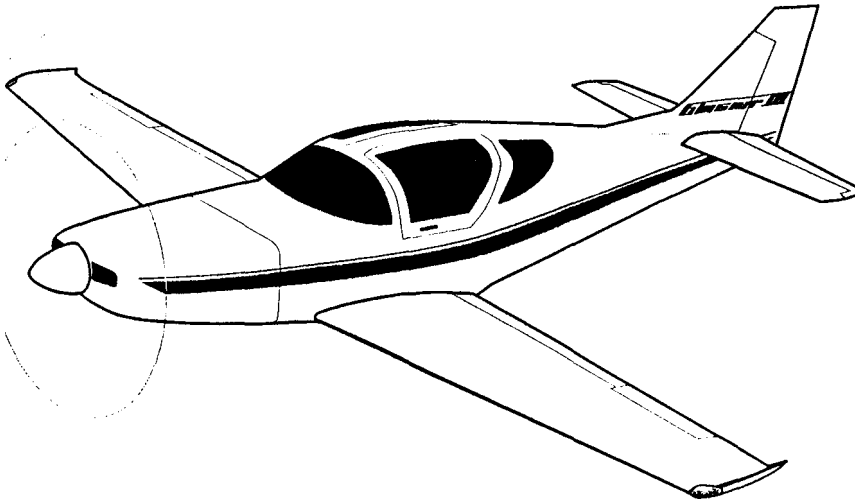
GLASAIR SUPER 11-S RG

Model SH-2R



-- Ron Wanttaja

OWNER'S MANUAL

Serial#____ _

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LOG OF REVISIONS

PAGE NO.	REVISION

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SECTION 1

GENERAL INFORMATION

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1-1 INTRODUCTION

Thank you for selecting a Glasair Super 11-S RG kit aircraft--a very complete, high performance composite kit. We hope that flying it is a safe, rewarding, and enjoyable experience for you. The sole purpose of this manual is to explain the safe and efficient operation of your Glasair Super 11-S RG aircraft.

The Glasair Super 11-S RG is a high performance, two-place, low-wing, aircraft that features retractable tricycle landing gear and an airframe made entirely from female molded fiberglass composite components.

The Glasair was designed to provide the highest utility possible in a homebuilt aircraft. The aerodynamically clean airframe is responsible for the Glasair's high top speed and its exceptional operating efficiency. The excellent high speed performance is complemented by good slow flight characteristics and an honest, predictable stall. The rugged landing gear permits operation from rough, short fields. The Glasair Super 11-S RG's comfortable side-by-side seating, ample baggage capacity, and good range make it an unparalleled cross-country traveler. Thanks to the light, responsive controls, sport aerobatics in the Glasair are pure delight. The integration of all these capabilities in a single aircraft make the Glasair Super 11-S RG the ultimate in performance and versatility.

1-2 PILOT ABILITY

The Glasair Super 11-S RG is a high performance airplane. To fly the RG safely, the pilot needs the necessary skills and confidence to operate and control the airplane automatically. Activities requiring attention outside the airplane, such as avoiding traffic and flight path planning, will occupy much of the pilot's thought and time.

Although you may have dreamed of being at the controls of a high performance plane such as the Glasair Super 11-S RG, please be honest with yourself about your experience and ability. Unless you have adequate experience, we strongly advise that you initially fly the Glasair with extended wing tips. The longer wing will permit slower approaches that feel more comfortable during the "training phase." Remove the wing tip extensions only when you feel comfortable and confident enough to do so.

NOTE

With wing tip extensions installed, minimum control speed is as critical as stall speed in setting Vs, as defined in the FARs and this Owner's Manual. This is why the minimum airspeed (Vs) is not lowered for Glasairs with wing tip extensions installed, even though the stall speed is lower than in the standard configuration. With tip extensions installed, therefore, the pilot must be careful to let the airspeed rise above Vs before rotating for take off.

1-2.1 FAA Regulations

The owner and operator should be familiar with the Federal Aviation Regulations (FARs) applicable to the operation and maintenance of an airplane and with FAR Part 91, General Operating and Flight Rules. Further, the airplane must be operated and maintained in accordance with FAA Airworthiness Directives which may be issued against it regarding powerplants, propellers, and any other parts not manufactured by Stoddard-Hamilton Aircraft.

WARNING

Revisions or Service Bulletins issued by Stoddard-Hamilton that are mandatory in nature must be complied with. Review a current Service Bulletin list to detennine which Service Bulletins apply to the Glasair Super 11-S RG.

The Federal Aviation Regulations place the responsibility for maintenance of this airplane on the owner and operator. All limits, procedures, safety practices, time limits, servicing, and maintenance requirements contained in this manual are considered mandatory for continued safe airworthiness and to maintain the airplane in a condition equal to that of its original construction.

1-2.2 Familiarization Rides

There is one last step you can take to confirm your ability to fly the Glasair Super 11-S RG you have built. In addition to demonstration flights prior to purchase, Stoddard-Hamilton Aircraft offers familiarization rides to its customers who are ready to make first flights in their own Glasairs.

We strongly urge you to schedule a trip to our facilities for a familiarization ride when your aircraft is finished. You will fly one of our demonstration models with a factory representative to acquaint yourself with the handling characteristics of the airplane. Why test yourself and your newly built Glasair Super 11-S RG at the same time?

1-3 IMPORTANT NOTICE

This manual is not designed, nor can it serve as a substitute for adequate and competent flight instruction. It is not intended to be a guide of basic flight instruction or a training manual.

This manual should be read thoroughly and carefully by the owner and/or operator in order to become familiar with the operation of the aircraft. It is intended to serve only as a guide under most circumstances, but cannot take the place of good sound judgment during flight operations. Multiple emergencies, adverse weather, terrain, etc., may require deviation from the recommended procedures. Furthermore, this Owner's Manual does not provide a discussion of all possible dangerous situations an owner or operator may encounter.

Flying in itself is not inherently dangerous, but to an even greater extent than any other mode of travel, it is terribly unforgiving of any carelessness, incapacity, or neglect. The builder/pilot is entirely responsible for manufacture, inspection, maintenance, test flight, and normal operation of the aircraft. Thorough, careful procedures, therefore, must be carried out in all these phases.

How well the plane is built, maintained, and operated will determine how safely it performs. Maximum performance and safe operation can only be achieved by a skilled pilot and a good mechanic. Thorough, careful construction, continued maintenance, and diligent practice during the early phases of flight familiarization are mandatory.

The information in this manual refers to the Glasair Super 11-S RG aircraft (Model SH-2R) built according to the appropriate Instruction Manuals. Any modifications to the aircraft that deviate from the Instruction Manuals may alter the applicability of this manual to your airplane.

The performance data presented in this manual is based on data gathered during flight tests of Stoddard-Hamilton's own aircraft. Due to differences in the engine and propeller installed, quality of workmanship, and many other variables, each airplane will vary somewhat in performance. Do not assume that your aircraft will have the exact same characteristics as our prototype.

1-4 USE OF THE MANUAL

The Glasair Super 11-S RG Owner's Manual is designed to maintain documents necessary for the safe and efficient operation of the aircraft. It has been prepared in loose leaf form for easy revision and in a convenient size for storage in the airplane. The manual is divided into nine major sections, which are listed in the Table of Contents. Each section also has its own individual Table of Contents.

1-5 REVISING THE MANUAL

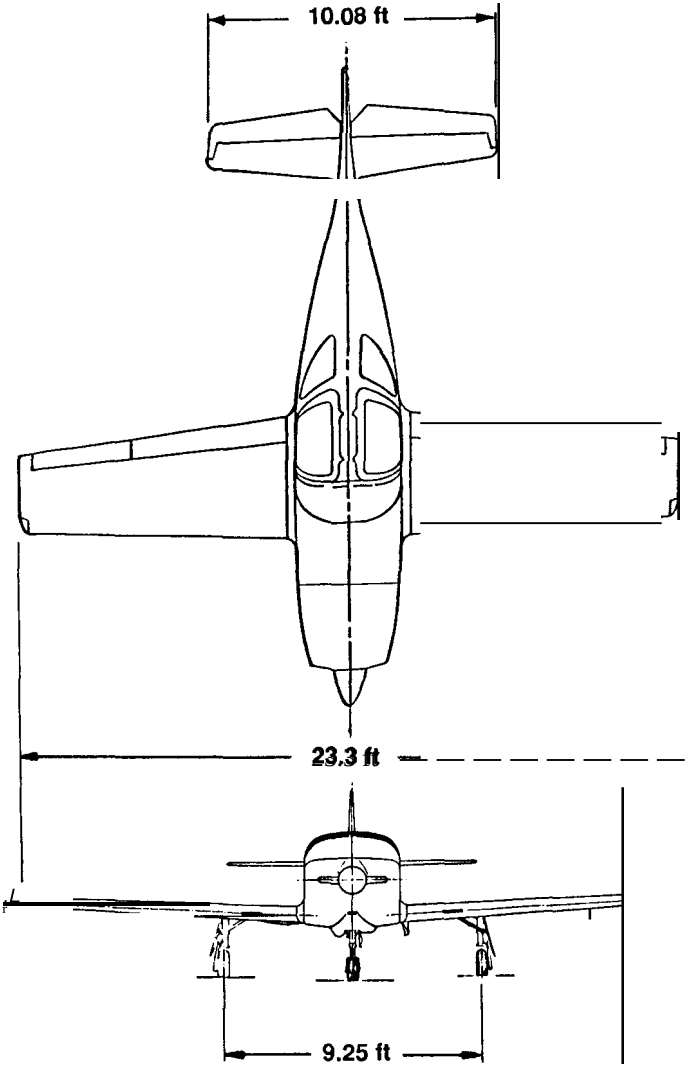
Immediately following the title page is the "Log of Revisions," which lists all revisions to the Owner's Manual by the page number, revision letter, and date issued. After receiving a revision, remove all the obsolete pages and insert the revised pages. Discard the obsolete pages. Insert the latest "Log of Revisions" page on top of the previous one, behind the title page.

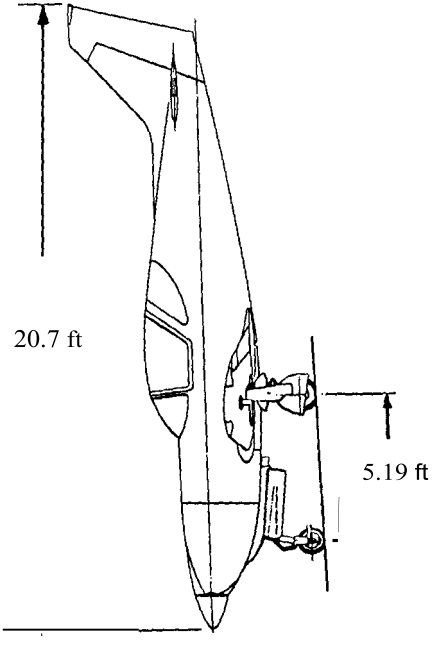
1-6 WARNINGS, CAUTIONS AND NOTES

The following definitions apply to WARNINGS, CAUTIONS, and NOTES throughout this manual.

WARNING	Procedures, practices, etc., which may result in personal injury or loss of life if not carefully followed.
CAUTION	Procedures, practices, etc., which if not strictly observed may result in damage or destruction of equipment.
NOTE	An operating procedure, condition, etc., which it is considered essential to emphasize.

1-7 AIRPLANE THREE VIEW




20.7 ft
5.19 ft

1-8 SPECIFICATIONS

Wing Span	23.3 ft
With wing tip extensions	27.3 ft
Wing Area	81.3 ft^2
With wing tip extensions	91.5 ft^2
Wing Aspect Ratio	6.20
With wing tip extensions	7.64
Length Overall	20.7 ft
Height Overall (w/o propeller)	6.8 ft
Wheel Base	5.19 ft
Wheel Span (Track)	9.25 ft
Cabin Width	**42.0** in
Baggage Space	12 ft^3
Gross Weight:	
Normal	2100 lb
With wing tip extensions	2200 lb
Aerobatic	1900 lb
Empty Weight (approx.)	1400 lb
Useful Load (approx.)	700 lb
With wing tip extensions (approx.)	775 lb
Baggage Capacity (max.)	100 lb

Wing Loading (gross) .....25.83 lb/ft^2
With wing tip extensions .....24.04 lb/ft^2

Fuel Capacity:
Main Wing Tank.....40 gal (240 lb)
Header Tank ..... 8 gal (48 lb)
Wing tip extensions.....11 gal (66 lb)

Oil Capacity.....8 qt (15 lb)

Seats 2

Tire Size:
Main Gear.....5.00 X 5, 6 Ply Rating
Nose Gear ..... 11 x 4.00-5, 8 Ply Rating

1-9 PERFORMANCE DATA

NOTE

These figures are based on Stoddard-Hamilton's own aircraft equipped with a 180 horsepower Lycoming 10-360 engine and a Hartzell constant speed propeller. Unless otherwise specified, the figures are for aircraft equipped with the standard, short wing tips (23.3 ft wing span). To obtain approximate performance figures for Glasairs equipped with 160 or 200 horsepower engines, subtract or add 5%. The performance of a different airplane will vary depending on engine horsepower, propeller choice, aircraft payload, airframe construction, and pilot ability. Because of inaccurate airspeed measurement at high angles of attack, the stall speeds published here are approximate (within ± 2 mph). Column space has been provided for the actual performance data for your own aircraft.

Top Speed (Sea level, TAS) ..... 238 mph ____ _

Cruise Speed (75% power@ 8000', TAS) ..... 228 mph ____ _

Rate of climb (from sea level):

Solo (app. 1700lb)..... 2700 ft/min ____

Gross..... 1700 ft/min ____ _

Stall Speeds at Gross (V_{50}): (IAS, full flaps)

Standard Flaps.....73 mph ____ _

Slotted Flaps.....68 mph ____ _

Slotted Flaps w/ Wing-Tip Ext.....63 mph ____ _

Clean Stall Speed at Gross CVs): (IAS)

Standard Wing Tips (23.3 ft wing span)..... 80 mph ___ _

Wing Tip Extensions (27.3 ft wing span) .....77 mph ___ _

Recommended Glide Speed (engine out) .....125 mph

The recommended glide speed is an estimate based on the fact that the best glide airspeed will usually be a few miles an hour faster than the best rate of climb airspeed.

Best Rate of Climb Speed (Vy) ..... 120 mph___ _

Best Angle of Climb Speed (VJ ..... 100 mph ____ _

Approach Speeds (1.3 x Vso) ..... 104 mph ____ _

Never Exceed Speed CVne) .....260 mph

Maneuvering Speed (Va).....145 mph

Maximum Structural Cruising Speed CVno) .....200 mph

Maximum Flap Extension Speed, Standard Flaps(Ve) .....120 mph

Maximum Flap Extension Speed, Slotted FlapsCVte) .....140 mph

Maximum Gear Extension Speed CVie).....140 mph

Maximum Gear Operating speed ($Vi_{0)}$ ----------- 140 mph

Structural Limit Loads (at 2100 lb gross weight)
Positive ..... 3.8 Gs
Negative ..... 1.0 Gs

Structural Limit Loads (at 1900 lb aerobatic weight)
Positive ..... 6.0 Gs
Negative ..... 4.0 Gs

Range at 55% power (approx. 8 gal/hr).....1296 miles
With wing tip extensions.....1593 miles

Service ceiling (approx.) .....19,000 ft

Roll rate .....140°/sec
With wing tip extensions.....90°/sec

1-10 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

1-10.1 General Airspeed

CAS Calibrated Airspeed is the indicated speed of an airplane, corrected for position and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.

KCAS Calibrated Airspeed expressed in knots.

GS Ground Speed is the speed of an airplane relative to the ground.

IAS Indicated Airspeed is the speed of an airplane as shown on the airspeed indicator when corrected for instrument error. IAS values published in this handbook assume zero instrument error.

KIAS Indicated Airspeed expressed in knots.

TAS True Airspeed is the airspeed of an airplane relative to undisturbed air which is the CAS corrected for altitude, temperature, and compressibility.

Va Maneuvering Speed is the maximum speed at which application of full available aerodynamic control will not over stress the airplane.

Vre Maximum Flap Extended Speed is the highest speed permissible with wing flaps in a prescribed extended position.

V_{le} Maximum Landing Gear Extended Speed is the maximum speed at which an airplane can be safely flown with the landing gear extended.

V_{lo} Maximum Landing Gear Operating Speed is the maximum speed at which the landing gear can be safely extended or retracted.

Vne Never Exceed Speed is the speed limit that may not be exceeded at any time.

Vno Maximum Structural Cruising Speed is the speed that should not be exceeded except in smooth air and then only with caution.

Vs Stalling Speed or the minimum steady flight speed at which the airplane is controllable.

Vso Stalling Speed or the minimum steady flight speed at which the airplane is controllable in the landing configuration.

Vx Best Angle-of-Climb Speed is the airspeed which delivers the greatest gain of altitude in the shortest possible horizontal distance.

Vy Best Rate-of-Climb Speed is the airspeed which delivers the greatest gain in altitude in the shortest possible time.

1-10.2 Weight and Balance

Datum An imaginary vertical plane from which all horizontal distances are measured for balance purposes.

Station A location along the airplane fuselage usually given in terms of distance from the reference datum.

Arm The horizontal distance from the reference datum to the center of gravity (CG) of an item.

Moment The product of the weight of an item multiplied by its arm.

Mean Aerodynamic Chord (MAC) The value that, when multiplied by the span, results in the wing area.

Airplane Center of Gravity (CG) The point at which an airplane would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane.

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 locations within which the airplane must be operated at a given weight.

Empty Weight Weight of an airplane including full operating fluids, unusable fuel, full oil, and optional equipment.

Maximum Gross Weight Maximum weight approved for flight operations.

Useful Load Difference between maximum gross weight and empty weight.

Payload Weight of occupants and baggage.

Tare The weight of chocks, blocks, stands, etc., used on the scales when weighing an airplane.

SECTION 2

LIMITATIONS

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2-1 AIRSPEED LIMITATIONS

Vne	260 mph	Do not exceed this speed in any operation.
Va	145 mph	Do not make full or abrupt control movements above this speed.
Vno	200 mph	Do not exceed this speed except in smooth air and then only with caution.
Vte	120 mph	(Standard flaps) Do not extend flaps or operate with flaps extended above this speed.
Vte	140 mph	(Slotted flaps) Do not extend flaps or operate with flaps extended above this speed.
V1JV10	140 mph	Do not extend or retract the landing gear, or operate with gear extended above this speed, except in an emergency.

NOTE

Definitions of these airspeeds are given in FAR Part 1, paragraph 1.2. All airspeeds are calibrated airspeeds (GAS). During flight test, the airspeed indicator should be calibrated so as to distinguish indicated airspeeds (IAS) from calibrated airspeeds (GAS). Above 200 knots, calibrated airspeed becomes inaccurate due to compressibility around the leading edge of the pitot tube. Equivalent airspeed (EAS) is calibrated airspeed corrected for compressibility. EAS will always be lower than GAS above 200 knots. The differences between IAS, GAS, and EAS are determined by experiment.

2-2 AIRSPEED INDICATOR MARKINGS

WHITE ARC..... 73 to 120 mph
(Full Flap Operating Range, Standard Flaps)

WHITE ARC..... 68 to 140 mph
(Full Flap Operating Range, Slotted Flaps)

GREEN ARC..... 80 to 200 mph
(Normal Operating Range)

Determine the Indicated gross weight stall speed with flaps (V_{50}) for the white arc and the indicated clean stall speed (V_{5}) for the green arc for your own airplane during flight test.

YELLOW ARC ..... 200 to 260 mph
(Operate with Caution; Only in Smooth Air)

RED LINE ..... 260 mph
(Maximum Speed for All Operations)

2-3 POWERPLANT LIMITATIONS

2-3.1 Approved Engines

Engines approved for the Glasair Super 11-S RG are:
Lycoming 0-320 D and E series engines, or other 0-320 series with the carburetor mounted on the underside of the oil sump, near the front.

NOTE

Lycoming 0-320 H series engines are not approved for use on the Glasair aircraft.

Lycoming 10-320 B series engines, or other 10-320 series engines with aft mounted (horizontal) injectors.

Lycoming 10-360 (180 hp) B series engines, or other 10-360 series with aft mounted (horizontal) injectors.

Lycoming 10-360 (200 hp) C series engines. These engines have aft-mounted injectors. If a 200 hp engine is used, the upper cowling must be modified slightly to provide clearance for the cylinder heads.

2-3.2 Oil Pressure

Maximum Normal Operating .....90 psi
Minimum Normal Operating .....60 psi
Idling .....25 psi
Start & Warm-up Maximum (Red Line).....100 psi
Green Arc.....60 to 90 psi

2-3.3 Oil Temperature

Maximum (Red Line) ..... 245° F (118° C)
Recommended .....180° F (82°C)
Green Arc.....160° F to 220° F
Yellow Arc .....100° F to 160° F

2-3.4 Fuel Pressure (Carbureted Engine)

Maximum .....8.0 psi
Recommended .....3.0 psi
Minimum .....0.5 psi

2-3.5 Fuel Pressure (Injected Engine)

Boost pump pressure limits to injector inlet:

Zero Fuel Flow..... 45 psi maximum
Maximum Fuel Flow ..... 14 psi minimum

2-3.6 Cylinder Head Temperature

Maximum (Red Line).....500° F (260° C)
Normal Operating (Green Arc)..... 180° F to 435° F

2-3.7 Tachometer

Maximum RPM (Red Line).....2700 rpm
Normal Operating (Green Arc)..... 600 to 2700 rpm

Varying rpm limitations exist for Lycoming 10-360 engines and Hartzell constant speed propeller combinations. Refer to your propeller Owner's Manual for placards.

2-4 VACUUM PRESSURE GAUGE

Operating Range .....4.3 to 5.9 in. Hg

2-5 WEIGHT LIMITS

Maximum Take-off/Landing Weight (Gross)
Standard Wing (23.3 ft wing span) .....2100 lb
With tip extensions (27.3 ft wing span).....2200 lb
Maximum Baggage Weight .....100 lb
Maximum Aerobatic Weight (Gross) .....1900 lb

WARNING

These figures depend on the airplane being within safe Center of Gravity limits. Do not fly the airplane if its computed flight CG falls outside of the published limits. Due to variables such as fuel, passenger, and baggage weight, these figures may be reduced somewhat. Before each flight, compute the CG to determine whether the aircraft is within safe CG limits.

2-6 CENTER OF GRAVITY LIMITS (GEAR EXTENDED)

Forward Limit .....Station 89.71
Aft Limit.....Station 97.72

The reference datum is 58.0 inches forward of the cowling attach flange joggle. Stations are measured in inches from the datum.

2-7 FLIGHT LOAD FACTORS

At maximum gross weight (2100 lb for the standard, 23.3 fl wing; 2200 lb for the extended, 27.3 fl wing), the G limits are:

+3.8 Gs
-1.0 Gs

At an aerobatic weight of 1900 lb, the G limits are:

+6.0 Gs (+9.0 Gs, ultimate)
-4.0 Gs (-6.0 Gs, ultimate)

2-8 AEROBATIC MANEUVER LIMITATIONS

During the flight test period, the test pilot should log all aerobatic maneuvers successfully completed. When application is made for the unlimited duration airworthiness certificate (or at a later date), the builder can request that the operating limitations be amended to permit the logged maneuvers. In addition, the FAA inspector may request an actual flight demonstration of the maneuvers.

The Glasair is not a competition class aerobatic aircraft. It was designed as a sport aerobatic type plane. Maneuvers capable in the Glasair aircraft are:

1. Aileron rolls
2. Point rolls
3. Slow rolls
4. Barrel rolls
5. Vertical rolls
6. Loops
7. Hammerhead stalls
8. Cuban eights
9. Immelmanns
10. Reverse Cuban eights
11. Outside turns
12. Continuous rolls
13. Inverted flight
14. Half outside loops (from the bottom)
15. Cloverleaf

These listed aerobatic maneuvers are maneuvers that can be performed in the Glasair; pilot ability and skill will determine whether they can be accomplished safely. Do not expect that 10 hours of dual aerobatic instruction in a Cessna 152 Aerobat or Citabria will completely prepare you for flying the Glasair aerobatically. We recommend that you try to get some higher performance training in an aircraft such as a Pitts or an Eagle and become proficient in it before attempting any serious aerobatics in the Glasair. The best method would be to have an experienced aerobatic instructor fly with you in your Glasair and train you in some of the basic maneuvers and techniques. Treat any aerobatic maneuvers with respect, and approach all practice with a calm, disciplined attitude. Wear a parachute at all times and never attempt any maneuvers below 3000 feet AGL.

NOTE

Adhere to FAR Part 91.71 when engaging in aerobatic maneuvers. Refer to FAR Part 91.15 on the use of parachutes, and FAR Part 91.70 on aircraft speed limits.

WARNING

Snap rolls, tail slides, torque rolls, lomcevaks, or any other high empennage or fuselage loading maneuvers are prohibited in the Glasair.

