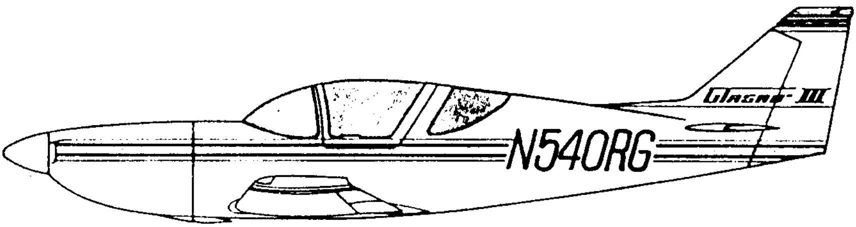
GLASAIR III

Model SH-3R



OWNER'S MANUAL

Aircraft Serial #__________

Manual P/N 633-0130-101

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SECTION 1

GENERAL INFORMATION

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1-1 INTRODUCTION

Thank you for selecting a Glasair III kit aircraft-- the most complete, highest performance composite kit available. We hope that flying it is a safe, rewarding, and enjoyable experience for you. The sole purpose of this manual is to help you with the safe and efficient operation of your Glasair III aircraft.

The Glasair III is a high performance two-place, low-wing, retractable gear aircraft, with an airframe made entirely from female molded fiberglass composite components.

The Glasair III 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 also for its exceptional efficiency of operation. The excellent high speed performance is complemented by good slow flight characteristics and an honest, predictable stall. The Glasair III's comfortable side-by-side seating, ample baggage capacity, and good range make it an unparalleled cross-country traveller. Due 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 III the ultimate in performance and versatility.

1-2 PILOT ABILITY

The Glasair III is a very high performance airplane. To safely operate the Glasair III, pilots need the necessary skills and confidence to operate and control the airplane automatically or by second nature. Avoiding traffic and planning which way to point the aircraft far enough in advance will occupy much of the pilot's thoughts.

This extremely fast airplane is heavy, yet very responsive. Because the Glasair III operates at such high speeds, the wing area is the same as the Glasair II RG, yet the empty weight is approximately five hundred pounds greater. The power-off sink rate is over 1500 feet per minute. On take-off roll, the Glasair III is in a similar performance category as many WWII fighters, and can be though of as a lightweight P-51 Mustang.

Although you may have dreamed of being at the controls of such an airplane, please be honest with yourself about your experience and ability. Unless you have adequate experience, we strongly advise all Glasair III pilots to initially fly the airplane with extended wing tips during the "training phase." The longer wing should allow you to make reasonably slower approaches and feel more comfortable during this phase. You should remove the wing tip extensions only when you feel comfortable and confident enough to do so.

FAA Regulations

Although few people seem to be aware of the fact, FAR 61.31(e) provides that to act as pilot in command of an aircraft of greater than 200 hp, or an aircraft with retractable gear, flaps, and a controllable propeller, the pilot must have received flight instruction from a certified flight instructor and obtained the proper high performance endorsement to his license.

According to these regulations, the Glasair III is a high performance aircraft requiring an endorsement.

Familiarization Rides

There is one last step you can take to confirm your ability to fly the Glasair you have chosen to build. In addition to test flights prior to purchase, Stoddard-Hamilton Aircraft offers familiarization rides to its customers who are ready to take their first flight in their own Glasair.

We strongly urge all Glasair builders to schedule a trip to our facilities (when your aircraft is finished) to fly one of our demonstration models with a factory representative and become familiar with the handling characteristics of the airplane. Why test yourself and your newly built Glasair III 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, nor a training manual.

This manual should be read thoroughly and carefully by the owner and 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 judgement 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.

The owner and operator should be familiar with the Federal Aviation Regulations applicable to the operation and maintenance of an airplane, and 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 in regards to powerplants, propellers, etc., which includes any parts not manufactured by Stoddard-Hamilton Aircraft. Revisions or Service Bulletins issued by Stoddard-Hamilton that are mandatory in nature must be complied with.

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.

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 good mechanic. Thorough, careful construction, continued maintenance, and diligent practice during the early phases of flight familiarization are mandatory.

The information contained in this manual refers to the Glasair III aircraft (Model SH-3R) built according to the appropriate Instruction Manuals (Volumes I and II). Any homebuilder 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 Glasair III prototype, N540RG. 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 III 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 updates 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 are the "Log of Revisions" pages. The Log of Revisions pages list all revisions to the manual by a revision letter and date. Revisions to pages of this manual are indicated by a revision letter and a revision date at the bottom of the page along with the page number. After receiving a revision, remove all the obsolete pages and insert the revised pages. Insert the latest "Log of Revisions" page on top of the previous one, behind the title page. Discard the obsolete pages.

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.

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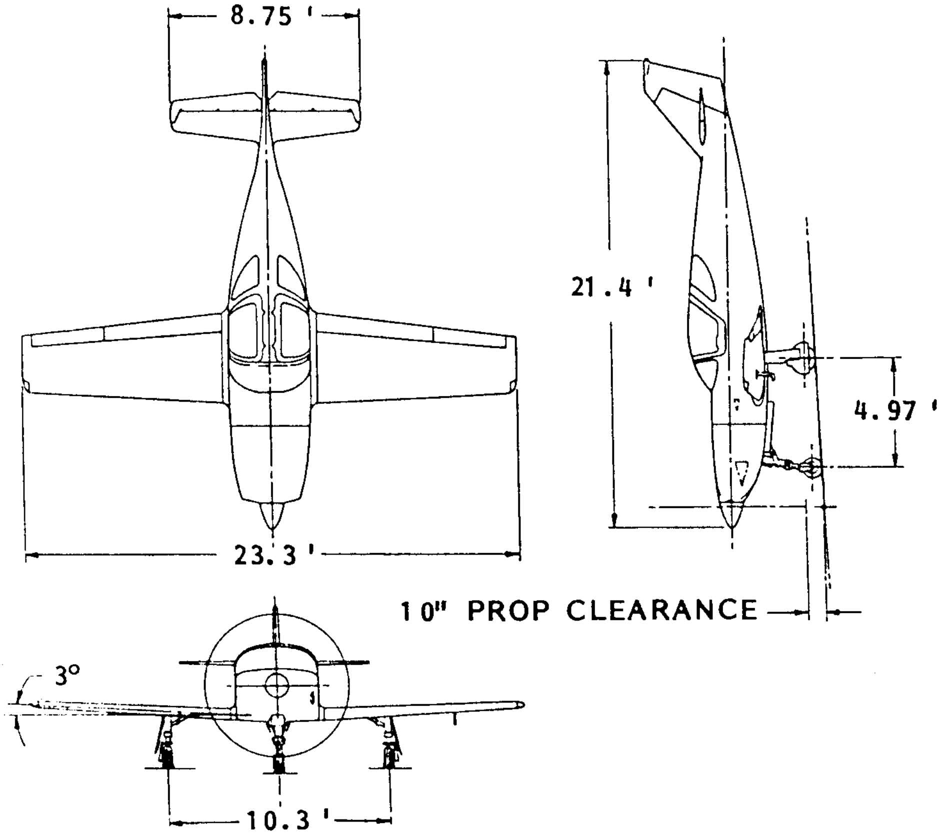
1-7 AIRPLANE THREE VIEW



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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	6.67
With Wing Tip Extensions	7.64
Length Overall	21.4 ft.
Height Overall (w/o propeller)	7.2 ft.
Wheel Base	4.97 ft.
Wheel Span (Track)	10.3 ft.
Cabin Width	42 in.
Baggage Space	12 $ft.^3$
Gross Weight:	
Normal	2400 lb.
Normal with wing tip extensions	2500 lb.
Aerobatic (no wing tip extensions)	2120 lb.
Empty Weight (approx.)	1550 lb.
Useful Load (approx.)	850 lb.
Baggage Capacity (max.)	100 lb.

Wing Loading (gross). . . . . .29.52 lb./ft^2
    With Wing Tip Extensions . . . . . . .27.3 lb./ft^2

Fuel Capacity:
    Main Wing Tank . . . . .53 gal. (424 lb.)
    Header Tank. . . . . 8 gal. (48 lb.)
    Optional Tip Extensions. . . . .11 gal. (66 lb.)

Oil Capacity. . . . . .12 qt. (22.5 lb.)

Seats 2

Tire Size:
    Main Gear. . . . . 5.00 X 5
    Nose Gear. . . . . 11.400 X 5

1-9 PERFORMANCE DATA*

Top Speed (Sea level) . . . . .294 mph

Cruise Speed (75% power @ 8000 ft.) . . . . . . .282 mph

Rate of climb (from sea level):
Solo. . . . . .3750 ft/min
Gross . . . . .2400 ft/min

Stall Speeds:
Clean (V_s), Solo. . . . . 74 mph
Flaps Down (V_{so}), Solo. . . . . 70 mph
Flaps Down (V_{so}), Gross . . . . 78 mph

Recommended Glide Speed (engine out)
Gear Up. . . . . .140 mph**
Gear Down. . . . . .120 mph**

Best Rate of Climb Speed (V_y). . . . . 130 mph

Best Angle of Climb Speed (V_x). . . . . .100 mph

Approach Speeds . . . . 95 mph

Never Exceed Speed (V_{ne}). . . . . .335 mph

Maneuvering Speed (V_a). . . . . .201 mph

Maximum Structural Cruising Speed (V_{no}) . . . . .280 mph

Maximum Flap Extension Speed (V_{fe}). . . . . . . .120 mph

Maximum Gear Extended Speed (V_{le}) . . . . .140 mph

Maximum Gear Operating Speed (V_{lo}). . . . . . . .140 mph

Structural Limit Loads at 2400 lb. gross weight (2500 lb. with wing tip extensions):
Positive. . . . . .3.8 G's
Negative. . . . . .1.0 G's

Structural Limit Loads at 2120 lb. aerobatic weight:
Positive. . . . . .6.0 G's
Negative. . . . . .4.0 G's

Range at 55% power (approx.). . . . . 1300 miles

Service ceiling (approx.) . . . . 24,000 ft.

