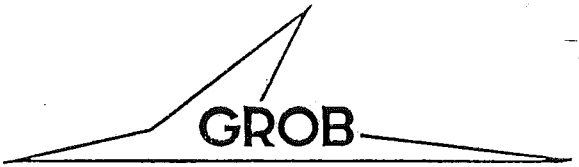

BURKHART GROB Luft- und
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Am Flugplatz
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Airplane Flight Manual

GROB G 115

Series G 115 A included

Airworthiness category: Normal/Utility

FAR compliance: FAR 23 incl. Amendment 32

This manual constitutes the approved airplane flight manual of the aircraft GROB G 115 and must be carried in the airplane at all times.

Scope and revised status can be seen from the Table of Contents or the Log of Revisions.

Airplane Serial No.: 8031 Airplane Regist. No.: OY SMC

Owner: AIRDANICA APS

As operating instruction in accordance with § 12(1) 2 LuftGerPo LBA - approved: 30. Oct. 89

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Log of Revisions

GROB G 115 Airplane Serial No.:_____ Airplane Regist. No.:_____

All revision material must be inserted into the handbook without delay. Deleted pages shall be removed and destroyed. This page shall be replaced and the page check-list updated by handwriting in accordance with the revised data or replaced. Revisions are identified by a vertical black line on the side.

This aircraft must only be operated when the airplane flight manual is fully updated!

Revision No.	Date	Revised pages and text	German LBA approval:	Stamp and signature
1	13.8. 1992	0-3,0-4,0-5,0-6, 0-7,2-10,2-22, 3-13,3-19,3-21, 4-20,6-19,6-20, 6-26,6-29,6-30, 7-3,7-11,7-19, 7-22,7-25,7-26 8-7 Issue 2/S: 6-30	31.8.92 i.A.	LUFTFAHRT-BUNDESAMT BRAUNSCHWEIG
2	12.12 1995	0-3,0-4,0-7,9-3, Isuue 2/S: 6-31.	4.1.96 i.A.	LUFTFAHRT-BUNDESAMT 13 BRAUNSCHWEIG

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Section 2

Limitations

2.1 General

This section provides the "German LBA-approved" operating limitations, instrument markings, color coding and basic placards necessary for the safe operation of the airplane and its systems.

Limitations associated with those optional systems and equipment which require handbook supplements can be found in Section 9 (Supplements).

2.3 Airspeed Limitations

Speed	IAS km/h (kts)	Remarks
V_A Design Maneuvering Speed Normal Utility	 176 (95) 184 (99)	Do not make full or abrupt control movements above this speed.
V_{FE} Maximum Flaps Extended Speed	175 (94)	Do not exceed this speed with the flaps extended.
V_{NE} Never Exceed Speed	303 (164)	Do not exceed this speed in any operation.
V_{NO} Maximum Structural Cruising Speed	250 (135)	Do not exceed this speed except in smooth air and then only with caution.

2.5 Airspeed Indicator Markings

Marking	IAS km/h	IAS kts	Meaning
white arc	89-175	48-94	Flap down Operating Range
blue radial line	127	69	Speed of the best rate of climb
green arc	98-250	53-135	Normal Operating Range
yellow arc	250-303	135-164	Caution Range "only by smooth air"
red radial line	303	164	Never Exceed

2.7 Power Plant Limitations

a) Number of engines: 1

b) Engine manufacturer: Lycoming

c) Engine model: O - 235 H2C

d) Engine operating limits

max. take-off power (5 minutes)	115 HP
max. rotation speed during take-off	2800 RPM
max. continuous horsepower	112 HP
max. continuous rotation speed	2700 RPM

e) Oil pressure

minimum	1,7 bar	(25 PSI)
normal (green arc)	4,1 - 6,2 bar	(60 - 90 PSI)
maximum	6,9 bar	(100 PSI)

f) Fuel pressure

minimum	0,04 bar	(0.5 PSI)
normal (geen arc)	0,04 - 0,55 bar	(0.5 - 8 PSI)
maximum	0,55 bar	(8 PSI)

g) Oil temperature

minimum (not for continous operation)	40 - 60 °C
normal (green arc)	60 - 118 °C
maximum	118 °C

- suction indicator (if installed)

normal (green arc)	4,5-5,4 inch HG

- Cylinder head temperature (if installed)

minimum	65 °C
normal (green arc)	65 - 204 °C
maximum	260 °C

h)	Fuel grade (min. 100 octane)	Avgas 100 or 100 LL
i)	Oil specification (see page 1 - 5)	MIL-L-6082 or MIL-L-22851
j)	Number of propellers	1
k)	Propeller manufacturer	Sensenich Co.
l)	Propeller model	72CKS6-2-53
m)	Propeller diameter	1,78 m (5.8 ft)
n)	Propeller pitch at 0,75•R	1,35 m (4.4 ft)
o)	Propeller rotation speed limitations	
	during take-off (max. 5 minutes) maximum continuous	2800 RPM 2700 RPM