WARNING

The Glasair is a high performance aircraft. Aerobatics in the Glasair are to be approached with caution and only after prior dual instruction from an experienced aerobatic instructor. The aircraft has such a low drag coefficient that in the event of falling out of a maneuver, red line velocity can be reached or exceeded in very little time.

WARNING

Do not exceed the structural design limits of the aircraft. The limits are +6 Gs and -4 Gs at an aerobatic weight of 1900 lb. Structural failure can occur if these limits are exceeded.

WARNING

Aerobatics are prohibited with the wing tip extensions installed. This prohibition is based on the reduced roll rate with tip extensions rather than a strength limitation.

NOTE

Sustained inverted flight requires inverted oil and fuel systems. The 8 gallon header tank on the firewall is easily converted into an inverted fuel system by means of a flop tube fuel line installation. We recommend a Christen Industries inverted oil system. For aerobatics, we also recommend an aerobatic counterweighted propeller on which the blades go to coarse pitch to prevent engine or propeller damage in the event of engine oil pressure loss.

WARNING

Any negative, slipping, or cross-controlling maneuvers require an inverted fuel system to prevent unporting the fuel system. If an injector or pressure carburetor equipped engine is unported during flight, the engine will stall and quit under power.

2-9 INTENTIONAL SPINS PROHIBITED

Due to many variables that affect spin recovery, and our lack of control over these variables, we prohibit the Glasair from intentional spins. Some of the variables are: pilot technique, the manner in which the spin is entered, slight differences in wing and horizontal stabilizer incidence angles, center of gravity location, number of turns into the spin, spin direction, aileron position, power carried, and control rigging and adjustment.

2-10 FLIGHT IN ICING CONDITIONS

Flight in icing conditions is prohibited in the Glasair Super 11-S RG. The Glasair must not be exposed to icing encounters of any intensity. If the airplane is inadvertently flown into icing conditions, the pilot must make an immediate diversion by flying out of the area of visible moisture or going to an altitude where icing is not encountered.

NOTE

These precautions for flight in icing conditions apply to any aircraft without operational anti-ice and/or deice equipment.

2-11 FLIGHT IN THE VICINITY OF THUNDERSTORMS

The FAR Part 23 Airworthiness Standards for Normal, Utility, and Acrobatic Category Airplanes require that the airplane's structure be protected from the catastrophic effects of lightning, and that the airplane's fuel system be designed to prevent the ignition of fuel vapor by lightning.

WARNING

The Glasair Super 11-S RG, because of its composite structure which is transparent to an electrical charge, does not comply with FAR Part 23 Standards for lightning protection. For this reason, the Glasair Super 11-S RG is prohibited from flight in conditions that would expose the airplane to the possibility of a lightning strike.

2-12 PRECAUTIONS CONCERNING SLIPS

In order to help prevent fuel starvation as the result of slips or other uncoordinated flight, a pair of fuel tank check valves are installed in the main wing tank. They help ensure that the main tank fuel sump will remain covered with fuel as fuel transfers from one side of the wing to the other.

Slips longer than 30 seconds in duration are prohibited while drawing fuel from the main fuel tank. If less than ten (10) gallons of fuel remains in the main tank, slips are prohibited entirely when drawing fuel from the main tank.

WARNING

If the aircraft is parked on sloping ground with one wing low and with a partially empty main fuel tank, fuel slowly transfers into the low wing creating a wing-heavy condition that can cause control difficulty after takeoff. Making tight turns while taxiing can have the same effect. A heavy left wing is especially critical since the resulting left-turning tendency exacerbates the effects of engine torque. If you suspect an unbalanced fuel condition, taxi to level ground and allow sufficient time for the main tank fuel level to equalize before attempting takeoff.

NOTE

Because of the total drag with both gear and flaps extended, slips should rarely be needed in the Glasair Super 11-S RG.

2-13 REQUIRED EQUIPMENT

Builders of Experimental Category aircraft must comply with Part 91.33 of the Federal Aviation Regulations, which specifies the minimum instrumentation and equipment that must be installed and operational for various flight conditions. Equipment is specified for both VFR and IFR flight and for both day and night conditions.

2-14 PLACARDS

2-14.1 Placards and Markings Required by FARs

Placards and markings required for certification of an experimental amateur built aircraft are:

1. The word **"EXPERIMENTAL",** in 2" high block letters, displayed near each entrance to the cabin. (On our factory Glasairs, this is located on the baggage bulkhead.)

2. A permanently installed, fireproof identification plate that is permanently stamped or engraved with the information required by FAR 45.13. The data plate must be located on the exterior of the aircraft, either just aft of the entry door or on the fuselage near the tail surfaces and must be legible to a person standing on the ground.

3. A Passenger Warning Placard, permanently installed in the cockpit in full view of all the occupants with the words: **"PASSENGER WARNING-THIS AIRCRAFT IS AMATEUR BUILT AND DOES NOT COMPLY WITH FEDERAL SAFETY REGULATIONS FOR STANDARD AIRCRAFT."**

2-14.2 Canopies

We recommend installing a placard on the inside of the fuselage near the latch handle for each gull wing canopy with this warning:

"WARNING-DO NOT OPEN CANOPY IN FLIGHT."

The canopy will be torn off if opened in flight.

2-14.3 Airplane Exterior Placards

Place a **"NO STEP"** placard on the upper surface of each flap panel just outboard of the fuselage near the entrances to the cabin.

Apply a placard specifying the fuel type and quantity near each fuel filler cap. (A permanent engraving of these markings on the fuel caps is a good idea.)

2-14.4 Baggage Compartment Placards

We recommend the following placards for the baggage compartment:

1. **"NOT TO EXCEED 100 LB OF BAGGAGE"**

   Use 100 pounds or a lesser value, whichever is permissible while remaining within CG limits

2. **"Keep all articles securely stowed to avoid the possibility of interference with the control system."**

2-14.5 Fuel Valve Placard

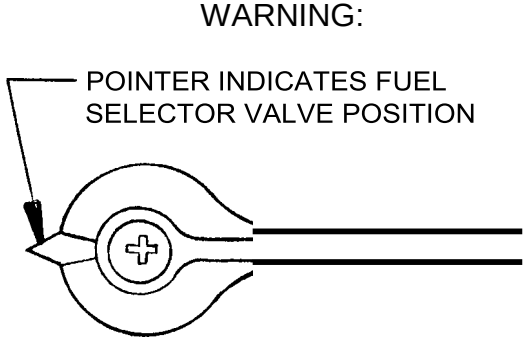


FIGURE (2-1)

Install a placard in the aircraft to show that the small pointer on the fuel selector valve handle, not the handle itself, indicates the chosen fuel tank. This will help eliminate the possibility of a fuel starvation incident that could occur if a pilot who is not familiar with the airplane uses the handle as the pointer. A suggested placard is shown in FIGURE (2-1).

WARNING

Make sure that the fuel selector valve engages the detent for the desired tank. If the valve is positioned between detents, fuel will feed from the header tank. When the header tank is empty, the engine will pull air from the tank and quit from fuel starvation. Also, make sure that the fuel selector valve cannot inadvertently be bumped out of position duringflight.

2-14.6 Minimum Controllable Airspeed

If the aircraft is fitted with wing tip extensions, we recommend that the owner conduct a series of stall tests at a safe altitude to determine if Vmc, minimum controllable airspeed, occurs at a higher airspeed than the actual stall speed.

If this condition exists, determine Vmc and install the following placard on the instrument panel:

"Vmc is _ mph. DO NOT ROTATE BELOW THIS AIRSPEED ON TAKEOFF."

NOTE

All placards should be highly visible and easy to read. Advise passengers of pertinent placards.

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SECTION 3

EMERGENCY PROCEDURES

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3-1 INTRODUCTION

The emergency procedures described in this section are applicable to most aircraft including the Glasair Super 11-S RG. These procedures are suggested as the best course of action for coping with the particular condition described, but are not a substitute for sound judgment and common sense. Since emergencies rarely happen, their occurrence is usually unexpected, and the best corrective action may not always be obvious. Pilots should familiarize themselves with the procedures given in this section and be prepared to take appropriate action should an emergency arise.

The recommended procedures given herein for coping with emergency situations are the best techniques presently available, based on flight test results and operational experience. Multiple emergencies, weather, unusual conditions, etc., may require deviation from these procedures. Each pilot must make the final decision as to the correct procedure under the circumstances and is responsible for the final decision.

3-2 FIRE

3-2.1 Engine Fire

We strongly recommend that all Glasairs be equipped with at least a 2 lb Halon type fire extinguisher. The extinguisher should be located within easy reach of both pilot and passenger.

In-Flight Fire

Immediately shut off the fuel supply to the engine. Turn off all electrical accessories. Close all vents and the cabin heat box to prevent smoke from entering the cabin. Execute an emergency landing as soon as possible.

If smoke and fumes are bad enough to overcome the pilot, open the canopies so that a safe landing can be accomplished.

WARNING

Open the gull wing canopies in flight only as a last resort. Never attempt this procedure under normal circumstances as the gull wing canopies will depart the aircraft.

Ground Fire

If an engine fire occurs while starting the engine on the ground, pull the mixture to the full lean, idle cutoff position, open the throttle, and continue cranking the engine with the starter. (This is an attempt to pull the fire back into the engine.) Engine fires during start are usually the result of over-priming. If the engine has already started and is running, let it continue running in an attempt to pull the fire back into the engine.

If the fire continues to burn for longer than a few seconds, shut the engine down and extinguish the fire by the best available external means. Use a Halon type extinguisher, if possible.

3-2.2 Electrical Fire

In the event of an electrical fire on the ground, turn all electrical systems off, including the master switch. Shut down the engine. Clear the aircraft and use a Halon type fire extinguisher.

If an electrical fire occurs in the air, turn the alternator switch, master switch, and all electrical equipment off, reduce speed (95 mph), open air vents to provide fresh air for breathing, and extinguish the fire, if possible. Land as soon as possible and remedy the problem before further flight.

If smoke and fumes are bad enough to overcome the pilot, open the canopies so that a safe landing can be accomplished.

3-3 ENGINE FAILURE

3-3.1 General

The Lycoming aircraft engine **is very** reliable and the probability of a catastrophic engine failure without some type of advance warning is quite low. Early indications of an engine failure are lowering oil pressure, increasing oil temperature, high cylinder head temperatures, excessive mechanical noise, lowering fuel pressure, and so on. Pilot induced failures, on the other hand, are far more common: carburetor ice, mixture set too lean, fuel starvation, etc. Keep these in mind if an engine problem or failure should arise.

3-3.2 Engine Failure on Takeoff

If the engine fails after the aircraft has left the ground on takeoff, lower the nose to maintain flying speed. If there is not sufficient prepared landing area remaining in front of the aircraft, prepare to land straight ahead. Small turns may be made to avoid obstacles. Only if enough altitude and airspeed are available, can a 180° turn be made to return to the airfield. You are much more likely to survive an emergency straight ahead ditching of the plane than a stall and spin resulting from a steep, slow turn back to the field.

Due to the high wing loading and the extra drag with gear extended, the engine-out sink rate will be high. Consequently, time to locate a suitable ditching site will be limited. Always maintain adequate flying speed.

If the landing gear has been retracted, keep it retracted. unless you are assured of returning to the runway or another hard surface landing area. A belly landing on the runway is acceptable if it guarantees making it to the runway. Soft surface forced landings should always be made with the gear up to minimize airframe damage and to reduce the possibility of flipping over the nose.

Only if there is time and you have maintained control of the aircraft should you attempt to restart the engine. Check for adequate fuel pressure and switch on the electric fuel pump. **Make** sure the mixture control is in the full rich position. Check the fuel quantity and move the fuel selector valve to the fullest tank. Make sure the magneto switch is in the "BOTH" position.

3-3.3 Engine Failure in Flight

In the event of an engine failure during flight, maintain best glide speed (125 mph) and prepare for a forced landing. Quickly check that fuel pressure is adequate, that the mixture is full rich, that the fuel valve is on, that there is adequate fuel in the tanks, and that the mags are both on. Switch to the header tank if it is full of fuel. If time permits, and one of the above conditions is the problem, attempt a restart after the problem is resolved.

Engine roughness may be caused by a bad magneto, induction problems, improper leaning, plug fouling, fuel starvation, carburetor icing, water in the fuel, etc. If you encounter engine roughness or power loss in flight, check all engine gauges to verify that the pressures and temperatures fall within the allowable ranges. Also, check the mixture setting, fuel tank selection. carb heat, magnetos, etc. If none of these items alleviates the problem. make a precautionary landing at the next airport and troubleshoot the problem.

3-3.4 Engine Out Approach and Landing

If loss of power occurs at altitude and if your plane is equipped with a constant speed propeller, immediately (while there is still enough oil pressure to operate the prop) pull the propeller control to the full aft (coarse pitch) position to reduce drag. Trim the aircraft for best gliding speed (125 mph), and look for a suitable landing field. If measures taken to restore power are not effective, and if time permits, check your charts for airports in the immediate vicinity; it may be possible to land at one if you have sufficient altitude. If possible, notify the FSS of your location, difficulty, and intentions.

When you have located a suitable field, establish a spiral pattern around the field. Try to be at 1000 feet above the field at the downwind position, to make a normal approach. If you are forced to land away from an airport, it is advisable to fly an imaginary pattern with downwind, base, and final legs. This will help you make correct altitude and approach speed judgments for an unknown landing site.

Remember that the power-off glide will be steeper than the engine idle glide that you are used to. Always leave yourself enough altitude and airspeed to clear obstacles.

WARNING

Keep the gear and flaps retracted until you are assured of making the field. Conversely, the gear and flaps work very effectively if you are too high on approach. Engine out landings on a hard surface runway should be made with the gear down. On a soft surface keep the gear retracted to minimize airframe damage and reduce the chance of injury. Retracting the flaps at the last minute before touchdown will minimize flap damage.

Keep the airspeed relatively high (105-115 mph, depending on flap setting) throughout the approach to keep the sink rate low and to provide enough excess lift so that the descent can be arrested in the flare. Bleed off the airspeed in the flare, however, so that the actual touchdown is made at the lowest possible airspeed.

When committed to landing:

1. Throttle closed or off.
2. Mixture full lean.
3. Fuel selector off.
4. Alternator and Master switches off.
5. Ignition switches off.
6. Seat belt and shoulder harness tight.
7. Flaps as required.

Touch down at the minimum controllable airspeed, being careful not to stall and drop the airplane in. Especially if forced to land in trees, allow the airplane to fly into the trees rather than stalling it and dropping to the ground through the trees.

In very rough terrain, try to fly the airplane so that the fuselage area (passenger compartment) misses the larger objects, such as the biggest tree trunks and rocks. Sacrifice other parts of the airframe (wings, landing gear) to absorb the impact energy.

3-4 EMERGENCY LANDING GEAR EXTENSION

3-4.1 Standard Emergency Extension System

In the event of an electrical failure that prevents the normal extension of the landing gear, it will be necessary to extend the landing gear by using the manual pressure relief valve. Electrical problems that could result in failure of the gear actuation system are a low battery, or some kind of defect in the RG electrical system such as a burned-out solenoid.

To actuate the emergency gear extension system:

1. Move the gear switch to the down position.

2. Pull the large electrical hydraulic pump circuit breaker, leaving the 5 Amp control breaker in.

3. Turn the valve handle 90° to the emergency gear extension position. Watch the pressure gauge to confirm release of pressure.

4. Wait for the gear to extend. This can take several minutes due to fluid flow restrictions.

5. Check the status of the gear by means of the gear indicator lights.

6. If the green gear indicator lights do not come on, try side-slipping or pulling some Gs to promote gear extension. If the gas spring is low on pressure, stalling the aircraft may be necessary to achieve nose gear extension.

NOTE

Failure of all three green lights to come on may indicate that a gear control microswitch is faulty or that the gear is blocked from extending completely. In either case, pull the control breaker to disconnect the power to the hydraulic pump solenoids (after verifying that the gear indicator lights are functioning properly).

NOTE

If hydraulic pressure is lost, roll out straight ahead after landing, and shut the engine down. After coming to a stop and before attempting to taxi, clamp the main gear side braces in the extended position to prevent their collapse.

3-4.2 Optional Emergency Extension Hand Pump System

If your airplane is equipped with the optional, emergency gear extension hand pump, use the following procedures to extend the gear in the event of a problem.

1. Move the gear switch to the down position.

2. Pull the large electric hydraulic pump circuit breaker. Leave the 5 Amp control breaker in.

3. Turn the emergency extension release valve handle 90° to the emergency gear extension position. (Opens the release valve.)

4. Pull the hand pump handle to the extended position.

5. Pump until 800 psi (maximum) is indicated on the pressure gauge and the gear indicator lights show that all three gear are fully extended (three green lights).

6. Leave the emergency extension pressure release valve in the open position.

7. If additional problems exist and all three green lights do not come on, pull the 5 Amp control circuit breaker.

NOTE

Failure of all three green lights to come on may indicate that a gear control microswitch is faulty or that the gear is blocked from extending completely. In either case, pull the control breaker to disconnect the power to the hydraulic pump solenoids (after verifying that the gear indicator lights are functioning properly).

3-5 SPINS AND SPIRAL DIVES

3-5.1 Spins

WARNING

Intentional spins are prohibited in the Glasair Super 11-S RG.

Since the wing must be stalled for a spin to occur, inadvertent spins can be prevented by avoiding inadvertent stalls. The pilot must be thoroughly familiar with the Glasair's stall and pre-stall behavior to avoid inadvertent stalls. Remember that a stall can occur at any airspeed and attitude; a pilot who is thoroughly familiar with the Glasair's stall behavior under all conditions will be unlikely to enter an inadvertent spin.

The stall strips must be installed on the inboard wing leading edges to help ensure that there is no tendency for a wing to drop during the stall and to provide a good margin of pre-stall buffet for stall warning.

If a spin is entered inadvertently, immediately apply standard spin recovery control inputs.

Standard spin recovery procedures for spin entry are:

1. Power off.

2. Retract flaps, if applied, and neutralize the ailerons.

3. Immediately apply full rudder opposite to the direction of rotation, and neutralize the stick. If a spin has fully developed, apply rudder opposite to the direction of rotation, while holding full aft stick.

--as rotation stops--

4. Neutralize the rudder.

5. If the spin was fully developed, release or neutralize the stick to break the stall.

6. Pull out of dive.

WARNING

If a spin is entered inadvertently, do not push full forward stick. This action will substantially delay recovery, accelerate the spin, and could prevent recovery. We **recommend full aft stick until rotation stops. This holds the elevator in the up position which provides more airflow over the rudder to help stop rotation. As rotation stops, release back pressure to recover from the stall. Also, keep the ailerons neutral. Aileron opposite to the spin direction will flatten the spin, making recovery more difficult.**

If a wing drops during a stall, immediately apply "top" rudder to catch the wing drop and then apply forward stick to break the stall before the situation can progress to a fully developed spin.

3-5.2 Spiral Dives

A spiral dive is a situation that develops when the nose of the aircraft begins dropping out of a turn. (A spin, on the other hand, develops from excessive yaw during a stall.) In a spiral dive, speed builds rapidly as the nose drops and, if the pilot attempts to raise the nose by applying back pressure, the turn will tighten and G forces will begin to build. If allowed to continue, the aircraft will either strike the ground at high speed or will suffer in-flight structural failure from excessive G loads.

The proper recovery from a spiral dive is to first reduce power by bringing the throttle control back to prevent exceeding Vne• Simultaneously with the power reduction, level the wings and then apply gentle back pressure to stop the dive.

A spiral dive is a common result (usually fatal) of flying into instrument conditions without proper training or proper instrumentation. For this reason, pilots who are not rated and current in IFR flight must avoid flight in conditions of reduced visibility.

SECTION 4

NORMAL OPERATING PROCEDURES

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4-1 INTRODUCTION

This section describes the normal operating procedures for both ground and flight operations. All pilots should be thoroughly familiar with this section along with the Emergency Procedures, Operating Limitations, Initial Systems Checkout, Flight Test Procedures, and Performance Data before attempting any ground or flight operations.

NOTE

We recommend making plasticized summary charts of the Normal Operating Procedures as described in this section. Keep the charts in a handy location in your aircraft.

4-2 PREFLIGHT CHECKLIST

Before every flight, check the exterior and interior of the aircraft for anything that looks suspicious or out of line. Use the following preflight walk-around checklist as a guide when "preflighting" the aircraft.

PREFLIGHT WALK-AROUND

A. COCKPIT--Reach inside cockpit and check:

1. Throttle out or closed.
2. Mixture full lean (idle cutoff).
3. Carb heat in (cold or off).
4. Switches off (magneto and master switches).
5. Before moving the aircraft: Check the hydraulic pressure. If low (under 200 psi), turn on the master switch momentarily (with the gear switch in the down position). Push upward at the center pivot point of one of the main gear side braces to close the microswitch and actuate the hydraulic pump. (Simply rocking the aircraft from side to side may be enough to actuate the switch.) This operation is necessary to ensure that the gear is solidly extended before taxiing.

B. WING, ENGINE, & FUEL-Remove all control locks, jack pads, tie-down rings, pitot cover, etc. Lower flaps to full down position and check:

1. Condition of wing skins for stress cracks and fractures.
2. Wing attach screws in fuselage.
3. Fuel vent lines for obstructions. (Use a length of 3/8" ID tubing to blow into vents.) Also, check for venting or spilled fuel on the ground under the vents.
4. Left flap hinges for condition and security.
5. Flap actuator fitting bolts.
6. Hydraulic and electric lines at aft spar for security and chafing.
7. Left aileron hinge pins, safety wire, actuator fitting bolts, counterweight fasteners, and possible obstructions to counterweight (i.e. loose wires in wing tip).
8. Left aileron--full travel.

9. Pitot tube orifices for obstruction.
10. Fuel level and fuel cap for security.
11. Left main gear:
    a. Tire condition and pressure
    b. Oleo strut for leaks and proper extension (do not use a pressure gauge unless the airplane is on jacks);
    c. Condition of brake disc and pads;
    d. Security of doors and gear hardware;
    e. Hydraulic system for leaks and chafed lines;
    f. Electrical system for loose connections and frayed wires.
12. Main fuel sump: drain into clear cup and check for water and debris. Drain until water or debris is gone.
13. Fuel filter: drain into clear cup and check for water and debris. Drain until water or debris is gone.

NOTE

When draining the fuel filter, the fuel selector must be turned to the header tank position to provide a pressure head of fuel to the filter.

14. Cowling fasteners and hinge pins for security.
15. Exhaust pipe for security.
16. Nose gear:
    a. Tire condition and pressure;
    b. Oleo strut for leaks and extension (do not use pressure gauge unless the airplane is on jacks);
    c. Condition and tightness of shimmy damper;
    d. Security of doors and gear hardware;
    e. Hydraulic system for leaks and chafed lines;
    f. Electrical system for loose connections and frayed wires.
17. Propeller for nicks and cracks. Propeller and spinner for looseness.

WARNING

Wooden fixed pitch propeller attach bolts can loosen due to climate, temperature, and humidity changes. Retorque the propeller bolts after the first few hours and then again every 25 hours. Recheck bolt torque whenever the aircraft is exposed to extended periods of hot, dry weather.

18. Engine cooling inlets for obstructions (bird nests, etc.)
19. Alternator belt for condition and tension.
20. Carburetor air inlet for obstructions. **Make** sure flap valve for carb heat (if applicable) is open.
21. Engine oil level. Fill if needed. Give inside of cowl a general inspection through oil access door.

NOTE

Do not operate engine with less than 6 quarts of oil.

22. Right main gear:
    a. Tire condition and pressure;
    b. Oleo strut for leaks and proper extension (do not use a pressure gauge unless the airplane is on jacks);
    c. Condition of brake disc and pads;
    d. Security of doors and gear hardware;
    e. Hydraulic system for leaks and chafed lines;
    f. Electrical system for loose connections and frayed wires.
23. Condition of wing skins for stress cracks and fractures.
24. Right aileron--full travel.
25. Right aileron hinge pins, safety wire, actuator fitting bolts, counterweight fasteners, and possible obstructions to counterweight (i.e. loose wires in wing tip).
26. Hydraulic and electric lines at aft spar for security and chafing.

27. Right flap hinges for condition and security.
28. Flap actuator fitting bolts.
29. Wing attach screws in fuselage.

C. TAIL CONE AND EMPENNAGE--Check condition of fuselage and empennage skins for stress cracks and fractures. Give stabilizer an integrity shake and check:

1. Elevator actuator fitting attach hardware.
2. Elevator hinge fittings and bolts for condition and security.
3. Elevator for full travel, binding, and chafing.
4. Rudder for full travel, binding, and chafing.
5. Actuator linkage attach bolts for rudder and elevator. Pivot rudder to right to check.
6. Rudder hinge pins and safety wire.
7. Empennage counterweights for security and chafing.

D. COCKPIT-Turn on master switch.

CAUTION

Make sure the gear switch is in the DOWN position before turning on the master switch. Inadvertent gear retraction will occur if the gear switch is in the UP position when the master switch is actuated.