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

Takeoff Ground Roll***
Solo (1900 lb.). . . . . .600 ft.
Gross (2400 lb.). . . . . .900 ft.

Landing Ground Roll***
Solo. . . . . 700 ft.
Gross . . . . 850 ft.

* These figures are based on the Stoddard-Hamilton prototype N540RG equipped with a 300 horsepower Lycoming IO-540 engine, a Hartzell constant speed propeller, and standard wing span. With wing tip extensions installed, the stall speeds and approach speeds are reduced by about 6 mph, the rate of climb is increased by about 100 ft./min, and the roll rate is reduced by 50°/sec. The performance of a different airplane will vary depending on engine horsepower, propeller choice, aircraft payload, airframe construction, and pilot ability.

** This is the approximate airspeed that provides the maximum glide range for the prototype Glasair III when loaded to about 2000 lbs. gross. The best glide airspeed will vary somewhat for each individual airplane depending on a variety of factors. To achieve the maximum engine-out glide range, the propeller must be pulled back to coarse pitch. Keep in mind also that the best glide airspeed goes up as the aircraft weight increases, and the maximum glide range will be significantly affected by such external factors as headwinds, tailwinds, downdrafts, etc.

*** These figures are based on a dry paved strip at 138 ft. (MSL) altitude, with little wind present, and a temperature of 62° F. Maximum braking was applied as soon as the nose wheel touched down for all landings. On takeoffs, the brakes were held to full power and then released. For normal operations, the landing and take off distances are typically about twice as long as listed here. The figures will vary with payload, temperature, surface of field, altitude, and pilot ability.

1-10 SYMBOLS, ABBREVIATIONS, AND TERMINOLOGY

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.
V_a	Maneuvering Speed is the maximum speed at which application of full available aerodynamic control will not overstress the airplane.

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

V_{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.

V_{ne} Never Exceed Speed is the speed limit that may not be exceeded at any time.

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

V_{s} Stalling Speed or the minimum steady flight speed at which the airplane is controllable.

V_{so} Stalling Speed or the minimum steady flight speed at which the airplane is controllable in the landing configuration.

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

V_{y} Best Rate-of-Climb Speed is the airspeed which delivers the greatest gain in altitude in the shortest possible time.

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.
MAC	MAC (mean aerodynamic chord) is defined as 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

V_{ne}	= 335 mph	Do not exceed this speed in any operation.
V_{a}	= 201 mph	Do not make full or abrupt control movements above this speed.
V_{no}	= 280 mph	Do not exceed this speed except in smooth air and then only with caution.
V_{fe}	= 120 mph	Do not extend flaps or operate with flaps extended above this speed.
V_{le}	= 140 mph	Do not operate with gear extended above this speed, except in emergency.
V_{lo}	= 140 mph	Do not retract or extend the landing gear above this speed, except in emergency.

NOTE

Definitions of these airspeeds are given in FAR Part 1, paragraph 1.2. All airspeeds are calibrated airspeeds (CAS). During flight test, the airspeed indicator should be calibrated so as to distinguish indicated airspeeds (IAS) from calibrated airspeeds (CAS). 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 CAS above 200 knots. The differences between IAS, CAS, and EAS are determined by experiment.

2-2 AIRSPEED INDICATOR MARKINGS

WHITE ARC. 78 to 120 mph
(Full Flap Operating Range)

GREEN ARC. 82 to 280 mph
(Normal Operating Range)

YELLOW ARC . . . . .280 to 335 mph
(Operate with Caution; Only in Smooth Air)

RED LINE . . . . .335 mph
(Maximum Speed for All Operations)

2-3 POWERPLANT LIMITATIONS

2-3.1 Approved Engines

Engines approved for the Glasair RG are:

250, 260, 290, or 300 hp Lycoming IO-540 engines with a straight air inlet housing mounted on the aft side of the oil sump. To fit the Glasair III engine mount, the engine must be fitted with the small engine mount brackets (mounting "ears", Lycoming p/n 71047).

Also, the oil level gauge must be of the cam-action type (Lycoming p/n 76897) used with the 2.19", short oil filler extension (Lycoming p/n 74313). This combination is used on the K and G series engines with the tuned sumps.

The third items that may need to be changed are the fuel manifold bracket and the tube assemblies from the fuel manifold to the injector nozzles. To provide clearance from the cowling, the fuel manifold bracket must be the type that mounts the fuel manifold to the right side and below the crankcase center split joint.

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 245° F.
Yellow Arc. . . . . 100° F. to 160° F.

2-3.4 Fuel Pressure

Boost pump pressure limits to injector inlet:

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

2-3.5 Cylinder Head Temperature

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

2-3.6 Tachometer

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

2-4 VACUUM PRESSURE GAUGE

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

2-5 WEIGHT LIMITS

Maximum Take-off/Landing Weight (Gross). . . . .2400 lb.
With Wing Tip Extensions. . . . . .2500 lb.

Maximum Baggage Weight . . . . 100 lb.

WARNING

These figures are dependent 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, the CG should be computed to determine whether the aircraft is within safe CG limits.

2-6 CENTER OF GRAVITY LIMITS (LANDING GEAR EXTENDED)

Forward Limit. . . . . Station 79.65
Aft Limit. . . . . Station 87.88

The reference datum point is 60.0 inches forward of the firewall/cowling split line.

2-7 FLIGHT LOAD FACTORS

At the 2400 lb. gross weight (or 2500 lb. with wing tip extensions) the G limits are:

+3.8 G's
-1.0 G's

At an aerobatic weight of 2120 pounds, the G limits are:

+6 G's
-4 G's

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, 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 III is not a competition class aerobatic aircraft. It was designed as a sport aerobatic type plane. Maneuvers capable in the Glasair III 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. Immelmans
10. Reverse cuban eights
11. Outside turns
12. Continuous rolls
13. Inverted flight
14. Half outside loops (from the bottom)
15. Cloverleafs
16. Vertical eights

NOTE

These listed aerobatic maneuvers are maneuvers that can be performed in the Glasair III. Pilot ability and skill will determine whether they can be accomplished safely. Do not expect that 10 hours of dual aerobatic instruction time in a Cessna 152 Aerobat or Citabria will prepare you for flying the Glasair III aerobatically. You should fly a Pitts or an Eagle and become proficient in it before attempting any serious aerobatics in the Glasair III. 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.

W A R N I N G

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

W A R N I N G

Since the Glasair III is a high performance aircraft, aerobatics are to be approached with caution and only after prior dual instruction from an expert aerobatic instructor. The aircraft has such a low drag coefficient that, in falling out of a maneuver, red line velocity can be reached or exceeded (with significant altitude loss) in very little time.

W A R N I N G

Do not exceed the structural design limits of the aircraft. The limits are +6 G's and -4 G's at an aerobatic weight of 2120 lbs. Structural failure can occur.

NOTE

Sustained inverted flight requires inverted oil and fuel systems. The eight 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.

W A R N I N G

Any negative, slipping, or cross-controlling maneuvers require an inverted fuel system to prevent unporting the fuel system. If an injector equipped engine is unported during flight, the engine will 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 III from intentional spins. Some of the variables are: pilot technique, the manner in which the spin is entered, incidence angle of the wing and horizontal stabilizer, CG, number of turns into the spin, spin direction, aileron position, power carried, rudder size, and control rigging and adjustment.

2-10 FLIGHT IN ICING CONDITIONS

Flight in icing conditions is prohibited in the Glasair III. The Glasair III 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 de-ice 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.

W A R N I N G

> The Glasair III, 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 III 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 check valves are installed in the main wing tank, which help ensure that the main tank fuel sump will remain covered with fuel by restricting the transfer of fuel 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.

W A R N I N G

Avoid prolonged parking on uneven ground with a wing low just prior to takeoff. This may cause a heavy wing condition which can be hazardous at minimum airspeeds.

NOTE

Because of the total drag with both gear and flaps extended, slips should rarely be needed in the Glasair III.

2-13 REQUIRED EQUIPMENT

Builders of Experimental Category aircraft must comply with Part 91.33 of the Federal Aviation Regulations, which specifies the minimum numbers and types of airplane instruments and equipment which must be installed and operable for various kinds of 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 FAR

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.

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."

4. A permanent exterior placard specifying the aircraft make, model number, and serial number.

2-14.2 Gull Wing 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 except in an emergency." The canopy will be torn off if opened in flight.

2-14.3 Airplane Exterior Placards

A "NO STEP" placard should be placed on the upper surface of each flap panel just outboard of the fuselage near the entrances to the cabin.

A placard specifying the fuel type and quantity should be applied near each fuel filler cap. (Permanently engraving these markings on the fuel caps is a good idea.)

2-14.4 Crosswind Component

We recommend the installation of a placard on the instrument panel specifying the maximum crosswind component, such as:

"MAXIMUM CROSSWIND COMPONENT--25 MPH."

2-14.5 Baggage Compartment Placards

We recommend the following placards for the baggage compartment:

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

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

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 III. These procedures are suggested as the best course of action for coping with the particular condition described, but are not a substitute for sound judgement 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 believed by Stoddard-Hamilton Aircraft to be the best techniques, 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 he is responsible for the final decision.

3-2 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.

