

CUB CRAFTERS
CC11-160

CUB CRAFTERS, INC.

CC11-160 PILOT'S OPERATING HANDBOOK
AND FLIGHT TRAINING SUPPLEMENT

CARBON CUB

Airplane Serial Number: CC11-

Airplane Registration Number: NXXXXX

This airplane is approved as a special light-sport category aircraft (S-LSA) as defined by 14CFR§1.1 and meets the requirements of ASTM consensus standard F2245. This document must be carried in the airplane at all times.

CUB CRAFTERS, INC.
1918 S 16th Avenue,
Yakima WA. 98903 USA

Website: www.cubcrafters.com
Email: support@cubcrafters.com

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CC11-160**

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WARNING

**THIS OPERATING MANUAL IS ONLY VALID FOR USE
WITH THE AIRCRAFT IDENTIFIED ON THE FACE
PAGE. ANY REVISIONS TO THIS MANUAL MUST BE
INSERTED AS APPROPRIATE**

NOTE

This document (SSC10020AFM) is applicable to
CC11-160 serial numbers CC11-00294 and on.

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INTRODUCTION

Welcome to the group of discriminating pilots that truly enjoy flying and have selected the Carbon Cub SS. It is our aim at Cub Crafters to ensure that you get the most from your airplane. This manual has been prepared to provide you with information about your airplane's equipment, operating procedures, performance, and suggested care. It also provides you with contact information for Cub Crafters to help you contact us at any time. However, you must do your part and study this manual carefully.

This POH, which was put in your aircraft at the time of delivery, is specifically applicable to CC11-160 Serial Number CC11-00XXX. To operate the aircraft legally, it must be kept up to date as new revisions become available and are sent to you.

In order to send you information in a timely manner, you must ensure that we have your current address. Please use the change of address form found in the Supplements section of this manual. You can also log on to our website, follow the owner support link and download the Change of Address/Ownership form. This will allow us to send updated information to you as it becomes available

Our website is:

www.cubcrafters.com

CUB CRAFTERS CC11-160

This manual has been prepared in accordance with consensus standard ASTM F 2746. The Carbon Cub has been shown to comply with consensus standard ASTM F 2245. The airplane must be maintained in accordance with consensus standard ASTM F 2295, Standard Practice for Continued Operational Safety Monitoring of a Light Sport Aircraft. Please note that this standard describes the responsibilities of the Owner/Operator.

REVISIONS

Whenever revisions are issued, they must be inserted in the appropriate place in the manual.

A black vertical line along the outside margin of the page will identify revised text and illustrations. Changes in spelling, punctuation and formatting will not be marked.

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LOG OF REVISIONS

Current revisions to the Pilot's Operating Manual and Flight Manual.

Revision	Revised Sections	Description of Revision
NC	ALL	Initial Release
A	Section 0 Section 5	Revision to Handbook Revised Figure 5-4 Added Figure 5-5
B	Section 0 Section 5 Section 9	Added Serial Number Effectivity Revision to Handbook Updated Calibration Chart Removed Manifold Pressure Revised Supplement 9.2 Single Place Conversion
C	Section 0 Section 9	Revision to Handbook Revision to Table of Contents Added Supplement 9.2 Single Place Conversion Added Supplement 9.7 Executive Glass Touch Panel
D	Section 0 Section 9	Revision to Handbook Revision to Table of Contents Revision to Table of Contents Changed Supplement 9.1 Straight and Amphibious Floats, to "Reserved" placeholder Added Supplement 9.8 Aerocet 1500 Amphibious Floats
E	Section 0 Section 1 Section 2 Section 3 Section 4	Revision to Handbook. Added Serial Number Effectivity Revised Figure 1-1. Added Recommended Oil Qty. Separated Environmental Limitations by S-LSA and E-LSA. Updated Tank Filler Placards. Added Static Port Placard. Added Recommended Oil Qty. Added Note for ELT GPS Feature. Added Recommended Oil Qty.

Issued: 12/04/13
Date of Revision: 11/23/18

REPORT SSC10020AFM
Page Number: 0-7

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LIST OF EFFECTIVE PAGES

Rev	Page Number	Change	Date	Prepared	Checked
NC	All	Initial Release	12/04/13	AMS	ECL
A	0-7 0-8 5-9 5-10	Log of Revisions List of Effective Pages Revised "Std" to "ISA" in Figure 5-4 Added Figure 5-5	12/16/13	AMS	ECL
B	0-i 0-7 0-8 0-9 5-4 5-11 – 5-12 9-0-i – 9-0-iv 9-2	Added Serial Number Effectivity Log of Revisions List of Effective Pages Updated Table of Contents Updated Figure 5-1 Removed Manifold Pressure Column Updated Table of Contents Added Single Place Conversion Instructions	05/16/14	AMS	ECL
C	0-7 0-8 0-9 9-0 9-2 9-7	Log of Revisions List of Effective Pages Revised Table of Contents Revised Table of Contents Added Single Place Conversion Supplement Added Executive Glass Touch Panel Supplement	08/05/14	VCS	ECL

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Rev	Page Number	Change	Date	Prepared	Checked
D	0-7	Log of Revisions	04/14/15	VCS	ECL
	0-8	List of Effective Pages			
	0-10	Revised Table of Contents			
	9-0-i	Revised Table of Contents			
	9-1-1	Changed Supplement 9.1 from, Straight and Amphibious Floats, to Reserved.			
	9-8-1	Added Aerocet 1500 Amphibious Floats Supplement			
E	0-7	Log of Revisions.	11/23/18	MH	ECL
	0-8	List of Effective Pages.			
	0-iii	Added Serial Number Effectivity.			
	1-3	Added Rec. Oil Qty.			
	1-4	Revised Figure 1-1			
	2-4	Added Rec. Oil Qty.			
	2-7	Separated Environmental Limitations by S-LSA and E-LSA.			
	2-12	Updated Tank Filler Placard.			
	2-13	Updated Tank Filler Placard.			
	2-15	Added Static Port Placard.			
	3-6	Added Note for ELT GPS Feature.			
	3-19	Added Note for ELT GPS Feature.			
4-15	Added Rec. Oil Qty.				

Issued: 12/04/13

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1 GENERAL INFORMATION

1.1 INTRODUCTION

This Pilot's Operating Handbook contains information required by the FAA and ASTM at the time the aircraft was certified. It also has additional data which Cub Crafters, based on its experience, has found useful.

This manual is the approved Pilot's Operating Handbook and it is part of the equipment that must be onboard the aircraft whenever it is operated.

This manual is not a substitute for adequate, competent flight training, knowledge of current Safety Alerts, Service Bulletins, and/or Notifications affecting the airplane or applicable aviation regulations.

The pilot-in-command is responsible for determining whether the airplane is safe for flight. She/he is also responsible for ensuring that all operations are conducted within the limitations defined by the appropriate FAA regulations, this manual, the aircraft's instrument markings, and appropriate placards.

While it is intended that this manual be used in flight, it must be studied regularly. The pilot must be familiar with all limitations, performance data, procedures and operational handling characteristics of the airplane prior to operating the airplane.

The information in this manual is divided into numbered sections, each of which is provided with a tab divider. The order of the sections has been designed so that the **LIMITATIONS** and **EMERGENCY PROCEDURES** may be looked up quickly. The **EMERGENCY PROCEDURES** section has a red divider tab.

The owner is reminded that it is her/his responsibility to ensure that Cub Crafters has the appropriate contact information so that flight safety and other important information can be communicated in a timely manner.

1.2 WARNINGS, CAUTIONS, AND NOTES

WARNINGS, CAUTIONS and **NOTES** are used to emphasize critical and important information, and are used as defined below:

WARNING
**AN OPERATING PROCEDURE, PRACTICE, OR A
CONDITION WHICH, IF NOT CORRECTLY
FOLLOWED OR REMEDIED, COULD RESULT IN
SERIOUS PERSONAL INJURY OR LOSS OF
LIFE.**

CAUTION
**An operating procedure, practice, or a condition
which, if not strictly observed or corrected, could
result in destruction of, or damage to equipment.**

NOTE
**An operating procedure, practice, or condition which
is important to emphasize.**

1.3 SUMMARY OF PERFORMANCE SPECIFICATIONS

Gross Weight (wheels or skis)	1320 lbs
Gross Weight (floats)	1430 lbs
Top Speed (Sea Level/80hp)	89 mph
Cruise Speed (6000', 80hp)	96 mph
Range (6000', 80hp, w/reserves)	432 sm
Endurance (6000', 80hp, w/reserves)	4.5 hours
Rate of Climb (2000')	>1500 fpm
Stall Speed (full flaps)	32 mph
Stall Speed (no flaps).....	40 mph
Fuel Capacity (Total, both tanks)	25 gallons
Fuel Capacity (Usable, both tanks)	24 gallons
Fuel Capacity, Extended Total (if installed)....	44 gallons
Fuel Capacity, Extended Usable (if installed)	40 gallons
Approved Fuel Grades	100 or 100LL
Maximum Continuous Engine Power	80 hp
Maximum Takeoff Power (5 minutes)	180 hp
Maximum Engine RPM	2700
Oil Capacity.....	3.5 to 6 Quarts (4 Quarts Recommended)

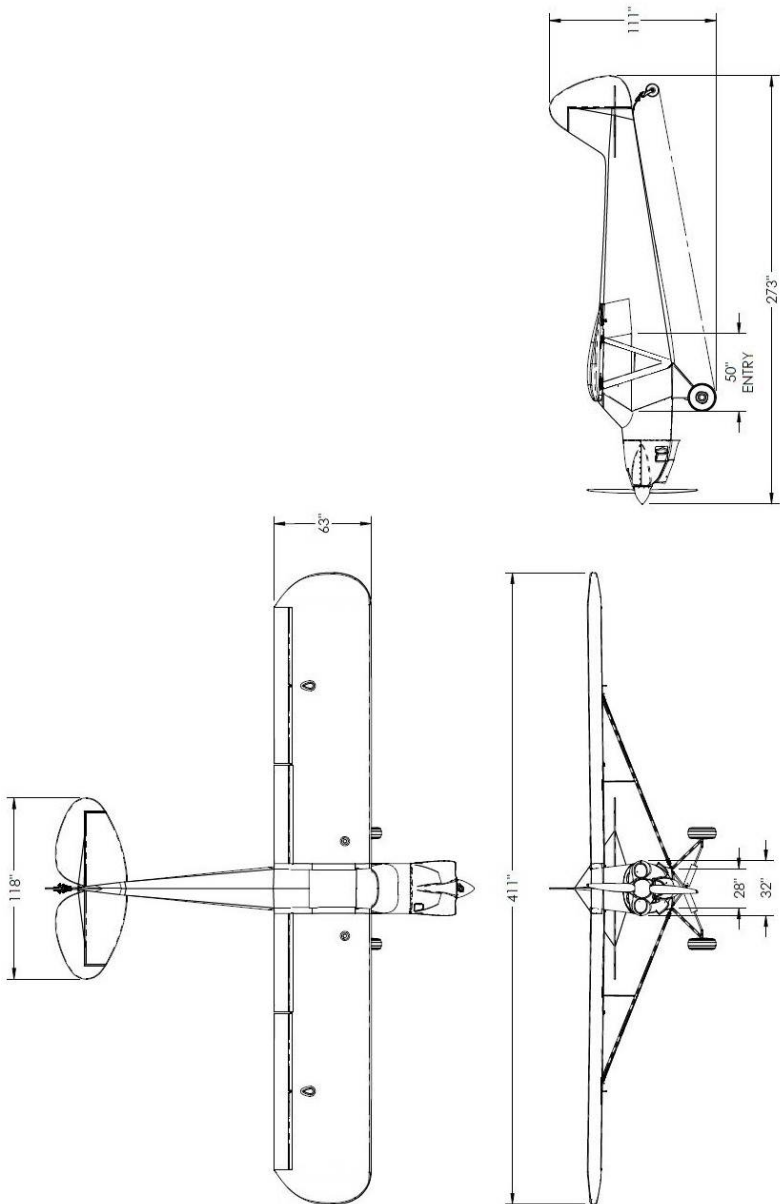


Figure 1-1 Three View Drawing

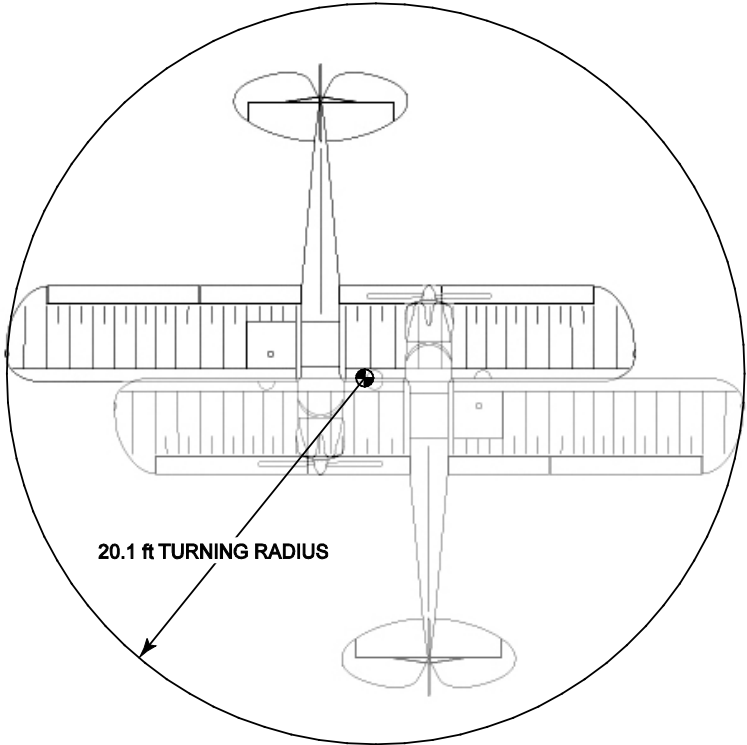


Figure 1-2 Turning Radius with Standard Landing Gear

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2. LIMITATIONS

2.1 GENERAL

This section provides the approved operating limitations, instrument markings, color-coding and basic placards for operation of the aircraft.

Limitations associated with optional systems and equipment which requires handbook supplements can be found in Section 9 "Supplements".

2.2 AIRSPEED LIMITATIONS

<u>SPEED</u>	<u>IAS (mph/kts)</u>
Never Exceed Speed (V_{NE})	141/122
<i>Do not exceed this speed in any operation.</i>	
Maximum Operating Maneuvering Speed (V_O)	
At 1320 lbs gross weight	93/81
At 1430 lbs gross weight (float equipped)	97/84
At 1100 lbs gross weight	85/74
At minimum gross weigh (1010 lbs)	85/74

Do not make full or abrupt control movements above this speed.

CAUTION

Maximum operating speed *DECREASES* at lighter weight as the effects of aerodynamic forces become more pronounced. Linear interpolation may be used for intermediate gross weights.

<u>SPEED</u>	<u>IAS (mph/kts)</u>
Maximum Flap Extended Speed (V_{FE})	
First notch (15°)	85/74
Second notch (35°)	81/70
Full flaps (50°)	81/70

Do not exceed the flap speed corresponding to a given setting

Maximum Demonstrated
Crosswind Component 13/11

Stall Speed
 Stall Speed with Full Flaps 32/28
 Stall Speed with No Flaps 40/35

Window open operation
 Maximum speed with one window open 81/70

NOTE

Windows must be closed for takeoff and landing. Only one window may be open in flight at a time.

2.3 AIRSPEED INDICATOR MARKINGS

Airspeed indicator markings and their significance are shown in Table 2-1.

MARKING	SPEED RANGE OR VALUE (IAS mph/kts)	SIGNIFICANCE
Red radial line	141/ 122	Never exceed speed V_{NE}
Yellow arc	101-141/ 88-122	Operations must be conducted with caution and in smooth air
Green arc	40-101/ 37-88	Normal operating range
White arc	32-81/ 28-70	Operating range with up to 50° flaps extended

Table 2-1 Airspeed Indicator Markings

2.4 POWERPLANT LIMITATIONS

Engine manufacturerAirmotive Engineering Corp.
Engine model numberTitan 340CC

Engine operating limits

Max Continuous Power80 hp
Takeoff Power180 hp
Maximum Engine Speed (5 minutes)2700 rpm
Oil Pressure, Minimum 25 psi
Oil Pressure, Maximum 100 psi
Oil Temperature, Maximum 245 °F
Cylinder Head Temperature, Maximum..... 450 °F
Fuel Limitations (grade).....100 or 100LL
Oil Capacity 3.5 to 6 Quarts
(4 Quarts Recommended)

NOTE

Cub Crafters does not recommend the use of automotive fuels in the engine. The engine has not been tested with the additives often found in auto fuel, and unleaded fuel will result in accelerated wear of the valves and cylinders.

2.5 POWERPLANT INSTRUMENT MARKINGS

TACHOMETER	Red radial line	2700 rpm
	Green arc (normal operating range)	500-2700 rpm
OIL PRESSURE	Yellow arc (caution, low)	25-40 psi
	Green arc (normal)	40-85 psi
	Yellow arc (caution, high)	85-100 psi
	Red radial line (maximum)	100 psi
OIL TEMPERATURE	Yellow arc (caution, low)	40-120°F
	Green arc (normal)	120-245°F
	Red radial line (maximum)	245°F

Table 2-2 Powerplant Instrument Markings

2.6 WEIGHT LIMITS

Maximum Weight (On Wheels or Skis) 1320 lbs/600 kg
Maximum Weight (On Floats)..... 1430 lbs/650 kg

2.7 CENTER OF GRAVITY

Forward CG Limits
At 1320 lbs/600kg..... 73.0 inches aft of datum
At 1100 lbs/500 kg or less . 70.5 inches aft of datum
(Straight line variation between points given)

Aft CG Limit (at all weights) 78.5 inches aft of datum

The datum is 60 inches forward of wing leading edge.

2.8 MANEUVERS

<p style="text-align: center;">CAUTION All aerobatic maneuvers, including spins, are prohibited.</p>
--

2.9 MANEUVER LOAD FACTORS

Maximum positive load factor, flaps up4.0 g
Maximum positive load factor, flaps down.....2.0 g
Maximum negative load factor-2.0 g

No inverted maneuvers are approved.

2.10 MINIMUM FLIGHT CREW

The minimum required flight crew is one pilot in the front seat. This does not preclude a qualified flight instructor giving dual instruction from the back seat, if equipped.

2.11 ENVIROMENTAL LIMITATIONS

S-LSA:

Day V.F.R.

Flight into I.M.C. is prohibited.

Flight into known icing is prohibited.

E-LSA:

This aircraft may operate day and night VFR when equipped in accordance with the appropriate national operating rules.

Flight into I.M.C. is prohibited.

Flight into known icing is prohibited.

2.12 MAXIMUM OPERATING ALTITUDE

The maximum operating altitude is 17,999 feet. Use supplemental oxygen as required by your Civil Aviation Authority.

2.13 MAXIMUM PASSENGER SEATING

The aircraft is approved to carry one passenger, seated behind the pilot, if equipped.

2.14 ALLOWABLE FUEL LOADING

Standard Configuration:

- 25.0 US gallons/94 liters total capacity
- 24.0 US gallons/90 liters total usable

Extended Range Configuration:

- 44.0 US gallons/167 liters total capacity
- 40.0 US gallons/150 liters total usable

2.15 BAGGAGE AND CARGO LOADING

Standard Configuration:

- Forward cargo compartment
(behind passenger)..... 100 lbs/45 kg
- Cargo shelf compartment
(behind forward cargo compartment) 20 lbs/9 kg

Extended Cargo Configuration:

- Forward cargo compartment
(behind passenger)..... 100 lbs/45 kg
- Extended cargo compartment
(behind forward cargo compartment) ... 60 lbs/27 kg

See Section 6 for loading information and distribution.

2.16 SMOKING

Smoking is prohibited in the aircraft

2.17 TYPES OF SURFACES

The aircraft may be operated from paved and unpaved runways.

2.18 VORTEX GENERATORS

The aircraft is allowed to fly with the following number of vortex generators missing:

- Not more than three vortex generators missing on an aircraft.
- Not more than two vortex generators missing on a wing.
- The missing vortex generators must not be next to each other.

2.19 PLACARDS

In view of the pilot:

OPERATOR MUST READ AND BE FAMILIAR WITH PILOT OPERATING HANDBOOK BEFORE FLYING AIRCRAFT. NO INTENTIONAL SPINS.

OR

READ THE PILOT'S OPERATING HANDBOOK. NO INTENTIONAL SPINS. FLIGHT INTO IMC PROHIBITED.

NXXXXX						
FOR	N	30	60	E	120	150
STEER						
FOR	S	210	240	W	300	330
STEER						
MONTH DAY, YEAR				AIRPATH		

If equipped with extended range fuel tanks:

**MAXIMUM FUEL
IMBALANCE**
5 GALLONS DIFFERENCE
BETWEEN TANKS

or

**MAXIMUM FUEL
IMBALANCE**
18 LITERS DIFFERENCE
BETWEEN TANKS

On top inboard of all lift struts:

NO STEP

Behind the front seat (S-LSA Aircraft):

THIS AIRCRAFT WAS MANUFACTURED IN ACCORDANCE WITH LIGHT SPORT AIRCRAFT AIRWORTHINESS STANDARDS AND DOES NOT CONFORM TO STANDARD CATEGORY AIRWORTHINESS REQUIREMENTS

Near forward cargo compartment:



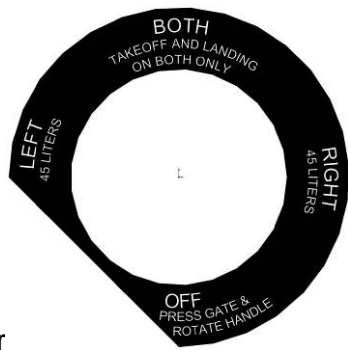
or



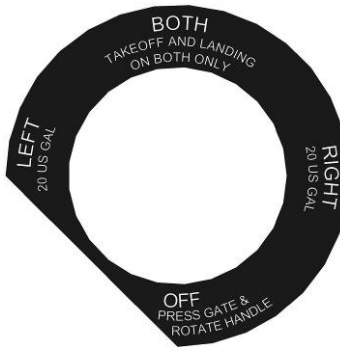
Next to fuel selector for standard tanks:



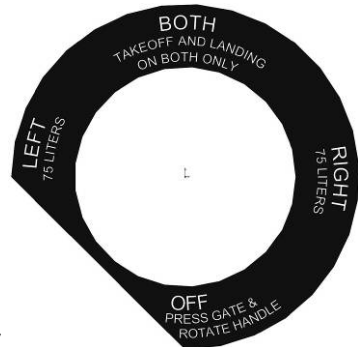
or



Next to fuel selector for extended range tanks:



or



**SECTION 2
LIMITATIONS**

**CUB CRAFTERS
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In cargo shelf compartment:

**CARGO SHELF
COMPARTMENT
MAX CAPACITY
20 LBS**

or

**CARGO SHELF
COMPARTMENT
MAX CAPACITY
9 KGS**

On extended baggage compartment door:

**EXTENDED CARGO
COMPARTMENT
MAX CAPACITY
60 LBS**

or

**EXTENDED CARGO
COMPARTMENT
MAX CAPACITY
27 KGS**

On flap lever:

**F
L
A
P

L
E
V
E
R**

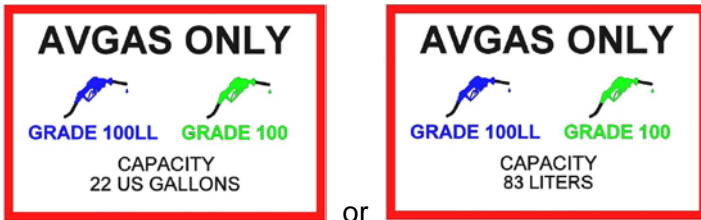
On wing next to tank filler with standard tanks:

AVGAS ONLY
 
GRADE 100LL GRADE 100
CAPACITY
12.5 US GALLONS

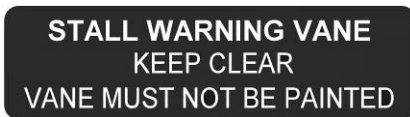
or

AVGAS ONLY
 
GRADE 100LL GRADE 100
CAPACITY
47 LITERS

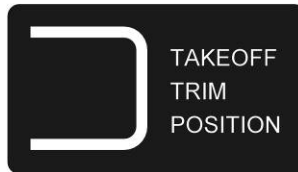
On wing next to tank filler with extended range tanks:



Near stall warning vane:



On right-hand side of empennage:



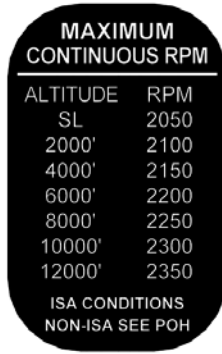
On open door jamb:

L I G H T - S P O R T

Below each throttle control:



On the instrument panel:



A black rounded rectangular chart with white text. The title is 'MAXIMUM CONTINUOUS RPM'. Below the title is a table with two columns: 'ALTITUDE' and 'RPM'. The table lists RPM values for altitudes from Sea Level (SL) to 12000 feet. Below the table, it specifies 'ISA CONDITIONS' and 'NON-ISA SEE POH'.

ALTITUDE	RPM
SL	2050
2000'	2100
4000'	2150
6000'	2200
8000'	2250
10000'	2300
12000'	2350

ISA CONDITIONS
NON-ISA SEE POH

On instrument panel, if equipped:



Next to windows:

MAXIMUM SPEED WINDOWS OPEN 81 MPH / 70 KTS.
WINDOWS MUST BE CLOSED FOR TAKEOFF AND LANDING.
ONLY ONE WINDOW MAY BE OPEN IN FLIGHT AT A TIME.

Located above the right fuel drain, left fuel drain, and gascolator on cowl.

FUEL DRAIN

On exterior boot cowl, both sides of the fuselage:

**STATIC SOURCE
KEEP CLEAR**

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EMERGENCY PROCEDURES**

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3 EMERGENCY PROCEDURES

3.1 GENERAL

This section provides the recommended procedures that should be followed during an emergency or a critical situation. It is divided into two parts. The first contains emergency procedure checklists. The second part amplifies the items listed in the checklists and includes information that is not readily adaptable to a checklist format or which the pilot could not be expected to refer to in an emergency situation. This information should be reviewed regularly.

Pilots must familiarize themselves with the procedures in this section and must be prepared to take appropriate action should an emergency arise.

It is stressed that the procedures outlined in this section are recommendations only. They are not a substitute for sound judgment and common sense and may have to be adjusted, depending on the circumstances prevailing at the time of the emergency. It is important that the pilot be thoroughly familiar with the aircraft. The pilot must review and practice as many of these procedures as are safe to perform as part of his training.