Check:

1. Fuel gauge for agreement with level in tank.

NOTE

For mechanical type fuel gauge, shake the aircraft and watch for movement of the fuel quantity indicator.

2. Nav and strobe lights.
3. Gear warning lights.
4. Loose items in baggage compartment and under instrument panel.

NOTE

Use the space below to add to the preflight checklist any items that apply to options or modifications that you have installed.

4-3 PRE-START AND ENGINE START CHECKLIST

4-3.1 General

After the preflight check, the airplane can be boarded and the engine started. Before starting the engine:

1. Set the fuel selector to the main fuel tank or the fullest tank.
2. Move the carb heat control to the off position (if applicable).
3. Turn master switches on.
4. Turn electric fuel pump on.
5. Set the brakes.
6. Check to see whether the propeller is clear of all objects, people, etc. (shout, "Clear prop!")

4-3.2 Normal Start

1. Crack throttle 1/8".
2. Set mixture full rich.
3. Engage the starter by rotating the magneto switch clockwise.
4. When the engine fires, move the magneto switch to "both", and advance throttle to desired setting. If the engine does not fire within 5 to 1O seconds, disengage starter switch, and try again after a few seconds.

4-3.3 Cold Start

1. Open throttle **1/4".**
2. Set mixture full rich.
3. Prime as required.
4. Engage starter.
5. When engine fires, advance throttle to desired setting. If the engine does not fire within 5 to 1O seconds, disengage starter switch and prime with one to three strokes of the primer. Repeat starting procedure.

4-3.4 Flooded Start

1. Open the throttle fully.
2. Set mixture full lean.
3. Electric fuel pump off.
4. Engage starter. When engine fires, advance the mixture control and move the throttle to the desired setting.

After the engine starts, switch off the electric fuel pump, and check to see whether the oil pressure comes up into the green arc range (normal operating pressure: 60-90 psi; minimum idling pressure: 25 psi) after about 30 seconds of operation. If proper pressure does not develop, shut the engine down and determine the cause before proceeding. Let the engine warm up at about 1000-1200 rpm before take-off.

NOTE

These starting procedures are for a normally aspirated (non-turbocharged) carbureted engine. Refer to your engine Operator's Manual for injected engine starting procedures.

4-4 RUN-UP AND PRE-TAKEOFF CHECKLIST (CIGARS)

ONTROLS:

- Check full travel of stick in all directions while watching ailerons and elevator.
- Check full travel of rudder and flaps.
- **Make** sure all control surfaces move in the proper direction.

INSTRUMENTS:

- Set altimeter and directional gyro.
- Check all instruments for normal operating ranges.
- Check all switches and circuit breakers.

GAS:

- Enough fuel and reserve for planned flight?
- Fuel valve switched to desired tank.
- Check fuel pressure with electric fuel boost pump both on and off.
- At high density altitude, lean mixture appropriately for best power during takeoff.

WARNING

Make sure that the fuel selector valve engages the detent for the desired tank. If the valve is positioned between detents, fuel will feed from the header tank. When the header tank is empty, the engine will pull air from the tank and quit from fuel starvation. Make sure that the valve cannot inadvertently be bumped out of position during flight.

8,TTITUDE:

- Trim set at neutral position (for takeoff).

B_UN-UP:

- Face into wind; set brakes.
- Advance throttle to 1800 rpm
  a. Check magnetos; rpm drop should not exceed 175 rpm and 50 rpm between magnetos.
  b. Cycle constant speed prop (if installed).
  c. Select carburetor heat (if installed) and check for a perceptible rpm drop.
  d. Check all engine instruments.
  e. Check ammeter.
  f. Check suction gauge.
- Reduce throttle to 1000 rpm.
- Turn autopilot off (if installed).

§.EAT BELTS:

- Check seat belts are snug and properly latched.
- Check canopies closed and latched.

NOTE

Do not overheat the engine by excessive ground run up and taxi on hot days.

4-5 TAXIING

The tricycle landing gear configuration makes taxiing the Glasair Super 11-S RG a simple matter. Visibility over the nose is excellent. Steering at slow taxi speeds is by differential braking. Above about 30 mph indicated airspeed, the rudder begins to become effective for directional control. It is best to keep the speed well under control while taxiing and to taxi defensively when in the vicinity of other ground traffic.

In most conditions, taxi with the stick in the full aft (elevator up) position. This reduces the weight on the nose wheel and makes steering easier. Only in the instance of a very strong tail wind (i.e. a strong enough wind to move the aircraft itself) should the airplane be taxied with the stick forward. In very strong crosswinds, hold aileron into the wind while taxiing.

In warm weather, the Glasair Super 11-S RG may be taxied with the gull wing canopies open. In wet weather, if the aircraft is not equipped with windshield defrost, cracking open either canopy slightly will keep the inside of the windshield from fogging prior to takeoff.

Keep the canopies latched in very windy conditions or if taxiing through the prop wash of another airplane.

4-6 TAKEOFF

4-6.1 General

Before takeoff, all preflight, pre-start, engine start, and run-up checklists must be properly complied with. Keep in mind that the Glasair Super 11-S RG is a very responsive aircraft. Rapid, jerky control inputs are not necessary or recommended.

WARNING

If the aircraft is parked on sloping ground with one wing low and with a partially empty main fuel tank, fuel slowly transfers into the low wing creating a wing-heavy condition that can cause control difficulty after takeoff . Making tight taxi turns can have the same effect. A heavy left wing is especially critical since the resulting left-turning tendency in flight exacerbates the effects of engine torque. If you suspect an unbalanced fuel condition, taxi to level ground and allow sufficient time for the main tank fuel level to equalize before attempting takeoff.

When applying power for takeoff, advance the throttle smoothly and slowly. Follow the throttle with right rudder, as necessary, to overcome the torque effects of the engine and propeller and to keep the airplane tracking straight down the runway.

Check the full throttle operation of the engine during the early part of the takeoff roll. Abort the takeoff if there is any sign of engine roughness or if the engine doesn't seem to be developing full power. Correct any problems with the engine before attempting another takeoff.

4-6.2 Normal Takeoff

Make sure the canopies are securely latched and check that the electric fuel boost pump is on. For airplanes with electric flaps, move the flaps to the 15° down position. After making sure no other airplanes are landing, line the airplane up with the runway centerline. Advance the throttle smoothly and slowly until full power is achieved.

For airplanes with manual flaps, the flaps may be lowered to the first notch after reaching about 20 mph, if desired. At about 65 mph, ease the stick back to achieve a takeoff angle of attack and let the airplane fly itself off.

The manual flaps can be applied only with an air load holding them against the stops on the ratchet plate. Otherwise, the handle and flaps will fall to the fully extended position. This is true for all flap positions except the fully retracted position.

WARNING

For the Glasair Super 11-S with wing tip extensions installed, minimum controllable airspeed is as critical as stall speed in setting Vs, as defined in the FARs and the Glasair Owner's Manual. If wing tip extensions are installed on the aircraft, therefore, the pilot must be careful to let the airspeed reach V_s before rotating for take off. Each builder must determine Vs for his particular Glasair.

As the airplane accelerates after lift-off, ease the flaps up, making sure that they are completely retracted before reaching V_{le} (120 mph for standard flaps or 140 mph for slotted flaps). Let the airplane accelerate to 120 mph which is the best rate of climb airspeed. The landing gear may be retracted at any time after lift-off, but it is best to wait until the airplane is beyond the point of being able to land straight ahead on the runway in the event of an engine failure immediately after lift-off.

NOTE

Leave the electric fuel boost pump on at all times while in the pattern. When leaving the pattern, attain adequate altitude before switching the pump off.

4-6.3 Short Field Takeoff

The short field takeoff is the same as the normal takeoff except that, after lining up on the runway, hold the brakes while advancing the power. Release the brakes after full power is reached. Use one notch of flaps (15°). As the airplane passes through Vs (to be determined by each builder for his particular aircraft), ease the stick back to rotate the wing to a takeoff angle of attack.

NOTE

If wing tip extensions are installed, be especially careful to let the airplane accelerate to Vs before rotating. In this configuration, the airplane may be ready to fly at a speed below which adequate control authority exists to maintain directional control. Refer to Section 2-14.6 for further recommendations.

Once airborne, the airplane will accelerate quickly to 100 mph which is the best angle of climb speed. Establish a climb at this airspeed (100 mph) until obstacles are cleared. When all obstacles are cleared, ease the flaps off while accelerating to the best rate of climb airspeed (120 mph).

4-6.4 High Density Altitude Takeoff

At high density altitude (above 4000 ft MSL), lean the engine during run-up for best takeoff power. Follow the leaning procedures described in the Lycoming Engine Operator's Manual for your powerplant.

NOTE

Since every airplane is different, accurate high density altitude takeoff distances are difficult to predict. Many factors affect takeoff performance such as gross weight, temperature, relative humidity, type of propeller, altitude, engine horsepower, pilot ability, etc. We recommend that each builder determine high density altitude takeoff performance data for his own airplane.

4-7 CLIMB

After lift-off, let the airspeed rise to 100 mph for best angle of climb when clearing obstacles. Best rate of climb airspeed is 120 mph. If no obstacles are present, we recommend letting the airspeed build to at least 120 mph before stabilizing the climb in order to avoid overheating the engine. Pay close attention to engine temperatures during climb; temperatures can exceed the normal ranges if the airspeed is too low on hot days. We recommend 130 mph for climb out on hot days.

The most important consideration during the climb is visibility. Lower the nose or perform "S" turns periodically to check for traffic.

When clear of terrain and an adequate climb rate is established, reduce power to avoid excessive fuel burn and high engine temperatures.

4-8 STALLS

4-8.1 General

Stall recovery for the Glasair Super 11-S RG is typical of most conventional aircraft--lower the nose with forward stick, and add power. The stall characteristics are predictable for both power off and moderate power on stalls. Just before the stall, slight buffeting is felt, giving an early indication of the stall.

The Glasair Super 11-S RG should not be intentionally stalled with any heavy baggage in the baggage compartment unless it is securely fastened down. When practicing stalls, be sure to check the air space for any conflicting traffic.

NOTE

Stall strips are mandatory on the Glasair Super 11-S RG to induce the wing roots to stall first. Without these stall strips properly installed, the stall may be unpredictable or erratic. Refer to the Final Assembly section of the Glasair Super 11-S RG Instruction Manuals for a description of stall strip installation. The stall strips make a nice gentle stall possible with an adequate margin of stall warning.

WARNING

Intentional spins are prohibited in the Glasair Super 11-S RG. We strongly recommend that stalls be practiced at least 3000 ft AGL. Be familiar with standard spin recovery procedures in the event of an inadvertent spin entry while practicing stalls.

Remember that an airplane can stall at any airspeed and attitude (high speed stalls) but the recovery is always the same: stick forward and add power. The rudder is effective in keeping the wings level throughout the stall.

Just prior to the stall, a moderate burble or airframe shake, induced by the stall strips at the wing root, will be felt. If the stick is held back, the shake will become more pronounced, followed by the nose dropping. To recover, move the stick forward and apply power. Keep the wings level, if necessary, with the rudder.

WARNING

Do not use the ailerons to keep the wings level in a stall as this will more easily cause a spin entry or aggravate spin recovery.

4-8.2 Power Off Stalls

When practicing power off stalls, hold the nose up in a slight climb attitude, gradually bringing the stick back as the speed bleeds off, until the plane begins to stall. Practice power off stalls at each flap setting to get the feel of the stall in each mode from fully retracted to fully extended flaps.

If flaps are extended with the gear retracted, the gear warning horn will sound unless an override breaker has been installed in the gear warning circuit and the breaker is opened for practicing stalls.

With flaps applied, the plane feels more stabilized, the stall speed is lowered by a few mph, the actual point of the stall is a little more sudden, and the nose drops slightly lower. Because of the extra drag with the flaps lowered, the stall is more pronounced and there is less time lag between the wing root buffet and the nose dropping. The stall with full flaps is still quite gentle and a quick recovery with minimal altitude loss is possible. Release back pressure on the stick, apply full power, stabilize the plane back into a climb and gently ease the flaps off.

4-8.3 Power On Stalls

Do not practice these types of stalls lower than 5000 ft AGL. Power on stalls are more pronounced or sudden because of the high angle of attack, but recovery is the same as with power off stalls: stick forward and add power. With power applied, the torque effects of the engine and propeller induce rolling and yawing forces during the stall. For this reason, a wing drop is more likely to occur in a power on stall.

WARNING

Power on stalls can more easily lead to a spin entry. Give yourself plenty of recovery room for safety in the event of an inadvertent spin. As the power is increased above **1800** rpm, a spin becomes more and more likely during power on stalls.

4-8.4 Accelerated Stalls

An airplane can stall at any airspeed and any attitude since exceeding the acceptable angle of attack is what causes a stall. As with most aircraft, the Glasair will stall at a progressively higher airspeed as the angle of bank in a turn is increased.

A common means of inadvertently entering an accelerated stall is to pull the stick back too suddenly after recovery is made from an initial stall. This is typically done to avoid altitude loss.

In most cases, incipient stall recovery is made by simply relaxing the back pressure or neutralizing the stick. To minimize altitude loss during an inadvertent approach-to-landing stall or a departure stall, immediate application of full power is necessary.

4-9 CRUISE

Hold the plane at the desired altitude, when it is reached, and throttle back to the desired cruise rpm. It takes a little while for the airplane to adjust to the cruise attitude after climb out. Use the elevator trim to trim away stick pressure as the airplane increases in speed. An airplane in trim is a much easier airplane to handle.

NOTE

Adjust the ground adjustable aileron and rudder trim tabs between test flights for the desired optimum cruise conditions. Refer to the Rudder Assembly Section and the Aileron Assembly Sections of the Glasair Super 11-S RG Instruction Manuals for details on how to adjust the tabs.

4-10 CRUISE PERFORMANCE

The following figures are to be used as guides for determining the desired cruise rpm and speeds. The values given here are for a Glasair Super 11-S RG equipped with a Lycoming 180 hp engine and Hartzell constant speed propeller at 8000 ft MSL. Cruise performance will vary from plane to plane depending on many factors (such as propeller, engine horsepower, etc.). The fuel consumption values represent the average between best power and best economy mixture settings, as specified in the Lycoming Operator's Manual.

RPM	POWER	GAUHR	
2200	55%	7.9	197 mph
2400	65%	9.2	214 mph
2700	75%	10.7	228 mph

NOTE

To obtain approximate performance figures for Glasair Super 11-S RGs equipped with 160 hp or 200 hp engines, subtract or add 5%.

If an EGT gauge is used, lean the engine to 50° F rich of peak EGT (hottest cylinder) to obtain the optimum fuel consumption rate, or follow the recommendations in your Lycoming Operator's Manual.

4-11 FUEL MANAGEMENT

4-11.1 Fuel En Route

Determine by careful experimentation what your aircraft burns in fuel per hour at various power settings such as 55% and 75% power. Plan your flights so that you always have a 45 minute reserve on board in case of any unexpected delays. Always keep track of how much fuel remains in both the main and header tanks. Make sure that, for takeoff and landing, the fuel tank selector valve is set to a fuel tank that has ample fuel.

WARNING

Make sure that the fuel selector valve engages the detent for the desired tank. If the valve is positioned between detents, fuel will feed from the header tank. When the header tank is empty, the engine will pull air from the tank and quit from fuel starvation. Make sure that the valve cannot inadvertently be bumped out of position during flight.

4-11.2 Fuel Filling (Thermal expansion)

When filling the main fuel tank allow for 2 gallons of thermal expansion. Standard usable capacity is 40 gallons. Total volume is 42 gallons. If topped off, the expanding fuel in the wing tanks will be forced overboard through the wing vent system.

WARNING

When fueling the airplane, always ground it with a grounding strap attached to a metal component (such as the exhaust stack). Before opening the fuel filler cap, touch it with the fuel nozzle and with your hand to discharge any static electricity that may exist. Always have a fire extinguisher nearby.

WARNING

Fuel spills (caused by overfilling, fuel expansion, improperly installed fuel vent lines, or the wings not being level) are always a possibility when fueling the aircraft. Be aware of the potential for spills, especially when the airplane is parked on uneven ground. If a fuel spill occurs, move the airplane well away from the spill (upwind if possible), and have someone stand by with a fire extinguisher before attempting to start the engine.

NOTE

The optional fuel vent float valves, available from Stoddard-Hamilton Aircraft, can help reduce the potential for fuel spills.

4-12 DESCENT

Never pull power off and dive down in cold air. The rapid cooling at idle and high velocity can be very hard on an engine. When descending keep a little power on and don't descend too fast. Another thing to keep in mind when descending is that the airplane is very clean aerodynamically. If you are in a 190 to 200 mph cruise, it doesn't take much of a descent angle to reach red line, so be cautious. Also remember that, with a very clean airframe, you are limited to fairly shallow descents, so plan your descent in advance to reach your destination airport at pattern altitude.

Be sure your seat belts are fastened snugly when descending. Coming down from smooth air into turbulent air at a high rate of speed can be especially tough on you and the airframe. Maximum structural cruising speed Nno) of the Glasair is 200 mph IAS.

Gradually push the mixture control rich during long descents.

4-13 APPROACH AND LANDING

4-13.1 Pre-Landing Check List

A suggested pre-landing check list has the acronym GUMP:

GAS:

- Fuel boost pump on.
- Check fuel quantity.
- Select proper tank. Verify that handle engages detent.
- Throttle reduced as necessary.
- Carb heat on. (if installed)

UNDERCARRIAGE:

- Extend landing gear (below 140 mph IAS).
- Check for hydraulic pressure and three green lights.

MIXTURE:

- Push to full rich position.

ROP:

- Move prop control to high rpm, flat pitch (forward) position.

NOTE

We recommend completing the pre-landing check list before entering the pattern so that the pilot's attention can be directed outside the airplane to clear for traffic while in the pattern. Some of our pilots like to go to full flaps early in the approach (before turning onto the downwind leg) to provide maximum visibility over the nose and also to reduce their work load while in the pattern.

4-13.2 Approach

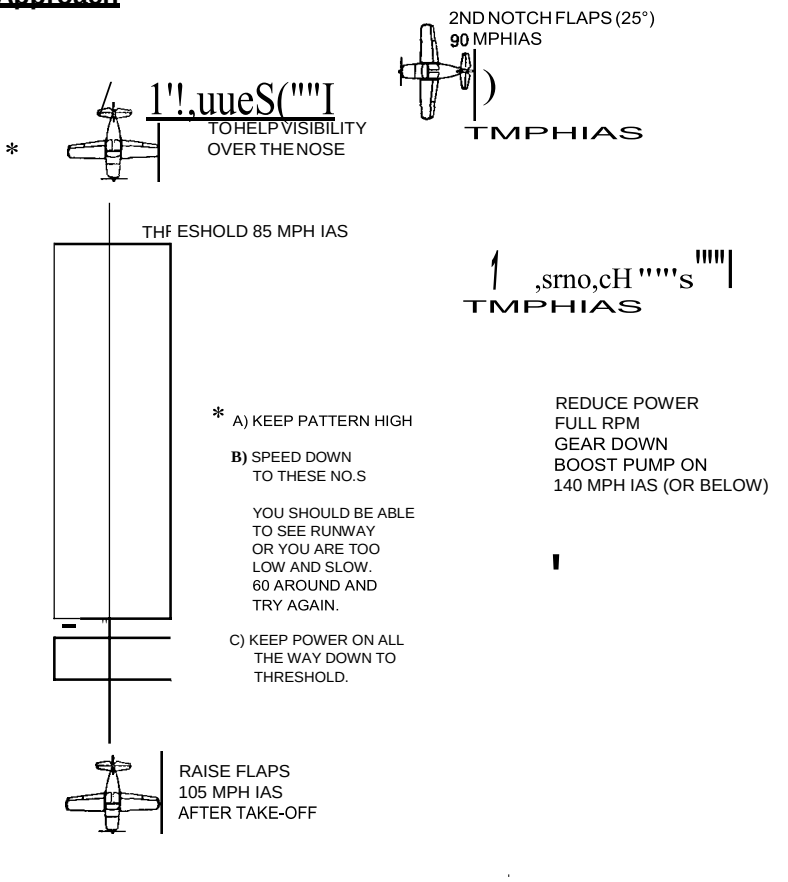


FIGURE (4-1)

The Glasair is a fast, clean aircraft that will take longer to slow down than you may be used to. If you enter the pattern at 200 mph, you may have to circle an extra lap before you land. To avoid overtaking other aircraft, plan ahead to slow down before entering the pattern.

Enter the pattern on the 45° at about 130 to 140 mph. Turn on the electric fuel boost pump, switch to the desired tank, and pull the carb heat (if installed) for 5 to 7 seconds to check for ice. Move the gear switch to the down position (maximum gear extension speed is 140 mph) and check for three green lights, indicating the gear are fully extended. Push the mixture full rich, and move the prop control forward to the high rpm (flat pitch) position (if applicable). Slow the airplane to about 120 mph when abreast of the threshold on downwind and pull the first notch of flaps (15°).

NOTE

Approach speeds shown are for the company prototype. Speeds for other Glasairs will vary depending on a variety of factors that affect the indicated stall speed. When test flying, keep the final approach speed between 1.3 and 1.4 times the indicated stall speed in the landing configuration $0,/_{50)}$. When familiar with the airplane, this value may be reduced to between 1.2 and 1.3 times the indicated stall speed $0/so)$-

Continue slowing the airplane and pull the second notch of flaps (25°) at about 90 mph on base leg. Throughout downwind, base, and final, continue to trim the airplane, as necessary. Turn onto final approach at approximately 85 mph, and pull full flaps **(34°)** if needed. Control altitude with power and airspeed with pitch.

The degrees specified for the flap settings are for the standard, manual flaps.

You should be at about 85 mph over the threshold under normal conditions. Even at these airspeeds you will need to carry a little power through the approach to keep the sink rate under control. Carry a little more airspeed (90 mph) if you are heavily loaded or in gusty or strong wind conditions.

When on final, you should be pattern high with your speed down and a somewhat high angle of descent. This allows visibility over the nose all the way down through final. Do not approach the field low and slow with a shallow descent angle. If you're low and slow, go around and try again. If you can't see the runway numbers all the way down to flare, your approach is not correct.

4-13.3 Landing

The landing in the Glasair Super 11-S RG is similar to the landing in any nose wheel airplane. Due to the high sink rate with gear and flaps extended and the propeller in flat pitch, the flare may have to be started somewhat higher above the ground and back pressure applied to the stick more rapidly in order to break the glide.

Keep the power off sink rate in mind when flying landing approaches. At a standard pattern altitude of 800 ft AGL, a fairly tight pattern must be maintained to execute a power-off glide to the runway. Especially avoid letting your airspeed get too low during a power-off approach; the sink rate increases at lower approach speeds and you have less excess lift available to arrest the descent in the flare.

Always touchdown on the main wheels first with enough airspeed to allow the nose gear to come down gently. If the airplane is too slow with a high angle of attack at touchdown, the reduced airflow over the elevator may not provide adequate elevator authority to prevent the nose wheel from slamming down after touchdown. Carry a little power prior to touchdown and then cut power just before touchdown. Do not attempt full stall landings in the RG model.

CAUTION

If you don't like the way you're set up for landing, don't be ashamed or too proud to go around and try it again. It is much better to go around than to damage the plane or yourself.

On a balked landing (go-around), add full power (applying right rudder, as necessary), stabilize the plane in a climb, and ease the flaps off. The plane has enough power to go around with full flaps, but with limited performance. **Make** sure to ease the flaps off; raising the flaps all of a sudden will cause unnecessary pitch change and loss of lift.

We cannot stress enough that, if you do not have a lot of flying experience in aircraft with wing loading and performance similar to the Glasair Super 11-S RG, we recommend the initial use of the wing tip extensions. They can be thought of as transforming your Glasair into an intermediate trainer.

4-13.4 Slipping the Aircraft

The Glasair Super 11-S RG will slip with full flaps. With the normal high descent rate with the gear and flaps extended, however, slips should not be necessary. The amount of slip is limited by the amount of rudder power available. On a full flap, slipping approach, there is a very rapid sink rate which must be checked by adding power. Speed should be kept comfortably above the stall (85-90 mph) throughout the approach.

WARNING

If less than ten (10) gallons of fuel remain in the main tank, slips are prohibited when drawing fuel from the main tank.

CAUTION

Attempt such maneuvers as full flap, full slip approaches only after becoming thoroughly familiar and proficient with the normal flying and handling characteristics of your Glasair Super 11-S RG.

4-13.5 Crosswinds

Normal crosswind landing procedures for conventional aircraft apply to the Glasair Super 11-S RG. Especially strong crosswinds require a crab into the wind and straightening out just before touchdown while holding the upwind wing low.

The maximum crosswind that can be handled by the Glasair Super 11-S RG is highly dependent on pilot proficiency and technique.

