the turn coordinator instrument, the roll axis computer receives signals from the PFD and the NAV/GPS radio. The roll computer computes roll steering commands for turns, radio intercepts, and tracking. Roll axis steering is accomplished by autopilot steering commands to the aileron trim motor and spring cartridge.

The pitch computer receives altitude data from the altitude encoder pressure transducer plumbed into the static system, the PFD, and #1 NAV radio. Pitch axis command for altitude hold is accomplished by pitch computer commands to the autopilot elevator trim motor.

28 VDC for the autopilot is supplied through the 5-amp AUTOPILOT circuit breaker on the Essential Bus.

All Autopilot mode selection is performed by using the mode select buttons and VS knob on the autopilot programmer/computer in the center console. Annunciators in the programmer/computer display window announce modes. *Refer to Figure 1* for an illustration of the programmer/computer.

**RDY (Ready)**– Illuminates when autopilot is ready for engagement. When the airplane's Battery Master switch is turned on and the rate gyro RPM is correct, the RDY annunciator will come on indicating the autopilot is ready for the functional check and operation. The autopilot cannot be engaged unless the RDY light is illuminated.

**NAV (Heading) Mode** – When HDG is selected, the autopilot will engage the HDG mode, fly the airplane to, and hold the heading set on the PFD. Subsequent heading changes are made using the HDG bug knob on the PFD. For smoothest transition to HDG mode, it is recommended that the airplane be aligned to within 10° of the selected heading before engaging HDG. The HDG mode is also used in combination with the NAV mode to set up a pilot selected intercept angle to a course.

**GPSS (GPS Steering)** – Pressing NAV twice will cause the autopilot to go to GPSS for smoother tracking and transitions. When GPSS is selected, the autopilot can be switched between heading and GPSS modes of operation. In the heading mode, the converter receives a heading error signal from the heading bug on the Horizontal Situation Indicator. GPSS converts this information and sends this heading error directly to the autopilot.

In the GPSS mode, the converter receives ground speed and bank angle digital signals that are calculated and converted to a commanded turn rate. The turn rate is then scaled and converted to a DC heading error signal that is compatible with the autopilot. The end result is an autopilot that can be directly coupled to the roll steering commands produced by the GPS Navigator, eliminating the need for the pilot to make any further adjustments to the PFD course arrow.

**REV (Reverse Course)** – When REV is selected, the autopilot will automatically execute high sensitivity gain for an approach where tracking the front course outbound or tracking the back course inbound is required. The APR and REV annunciators will illuminate when REV is selected.

**APR (Approach)** – When APR is selected, the autopilot provides increased sensitivity for VOR or GPS approaches. APR may also be used to provide increased sensitivity for enroute course tracking.

**ALT (Altitude Hold), Mode** – When ALT is selected, the autopilot will hold the altitude at the time the mode was selected. Altitude hold will not engage if an autopilot roll mode is not engaged. Altitude correction for enroute barometric pressure changes may be made by rotation of the VS knob on the autopilot programmer/computer. Clockwise rotation will increase and counterclockwise rotation will decrease altitude 20 feet for each 'click.' The maximum adjustment is  $\pm 360$  feet. Adjustments greater than 360 feet can be made by selecting VS mode and flying the airplane to the new altitude and then re-engaging ALT mode.

**VS (Vertical Speed) Mode** – When VS is selected, the autopilot will synchronize to and hold the vertical speed at the time the mode was selected. Altitude hold will not engage if an autopilot roll mode is not engaged. The vertical speed is displayed in 100-foot increments at the far right of the programmer/computer window next to the VS annunciation. A plus (+) value indicates climb and a negative or minus (-) value indicates descent. Vertical speed can be adjusted by rotating the VS knob on the programmer/computer. Clockwise rotation increases and counterclockwise rotation decreases rate of climb (or descent) 100 FPM for each 'click.' The maximum adjustment is  $\pm 1600$  FPM.

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**Pilot's Operating Handbook and  
FAA Approved Airplane Flight Manual  
Supplement  
for  
SR20 Airplanes Registered in the European  
Union**

1. This supplement is required for operation of Cirrus Design SR20 airplane serial numbers 1005 and subsequent when registered in the European Union. This supplement must be attached to the applicable SR20 EASA/FAA-approved Airplane Flight Manual.
2. The information contained within this supplement is to be used in conjunction with the basic AFM and supplements. The information contained herein supplements or supersedes that in the basic manual and approved supplements only in those areas indicated.
3. Compliance with the limitations contained in the basic manual and approved supplements is mandatory.
4. Foreign operating rules and any references to such rules in the basic manual and approved supplements are not applicable in the European Union. The aircraft must be equipped and operated in accordance with applicable operating requirements.

• Note •

A Kinds of Operating Equipment List (KOEL) may not necessarily apply in the European Union.

EASA Approved



Date

27 May 2004

European Aviation Safety Agency

UNDER EASA APPROVAL No. 2004-5753

## Section 1 - General

No Change.

## Section 2 - Limitations

Two-blade propellers are not EASA approved for use on this airplane. Ignore all references to the two-blade propeller in this Pilot's Operating Handbook.

Amend "**Propeller**" limitation to read as follows:

### **Hartzell**

Propeller Type..... Constant Speed

### *Three-Blade Propeller:*

Model Number ..... PHC-J3YF-1MF/F7392-1

Diameter .....74.0" (72.5" Minimum)

Model Number ..... PHC-J3YF-1RF/F7392-1

Diameter .....74.0" (72.5" Minimum)

## Section 3 - Emergency Procedures

No Change.

## Section 4 - Normal Procedures

No Change.

## Section 5 - Performance

No Change.

## Section 6 - Weight & Balance

No Change.

## Section 7 - Systems Description

No Change.

## **Section 8 - Handling, Servicing & Maintenance**

No Change.

## **Section 9 - Supplements**

No Change.

## **Section 10 - Safety Information**

No Change.

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

# Honeywell KGP 560 Terrain/ Awareness Warning System

When the Honeywell KGP 560 Terrain Awareness and Warning System is installed in the Cirrus Design SR20, this Supplement is applicable and must be inserted in the Supplements Section (Section 9) of the Cirrus Design SR20 Pilot's Operating Handbook. This document must be carried in the airplane at all times. Information in this supplement adds to, supersedes, or deletes information in the basic SR20 Pilot's Operating Handbook.

• Note •

This POH Supplement Revision dated Revision 01: 12-15-07 supersedes and replaces the original release of this supplement dated Original: 07-03-04.

FAA Approved Joseph C. Mies Date 15 Dec 2007  
for Royace H. Prather, Manager  
Chicago Aircraft Certification Office, ACE-115C  
Federal Aviation Administration

## Section 1 - General

The airplane is equipped with an Honeywell KGP 560 Terrain Awareness and Warning System that performs the functions of a Class C Terrain Awareness and Warning System (TAWS) in accordance with TSO C151b.

Incorporating much of the technology found in TAWS for air transport aircraft, the KGP 560 supports:

- Alerting for premature descent.
- Alerting for excessive rate of climb/descent.
- Altitude callout (500 ft) and alerting within 5 nm of 2000 ft public runways.
- Look-ahead algorithms and integrated terrain/obstacle database.

The system consists of the 560 GA-EGPWS Processor mounted on the underside of the pilot-side kickplate, a Terrain/Obstacle Database integral to the processor, the Configuration Module integral to the system's wire harness, and the TAWS annunciator panel mounted on the lower LH portion of the instrument panel.

The KGP 560 receives data from the GPS sensor, Transponder, Primary Flight Display, and the Multifunction Display (MFD). Aural alerts are communicated to the pilot via the GMA 340 Audio Panel. To enhance the situational awareness to the pilot, color-coded terrain display is interfaced on the MFD.

For specific MFD operational details *refer to the Avidyne FlightMax EX5000C Pilot's Guide*.

For specific KGP 560 operational details, *refer to the KGP 560 & 860 EGPWS Pilot's Guide, P/N 006-18254-001, Revision 04 or later*.

## Section 2 - Limitations

1. Do not use the Terrain Awareness Display for navigation of the aircraft. The KGP 560 Terrain Awareness and Warning System is intended to serve as a situational awareness tool only and may not provide the accuracy fidelity on which to solely base terrain or obstacle avoidance maneuvering decisions.

## Section 3 - Emergency Procedures

### Off-Airport Landings

1. For ditching or other off-airport landings, inhibit the Terrain Awareness System functions by selecting the TERR INHIBIT switch on the annunciator panel to prevent unwanted aural alerting.

## Section 4 - Normal Procedures

• Note •

Only vertical maneuvers are recommended responses to warnings and alerts unless operating in VMC or the pilot determines, using all available information and instruments, that a turn, in addition to the vertical escape maneuver, is the safest course of action.

During certain operations, warning thresholds may be exceeded due to specific terrain or operating procedures. During day VFR flight, these warnings may be considered as a cautionary.

If the TAWS issues an alert when the Terrain Awareness Display Page is not selected, a pop up message will appear on the active display page of the MFD. To clear the alert, the pilot must acknowledge the pop up message by pressing the Soft Key next to the displayed "OK".

Pilots are authorized to deviate from their current air traffic control (ATC) clearance to the extent necessary to comply with a TAWS warning.

## Activate TAWS

• Note •

If the aircraft horizontal position derived from the Garmin Navigator (GPS 1) is invalid, TAWS will be inoperative and the TERR INOP annunciator will illuminate.

1. SKYWATCH/TAWS Circuit Breaker..... IN
2. MFD Circuit Breaker..... IN
3. Battery Master Switch ..... ON
4. Avionics Power Switch ..... ON
5. Verify TERR INOP Annunciator .....OFF
6. At MFD prompt, any Key .....PRESS
7. MFD Soft Keys ..... SET to TAWS

## Response To Ground Proximity Warnings

### ***Aural “PULL UP” Warning***

### ***Red TERR WARN Annunciation***

1. Level the wings, simultaneously adding full power.
2. Increase pitch attitude to 15 degrees nose up.
3. Adjust pitch attitude to ensure terrain clearance while respecting stall warning. If flaps are extended, retract flaps to the UP position.
4. Continue climb at best angle of climb speed ( $V_x$ ) until terrain clearance is assured.

### ***Aural “SINK RATE” Warning***

### ***Aural “DON’T SINK” Warning***

### ***Amber TERR CAUT Annunciation***

1. Initiate appropriate corrective action to remove the cause of the warning.

## Response To Awareness Alerts

***Aural “TERRAIN AHEAD” Alert***

***Aural “OBSTACLE AHEAD” Alert***

***Amber TERR CAUT Annunciation***

1. Take positive corrective action until the alert ceases. Stop descending, or initiate a climb turn as necessary, based on analysis of all available instruments and information.

***Aural “TERRAIN AHEAD; PULL UP” Alert***

***Aural “OBSTACLE AHEAD; PULL UP” Alert***

***Red TERR WARN Annunciation***

1. Level the wings, simultaneously adding full power.
2. Increase pitch attitude to 15 degrees nose up.
3. Adjust pitch attitude to ensure terrain clearance while respecting stall warning. If flaps are extended, retract flaps to the UP position.
4. Continue climb at best angle of climb speed ( $V_x$ ) until terrain clearance is assured.

## Deactivate TAWS

1. SKYWATCH/TAWS Circuit Breaker..... PULL  
or

2. Avionics Power Switch .....OFF

## Section 5 - Performance

No Change.

## Section 6 - Weight & Balance

Installation of the Honeywell KGP 560 Terrain Awareness and Warning System adds the following optional (Sym = O) equipment at the weight and arm shown in the following table.

ATA / Item	Description	Sym	Qty	Part Number	Unit Wt	Arm
34-01	KGP 560 Processor	O	1	15963-001	1.25	117.0

## Section 7 - Systems Description

The Honeywell KGP 560 Terrain Awareness and Warning System compares GPS information from the Garmin Navigator (GPS 1) to the integrated Terrain/Obstacle Database to produce a real-time model of the surrounding terrain. This “virtual” picture is then sent to the MFD to provide enhanced situational awareness to the pilot.

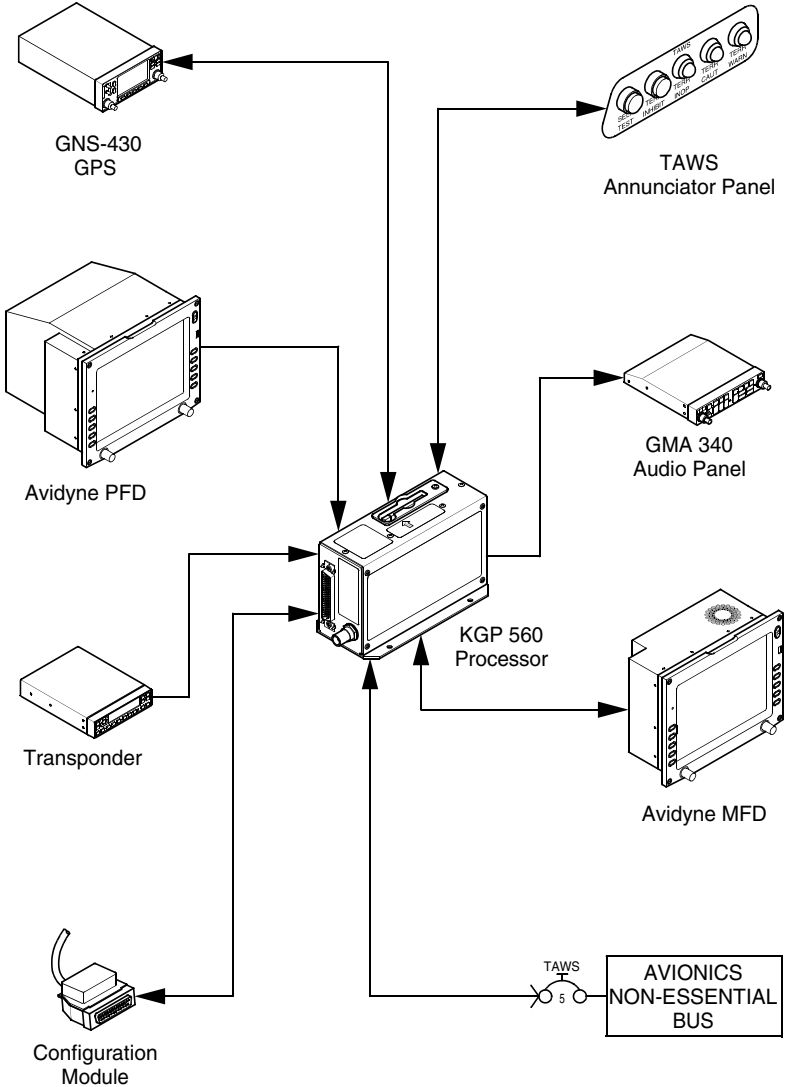
The system consists of the 560 GA-EGPWS Processor mounted on the underside of the pilot-side kickplate, a Terrain/Obstacle Database integral to the processor, the Configuration Module integral to the system’s wire harness, and the TAWS annunciator panel mounted on the lower LH portion of the instrument panel.