Above all, in any emergency situation, **MAINTAIN CONTROL OF THE AIRCRAFT.**

3.2 EMERGENCY OPERATION AIRSPEEDS

STALL SPEEDS

- Flaps up (V_{S1})..... 40 mph (IAS)
- Flaps down (50°) (V_{S0})32 mph (IAS)

OPERATING MANEUVERING SPEED (V_O)

- At 1320 lb (On Wheels or Skis).....93 mph (IAS)
- At 1430 lb (On Floats).....97 mph (IAS)

BEST GLIDE (V_G)

- Flaps up (1320 lb)68 mph (IAS)
- Flaps down (50°, 1320 lb)49 mph (IAS)

3.3 EMERGENCY CHECKLIST

3.3.1 ENGINE FIRE DURING START

StarterCrank engine
Continue to get a start that would suck the flames and accumulated fire into the engine.

If engine starts:

Power 1700 RPM for a few minutes
EngineShut down by pulling mixture to idle cut-off

Have a qualified technician thoroughly inspect the engine and the airframe.

If engine fails to start:

MixtureIdle Cut-off
Throttle Closed
Fuel Selector Off

Have a qualified technician thoroughly inspect the engine and the airframe.

If fire persists:

Fire ExtinguisherIf safe to do so, remove extinguisher and attempt to extinguish fire

IF FIRE PERSISTS, ABANDON AIRCRAFT AND SUMMON HELP.

3.3.2 ENGINE FAILURE DURING TAKEOFF

PRIOR TO LIFT-OFF

Maintain directional control

- Throttle Idle
- Brakes Apply as necessary
- Wing Flaps Retract
- Mixture Idle Cut-off
- Electronic Ignition Switch Off
- Master Switch Off

AFTER LIFT-OFF

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

If insufficient runway remains:

- Maintain a safe airspeed.
- Use shallow turns to avoid obstructions.
- Use of flaps depends on circumstances. Normally, flaps should be extended for touchdown.

If there is sufficient altitude to attempt a restart, proceed as follows:

- Maintain safe airspeed
- Fuel Selector Both
- Mixture Check Rich
- Electronic Ignition Ensure Both On
- Ignition Backup Battery Emergency Starter..... Engage

If restart is unsuccessful, when landing area is assured:

Throttle Idle
Mixture Idle Cut-off
Electronic Ignition..... Off
Ignition Backup Battery Off
Master Switch Off
Fuel Selector Off
ELT Activated
Seat Belts..... Tight and Secure
Door Open
TouchdownAt the lowest possible airspeed

3.3.3 TOTAL LOSS OF ENGINE POWER IN FLIGHT

If at low altitude:

Airspeed (best glide)MAINTAIN 68 mph (IAS)

If altitude permits:

Airspeed (best glide).....MAINTAIN 68 mph (IAS)
Fuel SelectorBoth
MixtureFull rich
Carburetor Heat On (Hot)
Electronic Ignition..... Ensure both on
Ignition Backup Battery Emergency
Engine Instruments Check for indication of cause
of engine power loss
StarterEngage

If power is not restored and is insufficient to sustain level flight, prepare for an emergency landing without engine power (Section 3.3.4).

3.3.4 EMERGENCY LANDING WITHOUT ENGINE POWER

Locate suitable field.

- Airspeed 68 mph (IAS, flaps up)
- Seat Belts Tight and secure

When landing area is assured:

- Throttle Idle
- Mixture Idle Cut-off
- Flaps As required
- Door Open
- Touchdown At the lowest possible airspeed
- ELT Activate

If time permits, check GPS or charts for airports in the immediate vicinity. If possible, notify your difficulty and intentions by radio on frequency 121.50 and/or squawk 7700.

If practical, establish spiral pattern above the selected landing field. Fly a normal downwind approach, 1000' AGL abeam the desired landing point, noting any obstacles. Plan the initial approach for the middle of the field.

When aircraft comes to a stop:

- Electronic Ignition Off
- Ignition Backup Battery Off
- Master Switch Off
- Fuel Selector Off

NOTE

The ELT will not be able to receive a GPS signal through the carbon fiber seat base. To use the GPS feature, the ELT will need to be removed from the seat base.

3.3.5 PRECAUTIONARY LANDING WITH ENGINE POWER

Fuel Selector.....Both
Seat Belts..... Fastened
MixtureSet
FlapsSet
 Maximum speed first notch flaps (15°) 85 mph IAS
 Maximum speed full flaps (>15°) 81 mph IAS
Trim.....As required
Speed.....As required
(1.3 times full flaps stall speed at gross weight is 42 mph IAS)

If time permits, check GPS or charts for airports in the immediate vicinity.

If possible and if in contact with Air Traffic Control or another aircraft, notify your difficulty and intentions by radio on frequency 121.50 and/or squawk 7700, as appropriate.

Fly normal downwind approach 1000' AGL abeam the desired landing field, noting obstacles.

3.3.6 FIRE IN FLIGHT

Source of Fire..... Locate

ELECTRICAL FIRE

- Master Switch..... Off
- Windows..... Open
- Cabin Door..... Open

If source of fire is located and it is safe and practical:
Fire Extinguisher..... Activate
Land as soon as possible

If fire has been extinguished and electrical power is essential for the continuation of the flight to the nearest suitable airport or landing area:

- All Electrical Switches..... Off
- Avionics Master Switch and Avionics..... Off
- Circuit Breakers..... Check for faulty circuit

If any breakers are out, note the circuits and do not reset or use the equipment powered by these circuits

- Master Switch..... On
- Avionics Master Switch..... On
- Avionics and Electrical Switches..... On, one at a time, with a delay after each, to ensure that problem does not recur

CAUTION

If the above procedures do not fully contain a smoke/fire, the Alternator circuit breaker may be pulled. If this breaker is pulled and there has been an internal alternator failure, it is unlikely that electrical power from the alternator will be restored. Land as soon as it is safe to do so as the engine will run on battery power for a limited time only.

ENGINE FIRE

Fuel Selector Off
Throttle Idle
Mixture Idle cut-off
Cabin Heat Off
Airspeed Maintain the highest possible,
within limitations

Proceed with emergency descent (Section 3.3.9) and emergency landing without engine power (Section 3.3.4).

3.3.7 LOSS OF OIL PRESSURE

Land as soon as practical and investigate cause.
Prepare for emergency landing without power (Section 3.3.4).

3.3.8 HIGH OIL TEMPERATURE

Airspeed Increase
Power Reduce as much as practical
Mixture Enrich

Land as soon as practical and investigate cause.
Prepare for emergency landing without power (Section 3.3.4).

3.3.9 EMERGENCY DESCENT

WARNING
DO NOT EXCEED 141 mph (IAS) IN SMOOTH AIR WITH FLAPS UP.
DO NOT EXCEED 93 mph (IAS) IN ROUGH AIR WITH FLAPS UP.
DO NOT EXCEED 81 MPH (mph) WITH FLAPS DOWN.

Throttle Idle
Airspeed Do not exceed limitations

3.3.10 UNDERVOLTAGE

Low main bus voltage will be indicated by
MAIN.V (yellow) or MAIN.V (red)

This is likely due to an alternator output failure due to the alternator circuit breaker tripping, mechanical failure of the alternator or breaking of the alternator belt.

Master Switch Off
Circuit Breakers Check In

Wait a few seconds

Master Switch On

If the drive belt failure is obvious, the circuit breaker is out, or electrical power is NOT restored, determine what electrical equipment is essential to continue the flight and:

Non-Essential Electrical Equipment Off
SMARTmonitor Monitor closely

If engine fails (because main battery runs down)
Ignition Backup Battery Emergency

Land as soon as it is safe to do so

WARNING
THE ENGINE REQUIRES ELECTRICAL POWER TO ENERGIZE THE IGNITION SYSTEM. SHOULD THE ALTERNATOR NOT BE PRODUCING SUFFICIENT POWER AND THE MAIN AND IGNITION BACKUP BATTERIES BECOME DEPLETED, THE ENGINE WILL STOP RUNNING.

WARNING
SMARTmonitor WILL CEASE TO OPERATE WHEN THE MAIN BUS BATTERY VOLTAGE DROPS BELOW 9.3 V

CAUTION
If the alternator has an internal failure, it may need to be manually disconnected by pulling the circuit breaker. It is possible you will be unable to recover any alternator use until alternator is replaced.

CAUTION
The amount of time the engine will run on battery power alone will depend on the state of the batteries and load. Operation with the ignition backup battery alone is not expected to exceed 30 minutes.

3.3.11 OVERVOLTAGE

High main bus voltage will be indicated by a reading greater than 15V and **MAIN.V** (yellow) or **MAIN.V** (red)

This is situation may be due to voltage regulator failure.

In the event of system over voltage above 16V, the field circuit breaker will trip and will appear as a low voltage scenario.

3.3.12 LOSS OF IGNITION

Loss of the left or right ignition systems will be indicated by discrete red lights and SMARTmonitor screens **L.IGN OFF** or **R.IGN OFF** (red)

Ignition circuit breakers In
Electronic Ignition Both

If annunciation does not go out or circuit breaker trips again, turn the faulty ignition off and turn it back on. If the failure persists, monitor the situation and land as soon as practical.

CAUTION

The left ignition system will not function if the alternator is not working and the main battery is depleted.

3.3.13 INADVERTENT SPIN

Aileron ControlNeutral
Throttle Closed
Rudder Full Opposite
(Opposite to direction of spin)
Elevator Control Forward
(To break stall)
Elevator and Throttle As Required
(To resume level flight smoothly)

If flaps were down, retract once a safe flying speed has been attained. Ensure that the flap speed is not exceeded (81 mph IAS).

CAUTION
This recovery procedure is applicable only when the aircraft is in a spin. Application of controls as described above during a stall or after the aircraft has stopped gyrating may cause the aircraft to enter into a spin.

3.3.14 INADVERTENT ICING ENCOUNTER

WARNING
THIS AIRCRAFT IS NOT APPROVED FOR FLIGHT INTO KNOWN ICING.
FLIGHT INTO KNOWN ICING CONDITIONS IS PROHIBITED.

CAUTION

Ice accumulation on the wings and other airframe components will greatly increase the stall speed of the airplane and result in unpredictable flight characteristics.

Ice accumulation over engine induction air inlet can cause engine roughness and/or loss of power.

Ice formations on the propeller may cause severe propeller/engine vibrations.

Ice accumulation over the pitot tube may cause erroneous airspeed indications.

Ice build-up on the windshield will distort vision and probably obscure forward visibility.

At first indication of encountering icing conditions
Carburetor Heat..... On (Hot)

If ice continues to cause reduced power:
Throttle Full

Climb at maximum rate to produce as much heat as possible to aid in clearing the ice.

Then, fly toward warmer air, clear of visible moisture and/or descend to lower altitude (if **safe to do so**).

If condition persists, proceed with emergency descent (Section 3.3.9) and prepare for an emergency landing without engine power (Section 3.3.4).

3.3.15 UNCOMMANDED TRIM ACTUATION

Standard Trim Switch

TRIM circuit breaker.....Off (Pull)

3.4 AMPLIFIED EMERGENCY PROCEDURES

3.4.1 ENGINE FIRE DURING START

Engine fires during starting may be caused by excessive use of the engine fuel primer. The first attempt to extinguish the fire should be to draw the excess fuel into the engine.

If the engine has not already started, the mixture must be moved to cut-off and the throttle opened fully before cranking the engine.

If the engine starts, and fire goes out within a few seconds, run it at 1700 rpm for a few minutes.

If the fire continues for more than a few seconds, it should be extinguished by the best available external means.

WARNING

IF A FIRE IS ON THE GROUND, UNDER THE AIRPLANE, DUE TO OVER-PRIMING, AND THE ENGINE HAS STARTED, TAXI AWAY FROM THE FIRE AS QUICKLY AS POSSIBLE. IF A FIRE IS ON THE GROUND BUT ENGINE HAS NOT STARTED, ABANDON THE AIRPLANE IMMEDIATELY.

In either case, have the aircraft inspected thoroughly by a qualified mechanic to ensure that it is airworthy prior to any further flights.

3.4.2 ENGINE FAILURE DURING TAKEOFF

If an engine failure occurs prior to lifting off, the pilot must ensure he/she maintains control of the aircraft and comes to a stop on the remainder of the runway. The items in the checklist are listed to provide added safety after a failure of this type.

If engine power is lost after lift-off, the first response must be to lower the nose to maintain airspeed. In most cases, the landing should be straight ahead with only small changes in direction to avoid obstacles. There is seldom enough altitude and airspeed to execute a 180° gliding turn to the runway. In a turn the glide angle is considerably steeper and the stall speed is substantially higher (in a 60° bank the stall speed is 62 mph IAS, flaps up).

If the aircraft is high enough to attempt to re-start the engine, above all, maintain a safe airspeed. Ensure that the fuel selector is in the BOTH position, the mixture RICH and select the ignition backup battery.

If the engine failure was caused by fuel exhaustion due to the selector being on an empty tank, power will not be restored until the air in the fuel lines is flushed out, and this may take a few seconds.

3.4.3 TOTAL LOSS OF ENGINE POWER IN FLIGHT

If the engine loses power, whether this is a total or a partial loss of power or if the engine runs roughly, the most important thing to do is to continue flying the aircraft, maintaining a safe airspeed. Trim the aircraft as required. In case of a total loss of power, the best glide speed is 68 mph (IAS) with flaps up.

The aircraft will glide 1.2 nautical miles for every 1000 feet of altitude loss. The rate of descent will be approximately 715 feet per minute. Most GPS receivers have a "Direct To" (commonly D→) function that shows the closest airports. Use charts to assess the topography of airports in the immediate vicinity.

If there is enough altitude, try to determine the cause of failure. In most cases the reason is fuel exhaustion due to the selector being on an empty tank. Switching to the BOTH position or to the opposite tank causes fuel to feed to the engine. However, power will not be restored until the air in the fuel lines is purged, and this may take a few seconds.

Another common cause of engine failure is carburetor ice. Unfortunately, if this is the case, an excessively rich air/fuel mixture may have cooled the engine to the point where there may not be sufficient hot air in the engine compartment to melt the accumulation of carburetor ice, even when the carburetor heat control is in the full "hot" position. At this point the engine will not develop enough power to maintain airspeed and altitude. It is of the utmost importance that the guidelines concerning the use of the carburetor heat given in paragraph 7.5.7 (Air induction system) of this manual be followed closely.

The engine will fail if there is insufficient electrical power for the ignition system. If the alternator fails, the batteries will provide power for the ignition system. The amount of time they will do so will depend of the state of the batteries and the electrical load. Therefore, it is important to turn off all unnecessary electrical equipment. With a minimum load, the main battery could provide enough power to keep the engine running for considerable time. The main battery should be used first. At the first sign of loss of power of the engine and if the aircraft is so equipped, the backup battery should be selected. The ignition backup battery will probably not provide electrical power for more than 30 minutes. Therefore, there should be sufficient time to plan a landing at a safe site. Once the batteries become depleted, the engine will stop.

3.4.4 EMERGENCY LANDING WITHOUT ENGINE POWER

After locating a suitable field, establish a spiral pattern around this field. Try to be at 1,000 feet above the field at the downwind position, to make a normal approach. Plan the approach for landing at the midpoint of the runway; aim for the normal touchdown area only after gliding to the runway is assured.

Excess altitude may be lost by widening your pattern, using flaps, slipping, or by using a combination of these techniques.

If possible, transmit a MAYDAY message on 121.5 MHz stating location and intentions, and squawk 7700. Activate the ELT.

Once the landing site is secure and you are committed to land, apply flaps and reduce speed to 49 mph (IAS). Close the throttle, move the mixture control to idle cut-off,

shut off the electronic ignition switches, turn the fuel selector to OFF and turn off the master switch.

WARNING
BE EXTREMELY CAUTIOUS WHEN MANEUVERING FOR LANDING AT LOW ALTITUDES. MAINTAIN A SAFE MARGIN ABOVE STALL SPEED. SEE FIGURE 5-2 FOR STALL SPEED VERSUS ANGLE OF BANK.

NOTE
With the master switch off, the instrument, landing, and navigation lights will not operate.

If the landing site is very rough, there is a possibility that the aircraft may come to rest inverted. Should this occur, once the aircraft has come to a stop, open the cabin door (if you have not already done so). If the door is jammed, or if there is no clear path to leave the aircraft on the right side, it is relatively easy to unlatch and push out the window on the left side. Next, protect your head with one arm and release the seat harness with the other. Exit the aircraft through the door or the windows.

Once the risk of fire has passed, ensure that the emergency locator transmitter (ELT) has been activated. If battery power is available, it may be possible to transmit to passing aircraft using the aircraft's VHF radio.

NOTE
The ELT will not be able to receive a GPS signal through the carbon fiber seat base. To use the GPS feature, the ELT will need to be removed from the seat base.

3.4.5 PRECAUTIONARY LANDING WITH ENGINE POWER

A forced landing with engine power should be treated in the same way as described in the previous section. Bear in mind that if the engine is not running correctly, it may fail at any time. It is advisable to have a contingency plan in mind.

3.4.6 FIRE IN FLIGHT

The presence of fire is noted through smoke, smell, and heat in the cabin. Electrical fires are often accompanied by an acrid smell of burning insulation.

Engine fires are very rare. The procedures outlined in the checklist are very general and pilot judgment should be the determining factor in the action to be taken. The maximum rate of descent may be obtained by diving the aircraft to 141 mph (IAS) and adjusting the throttle so as not to exceed 2700 rpm. Use extreme caution when flying at these limits, and do not perform abrupt maneuvers. (See section 3.3.9).

It may be advisable to side slip the aircraft in case of an engine fire. This will direct the flames away from the fuselage. If there is an option as to which way to side slip, it is preferable to have the right wing up, as the gascolator is on the lower left side of the firewall.

If the fire persists, conduct an emergency descent, land immediately, and evacuate the aircraft.

3.4.7 LOSS OF OIL PRESSURE

More often than not, a loss of oil pressure will be gradual. If it is accompanied by an increase in oil temperature, it is a sign that there is a problem with the engine's oil system and the aircraft should be landed as soon as practical, as the engine may stop suddenly. At reduced power maintain altitude and proceed to the nearest suitable landing site. Be prepared for a power-off, forced landing.

Low oil pressure can be the result of a faulty gauge or sending unit or a malfunction in the oil pressure regulating system. In any case, land as soon as practical and have the problem investigated.

3.4.8 HIGH OIL TEMPERATURE

Abnormally high oil temperature indications may be caused by a variety of reasons, among them:

- Low oil level
- Obstruction in the air flow reaching the oil cooler
- Defective gauge

A rapid rise in oil temperature must be treated seriously. Monitor the oil pressure gauge. Reduce power, enrich the mixture and, if practical, maintain a high airspeed to ram cooling air through the oil cooler.

Land as soon as practical and investigate the cause, but be prepared for a power-off forced landing.

3.4.9 EMERGENCY DESCENT

An Emergency Descent should be initiated whenever a situation occurs at high altitude requiring a high rate of descent. This is done in order to minimize exposure of the crew and passengers to an uncontrolled fire or when smoke, toxic fumes, or other situation threatens control of the airplane through incapacitation or restricted visibility for the pilot (See paragraph, FIRE IN FLIGHT 3.4.6).

Retard throttle to IDLE.

Trim airplane for maximum allowed indicated airspeed appropriate to the configuration selected and the atmospheric conditions. Advise the control center if flight path is in an airway. The maximum rate of descent with flaps up may be obtained by diving the aircraft to 141 mph (IAS) and adjusting the throttle so as not to exceed 2700 rpm.

WARNING

IF DESCENT IS TO BE MADE USING FULL FLAPS, SLOW THE AIRPLANE TO 81 mph IAS PRIOR TO FLAP EXTENSION AND PRIOR TO STARTING THE DESCENT. EXCEEDING THE FLAP EXTENDED SPEED CAN CAUSE DAMAGE TO THE WING STRUCTURE AND POSSIBLE FAILURE OF THE FLAP ATTACHMENTS.

IF THE DESCENT IS TO BE MADE WITH THE FLAPS RETRACTED, DO NOT EXCEED 141 mph IAS (IN SMOOTH AIR) OR 93 mph IAS (IN ROUGH AIR). DO NOT MAKE FULL ABRUPT CONTROL MOVEMENTS ABOVE 93 mph IAS. EXCEEDING THE NEVER EXCEED SPEED OR THE DESIGN AND OPERATING SPEEDS CAN CAUSE SEVERE DAMAGE TO AND POSSIBLE FAILURE OF THE AIRPLANE STRUCTURE. MONITOR ENGINE RPM. DO NOT EXCEED 2700 RPM.

3.4.10 ALTERNATOR FAILURE

Alternator output failure can be caused by a mechanical failure of the alternator, a momentary over-voltage condition, or other reasons. In the case of over-voltage an automatic system will shut down and disconnect the alternator by tripping the field circuit breaker. The SMARTmonitor will show alternator operation and main battery voltage by monitoring the main bus, labeled MAIN.V. A zero or negative reading on the ammeter (if installed), or less than 12.6V on the SMARTmonitor, can indicate alternator output failure. The alternator circuit breaker may trip. A mechanical failure of the alternator may be accompanied by unusual sounds coming from the engine compartment. The first step is to reduce the electrical load to a minimum.

Turn the master switch OFF for at least one second. Reset tripped alternator circuit breakers (once). Turn the master switch ON. Check that the Electronic Systems Monitor shows green and greater than 12.6V and ammeter shows a POSITIVE indication (if installed).

If the alternator returns on line, continue flight, monitor the SMARTmonitor or ammeter (if installed) and have the system checked after landing.

If the alternator does not return on line, reduce electrical load to the minimum required for safe flight by switching off all non-essential systems. Maintain only the equipment required to provide information for safe flight. The batteries will provide power for the ignition system. The amount of time they will do so will depend on the state of the batteries and the electrical load. With minimum load, the main battery could provide enough power to keep the engine running for considerable time. The ignition backup battery should be selected once the

main battery becomes depleted and will probably not provide electrical power for more than 30 minutes. Therefore, there should be sufficient time to plan a landing at the first safe site that becomes available. Once the batteries become depleted, the engine will stop.

WARNING

THE ENGINE REQUIRES ELECTRICAL POWER TO ENERGIZE THE IGNITION SYSTEM. SHOULD THE ALTERNATOR NOT BE PRODUCING SUFFICIENT POWER AND THE MAIN AND IGNITION BACKUP BATTERIES BECOME DEPLETED, THE ENGINE WILL STOP RUNNING.

CAUTION

The amount of time the engine will run on battery power alone will depend on the state of the batteries and load. Operation with the ignition backup battery alone is not expected to exceed 30 minutes.

3.4.11 UNDERVOLTAGE

If the alternator does not produce more power than is being used, the SMARTmonitor will change to yellow. In this case the electrical system is being supplemented with battery power. For a short period (low RPM, high electrical demand) this may not require immediate corrective action. If the yellow warning is on for an extended period, the batteries could become depleted. When the battery is very near depleted, the SMARTmonitor will change to red and flash alarm.

If the SMARTmonitor is yellow or red, showing low voltage, and the aircraft is equipped with an ammeter, check the output. A positive indication on the ammeter and an illuminated light could be due to a faulty indication. Increase engine RPM. If the indication persists and there is evidence that the alternator's output is not

sufficient to meet electrical demand, turn off all non-essential electrical equipment. If the alternator's output does not meet electrical demand, be prepared to turn on the ignition backup battery should the main battery become depleted.

The batteries will provide power to the ignition system. The amount of time they will do so will depend on the state of the batteries and the electrical load. With minimum load, the main battery could provide enough power to keep the engine running for considerable time. The ignition backup battery will probably not provide electrical power for more than 30 minutes. Therefore, there should be sufficient time to plan a landing at the first safe site that becomes available. Once the batteries become depleted, the engine will stop.

WARNING

THE ENGINE REQUIRES ELECTRICAL POWER TO ENERGIZE THE IGNITION SYSTEM. SHOULD THE ALTERNATOR NOT BE PRODUCING SUFFICIENT POWER AND THE MAIN AND IGNITION BACKUP BATTERIES BECOME DEPLETED, THE ENGINE WILL STOP RUNNING.

CAUTION

The amount of time the engine will run on battery power alone will depend on the state of the batteries and load. Operation with the ignition backup battery alone is not expected to exceed 30 minutes.

3.4.12 OVERVOLTAGE

If voltage climbs above normal system operating voltage, the SMARTmonitor will turn yellow on MAIN.V screen. Increasing or decreasing electrical load may bring the system back to normal. Continue flight while monitoring MAIN.V. If voltage continues to rise the SMARTmonitor will turn red and flash MAIN.V. The automatic over voltage protection will activate to protect electrical equipment by tripping the field circuit breaker thereby shutting down and disconnecting the alternator. If the SMARTmonitor remains red for an extended period, but not high enough to trip the overvoltage protection, pull the FIELD circuit breaker to manually shut down the alternator and consider the alternator failed. Follow ALTERNATOR FAILURE section, but DO NOT reset FIELD circuit breaker.

3.4.13 INADVERTENT SPIN

If an inadvertent spin is entered, close the throttle, neutralize the ailerons and apply full rudder opposite to the direction of the spin. Move the elevator control forward to break the stall after applying the rudder. When the rotation stops, neutralize the rudder, relax the forward pressure on the elevator control as required to smoothly regain level flight, and return to initial power setting. If the flaps were down, retract them once a safe speed has been attained. Ensure that the maximum flap speed is not exceeded.

CAUTION

This recovery procedure is applicable only when the aircraft is in a spin. Application of controls as described above during a stall or after the aircraft has stopped gyrating may cause the aircraft to enter into a spin.

3.4.14 INADVERTENT ICING ENCOUNTER

Icing conditions are very difficult to predict. Aviation weather services may predict light, moderate, or severe icing conditions at certain locations and altitudes and no icing will be encountered. At other times, icing conditions may not be forecast and any of the above levels of icing may occur.

When unexpected icing conditions are encountered, immediate action must be taken to divert from them. It may be possible to descend to a lower, warmer altitude, or it may be necessary to return to an area where no icing is present.

NOTE

Ice is especially prevalent if flying in clouds or visible moisture. This aircraft is approved for VFR flight only.

If ice build-up becomes evident on the windshield and/or the lift struts or if the engine operates rough, apply full carburetor heat.

Carburetor ice may form in temperatures from 32° to 100°F when the relative humidity is greater than 50%. Be alert for this condition if flying when the difference between the temperature and dew point is less than 20° or when there is visible moisture in the air. If carburetor icing is suspected of causing a loss in power, apply full carburetor heat. If the engine operation remains rough, adjust the mixture control to obtain maximum smoothness. Leave the throttle setting the same and wait for the engine to run smoothly once again after the ice is cleared. If there is no improvement, gradually apply full throttle and initiate a maximum rate climb to produce as much heat as possible under the cowling.