4-14 ENGINE SHUT DOWN

1. Set the propeller control at minimum blade angle.
2. Idle until there is a decided decrease in cylinder head ternperature.
3. Turn radios off.
4. Turn all accessory switches off.
5. Set mixture to idle cutoff (full lean) and wait for the engine to stop.
6. Turn off mags and master switches.

SECTION 5

WEIGHT AND BALANCE

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5-1 GENERAL DATA

WARNING

To operate the Glasair safely, it must be flown within the specified CG limits. These limits must be strictly adhered to. Flight in either a nose-heavy or a tail-heavy airplane is unsafe, and can result in loss of control.

MAXIMUM GROSS WEIGHT
- Normal.....2100 lb
- With wing tip extensions .....2200 lb
- Aerobatic .....1900 lb

MEAN AERODYNAMIC CHORD (MAC)..... 44.5"
- With Wing Tip Extensions.....43.0"

WING LEADING EDGE AT MAC .....Station 83.70
- With Wing Tip Extensions.....Station 84.11

FLIGHT CG LIMITS
- Forward ..... 13.5% MAC
- Aft..... 31.5% MAC

STATIONS OF FLIGHT CG LIMITS

Standard Wing Tips (23.3 ft wing span):
- Forward .....Station 89.71 (13.5% MAC)
- Aft .....Station 97.72 (31.5% MAC)

With Tip Extensions (27.3 ft wing span):
- Forward .....Station 89.91 (13.5% MAC)
- Aft.....Station 97.65 (31.5% MAC)

NOTE

For aircraft with the **standard wing tips** (23.3 ft wing span) use the following formula to calculate aircraft CG with respect to **MAC:**

$$\text{Aircraft CG (\%MAC)} = \frac{\text{CG Station} - \mathbf{83.70}}{\mathbf{44.5}} \times 100$$

For aircraft with **wing tip extensions** (27.3 ft wing span) use this formula to calculate aircraft CG with respect to MAC:

$$\text{Aircraft CG (\%MAC)} = \frac{\text{CG Station} - \mathbf{84.11}}{\mathbf{43.0}} \times 100$$

VARIOUS MOMENT ARMS: (Glasair Super 11-S RG Prototype)

Oil (1.9 lb./qt.)	Station **44.00**
Fuel--Main Tank (6.0 lb/gal)	Station 89.85
Fuel--Header Tank (6.0 lb/gal)	Station 68.00
Fuel--Wing Tips (6.0 lb/gal)	Station 98.69
Firewall	Station 60.00
Baggage	Station 136.00
Passengers	Station 115.50
Instrument Panel	Station 89.00
Nose Wheel Axle	Station 43.00
Main Gear Axles	Station 105.25
Wing Tip Extensions	Station 100.62
Cowling Attach Flange Joggle	Station 58.00

The REFERENCE DATUM is located 58.0" forward of the cowling attach flange joggle (aft edge of the engine cowling). See FIGURE 5-1 on Page 5-6. Stations are measured in inches from the datum.

5-2 EMPTY WEIGHT CG CALCULATION

The empty weight CG of each individual aircraft must be determined before any additional CG calculations can be made.

First, with the wings level (wing tips at same height) and with waterline 100 level longitudinally, use a plumb bob to mark the location of the cowling attach flange joggle (the aft edge of the cowling) onto the floor.

> To level the airplane, use blocks under the wheels for coarse adjustments. Fine adjustments can be made just by raising a wing, the nose, or the tail; usually there is enough friction in the landing gear oleo struts that the adjustment will hold without slipping. Alternatively, you could block the nose or main gear oleos up or clamp them down to adjust the airplane for level. Refer to Subsection D, Marking the Fuselage Reference Lines, in the Fuselage Assembly section of the Instruction Manuals for procedures to mark waterline 100.

Measure 58.0" forward from the cowling attach flange joggle, and mark a line at this point perpendicular to the longitudinal centerline of the airplane. This line represents the intersection of a plane in space with the floor. This plane is defined as the reference datum (station 0.00) from which all moment arms are measured.

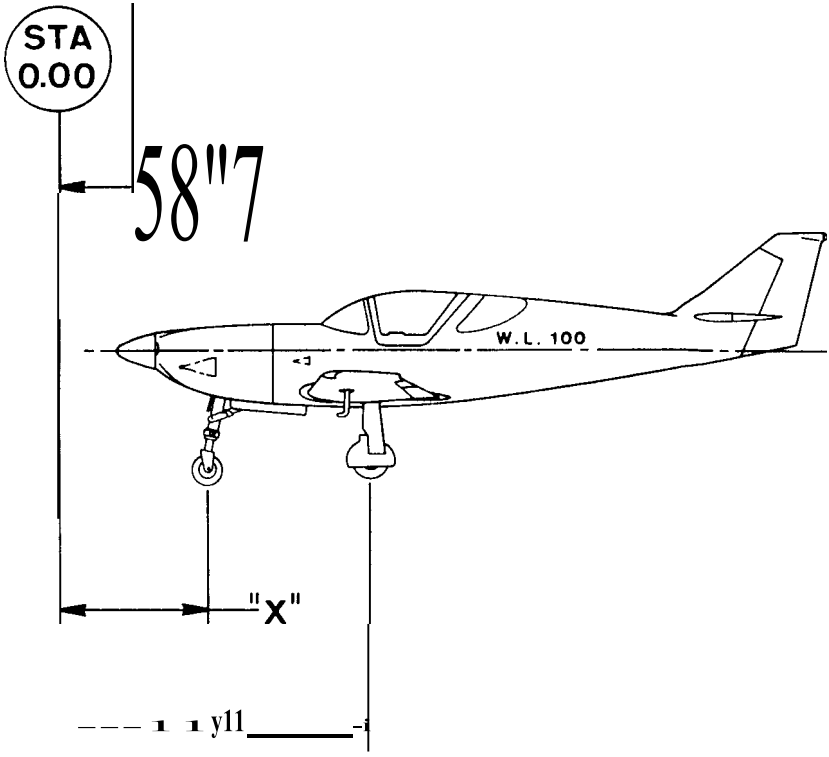


FIGURE (5-1)

Measure the distances marked "X" and "Y" in FIGURE (5-1) from the datum line to the centers of the nose and main gear axles. These distances represent the stations of the landing gear. For our example airplane, distance "X" is 43.00" and distance "Y" is 105.25".

Now weigh the airplane, without fuel, but with oil and other operating fluids, using three scales, one under each of the wheels. The scales should be capable of handling about 600 pounds each. While weighing the airplane, block up either the nose or main wheels so that waterline 100 and the wings are level. Be sure to subtract the weight of any blocks or wheel chocks used on the scales. The empty weight of our example Super 11-S RG is 1313 pounds with a 180 hp engine, a constant speed propeller, and a full IFR panel.

To determine the empty weight CG, use the data just collected.

Station is defined as the distance in inches from the reference datum.

Moment is the weight times the station.

Center of Gravity (CG) is defined as the sum of the moments divided by the sum of the weights:

$$CG = \frac{\text{Sum of Moments}}{\text{Sum of Weights}}$$

Empty Weight CG =

$$\frac{\text{(Nose Gear Weight)(X) + (Right Main + Left Main Weight)(Y)}}{\text{Airplane Total Weight}}$$

NOTE

"X" and "Y" in the above formula are the stations of the nose and main gear axles, respectively. Refer to FIGURE (5-1).

Following is a sample empty weight CG calculation:

Nose Gear:	323 lb, Station	43.00
Left Main Gear:	495 lb, Station	105.25
Right Main Gear:	495 lb, Station	105.25

$$CG = \frac{(323)(43.00) + (495 + 495)(105.25)}{323 + 495 + 495}$$

$$CG = \frac{118086.50}{1313} = \text{Station } 89.94$$

NOTE

The weights will vary with each individual airplane, depending upon many variables.

WARNING

Any modifications to the aircraft that add, subtract, or shift weight change the location of the empty weight CG. If any such modifications are made, recalculate the empty weight CG to permit accurate flight CG calculations.

5-3 FLIGHT CG CALCULATIONS

Calculate the flight CG for the extreme or worst case loading conditions expected, such as full fuel or minimum fuel situations, and heavy pilot, passenger, and baggage conditions. Consider the flight CG before every flight and recalculate the CG if conditions are different from any previous flight.

To calculate the flight CG, tabulate the weights, stations, and moments, as shown in the following examples. Add the weights and moments, and divide the total moment by the total weight to obtain the center of gravity.

WARNING

In most situations, the CG moves aft as fuel is burned from either the header tank or the main tank. Calculate the flight CG using the quantity of fuel expected to be remaining at the end of the flight. The flight should be planned so as to have eight gallons of reserve fuel (approx. 45 minutes) remaining at the end of the flight.

NOTE

The following are sample calculations for a Glasair Super 11-S RG.

5-3.1 Forward CG Limit Check

Conditions: Full fuel (8 gal) in header tank, full fuel (40 gal) in main tank, 110 lb pilot, no baggage. This simulates a worst case condition, approaching the forward CG limit.

ITEM	WEIGHT	STATION	MOMENT
Empty Airplane	1313.0	89.94	118086.50
Pilot	110.0	115.50	12705.00
Fuel (Aux. Tank)	48.0	68.00	3264.00
Fuel (Main Tank)	240.0	89.85	21564.00
Baggage	00.0	136.00	0.00
TOTAL	1711.0		155619.50

CG = $\frac{155619.50}{1711.0}$ = Station 90.95

CG(% MAC)= $\frac{90.95 - 83.70}{44.5}$ x 100 = 16.29% MAC

Both the gross weight and CG are well within limits for the flight depicted here. If the airplane had a heavier, 200 hp engine installed, however, and/or fewer accessories in the tail, there could possibly be a problem. If so, the pilot might need to carry ballast in the baggage compartment to keep the flight CG within the specified limits.

5-3.2 Aft CG Limit Check (Without wing tip extensions)

Conditions: No fuel in header tank, no fuel in main tank, 340 lb total of pilot and passenger, 100 lb baggage. This could be considered a worst case condition, approaching the aft CG limit.

ITEM	WEIGHT	STATION	MOMENT
Empty Airplane	1313.0	89.94	118086.50
Pilot and Passenger	340.0	115.50	39270.00
Fuel (Aux. Tank)	0.0	68.00	0.00
Fuel (Main Tank)	0.0	89.85	0.00
Baggage	100.0	136.00	13600.00
TOTAL	1753.0		170956.50

$$CG = \frac{170956.50}{1753.0} = \text{Station } 97.52$$

$$CG(\%\ MAC) = \frac{97.52 - 83.70}{44.5} \times 100 = 31.06\%\ MAC$$

Both the gross weight and the CG are within limits in this situation. Although this is an unrealistic example (there is no fuel on board the airplane), it illustrates the tendency of the CG to move aft as fuel is burned and approximates the extreme, worst case condition that might apply at the end of a long, heavily loaded cross-country flight.

5-3.3 Aft CG Limit Check (With wing tip extensions)

Conditions: Full fuel in main, header, and tip tanks, 340 lb total of pilot and passenger, 100 lb baggage. This could be considered a worst case condition, approaching the maximum gross weight or the aft CG limit.

ITEM	WEIGHT	STATION	MOMENT
Empty Airplane	1313.0	89.94	118086.50
Pilot and passenger	340.0	115.50	39270.00
Fuel (Hdr. Tank)	48.0	68.00	3264.00
Fuel (Main Tank)	240.0	89.85	21564.00
Fuel (Tip Tanks)	66.0	98.69	6513.54
Tip Extensions	23.0	100.62	2314.26
Short Tips Off	-4.0	100.62	-402.48
Baggage	100.0	136.00	13600.00
TOTAL	2126.0		204209.82

CG= $\frac{204209.82}{2126.0}$ = Station 96.05

CG(% MAC)= $\frac{96.05 - 84.11}{43.0}$ x 100 = 27.77% MAC

The CG is within the specified limits, but it will move aft as fuel is burned. With completely empty fuel tanks, the CG will be slightly farther aft than in the previous example because of the extra weight of the wing tip extensions.

SECTION 6

SYSTEMS DESCRIPTION

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6-1 POWERPLANT

The approved powerplants for the Glasair Super 11-S RG are the Lycoming 0-320, 10-320, and 10-360 models. The 0-320 and 10-320 models come in either 150 or 160 horsepower versions, depending on the model used. Either horsepower option is fine. Also available are the 10-360 180 and 200 horsepower engines, which provide added cruise and climb performance. Either injected or carbureted 150/160 hp engines may be used. Because of carburetor interference with the nose gear, however, the only 180 and 200 hp engines that may be used on the Glasair Super 11-S RG are injected models with the fuel servo mounted on the aft side of the induction housing. The 200 hp IO-360-C series engines require a slight modification to the upper engine cowling to clear the cylinder heads.

NOTE

200 hp IO-360-A series engines have the fuel servo mounted on the front side of the induction housing. Stoddard-Hamilton Aircraft does not support such an installation with a filtered induction system.

Engine mounts are available for approved engines with either the conical, Type I Dynafocal, or Type II Dynafocal style mounting system, depending on the engine model. The exhaust system used is a four into two into one collector.

Injected engines require higher fuel pressure than carbureted engines, so a different fuel boost pump is used with these engines. Injected engines also require a different exhaust system to provide clearance for the engine sump. An engine with an aft-mounted fuel servo requires a special 90° elbow between the engine and the servo with a left-side mounted NACA style intake system to duct air to the servo.

Shorter engine cowlings are available for installations with the non-extended hub propellers used for aerobatics or with 200 hp 10-360 engines. 10-360 engines also require different engine mounts and exhaust systems than the 0-320 and 10-320 engines.

We recommend purchasing the Operator's Manual for the Lycoming engine model installed in your airplane. The Lycoming manual for the 0-320 and 10-320 engines is part no. 60297-16. The manual for the 10-360 engines is part no. 60297-12. Besides operating instructions and performance tables, these manuals have information concerning installation, maintenance, and trouble-shooting.

NOTE

For new engines or engines returned to service following cylinder replacement or top overhaul of one or more cylinders, cruising should be done at 65% to 75% power until a total of 50 hours has accumulated or oil consumption has stabilized. This is to insure proper seating of the piston rings. Use straight mineral oil for the 50 hour break-in period. Use longer break-in periods for engines with chrome cylinders.

6-2 PROPELLER/GOVERNOR

We recommend Hartzell constant speed propellers for the RG model Glasair. These metal propellers are available in four different models depending on engine choice and service environment. Woodward governors are available for aerobatic and non-aerobatic propellers. The propeller model numbers are listed below:

HC-F2YL-1F/F7663D4	150/160 hp extended-hub 72"
HC-C2YL-4BF/FC7663D4	150/160 hp non-extended hub cw 74"
HC-F2YR-1F/F7068-2	180 hp extended hub 68"
HC-C2YK-1BF/F7666A2	180/200 hp non-extended hub 74"
HC-C2YK-4CF/FC7666A4	180/200 hp non-extended hub cw 72"

NOTE

Extended hub propellers are not recommended for aerobatic use. Non-extended hub propellers require a shorter engine cowl to accommodate them. The shorter cowl is available as an option.

NOTE

"cw" designates the counterweighted propellers recommended for aerobatics. The counterweights rotate the blades to coarse pitch if engine oil pressure is lost, preventing an engine over-speed condition.

CAUTION

The maximum allowable propeller diameter is **74".** Larger diameter propellers reduce the ground clearance, making a prop strike on rough terrain more probable.

WARNING

Some 10-360 engines, when coupled with Hartzell propellers, are subject to harmonic resonance problems, which impose rpm operating limitations on the engine-prop combination. Refer to your propeller Owner's Manual for further information and consult with your local propeller shop for proper engine and propeller combination rpm limitations. Avoid operating the engine in the restricted ranges.

6-3 FUEL SYSTEM

The standard Glasair Super 11-S RG fuel system has two fuel tanks: one main tank in the leading edge D-section of the wing, and a header tank on the aft surface of the firewall. Standard capacities are 40 gallons in the main tank and 8 gallons in the header tank for a total of 48 gallons. All but a very small amount of the fuel is usable. Wing tip tanks are available as an option. These tanks hold 5-1/2 gallons each for a total of 11 gallons extra. Total standard usable fuel with tips is 59 gallons.

NOTE

Use aviation grade gasoline--either grade 100 (green) or 1DOLL (blue) with the high compression 160, 180, and 200 horsepower engines or 80/87 grade (red) with the 150 horsepower model.

The main fuel tanks incorporate a system of baffles and check valves designed to help prevent fuel starvation resulting from slips or other uncoordinated maneuvers.

The fuel tanks are vented through 3/8" diameter aluminum tubing. A fuel gauge system that uses the standpipe type, **mechanical float** fuel sender requires that the vent lines from the outboard ends of the main tank and from the header tank be routed to a manifold at a low point in the fuselage. An additional vent line is routed between the header tank and the main tank fuel gauge housing. Because all the vent lines are connected together at the low point before they enter the slip stream, equal pressure exists on both sides of the gauge to ensure accurate fuel reading.

If you use a fuel gauge system with **capacitance probe** fuel senders in the main wing tank, routing the vent lines inboard to a common manifold is no longer necessary. The main tank can simply be vented through the lower wing panel at each tip.

We recommend using fuel vent float valves at each wing tip to prevent spilling fuel when the airplane is parked on uneven ground with full tanks. Each float valve incorporates a pressure relief valve, which prevents damage to the fuel tank from thermal expansion of the fuel, and a check valve, which opens to allow the engine to pull fuel from the tank in the unlikely event that both float valves stick in the closed position. If you install the fuel vent float valves, we recommend retaining the vent line between the header tank and the main tank to provide an avenue for fuel overflow due to thermal expansion in the main tank.

A mechanical fuel pump on the engine and an electric auxiliary pump in the wing center section supply fuel to the carburetor (or fuel injector). A three position fuel valve with positions for fuel off, main tank fuel on, and header tank fuel on is used for fuel management. A fuel sump with a fuel drain is mounted at the bottom of each tank.

A fuel screen is fitted to the fuel pickup in each sump and a cartridge type fuel filter is mounted at the low point of the fuel line forward of the firewall.

A carbureted engine is primed with an optional hand actuated essex pump located on the instrument panel.

If desired, the header tank may be fitted with a flop tube fuel pickup, instead of the standard sump, to provide fuel for inverted flight.

6-4 OIL SYSTEM

The engine oil system uses a mechanical oil pump with a wet sump on the bottom of the engine. The preferred location for the oil cooler radiator is on the firewall with air ducted to it from an opening in the engine baffling.

Oil capacity for approved engines is 8 quarts. Refer to the engine Operator's Manual applicable to your engine for recommendations on oil types and viscosity.

CAUTION

Operate new or overhauled engines on straight mineral oil for a minimum of 50 hours or until oil consumption has stabilized. After this period, change to an approved additive oil if so desired.

If an inverted oil system is desired, we recommend the Christen system (made by Aviat, Inc.) which we use on our aerobatic prototype.

6-5 LANDING GEAR

A tricycle retractable landing gear is used on the Glasair Super 11-S RG (SH-2R). All landing gear struts are of the pressurized air-oil type (oleo strut). The gear is retracted by an electrically driven hydraulic pump and three hydraulic actuators. A pressure switch turns the pump off when the gear is in the full up position. Microswitches mounted to the drag and side braces turn the pump off when the gear is in the fully extended position.

Emergency landing gear extension is achieved by a valve that dumps gear-retraction system pressure into the gear-extension system and back to the pump reservoir. Gravity, assisted by mechanical springs for the main gear and a gas spring for the nose gear, allows the gear to free-fall to the down and over-center locked position. The gear extends automatically if hydraulic pressure in the gear-retraction system is lost.

Also available is an optional emergency gear extension system that uses a hand-operated hydraulic pump to provide positive emergency gear extension and to maintain down system pressure. The extension springs are retained with this system to assist gear free-fall and to hold the gear in an over-center, locked position in case hydraulic down pressure cannot be maintained.

When the release valve is opened for emergency gear extension with either system, the force of the landing gear's free-fall creates a surge of hydraulic fluid from the gear retraction hydraulic lines into the hydraulic pump reservoir. An optional surge tank is available to capture this sudden flow before it reaches the pump reservoir, preventing a fluid spill during an actual emergency or when testing the emergency gear extension system.

Cleveland 5.00 X 5 wheels and brakes are used on the main gear. A Cleveland 5.00 X 5 wheel, fitted with a Lamb 11 x 4.00-5, 8 ply tire, is used on the nose gear.

The nose gear is free-castering, and steering is accomplished by differential braking. A friction type shimmy damper is incorporated on the nose gear. Each main gear strut is enclosed by a two-piece door system. The nose gear strut is covered by a single door.

Toe-in on the main gear is set at 0°·

6-6 BRAKES

Cleveland brakes and master cylinders are used, with toe pressure on the top of the rudder pedals causing braking action. The brake fluid reservoir is mounted to the engine mount. Brake pedals on the pilot's side are standard equipment on the Glasair Super 11-S RG. Dual brake controls are available as an option.

6-7 COCKPIT

The Glasair Super 11-S RG provides comfortable side-by-side seating for two passengers up to 6 ft 7 in tall and weighing up to 250 lb. Cabin width is approximately 42 inches, which provides plenty of room for a fully equipped instrument panel, if desired.

Baggage is stored directly behind the seat back and should be securely anchored down when in flight.

WARNING

Do not place any small loose articles in the baggage compartment. Stow all baggage in containers such as packs, suitcases, or bags. A small article, if misplaced, could bind up a control linkage causing loss of control of the aircraft.

The Glasair Super 11-S RG utilizes gull wing canopies with fore and aft bullet type latches. The latch system uses two-way handles, which can be operated from both inside and outside of the cockpit. This provides access from the outside in the event of an emergency. Canopies can be left open for ventilation during ground taxi.

WARNING

Do not open the canopies in flight. They will depart the aircraft.

6-8 CONTROL SYSTEM

The controls on the Glasair Super 11-S RG are of a conventional 3-axis design using dual stick controls for pitch and roll, and dual rudder pedals for **yaw.** Controls are light and responsive in all modes of flight.

For low speed flight, the builder has several different flap options from which to choose. The standard flaps are plain flaps that are piano-hinged to the lower wing trailing edge. The standard flaps may be either manually actuated or electrically actuated. Also available are electrically actuated slotted flaps, which reduce the stall speed (thus shortening the takeoff and landing distances and lowering the approach speed), improve visibility over the nose on landing approach, and increase the maximum flap speed from 120 mph to 140 mph.

For the manually actuated plain flaps, a thumb-operated button releases the flaps from their fully retracted position; the flaps are then extended by an upward pull on the centrally located flap handle. As the handle is pulled upward, a spring-loaded locking bar snaps into detents in a ratchet plate. The thumb operated button releases the locking bar, allowing the flaps to be retracted. The ratchet plate has four positions from 0° to 34° down. A slight air load is required to hold the flaps in the optional takeoff position (first notch). The pilot must wait to select flaps, therefore, until after the ground roll has started.

All flight control interconnections are push-pull tube linkages except for the rudder control. Rudder cables are used between the rudder pedals and the rudder bellcrank. A push-pull tube connection is used from the rudder bellcrank to the rudder.

The Glasair Super 11-S RG elevator trim system functions by introducing a spring tension on the elevator control horn in the direction desired by the pilot. The system also prevents an oversensitive elevator control and provides desirable control pressure feel. The elevator trim system is actuated by an elevator trim control wheel located in the center console. The trim wheel is geared to a cable drum around which the elevator trim actuating cable is wound. The elevator trim cable, with tension springs installed in-line at each end, is routed between the cable drum and the ends of the elevator actuator arm.

Rudder trim is accomplished by a fixed external trim tab and aileron trim by either an external trim tab or by rigging the flaps differentially. Aileron and rudder trim are adjustable on the ground only. Adjust the external trim tabs for optimum cruise conditions. See the Instruction Manuals and the Flight Test section of this Owner's Manual for further details.

6-9 HEATING AND VENTILATION SYSTEMS

Cabin heat is accomplished by a heat exchanger mounted on the exhaust system crossover tube from cylinder #2, with a heater valve mounted on the firewall. A push-pull cable control opens and closes the cabin heat valve. If desired, the warm cabin air can be diverted to provide windshield defrosting as well as heating for the occupants.

Two fresh air cabin vents are provided for the cockpit area. NACA style inlet ducts on both sides of the fuselage feed air into boxes which incorporate "eyeball" vent valves to control the flow of ventilation air into the cockpit.

6-10 ELECTRICAL SYSTEM

All circuits are protected by the appropriate circuit breakers, which are either rocker arm style or the standard push-pull type. The only difference between the Glasair Super 11-S RG's electrical system and that of more conventional aircraft is that the structure on the Glasair Super 11-S RG cannot be used as a ground or return. Instead, a negative bus bar is used with a return circuit needed for every electrical device.

Navigation and strobe lights are installed in the wing tips and the rudder; a landing light is mounted in the lower engine cowl. The navigation-position lights consist of an appropriately colored lens (red for left, green for right) mounted at the forward end of each wing tip, and a white tail light mounted in the rudder. Anti-collision strobe lights are mounted at the outermost points on the wing tips.