3-2.1 Engine Fire:

In-Flight Fire

Immediately shut off the fuel supply to the engine. Turn off all electrical accessories. Close the cabin fresh air vents if smoke is entering the cabin through them. Execute an emergency landing as soon as possible.

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

Ground Fire

If an engine fire should occur 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 on the ground are usually the result of flooding.

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, the engine should be shut down and the fire extinguished 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 (120 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, a canopy should be opened so that a safe landing can be accomplished. Always maintain control of the aircraft.

W A R N I N G

> Open the gull wing canopies in flight only as a last resort. This procedure should never be attempted under normal circumstances as the gull wing canopies will depart the aircraft.

3-3 ENGINE FAILURE

3-3.1 General

The Lycoming aircraft engine is very reliable and the probability of it failing catastrophically without some type of advance warning is quite low. Early indications of an engine failure are lowering oil pressure, increase in 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: 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 <u>and</u> 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, you can expect a high sink rate and, therefore, limited time to locate a suitable ditching site. 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 other hard surface landing area. A belly landing on the runway is worth it to be sure you make it there. Soft surface forced landings should always be made with the gear up to minimize airframe damage and 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. Check to see if fuel pressure is adequate, whether mixture is full rich, electric fuel pump is on, fuel is on, fuel quantity is sufficient, and that both magnetos are on.

3-3.3 Engine Failure in Flight:

In the event of an engine failure during flight, maintain best glide speed (140 mph, gear up; 120 mph, gear down) and prepare for a forced landing. Quickly check that fuel pressure is adequate, whether mixture is full rich, fuel valve is on, adequate fuel quantity is in the tanks, and 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 alleviated.

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

3-3.4 Engine Out Approach and Landing:

If loss of power occurs at altitude, 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 (140 mph, gear up), 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 2000 feet above the field at the downwind position, to make an approach. When the gear is lowered, reduce speed to 120 mph (best gear down gliding speed) and anticipate a sink rate of about 2200 feet per minute.

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 judgements 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.

W A R N I N G

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 hard surface runways 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.

Airspeed should be kept relatively high (110-120 mph) 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 should be made at the minimum controllable airspeed, being careful not to stall and drop the airplane in. Especially if forced to land in trees, the airplane should be allowed to fly into the trees rather than stalling 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

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 manually by using the emergency gear extension hand pump. 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 electric hydraulic pump circuit breaker (25 Amp).

3) Pull the emergency extension selector valve lever actuating handle forward (moves the selector valve lever to the UP position to allow gear extension).

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

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

6) Leave the emergency extension selector valve lever actuating handle in the pulled position to maintain fluid pressure.

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 the control breaker must be pulled to disconnect the power to the hydraulic pump solenoids.

NOTE

If hydraulic pressure is lost, roll out straight ahead when landing, and shut the engine down. Clamp the main gear side braces in the extended position to prevent collapse before attempting any taxi turns.

3-5 SPINS AND SPIRAL DIVES

3-5.1 Spins

W A R N I N G

Intentional spins are prohibited in the Glasair III.

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 III'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 III's stall behavior under all conditions will be unlikely to enter an inadvertent spin.

The stall strips must be installed evenly 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 an adequate margin of stall warning.

If a spin is entered inadvertently, standard spin recovery control inputs should immediately be applied.

Standard spin recovery procedures are:

1. Power off.
2. Apply full immediate opposite rudder to direction of rotation, while holding full aft stick.

--as rotation stops--

3. Release or neutralize the stick to break the stall.
4. Neutralize the rudder.
5. Pull out of dive.

W A R N I N G

> 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.

If a wing drops during a stall, immediately apply opposite 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 which 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 inflight 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 V_{ne}. 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.

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SECTION 4

NORMAL OPERATING PROCEDURES

Table of Contents

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

Prior to any flight, the exterior and interior of the aircraft should be checked 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. Switches off (magneto and master switches).
4. Before moving the aircraft: Check the hydraulic pressure on the gauge. 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 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 microswitch.) 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 flap to full down position and check:

1. Condition of wing skins for stress cracks and fractures.
2. Wing attach screws in fuselage.
3. Hinge pins and safety wire on left flap.
4. Flap actuator fitting bolts.
5. Hydraulic and electric lines at aft spar for security and chafing.

6. Left aileron hinge pins, safety wire, actuator fitting bolts, counterweight fasteners, and possible obstructions to counterweight (i.e. loose wires in wing tip).
7. Left aileron--full travel.
8. Pitot tube orifices for obstruction.
9. Fuel level and fuel cap for security.
10. 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 discs 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.
11. Main fuel sump: drain into clear cup and check for water and debris. Drain until water or debris is gone.
12. Fuel vent lines for obstructions. (Use a length of 3/8" ID tubing to blow into vents.)
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/gascolator, the fuel selector must be turned to the header tank position to provide a head of fuel to the filter.

14. Cowling fasteners and hinge pins for security.

15. Exhaust pipe for security.
16. <u>Nose gear</u>:
    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.
18. Engine cooling inlets for obstructions (bird's nests, etc.)
19. Alternator belt for condition and tension.
20. Air inlet for obstructions. Alternate air door for security and proper operation.
21. Engine oil level. Fill if needed. Give inside of cowl a general inspection through oil access door.

<u>NOTE</u>

Do not operate engine with less than 8 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 discs 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. Hinge pins and safety wire on left flap.
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 for full travel, binding, and chafing.

3. Rudder for full travel, binding, and chafing.
4. Actuator linkage attach bolts for rudder and elevator. Pivot rudder to right to check.
5. Elevator and rudder hinge pins and safety wire.
6. Empennage counterweights for security and chafing.

D. COCKPIT-Turn on master switch,

<u>CAUTION</u>

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.

<u>NOTE</u>

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

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

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. Prior to starting the engine you should:

1. Set the fuel selector to the main fuel tank or the fullest tank.
2. Turn master switches on.
3. Set the brakes.
4. Check to see whether the propeller is clear of all objects, people, etc. (shout, "Clear prop!")

4-3.2 Normal Start (Cold Engine)

1. Set propeller governor in "full RPM".
2. Open throttle approximately 1/4 travel.
3. Turn boost pump on and move mixture control to "Full Rich" position until a slight but steady flow is indicated.
4. Return mixture control to "Idle Cut-Off" position.
5. Engage the starter by rotating the magneto switch to the "Start" position.
6. When engine starts, place magneto selector switch in "Both" position.
7. Move mixture control slowly and smoothly to "Full Rich".
8. If the engine does not fire within 5 to 10 seconds, disengage starter switch, and try again after a few seconds.

NOTE

If engine fails to achieve a normal start, assume it to be flooded and use standard clearing procedure. Then repeat above procedure.

4-3.2 Cold Weather Start

During extreme cold weather, it may be necessary to preheat the engine and oil before starting.

4-3.4 Flooded Start

1. Open the throttle fully.
2. Set mixture full lean (idle cut-off).
3. Electric fuel pump off.
4. Engage starter. When engine fires, slowly advance the mixture control to the "Full Rich" position and move the throttle to the desired setting.

4-3.5 Hot Start

Because of the fact that fuel percolates and the system must be cleared of vapor, it is recommended that the same procedure, as outlined above for Normal Start (Cold Engine), be used for starting a hot engine.

If this procedure is unsuccessful, try letting the airplane sit a few minutes with the oil filler access door open to allow hot air to escape, or use a wet rag to cool the fuel distribution spider on top of the engine.

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) injected engine. Refer to your engine Operator's Manual for turbocharged engine starting procedures.

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

CONTROLS:

- --Check full travel of stick in all directions while visibly 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.

ATTITUDE:

- --Trim set at neutral position (for takeoff).

RUN-UP:

--Face into wind; set brakes.
--Throttle -- 2100-2200 rpm
  a. Magnetos -- check rpm drop not to exceed 175 rpm and 50 rpm between magnetos.
  b. Propeller -- cycle.
  c. Engine instruments -- check.
  d. Ammeter -- check.
  e. Suction gauge -- check.
--Reduce throttle to 1200 rpm.
--Autopilot -- off.

SEAT 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. Use the cowl flaps.

4-5 TAXIING

The tricycle landing gear configuration makes taxiing the Glasair III 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 tailwind (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 III may be taxied with the gull wing canopies open. Also, keep the cowl flaps open during taxi, takeoff, and climb in warm weather. In wet weather, cracking open either canopy slightly will keep the inside of the windshield from fogging prior to takeoff.

Keep the gullwing 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 III is a very responsive aircraft. Rapid, jerky control inputs are not necessary or recommended.

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. Make sure no other airplanes are landing and line the airplane up with the runway centerline. Advance the throttle smoothly and slowly until full power is achieved. After reaching about 20 mph, the flaps may be lowered to the first notch, if desired. At about 80 mph, ease the stick back to achieve a takeoff angle of attack and let the airplane fly itself off.

NOTE:

> Flaps can only be applied with an airload holding them against the stops on the ratchet plate, otherwise the handle will fall to the fully extended position. This is true for all flap positions except the fully retracted position.

As the airplane accelerates after lift-off, ease the flaps up, making sure that they are completely retracted before reaching an airspeed of 120 mph (max. flap extended speed). 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 right after lift-off. Let the airplane accelerate to 130 mph which is the best rate of climb airspeed.

NOTE

The electric fuel boost pump should be left on always while in the pattern. When leaving the pattern, adequate altitude should be attained 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 and hold the stick slightly farther back throughout the takeoff roll in order to become airborn as soon as possible. Once airborn, 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 (130 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.

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, 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 130 mph. If no obstacles are present, we recommend letting the airspeed build to at least 160 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 using cowl flaps and a speed of 160 mph for climbout on hot days.

The most important consideration during climb out is visibility. Make "S" turns periodically to check for traffic.