If the engine continues to run rough, it may indicate that ice is accumulating on the propeller.

It is also good practice to apply carburetor heat prior to and during an extended descent as a preventive measure.

CAUTION

Ice accumulation on the wings and other airframe components will greatly increase the stall speed of the airplane and result in unpredictable flight characteristics.

Ice accumulation over engine induction air inlet can cause engine roughness and/or loss of power.

Ice formations on the propeller may cause severe propeller/engine vibrations.

Ice accumulation over the pitot tube may cause erroneous airspeed indications.

Ice build-up on the windshield will distort vision and probably obscure forward visibility.

3.4.15 LOSS OF PRIMARY INSTRUMENTS

In the event of instrument failure, it is recommended to return to the airfield and perform a normal landing, paying very close attention to keep the airspeed well above stall speed. If the airspeed indicator is not functioning, the general feel and sound of the airplane should be used to ensure an adequate airspeed is maintained for safe flight and landing.

3.4.16 LOSS OF FLIGHT CONTROLS

Aileron or Rudder Failure (cable driven)

In the event of failure of the rudder or ailerons, control may still be maintained with the remaining control surface. Plan to land as soon as practical on a runway or field that minimizes the crosswind component. Do not perform abrupt maneuvers. Use an approach airspeed that is higher than normal for safety.

Elevator Failure (cable driven)

In the event of a failure of the elevator control system, the airplane may be controlled and landed using the stabilizer trim, power and flaps. Land as soon as possible and, if possible, elect an airport with a long runway. Prior to landing, establish level flight while maintaining a safe airspeed using a combination of power and elevator trim. Reduce power to establish a shallow decent. Adjust airspeed with trim. At touchdown, reduce power.

3.4.17 UNCOMMANDED TRIM ACTUATION

In the event of uncommanded trim motion with the standard trim switch installed on the pilot's control stick only, disable the system by pulling the TRIM circuit breaker located in the left wing root panel.

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**SECTION 4
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**CUB CRAFTERS
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4 NORMAL PROCEDURES

4.1 INTRODUCTION

This section describes the procedures that Cub Crafters recommends for the pilot to follow during normal operations of the aircraft. It is divided into two parts. The first has abbreviated checklists; these are in a format suitable for reference in the cockpit. The second part amplifies the information given in the checklists. It provides the pilot with detailed descriptions that will help him understand the procedures and techniques.

This manual assumes that the pilot is appropriately rated in an aircraft with a conventional, or tailwheel, landing gear configuration.

4.2 AIRSPEEDS FOR NORMAL OPERATIONS

The speeds in this section are based on a maximum weight of 1320 lbs (600 kg) under standard sea-level conditions.

	mph/kts
Never exceed speed (V_{NE})	141/122 (IAS)
Operating maneuvering speed (V_A)	93/80 (IAS)
Maximum flap speed (V_{FE})	
15°	85/74 (IAS)
Greater than 15°	81/70 (IAS)
Best rate of climb speed (V_Y)	71/61 (IAS)
Best angle of climb speed (V_X)	50/43 (IAS)
Maximum demonstrated crosswind velocity	13/11

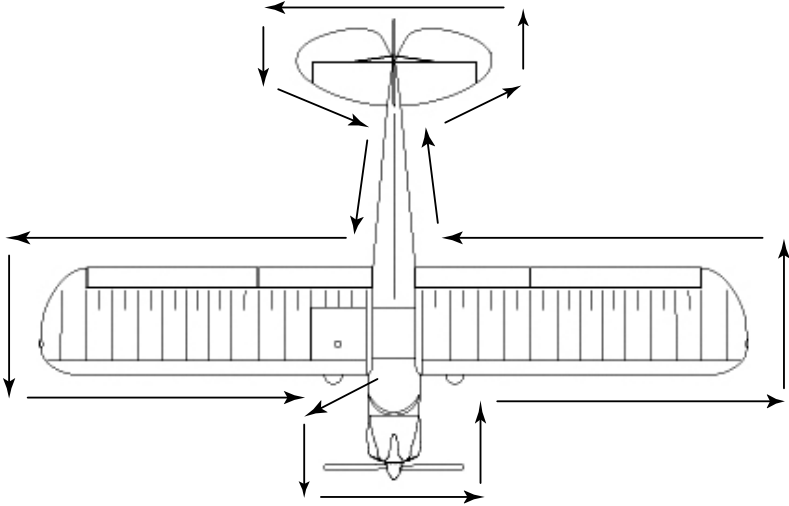


Figure 4-1 Walk Around

4.3 NORMAL PROCEDURES CHECKLIST

4.3.1 PREFLIGHT

4.3.1.1 Cockpit

- Flight Controls Free and correct operation
- Master Switch On
- SMARTmonitor Initial scan
MAIN.V
BACKUP.V
L.IGN OFF (red)
R.IGN OFF (red)
- Trim Check operation and set for takeoff
(marked on empennage)
- Fuel Selector Both
- Flaps Extend and retract
- Fuel Gauges Sufficient fuel for intended flight
- Mixture Idle cut-off
- Carburetor Heat Cold
- Ignition Switch Off
- Ignition Backup Battery Normal
- Electrical Switches Off
- Navigation/Strobe Lights (if installed) ... Check operation
- Landing Light(s) (if installed) Check operation
- Stall Warning Horn Check operation
- Master Switch Off
- Circuit Breakers (instrument panel) Check in
- Circuit Breakers (wing root) Check in
- Circuit Breakers (seat base) Check in
- ELT Connected and in “ARM” position
- Windows Clear
- Documentation Onboard
- Front Seat Adjust
- Rear Seat Check and belts secure
- Baggage and Cargo Secure

NOTE
Ensure forward bar under passenger seat does not conflict with rudder cables.

NOTE
If passenger seat will be unoccupied, secure seat harness to prevent it from interfering with the flight controls or the pilot during flight.

4.3.1.2 Nose Section

- Cowling Secure
- Cowl Flaps Secure
- Oil Door Open
- Oil Quantity 3.5 to 6 Qts
Check and dipstick secure
- Engine Condition Check
- Oil Door Close
- Propeller and Spinner Check condition
- Air Inlets Clear of obstructions
- Air Cleaner In place and clear of obstructions
- Fuel Strainer (forward of firewall on left) Drain
- Fuel Drain (behind firewall on left) Drain

4.3.1.3 Left Fuselage, Wing, and Landing Gear

- Chocks Remove
- Tire Check
- Brakes and Lines Check
- Main Landing Gear Leg and Wing Strut Check
- Fuel Tank Check quantity
- Fuel Cap/Vent Check vent is clear and cap secure
- Pitot Tube Check condition
- Jury Struts and Brackets Check condition
- Stall Warning Vane Check operation
- Landing Light (if installed) Check condition
- Aileron Control Cable Check condition
- Tie Down Remove
- Wing Struts Check condition
- Vortex Generators Check
- Wing Tip and Lights (if installed) Check condition
- Aileron Hinges Check
- Aileron Surface Check condition
- Flap Hinges Check
- Flap Surface Check condition
- Left Fuselage Check

4.3.1.4 Empennage

- Bracing Wires and Attach Brackets . Check for tension
- HingesCheck
- Rudder Cables.....Check
- Position Light (if installed).....Check
- Control Surfaces.....Check
- Tailwheel and SpringsCheck
- Tie Down Remove

4.3.1.5 Right Fuselage, Wing, and Landing Gear

- Right Fuselage Check
- Fuel Sump (under fuselage).....Drain
- Flap Surface..... Check Condition
- Flap Hinges Check
- Aileron Surface..... Check Condition
- Aileron Hinges..... Check
- Wing Tip and Lights (if installed) Check
- Vortex Generators..... Check
- Tie DownRemove
- Wing Struts..... Check Condition
- Jury Struts and Brackets Check Condition
- Fuel Cap/Vent Check vent is clear and cap secure
- Fuel Tank Check quantity
- Main Landing Gear Leg and Wing Strut..... Check
- Brakes and Lines Check
- Tire Check
- ChocksRemove

4.3.1.6 General

Check that all wings and other external surfaces are free from frost, ice, and/or snow.

4.3.2 STARTUP AND TAXI

4.3.2.1 Before Starting Engine

- Preflight Inspection Complete
- Pilot Seat Adjusted
- Seat Belts Fastened
- Passenger Briefing Complete
- Parking Brakes (on master cylinders).. Both wheels, set
- Door Closed and latched
- Fuel Selector Both
- Avionics Master Switch Off
- Propeller Area Clear

CAUTION

The parking brake on each main wheel is set by depressing the top of each rudder pedal and rotating the valve on each master cylinder so the lever is oriented horizontally while maintaining pressure on the pedal. To release the brakes, rotate both valves so the levers are oriented vertically. Do not close the valves without any pressure applied to the pedals, as this will not apply the brakes and will allow the aircraft to be moved while the brakes are rendered inoperative for ground operations.

4.3.2.2 Starting Engine

- Master Switch..... On
- MixtureFull rich
- Primer.....If required*
- Throttle Open 1/2 inch
- Starter Engage
- MAIN.V (SMARTmonitor)..... May alert

After engine has started:

- Oil Pressure Check
- ThrottleSet 1000 rpm
- Ignition Switch.....Both
- Lights.....As required
- Avionics Master Switch On
- SMARTmonitor..... Green

*Normal procedure three times. If engine is hot, omit this step.

WARNING
ENSURE THAT THE PRIMER IS CLOSED AND LOCKED AFTER THE ENGINE HAS STARTED. APPLYING THE PRIMER WITH THE ENGINE RUNNING WILL MAKE THE ENGINE STOP.

4.3.2.3 Starting Engine when Flooded

- Ignition SwitchBoth
- Mixture Idle cut-off
- Throttle Full open
- Starter Engage

When engine fires:

- Mixture Rich
- Throttle Retard to 1200 rpm
- Ignition Switch.....Both
- Oil Pressure Check
- Lights.....As required
- Avionics Master Switch On

4.3.2.4 Warm Up

- Throttle1000 to 1200 rpm

4.3.2.5 Taxiing

- Parking Brakes (on master cylinders).....Release both
- Taxi Area Clear
- Throttle Apply slowly
- BrakesCheck
- SteeringCheck

4.3.3 FLIGHT

4.3.3.1 Before Takeoff

- Brakes Set
- Throttle 1700 rpm
- Ignition Right,
SMARTmonitor L.IGN OFF (red)
Left Ignition Light illuminated;
Insignificant RPM drop:
No Roughness
- Ignition Left
SMARTmonitor R.IGN OFF (red)
Right Ignition Light illuminated;
Insignificant RPM drop:
No Roughness
- Backup Battery
 - Ignition Right
SMARTmonitor L.IGN OFF (red)
Left Ignition Light illuminated
 - Backup Battery Emergency
BAKUP IN.USE (yellow)
Insignificant RPM drop:
No Roughness
 - Backup BatteryNormal
- Ignition Both
SMARTmonitor normal scan, all green

- Carburetor Heat Hot (Note RPM drop then cold)
- Engine Instruments Check
- Ammeter (if installed) Check
- Throttle Check idle
- Throttle 1000 rpm
- Flight Instruments Check
- Fuel Selector Both and sufficient quantity for flight
- Mixture Set*
- Carburetor Heat Off
- Primer Closed and locked
- Trim Set
- Flaps First notch (takeoff)
- Controls Free and proper movement
- Strobes (if installed) As required
- Transponder and Other Avionics On
- Seat Belts Check fastened
- Circuit Breakers (wing root) Check in
- Circuit Breakers (seat base) Check in
- Circuit Breakers (instrument panel) Check in
- Doors and windows Closed
- Landing Lights (if required) On
- Ignition Check both
- Brakes Release

* When operating at high altitudes and/or temperatures, it may be necessary to lean the mixture for peak rpm.

4.3.3.2 Takeoff

- Accelerate to 40 mph IAS (depending on aircraft weight) allowing tail to rise; maintain directional control.
- Control stick Gentle back pressure
- Accelerate to desired climb speed
- Flaps Retract slowly after liftoff
- Landing Lights (if required) On

4.3.3.3 Climb

- Best Rate..... 71 mph IAS
- Best Angle 50 mph IAS
- Mixture..... Lean to obtain maximum rpm
- Carburetor Heat..... As required
- RPM..... 2700 for 5 minutes or less

4.3.3.4 Cruise

- Power Adjust
- Mixture..... Adjust
- Carburetor Heat..... As required
- RPM..... Reduce per placard to maintain 80 hp

4.3.3.5 Descent

- Power Adjust
- Mixture..... Adjust
- Carburetor Heat..... As required

4.3.3.6 Approach and Landing

4.3.3.6.1 Normal Landing

- Fuel Selector Both
- Seat Belts Fastened
- Mixture..... Set
- Flaps..... Set
 - Maximum Speed first notch flaps (15°)..... 85 mph IAS
 - Maximum Speed (>15°)..... 81 mph IAS
- Trim As required
- Speed As required
(1.3 times full flaps stall speed at gross weight is 42 mph IAS)
- Doors and windows Closed

4.3.3.6.2 Crosswind Landing

- Fuel Selector Both
- Seat Belts Fastened
- Mixture Set
- Flaps Set below white arc
 - Maximum Speed, first notch (15°) 85 mph IAS
 - Maximum Speed (>15°) 81 mph IAS
- Trim As required
- Speed As required
(A higher speed than normal is recommended)
- Ailerons-Rudder On short final
 - Use ailerons to keep upwind wing low
 - Rudder to hold runway alignment
- Touchdown Do not drift sideways during touchdown
- Landing Roll Use ailerons to keep upwind wing down, rudder and brakes to maintain directional control

4.3.3.7 Go-Around

- Throttle Full power
- Carburetor Heat (if applicable) Off
- Airspeed Above 52 mph
- Flaps Retract slowly
- Trim As required

4.3.3.8 Stopping Engine

- Parking Brakes Set
- Flaps Retract
- Electrical Equipment Off
- Avionics Master Switch Off
- Throttle Idle
- Mixture Idle cut off
- Ignition Off
- Master Switch Off

4.4 AMPLIFIED NORMAL PROCEDURES

4.4.1 PREFLIGHT

4.4.1.1 Cockpit

Enter the cockpit and operate the flight controls to ascertain that they operate freely in the correct sense. As a rule of thumb, if the stick is moved towards a control surface, that surface must go up. Make sure that the passenger (or cargo being carried in place of the rear seat) will not limit the travel of the control stick in any direction.

Set the leading edge of the horizontal stabilizer (pitch trim) to the takeoff position using the rocker switch on the control stick. Ensure that the stabilizer moves smoothly. The trim is in the takeoff position when the leading is within the marks on the left side of the empennage.

Check the flaps by lowering them to all positions and retracting them. Check that the detent on the handle engages in all positions.

Set the fuel selector to BOTH. Ensure that there is enough fuel for the intended flight by checking the sight gauges.

The mixture should be in the idle/cut-off position and the carburetor heat in the off (cold) position.

Ensure that the electronic ignition switch is off and the ignition backup battery is in the NORMAL position.

Check that all the electrical systems that will be used for the flight operate as intended. Note that the SMARTmonitor will run an initial scan. To confirm that the stall warning is functioning correctly, gently operate the vane on the leading edge of the left wing with the master switch on. The stall horn should sound.

After operating the electrical system, make sure that all circuit breakers are in. Note that some are located on the left upper wing root, others on the forward part of the seat base and the instrument panel.

Check that the windows are clean and clear of frost or snow.

Ensure that all the documentation required for the flight is onboard. This includes charts, airworthiness certificate, registration certificate, aircraft flight manual, weight and balance data, etc.

Adjust the position of the front seat.

Turn the master switch off before leaving the cockpit.

Verify rear seat straps are correctly routed through slide adjusters, as shown in Section 7.6. If no passenger is being carried, secure the aft seat belts and harnesses.

4.4.1.2 Nose Section

As you make your way around the forward part of the aircraft, inspect the condition of the cowling and cowl flaps for cracks and ensure the fasteners are secure.

Open the oil door on the right-hand side of the cowling. Check the oil quantity. The oil quantity for normal operation should be between 3.5 and 6 quarts (4 quarts recommended). Ensure that the oil filler cap is secure.

Inspect the engine through the door and then close and secure it.

Check the propeller for nicks and the spinner for security and cracks.

Verify air filter is installed and unobstructed.

Look through the air inlets on the front of the cowl and visually inspect the condition of the engine.

Check the general condition of the exhaust system. Drain fuel from both the gascolator and the lower left drain, and inspect for water and sediment. Dispose of the fuel in an appropriate manner.

The following is to be completed whenever the aircraft has been parked:

- In conditions where condensation may have accumulated in the fuel system.
 - In heavy or prolonged precipitation.
 - Whenever there is any question that water may have accumulated in the fuel system.
1. Gently rock the wings of the aircraft.
 2. Drain at least 1/8 gallon of fuel from the drain on the lower right side and the fuel gascolator on the forward left side. If water is present in the fuel, drain at least 1/8 gallon past the point when water was last observed.
 3. Jack the tail of the aircraft to flight level attitude (Reference SSC10000AMM Sections 6.3.2.1 & 6.3.2.2).
 4. Repeat Step 2.

4.4.1.3 Left Fuselage, Wing, and Landing Gear

Check the general condition of the left side of the fuselage.

Inspect the landing gear, tires, brakes, and shock absorber for condition and remove any chocks from under the wheel. Check the fuel cap by standing on the step provided on the landing gear. Visually check the fuel level in the wing tank and ensure there are no obstructions in the vent tube.

As you walk along the leading edge of the wing, look for dents, ensure that the tie downs have been removed, and gently operate the stall warning vane. Ensure that all the vortex generators are in place. If one should be missing, there will be a mark on the paint of the wing where it should be. Check the landing light lens for cracks and check the security of the wingtip light assembly (if installed). Check the general condition of the wings, lift struts, jury struts, and wing tip. Check the flaps and ailerons for general condition. Pay particular attention to the hinges to make sure they are secure and the cotter pins are in place.

4.4.1.4 Empennage

Check the tail surfaces for general condition and the tail wire bracing for security and tension. The hinges should all be secured with cotter pins.

Check the condition of the tailwheel and the springs.

Check the rudder cables for condition and proper attachment. Check the condition of the light (if installed) on the rudder. Remove the tie down.

4.4.1.5 Right Fuselage, Wing, and Landing Gear

Repeat the procedure carried out on the left wing, fuselage side, and landing gear.

4.4.1.6 General

Before re-entering the cockpit, make sure that the entire aircraft is free of snow or frost.

4.4.2 STARTUP AND TAXI

4.4.2.1 Before Starting the Engine

Adjust the pilot seat using the pins on the sides of the seat-base. The pins must be securely installed prior to flight. Adjust the straps to accommodate the passenger. Make certain the forward bar under the passenger seat does not conflict with the control systems. Seat belts should be fastened and the passenger briefed. Close the door. Engage the parking brakes, which are individual valves located on each brake master cylinder. Ensure that the fuel selector is in the BOTH position. Verify that the avionics master switch is off and ensure that the propeller area is clear.

4.4.2.2 Starting the Engine

Turn the master switch on. The SMARTmonitor will show MAIN.V and BACK.V in yellow or green. Push the mixture control in to full rich. If the engine is cold, it may be desirable to prime the engine. To do this, rotate the primer control until it unlocks, pull it out, allowing the pump to fill with fuel, and push it in, normally three times (more priming may be required in colder weather). After priming, make sure that the control is locked. Open the throttle 1/2 inch. Verify that the propeller area is clear and engage the starter. Oil pressure should rise within 30 seconds; otherwise, shut the engine down. Turn on any lights that may be required. The avionics master may

now be switched on and the radios tuned as necessary. The SMARTmonitor should be green for both MAIN.V and BACK.V after the engine has started.

4.4.2.3 Starting Engine when Flooded

The throttle should be in the full open position. Turn the master switch on. The mixture control should be in the idle cut-off position.

Verify that the propeller area is clear and engage the starter. As soon as the engine starts, move the mixture control to the rich position and retard the throttle. Oil pressure should rise within 30 seconds; otherwise, shut the engine down.

4.4.2.4 Warm Up

Before takeoff the engine should be warmed up for two to three minutes minimum, although longer may be required when the temperatures are below freezing. The engine is warm enough when it idles at around 600 rpm and accelerates smoothly. Ensure the oil pressure is within the green arc on the gauge.

Avoid running the engine at idle for too long, as it will tend to foul the spark plugs.

If you need to add power over loose stones or gravel, do so carefully to avoid damaging the propeller.

4.4.2.5 Taxiing

Before starting to taxi, make sure that the propeller blast will not affect the area behind the aircraft and that there are no unapproved, unqualified people close to the aircraft.

Release the parking brakes. Apply power and keep the control stick in the proper position at all times. Apply both brakes and steer from side-to-side to make sure the aircraft is controllable on the ground.

4.4.3 FLIGHT

4.4.3.1 Before Takeoff

When the run-up area is reached, set the parking brake. Perform the electronic ignition system check at 1700 rpm, as follows:

- Switch to the left ignition and note the rpm, check for engine smoothness and right fault light illuminated, and SMARTmonitor alarms (red) R. IGN OFF. Switch back to both.
- Switch to the right ignition and note the rpm, check for engine smoothness and left fault light illuminated, and SMARTmonitor alarms red L. IGN OFF.
- Switch ignition backup battery to EMERGENCY, check for engine smoothness, amber light illuminated, and SMARTmonitor alarms BACKUP IN.USE. Switch back to NORMAL
- Switch back to both.

There should be little to no drop with the electronic ignitions system. The engine should run smoothly on either system. If there is a fault indication light it should be checked.

Apply the carburetor heat to be sure that it is operating. You will note a drop of about 50 to 75 rpm when it is applied. This will also clear any ice that may have formed during taxiing. Bear in mind that when the carburetor heat is applied, unfiltered air is entering the engine. Therefore, its use on the ground should be kept to a minimum.

The presence of ice may be recognized by the fact that the engine may momentarily run roughly when the carburetor heat is applied. This may be followed by an increase in rpm. When the carburetor heat is removed, the rpm may increase beyond 1700 rpm.

Check all engine parameters. Apply an electrical load (for example, by switching on the landing light) and observe that there is an increase in the electrical current drawn from the alternator (if an ammeter is installed).

Retard the throttle to idle to verify that the engine runs smoothly at minimum rpm (at least 600 rpm). Advance it to 1000 rpm.

In hot and high conditions, especially above 3,000 feet, it is important to lean the mixture prior to the ignition check. To do this, apply full power. Slowly lean the mixture until you observe the peak RPM. Retard the throttle slowly and proceed with the rest of the run-up.

Prior to takeoff, verify that the flight instruments operate correctly. Ensure that the fuel selector is on BOTH, the mixture is set, and the carburetor heat in the cold position. Engine gauges should be in the normal ranges. Flaps should be selected for takeoff; first notch (15°) is recommended. The door should be closed and seat belts fastened.

4.4.3.2 Takeoff

4.4.3.2.1 Normal Takeoff

The normal takeoff technique uses the first notch (15°) of flaps. Align on the runway and open the throttle. Maintain directional control at all times using appropriate rudder inputs. With the elevator in neutral, allow the tail to come up. At about 40 mph IAS, apply back pressure on the stick until the aircraft leaves the runway.

4.4.3.3 Climb

The best rate of climb speed (V_Y) at gross weight is 71 mph IAS and best angle (V_X) is at 50 mph IAS, with flaps up. Full throttle may be used for up to 5 minutes.

Normal en-route climbs should be carried out at 80 to 90 mph. While climbing, lean the mixture to achieve maximum engine speed. Consider the use of carburetor heat if weather conditions that may produce carburetor icing prevail.

4.4.3.4 Cruise

Once cruising altitude is reached, set the power as desired. Use maximum continuous operation at 80 hp as placarded. Reduce the power to the selected setting and adjust the mixture. The engine may be leaned by slowly pulling the mixture back until there is a drop in rpm or the engine runs roughly. At this point, advance the mixture slightly (about 1/8 of an inch) or until the engine runs smoothly.

NOTE

With a new engine, try to use full power as often as possible until either a total of 50 hours of operations have been accumulated or the oil consumption has stabilized.

This will ensure that the piston rings seat correctly.

4.4.3.5 Descent

During descent use the carburetor heat as required. Take care not to exceed the maximum speed of the engine (2700 rpm). Also, use caution to prevent shock-cooling the engine by descending at high airspeeds with too low of a throttle setting. Enrich the mixture as you descend.

4.4.3.6 Approach and Landing

Flaps may be lowered to the first notch (15°) when the airspeed is below 85 mph IAS. The maximum speed for more flaps (>15°) is 81 mph IAS.

CAUTION

Plan the pattern so that steep turns are not required when turning from down-wind to base leg and from base leg to final. Steep turns increase stall speed (Fig 5-2 and 5-3, Stall Speed Versus Angle of Bank). Steep turns, low power, and slow airspeed can be dangerous, particularly if the airplane is heavily loaded and/or with gusty or turbulent wind conditions.

4.4.3.6.1 Normal Landing

The normal landing is in a three-point, stalled condition. Adjust the throttle and pitch attitude to compensate for ground effect as the aircraft approaches the runway. At approximately 10 feet AGL, smoothly begin landing flare to attain a three-point attitude. Maintain this attitude and adjust the throttle to accomplish a smooth touchdown. Gradually bring the stick back, keeping it back throughout the landing roll. Maintain directional control with rudder and differential braking, as necessary.

It is possible to settle the aircraft on the ground at higher speeds in a two-point configuration. The landing flare is kept flat, aiming to place the main landing gear wheels on

the runway at a minimum sink rate. When the wheels contact the ground, the stick must be moved forward to counteract the pitching up reaction of the aircraft. After the aircraft has slowed down, the tail may be brought down with the stick. Bear in mind that the rudder will begin to lose effectiveness as airspeed is reduced. Maintain directional control. Apply brakes as necessary.

4.4.3.6.2 Crosswind Landing

When established on a short final approach, use the ailerons and rudder to maintain the approach path. Lower the upwind wing using ailerons and use the rudder to hold runway alignment. At approximately 10 feet AGL, increase the pitch attitude to flare. Ensure that the aircraft is not drifting sideways when touching down. When a satisfactory touchdown has been accomplished, reduce the throttle to IDLE and adjust ailerons slightly to allow the downwind main wheel to touch down.

Maintain the stick deflected into the wind as necessary to keep the upwind wing from lifting, and use rudder and differential braking, as necessary, to maintain directional control. Once the three wheels are on the ground, move the stick all the way back and keep it there at all times during the landing roll. Apply brakes only as required to maintain directional control, slow to taxi speed or stop.

NOTE

It is recommended that a slightly higher airspeed be used on final approach during gusty or turbulent wind conditions. Add approximately one (1) mph IAS for each two (2) knots of reported gust.