Inside cockpit lighting is not supplied with the kit and is left up to the builder to procure and install if desired.

Most avionics antennas are mounted internally inside the fiberglass structure. Transponder and DME antennas are usually mounted externally on the fuselage belly.

6-11 INSTRUMENTATION

The Glasair Super 11-S RG instrument panel should have at least the following instruments:

1. Airspeed Indicator
2. Altimeter
3. Tachometer
4. Compass
5. Fuel pressure gauge (or fuel flow for injected engine)
6. Fuel quantity gauge for each tank
7. Oil temperature gauge
8. Oil pressure gauge
9. Tum and bank indicator
10. Cylinder head temperature gauge
11. Landing gear position indicator
12. Hydraulic pressure gauge (for the gear-extension pressure. If desired, an optional shuttle valve may be installed to read both the retraction and extension pressure.)
13. Manifold pressure gauge (recommended for constant speed propeller)

We do not recommend flying your Glasair without these instruments all working and calibrated properly.

In addition, FAR part 91.52 requires that an Emergency Locator Transmitter be installed for all flights beyond a 50 mile radius of the airport of departure.

The recommended ranges for the instruments (where applicable) are as follows:

1. Airspeed indicator
   - White arc (standard flaps) ..... 73 to 120 mph
   - White arc (slotted flaps) ..... 68 to 140 mph
   - Green arc ..... 80 to 200 mph
   - Yellow arc ..... 200 to 260 mph
   - Red line ..... 260 mph

2. Tachometer
   - Red line ..... 2700 rpm
   - Green arc ..... 600 to 2700 rpm

3. Cylinder head temperature
   - Red line ..... 500° F
   - Green arc ..... 180° F to 435° F

4. Fuel pressure (Carbureted engines)
   - Maximum ..... 6 psi
   - Desired ..... 3 psi
   - Minimum ..... 1/2 psi

(Consult the Lycoming Operator's Manual for recommended fuel pressures for the various injected engine models.)

5. Oil temperature
   - **Red line ..... 245°** F
   - Green arc ..... 160° F to 220° F
   - Yellow arc ..... 100° F to 160° F

6. Oil pressure
   - Minimum idling ..... 25 psi
   - Normal range ..... 60 to 90 psi

7. Hydraulic Pressure .....0 to 2000 psi

Instruments such as a directional gyro or artificial horizon, if used, are operated by vacuum pressure. We recommend using an electric tum and bank indicator if a vacuum system is used for the artificial horizon, so that a back-up system is available in the event of a system failure. If an electrical system is used, an ammeter should also be used in conjunction. All additional instruments, radios, etc. are up to the builder's discretion.

6-12 WING TIP EXTENSIONS

Optional wing tip extensions are available which provide an additional four feet of wingspan and an increase in aspect ratio from 6.20 to 7.64. The tip extensions provide an increase in climb performance, a decrease in stall speed, and an increase in airspeed at altitude or economy power settings. They also permit a 100 lb increase in maximum gross weight.

Since the tip extensions reduce the roll rate considerably, they are not approved for aerobatics. They are designed to be easily removable and replaced with the smaller, standard wing tips if more aggressive roll performance is desired. The tip extensions may also be used as tip tanks, with approximately 5.5 gallons capacity per side.

Since very few rental aircraft simulate the Glasair Super 11-S RG's performance, we recommend using the wing tip extensions for the initial test flights and pilot training. The tip extensions serve to lower the wing loading and reduce approach speed for those pilots with limited experience in high performance aircraft.

WARNING

Vs as defined in the FARs and in the Glasair Owner's Manual is "the stalling speed the minimum steady flight speed at which the airplane is controllable." In some aircraft Vs is limited by stall speed, in others the limiting factor is minimum control speed. For the Glasair Super 11-S in standard configuration, the limiting factor of Vs is stall speed. With wing tip extensions, control speed is as critical as stall speed in setting Vs. This is why Vs is not lowered for Glasairs with wing tip extensions installed, even though stall speed is lower than in the standard configuration. Vs for each individual airplane must be determined by test flight, and care must be taken not to operate below Vs when insufficient altitude exists for recovery.

SECTION 7

HANDLING, SERVICE, AND MAINTENANCE

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7-1 GENERAL

The purpose of this section is to describe ground handling procedures for the Glasair Super 11-S RG and also to outline the requirements for maintaining the aircraft in an airworthy condition. The Federal Aviation Regulations place the responsibility for the maintenance of this airplane on the owner and operator, who must ensure that all maintenance is done in conformity with all established airworthiness requirements.

The FAA, on request, will issue a repairman's certificate to the original builder of an experimental homebuilt aircraft. This certificate enables the builder to perform all the maintenance and overhaul work necessary to keep the aircraft in legal flying condition, and also enables the builder to conduct the annual condition inspection. The certificate applies only to the individual aircraft (not to others of the same model), and is non-transferable; if the airplane is sold, the new owner must have a licensed mechanic (or the original builder) perform the annual inspection.

All limits, procedures, safety practices, time limits, and servicing and maintenance requirements contained in this handbook are considered mandatory.

When testing a new experimental aircraft, inspection before and after each flight is a must for the first 25 hours. We cannot stress this enough. Any problems are most likely to occur during the initial hours of flight testing.

For the second 25 hours, we recommend performing a major inspection after each 5 hours of flight or if anything appears out of the ordinary. After the first 50 hours of flight, we recommend another major inspection at 75 hours, and then at the 100 hour mark.

The FARs require that a condition inspection of the airplane be completed and signed off every year. Review all items listed in the annual condition inspection checklist (Section 7-7) annually. If desired, the owner may also inspect the airplane at 100 hour intervals.

Inspection of your Glasair is at your discretion (except for the annual inspection, which is required by law). The above suggestions are given as guidelines; each builder should devise a schedule of periodic inspections for his or her aircraft.

7-2 TOWING, GROUND HANDLING

One person can move the airplane on a smooth, level surface using the optional tow bar. Attach the tow bar to the ends of the lower nose gear scissor pin where the scissor attaches to the nose gear fork.

CAUTION

1. Do not exert force on the propeller or control surfaces.

2. Do not force the nose gear beyond the pivot stops by attempting too tight a turn.

3. Do not push the airplane backwards unless the nose wheel is being steered by the tow bar; unless steered, the nose wheel will try to caster which may result in damage to the pivot stops or the nose gear fork.

4. Do not attempt to move the airplane if the main gear is obstructed by mud or snow-- damage to the gear mounting hardware may result.

7-3 TIE-DOWN

It is best to secure the airplane with the nose into the wind. In addition to the wing tie-down points, a tail tie-down should be used.

1. Thread the tie-down eyes (5/16-18) into their receptacles in the wings and at the tail.

2. Secure the airplane at the three points, using nylon line or chain.

3. Chock the main wheels, fore and aft.

4. At the least, use a lap belt to tie the control stick back to protect the ailerons and elevator from gusts. External gust locks, especially on the rudder are also recommended.

5. If high winds are expected, prop the tail with a support and tie the nose wheel down.

6. Use a canopy cover to keep moisture from entering the cockpit.

7. Make sure that the drain holes in the tail cone and the drain/vent holes in the control surfaces are clear to prevent the collection of water in any part of the airframe.

7-4 JACKING THE AIRPLANE

The Glasair Super 11-S RG must be jacked up and supported on jack stands for landing gear retraction tests, for periodic landing gear maintenance, and for annual inspections. A jacking system, consisting of jack stands and removable jack pads for the underside of the wing, is available from Stoddard-Hamilton for the Glasair Super 11-S RG. Follow these suggested procedures when jacking the airplane:

1. Place the jack pads in position on the lower surface of the wing.
2. Secure the pads by threading a tie-down eye or similar bolt (5/16-18), through the wing into the tie down plate. Indexing pins in the jack pads orient the jack pads properly.
3. To further ensure against the jack pads shifting, use duct tape or the equivalent to tape the pads to the wing.

CAUTION

Proper alignment of the indexing pin is important to prevent damaging the lower wing skins.

Support the tail of the airplane with a sturdy padded sawhorse and place approximately 50 to 60 pounds of padded weight on top of the horizontal stabilizer. Keep the weights close to the vertical fin. The weights are needed to keep the airplane from tipping onto its nose when on the jacks.

Jack the airplane up just enough for the wheels to clear the floor by about 1". Use a short step stool for access into the cockpit when the airplane is on jacks.

Safety Notes for Jacking the Airplane

1. No persons should be under the airplane while in the process of jacking. Only after you have finished jacking and checked the airplane for security on the stands should you crawl under the aircraft.

2. Always make sure that all people and objects are clear of the landing gear prior to a retraction test. If one of the gear struts became obstructed or wedged on something, it could pull the plane down off the stands.

3. The Glasair may be left on the jack stands for extended periods of time, but, as a general safety precaution, always leave the gear down when you are away from the plane.

4. Always remember to remove the jack pads from the wing prior to flight.

7-5 OUT-OF-SERVICE CARE

7-5.1 General

The following guidelines are meant to help prevent deterioration of the aircraft during periods of non-use or limited use. These procedures are applicable for situations in which the airplane is not used for periods of time between 7 and 30 days.

NOTE

If the aircraft is to be stored for longer periods, consult the Lycoming Engine Operator's Manual for engine preservation recommendations.

7-5.2 Mooring

If a hangar is not available, secure the aircraft as described above in the section on tie-down (section 7-3). To prevent oxidization of the finish, we recommend the use of light colored slip covers over the wings, fuselage, and tail surfaces during extended periods of outdoor tie-down.

7-5.3 Engine Preparation for Storage

Engines in airplanes that are flown only occasionally tend to exhibit cylinder wall corrosion much more than engines that are flown frequently.

Check for correct oil level and add oil if necessary to bring the level to the full mark.

Run the engine for at least five minutes at 1200 to 1500 rpm with oil and cylinder head temperatures in the normal operating range.

7-5.4 Fuel Tanks

Top up the fuel tanks to prevent condensation of water in the tanks.

7-5.5 Pitot Tube

Install cover.

7-5.6 Windshield and Canopies

Make sure both canopies are securely closed. We recommend that covers be installed over the canopy area if the aircraft is stored outdoors.

7-5.7 During Flyable Storage

Each seven days during flyable storage, rotate the propeller by hand. After rotating the engine six revolutions, stop the propeller 60° to 120° from its former position.

WARNING

Before rotating the propeller blades, make certain that the magneto/start switch is off, that the throttle is closed, and the mixture is in the idle cut-off position. Always stand in the clear when turning the propeller. There is always some danger that a cylinder will fire when the propeller is moved.

If, at the end of 30 days, the airplane will not be removed from storage, start and run the engine. The preferred method is to fly the airplane for 30 minutes.

7-5.8 Preparation for Return to Service

Remove all covers, gust locks, etc. and give the airplane a thorough inspection. Particularly check wheel wells, control openings, and the cowl inlets for bird nests.

Preflight the airplane following the procedures in Section 4-2.

7-6 50 HOUR POWERPLANT INSPECTION

In addition to the daily preflight inspections, make the following engine maintenance inspection after every 50 hours of operation. This inspection is in accordance with the Lycoming Engine Operator's Manual.

7-6.1 General Engine Compartment

Check fuel and oil line connections and repair any leaks. Make sure that all cowling, baffling, heat shields, and their attach hardware are in good condition. Any damaged or missing part of the cooling system must be replaced before the aircraft resumes operation. Inspect and service the air filter (if installed).

7-6.2 Ignition System

If spark plug fouling has been apparent, rotate the lower plugs to the upper position.

Examine the spark plug cable leads and the spark plug ceramics for corrosion and deposits. This condition is evidence of either leaking spark plugs or improper cleaning of the spark plug walls or connector ends. Where this condition is found, clean with alcohol or MEK. All parts should be clean and dry before reassembly.

Check the ignition harness for security of the mounting clamps and make sure all connections are tight and properly torqued at the spark plug and magneto terminals.

7-6.3 Fuel and Induction System

Check the primer lines (if installed) for leaks and security of clamps. Remove and clean the fuel inlet strainers. Check the mixture, throttle, and carb heat control linkages for travel, freedom of movement, security of clamps; lubricate if necessary. Check the air intake duct (carb heat box) for leaks and security.

Remove and inspect the Brackett air filter element. Replace the element after 200 hours of use or every 12 months or when it is difficult to see light through it due to foreign material. Clean with compressed air; do NOT wash and reuse. These filters are chemically treated to make them more effective.

7-6.4 Lubrication System

If the engine is equipped with an external, full-flow oil filter element, replace it. We recommend obtaining an oil filter can cutter and opening the old filter to inspect for metal particles that might indicate internal engine damage.

NOTE

Intervals between oil changes can be increased as much as 100% on engines equipped with full flow oil filters, provided the filter element is replaced each 50 hours of operation. For these engines, drain and replace the engine oil at every other 50 hour inspection. This increase in oil change intervals is recommended only if an air filter is also installed. See Lycoming Service Instruction 1319 B.

If the engine is not equipped **with** an external, full-flow oil filter, check the oil suction and oil pressure screens for metal particles. Check all oil lines for leaks, chafing, dents or cracks. Refill the engine **with** fresh oil.

7-6.5 Exhaust System

Check attaching flanges at exhaust ports on cylinder for evidence of leakage. Examine exhaust manifold for general condition. Inspect for cracks, especially in the cabin heat muff area. Soot on the inside surface of the aluminum heat muff shroud indicates the presence of cracks. Any cracks must be repaired by welding before further flight.

WARNING

Stainless steel exhaust systems must be repaired by qualified personnel using special methods to prevent contamination of the metal during welding, otherwise cracking may persist.

7-6.6 Cylinders

Check the rocker box covers for evidence of oil leaks. If leaks are found, replace the gaskets and tighten the screws to 50 in-lb.

Check the cylinders for cracked cooling fins and for excessive heat which is indicated by burned paint on the cylinder. Excessive heat is indicative of internal damage to the cylinder; if found, its cause must be determined and corrected before the aircraft resumes operation.

7-7 ANNUAL CONDITION INSPECTION

Annually perform the service and inspection procedures described below in accordance with the scope and detail of Appendix D of FAR part 43. If the aircraft is found to be in a condition for safe operation, an authorized person should make a proper entry in the airplane's log book, certifying the airworthiness of the airplane.

The following checklist is intended as a guide and is not represented to be complete. It is the responsibility of the operator and repairman to inspect and maintain the entire aircraft in an airworthy condition.

7-7.1 Powerplant and Propeller

A. Engine Run-up: start the engine and warm it up thoroughly. Check the following:

1. Oil pressure.
2. Alternator output.
3. Left magneto drop.
4. Right magneto drop.
5. Propeller control and governor action.
6. Suction gauge.
7. Static rpm.
8. Idle rpm.
9. Carb heat.
10. Magneto ground.
11. Mixture cutoff rpm rise at idle.

B. Engine Compartment Inspection:

1. Remove the engine cowl and check for leaks and stains.
2. Perform compression check. Record the results in the engine log book.
3. Drain oil; check screen or replace filter.

4. Safety wire screen or filter.
5. Refill with new oil.
6. Clean and adjust spark plugs; rotate upper and lower plugs.
7. Check ignition harness for breaks; check cigarettes and contact springs.

C. Magnetos:
1. Lubricate breaker cam follower.
2. Check condition of points and point gap.
3. Check P-leads for breaks, frays.
4. Check and adjust magneto timing.

D. Engine Controls: check the following controls for security, full range of travel, chafing, safety. Lubricate if necessary.
1. Throttle.
2. Mixture.
3. Prop pitch control.
4. Carb heat.

E. Battery inspection:
1. Clean the battery terminals.
2. Clean the battery box (if installed).
3. Check the electrolyte level and top up.
4. For an enclosed battery box, inspect the drain tube and vent lines for damage and obstructions.

F. General Engine Compartment and Engine Accessories:
1. Inspect alternator: mounting, wiring, terminals.
2. Inspect alternator belt and adjust tension, if needed.
3. Inspect starter: wiring, terminals, brushes.
4. Remove cabin heat muff and check exhaust for cracks. (Soot on the inner surface of the heat muff indicates a crack.)
5. Check exhaust springs, gaskets, and shrouds for security and cracks.

6. Check cylinder baffles for cracks and proper seal.
7. Check engine mount and braces for security, rust, chafing, condition of rubber bushings and bonding straps.
8. Check engine for loose nuts, bolts, and screws.
9. Check oil cooler and lines for security, chafing, and obstructions.
10. Check primer system for leaks.
11. Check all breather and overboard lines for security and obstruction.
12. Inspect fuel filter element and replace if necessary. Safety wire fuel filter bowl.
13. Clean carburetor or injector screens and check fuel flow.
14. Inspect carburetor or injector and fuel lines for security and leaks.
15. Inspect cabin heat box, control, and hoses for security and leaks.
16. Inspect carburetor heat box, damper, hoses for condition and operation.
17. Remove propeller spinner and check spinner, front plate, and back plate for security and cracks.
18. Inspect propeller track. Check blades for nicks. Check torque of mounting bolts. Resafety bolts. Grease propeller hub, if applicable. Reinstall spinner.
19. Inspect the induction air filter and clean with compressed air. Replace if it is difficult to see light through it due to foreign material or if it has been in service for 12 months or 200 hours since last replacement.
20. Wash engine and cowling, using a suitable solvent or degreaser.
21. Check cowling for chafing, cracks, or heat damage.
22. Top up brake fluid reservoir, leaving an air space for fluid expansion.
23. Check engine for any loose hardware and tools that may have been left in the engine compartment during maintenance.

G. Ground Run-up Check:
1. Oil pressure.
2. Alternator output.
3. Left magneto drop.
4. Right magneto drop.
5. Prop control and governor action.
6. Suction gauge.
7. Static rpm.
8. Idle rpm.
9. Carb heat.
10. Magneto ground.
11. Mixture cutoff rpm rise at idle.
12. After engine shut-down, check for oil leaks.
13. Reinstall the lower cowling.

7-7.2 Cabin and Fuselage

Remove kick panels, center console, seat pans, baggage bulkhead, wing attach covers, belly panel, and gear doors, as necessary. Inspect the following:

A. Inspect the control system pushrods, rod end bearings, cable and linkages for corrosion, safety, security, and chafing. Lubricate all bearing surfaces, pulleys, and gear as necessary. Check the following systems:
1. Aileron system.
2. Elevator system.
3. Rudder system.
4. Flap system.
5. Trim system.

B. Check the operation of the fuel selector valve. Check the valve markings.

C. Check all fuel lines for leaks, security, and chafing.

D. Drain the fuel tank sumps and check for contaminants. Remove and clean the fuel sump strainers (finger screens) if excessive contamination is apparent.

E. Check instruments for security, legibility, and markings.

F. Check the fuel tank gauges and senders, if applicable, for proper markings, indication, and freedom of movement.

G. Check the compass for discoloration, compass card displayed.

H. Check the circuit breakers and switches for security and condition.

I. Replace the instrument air filter.

J. Check all instrument wiring and plumbing for security and chafing.

K. Check radio equipment, wiring, antennas, and ELT battery for replacement date.

L. Check all Plexiglas for cracks.

M. Check canopy hinges and latches. Lubricate as required.

N. Inspect engine mount points on the aft side of firewall for cracks or stress marks in the fiberglass.

0. Check the pitot tube, the static ports, and the pitoUstatic plumbing.

P. Check the seat pans for cracks or stress marks.

Q. Check the seat belts and shoulder harnesses for security and condition.

R. Check the brake master cylinders and brake line fittings for leaks.

S. Check the stabilizer and the elevator actuator assembly for security and cracks.

T. Check the empennage counterweights for cracks and chafing.

U. Check and lubricate the elevator and rudder hinges. Verify that the rudder hinge is properly safetied.

V. Check all drain or breather holes for obstructions.

W. Check the elevator and the rudder for proper travel:
1. Elevator: 18° down, 30° up.
2. Rudder: 25° right, 24° left.

X. Check the navigation lights, the anti-collision lights, and the landing light for security and operation.

Y. Check the wing attach bolts and fittings for security, integrity, and safety.

7-7.3 Landing Gear

A. Jack up the airplane, following the procedures described in Section **7-4.**

B. Check the landing gear struts for general condition. Wipe clean the oleo struts and actuating cylinders.

C. Clean the landing gear wheel wells of any accumulation of mud or other debris.

D. Check the landing gear support structure for evidence of damage.

E. Check the oleo struts and the actuating cylinders for signs of leakage or damage. Check the fluid level and recharge the struts. See Section **7-8.4.**

F. Check the struts for excessive play in the scissors pivot points.

G. Check the condition of the hydraulic lines. Look for leaks in fittings and for chafing of the flexible lines.

H. Check the landing gear microswitches for security of mounting and proper operation.

I. Check all wiring for security and chafing.

J. Check the tires for cracks, wear, and proper inflation.

K. Repack the wheel bearings and inspect the wheels for cracks and corrosion.

L. Inspect the brake discs for excessive scoring, the brake lines for leaks or chafing, and the brake pads for wear. Replace the brake pads if necessary. Check the operation of the brakes and bleed them, if necessary.

M. Check the nose gear shimmy damper for security. Inspect the damper friction material for integrity. Adjust the shimmy damper clamps per the instructions in section 7-8.6.

N. Remove the nose gear emergency extension gas spring and check for proper pressure by compressing it against a bathroom scale. If the force needed to compress the gas spring is less than 80 lb, replace the spring. (The spring is normally replaced every two or three years.)

0. Check the gear doors for damage and security of mounting.

P. Inspect the hydraulic pump for security of mounting. Inspect the hydraulic lines for general condition and leaks. Check the level of the hydraulic fluid in the pump and top up if necessary.

CAUTION

Consult the hydraulic pump servicing instructions (Section 7-8.5) for a discussion of proper filling procedures and the correct fluid to use.

7-7.4 Landing Gear Operation Test

A. With the gear switch in the down position, switch on the master switch. The 3 green "lock" lights should illuminate.

8. Make sure there is nothing obstructing the gear. Move the gear switch to the "UP" position. The pump motor should start immediately and all three red lights should illuminate as the first strut leaves its locked position, indicating that the gear is in transit. Each green light switches off as the corresponding strut leaves the locked position.

C. With the gear in the retracted position, all indicator lights should be off. Check all the gear doors for complete closure. Adjust the gear doors if necessary.

D. With the gear retracted, move the flaps out of the full up position. The gear warning horn should sound.

E. With the gear retracted, move the gear switch to the "DOWN" position. The hydraulic pump should switch on immediately and the three red "transit" lights should illuminate. Each green "lock" light should illuminate as the corresponding gear leg reaches the fully extended position. The pump motor should switch off simultaneously with the last gear leg reaching its fully extended position and the last "lock" light switching on. The hydraulic pressure gauge should indicate between 200 and 800 psi. Readjust the side brace microswitches if this condition is not met.

F. Emergency Gear Extension Test:

1. Retract the gear.

2. With the gear switch in the "UP" position, disengage the 40 Amp (or 25 Amp) hydraulic pump breaker, leaving the 5 Amp breaker engaged so the gear position lights can indicate when the gear is down.

3. Turn the remotely-mounted pressure relief valve handle pointer to the side position. This opens the valve, relieving the pressure on the high pressure side of the system and allowing the gear to free fall assisted by the extension springs. If a hand pump option has been installed, pump the gear down with the hand pump until all three green lights are illuminated and the gear extension pressure gauge indicates abqut 800 psi.

NOTE

When the release valve is opened for emergency gear extension, the force of the landing gear's free-fall creates a surge of hydraulic fluid from the gear retraction hydraulic lines into the hydraulic pump reservoir, resulting in a temporary overflow situation. An optional surge tank is available from Stoddard-Hamilton to capture the sudden flow of fluid before it reaches the pump reservoir, preventing an inconvenient fluid spill.

After the emergency gear extension system has been checked, turn the relief valve handle back to the forward (closed) position, move the gear switch to the "DOWN" position, and re-engage the hydraulic pump and control circuit breakers. Push up at the center pivot points of one of the main gear side braces to close the microswitch. This switches the hydraulic pump on momentarily, building pressure in the system so that the airplane can be safely lowered off the jacks.

H. Let the airplane down off the jacks.

I. Check for loose hardware and tools in the fuselage and wheel well areas.

J. Reinstall the seat pans, the center console, the kick panels, the baggage bulkhead, the belly panel, and the wing attach fitting covers.

K. Vacuum the cockpit area. Clean the windshield and the canopies.

L. Check the hydraulic fluid level and replenish, if necessary.

7-7.5 In-Flight Landing Gear Warning Horn Test

A. Slow the aircraft to 90 mph.
B. Add one notch of flaps with the landing gear retracted.
(the horn should sound)
C. Lower the landing gear.
(the horn should silence)
D. Retract the wheels.
(the horn should sound)
E. Retract the flaps.
(the horn should silence)
F. Return to normal flight.