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

4-8 STALLS:

4-8.1 General:

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

The Glasair III 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 III 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 III 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.

W A R N I N G

Intentional spins are prohibited in the Glasair III. We strongly recommend that stalls be practiced at 3000 ft. AGL or higher. Be familiar with standard spin recovery procedures in the event of 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 will be felt resulting from the stall strips inducing the stall at the wing roots. 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.

W A R N I N G

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.

NOTE

> 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. To recover, 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.

W A R N I N G

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.

NOTE

Since the Glasair III is a very clean plane aerodynamically, it picks up speed rather quickly when the nose is lowered and power is applied. Full power is usually not necessary when recovering from a stall unless you don't want to lose altitude (as in an approach-to-landing stall).

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 climbout. 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

> The ground adjustable aileron and rudder trim tabs should be adjusted between test flights for the desired optimum cruise conditions. Refer to the Rudder and Aileron Assembly sections of the Glasair III 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 III equipped with standard wing, a Lycoming 300 hp engine and Hartzell constant speed propeller at 8000 ft. MSL. The values may vary from plane to plane depending on many factors (such as propeller, engine horsepower, etc.).

RPM	POWER	GAL/HR	TAS
2200	55%	11.6	248 mph
2400	65%	13.8	269 mph
2700	75%	16.4	282 mph

NOTE

To obtain the optimum fuel consumption rate for best economy, lean the engine according to procedures specified in the Lycoming Engine Operator's Manual.

4-11 FUEL MANAGEMENT

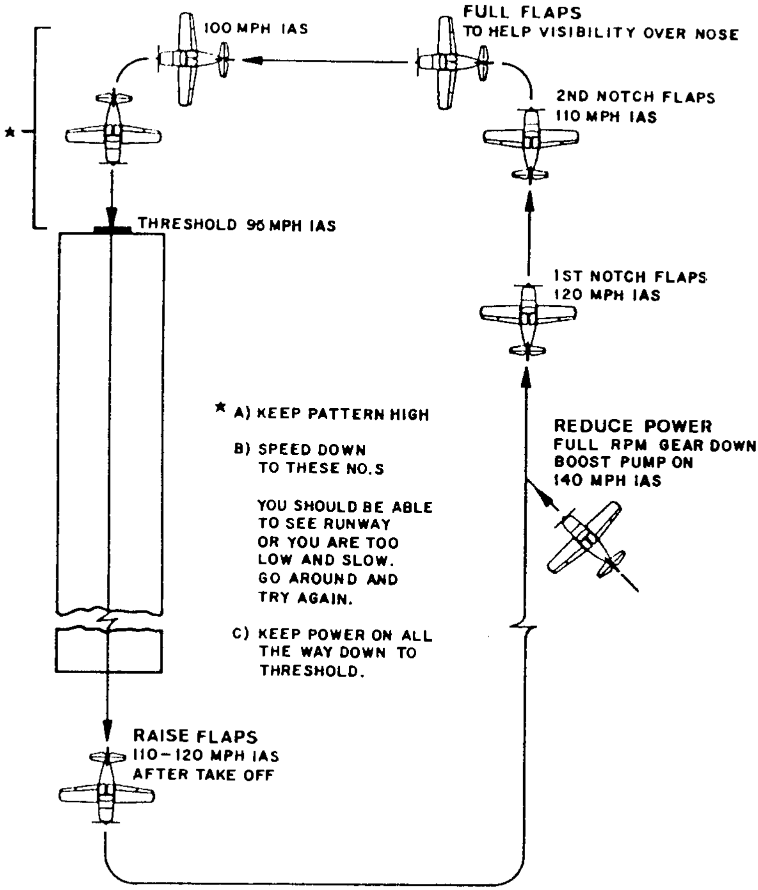
Determine by careful experimentation what your aircraft burns in fuel per hour at various power settings such as 55% and 75% power. Plan your flights so that you always have a 45 minute reserve on board in case of any unexpected delays. Always keep track of how much fuel is in both the main and header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

4-12 DESCENT

Never pull power off and dive down in cold air. The rapid cooling achieved by an engine 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 260 to 280 mph cruise, it doesn't take much of a descent angle to reach red line, so be cautious. Remember also with a very clean airframe that you are limited to fairly shallow descents, so plan your descent in advance so that you 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 (V_{no}) of the Glasair is 280 mph IAS.

Gradually push the mixture control rich during long descents.



FULL FLAPS
TO HELP VISIBILITY OVER NOSE
100 MPH IAS
2ND NOTCH FLAPS
110 MPH IAS
THRESHOLD 95 MPH IAS
1ST NOTCH FLAPS
120 MPH IAS
* A) KEEP PATTERN HIGH
B) SPEED DOWN
TO THESE NO.S
YOU SHOULD BE ABLE
TO SEE RUNWAY
OR YOU ARE TOO
LOW AND SLOW.
GO AROUND AND
TRY AGAIN.
C) KEEP POWER ON ALL
THE WAY DOWN TO
THRESHOLD.
REDUCE POWER
FULL RPM GEAR DOWN
BOOST PUMP ON
140 MPH IAS
RAISE FLAPS
110-120 MPH IAS
AFTER TAKE OFF

FIGURE (4-1)

4-13 APPROACH AND LANDING

4-13.1 Approach:

The Glasair is a fast, clean aircraft and it will take you longer to slow it down than you may be used to. If you enter the pattern at 200 mph, you may find yourself circling an extra lap before you land. You do not want to overtake other aircraft, so plan ahead to slow down before entering the pattern.

Enter the pattern on the 45° at about 140 mph or a speed which matches that of other aircraft entering the pattern. Turn on the electric fuel boost pump, and switch to the desired tank. Move the gear switch to the down position (max. gear operating speed is 140 mph); check for hydraulic pressure on the down side and 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. Slow the airplane to about 120 mph when abreast of the threshhold on downwind and pull the first notch of flaps (max. flap extension speed is 120 mph).

4-13.2 Pre-Landing Check List

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

GAS:
- --Fuel boost pump on.
- --Check fuel quantity.
- --Select proper tank.
- --Throttle reduced as necessary.

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

MIXTURE:
- --Push to full rich position.

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

Continue slowing the airplane and pull the second notch of flaps at about 110 mph before turning base leg. Throughout downwind, base, and final, continue to trim the airplane, as necessary. Apply full flaps on base to help visibility over the nose. Turn onto final approach at approximately 100 mph. Control altitude with power and airspeed with pitch. Keep power on all the way down until reaching the threshold, then ease off power while leveling off to touch down.

NOTE

> The Glasair III, with the gear extended and the propeller in flat pitch, has an impressive descent rate with power off. Keep the power on as necessary, therefore, all the way down final.

You should be at about 95 mph over the threshold under normal conditions. Even at these airspeeds you will need to carry power through the approach to keep the sink rate under control. Carry a little more airspeed (100 to 110 mph) if you are heavily loaded or in gusty or strong wind conditions.

NOTE

> When turning final, you should be at pattern altitude 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. In the Glasair III, it is not unusual to maintain pattern altitude until you turn onto final approach.

4-13.3 Landing:

The landing technique in the Glasair III is similar to that of most nosewheel airplanes except for the Glasair's much higher sink rate. 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.

Touchdown should always be 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 Glasair III.

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.

NOTE:

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 III, we strongly recommend the initial use of the wing tip extensions. They can be thought of as creating an intermediate trainer out of your Glasair III.

4-13.4 Slipping the Aircraft:

The Glasair III will slip with full flaps. With the normal high descent rate with the gear and flaps extended and power off, 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 (in excess of 2500 fpm) that must be checked by adding power. Speed should be kept comfortably above the stall (100-110 mph) throughout the approach.

W A R N I N G

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

CAUTION

Such maneuvers as full flap, full slip approaches should only be attempted after becoming thoroughly familiar and proficient with the normal flying and handling characteristics of your Glasair III.

4-13.5 Crosswinds:

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

The maximum crosswind component for the Glasair III is 25 mph and 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 temperature.
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.

If you run the engine to about 1000 or 1500 rpm before shut down, it helps to clear out the cylinders. Also, if after shut down the mixture is pushed in, it helps equalize the pressures and prevents trapped vapors in the fuel system, which is helpful if you anticipate a restart while the engine is still hot.

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S E C T I O N 5

WEIGHT AND BALANCE

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5-1 GENERAL DATA

WARNING

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

MAXIMUM GROSS WEIGHT. . . . . 2400 lb.
with Wing Tip Extensions . . . . 2500 lb.

MEAN AERODYNAMIC CHORD (MAC). . . . . .44.5"

STATION OF WING LEADING EDGE AT MAC 75.20

FLIGHT CG LIMITS
Forward. . . . . .10.0% MAC
Aft. . . . . .28.5% MAC

STATIONS OF FLIGHT CG LIMITS (GLASAIR III PROTOTYPE)
Forward. . . . . .Station 79.65 (10.0% MAC)
Aft. . . . . .Station 87.88 (28.5% MAC)

NOTE: Aircraft CG location in %MAC =

$$\frac{\text{Station} - 75.2}{44.5} \times 100$$

VARIOUS MOMENT ARMS: (Glasair III Prototype)

Oil (1.9 lb./qt.).	Station	36.50
Fuel--Main Tank (6.0 lb./gal.) . .	Station	81.35
Fuel--Header Tank (6.0 lb./gal.) .	Station	65.75
Firewall	Station	60.00
Baggage.	Station	132.20
Passengers	Station	108.75
Instrument Panel	Station	85.00
Nose Wheel Axle.	Station	34.06
Main Gear Axles.	Station	93.75

The REFERENCE DATUM is located 60.0" forward of the firewall/cowling split line. See FIGURE 5-1 on Page 5-5.