4.4.3.7 Short Field Procedures

4.4.3.7.1 Takeoff

Using the first notch of flaps (15°), add full power while holding the aircraft on the brakes. Release the brakes and allow the tail to rise. Rotate at about 40 mph, accelerate to V_x (50 mph) and climb out until obstacle clearance is achieved, then raise flaps and decrease climb rate as desired.

4.4.3.7.2 Landing

Make a normal approach and use two notches of flaps (35°). After clearing obstacles, the third notch/full flaps (50°) should be used for the final descent to the landing area. Power should be used as required to arrest the descent.

4.4.3.8 Soft Field Procedures

For soft field operations, proper use of the elevator and very mild braking should be exercised to prevent the aircraft from getting stuck or nosing over. Takeoff should be performed in three-point configuration. Landings should be made in three-point configuration, concentrating on a soft touch-down.

4.4.3.9 Balked Landing (Go-around)

In a balked landing, apply full power. Slowly retract the flaps to the first notch (15°) and establish a positive rate of climb. Maintain climb speed. Trim as required.

4.4.3.10 Stopping the Engine

The parking location should be free of loose material such as gravel, debris, or unsecured tie down ropes, which could be blown up by the propeller.

When the aircraft is parked, turn off all electrical equipment, including avionics. The engine must always be stopped by pulling the mixture control to the idle cut-off position. Turn the ignition switch off. Finally, turn the master switch off.

NOTE

Any device(s) plugged into an accessory port may drain the battery.

After the airplane has been positioned, release the brakes and determine whether the airplane is likely to roll as the crew exits. If so, set the parking brakes by turning the valve on each brake master cylinder while applying force to the brake pedals. Retract the flaps to prevent damage to the flaps and their operating mechanism in the event of strong winds from the tail direction.

Install wheel chocks, if available. Tie down both the wings and the tail. Straps or ropes are preferred over chains. Tie-downs should be firmly secured but without excessive tension. Close cabin windows and door.

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5 PERFORMANCE

5.1 INTRODUCTION

The purpose of this section is to provide information that will assist the pilot with planning a flight in detail with reasonable accuracy.

All data has been corrected to I.C.A.O. standard day conditions. Where appropriate, the data has been expanded analytically for variations in weight, altitude, temperature, etc.

The data has been derived from actual flight tests, taking into account the proficiency of an average pilot. The pilot must use sound judgment when assessing the effect of conditions not found in the charts, such as soft runways and winds aloft. The parameters will be affected by the performance of the engine. Therefore, the pilot must be thoroughly familiar with its operation, including the procedures for adjusting the mixture control.

Data should not be extrapolated beyond the limits shown on the charts.

All information is presented in the units used on the aircraft's instrumentation.

- Airspeeds will be presented in statute miles per hour
- Weights in pounds
- Altitudes in feet
- Temperatures in degrees Fahrenheit
- Wind speed in nautical miles per hour

All of the data presented in this chapter are based on an aircraft equipped with the Catto Propellers 78" x 54" pitch glass/carbon/wood composite propeller and 6.00 x 6 tires, though the aircraft may be equipped with different tires.

5.2 PERFORMANCE CHARTS

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5.2.1 AIRSPEED CALIBRATION

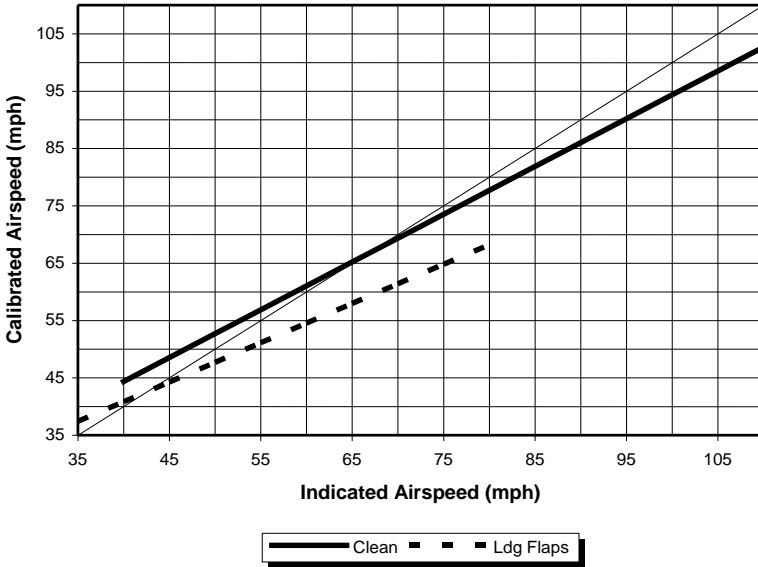


Figure 5-1 Airspeed System Calibration

NOTE
Indicated airspeed assumes zero instrument error.

NOTE
Airspeed indication can vary by several miles per hour depending on whether the door and windows are open or closed. All values listed are for indications with the windows and the door in the closed position.

5.2.2 STALL SPEED

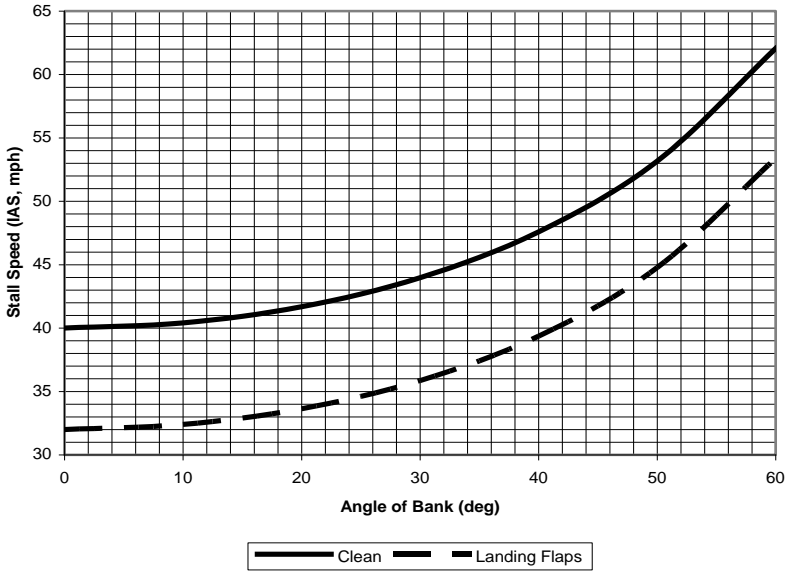


Figure 5-2 Stall Speed versus Angle of Bank

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5.2.3 TAKE OFF

5.2.3.1 Normal takeoff

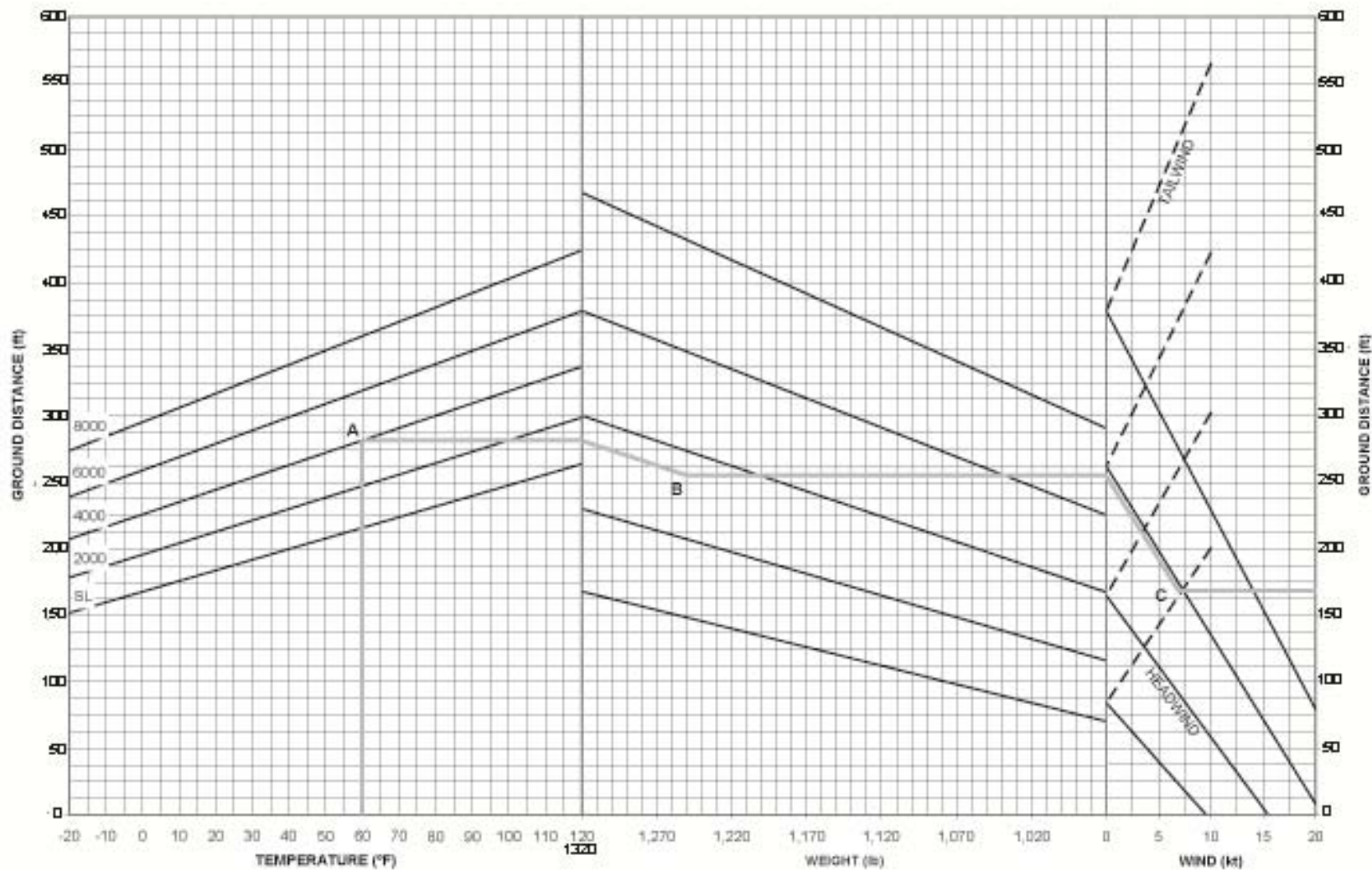


Figure 5-3 Takeoff Ground Distance at 1320 lbs

Example:
Takeoff conditions

Outside air temperature (OAT)	60° F
Pressure altitude at airport	4000 feet
Aircraft weight	1250 lbs.
Headwind	7 kts.

On the graph at the furthest left of the chart, identify point A where the OAT intersects with the pressure altitude at the airport. Note the pressure altitude lines on the chart are at even thousands of feet. If the field altitude is between two lines, place point A between the appropriate lines at approximately the correct spacing. Extend a line horizontally from point A to the reference line on the second graph (the one in the center). From there, follow parallel to the weight lines until you reach 1250 lbs. This is point B.

Extend a line horizontally from point B to the reference line on the graph on the right. From there, follow parallel to the wind lines until you reach 7 knots. This is point C.

From point C extend a line horizontally to the axis on the far right of the chart. This will give you the takeoff ground distance (approximately 175 ft) under the conditions listed above, assuming a smooth runway with no appreciable slope.

5.2.4 CLIMB RATE AND GRADIENT

Pressure Altitude (ft)		Indicated Airspeed (mph)	OAT (°F)	Climb Gradient (%)	Rate of Climb (fpm)
0	27°F Below ISA Temp	70	32	5	1890
2000		71	25	4	1850
4000		71	18	3	1759
6000		72	11	3	1608
8000		72	4	3	1374
0	ISA Temp	71	59	4	1750
2000		71	52	4	1667
4000		72	45	3	1578
6000		72	38	3	1410
8000		73	31	2	1165
0	16° Above ISA Temp	71	75	4	1620
2000		71	68	3	1503
4000		72	61	2	1415
6000		73	54	2	1237
8000		74	47	2	987

Figure 5-4 Maximum Rate and Gradient of Climb

<p>NOTE Mixture leaned for maximum RPM.</p>
--

5.2.5 RPM FOR 80 HORSEPOWER

Pressure Altitude (ft)	Temperature °F						
	ISA -30	ISA -20	ISA -10	ISA	ISA +10	ISA +20	ISA +30
0	2050 RPM	2050 RPM	2050 RPM	2050 RPM	2050 RPM	2100 RPM	2100 RPM
2000	2100 RPM	2100 RPM	2100 RPM	2100 RPM	2100 RPM	2100 RPM	2100 RPM
4000	2150 RPM	2150 RPM	2150 RPM	2150 RPM	2150 RPM	2150 RPM	2200 RPM
6000	2200 RPM	2200 RPM	2200 RPM	2200 RPM	2200 RPM	2200 RPM	2200 RPM
8000	2250 RPM	2250 RPM	2250 RPM	2250 RPM	2250 RPM	2250 RPM	2300 RPM
10000	2300 RPM	2300 RPM	2300 RPM	2300 RPM	2300 RPM	2300 RPM	2300 RPM

Figure 5-5 Engine RPM for 80 Horsepower

5.2.6 CRUISE

Pressure Altitude (ft)	RPM	Hp	% Power (of 180)	True Airspeed (mph)	Fuel Flow (gph)	Manifold Pressure
2000	1900	58	32	75	3.3	13.1
	2000	67	37	78	3.7	13.9
	2100	77	43	87	4.2	14.9
	2150	80	44	89	4.4	15.1
4000	1900	54	30	75	3.2	12.3
	2000	62	34	78	4.0	13.9
	2100	71	39	84	4.3	14.2
	2200	80	44	92	4.7	15.1
6000	1900	50	28	74	3.0	12.1
	2000	57	32	78	3.7	13.4
	2100	67	37	85	4.3	13.9
	2200	77	43	92	4.6	14.2
	2250	80	44	95	4.8	14.5
8000	1900	47	26	75	3.1	11
	2000	54	30	79	3.6	12.1
	2100	63	35	83	4.2	13
	2200	72	40	93	4.4	13.4
	2300	80	44	99	4.8	14.0

Chart Continues on the next page

Pressure Altitude (ft)	RPM	Hp	% Power (of 180)	True Airspeed (mph)	Fuel Flow (gph)	Manifold Pressure
10000	1900	44	24	76	2.9	10.2
	2000	51	28	80	3.3	11.4
	2100	58	32	85	3.6	12
	2200	67	37	93	4.0	12.9
	2300	76	42	99	4.3	13.6
	2350	80	44	103	4.5	13.8
12000	1900	40	22	67	2.8	10.6
	2000	47	26	73	3.2	11.2
	2100	55	31	83	3.7	11.7
	2200	64	36	92	4.0	12.2
	2300	72	40	97	4.3	13.0
	2400	80	44	105	4.7	13.5

Figure 5-6 Cruise Speed

5.2.6 LANDING

5.2.6.1 Landing over 50' obstacle

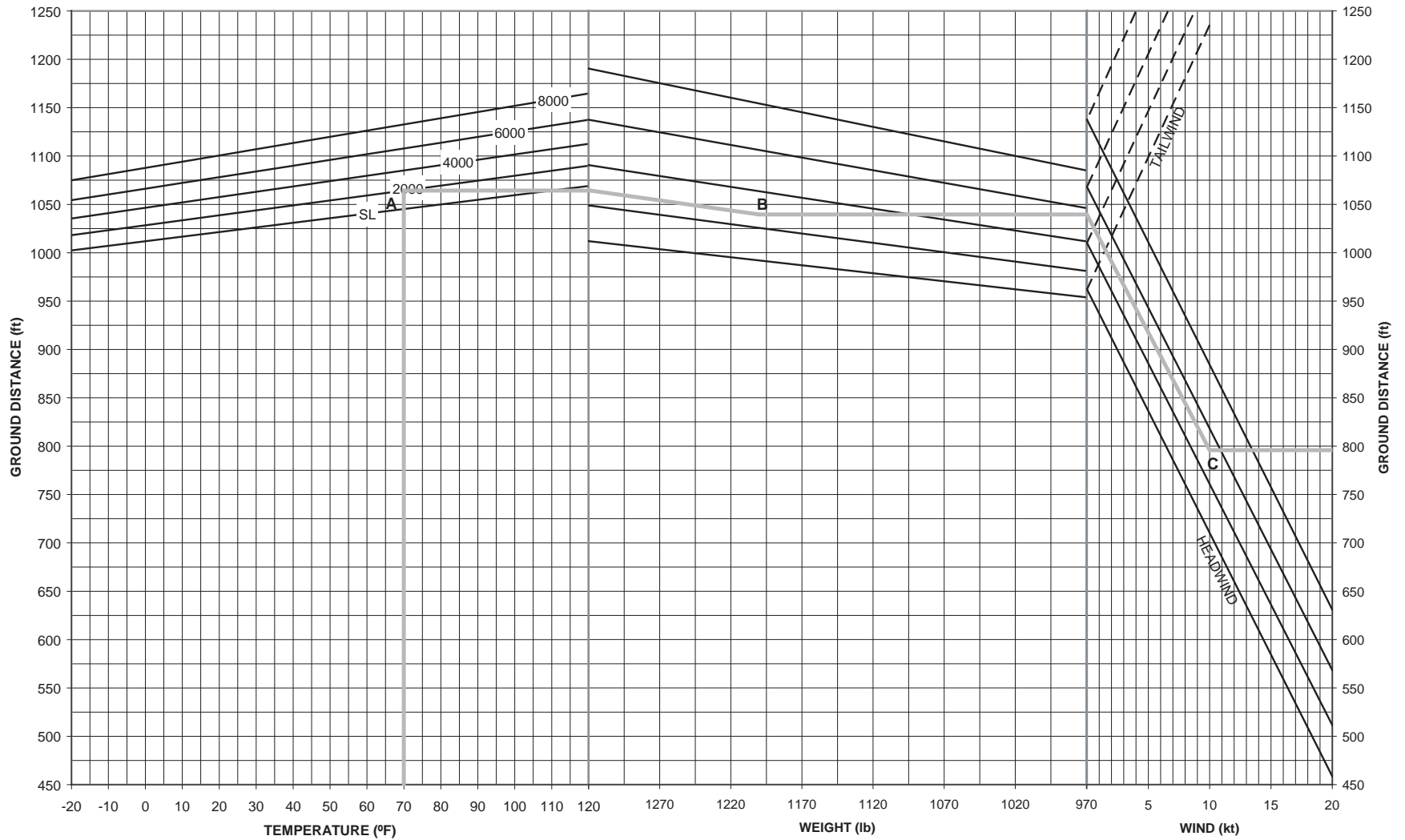


Figure 5-6 Landing Distance over 50' Obstacle

Example:
Landing conditions

Outside air temperature (OAT)	70 °F
Pressure altitude at airport	2000 feet
Aircraft weight	1200 lbs
Headwind	10 kts

On the graph at the furthest left of the chart, identify point A where the OAT intersects with the pressure altitude at the airport. Note the pressure altitude lines on the chart are at even thousands of feet. If the field altitude is between two lines, place point A between the appropriate lines at approximately the correct spacing. Extend a line horizontally from point A to the reference line on the second graph (the one in the center). From there, follow parallel to the weight lines until you reach 1200 lbs. This is point B.

Extend a line horizontally from point B to the reference line on the graph on the right. From there, follow parallel to the wind lines until you reach 10 knots. This is point C.

From point C extend a line horizontally to the axis on the far right of the chart. This will give you the total landing distance to clear a 50' obstacle (approximately 790 ft.) under the conditions listed above, assuming a smooth runway with no appreciable slope.

5.2.7 BALKED LANDING

Pressure altitude (ft)	Airspeed (mph IAS)	Climb gradient (%)
4,000	70	> 2.3

Figure 5-8 Balked Landing Climb Gradient

NOTE
First notch flaps (15°)
Mixture leaned for peak RPM

5.2.8 GLIDE

Statute Miles	Nautical Miles	Altitude Loss (ft)
1.4	1.2	1000
2.8	2.5	2000
4.3	3.7	3000
5.7	4.9	4000
7.1	6.2	5000
8.5	7.4	6000
9.9	8.6	7000
11.3	9.9	8000
12.8	11.1	9000
14.2	12.3	10000
15.6	13.6	11000
17.0	14.8	12000
18.4	16.0	13000
19.8	17.2	14000

Figure 5-9 Glide Performance

NOTE

At 1320 lbs, glide speed 68 mph, flaps up

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6 WEIGHT AND BALANCE

6.1 INTRODUCTION

This section provides two very important pieces of information. Section 6.3 describes the methods for determining the empty weight of the aircraft and the position of the center of gravity relative to the datum. Section 6.5 supplies the information necessary to calculate the takeoff weight and the position of the center of gravity for a given flight. An example is provided in paragraph 6.6.

Weight and balance limits are important for two reasons:

- The structure was designed for a certain maximum weight.
- Weight and center of gravity affect both the performance, stability, and control characteristics, particularly in stall and spin recovery.

The aircraft will only attain the performance and exhibit the handling characteristics used for certification if it is flown with the center of gravity within the approved range. An overloaded aircraft will not take off, climb, or cruise as well as a properly loaded one. The center of gravity is a determining factor in flight characteristics. If the CG is too far forward, the aircraft will require high stick forces for control and increases the risk of nosing over on the ground. If the CG is too far aft, the aircraft may pitch up during climb. Longitudinal and directional stability will be reduced. This can lead to inadvertent stalls and even spins. Spin recovery will become more difficult, if not impossible.

The aircraft will perform as intended when it is properly loaded. Before it was delivered, the aircraft was weighed and the CG location was computed. You will find this information in Section 6.4.

6.2 PERTINENT INFORMATION FOR WEIGHT AND BALANCE

Position of datum 60 inches ahead of wing leading edge

Maximum gross weight (wheels or skis) 1320 lbs

Maximum gross weight (floats) 1430 lbs

Forward CG Limits

At 1320 lbs73.0 inches aft of datum

At 1100 lbs or less70.5 inches aft of datum

(Straight line variation between points given)

Aft CG Limit (at all weights)78.5 inches aft of datum

Note that the aircraft can be equipped with different propellers and tires. These will affect weight and balance and performance.

Optional equipment must be included in the weight and balance data when it is installed.

6.2.1 TERMINOLOGY

Arm	The horizontal distance from the reference datum to the center of gravity (CG) of an item.
Basic Empty Weight	Standard empty weight plus optional equipment.
Center of gravity (CG)	The point at which an aircraft or an item of equipment would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight.
CG Arm	The arm obtained by adding the airplane's individual moments and dividing the sum by the total weight.
CG Limits	The extreme center of gravity limits within which the aircraft must be operated at a given weight.
Datum	An imaginary vertical plane from which all horizontal distances are measured for balance purposes.

Moment	The product of the weight of an item multiplied by its arm.
Maximum Takeoff Weight	Maximum weight approved for the start of the takeoff run.
Standard Empty Weight	Weight of a standard airplane, including unusable fuel, full operating fluids and oil.
Unusable fuel	The quantity of fuel at which the first evidence of malfunctioning occurs under the most adverse fuel feed condition.
Useful load	Difference between takeoff weight and basic empty weight.

6.3 WEIGHING PROCEDURES

This procedure is to be followed for weighing the landplane. To weigh aircraft equipped with floats, consult the maintenance manual, document SSC10000AMM.

6.3.1 PREPARATION

Make sure that all of the equipment listed in the Aircraft Equipment List (Section 6.4) is installed and is in the proper location.

1. Remove any items not listed on the Aircraft Equipment List (such as rags, charts, tools, etc.).
2. Clean the aircraft to remove excess dirt and grease.
3. Remove the fuel from the aircraft. This may be accomplished by opening the fuel drains until all remaining fuel is drained.
4. Check that the oil is at the recommended level.
5. Position the pilot's seat in the mid-range position. Retract the flaps, place all controls in neutral, and close the door and windows.
6. Place the aircraft in a hangar with the doors closed where the wind will not affect the readings of the scales.

6.3.2 LEVELING

Have a set of calibrated weighing scales available. The range should be up to 1000 lbs for each main and up to 250 lbs for the tail. Zero the scales or record the tare, as appropriate.

1. Place the aircraft approximately in a flight level attitude by supporting the tail wheel on a bench.
2. Place the aircraft on the calibrated weighing scales.
3. Level the aircraft as follows:
 - Place a level on the open door edge as shown in Figure 6-1. Lower or raise the tail until the aircraft is level. If necessary, this may be accomplished by letting air out of the tires.
 - Place the level on the upper forward cross tube located in the cabin just behind the windshield, as shown in Figure 6-2. Center the bubble to level the wings.



Figure 6-1 - Leveling the Aircraft



Figure 6-2 - Leveling the Aircraft

6.3.3 WEIGHING

1. Once the aircraft has been leveled, record the weight on the main wheels and the tailwheel.

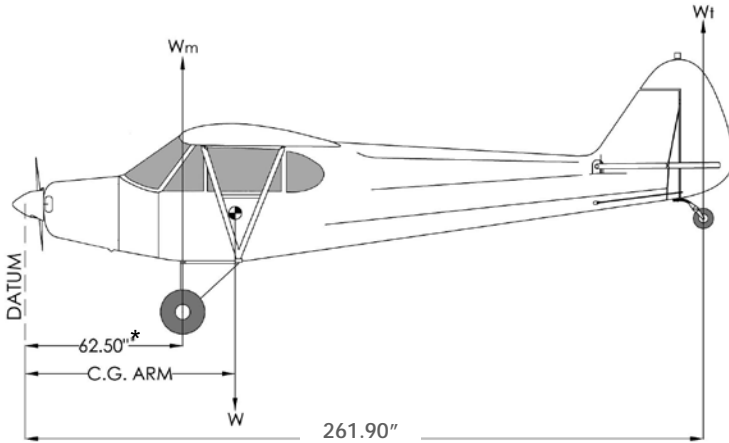


Figure 6-3 - Standard Aircraft Geometry

** 59.50 for aircraft equipped with 3X3 landing gear.*

Standard Aircraft CG Calculation:

$$CG\ Arm = \frac{(W_m \times 62.50) + (W_t \times 261.90)}{W}$$

3X3 Landing Gear Equipped Aircraft CG Calculation:

$$CG\ Arm = \frac{(W_m \times 59.50) + (W_t \times 261.90)}{W}$$

Where:

<i>CG Arm</i>	=	Distance from the datum to the center of gravity (in inches)
<i>W</i>	=	Total weight of the aircraft
<i>W_m</i>	=	Sum of the weight on both main wheels
<i>W_t</i>	=	Weight on the tailwheel

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6.4 WEIGHT AND BALANCE DATA AND RECORD

Table 6-1 shows the following information at the time when the aircraft was licensed at the factory:

- Basic empty Weight
- Center of Gravity
- Useful Load

MODEL CC11-160

Aircraft serial number: _____
Registration number: _____
Date: _____

Basic empty weight (lbs)	Arm (inches)	Moment (in·lbs)

Table 6-1 Basic Empty Weight

Useful load = Maximum takeoff weight- Basic empty weight
= 1320 – _____
= _____ lbs

This basic empty weight, CG, and useful load are for the aircraft as it was licensed at the factory. Please refer to the appropriate aircraft records to determine the latest information, as the aircraft may have been altered.