7-7.6 Wings

A. Remove all inspection covers and the wing tips.

B. Check the wing tips for cracks and stress marks.

C. Check all wiring and plumbing for chafing and security.

D. Check all control rods, rod ends, and bellcranks for corrosion, safety, security, and chafing.

E. Check the flaps and ailerons for proper travel:
   1. Aileron travel: 19° Down, 21° Up (±1°).
   2. Flap travel: 0° to 34° Down (Standard Flaps);
      0° to 40° Down (Slotted Flaps).

F. Inspect the aileron and flap hinges, pushrods, and counterweights for security, chafing, and safety wiring. Lubricate as necessary. (Be sure the wiring in the wing tips cannot jam the aileron counterweights.)

G. Check the wing skins, the leading edge, and the wheel wells for cracks, stress marks, and delamination.

H. Check the fuel tank, the fuel lines, and the fuel gauge housing for leaks or contaminants.

I. Check the fuel filler caps for proper labeling.

J. Check all drain and vent holes for obstruction.

K. Check inside the wings for loose hardware and tools.

L. Reinstall the inspection covers and the wing tips.

7-7.7 Paperwork

Make sure the following documents are present, current, and properly displayed (if applicable):

A. Airworthiness Certificate.
B. Registration Certificate.
C. Weight and Balance.
D. Placards.
E. Radio Station License.
F. Logbook: make a log book entry, noting any discrepancies and other pertinent information. Sign off the annual condition inspection as required by the operating limitations imposed with your Experimental Airworthiness Certificate.

7-8 SERVICING

7-8.1 Oil System

CAUTION

Oil consumption tends to be higher during break-in periods on new engines. Prolonged flights should be avoided and oil level monitored closely during this period. New or newly overhauled engines should be operated on straight mineral oil for a minimum of 50 hours or until oil consumption has stabilized. After this period, a change to an approved additive oil may be made.

Consult the Lycoming Engine Operator's Manual or Lycoming Service Instruction 1014 J for the recommended grades of oil to be used.

The engine oil filler cap and dipstick are accessible through the access door on the right side of the upper engine cowling. Maximum oil sump capacity of Lycoming engines recommended for the Glasair Super 11-S **RG** is 8 quarts.

If the engine is not equipped with an external full flow oil filter, the oil should be changed and the oil suction and oil pressure screens cleaned and checked for metal particles every 50 hours.

If the engine is equipped with an external full flow oil filter and also an air filter, the oil change intervals may be increased to every 100 hours as long as the oil filter element is replaced every 50 hours. See Lycoming Service Instruction 1319 B. If the airplane does not have an air filter, change the oil every 50 hours.

To assure complete drainage of the engine oil, the engine should be at operating temperature.

We recommend keeping a record in the flight log of all oil added between changes. This practice monitors changes in oil consumption patterns that can serve as a warning of impending problems. An oil analysis performed at every oil change is another valuable tool for monitoring the engine's condition.

7-8.2 Battery

Check the electrolyte level of the battery after each 25 hours of engine operation. Add distilled water if necessary. Do not fill the battery cells above the bottom of the split ring. If the battery is filled when in a low state of charge, it will overflow when charged.

CAUTION

Excessive overcharging can cause heating and boiling.

Excessive water consumption may be an indication that the voltage regulator requires adjustment.

If an enclosed battery box is used, it must have a drain to eliminate liquids that might collect in the box and it must be vented overboard to dispose of hydrogen gas and electrolyte fumes that are discharged during normal operation. To ensure proper venting of the fumes and gas, inspect the vent tubes periodically for condition and obstructions. Also inspect the battery box drain tube.

7-8.3 Tires

Tire Specifications:

Main Gear:	5.00-5, 6 ply rating
Nose Gear:	**11 x 4.00-5, 8 ply**

Maintain an inflation pressure of 35 to 50 psi in the main wheel tires. Inflate the nose wheel tire to 50 psi.

Inspect the tires for breaks and cuts when inflating.

7-8.4 Landing Gear Oleo Struts

PRESSURIZING THE STRUTS

To pressurize the struts, the airplane must be jacked up to allow complete extension of the struts. Otherwise, if the struts are compressed, the fluid level will be above the level of the air valve.

Pressurize the main gear struts to 90 psi and the nose gear strut to 11O psi, using either nitrogen or Q.!Y compressed air.

WARNING

Never fill the shock struts with oxygen.

FILLING THE OLEO STRUTS

To fill the oleo struts, the airplane must be jacked up to allow complete strut extension.

With the strut fully extended, remove the air valve cap and use a suitable tool to depress the valve core. Allow the strut to fully deflate.

CAUTION

Cover the air valve with a rag while deflating the strut to protect the mechanic's face and eyes from hydraulic fluid that might spray out.

Remove the Schrader valve body assembly from the valve boss on the trunnion cylinder assembly.

Fill the oleo strut to within 1/2" of the level of the valve boss. Use type 15 hydraulic fluid **(Mil-H-5606).**

Because the hydraulic fluid must flow down through small holes in the metering piston, add the fluid slowly, giving it plenty of time to assume its new level. Air can also become trapped under the metering piston, leading to faulty fluid level indications. Shake the struts (very gently: the airplane is on jacks) or tap them to promote the elimination of any trapped air.

NOTE

It is desirable to have the fluid level slightly below the level of the valve assembly so that the person pressurizing the strut will not be sprayed with hydraulic fluid.

Reinstall the valve body assembly in the valve boss on the trunnion cylinder assembly, using Teflon thread sealant or Teflon tape on the threads.

Pressurize the struts, as described in the previous section.

Let the airplane down off the jacks.

NOTE

For a description of oleo strut service procedures, refer to the Glasair Oleo Strut Service Instructions (Part Number 632-0195-014) available from Stoddard-Hamilton Aircraft.

7-8.5 RG Hydraulic Pump

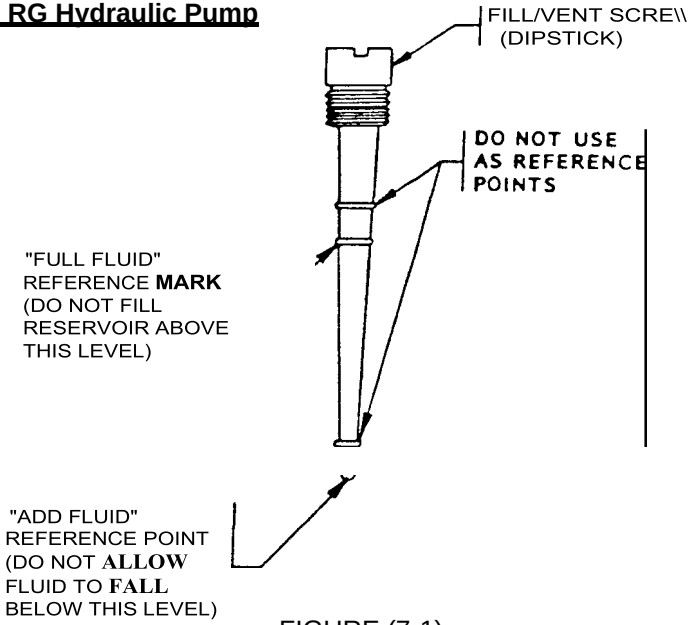


FIGURE (7-1)

Check the fluid level in the retractable gear hydraulic pump at least every 100 hours of flight time, or if indications (such as incomplete or sluggish retraction) suggest that the fluid level may have fallen. Use MIL-5606 hydraulic fluid in the hydraulic pump.

Do not thread the fill/vent screw into the hydraulic pump reservoir when checking the fluid level. Use the proper reference marks on the dipstick, as shown in FIGURE (7-1).

CAUTION

If the reservoir is filled above the "FULL" mark shown in FIGURE (7-1), damage to the pump seals could result. The uppermost mark on the dipstick is a reference for the fluid level when the dipstick is threaded into the pump and should not be used.

CAUTION

After checking the fluid level in the pump reservoir, thread the fill/vent screw (dipstick) all the way into the pump and then back it out one full turn to vent the reservoir. If the fill/vent screw is not backed out after bottoming, damage to the pump seals could result.

Some pilots may wish to tighten the fill/vent screw all the way to prevent spilling hydraulic fluid when performing negative G aerobatic maneuvers. If this is done, fill the pump reservoir only half full to provide an ample air cushion above the hydraulic fluid to help prevent damage to the pump. During all other flight operations, the pump must be vented.

7-8.6 Nose Gear Shimmy Damper

Inspect the nose gear shimmy damper friction material periodically for wear and damage.

To remove the friction collars for inspection of the friction material, remove the friction collar clamp bolts. Swing the forward clamp half out of the way, leaving it attached to the upper scissor.

Check that the friction material is well adhered to the strut, and replace any damaged material.

Reassemble the friction collars, leaving the clamp bolts loose. Connect the Stoddard-Hamilton RG tow bar (or equivalent 29-1/2" long lever) to the lower scissors pin, and hook a fisherman's scale (spring balance) to the "T" handle end of the tow bar. Measure the internal friction of the nose gear strut by lowering the tail of the aircraft and rotating (steering) the nose gear with the fisherman's scale on the end of the tow bar. Now adjust the tightness of the clamp bolts equally until the force required to steer the nose gear is 6 to 12 lb greater than the internal friction measurement.

NOTE

Make a check of the shimmy damper tightness as a part of every preflight inspection.

7-8.7 Brakes

The brake hydraulic fluid reservoir is mounted on an engine mount tube to simplify access for service and maintenance. Check the brake fluid level periodically and top it up if necessary.

There is no need to adjust the brakes since the brake pistons move to compensate for brake pad wear. Inspect the brake pads at every preflight, however, and replace them if worn excessively.

WARNING

The minimum brake lining thickness is 1/10". If the brake pads are excessively worn, the piston O-rings can protrude beyond the caliper housing, resulting in loss of hydraulic fluid and complete brake failure.

The Cleveland brakes supplied with Glasair kits use floating calipers, which are free to move from side to side, rather than being solidly attached to the torque plates. This provides for equal lining wear on both pieces of lining material. Periodically (at least at every annual inspection), check that the brake caliper assembly is free to float from side to side. Grasp the caliper and wiggle it back and forth (parallel to the wheel axle) to check for a little play. If no play is present, lubricate the caliper anchor pins and torque plate bushings with a dry lubricant such as silicone or graphite. If the anchor pins or torque plate bushings are dirty or corroded, disassemble the calipers, clean the anchor pins and bushings or remove corrosion with fine sandpaper, lubricate the anchor pins, and reassemble.

NOTE

Do NOT use any petroleum base lubricants (oil, grease, or WD-40) on the caliper anchor pins. Petroleum base lubricants are sticky and attract dust and dirt which can impede the floating action of the calipers.

BRAKE LINING REPLACEMENT

There is no need to jack the aircraft or disconnect the brake hydraulic lines to replace the brake linings.

You will need a brake lining installation tool and a new set of brake linings and rivets to fit your calipers. Brake linings are available from the Glasair Options Catalog.

STEP 1

Remove the safety wire and the two bolts that secure the back plate to the caliper housing.

> Do not confuse the caliper housing bolts with the anchor pin nuts. The caliper housing bolts are the farthest from the axle.

Remove the caliper back plate, with its piece of lining material attached. Slide the caliper housing away from the wheel in a direction parallel to the wheel axle until the anchor pins clear the torque plate bushings. Remove the pressure plate (the small metal plate with the other piece of brake lining material attached) by sliding it off the anchor pins of the brake caliper housing assembly.

Take the time now to push the caliper piston back into the caliper housing. The piston is the round piece that protrudes slightly from the caliper housing and is located under the pressure plate that was just removed. As the brake lining wears, the piston protrudes farther from the caliper housing. To accommodate the thickness of the new linings and permit assembly of the caliper to the brake disc, the piston must be pressed back into the housing. Hold the caliper housing in both hands and press the piston back in using both thumbs equally. Push the piston straight in to avoid unseating the piston O-rings. If the O-rings are unseated, loss of brake fluid or entry of air into the system may result.

NOTE

Do not press on the brake pedal while the caliper is disassembled. This will push the piston completely out of the caliper, causing a mess and resulting in further work to refill and bleed the brake system. We recommend placing a small clamp or band around the caliper to prevent the piston from accidentally popping out.

Slide the caliper anchor pins back into the torque plate bushings temporarily to support the caliper housing while the new lining material is being installed.

STEP2

Examine the pieces of lining material that are attached to the back plate and the pressure plate, noting the relationship of the pieces and the direction that the rivets are installed. Note that the head of the rivet fits into the counterbored side of the brake lining material and the tail of the rivet (the end that is formed during brake lining installation) fits into the counterbored side of the pressure plate or back plate.

STEP3

Place the back plate or pressure plate on a vise with the lining material down and with the rivets positioned over the gap between the vise jaws. Use a hammer and the punch supplied with the lining installation tool to drive each rivet out. Hammering with the punch uncrimps the tail end of the rivet and pushes it out of the assembly.

STEP4

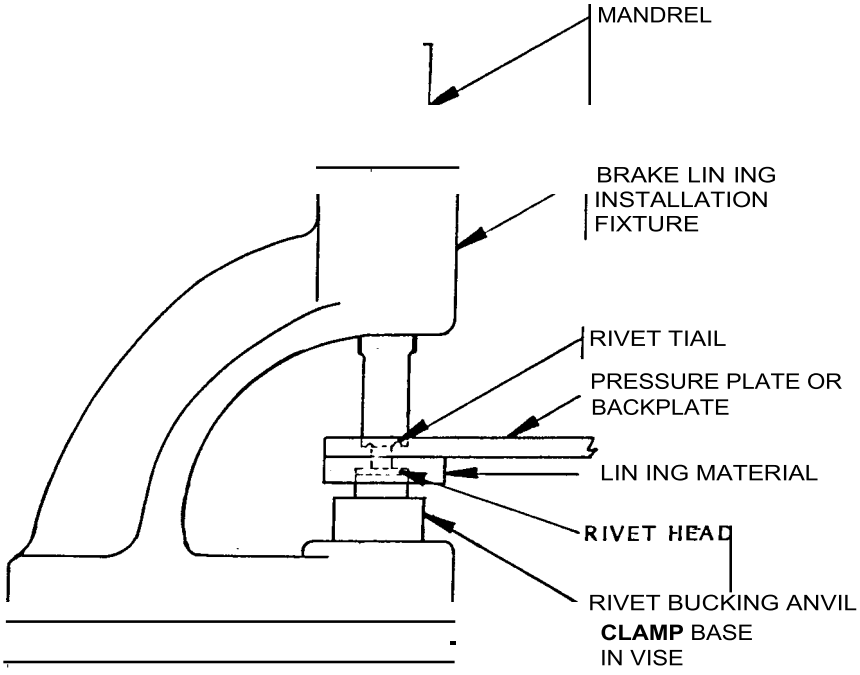


FIGURE **(7-2)**

Position the new lining material against the back plate or the pressure plate, making sure that the counterbores on both pieces are facing outward so that the rivets can be installed correctly. In other words, place the flat side of the lining material against the flat side of the pressure plate or back plate.

Insert a rivet into each of the holes in the lining material with the head of the rivet fitting into the counterbore in the lining. Clamp the rivet installation fixture in a vise, and place the plate and lining into the installation fixture with the head of the rivet down against the bucking anvil of the tool. Insert the rivet setting mandrel into the fixture with the mandrel contacting the rivet tail. Refer to FIGURE (7-2).

Support the plate and the lining in the installation fixture with one hand while hitting the mandrel with a hammer. Check the security of the lining frequently while proceeding. Stop when the lining is firmly attached to the plate (there is no movement when wiggled by hand) but before the lining begins to crack from over-driving. The brake plates are now ready for reassembly to the caliper housing.

STEPS

Slide the caliper housing off the torque plate where it was placed temporarily after disassembly. **Make** sure the piston is pushed all the way into the caliper housing, as mentioned previously.

Inspect the bores of the torque plate bushings for dirt or corrosion. Clean or use fine sandpaper to remove corrosion, if necessary. Do the same for the caliper housing anchor pins.

Lubricate the caliper housing anchor pins with silicone lubricant or with aerosol graphite spray. As mentioned previously, do NOT use a petroleum base lubricant.

Slide the pressure plate with its new lining material over the caliper housing anchor pins, with the pressure plate against the piston. Slide the caliper housing anchor pins into the torque plate bushings until the lining on the pressure plate contacts the brake disc.

Position the back plate with its new lining material against the other side of the disc and thread the two caliper housing bolts with their washers into the back plate from the opposite side of the caliper housing. Tighten the bolts to 90 inch-pounds. Safety wire the bolts using standard procedures.

STEP6

Check the brakes for firm pedal pressure and bleed the system if either brake feels spongy.

STEP7

To provide the maximum service life, the brake lining material must be properly broken-in by gently heat curing the resins, as described below. Excessive heat applied before curing will carburize the lining material, lowering the braking coefficient and reducing the service life of the linings.

To break-in the new brake lining material, perform a minimum of six stops from a speed of between 25 and 40 mph, using light pedal effort and letting the brakes cool partially (about one minute) between stops. This procedure generates enough heat to cure the resins in the lining, yet will not carburize the material by heating excessively. Once the linings are properly cured, they will provide many hours of maintenance free service.

7-8.8 Propeller

For constant speed propellers, instructions for propeller operation, servicing, and maintenance are contained in the propeller owner's manual furnished with the propeller.

WARNING

When servicing the propeller, always make sure that the magneto switch is off, the throttle is closed, the mixture is in the idle cutoff position, and the engine has cooled completely. Stand in the clear when moving a propeller. There is always some danger of a cylinder firing when the propeller is moved. The best procedure is to turn the propeller backwards, or counter-clockwise as viewed from the cockpit. This way the impulse coupling cam in the magneto cannot catch and fire a cylinder.

Daily Inspection

Inspect the blades for nicks, gouges, and cracks. Inspect the spinner and the visible hub parts for damage or cracks. Repair prior to the next flight. See the Propeller Owner's Manual for blade repair procedures.

Inspect for grease or oil leakage. Leaks would show up on the inside of the spinner or at the base of the blades next to the hub.

100 Hour Inspection

Remove the spinner.

Inspect the blades for nicks and gouges. Repair nicks and gouges using the procedures described in the propeller Owner's Manual. Always consider propeller balance when removing material from a blade.

Inspect hub parts for cracks or wear.

Check all visible parts for wear and safety.

Check the inside of the spinner and at the base of the blades next to the hub for evidence of oil and grease leaks.

Grease the propeller hub through the zerk fittings.

CAUTION

Consult the propeller Owner's Manual for proper lubrication procedures. On some propellers, one of the zerk fittings must be removed to avoid pressurizing the hub.

Make an entry in the propeller log book verifying the 100 hour inspection, and describing any maintenance performed.

7-8.9 Induction Air Filter

The Brackett air filter element used in the induction system is treated with a wetted agent to capture dust and repel water. The element has also been treated with a fire retardant. Replace the element every 200 hours of use or every 12 months or when it is difficult to see light through it due to foreign material. Clean with compressed air. Since the filter's effectiveness depends on its chemical treatment, do NOT wash and reuse it.

When operating under severely dusty conditions, check the element daily and replace it when needed.

7-8.10 Airframe care

The fiberglass composite structure of the Glasair Super 11-S RG should give many years of trouble free service. This structure is virtually corrosion free and, because all exterior surfaces are shielded from ultraviolet radiation by a special primer under the finish paint, exposure to sunlight is not a problem. Do not expose any unprotected fiberglass surfaces to direct sunlight for a prolonged time.

Extended exposure to the ultraviolet radiation in sunlight will cause the finish paint to oxidize, requiring buffing to restore the original gloss. If the airplane is to be tied down outside for an extended time, we recommend covering the wings, fuselage, and tail surfaces with protective slip covers to prevent finish paint oxidization.

Some minor surface cracking has occurred on the Stoddard-Hamilton prototypes. This cracking is usually just a cosmetic concern and not a structural problem. If surface cracks appear in the finish in a high stress or vibration area, however, it may indicate damage to the underlying structure. Check the fiberglass structure below the finish by sanding down to the fiberglass laminate. Do not sand into the laminate. If the fiberglass structure is damaged, it will have a white colored ridge or notch, indicating torn or compressed fibers. If no damage has occurred to the structure, the glass will be smooth and translucent. If damage has occurred, contact Stoddard-Hamilton for repair consultation.

To help keep the exterior finish in like new condition, it must be kept clean and waxed. Follow the paint manufacturer's recommendations for care. We recommend washing the airframe by hand. Flush away loose dirt with clean water and then wash with a mild soap and water solution, using a soft cleaning cloth. Rinse thoroughly with clean water to prevent build-up of a residue of cleaning solution.

CAUTION

If high pressure washing equipment is used, keep the stream of water away from wheel bearings, propeller hub bearings, pitot-static ports, electrical and avionics equipment, etc. Avoid directing the stream toward the wings and tail surfaces from the rear where the water can more easily enter the structure.

Wax the airframe with a high quality paste type wax. We recommend avoiding the use of waxes containing silicone. Silicone is very difficult to remove from a surface, even with solvents such as acetone, and its presence may inhibit a good bond in the event that airframe repair or finish touch-up is necessary.

7-8.11 Windshield and Canopies

Keep the windshield and canopy Plexiglas clean, and wax it with a Plexiglas polish such as Mirrorglaze. To prevent scratches, wash the windows carefully with plenty of mild soap and water solution, using the palm of the hand to feel and dislodge dirt and mud. A soft cloth, chamois, or sponge may be used but only to carry water to the surface. Rinse thoroughly and then dry with a clean moist chamois. Rubbing the surface of the plastic with a dry cloth builds up an electrostatic charge which attracts dust particles in the air.

Remove oil and grease with a cloth moistened with isopropyl alcohol. Never use gasoline, benzene, alcohol, acetone, carbon tetrachloride, lacquer thinner, or glass cleaner. These materials will soften the plastic and may cause it to craze.

After a thorough cleaning, wax the surface with a good grade of commercial wax (Mirrorglaze or similar). The wax will fill in minor scratches and help prevent further scratching. Apply a thin, even coat of wax and bring it to a high polish by rubbing lightly with a clean, dry, soft flannel cloth.

7-8.12 Engine Cleaning

Use standard, parts-cleaning solvent to clean the engine. Spray or brush the fluid over the engine, rinse thoroughly with water, and allow to dry. Engine degreasers may be used cautiously and should always be properly neutralized after use.

CAUTION

Pay particular attention to electrical equipment during engine cleaning. Do not allow cleaning fluids to enter the magnetos, the starter, the alternator, or the like. Cover all openings in such equipment before cleaning.

SECTION 8

FLIGHT TEST

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8-1 INTRODUCTION

Approach flight testing in a frame of mind of absolute seriousness, yet also in a relaxed, non-rushed way. If there is any advice we could give an anxious and excited builder, soon to become a Glasair pilot, it is this: DO NOT BE IN A HURRY! The first flight should be flown in an atmosphere of calm, not haste. You have too much time, money, and life invested in this project to make a mistake at this point, so slow down, and make each step a sure and calculated one.

It cannot be stressed enough at this time that the pilot be thoroughly familiar with all aspects of the Glasair Super 11-S RG: the airframe, weight and balance, canopies, control systems, engine, electrical system, fuel system, normal operating procedures, emergency procedures, and operating limitations. The pilot should have read and understood this entire Owner's Manual.

Aircraft homebuilders often concentrate all their time and effort on the completion of their project and let their flying skills get rusty. Obviously, this is not a good situation for someone about to test fly a high performance airplane. The new test pilot should have enough recent time in a fast, high performance, retractable gear airplane to feel comfortable. Any nervousness or tension interferes with a pilot's ability to safely control the airplane under normal circumstances, and inhibits appropriate reactions in an emergency.

Over half of all homebuilt accidents occur within the first 40 hours of operation. To help reduce the accident rate during the flight test period, Stoddard-Hamilton is proud to have participated in the development of FAA Advisory Circular 90-89, "Amateur Built Aircraft Flight Testing Handbook." We strongly recommend procuring a copy of AC 90-89, available from:

Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402.

8-2 GROUND TESTS

Prior to taxi testing, the engine should be run without the engine cowl in place so that oil leaks, fuel leaks, or vibration problems can be spotted and remedied immediately. Run the engine at various power settings from idle to maximum static rpm.

WARNING

Some Glasair builders have reported fuel contamination consisting of fine, powdery fiberglass particles restricting the carburetor or injector inlet filters enough to cause engine failure. During the initial systems checkout phase before engine run, flush the fuel tanks thoroughly with fuel until no contamination is evident. This can be accomplished by first flushing the tank with a few gallons of fuel at a time, draining it through the fuel tank drain port. Then completely fill and drain the tanks. An automotive fuel pump with a clear inline filter can temporarily be assembled as a tool to circulate the fuel back into the aircraft until the contamination clears. During engine operation, inspect and clean the fuel filters (both the firewall mounted fuel filter and the inlet filter to the carburetor or injector) every hour for the first four hours and every five hours after that until contamination clears up completely.

CAUTION

Make sure the airplane is adequately secured and the area around the propeller is clear of objects and small rocks. Have someone stand by with a fire extinguisher during initial engine runs.