The 560 GA-EGPWS Processor is powered by 28 VDC through the 5-amp SKYWATCH/TAWS circuit breaker on the Avionics Nonessential Bus.

For a additional system information, *refer to the KGP 560 & 860 EGPWS Pilot’s Guide, P/N 006-18254-001, Revision 04 or later.*

### **System Constraints**

- If there is no terrain data in the database for a particular area, then TAWS alerting is not available for that area. The affected area on the Terrain Awareness Display Page will be colored a MAGENTA dot pattern.
- If the TAWS has been inhibited (e.g. the pilot selected TERR INHIBIT) the system will not give aural alerts. The MFD will display a purple message block with cyan text reading, “TAWS Inhibited”.
- The TAWS will not be available and the TERR INOP annunciator will illuminate if any of the following components are inoperative: MFD, PFD, GPS 1, Transponder, or Attitude Encoder.



SR20\_FM09\_2031

Figure - 1

**Honeywell KGP 560 TAWS Simplified Schematic**

P/N 11934-S30

Revision 01: 12-15-07

## TAWS Annunciator Panel

TAWS terrain annunciations and control functions are incorporated into the Annunciator Panel. The panel consists of a momentary pushbutton switch (SELF TEST), an illuminated pushbutton switch (TERR INHIBIT), and three LEDs for Terrain Warning (TERR WARN), Terrain Caution (TERR CAUT), Terrain Inoperative (TERR INOP).

- SELF TEST - Provides test function for the TAWS.
- TERR INHIBIT - To inhibit nuisance or unwanted warnings at airports that are not in the system database, the pilot may select the TERR INHIBIT switch. Although selection will inhibit all TAWS visual and aural alerts, the Terrain Awareness Display will remain functional with the message "Warnings Inhibited" displayed on the MFD. When activated the switch will illuminate amber.
- TERR INOP - Indicates the TAWS inoperative. When activated the LED will illuminate amber.
- TERR CAUT - Indicates a possible terrain or obstacle conflict within 40-60 seconds. When activated the LED will illuminate amber.
- TERR WARN - Indicates a possible terrain or obstacle conflict within 30 seconds. When activated the LED will illuminate red.

The annunciators are dimmed via the instrument panel lighting dimmer switch. The TAWS annunciator panel is powered by 28 VDC through the 2-amp ANNUN circuit breaker on the Essential Bus

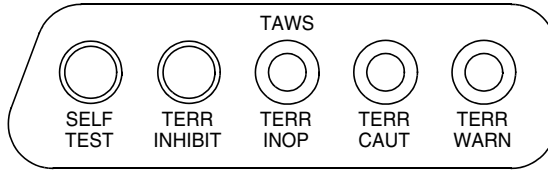
### Alert Priority

When any of the TAWS aural alerts are in progress, all aural TRAFFIC alerts are inhibited.

### Advisory Callout

The advisory callout "*FIVE HUNDRED*", occurs at approximately 500 feet AGL.





SR20\_FM09\_2033

Annunciator	Color	Function
SELF TEST	N/A	Provides test function for TAWS
TERR INHIBIT	AMBER	All TAWS alerting functions inhibited
TERR INOP	AMBER	Indicates TAWS inoperative
TERR CAUT	AMBER	Possible terrain or obstacle conflict within 40-60 seconds
TERR WARN	RED	Possible terrain or obstacle conflict within 30 seconds

**Figure - 2**  
**TAWS Annunciator Panel**

## MFD Terrain Awareness Display

### • **WARNING** •

Do not use the Terrain Awareness Display for navigation of the aircraft. The TAWS is intended to serve as a situational awareness tool only and may not provide the accuracy fidelity on which to solely base terrain or obstacle avoidance maneuvering decisions.

To select the Terrain Awareness Display Page on the MFD, rotate the page knob to TAWS.

Terrain and obstacle alerts are the most critical situations displayed by TAWS. There are two levels of alerts:

- **Caution Alert** - Possible terrain or obstacle conflict within 40-60 seconds. When triggered, the terrain or obstacle that caused the alert is displayed in bright yellow. In addition, a message describing the nature of the alert is presented in the MFD message bar.
- **Warning Alert** - Possible terrain or obstacle conflict within 30 seconds. When triggered, the terrain or obstacle that caused the alert is displayed in bright red. In addition, a message describing the nature of the alert is presented in the message bar

When a caution or warning alert is active, the display image surrounding the target is enlarged somewhat to allow the terrain or obstacle to be better seen on the display.

If a terrain or obstacle alert occurs while a page other than Terrain Awareness Display Page is being displayed, a terrain or obstacle alert message is displayed in the Message Bar. When the pilot acknowledges this message, the MFD will automatically switch to the Terrain Awareness Display Page.

The message bar will be removed from the display when the TAWS is no longer in alert status, or if the pilot acknowledges the message from the Terrain Awareness Display Page.

### ***Geometric Altitude versus Measured Sea Level***

An indication of MSL-G or Geometric Altitude may appear on the left side of the MFD indicating the height above Measured Sea Level (MSL) calculated from the GPS.

This data serves as the reference for color-coding for the Terrain Awareness Display Page and as an input to the TAWS Look-Ahead algorithm. Because it is derived from GPS, Geometric Altitude may differ from corrected barometric altitude. Therefore, Geometric Altitude may be in error by as much as 100 ft and should not be used for navigation. MSL-G is presented solely to provide the pilot additional situational awareness regarding the true MSL height upon which the TAWS Terrain Display and Alerting is based.

## Self Test

Proper operation of the TAWS can be verified when the aircraft is on the ground as follows:

1. Select the TAWS page on the MFD
2. Clear all caution messages in the lower right corner
3. Ensure that the TERR INHIBIT switch is not engaged, and momentarily push the SELF TEST switch:
  - a. The amber TERR INOP light should be illuminated.
  - b. The amber TERR INOP light should extinguish.
  - c. The red TERR WARN light should be illuminated.
  - d. An aural “EGPWS SYSTEM OK” is enunciated over cockpit speaker.
  - e. The red TERR WARN light should extinguish.
  - f. The amber TERR CAUT light should be illuminated.
  - g. The amber TERR CAUT light should extinguish.
  - h. A terrain self-test pattern should appear on the MFD.
  - i. The terrain self-test should disappear after several sweeps of the terrain display.
  - j. A TAWS Sensor Self Test Caution message should appear in the lower right corner of the MFD.
4. Acknowledge and clear this caution.

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

# Avidyne EMax™ Engine Instrumentation

When the Avidyne EMax™ Engine Instrumentation system is installed in the Cirrus Design SR20, this POH Supplement is applicable and must be inserted in the Supplements Section (Section 9) of the Cirrus Design SR20 Pilot's Operating Handbook. This document must be carried in the airplane at all times. Information in this supplement adds to, supersedes, or deletes information in the basic SR20 Pilot's Operating Handbook.

• Note •

This POH Supplement Revision dated Revision 01: 12-15-07 supersedes and replaces the original release of this supplement dated Original: 10-12-05.

FAA Approved Joseph C. Mies Date 15 Dec 2007  
for Royace H. Prather, Manager  
Chicago Aircraft Certification Office, ACE-115C  
Federal Aviation Administration

## Section 1 - General

EMax™ Engine Instrumentation provides the pilot with engine parameters depicted on simulated gauges and electrical system parameters located in a dedicated region within in the EX5000C MFD display.



Figure - 1  
Avidyne EMax™ Engine Instrumentation

## Section 2 - Limitations

No Change.

## Section 3 - Emergency Procedures

No Change.

## Section 4 - Normal Procedures

No Change.

## Section 5 - Performance

No Change.

## Section 6 - Weight & Balance

Installation of the Avidyne Engine Instruments adds the following optional (Sym = O) equipment at the weight and arm shown in the following table.

ATA / Item	Description	Sym	Qty	Part Number	Unit Wt	Arm
34-03	Engine Sensors	O	11	-	1.0	75.0
34-04	Engine Sensor Unit	O	1	14843-001	1.1	118.0
34-05	Engine Sensor Harness	O	1	15030-001	0.9	92.0
34-06	Engine Sensor Cabin Harness	O	1	15032-001	2.1	108.0

## Section 7 - System Description

An Engine Sensor Unit interfaces (SIU) with engine-mounted sensors, some of which are shared with the standard airplane gauges, and provide data to the MFD for display.

Airplanes equipped with EMax™ Engine Instrumentation display all engine settings and parameters on a dedicated MFD engine monitor page. The MFD also displays engine and fuel data in data blocks on the full-screen moving map display. In the event of an exceedence, each out-of-limit parameter is highlighted on the screen for immediate attention. The engine monitor also includes data capture capability,

providing full-time recording of critical engine performance parameters.

The Engine Instruments system is powered by 28 VDC supplied through the 5-amp Engine Instruments breaker on the Main Bus 1.

*Refer to Avidyne FlightMax EX5000C Pilot's Guide for a more complete description of EMax Engine Instruments, its operating modes, and additional detailed operating procedures.*



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

# Avidyne CMax™ Electronic Approach Charts

When the Avidyne CMax™ Electronic Approach Charts system is installed in the Cirrus Design SR20, this POH Supplement is applicable and must be inserted in the Supplements Section (Section 9) of the Cirrus Design SR20 Pilot's Operating Handbook. This document must be carried in the airplane at all times. Information in this supplement adds to, supersedes, or deletes information in the basic SR20 Pilot's Operating Handbook.

• Note •

This POH Supplement Revision dated Revision 01: 12-15-07 supersedes and replaces the original release of this supplement dated Original: 10-12-05.

FAA Approved Joseph C. Mies Date 15 Dec 2007  
for Royace H. Prather, Manager  
Chicago Aircraft Certification Office, ACE-115C  
Federal Aviation Administration

## Section 1 - General

Avidyne CMax™ Electronic Approach Charts allows the pilot to view terminal procedure chart data on the EX5000C MFD. If the chart is geo-referenced, an ownship symbol and flight plan legs can be overlaid on the chart to further enhance the pilot's situational awareness. Most approach charts and airport diagrams are geo-referenced; most arrival, departure, and miscellaneous charts are not.



Figure - 1  
Avidyne CMax™ Electronic Approach Charts

## Section 2 - Limitations

1. Do not use the CMax Approach Charts function for navigation of the aircraft. The CMax Approach Charts function is intended to serve as a situational awareness tool only.
2. The Avidyne FlightMax EX5000C Pilot's Guide, P/N 600-00108-000, Revision 03 or later, must be available to the pilot during all flight operations.

## Section 3 - Emergency Procedures

### Loss of CMax™ Electronic Approach Charts

- In the event CMax Approach Charts cannot be displayed on the MFD, refer to back-up approach data such as paper copies or a laptop containing the JeppView software and data.
- If no back-up data is available contact Air Traffic Control for approach information.

## Section 4 - Normal Procedures

### • Note •

Back-up approach charts for CMax are not required. However, back-up approach data for departure, destination, and alternate field is recommended. Reference CMax Description in this supplement.

## Section 7 - System Description

The CMax installation is entirely software dependant. No additional hardware is required.

### • Note •

Back-up approach charts for CMax are not required. However, back-up approach data for departure, destination, and alternate field is recommended. Back-up approach data could be printed copies of published approach charts, a laptop containing the JeppView software and data, or notes providing the approach vertical data (the Garmin 430 can display lateral approach information).

Refer to Avidyne FlightMax EX5000C Pilot's Guide, for a more complete description of CMax Approach Charts, its operating modes, and additional detailed operating procedures.

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

# **XM Satellite Weather System**

When the XM Satellite Weather System system is installed in the Cirrus Design SR20, this POH Supplement is applicable and must be inserted in the Supplements Section (Section 9) of the Cirrus Design SR20 Pilot's Operating Handbook. This document must be carried in the airplane at all times. Information in this supplement adds to, supersedes, or deletes information in the basic SR20 Pilot's Operating Handbook.

• Note •

This POH Supplement Revision dated Revision 01: 12-15-07 supersedes and replaces the original release of this supplement dated Original: 10-12-05.

FAA Approved Joseph C. Mies Date 15 Dec 2007  
for Royace H. Prather, Manager  
Chicago Aircraft Certification Office, ACE-115C  
Federal Aviation Administration

## Section 1 - General

The XM Satellite Weather System enhances situational awareness by providing the pilot with real time, graphical weather information depicted on the MAP page of the EX5000C MFD display.



Figure - 1  
XM Satellite Weather Overlay

## Section 2 - Limitations

1. Do not use the XM Satellite Weather System for navigation of the aircraft. The XM Satellite Weather System is intended to serve as a situational awareness tool only.

## Section 3 - Emergency Procedures

No Change.

## Section 4 - Normal Procedures

No Change.

## Section 5 - Performance

No Change.

## Section 6 - Weight & Balance

Installation of the XM Satellite Weather System adds the following optional (Sym = O) equipment at the weight and arm shown in the following table.

ATA / Item	Description	Sym	Qty	Part Number	Unit Wt	Arm
34-07	XM Receiver	O	1	16665-001	1.7	114.0

## Section 7 - System Description

The XM Satellite Weather System enhances situational awareness by providing the pilot with real time, graphical weather information. The XM antenna, integrated with the COM1 antenna, receives weather information from dual-redundancy satellites. This signal is sent to the XM receiver, installed in the co-pilot side of the instrument console, which interprets and overlays the weather data on the MAP page of the EX5000C MFD.

Once activated, the XM Satellite Weather System will overlay the following weather data on the EX5000C MFD:

- NEXRAD Radar

- METARs
- SIGMETs
- AIRMETs
- TFRs
- Lightning Strikes

The XM Satellite Weather System is powered by 28 VDC supplied through the 3-amp Weather/Stormscope breaker on the Non-Essential Bus.

*Refer to Avidyne FlightMax EX5000C Pilot's Guide for a more complete description of XM Satellite Weather System, its operating modes, and additional detailed operating procedures.*



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

# **Avidyne Flight Director**

When the Avidyne Flight Director is installed in the Cirrus Design SR20, this POH Supplement is applicable and must be inserted in the Supplements Section (Section 9) of the Cirrus Design SR20 Pilot's Operating Handbook. This document must be carried in the airplane at all times. Information in this supplement adds to, supersedes, or deletes information in the basic SR20 Pilot's Operating Handbook.

• Note •

This POH Supplement Revision dated Revision 02: 12-15-07 supersedes and replaces the original release of this supplement dated Revision 01: 08-15-07.