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MODEL: CC11-160		SERIAL NUMBER		REGISTRATION NUMBER			PAGE NUMBER		
Date	Item No.	Description of Article or Modification	Added (+) Removed (-)	Weight Change			Running Basic Empty Weight		
				Wt (lb.)	Arm (in.)	Moment	Wt (lb.)	Arm (in.)	Moment
		<u>Original Equipment List</u>							
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10								
	11								
	12								
	13								
	14								
	15								
	16								
	17								
	18								
		The above items are included in the empty weight.							

Table 6-2 Weight and Balance Record

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**6.5 WEIGHT AND BALANCE DETERMINATION
FOR FLIGHT**

In order to calculate the weight and balance of the aircraft:

1. Insert the respective loads in Table 6-3 or 6-4.
2. Multiply each load by its respective arm and note the moment.
3. Add the loads to calculate the takeoff weight
4. Add the moments to compute the total moment.
5. Divide the moment by the takeoff weight. This is the final position of the center of gravity.
6. Plot the point on Figure 6-4. If it is within the weight and balance envelope, the aircraft is within the approved envelope.

**SECTION 6
WEIGHT AND BALANCE**

**CUB CRAFTERS
CC11-160**

Item	Weight (lbs)	Moment Arm (in)	Moment (in-lbs)
Aircraft Empty			
Fuel		83.90	
Pilot		71.40	
Passenger		96.08	
Forward Cargo Compartment (100 lb max)		110.40	
Cargo Shelf Compartment (20 lb max)		134.40	
TOTAL			
CG Station:			

Table 6-3 - Weight and Balance Loading Form

Item	Weight (lbs)	Moment Arm (in)	Moment (in-lbs)
Aircraft Empty			
Fuel		83.90	
Pilot		71.40	
Passenger		96.08	
Forward Cargo Compartment (100 lb max)		110.40	
Extended Cargo Compartment (60 lb max)		138.40	
TOTAL			
CG Station:			

**Table 6-4 - Weight and Balance Loading Form
Extended Cargo Compartment**

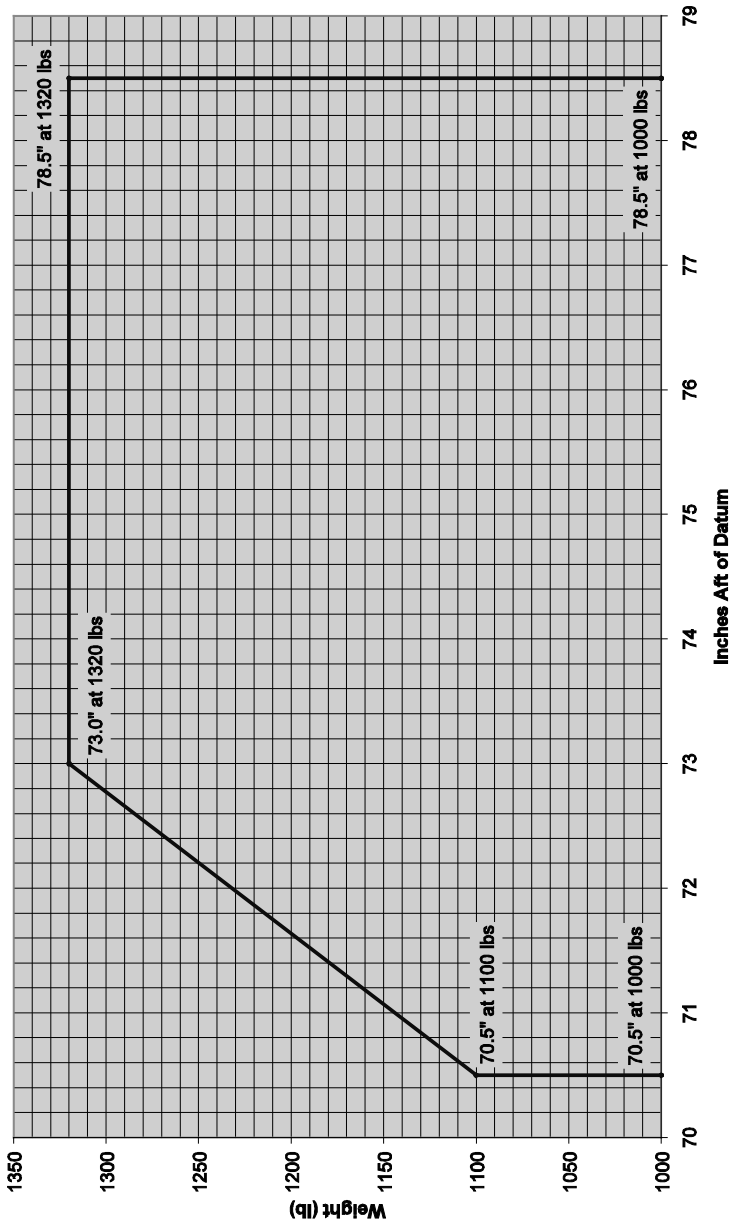


Figure 6-4 - Weight and Balance Envelope

**6.6 SAMPLE WEIGHT AND BALANCE
CALCULATION**

This section will provide a sample weight and balance calculation using the methods given in paragraph 6.5.

Item	Weight (lbs)	Moment Arm (in)	Moment (in·lbs)
Aircraft Empty	883	72.28	63825.5
Fuel	120	83.90	10068.0
Pilot	170	71.40	12138.0
Passenger	130	96.08	12490.4
Forward Cargo Compartment (100 lb max)	12	110.40	1324.8
Cargo Shelf Compartment (20 lb max)	0	134.40	0.0
TOTAL	1315		99846.7
CG Station:	75.9		

Table 6-5 - Sample Weight and Balance

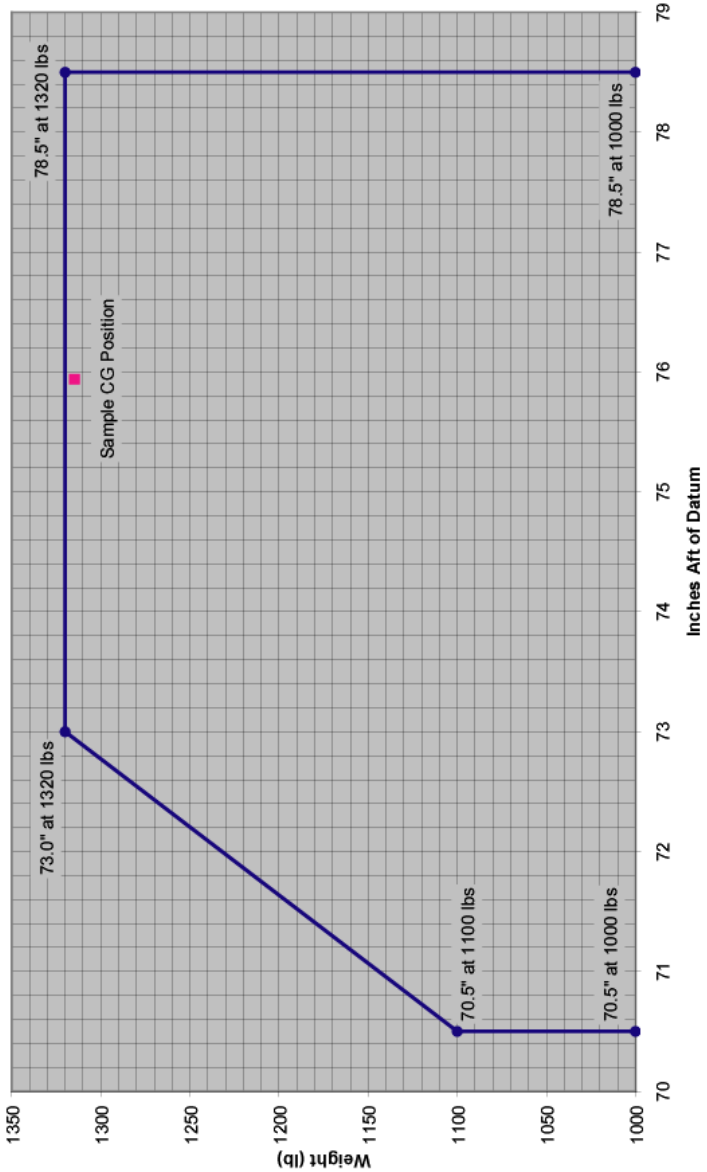


Figure 6-5 - Sample CG Location

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7 AIRCRAFT SYSTEM AND DESCRIPTION

7.1 INTRODUCTION

This section gives a description of the operation of the aircraft systems and standard equipment. For information and operation of optional equipment, please refer to Section 9.

7.2 AIRFRAME

The structure of the fuselage consists of a truss made of high-strength steel tubing. The members are joined together using inert gas fusion welding. The steel structure is powder coated to protect it from corrosion.

The wing is made up of a framework of stamped aluminum ribs mounted onto extruded wing spars. Tubular drag and compression struts and high strength stainless steel drag wires make up the rest of the structure. The leading edges are covered with aluminum sheet. The wing tip is made from carbon fiber and is fairly flexible, enabling it to withstand some abuse.

The wings attach onto the fuselage with hinge fittings and are supported by two lift struts. The rigging of the wings is accomplished by adjusting the forks that join the lift struts to the fuselage.

The fin, rudder, stabilizers, and elevators are all constructed of tubular steel with steel channel ribs. Stainless steel tie rods and fittings brace the stabilizers to the fin and fuselage. The tail brace wires should not be used for lifting or handling the aircraft on the ground.

The fuselage, wings, empennage, and landing gear are covered with a polyester fiber treated with Cub Crafters'

proprietary covering process, which provides an excellent, durable finish.

7.3 LANDING GEAR

The aircraft has a conventional, or tailwheel, landing gear configuration. The main gear legs are made from welded steel tubing. Bungee cords on cabane struts provide shock absorption. The main wheels carry 6.00 X 6 tires standard.

An optional Alpha Omega Suspension System can be installed in place of the bungee cord suspension. See Burl's Aircraft, LLC for manufacturer's information.

Each main wheel is provided with a set of disc brakes. The left and right systems are independent of each other. There are two valves that operate the parking brake located under the pilot's seat. The units form an integral part with the copilot's toe brakes. To operate the parking brake, press both brake pedals and rotate both valves 90 degrees (if the valve is vertical, the brakes are unlocked, if the valve is horizontal, the brakes are locked).

The tailwheel swivels through 360 degrees and is steerable via the rudder pedals. It is mounted to the fuselage with steel leaf springs.

7.4 FLIGHT CONTROLS

The aircraft has conventional controls, operated with a control stick and rudder pedals and actuated with cables.

Pitch trim is accomplished via an electric servo which moves the leading edge of the horizontal stabilizer up and down, changing the angle of incidence. The servo is actuated with a rocker switch located on the control stick. Optional rear seat trim can be added for flight instruction (See section 9.5).

Slotted flaps are actuated mechanically using a lever in the upper, left-hand side of the cockpit ahead of the pilot. The flaps have four positions: retracted, 15°, 35°, and 50°.

The flap lever has a spring latch system that will hold the flap in the selected position. To extend the flaps, depress the trigger on the flap handle and pull down and back on the flap handle. To retract the flaps, depress the trigger and move the handle up and forward.

The flight controls allow the aircraft to be flown solo from the front seat only or controlled from the rear seat when a pilot or properly trained student pilot is at the front seat controls. The front seat occupant must be able to properly use the controls in the front or be able to follow instructions from an instructor seated in the rear.

7.5 POWERPLANT

7.5.1 ENGINE

The aircraft is powered by an AEC Titan 340CC engine. This is an air-cooled four cylinder powerplant that is

capable of delivering up to 180 hp for takeoff and a maximum continuous power of 80 hp.

A throttle controls power to the engine. Each occupant is provided with a throttle on the left side of the cockpit. The air-to-fuel mixture is adjusted manually with a control on the left side of the instrument panel. Pulling the mixture control all the way back operates a cut-off valve on the carburetor that stops the supply of fuel to the engine. The mixture control should always be used to stop the engine.

7.5.2 ENGINE MOUNT

The structure of the mount is made of high-strength steel and the engine is attached to the mount through rubber mounts that help reduce vibration.

7.5.3 PROPELLER

The standard aircraft comes with a Catto 80" x 50" wood core composite encased propeller.

7.5.4 ENGINE COWLING

The engine cowling is made of composite materials. The upper and lower cowl can both be removed using Philips-head fasteners. There is an oil access door located in the upper, right-hand portion that allows easy access to the oil fill neck/dip stick, making removal of the cowl unnecessary during preflight inspections.

The lower cowl is equipped with ground adjustable cowl flaps. Remove the lower cowl from the aircraft to adjust the flaps as necessary, ensuring all attachment fasteners are retightened.

7.5.5 EXHAUST SYSTEM

The exhaust system is made of stainless steel. It is covered with a shroud that is used as a heat exchanger

to provide hot air for the cabin and for the induction system.

7.5.6 IGNITION SYSTEM

Ignition is provided by two independent electronic ignition modules. They are powered by the aircraft's electrical system. Like magnetos, the engine will run with the Master Switch off. The pilot must ensure that both modules are operating correctly prior to takeoff. Fault indication lights are located on the instrument panel.

In an emergency, the engine will continue to run if one of the ignition modules should fail. If equipped, the pilot may switch the right ignition to run on a backup battery by selecting the "EMERGENCY" position on the switch.

When the ignition backup battery is powering the right ignition system, the ignition system is isolated and disconnected from the rest of the electrical system. If the left ignition is disabled and the ignition backup battery is being used, the ignition backup battery will not be charging. When the ignition backup battery is exhausted, the engine will stop. In test conditions, the ignition backup battery has been shown to last approximately 30 minutes.

WARNING
WHEN THE RIGHT IGNITION BACKUP BATTERY IS IN USE, IT IS NOT BEING CHARGED. THE SWITCH ON THE INSTRUMENT PANEL SHOULD BE IN THE "NORMAL" POSITION EXCEPT FOR TESTING OR IN AN ACTUAL EMERGENCY.

7.5.7 AIR INDUCTION SYSTEM

The induction air for the engine enters through a filter on the lower side of the cowling. Alternatively, the pilot may

use the carburetor heat control which operates a butterfly valve allowing heated, unfiltered air into the carburetor. The control is located on the instrument panel.

CAUTION

Ground operations with the carburetor heat control in the hot position must be limited because of the fact that air by-passes the filter.

Should the air filter become obstructed, the carburetor air control provides an alternate means of supplying the engine with air for the induction system.

It is important that the pilot become knowledgeable about carburetor icing and the use of the carburetor heat. Cub Crafters recommends the following publication, available from the FAA website:

Advisory Circular 20-113 - Pilot Precautions and Procedures to be taken in Preventing Aircraft Reciprocating Engine Induction System and Fuel System Icing Problems.

WARNING

AS CARBURETOR ICE ACCUMULATES, IT PRODUCES AN EXCESSIVELY RICH AIR/FUEL MIXTURE. THE ENGINE MAY START TO LOSE POWER OR STOP COMPLETELY. AT THIS POINT THERE MAY NOT BE SUFFICIENT HOT AIR IN THE ENGINE COMPARTMENT TO MELT THE ACCUMULATION OF CARBURETOR ICE, EVEN WHEN THE CARBURETOR HEAT CONTROL IS IN THE FULL "HOT" POSITION.

In general, follow these practices:

When icing conditions exist, apply carburetor heat often in all flight regimes. The main symptom of icing in the induction system will be loss of power.

Never use partial carburetor heat. Partial heat could make matters worse. Remember, full heat or nothing.

Be especially vigilant at lower power settings. It is good practice to use carburetor heat during any descent where you have reduced power, especially for landing.

In conditions conducive to icing or if ice was noted during engine run-up, perform another carburetor heat check immediately before takeoff. DO NOT leave carburetor heat on for the actual takeoff.

7.5.8 OIL SYSTEM

The oil system is an integral part of the engine, except for the cooler that is mounted on the top center of the engine cooling plenum, above the engine. The oil filler is on the right side of the engine.

A spin-on oil filter is installed and is located on the top, right of the aft side of the engine.

7.5.9 FUEL SYSTEM

In the standard configured aircraft, fuel is carried in two tanks located on the inboard end of the wings. Each tank has a total capacity of 12.5 gallons for a total of 25 gallons. The total usable fuel is 24 gallons.

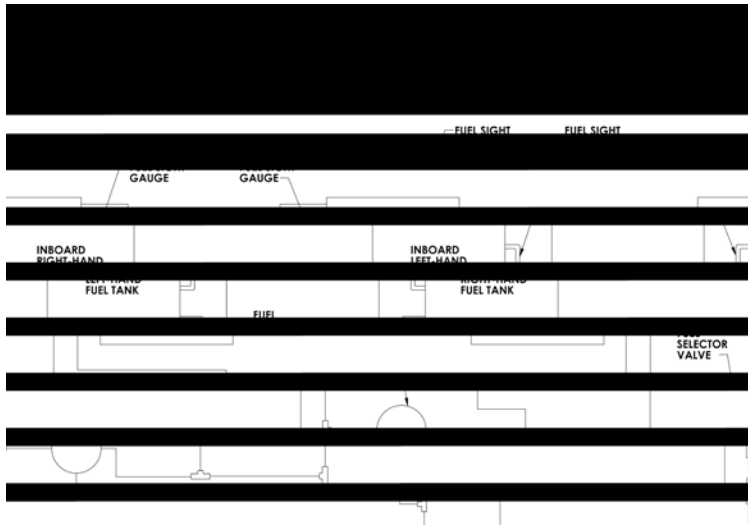


Figure 1 - Standard Fuel Tank Configuration with Additional Fuel Drain

In the extended range configuration, there are two interconnected tanks on the inboard end of each wing. Between the two tanks, they have a capacity of 22 gallons for a total of 44 gallons. The total usable fuel is 40 gallons.

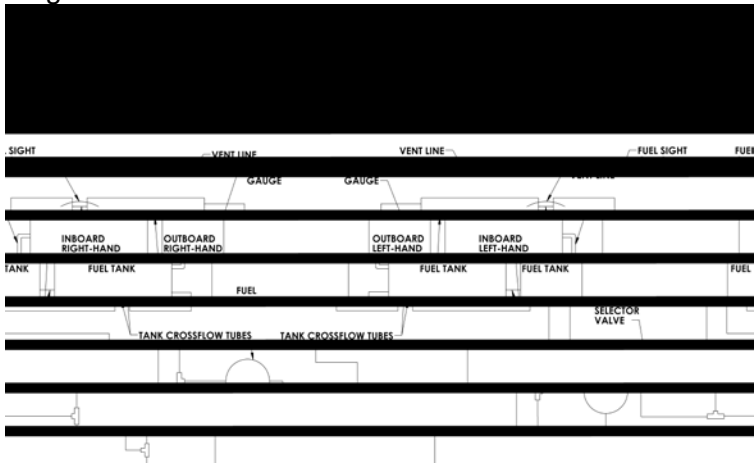


Figure 2 - Extended Range Fuel Tank Configuration with Additional Fuel Drain

The tanks are made of aluminum. There are three drains for the entire aircraft. One is located underneath the fuselage on the right side halfway between the landing gear and the tail; the other two are located on the left side, under the cowl and just forward and aft of the firewall. These should be drained before each flight to test for water and sediment in the fuel system. The fuel system is gravity-fed with no separate boost pump.

The fuel flows from the tanks into a selector valve located on the lower, left side of the cockpit that has four positions:

- Both. The engine is fed by all fuel tanks
- Left. Fuel is supplied by the left tank(s)
- Right. Fuel is supplied by the right tank(s)
- Off. Fuel supply to the engine is cut off

Fuel will flow from one set of tanks to the other when the selector valve is in either the Off or the Both position. When parking the aircraft on a slope, leave the selector on either the left or right position to prevent cross-feeding and overflowing of the lower tank.

The engine may be operated on the Both, Left or Right positions. However, the Both position is required for takeoff and landing. There is a pilot operated primer valve that can be used to assist starting, especially when the engine is cold.

CAUTION

Ensure that the primer is locked prior to takeoff.

Fuel quantity is determined with two sight-gauges located on either side of the cockpit at the wing root. The ventilation of the tanks is through the forward facing vented fuel caps.

Prior to refueling the aircraft, connect the fueling equipment's grounding wire to either of the wing tie downs or the exhaust pipe. This will ensure there is no electrical potential difference between the aircraft and the fueling equipment and will minimize the risk of electrical sparks when the aircraft is being refueled.

7.5.10 ELECTRICAL SYSTEM

The SMARTmonitor is a system that monitors five different parameters in the aircraft's electrical and engine ignition systems. Each parameter has a dedicated screen to display information about that parameter. The display screen is also a push button that serves to control the SMARTmonitor. The SMARTmonitor can display up to five screens.



Figure 3 - SMARTmonitor

- MAIN.V – This screen is dedicated to the main bus voltage. The bottom line of text will display the voltage of the main battery and alternator.
 - Before the engine is running, this will be the main battery voltage.
 - The display will be GREEN during normal operating conditions, with the alternator providing sufficient output. The voltage reading will be between 12.6v and 15.0v.



- The display will be YELLOW when the voltage is between 10.8v and 12.5v because the alternator is not charging the main battery. The display will also be YELLOW if the voltage is abnormally high between 15.1v and 15.7v.



- The display will be RED when the battery is considered depleted and is 10.7v or below. The display will also be RED if the alternator has driven the voltage to 15.8v or above.



- When the screen first turns RED it will FLASH until acknowledged by pressing the screen.
- BACK.V – This screen is dedicated to the ignition backup battery voltage. The bottom line of text will display the voltage.
 - The display will be GREEN when the battery voltage is 12.4v or higher.



- Due to protection circuitry, this voltage should be about 0.2v lower than the main bus voltage when the alternator is charging the main battery. If the alternator fails and the main battery is being depleted, the same protection circuitry will keep the backup battery from discharging so the backup battery will show a higher voltage than the main battery.
- The display will be YELLOW when the battery voltage is between 10.8v and 12.4v.



- The display will be RED when the battery is almost depleted at 10.7v or below



- When the screen first turns RED it will FLASH until acknowledged by pressing the screen
- L. IGN – This screen is dedicated to the on-off state of the left electronic ignition module. The bottom line of text will display ON or OFF accordingly.
 - The display will be GREEN when the L. IGN is ON.
 - The display will be RED when the L. IGN is OFF.



- When the screen first turns RED it will FLASH for 5 seconds or until acknowledged by pressing the screen.
- The display may momentarily turn YELLOW when transitioning from green to red or from red to green. This is normal operation. If the display remains YELLOW, displaying CHECK, turn that ignition system off (left or right applicable)

momentarily to verify the operation of the ignition system. If the YELLOW display persists, continue flight to the next scheduled stop and have it checked by a qualified technician.

- R. IGN – This screen is dedicated to the on-off state of the right electronic ignition module. This screen indicates and operates the same as L. IGN.



- BACKUP – This screen is dedicated to when the ignition backup battery is charging or in-use.
 - The display will be YELLOW and the bottom line will read IN.USE when the backup battery is in use.



- When the screen first turns YELLOW it will FLASH for 5 seconds or until acknowledged by pressing the screen
- The display will be GREEN and the bottom line will read CHRGE when the backup battery switch is in NORMAL and charging.
- The display may momentarily turn RED when transitioning from green to yellow or from yellow to green. This is normal operation. If the display remains RED displaying WARN, verify BACK.V is okay and check system at next scheduled stop.

The SMARTmonitor has two modes of operation, AUTO SCAN and MANUAL SCAN.

- AUTO SCAN – The SMARTmonitor will startup in this mode by default.
 - This scan can be halted into MANUAL mode by tapping the screen once.
 - Will be confirmed with the text HALT SCAN on a YELLOW display.



- This scan will **always** include MAIN.V and BACK.V.
- This scan will not include when they are normal:
 - L. IGN and R. IGN when they are ON.
 - BACKUP when charging.
- When a parameter produces a FLASHING screen, AUTO SCAN will switch immediately to that screen.
 - If the screen button is pressed, AUTO SCAN will halt and the SMARTmonitor will be in MANUAL mode.
 - If left alone, L. IGN, R. IGN, and BACKUP will revert back to AUTO SCAN after 5 seconds.
 - If left alone, MAIN.V and BACK.V will continue to alarm until acknowledged.

- This scan will include any abnormal indication. Should the parameter become normal, it will cease to scan.
- Scan order can be reversed by double tapping the screen.
 - Confirmation will be shown with a YELLOW display, FWD or REV, and an arrow.
- MANUAL SCAN – Used to closely monitor a single parameter.
 - Single taps will cycle through, same as AUTO SCAN”
 - MAIN.V – always
 - BACK.V – always
 - L. IGN – only when abnormal
 - R. IGN - only when abnormal
 - BACKUP – only when abnormal
 - Scan order can be reversed by double tapping the screen.
 - Confirmation will be shown with a YELLOW display, FWD or REV, and an arrow.
 - When a parameter produces a FLASHING screen, the SMARTmonitor will switch immediately to that screen.
 - If the screen button is pressed, the SMARTmonitor will remain on the alarming screen.
 - If left alone, L. IGN, R. IGN, and BACKUP will revert back to AUTO SCAN after 5 seconds.
 - If left alone MAIN.V and BACK.V will continue to alarm until acknowledged.
 - Pressing the screen for at least 1 second will change back to AUTO SCAN.

- After the screen is released, AUTO SCAN with a YELLOW display will confirm the mode change.



The SMARTmonitor display screen is also a push button. The following is a list of button press inputs and the results.

- While in AUTO SCAN
 - A single tap will revert to MANUAL SCAN.
 - Double tapping will reverse the direction of the scan.
 - Acknowledging a FLASHING alarm with a single tap will stop the flashing and revert to MANUAL SCAN, remaining on the alarming screen.
- While in MANUAL SCAN
 - A single tap will progress through the screens as described above.
 - Double tapping will reverse the direction of the scan.
 - Acknowledging FLASHING alarm with a single tap will stop the flashing and remain on the alarming screen.
 - Pressing for 1 second or more will change to AUTO SCAN mode.

The SMARTmonitor receives power from the main electrical bus when the master switch is ON, and from the ignition backup battery switch when in EMERGENCY.