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.

NOTE: Empty weight CG calculations are initially done without the battery or battery box installed. The battery is then positioned to optimize the CG location.

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 firewall/cowling split line on the floor. Measure 60.0" forward from the cowling split line mark, 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.

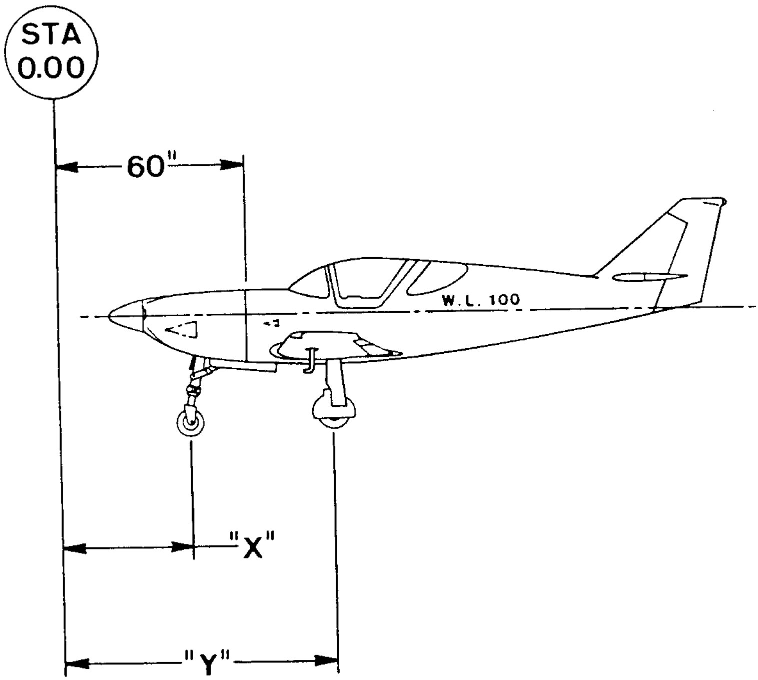

FIGURE (5-1)

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. On our prototype, distance "X" is 34.06" and distance "Y" is 93.75".

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 1000 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 prototype Glasair III is 1650 pounds with a full IFR panel.

NOTE

Our prototype aircraft is estimated to be about 50 lb. heavier than a kit-built aircraft due to prototype construction methods.

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 =

$$\frac{(\text{Nose Gear Weight})(X) + (\text{Rt Main} + \text{Lt Main Weight})(Y)}{\text{Airplane Empty Weight}}$$

NOTE

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

The following is a sample empty weight CG calculation, using the data for the Glasair III prototype:

Nose Gear:	383 lbs., Station 34.06
Left Main Gear:	634 lbs., Station 93.75
Right Main Gear:	633 lbs., Station 93.75

$$CG = \frac{(383)(34.06) + (634 + 633)(93.75)}{383 + 634 + 633}$$

$$CG = \frac{131{,}835.0}{1650} = \text{Station } \underline{79.90}$$

NOTE

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

WARNING

If any modifications are made to the aircraft that add, subtract, or shift weight, the empty weight CG will be altered. Therefore, if any such modifications are made, the empty weight CG must be redetermined to give accurate flight CG calculations.

5-3 FLIGHT CG CALCULATION

Flight CG calculations should be made for the extreme or worst case loading conditions such as full fuel or minimum fuel situations, and for heavy pilot, passenger, and baggage conditions. The flight CG should be considered prior to each flight and calculations made if situations 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.

W A R N I N G

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 ten gallons of reserve fuel (approx. 30 minutes at maximum continuous power except takeoff) remaining at the end of the flight.

NOTE

The following examples are based on the empty weight, and empty weight CG of the Glasair III prototype.

Example 1: Forward Center of Gravity Limit Check

Conditions: Full fuel (8 gallons) in header tank, minimum fuel (2 gallons) in main tank, 12 qt. oil (included in empty weight), 135 lb. pilot, no baggage. This could be considered a worst case condition, approaching the forward CG limit.

ITEM	WEIGHT	STATION	MOMENT
Empty Airplane	1650.0	79.90	131835.0
Pilot	135.0	108.75	14681.25
Fuel (Hdr. Tank)	48.0	65.75	3156.0
Fuel (Main Tank)	12.0	81.30	975.6
Baggage	00.0	132.20	0.0
TOTAL	1845.0		150647.85

$$CG = \frac{150647.85}{1845.0} = \text{Station } 81.65$$

Both the gross weight and CG are within limits for the flight depicted in Example 1. A lighter pilot might have to carry ballast in the baggage compartment to avoid exceeding the forward CG limit.

Example 2: Rearward Center of Gravity Limit Check

Conditions: 10 gal. (60 lb.) fuel in main tank, 12 qt. oil (included in empty weight), 200 lb. pilot, 200 lb. passenger, 100 lb. baggage. This is a worst case condition, approaching the aft CG limit.

ITEM	WEIGHT	STATION	MOMENT
Empty Airplane	1650.0	79.90	131835.0
Fuel (Main Tank)	60.0	81.30	4878.0
Fuel (Hdr. Tank)	0.0	65.75	0.0
Occupants	400.0	108.75	43500.0
Baggage	100.0	132.20	13220.0
TOTAL	2210.0		193433.0

$$CG = \frac{193433.0}{2210.0} = \text{Station } 87.53$$

Both the CG and the gross weight are within limits in this situation. Heavier occupants could shift the CG beyond the aft limit.

5-4 BATTERY BOX LOCATION:

Requirements:

1. Most rearward CG calculations.
2. Weight of battery and battery box.

The following formula provides the most rearward station at which the battery assembly can be installed without exceeding the aft CG limit. If the battery is placed farther aft, placard the baggage compartment to maintain the required aft CG limit.

$$X = \frac{D \times W}{B} + \text{aft CG limit}$$

X--maximum aft battery location that maintains aft CG limit.
D--aft CG limit minus the most rearward CG obtained in Example 2. (must be a positive number)
W--weight of aircraft as loaded for most rearward CG.
B--weight of battery and battery box.

For the Glasair III prototype:

$$X = \frac{(87.88 - 87.53) \times 2210}{26} + 87.88$$

X = 117.63"

The battery can be mounted a maximum of 117.63" aft of the datum with the aircraft still within the CG limits when loaded as in Example 2 on the preceding page.

SECTION 6

SYSTEMS DESCRIPTION

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6-1 POWERPLANT

The approved powerplants for the Glasair III are the 250, 260, and 300 hp Lycoming IO-540 models. The injector must be mounted on a straight air inlet housing on the aft side of the oil sump. We recommend using the Bendix RSA injector, since this unit does not require a fuel return line to the fuel tank, as does the RS type injector.

The Glasair III engine induction air is routed from a NACA duct on the left side of the engine cowling through a full-time air filter connected to the injector body by a short length of SCAT tubing. The injector is mounted sideways in the cowl on a 90° steel elbow which fits onto the air inlet housing.

We recommend purchasing the Operator's Manual for the Lycoming engine model installed in your airplane. The Lycoming manual for the IO-540 engines is part no. 60297-10. Besides operating instructions and performance tables, these manuals have information concerning installation, maintenance, and trouble-shooting.

NOTE

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 and is applicable to new engines, and engines in service following cylinder replacement or top overhaul of one or more cylinders. Use straight mineral oil for the 50 hour break-in period.

6-2 PROPELLER/GOVERNOR

We recommend the Hartzell model number HCC2YK-1BF/F8475J4 constant speed propeller for the Glasair III. Woodward governors are available for both wide and narrow deck IO-540 engines.

6-3 FUEL SYSTEM

The standard Glasair III fuel system has two fuel tanks: one main tank in the wing, and a header tank on the aft surface of the firewall. The main tank consists of the full span of the wing leading edge D-section plus aft fuel bays between ribs C and D. Standard capacities are 53 gallons in the main tank and 8 gallons in the header tank for a total of 61 gallons. All but a very small amount of the fuel is usable.

NOTE

Consult the Lycoming Engine Operator's Manual for the recommended fuel grade and octane rating for your particular engine.

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 72 gallons.

The fuel tanks are vented through 3/8" diameter aluminum tubing. Vent lines from the outboard ends of the main tank and from the header tank are 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 slipstream, equal pressure exists on both sides of the fuel gauge to ensure accurate fuel readings.

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

A mechanical fuel pump on the engine and an electric auxiliary pump in the seat pan area of the wing supply the fuel to the fuel injector. A three position fuel valve for fuel management is used with positions for fuel off, main tank fuel on, and header tank fuel on. A fuel sump drain is located at the bottom of each tank.

A fuel screen is fitted to the fuel pickup in each sump and a cartridge element type fuel filter/gascolator is mounted forward of the firewall.

If desired, the header tank may be fitted with a flop tube fuel pickup 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 right side of the lower cowling, with air ducted to it from an opening on the engine baffling.

Oil capacity for approved engines is 12 quarts. Refer to the engine Operator's Manual applicable to your engine for recommended oil types and viscosity.

CAUTION

> New or 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, if so desired.

If an inverted oil system is desired, we recommend the Christen system which we use on our prototype. The IO-540 may need its engine case and oil sump modified to accommodate this system.

6-5 LANDING GEAR

A tricycle retractable landing gear is used on the Glasair III (SH-3R). All landing gear struts are of the pressurized air-oil type (oleo strut). The gear are retracted by an electrically driven hydraulic pump and three hydraulic cylinders. A pressure switch turns the pump off when the gear are in the full up position. Microswitches actuated by the nose gear drag brace and main gear side braces and by the hydraulic actuators turn the pump off when the gear is in the fully extended position.