FAA Approved Joseph C. Mies Date 15 Dec 2007  
for Royace H. Prather, Manager  
Chicago Aircraft Certification Office, ACE-115C  
Federal Aviation Administration

## Section 1 - General

The Flight Director system enhances situational awareness by reducing cockpit workload through providing a visual cue for the pilot to follow as indicated by the PFD's Flight Director Steering Command Bar. Through turning or pitching the airplane as "directed" by the Steering Command Bar, the pilot will follow the necessary course to arrive at a programmed destination.

The Avidyne system software version for this installation is 530-00159-XXX, where X can be any digit from 0 to 9.



Avidyne Primary Flight Display with Flight Director  
Figure - 1

## Section 2 - Limitations

1. The Flight Director System integrates with the Primary Flight Display (PFD) System. Adherence to the PFD imitations in the basic SR20 Pilot's Operating Handbook is mandatory.
2. The Avidyne FlightMax Entegra-Series PFD Pilot's Guide, P/N 600-00142-000, Revision 03, or latest revision, must be available to the pilot during all flight operations.

## Section 3 - Emergency Procedures

No Change.

## Section 4 - Normal Procedures

No Change.

## Section 5 - Performance

No Change.

## Section 6 - Weight & Balance

No Change.

## Section 7 - System Description

Fully integrated with the S-Tec System 55X Autopilot, the Flight Director system replaces the "flying W" aircraft reference symbol on the PFD with the Flight Director Steering Command Bars and Wedge.

The system consists of two lighted push-buttons installed on the upper, LH side of the instrument panel and associated relays and wiring between the PFD and autopilot. The remaining portion of the Flight Director system is entirely software dependant.

When a vertical mode of the autopilot is being used, a set of flight director command bars will indicate the required steering of the aircraft to achieve the commanded tracking from the autopilot. In autopilot mode, "AP" will be in the autopilot annunciation field, the command bars will be visible and magenta and the aircraft should track the bars.

In flight director only mode, "FD" will be displayed in the autopilot annunciation field, the command bars will be visible and green, and

the pilot is expected to actuate the flight controls as required to track the bars.

The following describes push-button annunciation and related Autopilot and Flight Director status:

No Annunciation	• Autopilot off. <i>or</i> • Autopilot not active in either roll or pitch control.
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Green <b>AP ON</b> Annunciation	• Autopilot active in roll and/or pitch control. • If Autopilot active in roll and pitch control, “AP” annunciation appears on top edge of PFD, and Flight Director Steering Command Bars MAGENTA.
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Amber <b>AP OFF</b> <b>FD ON</b> Annunciation	• Autopilot uncoupled. • If Autopilot active in roll and pitch control, Flight Director ON, “FD” annunciation appears on top edge of PFD, and Flight Director Steering Command Bars GREEN.
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The Flight Director system is powered by 28 VDC through the 5-amp AUTOPILOT circuit breaker on the Essential Bus.

*Refer to Avidyne FlightMax Entegra-Series PFD Pilot’s Guide, for a more complete description of the Flight Director, its operating modes, and additional detailed operating procedures.*

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

**SR20 Airplanes Equipped with the  
“G3 Wing”**

When the G3 Wing is installed on the Cirrus Design SR20 Serials 1878, 1886 and subsequent, this POH Supplement is applicable and must be inserted in the Supplements Section (Section 9) of the Cirrus Design SR20 Pilot's Operating Handbook. This document must be carried in the airplane at all times. Information in this supplement adds to, supersedes, or deletes information in the basic SR20 Pilot's Operating Handbook.

• Note •

This POH Supplement Change, dated Revision 02: 05-09-11, supersedes and replaces Revision 01 of this POH Supplement dated 08-26-09.

FAA Approved Joseph C. Miss Date May 9, 2011  
for Charles Smalley, Manager  
Chicago Aircraft Certification Office, ACE-115C  
Federal Aviation Administration

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# Section 1 - General

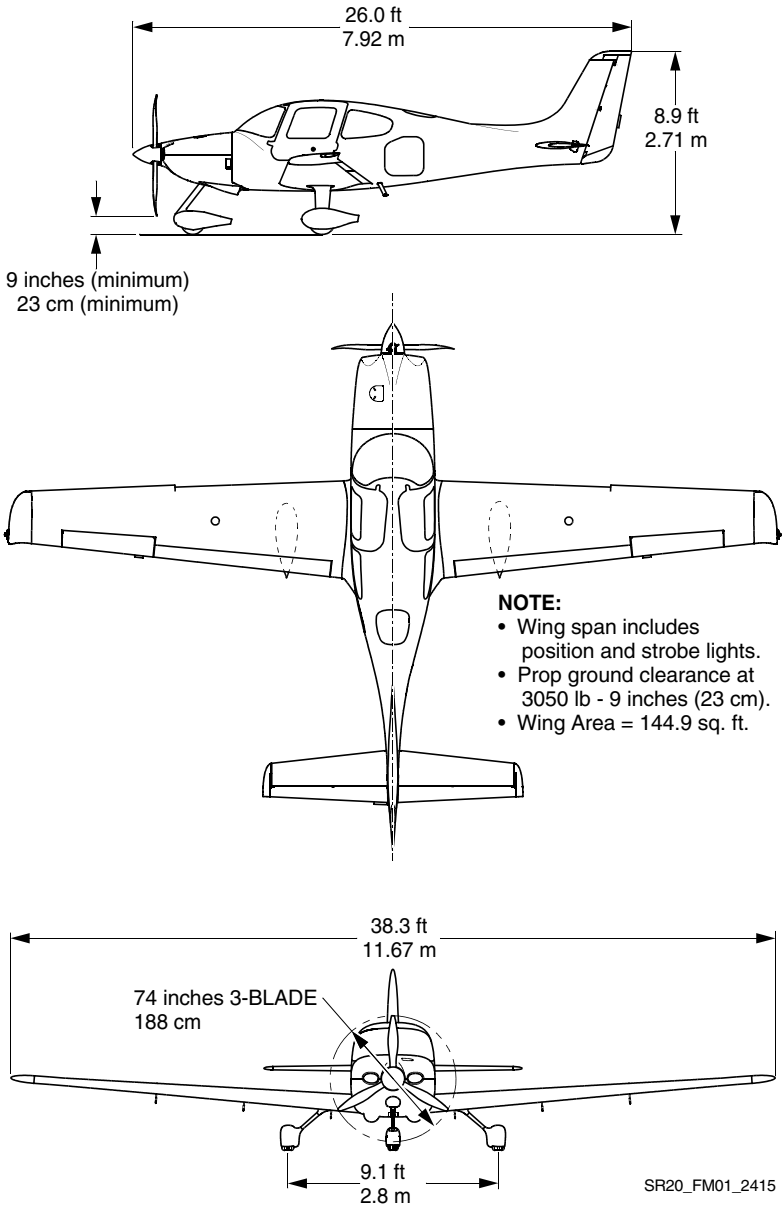
The G3 Wing is constructed in a conventional spar, rib, and shear section arrangement. The upper and lower skins are bonded to the spar, ribs, and aft shear web forming a torsion box that carries all of the wing bending and torsion loads. The rear shear webs are similar in construction but do not carry through the fuselage. The main spar is laminated epoxy/carbon fiber in a C-section, and is continuous from wing tip to wing tip. The wing spar passes under the fuselage below the two front seats and is attached to the fuselage in two locations. Lift and landing loads are carried by the single carry-through spar, plus a pair of rear shear webs (one on each wing) attached to the fuselage.

G3 Wingspan is increase by three feet and wing geometry is slightly changed with an 1° increase in dihedral which allows for the elimination of the aileron-rudder interconnect system. Because of the wingspan and geometry changes, aircraft performance data has been updated and included in Section 5 - Performance.

The main landing gear is moved slightly inboard and the strut angle increased to achieve an increase in airplane height of 1.5 inches.

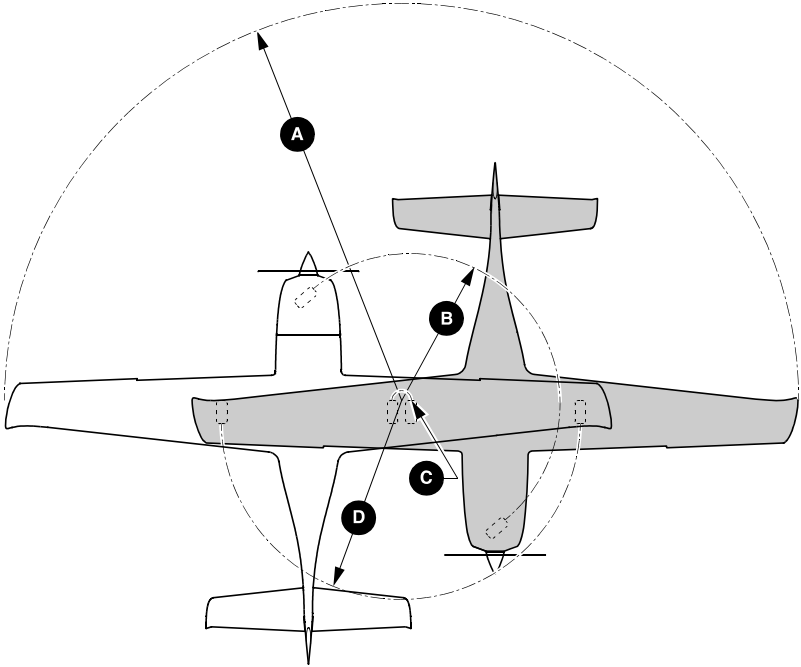
Other G3 Wing updates include:

- wing tip with integral, leading edge recognition lights.
- relocation of the fresh air inlets to the engine cowl and related environmental system changes,
- improved trailing edge aerodynamics
- improved wing root fairings,
- relocation of the stall warning port,



**Figure - 1**  
**Turning Radius**





**GROUND TURNING CLEARANCE**

<b>A</b>	RADIUS FOR WING TIP	.....	24.3 ft.	(7.41 m)
<b>B</b>	RADIUS FOR NOSE GEAR	.....	7.0 ft.	(2.16 m)
<b>C</b>	RADIUS FOR INSIDE GEAR	.....	0.5 ft.	(0.15 m)
<b>D</b>	RADIUS FOR OUTSIDE GEAR	.....	9.1 ft.	(2.77 m)

TURNING RADII ARE CALCULATED USING ONE BRAKE AND PARTIAL POWER. ACTUAL TURNING RADIUS MAY VARY AS MUCH AS THREE FEET.

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**Figure - 2**  
**Airplane Three View**

# The Airplane

## Fuel

Total Capacity .....58.5 U.S. Gallons (221.0 L)  
Total Usable .....56.0 U.S. Gallons (212.0 L)

## Maximum Certificated Weights

Maximum Gross for Takeoff ..... 3050 lb (1383 Kg)  
Maximum Useful Load ..... 1000 lb (454 Kg)  
Full Fuel Payload ..... 671 lb (304 Kg)

## Section 2 - Limitations

### Airspeed Limitations

The indicated airspeeds in the following table are based upon Section 5 Airspeed Calibrations using the normal static source. When using the alternate static source, allow for the airspeed calibration variations between the normal and alternate static sources.

Speed	KIAS	KCAS	Remarks
V <sub>NE</sub>	200	204	<b>Never Exceed Speed</b> is the speed limit that may not be exceeded at any time.
V <sub>NO</sub>	163	166	<b>Maximum Structural Cruising Speed</b> is the speed that should not be exceeded except in smooth air, and then only with caution.
V <sub>O</sub> 3050 Lb	130	131	<b>Operating Maneuvering Speed</b> is the maximum speed at which full control travel may be used. Below this speed the airplane stalls before limit loads are reached. Above this speed, full control movements can damage the airplane.
V <sub>FE</sub> 50% Flaps 100% Flaps	119 104	120 104	<b>Maximum Flap Extended Speed</b> is the highest speed permissible with wing flaps extended.
V <sub>PD</sub>	133	135	<b>Maximum Demonstrated Parachute Deployment Speed</b> is the maximum speed at which parachute deployment has been demonstrated.

## Airspeed Indicator Markings

The airspeed indicator markings are based upon Section 5 Airspeed Calibrations using the normal static source. When using the alternate static source, allow for the airspeed calibration variations between the normal and alternate static sources.

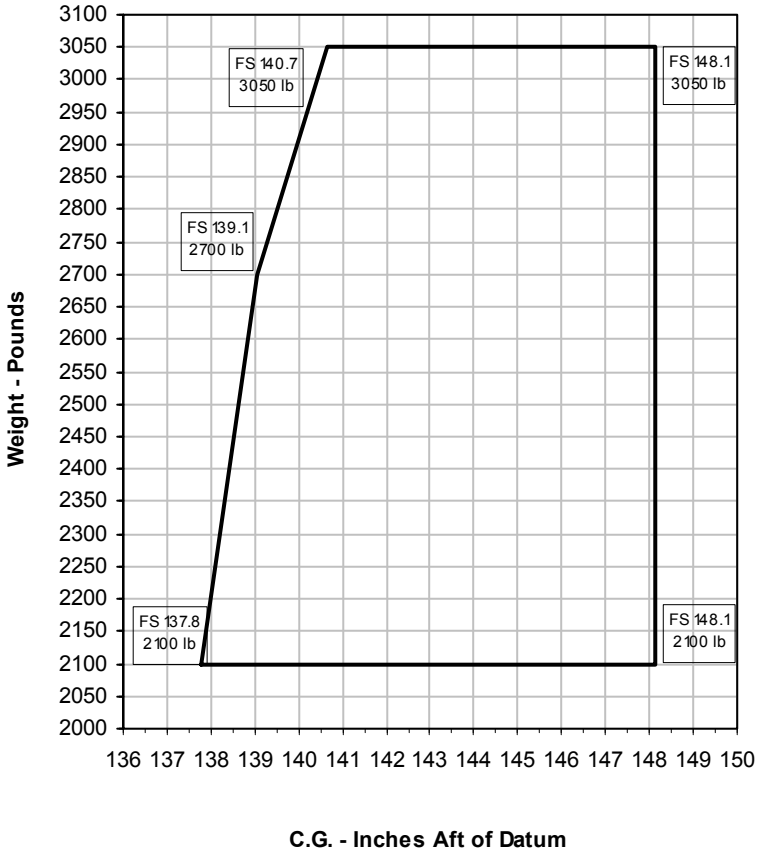
Marking	Value (KIAS)	Remarks
White Arc	61 - 104	Full Flap Operating Range. Lower limit is the most adverse stall speed in the landing configuration. Upper limit is the maximum speed permissible with flaps extended.
Green Arc	69 - 163	Normal Operating Range. Lower limit is the maximum weight stall at most forward C.G. with flaps retracted. Upper limit is the maximum structural cruising speed.
Yellow Arc	163 - 200	Caution Range. Operations must be conducted with caution and only in smooth air.
Red Line	200	Never exceed speed. Maximum speed for all operations.