CAUTION
The SMARTmonitor will cease to operate when the supply voltage drops below 9.3 V

7.5.11 LIGHTS

An optional LED lighting package may be installed on the aircraft. This package includes a position light on the rudder, a landing light mounted in the leading edge of the left wing, and anti-collision light assemblies on each wingtip consisting of a navigation light and strobe.

An optional landing light is available for the right wing.

7.5.12 STALL WARNING

The stall warning system is activated by a vane located on the leading edge of the right wing. As the aircraft approaches the stall, a horn will sound. The system is calibrated so that the horn will come on at least 5-10 miles per hour above the stall speed.

7.5.13 PITOT-STATIC SYSTEM

The pitot system senses dynamic pressure through a tube that is aligned with the flow of air and is located in the leading edge of the jury strut on the left wing.

The static pressure source for each instrument is vented to the inside of the cabin. Because of this, the indications for airspeed, altitude, and rate of climb will be affected by opening the windows, door, or cabin air vents.

7.6 COCKPIT

Entry to the cockpit is through a door and window arrangement on the right side of the aircraft. The window is latched to the door using rotating tangs that engage slots in the door. The door is opened using a rotating handle. The window must be raised until it engages the latch on the wing. Close the door by rotating the door handle and pulling it closed. Rotate the handle in the opposite direction once the door is fully closed, allowing the latching pins to engage in the fuselage. Release the

window latch on the wing and lower the window closed. Engage the tangs in the door.

A window on the left-hand side of the fuselage operates in a similar manner to that on the right.

The aircraft seats up to two in a tandem configuration. All flight controls are within reach of the front occupant, and therefore, the aircraft must be flown from this position. The rear occupant, if rear seat equipped, is provided with a stick, rudder pedals, throttle and brakes for flight instruction.

The front seat is adjustable fore and aft. To move the seat, remove the quick-release pins on the sides of the seat and slide to the desired position. Reinstall the pins, making sure both pins are fully engaged.

CAUTION

Ensure that the seat is secure prior to takeoff.

If equipped with a rear seat, the seat straps should be checked for proper routing through the slide adjuster as shown below.

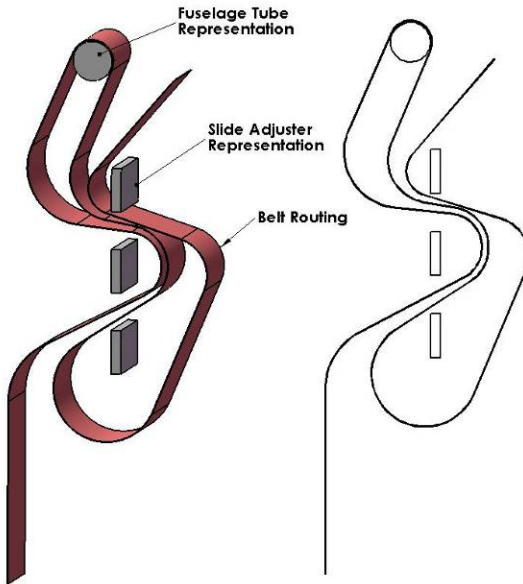


Figure 4 - Rear Seat Strap Routing

When the rear seat is not in use, it can be stowed in the Sling Seat Holder. See the Aircraft Maintenance Manual Section 5.4.15.

Disconnect the two cinched nylon straps holding the seat cross bar to the floor by unscrewing and pushing in on the screw. This will allow the tab to rotate and slide the pin out of the seat base connector. Lift the rear seat cross bar up and out of the retaining slots. See Figure 5 and Figure 6.

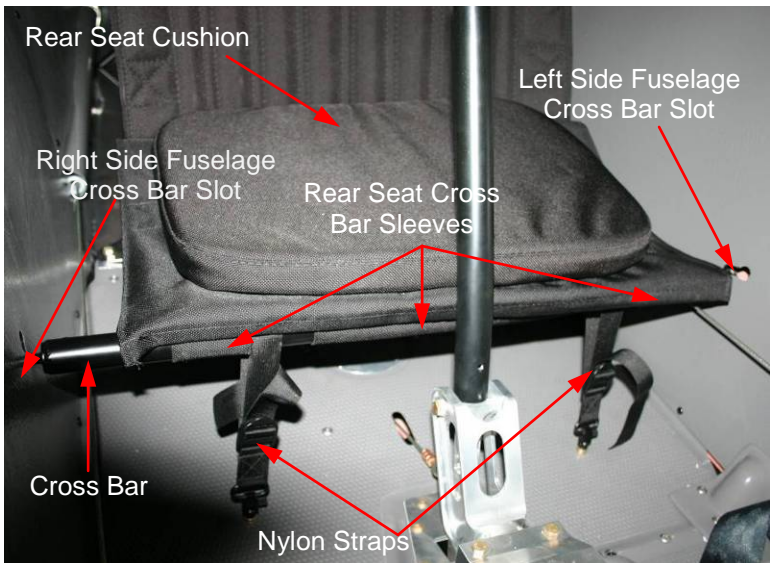


Figure 5 - Removal of Rear Seat Bar



Figure 6 - Disconnecting Nylon Straps

Slide the cross bar out of the rear seat cross bar sleeves and the nylon straps. Remove the seat cushion from the rear seat. Fold the rear seat for stowage. See Figure 7.



Figure 7 - Folding Rear Seat

Tuck the rear seat, seat cushion, and nylon cross bar straps (if seat cross bar not re-installed) in the Sling Seat Holder (also stores the Pilot's Operating Handbook) as shown in Figure 8.



Figure 8 - Stowage in Sling Seat Holder

The seat cross bar can either be securely stowed in the aft baggage compartment or reinstalled in the fuselage cross bar slots. If the cross bar is reinstalled, the nylon straps must be reinstalled on the cross bar and re-attached to the floorboard in order to securely hold the cross bar in place.

7.7 INSTRUMENT PANEL

The instrument panel contains all flight, navigation, and engine instruments that are required for V.F.R. operations. See Manufacturer's instructions regarding operation of equipment installed in the instrument panel.

7.8 CABIN HEAT

Hot air for heating the cabin is supplied by a heat exchanger located around the engine exhaust. Hot air enters the cabin through opening in the floorboard. To select the heater, the control on the upper right part of the instrument panel must be pulled aft.

7.9 BAGGAGE AND CARGO COMPARTMENT

The standard aircraft has a cargo compartment located behind the rear occupant that is divided into two areas. The forward area has a capacity of 100 lbs and the upper aft area 20 lbs.

The extended baggage configured aircraft has a forward cargo compartment located behind the pilot that has a capacity of 100 lbs and an extended cargo compartment that has a capacity of 60 lbs.

7.10 ELT OPERATION AND LOCATION

The aircraft is supplied with an ELT transmitter that meets TSO C91a. The ELT is mounted in a bracket directly underneath the pilot's seat and may be accessed

through an opening on the forward side of the seat column.

7.11 MUSIC JACK

An optional Music Jack may be installed on the aircraft.

NOTE

When any device is plugged into the music jack, this will disable all GPS auditory warnings. However, visual warnings will still be displayed on the GPS screen.

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8 HANDLING AND SERVICING

8.1 INTRODUCTION

This section gives a description of the ground handling and basic servicing of the aircraft.

8.2 GROUND HANDLING

8.2.1 TOWING INSTRUCTIONS

The aircraft can be moved manually without the use of a tow bar. The forward lift struts and the leading edge of the horizontal or vertical stabilizer may be used for moving the aircraft. Pushing or pulling on the propeller is not recommended.

8.2.2 TIE-DOWN INSTRUCTIONS

If possible, tie-down the aircraft pointed into the wind. The flaps should be fully retracted. If tie-downs are unavailable, the parking brake should be set. If tie-downs are available, tie-down both wings using the tie down rings on the outboard portion of the forward wing strut at the strut/wing interface. Tie down the tailwheel at the head of the tailwheel.

8.3 SERVICING FUEL, OIL, AND OTHER FLUIDS

8.3.1 OIL

Approved Oils:
Phillips XC 20W50

The oil is checked by using the oil door on the upper right portion of the cowl. Determine oil level by reading the markings on the dipstick.

8.3.2 FUEL

Approved Fuel Grades:
100 Aviation Fuel (green tint)
100LL Aviation Fuel (blue tint)

The fuel caps on each tank have a forward facing vented cap. Prior to fueling, attach a ground cable and remove fuel caps. Monitor the amount of fuel added by visually watching the amount of fuel rise inside the tank. Sump the drains as described in the preflight actions under the **NORMAL PROCEDURES** section. Secure fuel caps on both tanks with vent tube facing forward.

8.3.3 BRAKE FLUID

Approved Fluid:
Brake Fluid per MIL-H-5606G (Aeroshell #41)

Visually inspect fluid levels. If brake fluid is required, fill with an approved fluid approximately 2/3 full to leave space for the reservoir cap when it is installed.

8.3.4 AIR FILTER

Approved Air Filter:
Cub Crafters Part Number PC54108-001

Visually inspect air filter. Depending on the operating conditions, filter life will vary. Monitor filter and obtain replacement from Cub Crafters when required.

8.4 CLEANING AND CARE

8.4.1 EXTERIOR

Use mild automotive soap for washing the exterior of the aircraft.

The windows and windshield can be cleaned using Zep Foaming Glass Cleaner.

8.4.2 INTERIOR

A damp rag is typically adequate for cleaning the interior of the aircraft.

The windows and windshield can be cleaned using Zep Foaming Glass Cleaner.

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9.0 GENERAL

This section provides information that amends certain limitations, procedures and data which are applicable to airplanes equipped with one or more of the optional systems. These systems are not part of the standard package. In addition, this section contains forms for the owner/operator to report service difficulties and change of address/ownership.

This section has a log of approved supplements. It should be used to ensure that all pertinent supplements have been included in the Pilot's Operating Handbook. Each supplement contains its own Log of Effective Pages.

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9.1 (RESERVED)

LOG OF REVISIONS

Current revisions to the Pilot's Operating Manual and Flight Manual Section 9.1.

Rev	Pages	Description of Revision
NC	ALL	Initial Release
A	ALL	Changed to Reserved

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9.2 SINGLE PLACE CONVERSION

LOG OF REVISIONS

Current revisions to the Pilot's Operating Manual and Flight Manual Section 9.2.

Rev	Pages	Description of Revision
NC	ALL	Initial Release
A	ALL	Added Single Place Conversion Information

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9.2.1 GENERAL

This supplement describes the process and requirements for converting a two place aircraft to a single place aircraft and provides authorization to perform this conversion. In accordance with FAA regulations and ASTM standards, the basic empty weight of a two place CC11-160 aircraft on wheels equipped with a Titan 340CC engine must not exceed 903 pounds. A single place aircraft basic empty weight must not exceed 1093 pounds. On floats, a two place aircraft basic empty weight must not exceed 1013 pounds or 1203 pounds when converted to a single place aircraft.

The aircraft may be converted back and forth from single place to a two place configuration as described in this supplement, as long as it meets the empty weight requirements for that configuration per Section 9.2.2.2. This may be useful for owners/operators to install special equipment such as large tires, skis, etc but would put them overweight for two place operation. This conversion is considered an owner/operator task.

9.2.2 LIMITATIONS

9.2.2.1 GENERAL

The conversion requires the following items:

For Single Place Operation:

- Rear seat must be removed or stowed
- Rear control stick must be removed
- Rear control stick cover must be installed
- Single Seat Placard must be installed
- Maximum empty weight per Section 9.2.2.2.

For Two Place Operation:

- Rear seat must be installed.
- Single Seat Placard must be removed
- Maximum empty weight per Section 9.2.2.2.

9.2.2.2 EMPTY WEIGHT INFORMATION

The maximum empty weights as defined by ASTM and FAA regulations are as shown in the table below. The aircraft must always comply with the weights shown below.

	Max Empty Weight (CC340 Engine)	Configuration
Wheels/Skis	903 lbs	Two Place
Wheels/Skis	1093 lbs	Single Place
Floats	1013 lbs	Two Place
Floats	1203 lbs	Single Place

Table 9-2-1 - Maximum Empty Weights

9.2.2.3 PLACARDS

This placard is designed to be fixed using Velcro™ and must be present when equipped for single place operation. This placard must be removed for dual place operation. The placard may be installed on the instrument panel or on the overhead tube near the compass correction card.

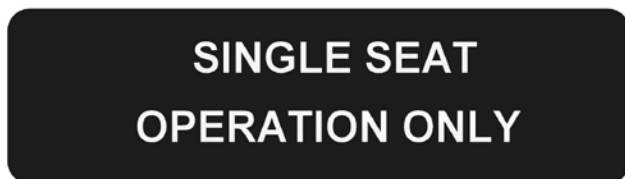


Figure 9.2.1 - Single Seat Placard

9.2.3 CONVERSION PROCEDURES**9.2.3.1 FROM TWO PLACE TO SINGLE PLACE**

Remove or stow the rear seat. See Section 9.2.3.4. Remove the rear stick and install the rear stick cover. Install placard on the instrument panel, overhead tube near the compass correction card, or in another conspicuous place. The maximum empty weight in this configuration is shown in Section 9.2.2.2.

9.2.3.2 FROM SINGLE PLACE TO TWO PLACE

Install rear seat. Remove the rear stick cover and install rear stick (if desired). Remove the placard governing single place operation only. The aircraft maximum empty weight configuration is shown in Section 9.2.2.2.

9.2.3.3 DETERMINATION OF LOADING CHANGE

Use the table below to determine the weight and balance changes for converting a two place to a single place aircraft. Use the information in reverse when the aircraft is returned to service in a two place configuration. Use only the applicable information (stowing vs. removing seat).

NOTE

If an Oregon Aero Seat Cushion is installed, use the following calculation that pertains to your configuration.

Item	Weight (lb)	Arm (in)	Moment (in-lbs)
Standard Rear Seat Removal (includes seat cross bar)	-6.15	96.08	-590.89
Rear Seat Removal with Oregon Aero Seat Cushion Cloth (includes seat cross bar)	-7.5	96.08	-759.03
Rear Seat Removal with Oregon Aero Seat Cushion Leather (includes seat cross bar)	-7.9	96.08	-720.60
Rear Control Stick Removal	-0.20	84.08	-16.82
Rear Control Stick Cover	0.69	84.08	58.02

Table 9-2-2 - Weight & Balance Changes

Use the table below to determine the weight and loading for a single seat aircraft. Note that in the example below, the rear seat is shown as completely removed. If the seat is stowed and not removed, remove this from your calculations. If any changes are made for main gear or tailwheel, the main gear arm is 62.5 inches and the tailwheel arm is 261.9 inches.

Item	Weight (lbs)	Moment Arm (in)	Moment (in·lbs)
Aircraft Empty			
Fuel		83.90	
Pilot		71.40	
Passenger Seat Removal		96.08	
Rear Stick Removal	-0.20	84.08	-16.8
Rear Stick Stub Cover	0.69	84.08	58.0
Forward Cargo Compartment (100 lb max)		110.40	
Cargo Shelf Compartment (20 lb max)		134.40	
TOTAL			
CG Station:			

Table 9-2-3 - Weight & Balance Loading Form

9.2.3.4 INSTALLATION OF REAR STICK COVER

1. Loosen and remove the AN3 bolt, washers, and AN365 lock nut holding the rear stick into the rear stick stub.



2. For first time installation, remove floor fasteners and install the rear stick cover over the stick stub and match drill to the existing fasteners on the floorboard.

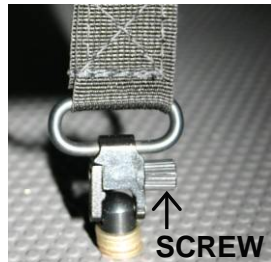


3. Fasten the stick cover to the floorboard using existing hardware from the last step.
4. Move the front control stick through the full range of motion (including trim) and ensure there is no contact between the rear stick stub and the stick cover.

5. Adjust weight and balance information accordingly.
6. For reinstallation, remove the stick cover, install the fasteners back into the floorboard. Install the rear stick and torque the fastener to 43-48 in-lbs. Ensure full range of motion (including trim) is met without the rear stick contracting anything. Adjust weight and balance information accordingly.

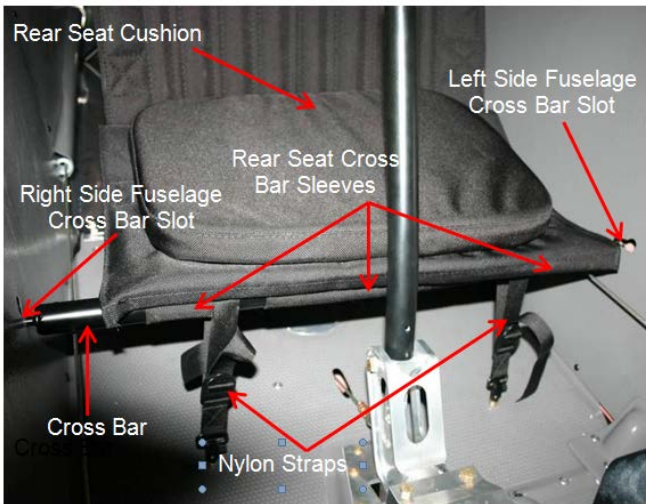
9.2.3.5 REAR SEAT REMOVAL OR STOWAGE

1. Disconnect the two cinched nylon straps holding the seat cross bar to the floor by unscrewing and pushing in on the screw. This will allow the tab to rotate and slide the pin out of the seat base connector.



2. Lift the rear seat cross bar up and out of the retaining slots.

SECTION 9.2 **CUB CRAFTERS**
SUPPLEMENT- SINGLE PLACE CONVERSION **CC11-160**



3. Slide the cross bar out of the rear seat cross bar sleeves and the nylon straps. Remove the seat cushion from the rear seat. Fold the rear seat for stowage above the Sling Seat Holder (also stores the Pilot's Operating Handbook).



4. The seat cross bar can either be securely stowed in the aft baggage compartment or reinstalled in the fuselage cross bar slots. If the cross bar is reinstalled, the nylon straps must be reinstalled on the cross bar and attached to the floorboard in order to securely hold the seat cross bar in place.
5. Tuck the seat cushion and, if cross bar not reinstalled, nylon cross bar nylon straps in the sling seat holder.
6. If the seat is completely removed from the aircraft, loosen the two straps at the top of the seat and remove the seat, and rear seat cross tube. If removed, note that the 6.15 lbs includes the entire seat and cross bar.
7. Adjust weight and balance information accordingly if the seat is removed.
8. Reinstallation involves dropping the seat down out of the storage area (or installing the top straps if the seat was removed) and inserting the rear seat cross tube and hold down straps, then fastening the hold down straps back to the floor.

9.2.3.6 REAR SEAT HARNESSSES / RESTRAINTS

1. If the aircraft will be operated without a rear seat, stow the lap and shoulder harnesses such that it cannot interfere with safe operation of the aircraft.

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9.3 CONVERSION TABLES

LOG OF REVISIONS

Current revisions to the Pilot's Operating Handbook and Flight Training Supplement Section 9.3.

Rev	Pages	Description of Revision
NC	ALL	Initial Release

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9.3.1 WEIGHT

**POUNDS INTO KILOGRAMS
LIVRES EN KILOGRAMMES**

LB	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg
0		0.454	0.907	1.361	1.814	2.268	2.722	3.175	3.629	4.082
10	4.536	4.990	5.443	5.897	6.350	6.804	7.257	7.711	8.165	8.618
20	9.072	9.525	9.979	10.433	10.886	11.340	11.793	12.247	12.701	13.154
30	13.608	14.061	14.515	14.969	15.422	15.876	16.329	16.783	17.237	17.690
40	18.144	18.597	19.051	19.504	19.958	20.412	20.865	21.319	21.772	22.226
50	22.680	23.133	23.587	24.040	24.494	24.948	25.401	25.855	26.308	26.762
60	27.216	27.669	28.123	28.576	29.030	29.484	29.937	30.391	30.844	31.298
70	31.752	32.205	32.659	33.112	33.566	34.019	34.473	34.927	35.380	35.834
80	36.287	36.741	37.195	37.648	38.102	38.555	39.009	39.463	39.916	40.370
90	40.823	41.277	41.731	42.184	42.638	43.091	43.545	43.999	44.452	44.906
100	45.359	45.813	46.266	46.720	47.174	47.627	48.081	48.534	48.988	49.442

9.3.2 LENGTH

**FEET INTO METERS
PIEDS EN METRES**

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

**SECTION 9.3
SUPPLEMENT- CONVERSION TABLES**

**CUB CRAFTERS
CC11-160**

**INCHES INTO CENTIMETERS
POUCES EN CENTIMETRES**

IN	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
	CM	CM	CM	CM	CM	CM	CM	CM	CM	CM
0		2.5	5.1	7.6	10.2	12.7	15.2	17.8	20.3	22.9
10	25.4	27.9	30.5	33.0	35.6	38.1	40.6	43.2	45.7	48.3
20	50.8	53.3	55.9	58.4	61.0	63.5	66.0	68.6	71.1	73.7
30	76.2	78.7	81.8	83.8	86.4	88.9	91.4	94.0	96.5	99.1
40	101.6	104.1	106.9	109.2	111.8	114.3	116.8	119.4	121.9	124.5
50	127.0	129.5	132.1	134.6	137.2	139.7	142.2	144.8	147.3	149.9
60	152.4	154.9	157.5	160.0	162.6	165.1	167.6	170.2	172.7	175.3
70	177.8	180.3	182.9	185.4	188.1	190.5	193.0	195.6	198.1	200.7
80	203.2	205.7	208.3	210.8	213.4	215.9	218.4	221.0	223.5	226.1
90	228.6	231.1	233.9	236.2	238.8	241.3	243.8	246.4	248.9	251.5
100	254.0	256.5	259.1	261.6	264.2	266.7	269.2	271.8	274.3	276.9

9.3.3 VOLUME

**GALLONS INTO LITERS
GALLONS EN LITRES**

Gal	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
	Liters	Liters	Liters	Liters	Liters	Liters	Liters	Liters	Liters	Liters
0		3.79	7.57	11.36	15.14	18.93	22.71	26.50	30.28	34.07
10	37.85	41.64	45.42	49.21	52.10	56.78	60.57	64.35	68.14	71.92
20	75.71	79.49	83.28	87.06	90.85	94.64	98.42	102.21	105.99	109.78
30	113.56	117.35	121.13	124.92	128.7	132.49	136.27	140.06	143.85	147.63
40	151.42	155.20	158.99	162.77	166.56	170.34	174.13	177.91	181.70	185.49
50	189.27	193.06	196.84	200.63	204.41	208.20	211.98	215.77	219.55	223.34
60	227.12	230.91	234.70	238.48	242.27	246.05	249.84	253.62	257.41	261.19
70	264.98	268.76	272.55	276.34	280.12	283.91	287.69	291.48	295.26	299.05
80	302.83	306.62	310.40	314.19	317.97	321.76	325.55	329.33	333.12	336.90
90	340.69	344.47	348.26	352.04	355.83	359.61	363.34	367.18	370.97	374.76
100	378.54	382.33	386.11	389.90	393.68	397.47	401.25	405.04	408.82	412.61

9.3.4 TEMPERATURE

**FAHRENHEIT INTO CELSIUS
FAHRENHEIT EN CELSIUS**

°F	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
0		-17.20	-16.7	-16.10	-15.60	-15.00	-14.40	-13.90	-13.30	-12.80
10	-12.20	-11.70	-11.10	-10.60	-10.00	-9.44	-8.89	-8.33	-7.78	-7.22
20	-6.67	-6.11	-5.56	-5.00	-4.44	-3.89	-3.33	-2.78	-2.22	-1.67
30	-1.11	-0.56	0.00	0.56	1.11	1.67	2.22	2.78	3.33	3.89
40	4.44	5.00	5.56	6.11	6.67	7.22	7.78	8.33	8.89	9.44
50	10.00	10.60	11.10	11.70	12.00	12.80	13.30	13.90	14.40	15.00
60	15.60	16.10	16.70	17.20	17.80	18.30	18.90	19.40	20.00	20.60
70	21.10	21.70	22.20	22.80	23.30	23.90	24.40	25.00	25.60	26.10
80	26.70	27.20	27.80	28.30	28.90	29.40	30.00	30.60	31.10	31.70
90	32.20	32.80	33.30	33.90	34.40	35.00	35.60	36.10	36.70	37.20
100	37.80	38.30	38.90	39.40	40.00	40.60	41.10	41.70	42.20	42.80

9.3.5 TORQUE

INCH POUNDS INTO NEWTON METERS

In-lbs.	+0	+10	+20	+30	+40	+50	+60	+70	+80	+90
	N-m	N-m	N-m	N-m	N-m	N-m	N-m	N-m	N-m	N-m
0		1.1	2.3	3.4	4.5	5.6	6.8	7.9	9.0	10.2
100	11.3	12.4	13.6	14.7	15.8	16.9	18.1	19.2	20.3	21.5
200	22.6	23.7	24.9	26.0	27.1	28.2	29.4	30.5	31.6	32.8
300	33.9	35.0	36.2	37.3	38.4	39.5	40.7	41.8	42.9	44.1

FOOT POUNDS INTO NEWTON METERS

Ft-lb.	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
	N-m	N-m	N-m	N-m	N-m	N-m	N-m	N-m	N-m	N-m
20	27.1	28.5	29.8	31.2	32.5	33.9	35.3	36.6	38.0	39.3
30	40.7	42.0	43.4	44.7	46.1	47.5	48.8	50.2	51.5	52.9
40	54.2	55.6	56.9	58.3	59.7	61.0	62.4	63.7	65.1	66.4
50	67.8	69.1	70.5	71.9	73.2	74.6	75.9	77.3	78.6	80.0
60	81.3	82.7	84.1	85.4	86.8	88.1	89.5	90.8	92.2	93.6

9.3.6 SPEED

MILES PER HOUR INTO KNOTS

MPH	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
	knots	knots	knots	knots	knots	knots	knots	knots	knots	knots
0	0.0	0.9	1.7	2.6	3.5	4.3	5.2	6.1	7.0	7.8
10	8.7	9.6	10.4	11.3	12.2	13.0	13.9	14.8	15.6	16.5
20	17.4	18.2	19.1	20.0	20.9	21.7	22.6	23.5	24.3	25.2
30	26.1	26.9	27.8	28.7	29.5	30.4	31.3	32.2	33.0	33.9
40	34.8	35.6	36.5	37.4	38.2	39.1	40.0	40.8	41.7	42.6
50	43.4	44.3	45.2	46.1	46.9	47.8	48.7	49.5	50.4	51.3
60	52.1	53.0	53.9	54.7	55.6	56.5	57.4	58.2	59.1	60.0
70	60.8	61.7	62.6	63.4	64.3	65.2	66.0	66.9	67.8	68.6
80	69.5	70.4	71.3	72.1	73.0	73.9	74.7	75.6	76.5	77.3
90	78.2	79.1	79.9	80.8	81.7	82.6	83.4	84.3	85.2	86.0
100	86.9	87.8	88.6	89.5	90.4	91.2	92.1	93.0	93.8	94.7
110	95.6	96.5	97.3	98.2	99.1	100.0	100.8	101.7	102.5	103.4
120	104.3	105.1	106.0	106.9	107.8	108.6	109.5	110.4	111.2	112.1
130	113.0	113.9	114.8	115.6	116.5	117.3	118.2	119.1	120.0	120.8
140	121.7	122.6	123.5	124.3	125.2	126.0	126.9	127.8	128.7	129.5
150	130.3	131.2	132.1	132.9	133.8	134.7	135.6	136.5	137.4	138.2
160	139.0	139.9	140.8	141.6	142.5	143.4	144.3	145.2	146.1	146.9
170	147.7	148.6	149.5	150.3	151.2	152.1	152.9	153.8	154.7	155.5
180	156.4	157.3	158.2	159.0	159.9	160.8	161.6	162.5	163.4	164.2

9.3.7 DISTANCE

**STATUTE MILES, NAUTICAL MILES, AND
KILOMETERS**

(Statute Miles x 1.609 = Kilometers) (Kilometers x .622 = Statute Miles)

(Statute Miles x 8.69 = Nautical Miles) (Nautical Miles x 1.15 = Statute Miles)

(Nautical Miles x 1.852 = Kilometers) (Kilometers x .54 = Nautical Miles)

9.4 FORMS

LOG OF REVISIONS

Current revisions to the Pilot's Operating Handbook and Flight Training Supplement Section 9.4.