Run the engine for short periods of time and monitor temperature gauges to avoid overheating the engine. Have helpers observe the engine and related systems from the outside while you control the engine and monitor the instruments from inside the cockpit.

During the initial engine runs, make sure that all the engine instruments and controls work properly. Check the oil pressure, the alternator output, left and right magneto drops, and the rpm drop with carb heat. Switch the magnetos off momentarily to check the magneto ground connections.

Adjust the idle rpm, and verify that, at higher power settings, leaning the mixture control produces a rise in exhaust gas temperature; otherwise, the mixture is too lean. **Make** sure there is a slight rise in rpm when the mixture control is moved to the idle cutoff position.

After each engine run, check every system very closely and remedy defects if necessary. Check all wiring, hose ducting, fuel and oil lines, etc. for excessive vibration or chafing. **Make** sure all plumbing and wiring is securely fastened with nylon ties, hose clamps, or the like.

Check the full power engine operation before flight is attempted. Perform the full power checks with the engine fully cowled and with the spinner installed. Point the airplane into the wind to assist engine cooling, tie it down securely, and chock the wheels for the full power tests. Verify that the engine runs smoothly and strongly at full power.

CAUTION

Make sure the ramp is clear of stones that can be picked up by the propeller, damaging it. We recommend tying up the nose gear scissors with a rope to prevent nose gear strut compression, ensuring maximum propeller clearance.

If your airplane has a new, remanufactured, or overhauled engine, it should receive the same start, warm-up, and preflight checks as any other engine. Using low power settings for cruise during the break-in period is NOT recommended. A good engine break-in requires that the oil film that lubricates the piston rings and cylinder walls break down slightly and allow some wear to occur. This wear, or seating of the rings with the cylinder walls, will occur only with the use of non-detergent (straight mineral) oil and when pressures inside the cylinders are great enough to cause expansion of the piston rings. Pressures inside the cylinder become great enough only when power settings above 65% are used.

Full power for take-off and climb is not harmful; it is beneficial, although engine temperatures should be monitored closely to ensure that overheating does not occur. Use cruise power settings of 70% to 75% of rated power for the first 50 hours, or until oil consumption stabilizes, to achieve a good engine break-in.

Unfortunately, however, the initial ground checks of engine operation, as well as subsequent taxi tests, are characterized by relatively low power settings, which may not allow proper seating of the piston rings, and reduced cooling air flow, which may cause overheating and cylinder wall glazing. Piston rings that fail to seat and cylinder wall glazing can result in elevated cylinder head temperatures and excessive oil consumption.

One solution to this problem is to have an overhaul shop break in your engine on a test stand before installing it in your Glasair. This has the additional advantage of assuring you that the engine is sound before attempting flight. The ground tests described above will then verify that the engine functions properly as installed in the airframe.

8-3 TAXI TESTING

8-3.1 Low Speed Taxi

After the static engine tests are complete and any defects have been remedied, low speed taxi testing should be begun. To start with, sit in the cockpit and adjust your height and leg space from seat back to rudder pedals so that you're comfortable with the controls while maintaining maximum visibility.

Take the time to become familiar enough with instrument and control locations so that you do not have to spend time hunting for them. Check the operation of all your flight controls, engine controls, instrumentation, etc. Everything should operate smoothly with no binding or interference.

Make sure that all air has been bled out of the brakes and they are working properly before starting the engine. Low speed taxiing may be done with the canopies open for cooling on hot days. The pilot should use the lap belt and shoulder harness any time the airplane is moving.

The purpose of low speed taxi testing is to give the pilot a feel for steering by differential braking, and to reveal any defects in the landing gear before flight. The initial taxi testing should be done at no more than the speed of a fast walk to become familiar with the ground handling characteristics of the airplane and the space needed to maneuver.

Inspect the landing gear thoroughly between taxi tests, checking for such defects as loose wheel bearings, low oleo strut pressure, or improper adjustment of the nose gear shimmy damper. Check for any sign of the shimmy damper friction material deteriorating or coming loose.

8-3.2 High Speed Taxi

As taxi testing continues, gradually increase the taxi speed as you feel confident and comfortable to do so. Wear your parachute for the high speed taxi runs, not only to get used to wearing it, but also because of the possibility of a high speed taxi test turning into an unintentional first flight. This is not an uncommon occurrence but, with careful planning, it should not happen. To avoid an unintentional first flight, do not exceed 50 mph during high speed taxi tests.

CAUTION

The problem with an unintentional first flight arises when the excited pilot tries to get the airplane back on the ground. If for some reason you do lift off, do not try to force the airplane back on the ground. Level off gently and ease the power off, allowing the airplane to settle back to the runway. Bleed off airspeed and flare to a normal, main wheel first landing.

High speed taxi testing should be done on a long airport runway (at least 4000-5000 ft). Practice steering by tracking the runway centerline.

Do not make large, jerky control inputs. The airplane responds better, and you are less likely to get into trouble with smooth, steady, firm control pressures.

At 25-30 mph the aerodynamic controls begin to become effective; as the speed builds, try picking up the nose wheel to get a feel for the elevator control. Develop a smooth touch on the rudder pedals during the transition from low speed steering (with brakes) to high speed steering (aerodynamic rudder control) and back. Try runs with no flaps and with one notch of flaps (15°) to get a feel for the difference. Notice the rudder inputs necessary to counteract engine torque as power is applied.

Weight and balance is always a concern with a new homebuilt. Since errors in calculations are easy to make, a pilot preparing to fly an airplane should make specific tests to double check the CG. On the Glasair, the landing gear is located in a position that allows the pilot to lift the nose during taxi testing at the higher speeds.

If the nose can easily be lifted at speeds below 25 to 30 miles per hour, the CG could be too far aft and should be recalculated. If the nose wheel cannot be lifted off the ground until 50 or 60 miles per hour, the CG could be too far forward.

An aft CG could be much more dangerous than a forward CG because of the possibility of a stall-spin entry that is too flat for recovery. Also, pitch sensitivity may increase with an extreme aft CG.

An extreme forward CG can also be critical if a take off is attempted without enough elevator to rotate and not enough runway to stop. Also, if flight were achieved, a very high-speed landing might have to be made to prevent running out of elevator control.

CAUTION

Monitor the engine gauges during taxi testing. Stop and let the engine cool if there is any sign of overheating. Keep an eye on all of the other aircraft components, as testing continues, and remedy any problems that occur. Try to use the brakes as little as possible. Prolonged taxi tests or heavy brake usage can glaze the brake pads, or worse, cause a fire.

The most valuable thing you will have learned during the high speed taxi testing is how the airplane feels just prior to lift off speed. You should have learned what kind of input is required on the rudder pedals for directional control, when the elevator becomes effective, and also gained a general confidence in your own ability to react and adjust to handling the Glasair. When you feel confident in this area, you are almost ready for take off, and have part of the landing technique under control.

NOTE

Remove the engine cowl after the first hour of taxi testing and re-check the engine and all engine related systems.

The FAA requires one hour of logged taxi time on the airplane before they will sign off the aircraft log book and issue a Limited Duration Experimental Airworthiness Certificate. We recommend breaking the hour into short segments to avoid overheating the engine or the brakes.

8-4 FINAL INSPECTION

After one hour of taxi testing has been logged on the aircraft, it is time to submit your APPLICATION FOR AIRWORTHINESS CERTIFICATE and request an inspection by the FAA.

So as not to waste the FAA inspector's time, you should be absolutely certain that the airplane is ready when you call for the inspection. We recommend having an independent inspection performed by a knowledgeable person, such as an EAA designee, before calling for the FAA inspector.

Often, builders are so familiar with their projects that they will overlook deficiencies that are obvious to an unbiased observer. Any such deficiencies should be remedied before the FAA inspector arrives, otherwise the Airworthiness Certificate could be denied. Keep in mind that the primary objective of the inspections is not just to verify compliance with the law, but to ensure safety.

In addition to inspecting for acceptable workmanship and construction practices, the inspector will check the airplane for the minimum required instrumentation (see FAR 91.33), instrument range markings, ELT installation, pilot and passenger restraints, properly marked N-number, and the appropriate permanently installed placards.

The placards required for certification of an experimental amateur built aircraft are:

1. The word **"EXPERIMENTAL",** in 2" high block letters, displayed near each entrance to the cabin.

2. A permanently installed, fireproof identification plate that is permanently stamped or engraved with the information required by FAR 45.13. The data plate must be located on the exterior of the aircraft, either just aft of the entry door or on the fuselage near the tail surfaces and must be legible to a person standing on the ground.

3. A Passenger Warning Placard, permanently installed in the cockpit in full view of all the occupants with the words: **"PASSENGER WARNING--THIS AIRCRAFT IS AMATEUR BUiIT AND DOES NOT COMPLY WITH FEDERAL SAFETY REGULATIONS FOR STANDARD AIRCRAFT."**

You should also have the following documents ready for the inspector:

1. Application for Airworthiness Certificate, FAA form 8130-6.

2. Enough data (such as photographs or a 3-view drawing) to identify the aircraft.

3. An Aircraft Registration Certificate, AC Form 8050-3, or the pink copy of the Aircraft Registration Application, AC Form 8050-1.

4. A statement setting forth the purpose for which the aircraft is to be used; i.e. "Operating an amateur-built aircraft." The statement should include the estimated duration of the test period, and the areas over which the test will take place.

5. A notarized statement that the applicant fabricated and assembled the major portion of the aircraft for education or recreation, and has the evidence to support the statement available to the FAA upon request. A construction log maintained by the builder, including photographs taken as major components are completed, will be acceptable verification that the builder constructed the major portion of the aircraft.

6. Weight and balance data.

7. The Glasair Instruction Manuals with each section completion box checked off.

8. An aircraft log book with evidence of inspections, such as log book entries signed by the builder describing all inspections conducted during construction of the aircraft. This will verify that the construction has been accomplished in accordance with acceptable workmanship methods, techniques, and practices.

If no deficiencies are found in the aircraft, and if all the documents are in order, you will be issued a Limited Duration Experimental Airworthiness Certificate and Operating Limitations that will permit you to begin flight testing.

For a complete discussion of the certification and operation of amateur-built aircraft, obtain a copy of FAA Advisory Circular 20-27D. To request a free copy of this advisory circular, write to:

U.S. Department of Transportation
Utilization and Storage Section **M443.2**
Washington, D.C. 20590

8-5 FIRST FLIGHT

IMPORTANT CONSIDERATIONS:

1. The pilot should be confident in complex, high performance aircraft, with at least 10 hours of recent flight time, and should feel comfortable with high speed taxi in the Glasair.

2. The weather should be calm and clear.

3. Emergency procedures should be memorized and rehearsed mentally. The pilot should be familiar with open areas in the flight test vicinity for use as possible emergency landing sites.

4. Don't let a crowd gather and make you anxious and nervous. On the other hand, don't test fly alone. Recruit a small ground crew, consisting of a friend or two with a hand-held radio, to provide immediate assistance in the event of an emergency, but don't make the mistake of letting everyone come. You'll be much more calm and more level-headed.

5. If you are at a controlled airfield, plan your first flight when the airport is least busy. Early morning is usually best.

6. You should have 4,000 to 5,000 ft of runway for the first flight.

7. Check oil and fuel quantities and perform a very thorough pre-flight inspection. The stall strips should be securely taped in place on the leading edges of the wing.

8. Carry ballast (adequately secured), if necessary to keep the CG in the middle of its allowed range.

9. Wear a parachute and practice getting out of the airplane quickly.

After you feel confident with your high speed taxi tests and all systems look good, you are ready for your first take off and flight. Again, you should have good weather, no wind, and clear skies.

NOTE

Your first few flights should be accomplished with about half fuel; 15 to 20 gallons is fine. This is enough fuel to remain airborne for awhile, but not enough to add unnecessary weight to the airframe.

For the first take off, follow the normal take off procedures described in Section 4-6 of this manual. Align the airplane with the centerline of the runway, select the first notch of flaps (15°), and smoothly apply full power, adding right rudder as necessary to correct for engine torque effects. As the airplane accelerates through 50 mph, ease in a little aft stick to raise the nose; the airplane will fly itself off when it is ready. Any serious control problems should be immediately evident as soon as the airplane is airborne. If anything seems amiss, reduce power and land on the remaining runway.

NOTE

We recommend leaving the gear extended for the entire first flight. The purpose of the first flight is to verify that the engine and primary control systems are functioning normally, to begin to establish a familiarity with the feel of the controls, and to note any necessary changes in control rigging or trim. Leaving the gear down eliminates one item of concern and simplifies the pilot's work load in the event that a problem is encountered during the flight.

If the airplane seems controllable at lift off, allow the airplane to accelerate to at least 80 mph. Continue to climb straight out until at least 500 ft AGL is reached.

Retract the flaps when the climb is stabilized and the airplane is clear of all obstacles on initial climb-out. Make a gentle 180° turn to downwind and continue to climb out to 5000 ft AGL over the airfield. Once the first downwind turn is completed, turn off the fuel boost pump and trim the plane for a 130 mph climb. Keep monitoring the operating temperatures. Reduce power and level off if temperatures during climb-out become excessive. If temperatures continue to rise, return to the airfield and troubleshoot the problem.

Be alert to any peculiar noises, vibrations, or binding in the control systems. Keep an eye on all engine gauges during these initial flights. Remember these first few flights are training sessions for the pilot and test flights for the aircraft. The slightest unusual vibration, noise, or deviation from normal should be investigated. The airplane will be "talking" to you; be sure to listen.

When 5000 ft AGL is reached, level off while reducing power to hold altitude and maintain an easy cruise of about 130 mph. (140 mph is the maximum speed with the gear extended.) Keep within gliding range of the airport. It's best to stay directly over the field so you can spiral down if needed. Because of the Glasair Super 11-S RG's high wing loading, the sink rate is high with the gear down and power off.

Try to trim the airplane for hands off flying and note any tendency for the airplane to roll or skid. Adjust the rudder and aileron trim tabs when on the ground after the first flight.

Because the gear is left down and the resulting airspeeds are low, it will not be possible to fine tune the elevator trim until later flights.

Once you begin to feel comfortable with the feel of the airplane at cruise airspeed and are satisfied with the engine operation and temperatures, gradually reduce power to idle and re-trim the airplane for the landing configuration. Set the airplane up for an imaginary 110 mph downwind leg at 5000 ft, pull one notch of flaps (15°), turn the fuel boost pump on, and check carb heat. Trim the airplane for an 85 mph glide and try a few shallow turns to get a feel for the handling at low airspeeds. Add power, retract the flaps, and climb back to 5000 ft AGL.

Now, try a few gentle stalls. Make sure the area is clear of other traffic. Reduce power and allow the speed to bleed off by gently applying aft stick. Approach the stall slowly and cautiously and wait until a slight buffet is felt. Note the indicated airspeed and recover with forward stick and power. Catch any tendency for a wing to drop with top rudder. Stabilize the airplane in flight and repeat the stall procedure to verify the previous airspeed indication. Keep the minimum approach speed in the pattern between 1.3 and 1.4 times the indicated stall speed until completely comfortable with the Glasair's low speed handling characteristics.

The first flight should not exceed 15-20 minutes duration. After the stall speed has been established, continue to practice slow flight maneuvers at different flap settings while descending to the airport. You must know the airplane's stall speed and be familiar with the slow flight handling in order to make a confident approach and landing.

When back at the airport at pattern altitude, enter downwind and land, using the normal procedures described in Section 4-13. During the early flights and until the pilot becomes comfortable with the Glasair's handling, it is advisable to use the high end of the normal speed ranges recommended for the landing pattern.

We advise using full flaps for landing. Full flaps provide a nose-down attitude and allow a high, steep approach that keeps the airplane within gliding distance of the runway for safety in the event of a power problem. The nose-down attitude also provides better visibility of the runway throughout final approach.

After the first flight, remove the upper and lower engine cowling and all inspection cover plates. Give the entire aircraft a general inspection. Check the engine compartment for leaks, wiring problems, hot spots on the lower cowl near the exhaust, etc. Correct any problems.

Repeat this inspection procedure after each of the first **4** or 5 flights or until you are absolutely satisfied that no problems exist. We recommend that you remain within gliding distance of the field until you have a minimum of five hours on the airplane.

Inspect the fuel filter after the first flight and every hour of flight time after that until **4** or 5 hours have accumulated, and then every 5 hours until 25 hours have accumulated or until any contamination clears up completely. Fine fiberglass particles from construction procedures can remain in the fuel tank for several hours of flight time before they are all flushed out.

Adjust rudder and aileron trim tabs, if necessary, and adjust the stall strips to correct for a tendency for a wing to drop during the stall. (Consult the STALL STRIP INSTALLATION subdivision in the Final Assembly Section of the Instruction Manuals.)

8-6 FURTHER FLIGHT TESTING

8-6.1 General

In subsequent test flights, as the pilot becomes more familiar with the airplane, more of the airplane's systems may be tested and the known performance envelope may be expanded. During the next couple of flights, the test pilot should continue to explore the handling characteristics at both low and high speeds, and to make further trim adjustments if necessary. The pilot will also begin to become more comfortable with takeoffs and landings.

The purpose of the flight test period, in accordance with FAR 91.42(b), is to demonstrate that the airplane is controllable throughout its normal range of speeds and for all maneuvers to be executed, and has no hazardous operating characteristics, design features, or construction shortcomings.

Design and plan an organized flight test program to verify compliance with part 91.42(b).

8-6.2 Gear Retraction Test

Sometime during one of the first few test flights, after the rest of the aircraft systems are determined to be working well, the retraction of the gear may be tested.

NOTE

A successful retraction test should have been performed with the airplane on jacks before attempting to retract the gear in flight.

With the airplane in level flight below the maximum extension speed (140 mph), move the gear switch to the "UP" position. Each green light should switch off as the corresponding gear strut leaves the extended position. All three red lights should illuminate when the first gear strut leaves the fully extended position. The pressure switch in the retraction system should switch off the pump when the gear is fully retracted.

Confirm that all three red lights go out as the gear reaches the fully retracted position. A transit light that remains on may indicate that a gear strut is hanging partially out of its well; or it could simply mean that the position of the transit microswitch needs adjustment.

It is helpful to have another aircraft fly alongside to check the fit-up of the gear doors. If you do this, make sure that both pilots are proficient in formation flight; the two pilots should discuss and thoroughly understand all aspects of the flight plan before takeoff.

Even though the gear doors may fit well when tested on the jacks, the air loads in flight may cause a door to hang open slightly. It may be necessary to adjust door linkage, actuating cylinders, or even to change the positions of the side brace brackets slightly to achieve a good door fit-up. Attainment of the maximum possible speed and efficiency is highly dependent on a tight fit of the gear doors.

With the gear retracted, hydraulic pressure in the system can rise as high as 2200 psi before the thermal pressure relief valve in the pump actuates to reduce the pressure to around 1200 to 1800 psi. If the pressure rises above 2200 psi, reduce airspeed and lower the gear. Retract the gear again to determine if the pressure subsequently rises as high again. If the pressure will not stay below 2200 psi, the thermal pressure relief valve in the pump mechanism is faulty and needs to be readjusted or replaced.

The ability of the hydraulic system to hold the gear in the retracted position should have been tested on the jack stands before flight, but should also be checked during the flight test period. When the gear is retracted, the hydraulic pressure should bleed down very slowly with the pump cycling for only a few seconds every 30 to 60 minutes to counteract any internal pressure loss through the hydraulic actuating cylinders. There should be no external leaks in the system.

8-6.3 Gear Extension Test

Test the extension of the gear at altitude early in the gear operation test flight, so that if there is a problem with the gear extension, there will be time to remedy the problem before landing. Remember that maximum gear operation speed is 140 MPH. When the landing gear is extended, you should hear the characteristic "clunk" of the nose gear when it locks, indicating that the emergency gear down gas spring is working. The nose wheel green light should typically be the first one to come on.

If, during gear extension, all three green lights do not come on, use the lamp test switch to confirm that the bulb is not burned out or that there is not some other defect in the lamp circuit. Promote the gear's extension by side slipping and/or pulling positive Gs. Contact the control tower or another aircraft to confirm gear extension if your indicator lights are inoperative.

8-6.4 Emergency Gear Extension Test

Refer also to the Emergency Procedures Section for a description of emergency gear extension procedures.

To test the standard emergency gear extension system (or if there is an actual problem with the electrical or hydraulic system), switch off the 40 Amp main pump breaker (25 Amp for some pumps), leaving the 5 Amp control breaker in.

Turn the valve handle 90° to the emergency gear extension position. Watch the pressure gauge to confirm relief of pressure.

After the relief valve is opened, give the gear time to extend. Use the gear indicator lights to check the status of the gear's extension. If one or both of the main struts do not lock down (red lights on, green lights off), promote the gear's extension by side-slipping (step on the red light) and/or gently pulling some Gs.

To test the emergency gear extension system for an airplane equipped with the optional, emergency gear extension hand pump, move the gear switch to the down position and pull the large hydraulic pump circuit breaker, leaving the 5 Amp control breaker in. Turn the emergency extension release valve handle to the side position (this opens the release valve). Pull the hand pump handle to the extended position and pump until 800 psi (maximum) is indicated on the pressure gauge and the gear indicator lights show that all three gear are fully extended (three green lights). Leave the emergency extension pressure release valve in the open position.

NOTE

When the release valve is opened for emergency gear extension, the force of the landing gear's free-fall creates a surge of hydraulic fluid from the gear retraction hydraulic lines into the hydraulic pump reservoir, resulting in a temporary overflow situation. We recommend installing the optional surge tank (available from Stoddard-Hamilton) to capture the sudden flow of fluid before it reaches the pump reservoir, preventing an inconvenient fluid spill.

8-6.5 Envelope Expansion

You are flight testing a brand new airplane and you should treat it as a one-of-a-kind first prototype. Do not assume that your airplane will have exactly the same characteristics as our prototype or someone else's airplane. Minor builder modifications or slight variations could cause large differences in flight performance, handling, CG range, etc.

Approach this phase of flight testing very carefully and cautiously. The following conditions should be met before expanding the flight envelope of your airplane:

1. Stall strips adjusted and permanently installed.
2. All control surfaces properly balanced to ensure against flutter.
3. Trim tabs adjusted properly.
4. Pitot/static system calibrated, if necessary.

Once the above conditions are met, the aircraft can be flown above 200 mph IAS. We recommend increasing the airspeed in 1O mph increments on each succeeding flight or until you feel absolutely comfortable with the trim and handling of your Glasair. Do not push red line on your first flight.

As you increase speed, be particularly vigilant in watching for other aircraft. The Glasair Super 11-S RG's speed can be deceiving. Other aircraft can become a threat much more quickly than you are used to.

As mentioned earlier, your initial flight testing should be done with about 15 to 20 gallons of fuel on board. Once you feel confident with your ability to handle the airplane, increase the amount of fuel carried until you are flying with full fuel. Try switching from the main tank to the header tank. It is best to be within gliding distance of the airport when initially switching tanks to verify fuel system operation.

Also, ballast the airplane to shift the location of the CG fore and aft to gradually explore the handling of the airplane throughout the permitted range of CG locations.

WARNING

If ballast is used to adjust the CG location, be absolutely certain that it is securely restrained so that it cannot shift and interfere with the controls.

You do not need to expand your CG limits right away on the first few flights. Take your time; you have a lot of required flight time to log before you can leave your designated 25 mile radius test area. Make the best use of your time, learning as much about your plane as possible.

Explore the flap performance envelope. You should know your airplane's stall speeds when clean, and at each flap setting. Practice retracting the flaps smoothly and slowly while getting used to the pitch changes.

Do not feel obligated to expand your flight envelope to the limitations given in this handbook. The limitations given are those demonstrated by the designer; you may choose to restrict these limits as you determine, based on your own limitations and experience.

NOTE

Wear a currently repacked parachute for all flight testing, and know how to use it.

8-6.6 Aerobatics

After the normal handling characteristics of the airplane have been explored and you feel completely comfortable with the control and operation of the airplane, aerobatics may be attempted, if desired. Log all the aerobatic maneuvers performed. When the flight test period has been completed, and you apply for the unlimited duration airworthiness certificate, you can request that the operating limitations be amended to permit those aerobatic maneuvers that you have logged. The inspector may also request an actual flight demonstration of the maneuvers. If you are unfamiliar with aerobatics, the operating limitations can be amended at a later time, after you have received proper instruction and gained some experience.

NOTE

Consult the Limitations Section of this manual for a further discussion of aerobatics.

8-7 FINAL CERTIFICATION

After the flight testing period has been completed, the builder may submit an application for an unlimited duration airworthiness certificate. The aircraft flight log, with a record of the completed flight testing, should be submitted along with Form 8130-6 (Application for Airworthiness Certificate).

With the issuance of the unlimited duration airworthiness certificate, an operating limitation requiring a condition inspection at 12 month intervals is imposed. The aircraft builder can be certified as a repairman to enable him to perform the condition inspection. Specific information regarding repairman certification can be found in AC 65-23, Certification of Repairmen (Experimental Aircraft Builders).