## Weight Limits

Maximum Takeoff Weight ..... 3050 lb (1383 Kg)  
 Maximum Landing Weight ..... 3050 lb (1383 Kg)

# Center of Gravity Limits

Reference Datum ..... 100 inches forward of firewall  
Forward ..... Refer to Figure 3  
Aft ..... Refer to Figure 3



**Figure - 3**  
**C.G. Envelope**

## Flight Load Factor Limits

Flaps UP (0%), 3050 lb.....	+3.8g, -1.9g
Flaps 50%, 3050 lb.....	+1.9g, -0g
Flaps 100% (Down), 3050 lb. ....	+1.9g, -0g

## Fuel Limits

The maximum allowable fuel imbalance is 7.5 U.S. gallons (¼ tank).

Approved Fuel ..... Aviation Grade 100 LL (Blue) or 100 (Green)

Total Fuel Capacity ..... 58.5 U.S. gallons (229.0 L)

Total Fuel Each Tank ..... 29.3 U.S. gallons (114.5 L)

Total Usable Fuel (all flight conditions) ..... 56.0 U.S. gallons (212.0 L)

## Cirrus Airframe Parachute System (CAPS)

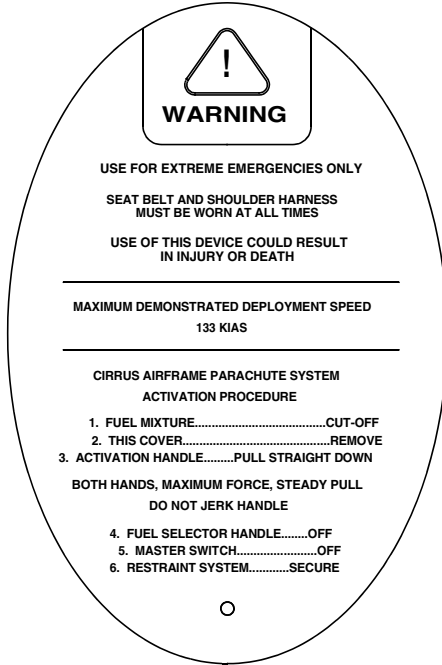
V<sub>PD</sub> Maximum Demonstrated Deployment Speed..... 133 KIAS

- Note •

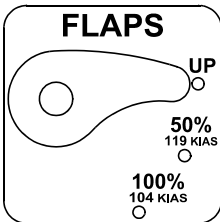
*Refer to Section 10 – Safety Information, for additional CAPS guidance.*

# Placards

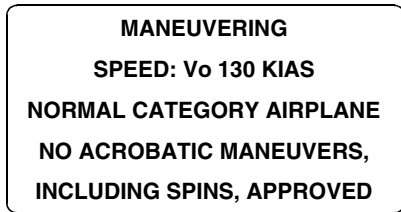
*CAPS Deployment Handle Cover, above pilot's right shoulder:*



*Engine control panel, flap control:*



*Instrument Panel, left :*



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# Section 3 - Emergency Procedures

## Airspeeds for Emergency Operations

### Maneuvering Speed:

3050 lb .....	130 KIAS
2600 lb .....	120 KIAS
2200 lb .....	110 KIAS

### Best Glide:

3050 lb .....	99 KIAS
2500 lb .....	95 KIAS

### Emergency Landing (Engine-out):

Flaps Up .....	87 KIAS
Flaps 50% .....	82 KIAS
Flaps 100% .....	76 KIAS

## Maximum Glide

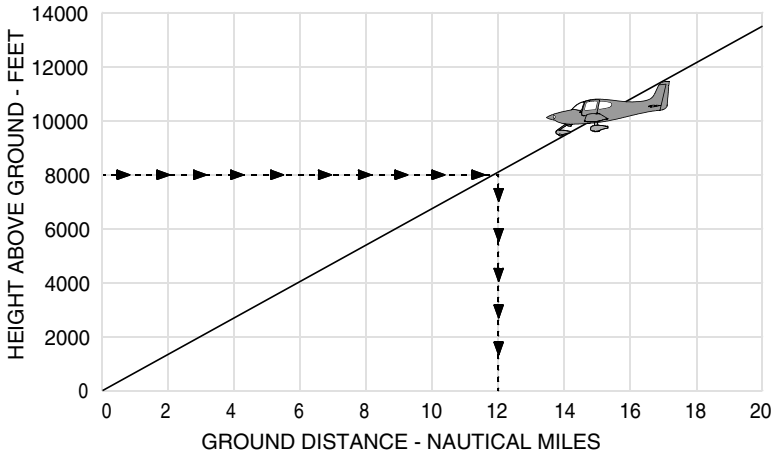
Conditions		Example:	
Power	OFF	Altitude	8,000 ft. AGL
Propeller	Windmilling	Airspeed	Best Glide
Flaps	0% (UP)	Glide Distance	12.0 NM
Wind	Zero		

### **Best Glide Speed**

99 KIAS at 3050 lb

95 KIAS at 2500 lb

### **Maximum Glide Ratio ~ 9 : 1**



## Emergency Descent

1. Power Lever ..... IDLE

2. Mixture ..... AS REQUIRED

### • Caution •

If significant turbulence is expected do not descend at indicated airspeeds greater than  $V_{NO}$  (163 KIAS)

3. Airspeed .....  $V_{NE}$  (200 KIAS)

# Section 4 - Normal Procedures

## Airspeeds for Normal Operation

Unless otherwise noted, the following speeds are based on a maximum weight of 3050 lb. and may be used for any lesser weight. However, to achieve the performance specified in Section 5 for takeoff and landing distance, the speed appropriate to the particular weight must be used.

### Takeoff Rotation:

- Normal, Flaps 50%.....65 - 70 KIAS
- Short Field, Flaps 50%..... 65 KIAS
- Obstacle Clearance, Flaps 50%..... 77 KIAS

### Enroute Climb, Flaps Up:

- Normal, SL ..... 96 KIAS
- Normal, 10,000' ..... 92 KIAS
- Best Rate of Climb, SL ..... 96 KIAS
- Best Rate of Climb, 10,000..... 92 KIAS
- Best Angle of Climb, SL..... 83 KIAS
- Best Angle of Climb, 10,000 ..... 87 KIAS

### Landing Approach:

- Normal Approach, Flaps Up ..... 88 KIAS
- Normal Approach, Flaps 50% ..... 83 KIAS
- Normal Approach, Flaps 100% ..... 78 KIAS
- Short Field, Flaps 100%..... 78 KIAS

### Go-Around, Flaps 50%:

- Full Power..... 78 KIAS

### Maximum Recommended Turbulent Air Penetration:

- 3050 Lb ..... 131 KIAS
- 2600 Lb ..... 122 KIAS
- 2200 Lb ..... 111 KIAS

### Maximum Demonstrated Crosswind Velocity:

- Takeoff or Landing ..... 20 Knots

## Airspeeds for Normal Operation

### Short Field Takeoff

- | 7. Airspeed at Obstacle.....77 KIAS

### Landing

#### *Short Field Landing*

- | For a short field landing in smooth air conditions, make an approach at 78 KIAS with full flaps using enough power to control the glide path (slightly higher approach speeds should be used under turbulent air conditions).

# Section 5 - Performance

## Airspeed Calibration: Normal Static Source

**Conditions:**

- Power for level flight or maximum continuous, whichever is less.
- Weight ..... 3050 LB

• Note •

Indicated airspeed values assume zero instrument error.

KIAS	KCAS		
	Flaps 0%	Flaps 50%	Flaps 100%
60	57	56	57
70	68	68	70
80	79	80	80
90	89	91	89
100	100	101	99
110	111	111	
120	121	121	
130	132		
140	142		
150	152		
160	163		
170	173		
180	183		
190	193		
200	204		

# Airspeed Calibration: Alternate Static Source

**Conditions:**

- Power for level flight or maximum continuous, whichever is less.
- Heater, Defroster & Vents ..... ON
- Weight ..... 3050 LB

• Note •

Indicated airspeed values assume zero instrument error.

KIAS	KCAS		
	Flaps 0%	Flaps 50%	Flaps 100%
60	61	58	54
70	68	66	63
80	77	74	72
90	85	83	82
100	94	92	92
110	103	102	101
120	112	112	
130	121	122	
140	131		
150	141		
160	150		
170	160		
180	170		
190	179		
200	189		
210	198		

# Altitude Correction: Normal Static Source

**Conditions:**

- Power for level flight or maximum continuous, whichever is less.
- Weight ..... 3050 LB

• Note •

Add correction to desired altitude to obtain indicated altitude to fly.

Indicated airspeed values assume zero instrument error.

Flaps	Press Alt	CORRECTION TO BE ADDED - FEET									
		Normal Static Source - KIAS									
		60	70	80	90	100	120	140	160	180	200
0%	S.L		12	9	5	0	-11	-23	-36	-49	-59
	5000		13	10	5	0	-13	-27	-42	-56	-69
	10000		16	12	6	0	-15	-32	-49	-66	-80
	15000		18	14	7	0	-17	-37	-58	-77	-94
50%	S.L		9	2	-4	-10	-16				
	5000		11	3	-5	-12	-18				
	10000		12	3	-6	-14	-22				
100%	S.L	10	1	-1	2	6					
	5000	10	-1	1	6	6					
	10000	37	45	48	50	56					

## Altitude Correction: Alternate Static Source

**Conditions:**

- Power for level flight or maximum continuous, whichever is less.
- Heater, Defroster, & Vents ..... ON
- Weight ..... 3050 LB

• Note •

Add correction to desired altitude to obtain indicated altitude to fly.

Indicated airspeed values assume zero instrument error.

Flaps	Press Alt	CORRECTION TO BE ADDED - FEET									
		Normal Static Source - KIAS									
		60	70	80	90	100	120	140	160	180	200
0%	S.L		12	28	43	57	82	104	126	148	172
	5000		16	35	54	71	104	136	168	203	242
	10000		20	43	66	87	128	169	211	258	311
	15000		23	51	78	103	152	200	251	308	373
50%	S.L		43	65	87	108	148				
	5000		21	32	39	42	26				
	10000		36	54	70	82	88				
100%	S.L	42	56	67	80	95					
	5000	37	45	48	50	56					
	10000	61	81	99	119	148					



# Stall Speeds

**Conditions:**

- Weight ..... 3050 LB
- C.G. .... Noted
- Power ..... Idle
- Bank Angle ..... Noted

• Note •

Altitude loss during wings level stall may be 250 feet or more.

KIAS values may not be accurate at stall.

Weight  LB	Bank Angle  Deg	STALL SPEEDS					
		Flaps 0% Full Up		Flaps 50%		Flaps 100% Full Down	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
3050  Most FWD C.G.	0	69	67	66	63	61	59
	15	70	68	67	65	62	60
	30	74	72	70	68	64	63
	45	81	80	76	75	70	70
	60	95	95	89	90	83	83
3050  Most AFT C.G.	0	69	67	63	60	59	56
	15	75	68	64	61	60	57
	30	77	72	66	64	62	60
	45	83	79	72	71	68	67
	60	99	94	85	85	79	79

# Takeoff Distance

**Conditions:**

- Winds.....Zero
- Runway.....Dry, Level, Paved
- Flaps.....50%
- Power.....Maximum, set before brake release

The following factors are to be applied to the computed takeoff distance for the noted condition:

- Headwind - Subtract 10% from computed distance for each 12 knots headwind.
- Tailwind - Add 10% for each 2 knots tailwind up to 10 knots.
- Grass Runway, Dry - Add 20% to ground roll distance.
- Grass Runway, Wet - Add 30% to ground roll distance.
- Sloped Runway - Increase table distances by 22% of the ground roll distance at Sea Level, 30% of the ground roll distance at 5000 ft, 43% of the ground roll distance at 10,000 ft for each 1% of upslope. Decrease table distances by 7% of the ground roll distance at Sea Level, 10% of the ground roll distance at 5000 ft, and 14% of the ground roll distance at 10,000 ft for each 1% of downslope.

**• Caution •**

The above corrections for runway slope are required to be included herein. These corrections should be used with caution since published runway slope data is usually the net slope from one end of the runway to the other. Many runways will have portions of their length at greater or lesser slopes than the published slope, lengthening (or shortening) takeoff ground roll estimated from the table.

- If brakes are not held while applying power, distances apply from point where full throttle and mixture setting is complete.
- For operation in outside air temperatures colder than this table provides, use coldest data shown.
- For operation in outside air temperatures warmer than this table provides, use extreme caution.