Rev	Pages	Description of Revision
NC	ALL	Initial Release

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9.4.1 CHANGE OF ADDRESS / OWNERSHIP

CHANGE OF ADDRESS/OWNERSHIP FORM			
Aircraft Serial Number: CC11-		Aircraft Registration Number:	
CURRENT OWNER (Last, First)		NEW OWNER (Last, First)	
COMPANY/ORGANIZATION		COMPANY/ORGANIZATION	
PREVIOUS ADDRESS Number and Street		NEW ADDRESS Number and Street	
City		City	
State/Province		State/Province	
Postal Code		Postal Code	
Country		Country	
TELEPHONE NUMBER(S)		TELEPHONE NUMBER(S)	
SIGNATURE		DATE	
FOR CUB CRAFTERS USE ONLY			
Change of Ownership/Address Log Number:		Date Received:	

**9.4.2 CONTINUED OPERATIONAL SAFETY
REPORTING**

CONTINUED OPERATIONAL SAFETY REPORTING FORM			
NAME (Last, First)			
COMPANY/ORGANIZATION			
ADDRESS Number and Street			
City		AIRCRAFT MODEL	
		CC11-_____	
State/Province	Postal Code	AIRCRAFT SERIAL NUMBER	
		CC11-_____	
Country		AIRCRAFT REGISTRATION NUMBER	
TELEPHONE NUMBER(S)			
DESCRIPTION OF SAFETY OF FLIGHT ISSUE OR SIGNIFICANT SERVICE DIFFICULTY:			
SIGNATURE		DATE	
FOR CUB CRAFTERS' USE ONLY			
COS Log Number:		Date Received:	

9.5 TWO-SWITCH ELEVATOR TRIM SYSTEM

LOG OF REVISIONS

Current revisions to the Pilot's Operating Handbook and Flight Training Supplement Section 9.5.

Rev	Pages	Description of Revision
NC	ALL	Initial Release

**SECTION 9.5
SUPPLEMENT- TWO-SWITCH
ELEVATOR TRIM SYSTEM**

**CUB CRAFTERS
CC11-160**

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9.5.1 GENERAL

This supplement must be attached to the Pilot's Operating Handbook when an additional switch is added to the aft control stick to operate the Two-Switch Elevator Trim System. The information contained herein supplements or supersedes the basic Pilot's Operating Handbook only in those areas listed in this supplement. For limitations, procedures and performance information not contained in this supplement, consult section 2 of this Pilot's Operating.

This supplement must remain in the handbook at all times when the Two-Switch Elevator Trim System is installed.

9.5.1.1 DESCRIPTION

The Two-Switch Elevator Trim System consists of the following controls:

- A trim switch on top of the pilot's control stick (Figure 1)
- A trim switch on top of the aft occupants control stick (Figure 1)
- A trim selector switch located on the left wing root panel between the forward and aft seats (Figure 2)

The elevator trim may be actuated from the front or the aft seat. If both switches are operated at the same time, priority will be assigned depending on the position of the selector switch.

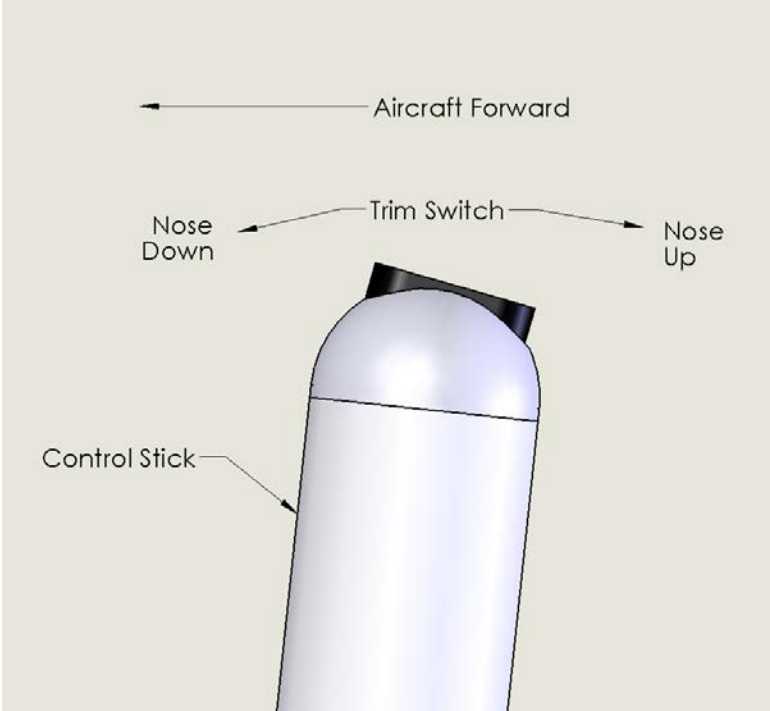


Figure 1 Switches on control sticks

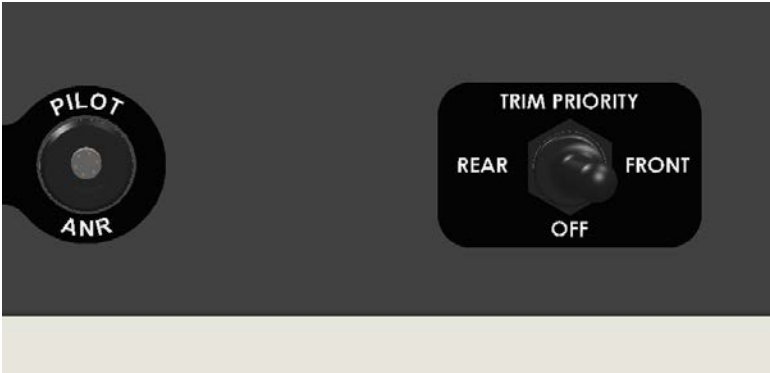


Figure 2 Trim Selector Switch

9.5.2 LIMITATIONS



PLACARD

9.5.3 EMERGENCY PROCEDURES

INADVERTENT ELEVATOR TRIM MOVEMENT

Trim selector switch Off

Should the elevator trim system begin to move without being operated intentionally, switch the selector switch on the left wing root panel to the OFF position (middle position Figure 2).

9.5.4 NORMAL PROCEDURES

9.5.4.1 PREFLIGHT

- Master switch On
- Trim selector switch..... Off
- Operate forward and aft trim switches
..... No movement
- Trim selector switch..... Forward
- Forward and aft trim switches
simultaneously..... Movement per fwd switch
- Trim selector switch.....Aft

**SECTION 9.5
SUPPLEMENT- TWO-SWITCH
ELEVATOR TRIM SYSTEM**

**CUB CRAFTERS
CC11-160**

- Forward and aft trim switches simultaneously Movement per aft switch
- Trim selector switch Set for intended operation

9.5.4.2 BEFORE TAKEOFF

- Trim selector switch Set for intended operation

9.5.5 PERFORMANCE

No change.

9.5.6 WEIGHT AND BALANCE

If the Two-Switch Elevator Trim System was installed at the factory, it is included in the licensed weight and balance information in section 6 of the Pilot's Operating Handbook. If it was retrofitted to the aircraft, the installation instructions provided by Cub Crafters will have the appropriate weight information that should be included in section 6 of the Pilot's Operating Handbook

9.5.7 DESCRIPTION AND OPERATION

The Two-Switch Elevator Trim System allows either occupant to operate the elevator trim. There is a selector switch on the left wing root panel (Figure 2) that has three positions,

- FRONT
- OFF
- REAR

When the selector switch is in the FRONT position, the system is biased in such a way that operation by the forward occupant will override any operation by the aft occupant.

The switch should normally be kept in the FRONT position to avoid inadvertent operation by an occupant in the aft seat.

Similarly, if the switch is in the REAR position, operation by the aft occupant will take priority over operation by the forward occupant. The REAR position will normally be used during flight instruction.

If the selector switch is turned to the OFF position, neither occupant will be able to operate the elevator trim.

**SECTION 9.5
SUPPLEMENT- TWO-SWITCH
ELEVATOR TRIM SYSTEM**

**CUB CRAFTERS
CC11-160**

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9.6 CHT MONITOR

LOG OF REVISIONS

Current revisions to the Pilot's Operating Handbook and Flight Training Supplement Section 9.6.

Rev	Pages	Description of Revision
NC	ALL	Initial Release

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9.6.1 GENERAL

This supplement must be attached to the Pilot's Operating Handbook when the CHT Monitor is installed. The information contained herein supplements or supersedes the basic Pilot's Operating Handbook only in those areas listed in this supplement. For limitation, procedures, and performance information not contained in this supplement, consult Section 2 of this Pilot's Operating Handbook.

This supplement must remain in the handbook at all times when the CHT Monitor is installed.

9.6.2 LIMITATIONS

Installation of the CHT Monitor does not affect the operating limitations of the CC11-160 aircraft. Please refer to Section 2 of this manual for the complete list of operating limitations.

9.6.3 EMERGENCY PROCEDURES

There are no specific emergency procedures related to the CHT monitor. Abnormal engine should not be disregarded and should be cross-referenced with other powerplant instruments. Any change in behavior of the engine should be treated seriously and checked by a suitable mechanic.

9.6.4 NORMAL PROCEDURES

Takeoff, climb and full throttle operations

CHT Maintain below 420°F

<p style="text-align: center;">CAUTION If CHT in any cylinder exceeds 420°F, increase airspeed and/or enrichen the mixture</p>
--

Cruise

CHT Maintain below 390°F
for maximum engine life

Descent

CHT Do not shock cool engine

9.6.5 PERFORMANCE

Installation of the CHT Monitor does not affect the performance of the CC11-160 aircraft. Please refer to Section 5 of this manual for complete performance information.

9.6.6 WEIGHT AND BALANCE

If the CHT Monitor was installed at the factory, it is included in the licensed weight and balance information in Section 6 of the Pilot's Operating Handbook. If it was retrofitted to the aircraft, the installation instructions provided by Cub Crafters will have the appropriate weight information that should be included in section 6 of the Pilot's Operating Handbook.

9.6.7 DESCRIPTION AND OPERATION

The CHT Monitor is a system that monitors the cylinder head temperature (CHT) of the aircraft's four individual cylinders and consists of the following:

- Temperature probes (one per cylinder)
- CHT Monitor

Each cylinder has a dedicated screen to display temperature. The display screen is also a push button that serves to control the CHT Monitor.



Figure 1 – CHT Monitor

The CHT Monitor screen displays CHT values via a bar graph per cylinder.

- The main bar graph scale starts at 200°F, with each tick along the top representing a 50° increment.
- The two additional bar graph ticks located below scale denote the transition points from GREEN to YELLOW (420°F) and from YELLOW to RED (450°F).

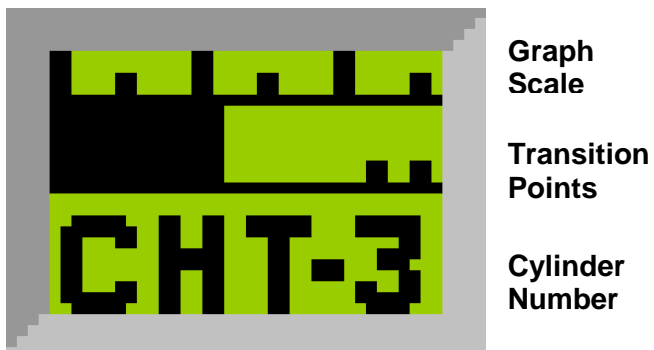


Figure 2 - CHT Monitor Display Screen

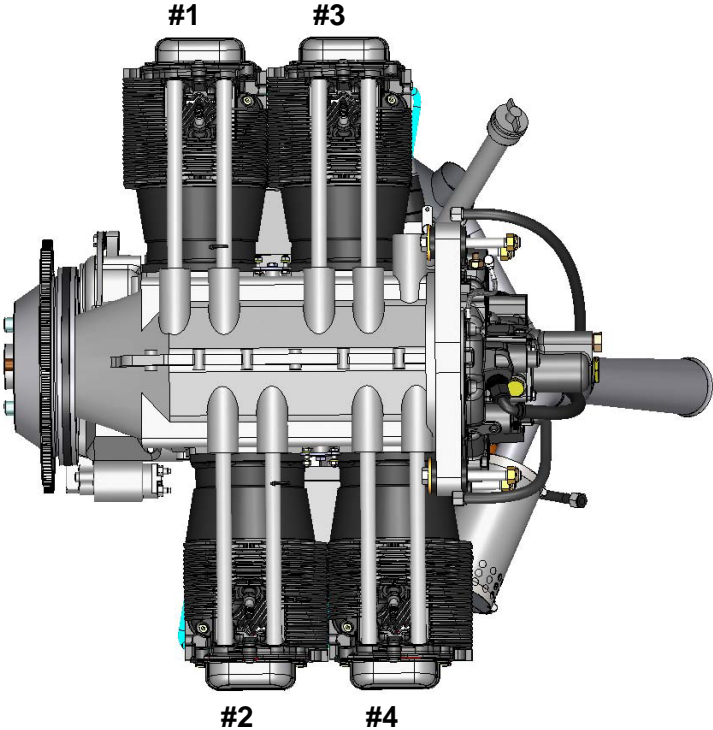





Figure 3: Cylinder Arrangement (Seen from above)

- CHT-1, CHT-2, CHT-3, and CHT-4 – Each screen is dedicated to a specific engine cylinder. The bottom line of text will display the respective cylinder.
 - The display will be GREEN during normal operating conditions. The temperature reading will be 419°F or below. The image shows a rectangular display with a green background. At the top, there are several horizontal bars of varying lengths, representing a temperature gauge. Below the gauge, the text "CHT-3" is displayed in a bold, black, sans-serif font.
 - The display will be YELLOW when the temperature is 420° to 449°F. The image shows a rectangular display with a yellow background. At the top, there are several horizontal bars of varying lengths, representing a temperature gauge. Below the gauge, the text "CHT-3" is displayed in a bold, black, sans-serif font.
 - The display will be RED when the temperature is 450°F and above. The image shows a rectangular display with a red background. At the top, there are several horizontal bars of varying lengths, representing a temperature gauge. Below the gauge, the text "CHT-3" is displayed in a bold, black, sans-serif font.
- When the screen first turns RED it will FLASH until acknowledged by pressing the screen.

The CHT Monitor has two modes of operation, AUTO SCAN and MANUAL SCAN.

- AUTO SCAN – The CHT Monitor will startup in this mode by default.
 - This scan will **always** include all four cylinders.
 - This scan can be halted into MANUAL mode by tapping the screen once.
 - Will be confirmed with the text HALT SCAN on a YELLOW display.



- When a parameter produces a FLASHING screen, AUTO SCAN will switch immediately to that screen.
 - If left alone, the FLASHING screen will continue to alarm until acknowledged/pressed.
 - If the screen button is pressed, FLASHING will cease, AUTO SCAN will halt, and the CHT Monitor will be in MANUAL mode and remain on the alarming screen.
- Scan order can be reversed by double tapping the screen.
 - Confirmation will be shown with a YELLOW display, FWD or REV, and an arrow.
- MANUAL SCAN – Used to closely monitor a single parameter.
 - Single taps will cycle through, same as AUTO SCAN.
 - CHT 1
 - CHT 2
 - CHT 3
 - CHT 4
 - Scan order can be reversed by double tapping the screen.
 - Confirmation will be shown with a YELLOW display, FWD or REV, and an arrow.
 - When a parameter produces a FLASHING screen, the CHT monitor will switch immediately to that screen.
 - If the screen button is pressed, the CHT Monitor will cease FLASHING, and remain on the alarming screen.

- If left alone, the FLASHING screen will continue to alarm until acknowledged/pressed.
- Pressing the screen for at least 1 second will change back to AUTO SCAN.
 - After the screen is released, AUTO SCAN with a YELLOW display will confirm the mode change.



The CHT Monitor display screen is also a push button. The following is a list of button press inputs and the results.

- While in AUTO SCAN
 - A single tap will revert to MANUAL SCAN.
 - Double tapping will reverse the direction of the scan.
 - Acknowledging a FLASHING alarm with a single tap will stop the flashing and revert to MANUAL SCAN, remaining on the alarming screen.
- While in MANUAL SCAN
 - A single tap will progress through the screens as described above.
 - Double tapping will reverse the direction of the scan.
 - Acknowledging a FLASHING alarm with a single tap will stop the flashing and remain on the alarming screen.
 - Pressing for 1 second or more will change to AUTO SCAN mode.

The CHT Monitor receives power from the main electrical bus when the master switch is ON and will not receive power from the Ignition Backup Battery system.

9.6.7.1 HIGH CYLINDER HEAD TEMPERATURE

In the event of a high CHT warning, any or all of the following steps should be taken to reduce cylinder temperatures.

- MixtureEnrich
- Aircraft Pitch (Climb only)Reduce
- Throttle Reduce rpm

It is recommended that for maximum engine longevity, CHT temperatures in cruise should be kept below 390°F.

9.6.7.2 LOSS OF CHT MONITOR POWER

The CHT Monitor will cease to function when the supply voltage drops below 9.3V or if the aircraft is running on the ignition backup battery system. This is not considered loss of a primary flight instrument, and is therefore not cause for an emergency situation.

However, aircraft experiencing either of these cases are also likely experiencing power issues and should consult the primary Section 3 of this manual for the complete list of emergency procedures. Aircraft operating with a loss of CHT Monitor power **and** not experiencing power issues are recommended to limit high engine RPM as well as excessive climb rates until the CHT Monitor can be restored to operation.

CAUTION
The CHT monitor will cease to operate when the supply voltage drops below 9.3 V

9.7 EXECUTIVE GLASS TOUCH PANEL

LOG OF REVISIONS

Current revisions to the Pilot's Operating Manual and Flight Manual Section 9.7.

Rev	Pages	Description of Revision
NC	ALL	Initial Release

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9.7.1 GENERAL

This supplement must be attached to the Pilot's Operating Handbook when the Executive **GLASS touch** Panel is installed. The information contained herein supplements or supersedes the basic Pilot's Operating Handbook only in those areas listed in this supplement. For limitation, procedures, and performance information not contained in this supplement, consult this Pilot's Operating Handbook.

9.7.1.1 DESCRIPTION

This supplement describes the process and requirements for operating CC11-160 aircraft equipped with the Executive **GLASS touch** Panel (Figure 9.1 and 9.2).

For further description, refer to the Garmin G3X Touch Pilot's Guide, Section 1, P/N 190-01754-00, Rev. A, dated March 2014, or later revision.



Figure 9.1 – Executive **GLASS touch Panel**



Figure 9.2 – Panel Overview

- 1 – SD Card Slot 2 – Direct-to Button 3 – Nearest Button
- 4 – Left Knob 5 – Menu Button 6 – Back Button
- 7 – Right Knob



Figure 9.3 – Panel Switches

**9.7.1.2 EXECUTIVE GLASS TOUCH PANEL
LINE REPLACEABLE UNITS (LRUs)**

LRU	Description
GDU 465	Single Display with Sirius XM
GSU 25	Air Data Computer and Attitude Heading Reference System
GMU 22	Magnetometer
GTP 59	Temperature Probe
GAP 26	Unheated Pitot/AOA Probe
GEA 24	Engine and Airframe Unit

9.7.2 LIMITATIONS

Installation of the Executive **GLASS touch** Panel does not affect the operating limitations of the CC11-160 aircraft. Please refer to Section 2 of this manual for the complete list of operating limitations.

NOTE

The aircraft electrical and engine ignition systems, SMARTmonitor, is not installed in this configuration.

9.7.3 EMERGENCY PROCEDURES

The Executive **GLASS touch** PFD has an automatic power backup called Integrated Backup Battery System (IBBS) from TCW Technologies. The IBBS will power the PFD, but will conserve battery power by not powering the COM radio and Transponder.

The IBBS switch enables the automatic battery system so that if main bus voltage falls below 11v, the IBBS automatically powers the PFD and the **IBBS IN USE** warning will appear on the screen. The PFD will operate for approximately 1 hour on the IBBS.

If annunciation comes on, monitor the situation and land as soon as practical.

NOTE

The IBBS battery is separate from the ignition backup battery. For further information on the ignition backup battery, refer to Section 3 of this manual.

9.7.4 NORMAL PROCEDURES

For further description, refer to the Garmin G3X Touch Pilot's Guide, P/N 190-01754-00, Rev. A, dated March 2014, or later revision.

9.7.4.1 SPECIFIC G3X SETTINGS FOR EXECUTIVE GLASS TOUCH PANEL (see Figure 9.4):

- COM Radio can be controlled by the radio face and / or Primary Flight Display (PFD).
- VOLTS 1: Main Bus and Main Battery Voltage
- VOLTS 2: Ignition Backup Battery Voltage
- Cautions and Warnings (see Figure 9.4):
 - **L IGN OFF** warning activates when the left electronic ignition is off
 - **R IGN OFF** warning activates when the right electronic ignition is off
 - **IGN BACKUP** cautions when right electronic ignition is operating from the ignition backup battery and the ignition backup battery is discharging
 - **IBBS IN USE** cautions when PFD is operating from battery power source



**Figure 9.4 – Cub Crafters Customized View
(For Reference Only)**

NOTE

When IBBS Switch is in the “ON” position, only the PFD will be activated. The Transponder and COM are activated separately with the Avionics Master Switch.

9.7.4.2 COCKPIT PREFLIGHT

- Flight Controls Free and correct operation
- IBBS Switch ... On and verify correct operation of PFD
- Master Switch On
- Trim Check operation and set for takeoff
(marked on empennage)
Trim Indicator on lower left of PFD Screen
- Fuel Selector Both
- Flaps Extend and retract
- Fuel Gauges..... Sufficient fuel for intended flight
- Fuel Flow Computer..... Fuel Level Adjusted as req'd
- Mixture Idle cut-off
- Carburetor Heat Cold
- Ignition Switch Off
- Ignition Backup Battery Normal
- Electrical Switches Off
- Navigation/Strobe Lights (if installed).. Check operation
- Landing Light(s) (if installed) Check operation
- Stall Warning Horn Check operation
- Master Switch..... Off
- IBBS Switch Off
- Circuit Breakers (instrument panel)..... Check in
- Circuit Breakers (wing root)..... Check in
- Circuit Breakers (seat base)..... Check in
- ELT and Antenna Connected and in "ARM" position
- Windows..... Clear
- Documentation Onboard
- Front Seat Adjust
- Rear Seat Check and belts secure
- Baggage..... Secure
- Passengers Briefed

9.7.4.3 STARTING ENGINE

- IBBS Switch..... On
- Master Switch..... On
- Mixture..... Full rich
- Primer If required*
- Throttle Open 1/2 inch
- Starter..... Engage

*Normal procedure three times. If engine is hot, omit this step

9.7.4.4 BEFORE TAKEOFF

- Brakes Set
- Throttle 1700 rpm*
- Ignition Right
 - G3X L.IGN OFF (red)
 - Left Ignition Light illuminated
 - Insignificant RPM drop
 - No Roughness
- Ignition Left
 - G3X R.IGN OFF (red)
 - Right Ignition Light illuminated
 - Insignificant RPM drop
 - No Roughness
- Backup Battery
 - Ignition Right
 - G3X L.IGN OFF (red)
 - Left Ignition Light illuminated
 - Backup Battery Emergency
 - G3X IGN BACKUP (yellow)
 - Insignificant RPM drop
 - No Roughness
 - Backup Battery Normal
- Ignition Both
 - Verify G3X Indications Extinguished
- Carburetor Heat..... Hot (Note RPM drop then cold)
- Engine Instruments..... Check
- Ammeter (if installed)..... Check

- Throttle Check idle
- Throttle 1000 rpm
- Flight Instruments..... Check
- Fuel Selector Both and sufficient quantity for flight
- Mixture Set*
- Carburetor Heat Off
- Primer..... Closed and locked
- Trim Set
- Flaps First notch (takeoff)
- Controls..... Free and proper movement
- Strobes (if installed) As required
- Transponder and Other Avionics On
- Seat Belts..... Check fastened
- Circuit Breakers (wing root)..... Check in
- Circuit Breakers (seat base)..... Check in
- Circuit Breakers (instrument panel)..... Check in
- Doors and windows..... Closed
- Landing Lights (if required) On
- Ignition Check both
- Brakes Release

* When operating at high altitudes and/or temperatures, it may be necessary to lean the mixture for peak rpm.

9.7.4.5 STOPPING ENGINE

- Parking Brakes Set
- Flaps Retract
- Electrical Equipment Off
- Avionics Master Switch Off
- Throttle Idle
- Mixture Idle cut off
- Ignition Off
- Master Switch Off
- IBBS Switch Off

9.7.5 PERFORMANCE

No change.

9.7.6 WEIGHT AND BALANCE

The Executive **GLASS touch** Panel was installed at the factory and is included in the certified weight and balance information in Section 6 of this Pilot's Operating Handbook and Flight Training Supplement.

NOTE

The Garmin G3X Touch Weight and Balance feature is not compatible with CC11-160 aircraft.

9.8 AEROCET 1500 AMPHIBIOUS FLOATS**LOG OF REVISIONS**

Current revisions to the Pilot's Operating Handbook and Flight Training Supplement Section 9.8.