2.11 Power Plant Instrument Markings

	red line	yellow arc caution-	green arc normal- Range	yellow arc caution-	red line
Tachometer [RPM]			1800-2700	2700-2800	2800
Oil temperature [°C]		40 - 60	60-118		118
Oil pressure [bar] (PSI)	1,7 (25)	1,7-4,1 (25-60)	4,1-6,2 (60-90)	6,2-6,9 (90-100)	6,9 (100)
Fuel pressure [bar] (PSI)	0,04 (0.5)		0,04 - 0,55 (0.5 - 8.0)		0,55 (8.0)
Fuel capacity [ltr] (US.gal) (Imp.gal.)		0 - 10 (0 - 2.64) (0 - 2.20)			
Suction [inch HG](PSI)			4,5-5,4 (2.2 - 2.65)		
Cylinder head temperature [°C]		0 - 65	65-204	204-260	260
Voltmeter [V]		6 - 10	10-15	15-16	16
Amperemeter [A]	-20	-20 bis -10	-10 bis 10	10-20	20

2.13 Weight Limits

Maximum take-off and landing weight — Normal 850 kg (1874.0 lbs)

Utility 800 kg (1763.7 lbs)

Maximum baggage in baggage compartment 20 kg (44.1 lbs)

2.15 Center of Gravity Limits

		Distance from Datum [mm] (ft)
Normal		
forward limit		
at 850 kg (1874.0 lbs)	17.8 % l_μ	221 (.725)
at 825 kg (1818.8 lbs) or less	16.0 % l_μ	199 (.653)
Utility		
forward limit	16.0 % l_μ	199 (.653)
Normal- and Utility		
aft limit	24.0 % l_μ	298 (.978)

Datum: Wing leading edge (see also page 6 - 6)

l_μ: Mean aerodynamic chord = 1,242 m (4.075 ft)

Horizontal reference: Canopy sill

2.17 Maneuver Limits

Normal	Entry Speed (km/h) [kts]
Lazy Eight	185 [100]
Chandelle	185 [100]
Steep turns up to 60°	185 [100]

Utility	Entry Speed (km/h) [kts]
Lazy Eight	185 [100]
Chandelle	185 [100]
Steep turns	185 [100]

Note:

Do not make full or abrupt control movements above V_A !

Acrobatic maneuvers incl. spins are not approved !

2.19 Flight Maneuvering Load Factors

	Maximum load factor	
Normal (850 kg) (1874.0 lbs)		
Flaps retracted	+ 3,8 g	- 1,52 g
Flaps extended	+ 3,8 g	
Utility (800 kg) (1763.7 lbs)		
Flaps retracted	+ 4,4 g	- 1,76 g
Flaps extended	+ 4,4 g	

2.21 Seating Capacity

Number: 2

Pilot's seat is the left-hand seat, except during school or instructional flight.

2.23 Kinds of Operation Limits

VFR day and night as well as CVFR (Controlled VFR, with required equipment). Flights in known icing conditions are not allowed.

Kinds of Operation Equipment List

This airplane may be operated in day or night VFR as well as CVFR when the appropriate equipment is installed and operable.

The following equipment list identifies the systems and equipment upon which type certification for each kind of operation was predicated. The following systems and items of equipment must be installed and operable for the par-

Electrical Power (ATA-24)			
1. Battery	1	1	1
2. D.C. Generator	1	1	1
3. D.C. Loadmeter	1	1	1
4. D.C. Generator Warning Light	1	1	1

	VFR-Day	VFR-Night	CVFR
Flight Controls (ATA-27)			
1. Flap System	1	1	1
2. Flap Position Indicator	1	1	1
3. Horizontal Stabilizer Trim System	1	1	1
4. Stall Warning Horn	1	1	1
Fuel (ATA-28)			
1. Fuel Boost Pumps	1	1	1
2. Fuel Quantity Indicator	1	1	1
3. Fuel Pressure	1	1	1
Ice and Rain Protection (ATA-30)			
1. Pitot Heat	0	0	0
2. Alternate Static Air Source	0	0	0
Instruments (ATA-31)			
1. Clock	0	0	1
Lights (ATA-33)			
1. Cockpit and Instrument (Required Illumination)	0	1	0
2. Anti-Collision	1	1	1
3. Landing Light	0	0	0
4. Position Light	0	3	0

	VFR-Day	VFR-Night	CVFR
Navigation (ATA-34)			
1. Altimeter	1	1	1
2. Airspeed	1	1	1
3. Magnetic Compass	1	1	1
4. Outside Air Temperature	0	0	0
5. Attitude Indicator	0	0	1
6. Directional Indicator	0	0	1
7. Turn and Bank Indicator	0	0	1
8. Vertical Speed Indicator	1	1	1
9. Navigation Radio (VOR)	0	0	1
Vacuum System			
1. Suction or Pressure Gauge	0	0	1
Engine Indicating (ATA-77)			
1. Tachometer Indicator (Engine)	1	1	1
2. Cylinder Head Temperature	0	0	0
3. EGT	0	0	0
4. Carburetor Heat Temperature	0	0	0
Engine Oil (ATA-79)			
1. Oil Temperature Indicator	1	1	1
2. Oil Pressure Indicator	1	1	1

Note :

The valid operational requirements have priority over this list.