# Takeoff Distance: 3000 LB

PRESS ALT FT		DISTANCE FT		TEMPERATURE ~ °C				ISA
		0	10	20	30	40		
<b>WEIGHT: 3050 LB</b> <b>Speed at Liftoff: 71 KIAS</b> <b>Speed over 50 Ft. Obstacle: 77 KIAS</b> <b>Flaps: 50%</b> <b>Power: Takeoff Power</b> <b>Runway: Dry, Paved</b>		<b>Headwind:</b> Subtract 10% for each 12 knots headwind. <b>Tailwind:</b> Add 10% for each 2 knots tailwind up to 10 knots. <b>Runway Slope:</b> Ref. Factors. <b>Dry Grass:</b> Add 20% to Ground Roll. <b>Wet Grass:</b> Add 30% to Ground Roll						
		<b>SL</b>	<b>Grnd Roll</b>	1319	1424	1534	1648	1767
		<b>50 ft</b>	1996	2145	2300	2460	2626	2221
<b>1000</b>		<b>Grnd Roll</b>	1448	1563	1684	1809	1940	1599
		<b>50 ft</b>	2183	2346	2515	2691	2872	2396
<b>2000</b>		<b>Grnd Roll</b>	1590	1717	1850	1988	2131	1730
		<b>50 ft</b>	2389	2568	2753	2945	3144	2586
<b>3000</b>		<b>Grnd Roll</b>	1748	1888	2034	2185	2343	1874
		<b>50 ft</b>	2616	2812	3015	3226	3444	2792
<b>4000</b>		<b>Grnd Roll</b>	1923	2077	2237	2404	2577	2030
		<b>50 ft</b>	2868	3082	3305	3536	3775	3017
<b>5000</b>		<b>Grnd Roll</b>	2117	2287	2463	2647	2837	2201
		<b>50 ft</b>	3145	3381	3625	3879	4141	3262
<b>6000</b>		<b>Grnd Roll</b>	2333	2519	2714	2916	3126	2388
		<b>50 ft</b>	3452	3711	3980	4258	4546	3529
<b>7000</b>		<b>Grnd Roll</b>	2572	2777	2992			2592
		<b>50 ft</b>	3792	4076	4371			3820
<b>8000</b>		<b>Grnd Roll</b>	2837	3064	3300			2815
		<b>50 ft</b>	4167	4480	4805			4137
<b>9000</b>		<b>Grnd Roll</b>	3132	3383	3644			3059
		<b>50 ft</b>	4584	4928	5285			4483
<b>10000</b>		<b>Grnd Roll</b>	3460	3737				3326
		<b>50 ft</b>	5045	5424				4860

# Takeoff Distance: 2500 LB

WEIGHT: 2500 LB Speed at Liffoff: 68 KIAS Speed over 50 Ft Obstacle: 75 KIAS Flaps: 50% Power: Takeoff Power Runway: Dry, Paved		Headwind: Subtract 10% for each 12 knots headwind. Tailwind: Add 10% for each 2 knots tailwind up to 10 knots. Runway Slope: Ref. Factors. Dry Grass: Add 20% to Ground Roll. Wet Grass: Add 30% to Ground Roll.					
PRESS ALT FT	DISTANCE FT	TEMPERATURE ~ °C					ISA
		0	10	20	30	40	
SL	Grnd Roll	787	850	915	983	1054	882
	50 ft	1215	1306	1400	1497	1598	1353
1000	Grnd Roll	864	933	1005	1079	1157	954
	50 ft	1329	1428	1531	1637	1748	1459
2000	Grnd Roll	949	1025	1104	1186	1271	1032
	50 ft	1454	1563	1676	1792	1913	1574
3000	Grnd Roll	1043	1126	1213	1304	1398	1118
	50 ft	1593	1712	1835	1963	2095	1700
4000	Grnd Roll	1147	1239	1335	1434	1537	1211
	50 ft	1745	1876	2011	2151	2296	1836
5000	Grnd Roll	1263	1364	1469	1579	1693	1313
	50 ft	1914	2057	2206	2359	2518	1985
6000	Grnd Roll	1392	1503	1619	1739	1865	1424
	50 ft	2101	2258	2421	2589	2764	2147
7000	Grnd Roll	1534	1657	1785			1546
	50 ft	2307	2479	2658			2324
8000	Grnd Roll	1692	1828	1969			1679
	50 ft	2535	2725	2922			2516
9000	Grnd Roll	1868	2018	2174			1825
	50 ft	2788	2997	3213			2727
10000	Grnd Roll	2064	2229				1984
	50 ft	3068	3298				2956

# Takeoff Climb Gradient

**Conditions:**

- Power ..... Full Throttle
- Mixture ..... Full Rich
- Flaps ..... 50%
- Airspeed ..... Best Rate of Climb

• Note •

Climb Gradients shown are the gain in altitude for the horizontal distance traversed expressed as Feet per Nautical Mile.

Cruise climbs or short duration climbs are permissible at best power as long as altitudes and temperatures remain within those specified in the table.

For operation in air colder than this table provides, use coldest data shown.

For operation in air warmer than this table provides, use extreme caution.

Weight  LB	Press Alt  FT	Climb Speed  KIAS	CLIMB GRADIENT ~ Feet per Nautical Mile				
			Temperature ~ °C				ISA
			-20	0	20	40	
3050	SL	89	678	621	568	518	581
	2000	88	587	532	481	433	504
	4000	87	500	447	398	351	430
	6000	86	416	365	318	274	358
	8000	85	336	287	241	199	289
	10000	84	259	212			224
2500	SL	88	957	880	808	741	826
	2000	87	841	767	698	634	729
	4000	86	730	659	593	531	636
	6000	85	624	555	492		545
	8000	84	522	456	396		459
	10000	83	425	362			377

# Takeoff Rate of Climb

**Conditions:**

- Power..... Full Throttle
- Mixture..... Full Rich
- Flaps..... 50%
- Airspeed ..... Best Rate of Climb

• Note •

Rate-of-Climb values shown are change in altitude for unit time expended expressed in Feet per Minute.

Cruise climbs or short duration climbs are permissible at best power as long as altitudes and temperatures remain within those specified in the table.

For operation in air colder than this table provides, use coldest data shown.

For operation in air warmer than this table provides, use extreme caution.

Weight  LB	Press Alt  FT	Climb Speed  KIAS	RATE OF CLIMB ~ Feet per Minute				
			Temperature ~ °C				
			-20	0	20	40	ISA
3050	SL	89	905	862	817	771	828
	2000	88	807	761	712	663	734
	4000	87	707	657	606	554	639
	6000	86	607	553	499	444	545
	8000	85	504	447	390	333	450
	10000	84	401	341			356
2500	SL	88	1256	1201	1144	1086	1158
	2000	87	1136	1077	1017	955	1044
	4000	86	1014	952	888	824	929
	6000	85	892	825	758		815
	8000	84	768	698	627		701
	10000	83	643	569			587

# Enroute Climb Gradient

**Conditions:**

- Power ..... Full Throttle
- Mixture ..... Full Rich
- Flaps ..... 0% (UP)
- Airspeed ..... Best Rate of Climb

• Note •

Climb Gradients shown are the gain in altitude for the horizontal distance traversed expressed as Feet per Nautical Mile.

Cruise climbs or short duration climbs are permissible at best power as long as altitudes and temperatures remain within those specified in the table.

For operation in air colder than this table provides, use coldest data shown.

For operation in air warmer than this table provides, use extreme caution.

The Maximum Operating Altitude of 17,500 feet MSL may be obtained if the airplane's gross weight does not exceed 2900 lb and the ambient temperature is -20° C or less.

Weight  LB	Press Alt  FT	Climb Speed  KIAS	CLIMB GRADIENT - Feet per Nautical Mile				
			Temperature ~ °C				ISA
			-20	0	20	40	
3050	SL	96	650	589	533	481	549
	2000	96	560	502	448	398	474
	4000	95	474	418	367	319	402
	6000	94	392	338	289	244	332
	8000	93	313	216	214	171	265
	10000	92	237	188			200
	12000	91	164	118			139
14000	90	95	51			80	
2500	SL	93	846	777	712	652	728
	2000	93	741	674	612	554	640
	4000	92	640	576	516	461	555
	6000	91	543	482	425		473
	8000	91	451	392	337		395
	10000	90	363	306			320
	12000	89	279	224			248
14000	88	198	147			180	

# Enroute Rate of Climb

**Conditions:**

- Power..... Full Throttle
- Mixture..... Full Rich
- Flaps.....0% (UP)
- Airspeed ..... Best Rate of Climb

• Note •

Rate-of-Climb values shown are change in altitude in feet per unit time expressed in Feet per Minute.

For operation in air colder than this table provides, use coldest data shown.

For operation in air warmer than this table provides, use extreme caution.

Cruise climbs or short duration climbs are permissible at best power as long as altitudes and temperatures remain within those specified in the table.

The Maximum Operating Altitude of 17,500 feet MSL may be obtained if the airplane's gross weight does not exceed 2900 lb and the ambient temperature is -20° C or less.

Weight  LB	Press Alt  FT	Climb Speed  KIAS	RATE OF CLIMB ~ Feet per Minute				
			Temperature ~ °C				
			-20	0	20	40	ISA
3050	SL	96	1007	949	890	830	905
	2000	96	868	808	748	688	775
	4000	95	756	693	630	567	671
	6000	94	642	576	510	445	566
	8000	93	527	458	389	321	462
	10000	92	411	339			357
	12000	91	294	218			252
	14000	90	175	97			148
2500	SL	93	1231	1175	1117	1058	1132
	2000	93	1109	1050	988	926	1016
	4000	92	987	923	858	793	900
	6000	91	863	796	727		785
	8000	91	738	667	595		670
	10000	90	612	537			555
	12000	88	484	405			440
	14000	88	355	273			325



# Time, Fuel and Distance to Climb

**Conditions:**

- Power ..... Full Throttle
- Mixture ..... Full Rich
- Weight ..... 3050 LB
- Winds ..... Zero
- Climb Airspeed ..... Noted

• Note •

Taxi Fuel - Add 1 gallon for start, taxi, and takeoff.

Temperature - Add 10% to computed values for each 10° C above standard.

Cruise climbs or short duration climbs are permissible at best power as long as altitudes and temperatures remain within those specified in the table.

Press Alt FT	OAT (ISA) °C	Climb Speed KIAS	Rate Of Climb FPM	TIME, FUEL, DISTANCE ~ From Sea Level		
				Time Minutes	Fuel U.S. Gal	Distance NM
SL	15	96	880	0.0	0.0	0
1000	13	96	828	1.3	0.3	2
2000	11	96	775	2.4	0.6	4
3000	9	95	723	3.8	1.0	6
4000	7	95	671	5.2	1.3	8
5000	5	95	618	6.7	1.7	11
6000	3	94	566	8.4	2.0	14
7000	1	94	514	10.3	2.4	17
8000	-1	93	462	12.3	2.9	21
9000	-3	93	409	14.6	3.3	25
10000	-5	92	357	17.2	3.8	29
11000	-7	92	305	20.3	4.4	35
12000	-9	91	252	23.8	5.0	41
13000	-11	91	200	28.3	5.8	49
14000	-13	90	148	34.0	6.8	60

# Balked Landing Climb Gradient

**Conditions:**

- Power..... Full Throttle
- Mixture..... Full Rich
- Flaps..... 100% (DN)
- Climb Airspeed ..... Best Rate of Climb

• Note •

Balked Landing Climb Gradients shown are the gain in altitude for the horizontal distance traversed expressed as Feet per Nautical Mile.

Dashed cells in the table represent performance below the minimum balked landing climb requirements.

For operation in air colder than this table provides, use coldest data shown.

For operation in air warmer than this table provides, use extreme caution.

This chart is required data for certification. However, significantly better performance can be achieved by climbing at Best Rate of Climb speeds shown with flaps down or following the Go-Around / Balked Landing procedure in Section 4.

Weight	Press Alt	Climb Speed	CLIMB GRADIENT ~ Feet per Nautical Mile				
			Temperature ~ °C				
LB	FT	KIAS	-20	0	20	40	ISA
3050	SL	84	654	588	527	470	542
	2000	81	569	504	444	388	470
	4000	78	484	420	361	306	399
	6000	75	399	335	277		326
	8000	72	313	250	193		253
	10000	69	225	164			179
2500	SL	84	878	796	720	650	739
	2000	81	779	698	624	556	657
	4000	78	680	601	528	461	575
	6000	75	582	504	433		493
	8000	72	485	408	338		412
	10000	69	387	311			329

## Balked Landing Rate of Climb

**Conditions:**

- Power ..... Full Throttle
- Mixture ..... Full Rich
- Flaps ..... 100% (DN)
- Climb Airspeed..... Noted

• Note •

Balked Landing Rate of Climb values shown are the full flaps change in altitude for unit time expended expressed in Feet per Minute.

Dashed cells in the table represent performance below the minimum balked landing climb requirements.

For operation in air colder than this table provides, use coldest data shown.

For operation in air warmer than this table provides, use extreme caution.

This chart is required data for certification. However, significantly better performance can be achieved by climbing at Best Rate of Climb speeds shown with flaps down or following the Go-Around / Balked Landing procedure in Section 4.

Weight LB	Press Alt FT	Climb Speed KIAS	RATE OF CLIMB ~ Feet per Minute				
			Temperature ~ °C				
			-20	0	20	40	ISA
3050	SL	84	854	798	741	684	756
	2000	81	744	685	625	565	652
	4000	78	633	571	508	446	549
	6000	75	521	455	390		445
	8000	72	407	339	271		342
	10000	69	293	221			239
2500	SL	84	1140	1076	1010	944	1027
	2000	81	1014	946	877	808	908
	4000	78	886	815	743	671	790
	6000	75	759	683	608		672
	8000	72	630	552	474		556
	10000	69	502	420			440

# Landing Distance

**Conditions:**

- Technique .....Normal
  - Winds.....Zero
  - Runway.....Dry, Level, Paved
  - Flaps..... 100%
  - Power.....3° Power Approach
- to 50 FT obstacle, then reduce power passing the estimated 50 foot point and smoothly continue power reduction to reach idle just prior to touchdown.

• Note •

The following factors are to be applied to the computed landing distance for the noted condition:

- Headwind - Subtract 10% from table distances for each 13 knots headwind.
- Tailwind - Add 10% to table distances for each 2 knots tailwind up to 10 knots.
- Grass Runway, Dry - Add 20% to ground roll distance.
- Grass Runway, Wet - Add 60% to ground roll distance.
- Sloped Runway - Increase table distances by 27% of the ground roll distance for each 1% of downslope. Decrease table distances by 9% of the ground roll distance for each 1% of upslope.

• Caution •

The above corrections for runway slope are required to be included herein. These corrections should be used with caution since published runway slope data is usually the net slope from one end of the runway to the other. Many runways will have portions of their length at greater or lesser slopes than the published slope, lengthening (or shortening) landing ground roll estimated from the table.

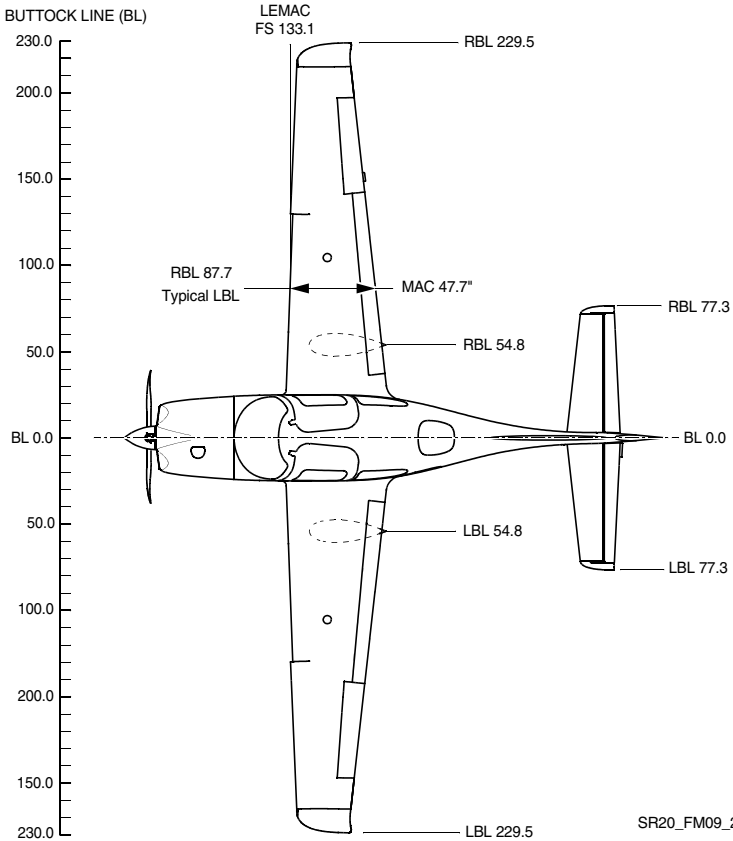
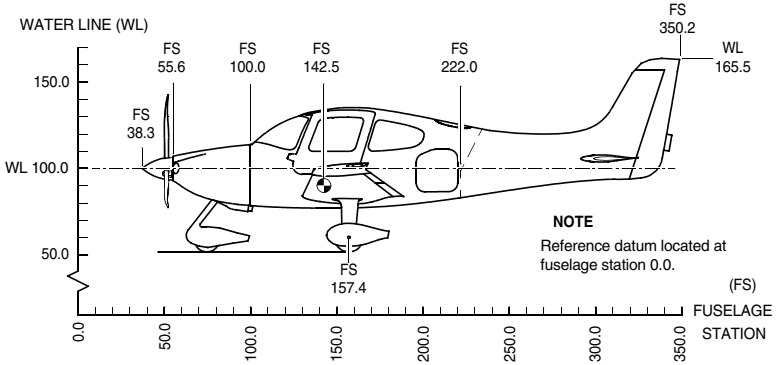
- For operation in outside air temperatures colder than this table provides, use coldest data shown.
- For operation in outside air temperatures warmer than this table provides, use extreme caution.