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 11.400 X 5 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. The main gear are enclosed by a two-piece door system. The nose gear is covered by a three-piece door.

Toe-in on the main gear is set at 0°.

6-6 BRAKES

Heavy duty Cleveland brakes (#30-133) and master cylinders (#10-19D) are used, with toe pressure on the top of the rudder pedals causing braking action. The brake fluid reservoir is mounted to an engine mount tube in the engine compartment. Brake pedals on the pilot's side are standard equipment on the Glasair III. Dual brake controls are available as an option.

6-7 COCKPIT

The Glasair III comfortably fits two passengers side by side up to 6 ft. 4 in. in height and 250 lb.

Baggage is stored directly behind the seat back and should be securely anchored down when in flight. Cabin width is approximately 42 inches which gives plenty of room for a fully equipped instrument panel if desired.

W A R N I N G

No loose small articles should be placed in the baggage compartment. All baggage should be placed 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 canopies for the Glasair III are a gull wing design with pin type latches. Two-way latch handles are used which allow the latches to be operated from both inside and outside of the cockpit. This allows 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 gull-wing canopies in flight. They will depart the aircraft.

6-8 CONTROL SYSTEM

The controls on the Glasair III 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.

Simple mechanical flaps are employed for low speed flight. The flaps are extended by means of 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. A thumb operated button releases the locking bar, allowing the flaps to be retracted. The ratchet plate has four positions from 0° to 34°. A slight air load is required to hold the flaps in the takeoff position (first notch); the pilot, therefore, must wait to select flaps until after the ground roll has started.

All interconnections between the cockpit controls and the control surfaces themselves are push-pull tube linkages except for the rudder pedal to rudder connection. Rudder cables are used between the rudder pedals and the rudder bellcrank; from the rudder bellcrank to the rudder, a push-pull tube is used.

The Glasair III elevator trim system functions by introducing a spring tension on the elevator in the direction desired by the pilot. The system also prevents an oversensitive elevator control and provides a 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 cables are wound. The elevator trim cables, their tension springs installed in-line, are 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 Manual and the Flight Test section of this manual for further details.

6-9 CABIN VENTILATION SYSTEM

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 III's electrical system and that of more conventional aircraft is that the structure on the Glasair III 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; the 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 point 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.

All radio antennas are mounted internally inside the fiberglass structure.

6-11 INSTRUMENTATION

The Glasair III instrument panel should consist of the following minimum instruments:

1. Airspeed Indicator
2. Altimeter
3. Compass
4. Turn and bank indicator
5. Tachometer
6. Manifold pressure gauge
7. Fuel pressure gauge
8. Fuel quantity gauge for each tank
9. Oil temperature gauge
10. Oil pressure gauge
11. Cylinder head temperature gauge
12. Landing gear position indicator
13. Hydraulic pressure gauge

We do not recommend flying your Glasair III 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 above instruments where applicable are as follows:

1. Airspeed indicator
   - Green arc . . . . 82 to 280 mph
   - White arc . . . . 78 to 120 mph
   - Yellow arc. . . . . . .280 to 335 mph
   - Red line. . . . . 335 mph

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

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

4. Oil temperature
   - Red line. . . . . 245° F.
   - Green arc . . . .160° F. to 245° 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 turn 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 6.67 to 7.64. The tip extensions provide an increase in climb performance, a decrease in stall speed, an increase in airspeed at altitude, and greatly improved lateral stability. 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 III's high power-to-weight ratio and heavy wing loading, we strongly recommend using the wing tip extensions for initial test flights and pilot training. The tip extensions serve to lower the wing loading and reduce approach speeds for those pilots with limited experience in high performance aircraft.

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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 III 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 will enable the builder to perform all the maintenance and overhaul work necessary to keep the aircraft in legal flying condition, and will also enable 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-transferrable; 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.

NOTE

When testing a new experimental aircraft, inspection 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). You cannot inspect your airplane too much; you can, however, inspect it too little. The above suggestions are given as guidelines; each builder should devise a schedule of periodic inspections for his 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 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 nose the airplane 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 III 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 III. Follow these suggested procedures when jacking the airplane:

Place the jack pads in position on the lower surface of the wing and 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.

CAUTION:

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

Support the tail of the airplane with a sturdy padded sawhorse, and, using the aft tie down point, tie the tail to a solid anchor in the ground. If a ground anchor is not available, 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 the gear became obstructed or wedged on an object, they could pull the plane down off the stands.

3. The aircraft 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. 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 the 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 the canopy area if the aircraft is stored outdoors.

7-5.7 During Flyable Storage

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

W A R N I N G

> Before rotation of 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, the engine should be started and run. 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 wheelwells, control openings, and the cowl inlets for birdsnests.

Preflight the airplane.

7-6 50 HOUR POWERPLANT INSPECTION

In addition to the daily pre-flight inspections, the following engine maintenance checks should be made 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.

7-6.2 Ignition System

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

Examine spark plug leads of cable and ceramics for corrosion and deposits. This condition is evidence of either leaking spark plugs, 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 ignition harness for security of mounting clamps and make sure connections are tight and properly torqued at spark plug and magneto terminals.

7-6.3 Fuel and Induction System

Remove and clean the fuel inlet strainers. Check the mixture and throttle control linkages for travel, freedom of movement, security of clamps; lubricate if necessary. Check the air intake duct 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.

If the engine is not equipped with an external, full-flow oil filter, drain the engine oil, check the oil suction and oil pressure screens for metal particles. Renew the engine oil.

Check all oil lines for leaks, chafing, and dents or cracks.

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. 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, or 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 inch lbs.

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, and, if found, its cause must be determined and corrected before the aircraft resumes operation.

7-7 ANNUAL INSPECTION

The service and inspection procedures described below should be performed annually 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, a proper entry should be made in the airplane's log book by an authorized person, 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 engine and warm 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. Magneto ground.
10. Mixture cutoff rpm rise at idle.

B. Engine Compartment Inspection:

1. Uncowl engine 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. 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. Cowl flap controls.

E. 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. Check exhaust pipes, exhaust springs, gaskets, and shrouds for security and cracks.
5. Check cylinder baffles for cracks and proper seal.
6. Check engine mount and braces for security, rust, chafing, condition of rubber bushings and bonding straps.
7. Check engine for loose nuts, bolts, and screws.
8. Check oil cooler and lines for security, chafing, and obstructions.
9. Check all breather and overboard lines for security and obstruction.
10. Inspect fuel filter element and replace if necessary. Safety wire fuel filter bowl.
11. Clean injector screens and check fuel flow.
12. Inspect injector and fuel lines for security and leaks.
13. Remove propeller spinner and check spinner, front plate, and back plate for security and cracks.
14. Inspect propeller track. Check blades for nicks. Check torque of mounting bolts. Resafety bolts. Grease propeller hub, if applicable. Reinstall spinner.

15. Inspect 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.
16. Wash engine and cowling, using a suitable solvent or engine degreaser.
17. Check cowling for chafing, cracks, or heat damage.
18. Top up brake fluid reservoir, leaving an air space for fluid expansion.
19. Check engine for any loose hardware and tools that may have been left in the engine compartment during maintenance.

F. 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. Magneto ground.
10. Mixture cutoff rpm rise at idle.
11. Check for oil leaks.
12. Reinstall 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. Battery inspection:

1. Clean terminals.
2. Clean battery box.
3. Check electrolyte level and top up.
4. Inspect drain tube and vent lines for damage and obstructions.

B. Inspect control system pushrods, rod end bearings, cable and linkages for corrosion, safety, security, and chafing. Lubricate all bearing surfaces, pulleys, and gears as necessary. Check the following systems:

1. Aileron system.
2. Elevator system.
3. Rudder system.
4. Flap system.
5. Trim system.

C. Check operation of fuel selector valve. Check valve markings.

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

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

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

G. Check fuel tank gauges and senders (if applicable) for proper markings, indication, and freedom of movement.

H. Check compass for discoloration, compass card displayed.

I. Check circuit breakers and switches for security and condition.

J. Replace instrument air filter.

K. Check instrument wiring and plumbing for security and chafing.

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

M. Check all plexiglass for cracks.

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

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

P. Check pitot tube, static port, and plumbing.

Q. Check seat pans for cracks or stress marks.

R. Check seat belts and shoulder harness for security, deterioration.

S. Check brake master cylinders for leaks.

T. Check stabilizer and elevator actuator assembly for security and cracks.

U. Check empennage counterweights for cracks and chafing.

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

W. Check all drain or breather holes for obstruction.

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

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

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

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

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

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

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

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

H. Check microswitches for security of mounting and operation.

I. Check wiring for security and chafing.

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

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

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

M. Inspect 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. Check gear doors for damage and security of mounting.

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

CAUTION

Consult the hydraulic pump servicing instructions in Section 7-8.5 on page 7-33 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.

B. Make sure there is nothing obstructing the gear. Move the gear switch to the "UP" position. The pump motor should start immediately and each of the three red lights should illuminate as the corresponding strut leaves its locked position, indicating that the gear is in transit.

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 flap handle 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 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 green 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) Pull the electric hydraulic pump circuit breaker (25 Amp).
3) Move the gear switch to the "DOWN" position.
4) Pull the emergency extension selector valve lever actuating handle forward (moves the selector valve lever to the vertical position to allow gear extension).
5) Pull the hand pump handle to the extended position.
6) Pump until 800 psi (maximum) is noted on the pressure gauge and the gear indicator lights indicate that all three gear are fully extended (three green lights).
7) Push the emergency extension valve lever back to its normal position, and reactivate the 25 Amp 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.