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SECTION 9

SAFETY INFORMATION

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9-1 INTRODUCTION

Like any other high performance airplane, the Glasair Super 11-S RG can be operated efficiently and safely only in the hands of a skilled pilot. This safety information is provided to refresh the pilot's knowledge of a number of safety subjects. These subjects should be reviewed periodically.

Topics in this section and other safety related issues are dealt with more fully in FAA Documents and other articles pertaining to the subject of safe flying. The safe pilot should be familiar with this literature.

The Glasair Super 11-S RG is designed to provide many years of safe and efficient transportation. By maintaining and flying the airplane prudently, its fullest potential will be realized.

It is mandatory that you fully understand the contents of this manual; that FAA requirements for ratings, certification, and review be scrupulously complied with; and that you allow only persons who are properly licensed and rated and thoroughly familiar with the contents of this Owner's Manual to operate the aircraft.

9-2 GENERAL

As a pilot, you are responsible to yourself and to those who fly with you, to other pilots and their passengers, and to people on the ground to fly wisely and safely.

The following material in this Safety Section covers several subjects in limited detail. Here are some General Do's and Don'ts:

Be thoroughly familiar with your airplane, know its limitations and your own.

Be current in your airplane, or fly with a qualified instructor until you are current/proficient.

Pre-plan all aspects of your flight--including weather and adequate fuel reserves.

Use services available--weather briefing, in-flight weather, and Flight Service Stations.

Carefully preflight your airplane.

Use the Check Lists in this manual.

Have more than enough fuel for takeoff, plus the trip, and an adequate reserve.

Be sure your weight loading and CG are within limits.

Pilot and passenger must use seat belts and shoulder harnesses at all times.

Be sure all loose articles and baggage are secured.

Check freedom of all controls during preflight inspection and before takeoff.

Maintain the prescribed airspeeds in takeoff, climb, descent, and landing.

Avoid large airplane wake turbulence.

Practice emergency procedures at safe altitudes and airspeeds, preferably with a qualified instructor pilot, until the required action is instinctive.

Keep your airplane in good mechanical condition.

Stay informed and alert; fly in a sensible manner.

DON'TS

Don't attempt takeoff with frost, ice, or snow on the airframe.

Don't take off with less than minimum recommended fuel plus adequate reserves, and don't run the tank dry before switching.

Don't fly in a reckless, show-off, careless manner.

Don't fly near thunderstorms or severe weather.

Don't fly in possible icing conditions. Don't fly close to mountainous terrain.

Don't apply controls abruptly or with high forces that could exceed design loads of the airplane.

Don't carry passengers during the flight test period. 11 illegal.

Don't fly into weather conditions that are beyond your ratings or current proficiency.

Don't attempt any takeoff or landing without using the check list.

Don't fly when physically or mentally exhausted or below par.

Don't trust to luck.

9-3 GENERAL SOURCES OF INFORMATION

A wealth of information created for the sole purpose of making flying safer, easier, and faster is available to the pilot. Take advantage of this information and be prepared for an emergency in the remote event that one should occur.

You, as a pilot, have responsibilities under government regulations. These are designed for your protection and the protection of your passengers. Compliance is mandatory.

9-3.1 Rules and Regulations

FAR Part 91, General Operating and Flight Rules. is a document of law governing operation of aircraft and the owner's and pilot's responsibilities. This document covers such subjects as:

Responsibility and authority of the pilot-in-command.
Certificates required.
Alcohol and other drugs.
Flight plans.
Pre-flight action.
Fuel requirements.
Flight rules.
Maintenance, preventive maintenance, alterations, inspection, and maintenance records.

These are only some of the topics covered. The owner and the pilot are responsible for compliance with all requirements of FAR Part 91.

9-3.2 Airworthiness Directives

FAR Part 39 specifies that no person may operate a product to which an airworthiness directive issued by the FAA applies, except in accordance with the requirements of that airworthiness directive. Since the Glasair is an Experimental airplane, no airworthiness directives apply to the airframe. The builder/pilot must comply, however, with any airworthiness directives that apply to certified engines, engine-related accessories, or propellers.

9-3.3 Airman Information, Advisories, and Notices

Airman's Information Manual

The Airman's Information Manual **(AIM)** is designed to provide airmen with basic flight information and ATC procedures for use in the national airspace system of the United States. It also contains items of interest to pilots concerning health and medical facts, factors affecting flight safety, a pilot/controller glossary of terms used in the Air Traffic Control System, information on safety, and accident and hazard reporting. It is revised at six month intervals and can be purchased locally or from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

The subjects discussed in the AIM are:

Controlled Air Space
Services Available to Pilots
Radio Phraseology and Technique
Airport Operations
Clearances and Separations
Pre-flight
Departures-IFR
En Route-IFR
Arrival-IFR
Emergency Procedures
Weather and Icing
Mountain Flying
Wake Turbulence-Vortices
Medical Facts for Pilots
Bird Hazards
Good Operating Practices
Airport Location Directory

All pilots must be thoroughly familiar with and use the infonnation in the **AIM.**

Advisory Information

NOTAMS (Notices to Ainnen) are documents that have information of a time-critical nature that would affect a pilot's decision to make a flight, such as an airport closed, terminal radar out of service, en route navigational aids out of service, etc.

Airmen can subscribe to services to obtain FAA NOTAMS and Airman Advisories, and these are also available at FAA Flight Service Stations.

FAA Advisory Circulars

The FAA issues advisory circulars to inform the aviation public of non-regulatory material of interest. Advisory Circulars contain information with which the prudent pilot should be familiar. A complete list of current FAA advisory circulars is published in Advisory Circular AC00-2, which lists advisory circulars that are for sale, as well as those distributed free of charge, and provides ordering information. Many advisory circulars which are for sale can be purchased locally in aviation bookstores or at FBOs.

FAA Advisory Circular 20-27D, which describes homebuilt aircraft certification and registration requirements and procedures, should be of particular interest to a Glasair builder. AC 20-27D is available free of charge from:

U.S. Department of Transportation
Utilization and Storage Section M443.2
Washington, DC 20590

Also highly recommended is AC 90-89, "Amateur-Built Aircraft Flight Testing Handbook". AC 90-89 is available from:

Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402.

FAA General Aviation News

FAA General Aviation News is published by the FAA in the interest of flight safety. The magazine is designed to promote safety in the air by calling the attention of general aviation airmen to current technical, regulatory, and procedural matters affecting the safe operation of aircraft. FAA General Aviation News is sold on subscription by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

9-4 GENERAL INFORMATION ON SPECIFIC TOPICS

9-4.1 Flight Planning

FAR Part 91 requires that, before beginning a flight, each pilot in command familiarize himself with all available information concerning that flight. Thorough flight planning is especially important in the Glasair Super 11-S RG because its high cruise speed makes it more difficult for a pilot to keep ahead of the airplane.

For the purpose of filing a flight plan, the FAA designation for the Glasair Super 11-S RG is GL-20.

Obtain a current and complete preflight briefing. This should consist of local, en route, and destination weather, and en route navaid information. En route terrain and obstructions, alternate airports, airport runways active, length of runways, and takeoff and landing distances required for expected conditions should be known.

The prudent pilot will review his planned en route track and stations, and make a list for quick reference. It is strongly recommended that a flight plan be filed with Flight Service Stations, even though the flight may be VFR. Also, advise Flight Service Stations of changes or delays of one hour or more, and remember to close the flight plan at destination.

The pilot must be completely familiar with the performance of the airplane and performance data in the Owner's Manual. The resultant effect of temperature and pressure altitude must be taken into account in determining performance if not accounted for on the charts. This Owner's Manual should be aboard the airplane at all times.

9-4.2 Maintenance Inspections

In addition to maintenance inspections and preflight information required by FAR Part 91, a complete preflight inspection is imperative. It is the responsibility of the owner and the operator to assure that the airplane is maintained in an airworthy condition and that proper maintenance records are kept.

This manual includes a checklist which must be followed for the preflight inspection. USE THE CHECKLIST!

9-4.3 Flight Operations

General

The pilot must be thoroughly familiar with all information published by Stoddard-Hamilton concerning the airplane, and must operate the aircraft in compliance with all limitations imposed by the Owner's Manual.

Coordination with Slower Traffic

Use courtesy when operating your high performance Glasair Super 11-S RG in the traffic pattern and when in the vicinity of much slower aircraft. If you cannot safely maintain speed to match that of other aircraft in the pattern, communicate to them that you will fly a wide, higher speed pattern.

Turbulent Weather

A complete and current weather briefing is a requirement for a safe trip.

Updating of weather information en route is also essential. The wise pilot knows that weather conditions can change quickly and treats weather forecasting as professional advice, rather than absolute fact. He obtains all the advice he can, but stays alert to any sign or report of changing conditions.

Thunderstorms, squall lines, and violent turbulence should be regarded as extremely dangerous and must be avoided. Hail and tornadic wind velocities encountered in thunderstorms can destroy any airplane, just as tornadoes destroy nearly everything in their path on the ground.

A roll cloud ahead of a squall line or thunderstorm is visible evidence of violent turbulence; the absence of a roll cloud, however, should not be interpreted as a sign that severe turbulence is not present.

Even though flight in severe turbulence must be avoided, flight in turbulent air may be encountered unexpectedly under certain conditions.

The following recommendations should be observed for airplane operation in turbulent air:

1. Flying through turbulent air presents two basic problems, the solution to both of which is proper airspeed. On one hand, if you maintain an excessive airspeed, you run the risk of structural damage or failure; on the other hand, if your airspeed is too low, you may stall.

2. If moderate to severe turbulence is encountered, reduce speed to the maneuvering speed (145 mph). This speed gives the best assurance of avoiding excessive stress loads and provides the proper margin against inadvertent stalls due to gusts.

3. Beware of over-controlling in attempting to correct for changes in attitude; applying control pressure abruptly will build up G-forces rapidly and could cause structural damage or even failure. Particularly watch your angle of bank, making turns as wide and shallow as possible. Be equally cautious in applying forward or back pressure to keep the nose level. Maintain straight and level attitude in either up or down drafts. Use trim sparingly to avoid being grossly out of trim as the vertical air columns change velocity and direction. If necessary to avoid excessive airspeed, lower the gear.

4. Be sure that your seat belt and shoulder harnesses are snug. You will be unable to control the aircraft in turbulence unless you are firmly restrained in your seat.

Flight in Icing Conditions

Flight in icing conditions is prohibited in the Glasair Super 11-S RG. The Glasair must not be exposed to icing encounters of any intensity. If the airplane is inadvertently flown into icing conditions, the pilot must make an immediate diversion by flying out of the area of visible moisture or going to an altitude where icing is not encountered. These same precautions apply to any aircraft without operational anti-ice and/or deice equipment.

Flight in the Vicinity of Thunderstorms

The FAR Part 23 Airworthiness Standards for Normal, Utility, and Acrobatic Category Airplanes require that the airplane's structure be protected from the catastrophic effects of lightning, and that the airplane's fuel system be designed to prevent the ignition of fuel vapor by lightning.

WARNING

The Glasair Super 11-S RG, because of its composite structure which is transparent to an electrical charge, does not comply with FAR Part 23 Standards for lightning protection. For this reason, the Glasair Super 11-S RG is prohibited from flight in conditions that would expose the airplane to the possibility of a lightning strike.

Mountain Flying

Pilots flying in mountainous areas should inform themselves of all aspects of mountain flying, including the effects of topographic features on weather conditions. **Many** good articles have been published, and a synopsis of mountain flying operations is included in the FAA Airman's Information Manual, Part One.

Avoid flight at low altitude over mountainous terrain, particularly near the lee slopes. If the wind velocity near the level of the ridge is in excess of 25 knots and approximately perpendicular to the ridge, mountain wave conditions are likely over and near the lee slopes. If the wind velocity at the level of the ridge exceeds 50 knots, a strong mountain wave is probable with extreme up and down drafts and severe turbulence.

Standing lenticular clouds are visible signs that a mountain wave exists, but their presence is dependent on moisture. Mountain wave turbulence can, of course, occur in dry air and the absence of such clouds should not be taken as any assurance that mountain wave turbulence will not be encountered.

The worst turbulence will be encountered in and below the rotor zone, which is usually 8 to 1O miles downwind from the ridge. This zone is sometimes characterized by the presence of "roll clouds", but only if sufficient moisture is present.

A mountain wave downdraft may exceed the climb capability of your airplane. Avoid mountain wave downdrafts.

VFR--Low Ceilings

If you are not instrument rated, do not attempt "VFR on top" or "Special VFR" flight. Being caught above a solid cloud layer when an emergency descent is required (or at destination) is an extremely hazardous position for the VFR pilot. Accepting a clearance out of certain airport control zones with no minimum ceiling and one mile visibility, as permitted with "Special VFR", is a foolish practice for the VFR pilot.

Avoid areas of low ceilings and restricted visibility unless you are instrument rated and proficient and have an instrument equipped airplane. Then proceed with caution and with planned alternates.

The Glasair Super 11-S RG is a poor "scud runner". Operating the Super 11-S RG in marginal VFR conditions is not advised. Obstacles, terrain, and areas of IFR conditions are very difficult to avoid when operating at high cruise speeds at low altitude in poor visibility conditions. Conversely, when the speed is lowered to increase maneuverability, the nose angle increases, making forward visibility equally difficult.

VFR at Night

When flying VFR at night, in addition to the altitude appropriate for the direction of flight, pilots should maintain a safe minimum altitude as dictated by terrain, obstacles such as TV towers, or communities in the area flown. This is especially true in mountainous terrain, where there is usually very little ground reference. Minimum clearance is 2,000 feet above the highest obstacle en route.

Do not depend on your ability to see obstacles in time to miss them. Flight on dark nights over sparsely populated country can be the same as IFR, and must be avoided by inexperienced or non-IFR rated pilots.

Bird Strikes

The "See and Avoid" principle applies to birds as well as to other aircraft. It becomes increasingly difficult, however, for a pilot to spot and avoid birds at speeds above 200 mph. At these speeds, the Glasair Super 11-S RG encounters birds so suddenly that they are unable to react quickly enough to get out of the way.

We recommend, therefore, that the Glasair Super 11-S RG not be operated in the vicinity of known bird gathering areas, i.e. landfills, shorelines, nesting areas, and, in general, low altitudes. With greater altitude fewer birds will be encountered.

Vertigo--Disorientation

Disorientation can occur in a variety of ways. During flight, inner ear balancing mechanisms are subjected to varied forces not normally experienced on the ground. This, combined with loss of outside visual reference, can cause vertigo. False interpretations (illusions) result, and may confuse the pilot's perception of the attitude and position of his airplane.

Under VFR conditions, the visual sense, using the horizon as a reference, can override the illusions. Under low visibility conditions (night, fog, clouds, haze, etc.) the illusions predominate. Only through awareness of these illusions, and proficiency in instrument flight procedures, can an airplane be operated safely in a low visibility environment.

Flying in fog, dense haze or dust, cloud banks, or very low visibility, with strobe lights or rotating beacons turned on can contribute to vertigo. Strobe lights and beacons should be turned off in these conditions, particularly at night.

All pilots should check the weather and use good judgment in planning flights. The VFR pilot should use extra caution in avoiding low visibility conditions.

Motion sickness often precedes or accompanies disorientation and may further jeopardize the flight.

Disorientation in low visibility conditions is not limited to VFR pilots. Although IFR pilots are trained to use their instruments as an artificial visual reference in place of a visual horizon, they may still experience vertigo. This can happen when the pilot's physical condition will not permit him to concentrate on his instruments, when the pilot is not proficient in flying instrument conditions in the airplane he is flying, or when the pilot's work load is increased by such factors as turbulence or equipment failure.

Even an instrument rated pilot encountering instrument conditions, intentionally or unintentionally, should ask himself whether or not he is sufficiently alert and proficient in the airplane he is flying to fly under low visibility conditions and the turbulence anticipated or encountered. If any doubt exists, the flight should not be made or it should be discontinued as soon as possible.

The result of vertigo is loss of control of the airplane. If the loss of control is sustained, it will result in an excessive speed accident. Excessive speed accidents occur in one of two manners: either as an in-flight airframe separation or as a high speed ground impact. All pilots are susceptible to this form of accident.

We recommend lowering the landing gear if the pilot finds himself in IFR conditions which approach the limits of his capabilities or ratings. Lowering the gear in IFR conditions, or during flight in severe turbulence, tends to stabilize the aircraft, assists in maintaining proper airspeed, and will reduce the possibility of reaching excessive airspeeds with catastrophic consequences, even where loss of control is experienced.

Descent

In piston powered airplanes, it is necessary to avoid prolonged descents with low power, as this produces two problems:

1. Excessively cool cylinder head temperatures which cause premature engine wear, and

2. Excessively rich mixtures due to idle enrichment (and altitude) which causes soot and lead deposits on the spark plugs (fouling).

The second of these is the more serious consideration; the engine may not respond to the throttle when it is desired to discontinue the descent.

Both problems are amenable to one solution: maintain adequate power to keep cylinder head temperatures in the "green" range during descent, and lean to best power mixture (that is, progressively enrich the mixture from cruise only slightly as altitude decreases). This procedure will lengthen the descent, of course, and requires some advance planning.

If it is necessary to make a prolonged descent at or near idle, as in practicing forced landings, at least avoid the problem of fouled spark plugs by frequently advancing the throttle until the engine runs smoothly and by maintaining an appropriate mixture setting with altitude.

Vortices--Wake Turbulence

Every airplane generates wake turbulence while in flight. Part of this is from the propeller or jet engine, and part from the wing tip vortices. The larger and heavier the airplane, the more pronounced and turbulent the wakes will be. Wing tip vortices from large, heavy airplanes are very severe at close range, degenerating with time, wind, and distance. In tests, vortex velocities of 133 knots have been recorded.

Encountering the rolling effect of wing tip vortices within two minutes after passage of large airplanes is most hazardous to light airplanes. This roll effect can exceed the maximum counter roll available in a light airplane.

The turbulent areas may remain for as long as three minutes or more, depending on wind conditions, and may extend several miles beyond the airplane. Plan to fly slightly above and to the windward side of the other airplanes. Because of the wide variety of conditions that can be encountered, there is no set rule to follow to avoid wake turbulence in all situations. The Airman's Information Manual and Advisory Circular 90-23, "Aircraft Wake Turbulence", provide a thorough discussion of the factors you should be aware of when wake turbulence may be encountered.

Take-off and Landing Conditions

Taxiing in deep snow or slush can result in a build-up inside the wheel wells. This can affect weight and balance or may freeze at altitude, preventing proper landing gear extension. When taking off on runways covered with water or freezing slush, the landing gear should remain extended for approximately ten seconds longer than normal, allowing the wheels to spin and dissipate the freezing moisture. The landing gear should then be cycled up, then down for approximately five seconds, and then retracted again. Caution must be exercised to ensure that this entire operation is performed below Maximum Landing Gear Operating Airspeed (140 mph).

Landing on runways covered by water or slush which cause hydroplaning, or landing on snow and ice covered runways is hazardous because of reduced braking effectiveness and reduced directional control due to insufficient surface friction. The pilot should also be alert to the possibility of the brakes freezing when operating the airplane on snowy or slushy runways.

Use caution when taking off or landing during gusty wind conditions. In particular, be aware of the special wind conditions caused by buildings or other obstructions located near the runway in a crosswind pattern.

9-4.4 Medical Facts for Pilots

General

When the pilot enters the airplane, he or she becomes an integral part of the flight system. The pilot is just as essential to a successful flight as the control surfaces. To ignore the pilot in preflight planning would be as senseless as failing to inspect the integrity of the control surfaces or any other vital part of the machine. The pilot has the sole responsibility for determining his or her own reliability prior to entering the airplane for flight. When piloting an airplane, an individual should be free of conditions that reduce alertness, impede the ability to make correct decisions, or slow reaction time.

Fatigue

Fatigue generally slows reaction times and causes errors due to inattention. In addition to the most common cause of fatigue (insufficient rest and loss of sleep), recent illness, the pressures of business, financial worries, and family problems can be important contributing factors. If you are tired, don't fly.

Hypoxia

Hypoxia is a lack of sufficient oxygen to keep the brain and other body tissues functioning properly. There is a wide individual variation in susceptibility to hypoxia. In addition to progressively insufficient oxygen at higher altitudes, anything interfering with the supply of oxygen to the brain, such as anemia, atherosclerosis, high blood pressure, certain drugs, and postural changes (twisting the head, for example, can block blood supply to the brain) can contribute to hypoxia. Persons who have recently overindulged in alcohol, who are moderate to heavy smokers, or who take certain drugs, may be more susceptible to hypoxia. Susceptibility may also vary in the same individual from day to day or even morning to evening.

It is impossible to predict when or where hypoxia will occur during a given flight, or how it will manifest itself. Some of the common symptoms of hypoxia are increased breathing rate, a light-headed or dizzy sensation, tingling sensation, sweating, reduced visual field (tunnel vision), sleepiness, blue coloring of the skin, fingernails, or lips (cyanosis), and behavior changes. Some people with hypoxia feel clammy and cold.

A particularly dangerous feature of hypoxia is an increased sense of well-being, called euphoria. It obscures a person's ability and desire to be critical of himself, slows reaction time, and impairs thinking ability. Consequently, a hypoxic individual often believes things are getting progressively better while he nears total collapse.

The symptoms are slow but progressive, insidious in onset, and are most marked at altitudes starting above ten thousand feet. Night vision, however, can be impaired starting as low as 5,000 feet.

Use oxygen on flights above 10,000 feet and at any time when symptoms appear. Should symptoms occur that cannot definitely be identified as either hypoxia or hyperventilation, try three or four deep breaths of oxygen. The symptoms should improve markedly if the condition was hypoxia (recovery from hypoxia is rapid).

Hyperventilation

Hyperventilation, or over-breathing, is a disturbance of respiration that may occur in individuals as a result of emotional tension or anxiety. Under conditions of emotional stress, fright, or pain, breathing rate may increase, causing increased lung ventilation. Since there is no corresponding increase in the carbon dioxide output of the body cells, carbon dioxide is "washed out" of the blood.

The most common symptoms of hyperventilation are tingling sensations around the mouth followed by tingling of the hands, legs, and feet, dizziness, faintness, hot and cold sensations, muscle spasms, nausea, sleepiness, and, finally, unconsciousness. If the symptoms persist, discontinue use of oxygen and consciously slow your breathing rate until symptoms clear, and then resume a normal breathing rate. Normal breathing can be aided by talking aloud.

Alcohol

Common sense and scientific evidence dictate that you must not fly while under the influence of alcohol. Even in small amounts alcohol produces, among other things, a dulling of critical judgment, a decreased sense of responsibility, diminished skill reactions and coordination, decreased speed and strength of muscular reflexes, decreases in efficiency of eye movements during reading, increased frequency of errors, constriction of visual fields, impaired night vision, loss of efficiency of sense of touch, decrease of memory and reasoning ability, increased susceptibility to fatigue and decreased attention span, decreased relevance of response, and increased self-confidence with decreased insight into immediate capabilities.

Tests have shown that pilots commit major errors of judgment and procedure at blood alcohol levels substantially less than the minimum legal levels of intoxication for most states. These tests further show a continuation of impairment from alcohol up to as many as 14 hours after consumption. The body metabolizes ingested alcohol at a rate of about one-third of an ounce per hour. Even after the body completely destroys a moderate amount of alcohol, a pilot can still be severely impaired for many hours by hangover.

The effects of alcohol on the body are magnified at altitude, as 2 oz. of alcohol at 18,000 feet produce the same adverse effects as 6 oz. at sea level. In other words, "the higher you get, the higher you get".

Because of the slow destruction of alcohol by the body, a pilot may still be under the influence eight hours after drinking a moderate amount of alcohol. Therefore, an excellent rule is to allow at least 12 to 24 hours between "bottle and throttle", depending on the amount of alcoholic beverage consumed. Even then, recent tests have shown that judgment and performance are affected after blood alcohol levels have returned to normal.

Self-medication or taking medicine in any form when you are flying can be extremely hazardous. Even simple home or over-the-counter remedies and drugs, such as aspirin, antihistamines, cold tablets, cough mixtures, laxatives, tranquilizers, and appetite suppressors, may seriously impair the judgment and coordination needed while flying. The safest rule is to take no medicine before or while flying, except after consultation with your Aviation Medical Examiner.

Scuba Diving

Flying shortly after any prolonged scuba diving could be dangerous. Under the increased pressure of the water, excess nitrogen is absorbed into your system. If sufficient time has not elapsed for your system to rid itself of this excess gas prior to takeoff, you may experience the bends at altitudes even under 10,000 feet where most light planes fly.

Carbon Monoxide and Night Vision

The presence of carbon monoxide results in hypoxia which will affect night vision in the same manner and extent as hypoxia from high altitudes. Even small levels of carbon monoxide have the same effect as an altitude increase of 8,000 to 10,000 feet. Smoking several cigarettes can result in a carbon monoxide saturation sufficient to affect visual sensitivity equal to an increase of 8,000 feet altitude.

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