## Landing Distance

<b>WEIGHT: 3050 LB</b> <b>Speed over 50 Ft Obstacle: 78 KIAS</b> <b>Flaps: 100%</b> <b>Power: Idle</b> <b>Runway: Dry, Level Paved Surface</b>		<b>Headwind:</b> Subtract 10% per each 13 knots headwind. <b>Tailwind:</b> Add 10% for each 2 knots tailwind up to 10 knots. <b>Runway Slope:</b> Ref. Factors. <b>Dry Grass:</b> Add 20% to Ground Roll <b>Wet Grass:</b> Add 60% to Ground Roll					
PRESS ALT FT	DISTANCE  FT	TEMPERATURE ~ °C					ISA
		0	10	20	30	40	
<b>SL</b>	<b>Grnd Roll</b>	809	838	868	897	927	853
	<b>Total</b>	2557	2609	2663	2717	2773	2636
<b>1000</b>	<b>Grnd Roll</b>	838	869	900	931	961	878
	<b>Total</b>	2610	2665	2722	2779	2838	2682
<b>2000</b>	<b>Grnd Roll</b>	870	901	933	965	997	905
	<b>Total</b>	2666	2725	2785	2846	2907	2731
<b>3000</b>	<b>Grnd Roll</b>	902	935	968	1001	1034	932
	<b>Total</b>	2726	2788	2852	2916	2981	2782
<b>4000</b>	<b>Grnd Roll</b>	936	971	1005	1039	1073	960
	<b>Total</b>	2790	2856	2923	2991	3060	2837
<b>5000</b>	<b>Grnd Roll</b>	972	1007	1043	1079	1114	990
	<b>Total</b>	2858	2928	2999	3070	3143	2894
<b>6000</b>	<b>Grnd Roll</b>	1009	1046	1083	1120	1157	1021
	<b>Total</b>	2931	3004	3079	3155	3232	2954
<b>7000</b>	<b>Grnd Roll</b>	1048	1086	1125	1163	1201	1052
	<b>Total</b>	3008	3086	3165	3245	3326	3017
<b>8000</b>	<b>Grnd Roll</b>	1089	1128	1168	1208	1248	1085
	<b>Total</b>	3091	3173	3256	3341	3427	3084
<b>9000</b>	<b>Grnd Roll</b>	1131	1173	1214	1255	1297	1119
	<b>Total</b>	3179	3265	3353	3443	3533	3154
<b>10000</b>	<b>Grnd Roll</b>	1176	1219	1262	1305	1348	1155
	<b>Total</b>	3272	3364	3457	3551	3646	3228

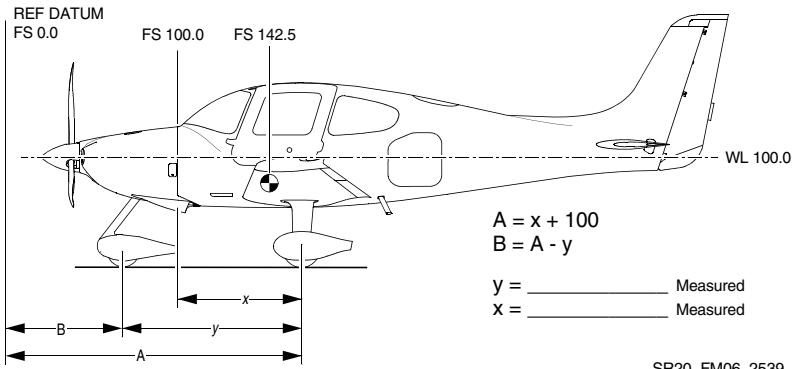
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# Section 6 - Weight and Balance



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# Airplane Weighing Form



Weighing Point	Scale Reading	- Tare	= Net Weight	X Arm	= Moment
L Main				A=	
R Main				A=	
Nose				B=	
<b>Total As Weighed</b>				CG=	
<b>CG = Total Moment / Total Weight</b>					
<i>Space below provided for additions or subtractions to as weighed condition</i>					
<b>Empty Weight</b>				CG=	
<b>Engine Oil (if oil drained)</b> <i>15 lb at FS 78.4, moment = 1176</i>					
Unusable Fuel			15.0	154.9	2324
Basic Empty Weight				CG=	

**Figure - 4**  
**Airplane Dimensional Data**



## Airplane Weighing Procedures

A basic empty weight and center of gravity were established for this airplane when the airplane was weighed just prior to initial delivery. However, major modifications, loss of records, addition or relocation of equipment, accomplishment of service bulletins, and weight gain over time may require re-weighing to keep the basic empty weight and center of gravity current. The frequency of weighing is determined by the operator. All changes to the basic empty weight and center of gravity are the responsibility of the operator. *Refer to Section 8 for specific servicing procedures.*

1. Preparation:
  - a. Inflate tires to recommended operating pressures.
  - b. Service brake reservoir.
  - c. Drain fuel system.
  - d. Service engine oil.
  - e. Move crew seats to the most forward position.
  - f. Raise flaps to the fully retracted position.
  - g. Place all control surfaces in neutral position.
  - h. Verify equipment installation and location by comparison to equipment list.
2. Leveling:
  - a. Level longitudinally with a spirit level placed on the pilot door sill and laterally with of a spirit level placed across the door sills. Alternately, level airplane by sighting the forward and aft tool holes along waterline 95.9.
  - b. Place scales under each wheel (minimum scale capacity, 500 pounds nose, 1000 pounds each main).
  - c. Deflate the nose tire and/or shim underneath scales as required to properly center the bubble in the level.

3. Weighing:
  - a. With the airplane level, doors closed, and brakes released, record the weight shown on each scale. Deduct the tare, if any, from each reading.
4. Measuring:
  - a. Obtain measurement 'x' by measuring horizontally along the airplane center line (BL 0) from a line stretched between the main wheel centers to a plumb bob dropped from the forward side of the firewall (FS 100). Add 100 to this measurement to obtain left and right weighing point arm (dimension 'A'). Typically, dimension 'A' will be in the neighborhood of 157.5.
  - b. Obtain measurement 'y' by measuring horizontally and parallel to the airplane centerline (BL 0), from center of nosewheel axle, left side, to a plumb bob dropped from the line stretched between the main wheel centers. Repeat on right side and average the measurements. Subtract this measurement from dimension 'A' to obtain the nosewheel weighing point arm (dimension 'B').
5. Determine and record the moment for each of the main and nose gear weighing points using the following formula:

$$\text{Moment} = \text{Net Weight} \times \text{Arm}$$

6. Calculate and record the as-weighed weight and moment by totaling the appropriate columns.
7. Determine and record the as-weighed C.G. in inches aft of datum using the following formula:
$$\text{C.G.} = \text{Total Moment} / \text{Total Weight}$$
8. Add or subtract any items not included in the as-weighed condition to determine the empty condition. Application of the above C.G. formula will determine the C.G for this condition.
9. Add the correction for engine oil (15 lb at FS 78.4), if the airplane was weighed with oil drained. Add the correction for unusable fuel (15.0 lb at FS 154.9) to determine the Basic Empty Weight and Moment. Calculate and record the Basic Empty Weight C.G. by applying the above C.G. formula.

10. Record the new weight and C.G. values on the Weight and Balance Record.

The above procedure determines the airplane Basic Empty Weight, moment, and center of gravity in inches aft of datum. C.G. can also be expressed in terms of its location as a percentage of the airplane Mean Aerodynamic Cord (MAC) using the following formula:

$$C.G. \% MAC = 100 \times (C.G. \text{ Inches} - LEMAC) / MAC$$

Where:

$$LEMAC = 133.1$$

$$MAC = 47.7$$

# Weight & Balance Loading Form

Serial Num: \_\_\_\_\_ Date: \_\_\_\_\_

Reg. Num: \_\_\_\_\_ Initials: \_\_\_\_\_

Item	Description	Weight LB	Moment/ 1000
1.	<b>Basic Empty Weight</b> <i>Includes unusable fuel &amp; full oil</i>		
2.	Front Seat Occupants <i>Pilot &amp; Passenger (total)</i>		
3.	Rear Seat Occupants		
4.	Baggage Area <i>130 lb maximum</i>		
5.	<b>Zero Fuel Condition Weight</b> <i>Sub total item 1 thru 4</i>		
6.	Fuel Loading <i>56 Gallon @ 6.0 lb/gal. Maximum</i>		
7.	<b>Ramp Condition Weight</b> <i>Sub total item 5 and 6</i>		
8.	Fuel for start, taxi, and runup <i>Normally 6 lb at average moment of 922.8</i>	-	-
9.	<b>Takeoff Condition Weight</b> <i>Subtract item 8 from item 7</i>		

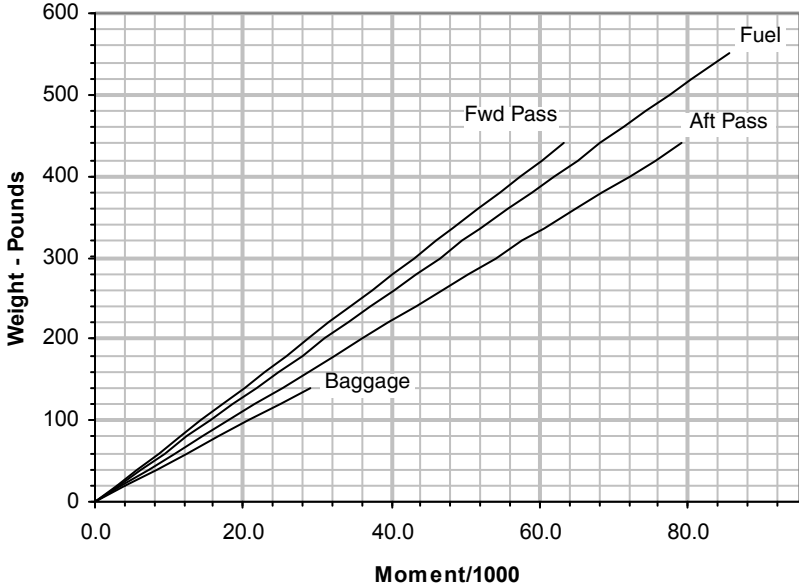
• Note •

The Takeoff Condition Weight must not exceed 3050 lb.

The Takeoff Condition Moment must be within the Minimum Moment to Maximum Moment range at the Takeoff Condition Weight. (Refer to Moment Limits graphs).

# Loading Data

Use the following chart or table to determine the moment/1000 for fuel and payload items to complete the Loading Form



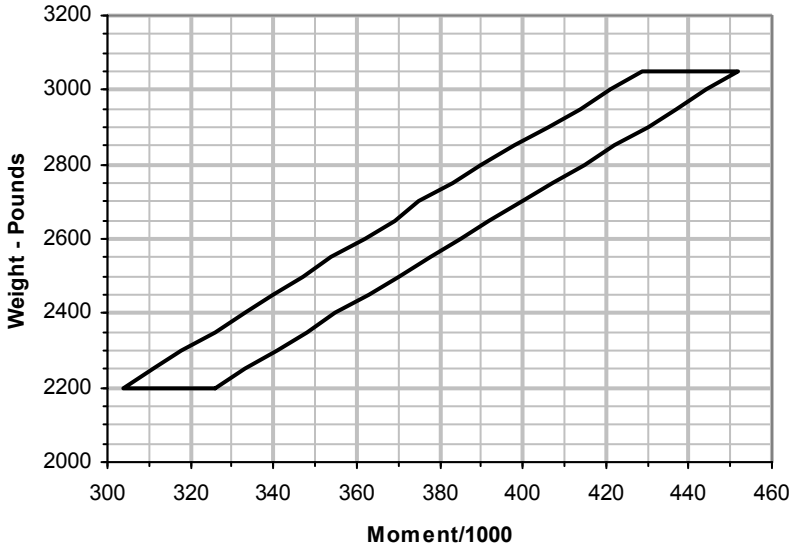
Weight LB	Fwd Pass FS 143.5	Aft Pass FS 180.0	Baggage FS 208.0	Fuel FS 153.8	Weight LB	Fwd Pass FS 143.5	Aft Pass FS 180.0	Fuel FS 153.8
20	2.87	3.60	4.16	3.10	220	31.57	39.60	34.08
40	5.74	7.20	8.32	6.20	240	34.44	43.20	37.18
60	8.61	10.80	12.48	9.29	260	37.31	46.80	40.27
80	11.48	14.40	16.64	12.39	280	40.18	50.40	43.37
100	14.35	18.00	20.80	15.49	300	43.05	54.00	46.47
120	17.22	21.60	24.96	18.59	320	45.92	57.60	49.57
140	20.09	25.20	(27.04)*	21.69	336**	48.79	61.20	52.05
160	22.96	28.80		24.78	360	51.66	64.80	
180	25.83	32.40		27.88	380	54.53	68.40	
200	28.70	36.00		30.98	400	57.40	72.00	

\*130 lb Maximum

\*\*56 U.S Gallons Usable

## Moment Limits

Use the following chart or table to determine if the weight and moment from the completed Weight and Balance Loading Form are within limits.



Weight LB	Moment/1000		Weight LB	Moment/1000	
	Minimum	Maximum		Minimum	Maximum
2200	304	326	2700	375	398
2250	311	333	2750	383	406
2300	318	341	2800	390	414
2350	326	348	2850	398	421
2400	333	354	2900	406	429
2450	340	362	2950	414	437
2500	347	369	3000	421	444
2550	354	375	3050	429	452
2600	362	383	2700	375	398
2650	369	390			

# Section 7 - Systems Description

## Airframe

### Wings

The wing structure is constructed of composite materials producing wing surfaces that are smooth and seamless. The wing cross section is a blend of several high performance airfoils. A high aspect ratio results in low drag. Each wing provides attach structure for the main landing gear and contains a 29.3-gallon fuel tank.