G. Let the airplane down off the jacks.

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

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

J. Vacuum cockpit area. Clean windshield and canopies.

7-7.5 Inflight Landing Gear Warning Horn Test

A. Slow aircraft to 120 mph.
B. Add 1 notch of flaps with landing gear retracted. (horn should sound)
C. Lower landing gear. (horn should silence)
D. Retract wheels. (horn should sound)
E. Retract flaps. (horn should silence
F. Return to normal flight.

7-7.6 Wing

A. Remove all inspection covers and the wing tips.

B. Check 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 flaps and ailerons for proper travel:
   1. Aileron travel: 19° Down, 24° Up.
   2. Flap travel: 0° to 34° Down.

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

G. Check wing skins, leading edge, and wheelwells for cracks, stress marks, and delamination.

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

I. Check fuel filler caps for proper labeling.

J. Check all drain and vent holes for obstruction.

K. Check inside wing for loose hardware and tools.

L. Reinstall inspection covers and wing tips.

7-7.6 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 log book entry, noting discrepancies and other pertinent information. Sign off the annual condition inspection as required by the operating limitation 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 is 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 III is 12 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.

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 engine 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.

The battery box is vented overboard to dispose of hydrogen gas and electrolyte fumes that are discharged during normal operation. To ensure disposal of the fumes and gas, the vent tubes should be inspected periodically for condition and obstructions. Also inspect the battery box drain tube.

7-8.3 Tires

Tire Specifications:

Main Gear: 5 x 5.00, 10 ply rating
Nose Gear: 11.4 x 5.00, 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 struts to 150 psi minimum, preferably using nitrogen or, as a substitute, using dry compressed air. The main gear struts should have about 3 inches of the chrome oleo cylinder showing as the aircraft sits on its gear.

WARNING

Never fill the shock struts with oxygen.

CAUTION

The nose strut may be inflated to a higher pressure, if necessary, to help provide extra propeller clearance. Make sure that, if higher nose strut pressure is used, the greater strut extension does not inhibit normal steering.

Filling 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).

NOTE

Because the hydraulic fluid must flow down through small holes in the metering piston, add the fluid slowly and give 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.

7-8.5 RG Hydraulic Pump

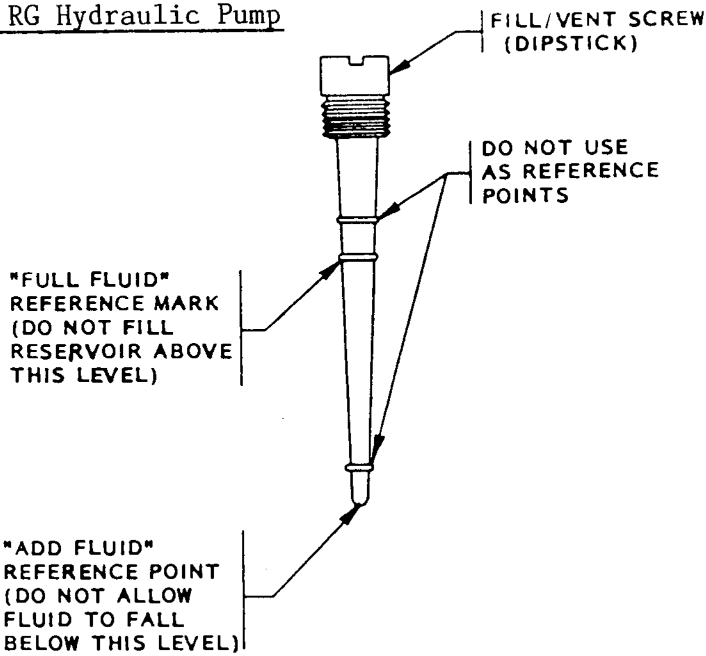

FIGURE (7-1)

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 or 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. Connect the Stoddard-Hamilton RG tow bar (or equivalent 29-1/2" long lever) to the lower scissors pin, and hook a fish 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 the nose gear with the fish scale on the end of the tow bar. Now adjust the tightness of the clamp bolts equally until a force of 6 to 12 lbs. <u>more</u> than the internal friction measurement is needed to steer the nose gear.

<u>NOTE</u>

> Check the shimmy damper tightness as part of every pre-flight inspection.

7-8.7 Brakes

The brake hydraulic fluid reservoir is mounted on an engine mount tube to simplify access for service and maintenance. The fluid level should be checked periodically and topped up if necessary.

There is no need to adjust the brakes since the brake pistons move to compensate for brake pad wear. The brake pads should be inspected at every pre-flight, however, and replaced if worn excessively.

W A R N I N G

> 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 silicon 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 and the installation tool are both 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.

NOTE

> 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 accomodate 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.

STEP 2:

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 countersunk 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.

STEP 3

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 ball peen 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.

STEP 4

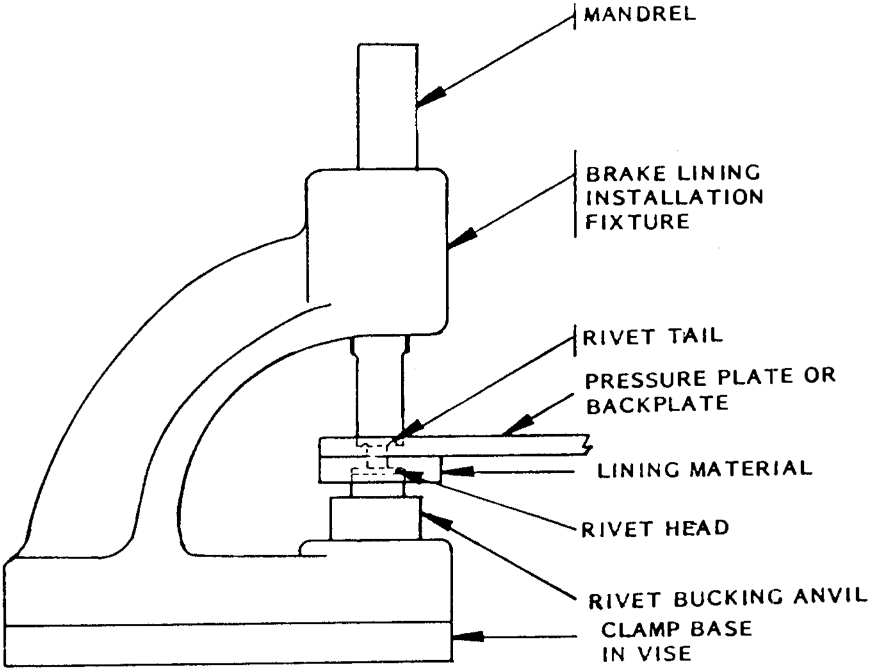

FIGURE (7-2)

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 tapping the mandrel with a hammer. Proceed slowly and rotate the assembly while driving the rivet so that the tail is evenly formed. Check the rivet frequently as you go to make sure it isn't splitting. Before setting the first rivet fully, start the other rivets to keep the lining aligned properly with the plate, and then set all the rivets fully. 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 rivets or the lining begin to crack from overdriving. The brake plates are now ready for reassembly to the caliper housing.

STEP 5

Slide the caliper housing off the torque plate where it was place 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.

STEP 6:

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

STEP 7

The brake lining material used in the Glasair III brakes is an asbestos based organic composition. To provide the optimum 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, preventing attainment of the required 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 cause the material to become carburized due to excessive heat. 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.

W A R N I N G

> 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 blades for nicks, gouges, and cracks. Inspect spinner and visible hub parts for damage or cracks. Repair prior to next flight. (See 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 spinner.

Inspect blades for nicks and gouges. Repair nicks and gouges using procedures described in 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 zerk fittings.

CAUTION

> Consult the propeller Owner's Manual for proper lubrication procedures. 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 Glasair III 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 III should give many years of trouble free service. This structure is virtually corrosion free and, because all exposed surfaces are coated with an ultraviolet ray protectant 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 period.

Extended exposure to the ultraviolet radiation in sunlight may 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 oxidization.

To help keep the exterior finish paint in like-new condition, it must be kept clean and waxed. Follow the paint manufacturer's care recommendations. 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 is necessary.

7-8.11 Windshield and Canopies

The windshield and canopy plexiglass should be kept clean and waxed with a plexiglass 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, benzine, alcohol, acetone, carbon tetrachloride, laquer thinner, or glass cleaner. These materials will soften the plastic and may cause it to craze.

After a thorough cleaning, the surface should be waxed 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. Do not use a power buffer; the heat generated by a buffing pad may soften the plastic.

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 such as Gunk Super Concentrate or NAPA Degreasing Compound may also be used cautiously. Dilute the compound following the directions on the container, spray or brush on, and rinse with water.

CAUTION

> Particular care should be given to electrical equipment before cleaning. Cleaning fluids should not be allowed to enter magnetos, starter, alternator, and the like. All other openings should be covered before cleaning.

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SECTION 8

FLIGHT TEST

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8-1 INTRODUCTION

Flight testing should be approached 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 done 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 III: 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.

The FAA has published a reprint from FAA General Aviation News titled, "Flight Testing Homebuilts." This publication suggests procedures for avoiding the most common causes of homebuilt aircraft accidents during flight testing. OVER HALF OF ALL HOMEBUILT ACCIDENTS OCCUR WITHIN THE FIRST 40 HOURS OF OPERATION.

We strongly recommend obtaining a copy of "Flight Testing Homebuilts" by writing to:

Assistant Public Printer
(Superintendent of Documents)
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.

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, and left and right magneto drops. 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.

Full power engine operation should also be checked before flight is attempted. Full power checks should be performed 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. We recommend tying up the nose gear scissors with a rope preventing nose gear strut compression to ensure extra propeller clearance. Verify that the engine runs smoothly and strongly at full power.