Rev	Pages	Description of Revision
NC	ALL	Initial Release

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9.8.1 GENERAL

This supplement must be attached to the Pilot's Operating Handbook when floats are installed per the Equipment List supplied with the aircraft and listed in Section 6 of the aircraft flying manual. The information contained herein supplements or supersedes the Pilot's Operating Handbook only in the areas listed in this supplement. For limitations, procedures and performance information not contained in this supplement, consult Section 2 of the Pilot's Operating Handbook. It should be noted that these floats are Experimental and as such there is no warranty to their compliance to either ASTM Standards or FAA Part 23 Regulations.

9.8.2 FUEL QUANTITY INDICATORS

To determine the fuel quantity when equipped with floats, use the fuel quantity indication for level flight. Fuel indications in the water will vary depending on the angle at which the aircraft is floating. Generally, using the markings for level flight will ensure that the amount of fuel available is greater than what is shown on the gauges.

9.8.3 BILGE PUMP

There is a bilge pump stowed in a float locker. Any water that has accumulated in the floats may be emptied out by removing the rubber plugs and using the pump to draw the water out. Make sure that no one is standing in the way of the water stream.

9.8.4 FLOAT COMPARTMENTS

There are six water tight compartments per float, one of which is a storage locker.

SECTION 9.8
SUPPLEMENT-FLOATS



CUB CRAFTERS CC11-160 E-LSA

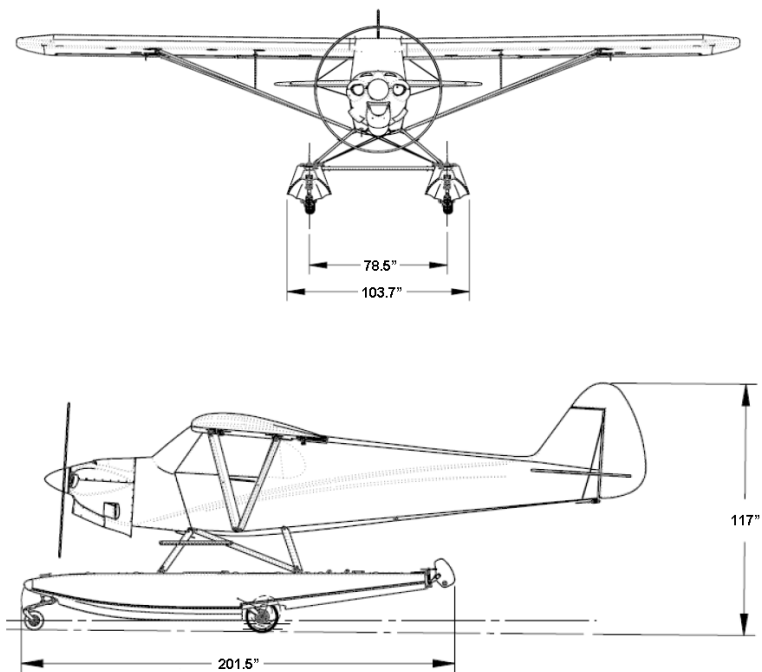


Figure 9-1-1 View of the Aircraft with Floats

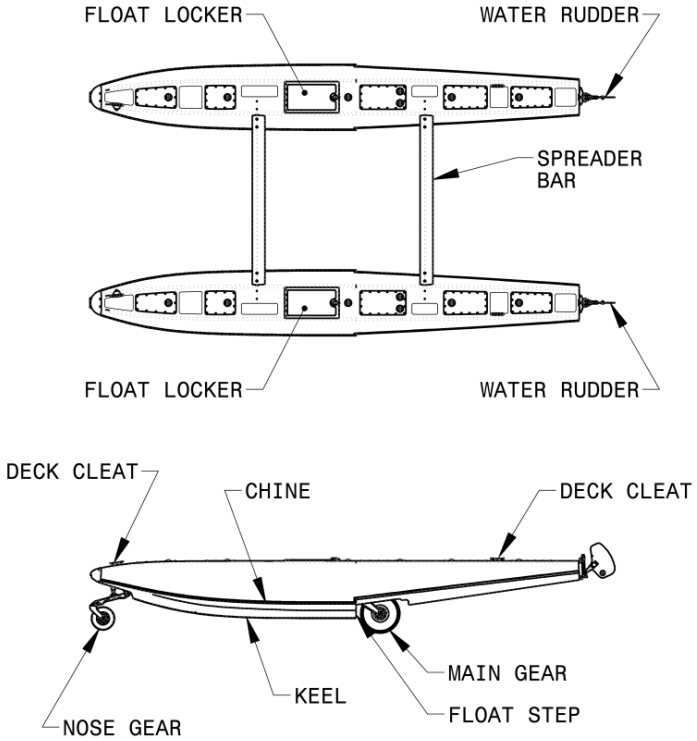


Figure 9-1-2 View of Floats

9.8.5 LIMITATIONS

GENERAL

This section provides the recommended operating limitations, instrument markings, color-coding and basic placards for operation that are specific to the Cub Crafters' CC11-160 when equipped with floats. By E-LSA classification, the owner may establish his/her own limitations, etc., but may not fly above the established E-LSA weight requirement.

Please refer to Section 2 of the aircraft flight manual for the complete list of operating limitations, instrument markings, color-coding and basic placards for operation that are common to the landplane and seaplane.

9.8.5.1 AIRSPEED LIMITATIONS

<u>INDICATED AIRSPEED (IAS)</u>	<u>MPH</u>	<u>KNOTS</u>
Never Exceed Speed (V_{NE})	141	123
Operating Maneuvering Speed (V_A) (at 1430 lbs.)	97	84
Maximum Flap Speed (V_{FE} flaps 50°)	81	70
Best Rate of Climb (V_Y) (at 1430 lbs.)	71	62
Best Angle of Climb (V_X) (at 1430 lbs.)	50	43
Maximum Demonstrated Crosswind	13	11
Maximum Demonstrated Wave Height.....		12 in.

9.8.5.2 CENTER OF GRAVITY

Maximum Gross Weight..... 1430 lbs.
Maximum Float Locker Baggage 80 lbs. each

Forward (at 1430 lbs.)73.0 in. aft of Datum
Aft (at 1430 lbs.)78.5 in. aft of Datum

Forward (at 1100 lbs.)70.5 in. aft of Datum
Aft (at 1100 lbs.)78.5 in. aft of Datum

The datum is 60 in. forward of wing leading edge.

9.8.5.3 PLACARDS

Locate near water rudder retraction handle stowage hook:



On hydraulic hand pump cover at gear selector handle:



9.8.6 EMERGENCY PROCEDURES

GENERAL

This section provides the procedures **recommended** when encountering an emergency or a critical situation as related specifically to operations when the floats are installed. It is highly recommended to establish one's own numbers for emergency conditions in lieu of the E-LSA classification. For all other emergency procedures, refer to Section 3 of the aircraft flight manual.

This section is divided into two parts. The first contains emergency procedure checklists. The second part amplifies the items listed in the checklists and includes information that is not readily adaptable to a checklist format or which the pilot could not be expected to refer to in an emergency situation. This information should be reviewed regularly.

Pilots must familiarize themselves with the procedures in this section and must be prepared to take appropriate action should an emergency arise.

It is stressed that the procedures outlined in this section are recommendations only. They are not a substitute for sound judgment and common sense and may have to be adjusted depending on the circumstances prevailing at the time of the emergency. It is important that the pilot be thoroughly familiar with the aircraft. He/She must review and practice as many of these procedures as are safe to perform as part of his/her training. Above all, in any emergency situation, **MAINTAIN CONTROL OF THE AIRCRAFT.**

9.8.6.1 AIRSPEEDS FOR EMERGENCY OPERATIONS

STALL SPEEDS (1430 lbs.)

<u>INDICATED AIRSPEED (IAS)</u>	<u>MPH</u>	<u>KNOTS</u>
Flaps up (V_{S1})	40	35
Flaps down (V_{S0})	32	28
BEST GLIDE (1430 lbs.)		
Flaps up (V_G)	68	59

9.8.6.2 Emergency Landing on WATER without Engine Power

<u>INDICATED AIRSPEED (IAS)</u>	<u>MPH</u>	<u>KNOTS</u>
Approach, flaps up (V_G)	68	59

- Seat Belts Tight and secure
- Flaps As required
- Landing Gear Up
- Door Open
- ELT Activate
- Touchdown Slightly tail low
- Control Stick Progress to full aft after touchdown

When aircraft comes to a stop:

- Ignition Off
- Master Switch Off
- Fuel Selector Off

If time permits, check GPS or charts for airports in the immediate vicinity. If possible, notify your difficulty and intentions by radio on 121.50 and/or squawk 7700.

9.8.6.3 Emergency Landing on LAND without Engine Power

<u>INDICATED AIRSPEED (IAS)</u>	<u>MPH</u>	<u>KNOTS</u>
Approach, flaps up (V_G)	68	59

- Seat Belts Tight and secure
- Flaps As required
- Gear (Amphibious Only) Down
- Door Open
- ELT Activate
- Touchdown Level attitude
- Control Stick As required for landing/x-wind

When aircraft comes to a stop:

- Ignition Off
- Master Switch Off
- Fuel Selector Off

If time permits, check GPS or charts for suitable landing areas in the immediate vicinity. If possible, notify your difficulty and intentions by radio on 121.50 and/or squawk 7700.

9.8.6.4 Landing Gear Fails to Retract or Extend

If possible, cycle the gear to address the problem. If the problem is unable to be corrected, leave the gear lever in the Down position and allow time for the gear to deploy by gravity. Reduce speed to aid the main gear to come down. Always attempt to land on Land in this condition, never on water.

WARNING

LANDING ON WATER WITH GEAR DOWN OR PARTIALLY DOWN WILL BE CATASTROPHIC AND CAN CAUSE INJURY OR DEATH

9.8.6.5 AMPLIFIED EMERGENCY PROCEDURES**9.8.6.5.1 Total Loss of Engine Power in Flight**

The aircraft with floats will glide 1.1 nautical miles for every 1000 feet of altitude loss. The rate of descent will be approximately 890 feet per minute. Most GPS devices have a "Direct to" function that shows the closest airports. Use charts to assess the topography of airports in the immediate vicinity.

9.8.6.5.2 Emergency Landing without Engine Power

When having to make an emergency landing on land with Gear Up, the pilot should use his/her best judgment to find the most suitable surface for landing.

WARNING

**DO NOT ATTEMPT TO LAND ON WATER UNLESS
ALL FOUR WHEELS ARE IN THE RETRACTED
POSITION**

9.8.7 NORMAL PROCEDURES

GENERAL

This section describes the procedures recommended for the pilot to follow during normal operations of the aircraft on floats. It is divided into two parts. The first has abbreviated checklists; these are in a format suitable for reference in the cockpit. The second part amplifies the information given in the checklists. It provides the pilot with detailed descriptions that will help him/her understand the procedures and techniques. This section contains complete checklists so that the pilot can carry out these activities out without having to turn back and forth in this manual.

9.8.7.1 AIRSPEEDS FOR NORMAL OPERATIONS

The speeds in this section are based on a maximum weight of 1,430 lbs., under standard conditions, at sea level.

9.8.7.2 MAXIMUM WAVE HEIGHT

Maximum Demonstrated Wave Height..... 12 in.

9.8.7.3 NORMAL PROCEDURES CHECKLIST

For ease of operation, this supplement will provide the complete checklist.

9.8.7.4 Cockpit Pre-Flight

- Flight Controls Free and correct operation
- Trim Check operation and set for takeoff
- Fuel Selector Both
- Flaps Proper operation
- Fuel Gauges..... Sufficient fuel for intended flight
(Use level flight indications for float operation)
- Mixture Idle Cut-Off
- Carburetor Heat Cold
- Ignition..... Off
- Ignition Backup Battery Switch..... On and Verify
Correct PFD Operation
- Electrical Switches Off
- Landing Gear Selector Up for Water
Down for Land
(Check for firm pressure on the pump handle)
- Water Rudders & Cables Check Extend/Retract
(Up for Land- ensure handle is stowed)
(Down for Water)
- Master Switch..... On
- Navigation/Strobe Lights Check operation
- Landing Light..... Check operation
- Stall Warning Horn Check operation
- Landing Gear Lights..... Check
- Master Switch..... Off
- Circuit Breakers..... Check in
- Windows.....Clear
- Documentation Onboard

If passenger seat unoccupied

- Passenger Seat Harness Secure & clear of stick

9.8.7.5 Preflight Right Fuselage, Wing, and Float

- Right Fuselage Check
- Fuel Sump Drain
- Flap Surface Check condition
- Flap Hinges Check
- Aileron Surface Check condition
- Aileron Hinges Check
- Wing Tip and Light..... Check
- Vortex Generators Check
- Fuel Cap Vent..... Check
- Fuel Quantity Check
- Main and Nose Gear Tires Check Inflated
Main (45 PSI), Nose Gear (70 PSI)
- Float.....Check for damage & water accumulation
(Use bilge pump as required)
- Spreader Bars/Struts Check

NOTE

Remove rubber plugs which serve as stoppers on the standpipe in each float compartment and pump out any accumulation of water. Reinstall rubber plugs with enough pressure for a snug fit. If excessive amount of water, investigate for damage. Observe how the plane is floating indicating a possible leaking or damaged float bay. Red in the water indicates a hydraulic leak.

- Bilge Rubber Plugs Secure
- Oar..... Check stowed and secure
- Float Hatches ...Cargo secure and hatches latched

9.8.7.6 Preflight Nose Section

- Oil Door Open
- Oil Quantity Check, Cap Secure
- Engine Condition Check
- Oil Door Close
- Propeller and Spinner..... Check
- Air Inlets..... Check
- Fuel Strainer and Fuel Drain Drain

9.8.7.7 Preflight Left Fuselage, Wing, and Float

- Float HatchesCargo secure and hatches latched
- Main and Nose Gear Tires Check Inflated
Main (45 PSI), Nose Gear (70 PSI)
- FloatCheck for damage and water accumulation
(Use bilge pump as required)
- Spreader Bars/Struts..... Check

NOTE

Remove rubber plugs which serve as stoppers on the standpipe in each float compartment and pump out any accumulation of water. Reinstall rubber plugs with enough pressure for a snug fit. If excessive amount of water, investigate for damage. Observe how the plane is floating indicating a possible leaking or damaged float bay. Red in the water indicates a hydraulic leak.

- Bilge Rubber PlugsSecure
- Fuel QuantityCheck
- Fuel Cap VentCheck
- Landing Light..... Check condition
- Pitot Tube Check condition
- Stall Warning Vane Check condition
- Wing Tip & Light..... Check condition
- Vortex GeneratorsCheck
- Aileron HingesCheck
- Aileron Surface..... Check condition
- Flap HingesCheck
- Flap Surface Check condition
- Water Rudder & Cables Check Extend/Retract
- Left FuselageCheck

9.8.7.8 Empennage

- Bracing Wires Check for tension
- Hinges Check
- Position Light (if installed) Check
- Control Surfaces Check

9.8.7.9 Pre-Flight General

Check that all wings and other external surfaces are free from frost, ice or snow.

9.8.7.10 Startup and Taxi

- Preflight Inspection Complete
- Pilot Seat Adjusted
- Seat Belts Fastened
- Passenger Briefing Complete
- Door Closed
- Fuel Selector Both
- Avionics Master Switch Off
- Water Rudders Down for Water, Up for Land
- Landing Gear Up for Water, Down for Land
- Propeller Area Clear

9.8.7.11 Starting Engine

- Master Switch On
- Check Gear Advisory Cancel any advisory audio
Press Test to check indicator lights
- Strobes On
- Mixture Full rich
- Primer Apply (3 times if cold, omit if hot)
- Throttle Open 1/2 inch
- Starter Engage
- Ignition Both

WARNING

**ENSURE THAT THE PRIMER IS IN AND LOCKED
AFTER THE ENGINE HAS STARTED. APPLYING THE
PRIMER WITH THE ENGINE RUNNING WILL CAUSE
THE ENGINE TO STOP**

After engine has started:

- Oil Pressure Check Green
- Throttle Set 1000 RPM (As Required on Water)
- Lights As required
- Avionics Master Switch On

9.8.7.12 Starting Engine When Flooded

- Ignition Switch Both
- Mixture Idle Cut-Off
- Throttle Full Open
- Starter Engage

When engine fires:

- Mixture Full Rich
- Throttle Retard to 1200 RPM
- Ignition Switch Both
- Oil Pressure Check
- Lights As required
- Avionics Master Switch On

9.8.7.13 Taxiing

- Water Rudders Down
- Taxi Area Clear
- Throttle Apply slowly

9.8.7.14 Before Takeoff

- Water Rudders Up
- Brakes Hold
- Throttle 1700 RPM
- Ignition Right, Insignificant RPM drop
Left, Insignificant RPM drop, Both
- Backup Battery
 - Ignition Right
 - Backup Battery Emergency
BAKUP IN USE (yellow)
 - Backup Battery Normal
 - Ignition Both

- Carburetor Heat..... Hot, RPM drop, Cold
- Engine Instruments..... Check
- Ammeter (if installed)..... Check
- Throttle Check idle
- Throttle 1000 RPM
- Flight Instruments Check
- Fuel Selector Both
- Mixture Set*
- Carburetor Heat Off
- Primer Closed and Locked
- Trim Set
- Flaps..... First notch (takeoff)
- Controls Free and proper movement
- Strobes and Lights..... As required
- Transponder and Other Avionics On
- Seat Belts Check fastened
- Circuit Breakers (wing root) Check in
- Circuit Breakers (seat base) Check in
- Circuit Breakers (instrument panel) Check in
- Doors and windows Closed
- Landing Lights (if required) On
- Ignition Check both

* Lean Mixture at high altitudes and/or temperatures for peak RPM.

9.8.7.15 Takeoff

- Water Rudders Check up
- Landing Gear..... Up for Water, Down for Land
- Control Stick Full aft for water
- Throttle Full
- Control Stick Relax pressure
On water, when the nose stops rising to attain the planing attitude (on the step)
- Accelerate to flight speed (depends on aircraft weight)
- Control Stick Gentle back pressure
- Flaps..... Retract slowly after liftoff

9.8.7.16 Climb

- Best Rate 71 mph IAS
- Best Angle..... 50 mph IAS
- MixtureLean to obtain maximum RPM
- Carburetor HeatAs required

9.8.7.17 Cruise

- Power Adjust
- Mixture Adjust
- Carburetor HeatCold, use as required

9.8.7.18 Descent

- Power Adjust
- Mixture Adjust
- Carburetor HeatAs required

9.8.7.19 Approach

- Fuel SelectorBoth
- Seat Belts..... Fastened
- MixtureSet
- FlapsSet
 - Maximum speed first notch flaps (15°).....85 MPH IAS
 - Maximum speed (>15°).....81 MPH IAS
- TrimAs required
- Speed.....As required
(1.3 times full flaps stall speed at gross weight is 42 mph IAS)
- Doors and windows..... Closed

9.8.7.20 Landing

- Water Rudders Check up
- Landing Gear..... Up for Water, Down for Land
- Control Stick Hold full aft as aircraft decelerates to taxi speed

WARNING

IF WHEELS ARE IN DOWN POSITION FOR A WATER LANDING, THE AIRCRAFT WILL FLIP OVER. FOR ALL WATER LANDING, ENSURE WHEELS ARE UP

9.8.7.21 Cross Wind Landing

- Fuel Selector Both
- Seat BeltsFastened
- Mixture..... Set
- Flaps..... Set below white arc
Maximum speed first notch flaps (15°)...85 mph IAS
Maximum speed full flaps (50°) 81 mph IAS
- Trim As required
- Speed As required
(A higher speed than normal is recommended)
- Water RuddersCheck up
- Landing Gear..... Up for Water, Down for Land
- Ailerons-Rudder..... On short final
Use ailerons to keep upwind wing low
Rudder to hold landing area alignment
- Touchdown Do not touch down in a slip
- Landing Roll..... Use ailerons to keep upwind wing down, rudder to keep directional control as appropriate, water rudders down (water only)

9.8.7.22 Go-Around

- Throttle Full power
- Carb Heat..... Off
- AirspeedAbove 52 mph
- FlapsRetract slowly
- Landing Gear Retract
- TrimAs required

9.8.7.23 Stopping Engine

- Flaps Retract
- Electrical Equipment Off
- Avionics Master Switch Off
- Throttle Idle
- MixtureIdle Cut-Off
- Ignition..... Off
- Master Switch..... Off

9.8.8 WEIGHT AND BALANCE

GENERAL

This section provides the position of the center of gravity relative to the datum. It also describes how to calculate the empty weight of the aircraft based on data for the landplane. Should it be necessary to weigh the aircraft on floats, please consult the maintenance manual.

9.8.8.1 WEIGHT AND BALANCE OF THE CC11-160 AIRCRAFT EQUIPPED WITH FLOATS

Maximum Gross Weight	1,430 lbs.
Position of Datum	60 inches ahead of wing leading edge
Position of Wheel Arm:	
Forward	-7.38 in.
Aft	99.50 in.

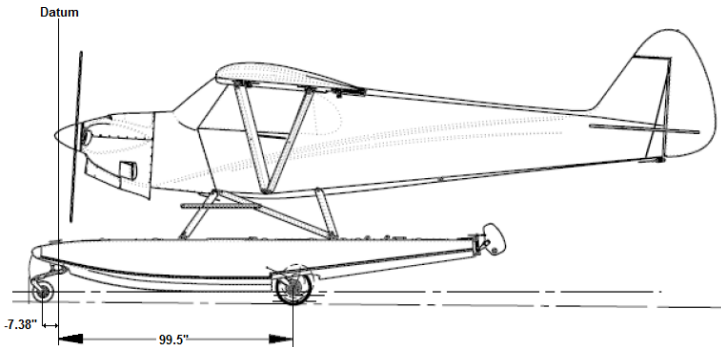


Figure 9-1-3 Arm of Wheels on Floats

Center of Gravity Limits at 1,430 lbs.

Forward 73.0 in. aft of datum
Aft..... 78.5 in. aft of datum

Center of Gravity Limits at 1,100 lbs. or less

Forward 70.5 in. aft of datum
Aft..... 78.5 in. aft of datum

9.8.8.2 DETERMINATION OF EMPTY WEIGHT

The empty weight and the position of the center of gravity are recorded in Section 6 of this manual.

The weight and moments of the floats are given in Table 9-1-1. If there is any difficulty or concern in values listed, weigh the airplane at each wheel location.

Item	Weight (lbs.)	Arm (in.)
Amphibious floats with attachment gear	270 (approx)	76.30
Gear retraction handle and Pump System	3.80	65.00
Rudder Bar and Springs	1.75	253.00
Steps	4.50	65.40

Table 9-1-1 - Weight of Amphibious Floats

9.8.8.3 WEIGHT AND BALANCE DETERMINATION FOR FLIGHT

In order to calculate the weight and balance of the aircraft:

1. Insert the respective loads in Table 9-1-2 or Table 9-1-3.
2. Multiply each load by its respective arm and note the moment.
3. Add the data in the weight column to calculate the takeoff weight.
4. Add the data in the moment column to compute the total moment.

SECTION 9.8
SUPPLEMENT-FLOATS



CUB CRAFTERS CC11-160 E-LSA

5. Divide the total moment by the takeoff weight to determine the position of the center of gravity.
6. Plot the point on Figure 9-1-2. If it is within the weight and balance envelope, the aircraft is within the approved envelope.

	Weight (lbs.)	Arm (in.)	Moment (lbs.-in.)
Basic empty weight			
Float hatches		71.40	
Pilot		71.40	
Passenger		96.08	
Fuel		83.90	
Forward cargo compartment (100 lbs. max)		110.40	
Cargo shelf compartment (20 lbs. max)		134.40	
Takeoff weight			

Table 9-1-2 –Weight and Balance Loading Form with Floats

	Weight (lb.)	Arm (in.)	Moment (lb-in)
Basic empty weight			
Float hatches (standard)		71.40	
Pilot		71.40	
Fuel		83.90	
Forward cargo compartment (100 lbs. max)		110.40	
Extended cargo compartment (60 lbs. max)		138.40	
Takeoff weight			

**Table 9-1-3 –Weight and Balance Loading Form with Floats
 And Extended Cargo Compartment**

CC11-160 CG Envelope

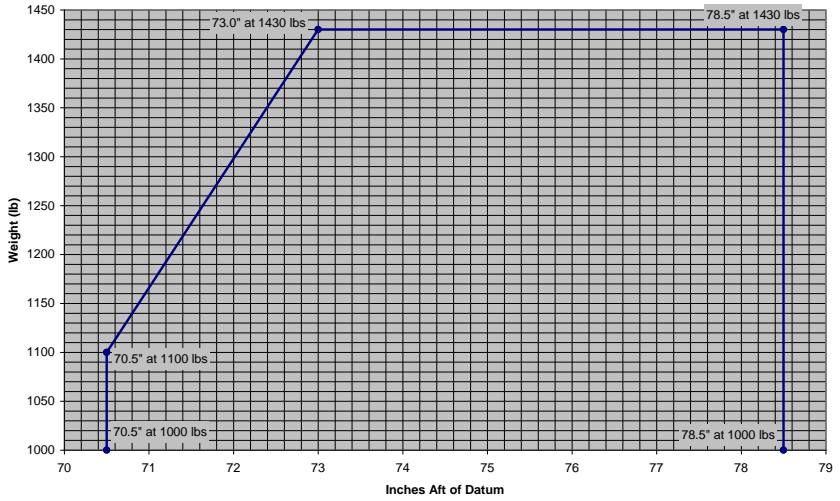


Figure 9-1-2 - Weight and Balance Envelope with Floats

9.8.9 PERFORMANCE

These floats are experimental and as such there is no warranty to their compliance to either ASTM Standards or FAA Part 23 Regulations. Therefore, performance information is not required and is not available at this time. Pilots are advised that takeoff and landing rolls will be increased from standard landing gear due to additional weight.

All values listed are at gross weight under standard sea level conditions. The charts below should be filled in by the owner in order to establish working numbers for the aircraft. Propeller, engine capability, etc. are all variables that are unique to each aircraft.

9.8.9.1 CLIMB

Pressure Altitude (ft)	IAS		Rate of Climb
	(MPH)	Knots	
1,000	70	61	
2,000	70	61	
3,000	70	61	
4,000	71	62	
5,000	71	62	
6,000	71	62	
7,000	71	62	
8,000	72	63	
9,000	72	63	
10,000	72	63	
11,000	72	63	
12,000	73	63	

9.8.9.2 Takeoff/Landing-Wheels

Wheel		Distance
Takeoff	Roll	
	50' Obstacle	
Land	Roll	
	50' Obstacle	

9.8.9.3 Takeoff/Landing-Water

Water	Condition	Distance
Takeoff	Roll	
	50' Obstacle	
Land	Roll	
	50' Obstacle	

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