The G3 Wing is constructed in a conventional spar, rib, and shear section arrangement. The upper and lower skins are bonded to the spar, ribs, and aft shear web forming a torsion box that carries all of the wing bending and torsion loads. The rear shear webs are similar in construction but do not carry through the fuselage. The main spar is laminated epoxy/carbon fiber in a C-section, and is continuous from wing tip to wing tip. The wing spar passes under the fuselage below the two front seats and is attached to the fuselage in two locations. Lift and landing loads are carried by the single carry-through spar, plus a pair of rear shear webs (one on each wing) attached to the fuselage.

### Rudder System

G3 Wing geometry is slightly changed with an increase in dihedral of 1° which allows for the elimination of the aileron-rudder interconnect system.

### Fuel System

A 56-gallon usable wet-wing fuel storage system provides fuel for engine operation. The system consists of a 29.3-gallon capacity (28 gallon usable) vented integral fuel tank and a fuel collector/sump in each wing, a three position selector valve, an electric boost pump, and an engine-driven fuel pump. Fuel is gravity fed from each tank to the associated collector sumps where the engine-driven fuel pump draws fuel through a filter and selector valve to pressure feed the engine fuel injection system. The electric boost pump is provided for engine priming and vapor suppression.

Each integral wing fuel tank has a filler cap in the upper surface of each wing for fuel servicing. Access panels in the lower surface of each wing allow access to the associated wet compartment (tank) for inspection and maintenance. Float-type fuel quantity sensors in each wing tank supply fuel level information to the fuel quantity indicators. Positive pressure in the tank is maintained through a vent line from each wing tank. Fuel, from each wing tank, gravity feeds through strainers and a flapper valve to the associated collector tank in each wing. Each collector tank/sump incorporates a flush mounted fuel drain and a vent to the associated fuel tank.

The engine-driven fuel pump pulls filtered fuel from the two collector tanks through a three-position (LEFT-RIGHT-OFF) selector valve. The selector valve allows tank selection. From the fuel pump, the fuel is metered to a flow divider, and delivered to the individual cylinders. Excess fuel is returned to the selected tank.

A dual-reading fuel-quantity indicator is located in the center console next to the fuel selector in plain view of the pilot. Fuel shutoff and tank selection is positioned nearby for easy access.

Fuel system venting is essential to system operation. Blockage of the system will result in decreasing fuel flow and eventual engine fuel starvation and stoppage. Venting is accomplished independently from each tank by a vent line leading to a NACA-type vent mounted in an access panel underneath the wing near each wing tip.

The airplane may be serviced to a reduced capacity to permit heavier cabin loadings. This is accomplished by filling each tank to a tab visible below the fuel filler, giving a reduced fuel load of 13.0 gallons usable in each tank (26 gallons total usable in all flight conditions).

Drain valves at the system low points allow draining the system for maintenance and for examination of fuel in the system for contamination and grade. The fuel must be sampled prior to each flight. A sampler cup is provided to drain a small amount of fuel from the wing tank drains, the collector tank drains, and the gascolator drain. If takeoff weight limitations for the next flight permit, the fuel tanks should be filled after each flight to prevent condensation.



# Section 8 - Handling, Servicing, and Maintenance

## Servicing

I

### Tire Inflation

Inflate nose tire to 30 psi (207 kPa) and main wheel tires to 62 psi (427kPa).

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**Pilots Operating Handbook and  
FAA Approved Airplane Flight Manual  
Supplement  
For**

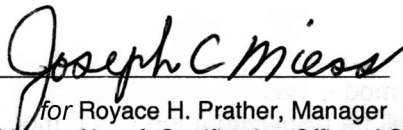
# **Garmin 400W-Series GPS Navigator**

When a Garmin 400W-Series GPS Navigator is installed in the Cirrus Design SR20, this Supplement is applicable and must be inserted in the Supplements Section (Section 9) of the Cirrus Design SR20 Pilot's Operating Handbook. This document must be carried in the airplane at all times. Information in this supplement either adds to, supersedes, or deletes information in the basic SR20 Pilot's Operating Handbook.

• Note •

This POH Supplement Change, dated Revision 01: 11-11-07, supersedes and replaces the original release of this POH Supplement dated 08-15-07.

FAA Approved

  
for Royace H. Prather, Manager

Date 11 Nov 2007

Chicago Aircraft Certification Office, ACE-115C  
Federal Aviation Administration

## Section 1 - General

The WAAS-enabled, Garmin 400W-Series GPS Navigator is capable of providing primary navigation information for enroute, terminal, non-precision, and precision approaches with typical position accuracies of 1 meter horizontally and 2 meters vertically.

The Wide Area Augmentation System (WAAS) consists of 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 data is then broadcast through geostationary satellites.

WAAS also provides the capability of quickly determining when signals from a given satellite are wrong and removing that satellite from the navigation solution using Receiver Autonomous Integrity Monitoring (RAIM), a technology developed to assess the integrity of GPS signals.

• Note •

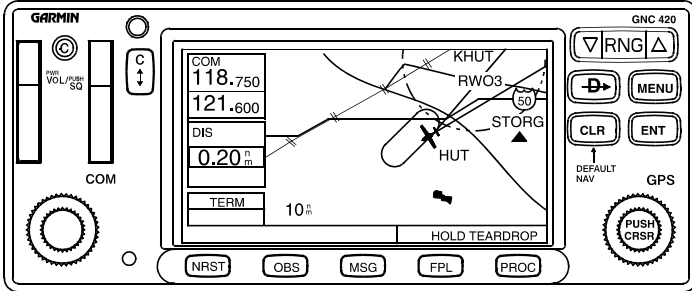
*WAAS satellite coverage is only available in North America. User in other parts of the world can receive WAAS data, however, the signal has not been corrected and thus does not improve the accuracy of your receiver.*

### Models Covered

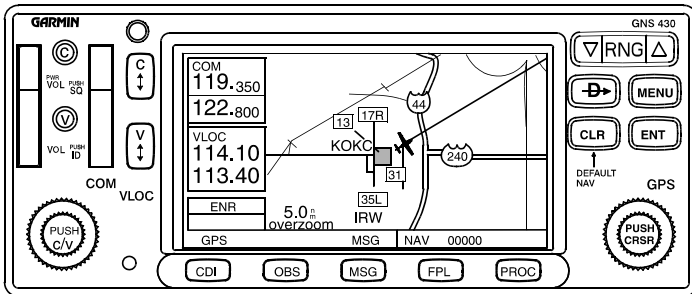
Two Garmin 400W-Series GPS Navigators are covered in this publication; the GNC 420W and GNS 430W. Generally, both models will be referred to as the Navigator, except where there are physical or operational differences.

• Note •

*For detailed descriptions and full operation instructions for the GNC 420W or GNS 430W Navigators, refer to the Garmin 400W-Series GPS Navigator Pilot's Guide and Reference, P/N 190-00356-00, Revision A or later revision.*



SR20\_FM09\_1285



SR20\_FM09\_1109

Figure - 1

GNC 420W and GNS 430W 400W-Series Navigators

## Section 2 – Limitations

1. The Garmin 400W-Series GPS Navigator Pilot's Guide and Reference, P/N 190-00356-00, Revision A or later must be immediately available to the pilot during flight. The software status stated in the pilot's guide must match that displayed on the equipment.
2. IFR enroute and terminal navigation is prohibited unless the pilot verifies the currency of the database or verifies each selected waypoint for accuracy by reference to current approved data.
3. The Garmin 400W-Series GPS Navigator meets RNP5 (BRNAV) requirements of AC 90-96 and is in accordance with AC 20-138, and JAA AMJ 20X2 Leaflet 2 Revision 01, provided it is receiving usable navigation information from the GPS receiver.
4. Do not use the TERRAIN Interface for navigation of the aircraft. The Terrain Display does not provide TAWS capability and is intended to serve as a situational awareness tool only and does not provide the accuracy fidelity on which to solely base terrain or obstacle avoidance maneuvering decisions.

## Section 3 - Emergency Procedures

1. If GPS Navigator information is not available or is invalid, utilize remaining operational navigation equipment as required.
2. If a "Loss of Integrity" (INTEG) or RAIM POSITION WARNING message is displayed during:
  - a. Enroute/Terminal; continue to navigate using GPS equipment and periodically cross-check the GPS guidance to other approved means of navigation.
  - b. GPS Approach; GPS approaches are not authorized under INTEG - execute a missed approach or revert to alternate navigation.

## Section 4 - Normal Procedures

Refer to the Systems Description Section of this supplement for integration differences when single and dual units are installed. Normal operating procedures are outlined in the Garmin 400W-Series GPS Navigator Pilot's Guide and Reference, P/N 190-00356-00, Revision A or later.

### Activate Navigator

1. Battery Master Switch.....ON
2. Avionics Power Switch .....ON
3. Navigator COM/ Power Switch..... Rotate ON

The Navigator will display a welcome page while the self-test is in progress. When the self test is successfully completed, the Navigator asks for NavData database confirmation, acquires position, and then displays the acquired position on the Navigators display and on the MFD.

• Note •

The Navigator is not coupled to an air and fuel data computer. Manual fuel-on-board and fuel flow entries must be made in order to use the fuel planning function of the AUX pages.

The GPS Navigator utilizes altitude information from the altitude encoders altitude digitizer to enhance altitude information.

### Deactivate Navigator

1. Navigator COM/ Power Switch.....Rotate CCW OFF

## Section 5 - Performance

No change from basic Handbook.

## Section 6 - Weight & Balance

No change from basic Handbook.

## Section 7 - Systems Description

• Note •

This section provides general description and aircraft integration information for the Garmin GNC 420W and GNS 430W 400W-Series Navigators. For detailed descriptions and operational instructions, *refer to the Garmin 400W-Series GPS Navigator Pilot's Guide and Reference, P/N 190-00356-00, Revision A or later revision*

### **GNC 420W**

The GNC 420W, designated as the secondary navigator (GPS 2), is a GPS Navigator and VHF communications transceiver. The GPS Navigator consists of a GPS receiver, a navigation computer, and a Jeppesen NavData database all contained in the GNC 420W control unit mounted in the center console. Additionally, a VHF communications receiver, designated COM 2, is also integrated into the unit.

#### ***GPS Navigator***

The GNC 420W navigator is coupled to the airplane's CDI. The GPS 2 antenna is located on top of the fuselage slightly aft of the rear window along the airplane centerline. The navigator is powered by 28 VDC through the 5-amp GPS2 and 7.5-amp COM 2 circuit breakers on the Avionics Non-Essential Bus.

#### ***Communication (COM) Transceiver***

The GNC 420W includes a digitally-tuned integrated VHF communications (COM) transceiver. The COM 2 antenna is located below the cabin on the airplane centerline.

28 VDC for transceiver operating is controlled through the Avionics Master Switch and supplied through the 7.5-amp COM 2 circuit breaker on the Avionics Non-Essential Bus.



## **GNS 430W**

The GNS 430W, designated as the primary navigator (GPS 1), includes all of the features of the GNC 420W with the addition of IFR certified VOR/Localizer and Glideslope receivers. In the event a second GNS 430W is installed, the second unit will function as described below except that the GPS Navigator is designated GPS 2, the NAV receiver is designated NAV 2, and the VHF communications receiver is designated COM 2.

GPS 2 Navigator and VHF NAV is powered by 28 VDC through the Avionics Master Switch and the 5-amp GPS 2 circuit breaker on the Avionics Non-essential Bus. 28 VDC for transceiver operation is supplied through the Avionics master Switch and the 7.5-amp COM 2 circuit breaker on the Avionics Non-Essential Bus.

The following describes a single GNS 430W unit and its functions.

### ***GPS Navigator***

The GNS 430W Navigator is coupled to the airplanes HSI and MFD. Typically, the second GPS Navigator provides backup and is approved for VFR use only. If the second GPS is also a GNS 430W, it will be coupled to the CDI and is also approved for IFR use.

The GPS 1 antenna is located on top of the fuselage slightly aft of the rear window along the airplane centerline and the GPS 2 antenna is located on top of the fuselage slightly forward of the rear window along the airplane centerline. The GNS 430W Navigator is powered by 28 VDC through the 5-amp GPS 1 circuit breaker on the Avionics Essential Bus.

### ***Navigation (NAV) Receiver***

The GNS 430W provides an integrated Navigation (NAV) receiver with VHF Omirange/Localizer (VOR/LOC) and Glideslope (G/S) capability. The NAV antenna is mounted on top of the vertical tail.

28 VDC for navigation receiver operation is controlled through the Avionics Master Switch on the bolster switch panel and supplied through the 5-amp GPS 1 circuit breaker on the Avionics Essential Bus.

### ***Communication (COM) Transceiver***

The GNS 430W includes a digitally-tuned integrated VHF communications (COM) transceiver. The COM 1 antenna is located above the cabin on the airplane centerline.

28 VDC for transceiver operating is controlled through the Avionics Master Switch and supplied through the 7.5-amp COM 1 circuit breaker on the Avionics Essential Bus.

### ***Avionics Integration***

The GNS 430W Navigator is integrated into the airplane avionics installation in three configurations:

1. Single GNS 430W (GPS 1) interfaced with the PFD and MFD and a single Garmin GNC 250XL (GPS 2) interfaced with the PFD and MFD.
  - GPS 1 in this configuration is a GNS 430W Navigator with VHF COM interfaced with the PFD and MFD as GPS 1/VLOC 1. Select NAV Source to GPS 1 or VLOC 1 through the PFD's NAV select button. With source set to GPS 1 or VLOC 1, it can be alternately set between GPS or VLOC by the CDI button on the navigator. The active source is identified on the PFD.
  - GPS 2 in this configuration is a GNC 250XL Navigator interfaced with the PFD and MFD as GPS 2. Select NAV Source to GPS 2 through the PFD's NAV select button. The active source is identified on the PFD.
2. Single GNS 430W (GPS 1) interfaced with the PFD and MFD and a single GNC 420W (GPS 2) interfaced with the MFD (VOR/LOC) indicator.
  - GPS 1 in this configuration is a GNS 430W Navigator with VHF COM interfaced with the PFD and MFD as GPS 1/VLOC 1. Select NAV Source to GPS 1 or VLOC 1 through the PFD's NAV select button. With source set to GPS 1 or VLOC 1, it can be alternately set between GPS or VLOC by the CDI button on the navigator. The active source is identified on the PFD.
  - GPS 2 in this configuration is a GNS 420W Navigator with VHF COM interfaced with the PFD and MFD as GPS 2. Select NAV Source to GPS 2 through the PFD's NAV select button. The active source is identified on the PFD.