If your airplane has a rebuilt engine, keep in mind when performing the initial ground checks of the engine that the best way to break in a rebuilt engine is to start it up and run it at high rpms and low heat to allow the rings to seat. The ideal method would be to install the engine on the airplane, fire it up, and take off immediately, keeping the airplane at high speed and high rpm to minimize the load on the engine and maximize cooling.

The initial ground checks of engine operation, however, as well as subsequent taxi tests, are characterized by relatively low rpm and reduced cooling air flow which may not allow proper seating of the piston rings. Piston rings that fail to seat can result in elevated cylinder head temperatures and excessive oil consumption. We recommend that you have an overhaul shop break in your rebuilt engine on a test stand before installing it in your Glasair. This has the additional advantage of assuring that your rebuilt 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 and can reach all controls. Since the Glasair III lands in a fairly nose-high attitude, be sure you are seated within one inch of the canopy for maximum visibility.

Take the time to become familiar 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 gull wing canopies open for cooling on hot days. The pilot should use his 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.

The landing gear should be inspected thoroughly between taxi tests, checking for such defects as loose wheel bearings, oleo strut pressure, and the 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 60 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.

NOTE

> 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 nosewheel 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 to get a feel for the difference. 25 to 30 mph of air load will be necessary to hold one notch of flaps. Notice the rudder inputs necessary to counteract engine torque as power is applied.

Weight and balance is always a concern with new homebuilts. Errors in calculations are easy to make. Therefore, a pilot ready to test an airplane should make specific tests to double check the CG prior to getting airborn. On Glasairs, the landing gear is located in a specific position that allows the pilot to lift the nose off 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 to recover from. 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 get airborn and not enough runway to stop. Also, if a high enough speed was reached and flight was achieved, a very high-speed landing would have to be made or the pilot could run out of elevator control at the low power setting and/or slower speed while landing.

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 III. 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, a builder is so familiar with his project that he 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 only 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.

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."

4. Exterior placard with the aircraft make, model number and serial number.

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 substantiation that the builder constructed the major portion of the aircraft.

6. Weight and balance data.

7. 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 substantiate 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 M-443.2
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 III.

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 flight test 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 calmer 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; 25 gallons is fine. This is enough fuel to remain airborn 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, and smoothly apply full power, adding right rudder as necessary to correct for engine torque effects.

As the airplane accelerates through 80 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 airborn. If anything seems amiss, chop power and land on the remaining runway.

NOTE

> We recommend leaving the gear extended for the entire first flight. The first flight should be used 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 120 mph. Continue to climb straight out until at least 500 ft. AGL is reached. 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 140 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.

NOTE

> 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 140 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 III's high wing loading, the sink rate is extremely high with 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 flight. Because the gear is left down and the resulting airspeeds are low, it will not be possible to fine tune the elevator trim tabs until later flights.

Once you begin to feel comfortable with the feel of the airplane 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 120 mph downwind leg at 5000 ft., pull one notch of flaps and turn the fuel boost pump on. Trim the airplane for a 95-100 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. Use 1.5 times the indicated stall speed as the minimum approach speed in the pattern 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 III's handling, it is advisable to use the high end of the normal speed ranges recommended for the landing pattern. It is best to use a high approach, keeping the runway within gliding range, for safety in the event of a power problem.

We advise using the full three notches of flaps for landing until the pilot has become thoroughly familiar and comfortable with the handling qualities of the airplane at all airspeeds. Full flaps will lower the nose for better visibility. If electric flaps have been installed, do not use more than about 35°. This will provide maximum lift without dramatically increasing the rate of descent.

The power-off sink rate of the Glasair III, with gear and flaps extended and with the propeller in flat pitch, can be quite high (approx. 2000 fpm). For this reason, use a power-on 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 trouble-free hours on the airplane.

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 builder should continue to explore the handling characteristics at both low and high speeds, and make further trim adjustments if necessary. The pilot will also begin to become more comfortable with take offs 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. An organized flight test program should be planned 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 gear operation speed (140 mph), move the gear switch to the "UP" position. Each green light should switch off and each red transit light should illuminate as the corresponding gear strut leaves the extended position. The transit switches in the retraction system should switch off the pump when the gear is fully retracted. If a transit switch were to fail, the pressure switch will then shut off the pump at about 1400 psi.

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 should be adjusted.

It is helpful to have another aircraft fly alongside to check the fit-up of the gear doors. 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.

Test the extension of the gear at altitude early in the gear retraction test flight, so that if there is a problem with the gear extension, there will be time to remedy the problem before landing. Maximum gear operation speed is 140 mph.

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. Contact the control tower or another aircraft to confirm gear extension if your indicator lights are inoperative.

If the indicator lamps are not defective, check for proper hydraulic pressure on the hydraulic pressure gauge. If the pressure is low or zero, use the emergency gear extension system to extend the gear as described in Section 3-4 of this manual.

8-6.3 Envelope Expansion

NOTE

> 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 the exact 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 tube calibrated, if necessary.

Once the above conditions are met, the aircraft can be flown above 200 mph IAS. We recommend increasing the airspeed in 10 mph increments on each succeeding flight or until you feel absolutely comfortable with the trim and handling of your Glasair III. Do not push red line on your first flight.

WARNING

> As you increase the speed, be particularly vigilant in watching for other aircraft. The Glasair III'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 25 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, the airplane should be ballasted 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 with each notch of flaps. 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.

8-6.4 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.

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 No. 65-23, Certification of Repairmen (Experimental Aircraft Builders).

SECTION 9

SAFETY INFORMATION

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9-1 INTRODUCTION

Like any other high performance airplane, the Glasair III 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 III 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, certifications, 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:

DO'S

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 pre-flight 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 pre-flight inspection and before take-off.

Maintain the prescribed airspeeds in takeoff, climb, descent and landing. Maintain minimum airspeed at all times.

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 take-off 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 fly into weather conditions that are beyond your ratings or current proficiency.

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

Don't attempt any take-off 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

There is a wealth of information available to the pilot created for the sole purpose of making your flying safer, easier, and faster. 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.
Liquor and 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. It is the owner's and pilot's responsibility to comply 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 III is an Experimental airplane, no airworthiness directives apply to the airframe. The builder/pilot should 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
Enroute-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 information in the AIM.

Advisory Information

NOTAMS (Notices to Airmen) 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, enroute 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.

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, Government Printing Office, Washington, D.C. 20402.

Of special interest is a reprint from FAA General Aviation News, titled "Flight Testing Homebuilts", which is designed as a guide for avoiding the most common causes of accidents during the flight test phase of a homebuilt aircraft. Since over half of all homebuilt accidents occur during the first 40 hours, we strongly recommend obtaining a copy of this article.

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 III because its higher cruise speed makes it more difficult for a pilot to keep ahead of the airplane.

Obtain a current and complete pre-flight briefing. This should consist of local, enroute, and destination weather, and enroute navaid information. Enroute terrain and obstructions, alternate airports, airport runways active, length of runways, and take-off and landing distances required for expected conditions should be known.

The prudent pilot will review his planned enroute 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 pre-flight information required by FAR Part 91, a complete pre-flight 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 contains a checklist for the pre-flight inspection which must be followed. 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 III in the traffic pattern and when in the vicinity of much slower aircraft. If you cannot safely maintain a 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 enroute 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 can be encountered in thunderstorms that 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; however, the absence of a roll cloud should not be interpreted as denoting 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 (201 mph). This speed gives the best assurance of avoiding excessive stress loads, and at the same time providing the proper margin against inadvertent stalls due to gusts.

3. Beware of overcontrolling 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. You should 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.

4. Be sure that your seat belts and shoulder harnesses are snug. You will be unable to control the aircraft in turbulence unless you are firmly retained in your seat.

Flight in Icing Conditions

Flight in icing conditions is prohibited in the Glasair III. 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 de-ice 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.

W A R N I N G

The Glasair III, 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 III 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 1.

Avoid flight at low altitudes 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 10 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 extemely 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 III is a poor "scud runner". Operating the Glasair III 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 and provide time for decision-making and navigation, 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 enroute.

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 III encounters birds so suddenly that they are unable to react quickly enough to get out of the way. Although the Glasair III is equipped with a very heavy duty windshield, it is untested for bird strikes. The size of the bird and velocity are important factors in whether the windshield will withstand a bird strike.

We recommend, therefore, that the Glasair III not be operated in the vicinity of common bird gatherings, i.e. landfills, shorelines, nesting areas, and, in general, low altitudes. The higher you go, the fewer birds you encounter.

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 judgement 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, intentional or unintentional, 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 inflight airframe separation or as a high speed ground impact. All airplanes are subject 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 maintain 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.

Takeoff and Landing Conditions

Taxiing in deep snow or slush can result in a build-up inside the wheelwells. 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 becomes an integral part of the man-machine system. He is just as essential to a successful flight as the control surfaces. To ignore the pilot in pre-flight 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 himself has the responsibility for determining his reliability prior to entering the airplane for flight. When piloting an airplane, an individual should be free of conditions which are harmful to alertness, ability to make correct decisions, and rapid 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), 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, are more susceptible to hypoxia than otherwise. 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, a tingling sensation, sweating, reduced visual field (tunnel vision), sleepiness, blue coloring of the skin, fingernails, and 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, an hypoxic individual often believes things are getting progressively better while he nears total collapse.

The sypmtoms 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 overbreathing, 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 symptom of hyperventilation is a tingling sensation 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. Alcohol, even in small amounts, produces, among other things, a dulling of critical judgement, 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 judgement 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 altitudes, 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 judgement and performance are affected after blood alcohol levels have returned to normal.

Drugs

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 judgement 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 prior to takeoff for your system to rid itself of this excess gas, 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 effect visual sensitivity equal to an increase of 8,000 feet altitude.