3. Dual GNS 430W units are installed. GPS 1 in this configuration is the uppermost GNS 430W unit in the console and GPS 2 is the lower GNS 430W unit.
  - GPS 1 in this configuration is a GNS 430W Navigator with VHF COM interfaced with the PFD and MFD as GPS 1/VLOC 1. Select NAV Source to GPS 1 or VLOC 1 through the PFD's NAV select button. With source set to GPS 1 or VLOC 1, it can be alternately set between GPS or VLOC by the CDI button on the navigator. The active source is identified on the PFD.
  - GPS 2 in this configuration is a GNS 430W Navigator with VHF COM interfaced with the PFD and MFD as GPS 2/VLOC 2. Select NAV Source to GPS 2 or VLOC 2 through the PFD's NAV select button. With source set to GPS 2 or VLOC 2, it can be alternately set between GPS or VLOC by the CDI button on the navigator. The active source is identified on the PFD.

## TERRAIN Interface

• Note •

TERRAIN functionality is a standard feature found in GNS 430W units with main software version 5.01 or above and valid terrain and obstacle databases installed.

Garmin TERRAIN is a terrain awareness system incorporated into GNS 430W units to increase situational awareness and aid in reducing controlled flight into terrain. The TERRAIN function displays altitudes of terrain and obstructions relative to the aircraft's altitude and are advisory in nature only. Individual obstructions may be shown if available in the database, however, not all obstructions may be available in the database and data may be inaccurate. TERRAIN information should be used as an aid to visual acquisition and not use to navigate or maneuver to avoid terrain.

For for a more detailed description of the TERRAIN function, *refer to the Garmin 400W-Series GPS Navigator Pilot's Guide and Reference, P/N 190-00356-00, Revision A or later revision.*

# **Section 10**

## **Safety Information**

### **Table of Contents**

Introduction .....	10-3
Cirrus Airframe Parachute System (CAPS) Deployment .....	10-4
Deployment Scenarios.....	10-4
Mid-Air Collision.....	10-4
Structural Failure .....	10-4
Loss of Control .....	10-5
Landing Required in Terrain not Permitting a Safe Landing...	10-5
Pilot Incapacitation .....	10-5
General Deployment Information.....	10-5
Deployment Speed .....	10-5
Deployment Altitude .....	10-6
Deployment Attitude .....	10-6
Landing Considerations .....	10-7
Emergency Landing Body Position.....	10-7
Door Position .....	10-7
Water Landings .....	10-8
Post Impact Fire .....	10-9
Ground Gusts .....	10-9
Taxiing, Steering, and Braking Practices .....	10-10
Proper Operating Practices .....	10-10
Brake Maintenance.....	10-11

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## Introduction

The Cirrus Design SR20 is a modern, advanced technology airplane designed to operate safely and efficiently in a flight environment. However, like any other aircraft, pilots must maintain proficiency to achieve maximum safety, utility, and economy.

As the pilot you must be thoroughly familiar with the contents of this Handbook, the Handbook Supplements, the SR20 Flight Checklist, and operational guides and data provided by manufacturers of equipment installed in this airplane. You must operate the airplane in accordance with the applicable FAA operating rules and within the Limitations specified in Section 2 of this Handbook.

The Normal Procedures section of this handbook was designed to provide guidance for day-to-day operation of this airplane. The procedures given are the result of flight testing, FAA certification requirements, and input from pilots with a variety of operational experience. Become fully familiar with the procedures, perform all the required checks, and operate the airplane within the limitations and as outlined in the procedures.

## **Cirrus Airframe Parachute System (CAPS) Deployment**

The Cirrus Airframe Parachute System (CAPS) is designed to lower the aircraft and its passengers to the ground in the event of a life-threatening emergency. However, because CAPS deployment is expected to result in damage to the airframe and, depending upon adverse external factors such as high deployment speed, low altitude, rough terrain or high wind conditions, may result in severe injury or death to the aircraft occupants, its use should not be taken lightly. Instead, possible CAPS activation scenarios should be well thought out and mentally practiced by every SR20 pilot.

The following discussion is meant to guide your thinking about CAPS activation. It is intended to be informative, not directive. It is the responsibility of you, the pilot, to determine when and how the CAPS will be used.

### **Deployment Scenarios**

This section describes possible scenarios in which the activation of the CAPS might be appropriate. This list is not intended to be exclusive, but merely illustrative of the type of circumstances when CAPS deployment could be the only means of saving the occupants of the aircraft.

#### ***Mid-air Collision***

A mid-air collision may render the airplane unflyable by damaging the control system or primary structure. If a mid-air collision occurs, immediately determine if the airplane is controllable and structurally capable of continued safe flight and landing. If it is not, CAPS activation should be considered.

#### ***Structural Failure***

Structural failure may result from many situations, such as: encountering severe gusts at speeds above the airplane's structural cruising speed, inadvertent full control movements above the airplane's maneuvering speed, or exceeding the design load factor while maneuvering. If a structural failure occurs, immediately determine if the airplane is controllable and structurally capable of



continued safe flight and landing. If it is not, CAPS activation should be considered.

### ***Loss of Control***

Loss of control may result from many situations, such as: a control system failure (disconnected or jammed controls); severe wake turbulence, severe turbulence causing upset, severe airframe icing, or sustained pilot disorientation caused by vertigo or panic; or a spiral/spin. If loss of control occurs, determine if the airplane can be recovered. If control cannot be regained, the CAPS should be activated. This decision should be made prior to your pre-determined decision altitude (2,000' AGL, as discussed below).

### ***Landing Required in Terrain not Permitting a Safe Landing***

If a forced landing is required because of engine failure, fuel exhaustion, excessive structural icing, or any other condition CAPS activation is only warranted if a landing cannot be made that ensures little or no risk to the aircraft occupants. However, if the condition occurs over terrain thought not to permit such a landing, such as: over extremely rough or mountainous terrain, over water out of gliding distance to land, over widespread ground fog or at night, CAPS activation should be considered.

### ***Pilot Incapacitation***

Pilot incapacitation may be the result of anything from a pilot's medical condition to a bird strike that injures the pilot. If this occurs and the passengers cannot reasonably accomplish a safe landing, CAPS activation by the passengers should be considered. This possibility should be explained to the passengers prior to the flight and all appropriate passengers should be briefed on CAPS operation so they could effectively deploy CAPS if required.

## **General Deployment Information**

### ***Deployment Speed***

The maximum speed at which deployment has been demonstrated is 135 KIAS. Deployment at higher speeds could subject the parachute and aircraft to excessive loads that could result in structural failure. Once a decision has been made to deploy the CAPS, make all reasonable efforts to slow to the minimum possible airspeed. However,

if time and altitude are critical, and/or ground impact is imminent, the CAPS should be activated regardless of airspeed.

### ***Deployment Altitude***

No minimum altitude for deployment has been set. This is because the actual altitude loss during a particular deployment depends upon the airplane's airspeed, altitude and attitude at deployment as well as other environmental factors. In all cases, however, the chances of a successful deployment increase with altitude. As a guideline, the demonstrated altitude loss from entry into a one-turn spin until under a stabilized parachute is 920 feet. Altitude loss from level flight deployments has been demonstrated at less than 400 feet. With these numbers in mind it might be useful to keep 2,000 feet AGL in mind as a cut-off decision altitude. Above 2,000 feet, there would normally be time to systematically assess and address the aircraft emergency. Below 2,000 feet, the decision to activate the CAPS has to come almost immediately in order to maximize the possibility of successful deployment. At any altitude, once the CAPS is determined to be the only alternative available for saving the aircraft occupants, deploy the system without delay.

### ***Deployment Attitude***

The CAPS has been tested in all flap configurations at speeds ranging from  $V_{so}$  to  $V_a$ . Most CAPS testing was accomplished from a level attitude. Deployment from a spin was also tested. From these tests it was found that as long as the parachute was introduced to the free air by the rocket, it would successfully recover the aircraft into its level descent attitude under parachute. However, it can be assumed that to minimize the chances of parachute entanglement and reduce aircraft oscillations under the parachute, the CAPS should be activated from a wings-level, upright attitude if at all possible.

## Landing Considerations

After a CAPS deployment, the airplane will descend at less than 1500 feet per minute with a lateral speed equal to the velocity of the surface wind. The CAPS landing touchdown is equivalent to ground impact from a height of approximately 10 feet. While the airframe, seats, and landing gear are designed to accommodate the stress, occupants must be prepared for the landing. The overriding consideration in all CAPS deployed landings is to prepare the occupants for the touchdown in order to protect them from injury as much as possible.

### ***Emergency Landing Body Position***

The most important consideration for a touchdown with CAPS deployed is to protect the occupants from injury, especially back injury. Contacting the ground with the back offset attempting to open a door or secure items increases the likelihood of back injury. All occupants must be in the emergency landing body position well before touchdown. After touchdown, all occupants should maintain the emergency landing body position until the airplane comes to a complete stop.

The emergency landing body position is assumed with tightened seat belt and shoulder harness by placing both hands on the lap, clasping one wrist with the opposite hand, and holding the upper torso erect and against the seat backs. The seat cushions contain an aluminum honeycomb core designed to crush under impact to absorb downward loads and help protect the spine from compression injury.

### ***Door Position***

For most situations, it is best to leave the doors latched and use the time available to transmit emergency calls, shut down systems, and get into the Emergency Landing Body Position well before impact. The discussion below gives some specific recommendations, however, the pilot's decision will depend upon all factors, including time to impact, altitude, terrain, winds, condition of airplane, etc.

There is the possibility that one or both doors could jam at impact. If this occurs, to exit the airplane, the occupants will have to force open a partially jammed door or break through a door window using the Emergency Exit Hammer located in the lid of the center armrest. This can significantly delay the occupants from exiting the airplane.

If the pilot elects to touchdown with a door opened, there are several additional factors the pilot must consider: loss of door, possibility of head injury, or injury from an object coming through the open door.

- If a door is open prior to touchdown in a CAPS landing, the door will most likely break away from the airplane at impact.
- If the door is open and the airplane contacts the ground in a rolled condition, an occupant could be thrown forward and strike their head on the exposed door pillar. Contacting the ground in a rolled condition could be caused by terrain that is not level, contacting an obstacle such as a tree, or by transient aircraft attitude.
- With a door open, it is possible for an object such as a tree limb or flying debris to come through the opening and strike an occupant.

**• WARNING •**

If it is decided to unlatch a door, unlatch one door only. Opening only one door will provide for emergency egress as well as reduce risks associated with ground contact. Typically, this would be the copilot's door as this allows the other occupants to exit first after the airplane comes to rest.

CAPS Landing Scenario	Door Position
Empty Copilot Seat	Unlatch Copilot Door
Very Little Time Before Impact	Keep Doors Closed
Fire	Unlatch Copilot Door
Water Landing	Unlatch Copilot Door
Condition Unknown	Keep Doors Closed

***Water Landings***

The ability of the airplane to float after a water landing has not been tested and is unknown. However, since there is the possibility that one or both doors could jam and use of the emergency egress hammer to break out a window could take some time, the pilot may wish to

consider unlatching a door prior to assuming the emergency landing body position in order to provide a ready escape path should the airplane begin to sink.

***Post Impact Fire***

If there is no fire prior to touchdown and the pilot is able to shut down the engine, fuel, and electrical systems, there is less chance of a post impact fire. If the pilot suspects a fire could result from impact, unlatching a door immediately prior to assuming the emergency landing body position should be considered to assure rapid egress.

***Ground Gusts***

If it is known or suspected that ground gusts are present in the landing zone, there is a possibility that the parachute could drag the airplane after touchdown, especially if the terrain is flat and without obstacles. In order to assure that the occupants can escape the airplane in the timeliest manner after the airplane comes to rest, the pilot may elect to unlatch the copilot's door for the CAPS landing. Occupants must be in the Emergency Landing Body Position for touchdown. Occupants must not loosen seat belts until the airplane comes to rest. When the airplane comes to rest, the occupants should exit the airplane and immediately move upwind to prevent a sudden gust from dragging the airplane in their direction.

## Taxiing, Steering, and Braking Practices

Cirrus aircraft use a castering nose wheel and rely on aerodynamic forces and differential braking for directional control while taxiing. Proper braking practices are therefore critical to avoid potential damage to the brakes.

The most common cause of brake damage and/or failure is the creation of excessive heat through improper braking practices. Pilots unaccustomed to free castering nose wheel steering may be inclined to “ride” the brakes to maintain constant taxi speeds and use the brakes excessively for steering.

### Proper Operating Practices

When taxiing, directional control is accomplished with rudder deflection and intermittent braking (toe taps) as necessary. Use only as much power as is necessary to achieve forward movement. Deceleration or taxi speed control using brakes but without a reduction in power will result in increased brake temperature.

On flat, smooth, hard surfaces, do not exceed 1000 RPM maximum continuous engine speed for taxi. Power settings slightly above 1000 RPM are permissible to start motion, for turf, soft surfaces, and on inclines. Use minimum power to maintain constant taxi speed.

“Riding the brakes” while taxiing is similar to driving a car with one foot on the brake and one foot on the gas. This causes a continuous build up of energy that would otherwise be moving the airplane.

Observe the following operating practices:

- Verify that the parking brake is completely disengaged before taxi.
- The rudder is effective for steering on the ground and should be used.
- Use only as much power (throttle) as is necessary to achieve forward movement. Keep in mind, any additional power added with the throttle will be absorbed in the brakes to maintain constant speed.
- Use rudder deflection and the minimum necessary inputs of differential braking to achieve directional control.

- Do not “ride the brakes”. Pilots should consciously remove pressure from the brakes while taxiing. Failure to do so results in excessive heat buildup, premature brake wear, and increased possibility of brake failure or fire.
- Avoid unnecessary high-speed taxiing. High-speed taxiing may result in excessive demands on the brakes, increased brake wear, and the possibility of brake failure or fire.
- Brakes have a large energy absorbing capacity; therefore, cooling time should be considered. Energy absorbed during a few seconds of deceleration can take up to an hour to dissipate. Always allow adequate cooling time after brake use.
- Allow a cooling period following a high-energy braking event. High-energy braking can include an aborted takeoff or the equivalent energy required for a Maximum Gross Weight full-stop from 70 knots in less than 1000 feet.

## Brake Maintenance

The brake assemblies and linings should be checked at every oil change (50 hours) for general condition, evidence of overheating, and deterioration. *Serials 1005 thru 2030 before SB 2X-05-01*: At every annual/100-hour inspection the brakes should be disassembled, the brake linings should be checked and the O-rings must be replaced. Refer to Section 8, Handling, Servicing, and Maintenance for specific servicing information on the Brake System.

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