The zeros (0) used in the above list mean that the equipment and/or system was not required for that kind of operation.

2.25 Fuel Limitations

Total capacity (nominal value)	100 liters (26.42 US.gal.) (22.0 Imp.gal.)
Unusable fuel	8,3 liters (2.2 US.gal.) (1.83 Imp.gal.)
Usable fuel	91,7 liters (24.23 US.gal.) (20.17 Imp.gal.)

Never takeoff when fuel gauge indicator is in yellow arc!

2.29 Maximum Operating Altitude Limit

The maximum certified operating altitude is 16400 ft MSL.

2.41 Placards

On LH cabin wall:

Limitations	
Category	Normal-airplane
Max. weight	850 kg (1874 lbs)
Max. flight maneuvering load factors (flaps UP)	+3,8 g -1,52 g
(flaps DOWN)	+3,8 g
Never exceed speed V_{NE} [IAS]	303 km/h (164 kt)
Max. structural cruising speed V_{NO} [IAS]	250 km/h (135 kt)
Design maneuvering speed V_A [IAS]	176 km/h (95 kt)
Max. flaps extended speed V_{FE} [IAS]	175 km/h (94 kt)
Acrobatic maneuvers incl. spins are not approved.	

RH and LH on cabin wall:

NO SMOKING

Beneath airspeed indicator:

Design maneuvering speed V_A	
Normal:	176 km/h IAS (95 kt)

On instrument panel: e.g.

D-EBGF

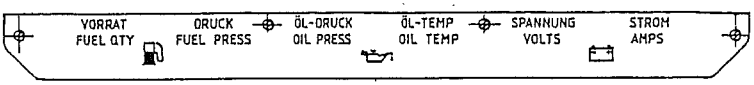
On stall warning lamp:

Stall Warning

On generator lamp:

Generator

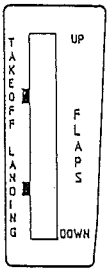
On powerplant instruments:



On flap switch:

Flaps

On flap indicator:

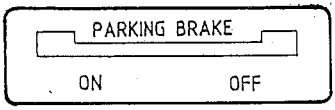


On trim indicator:

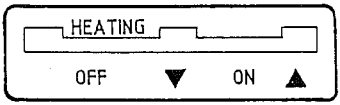
On carburetor preheat:

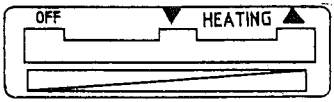
Carburetor heat

On parking brake lever:



On heating lever:

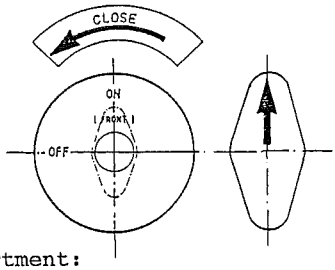




variable heat control only

On fuel cock:

AVGAS 100, 100 LL Usable 91,7 l (24.23 US.gal.) (20.17 Imp.gal.)



On baggage compartment:

Baggage max. 20 kg (44 lbs)

On access hole in the top cowling:

Oil capacity:	min. 1,9 Liter	(0.5 US.gal.) (0.42 Imp.gal.)
	max. 5,7 Liter	(1.5 US.gal.) (1.25 Imp.gal.)
Oil grades see airplane flight manual		

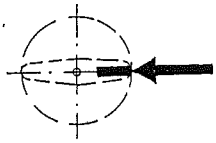
Check valve clearance every 100 flying hours and adjust,if necessary!

On external power plug:

External power supply 12 V DC

On fuel filler cap:

AVGAS 100, 100 LL Total 100 liters (26.4 US.gal.) (22.0 Imp.gal.)



Next to fuel filler cap:
(only if a grounding plate is fitted at the fuel filler neck)

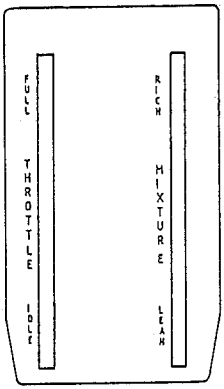
On main wheel fairing or on landing gear shock strut:

3,5 bar (51 PSI)

On nose wheel fairing or on nose wheel fork:

2,5 bar (36 PSI)

On throttle and mixture:



On ignition switch:

Deviation table (in vicinity of magnetic compass):

FOR	N	30	60	E	120	150
STEER						
FOR	S	210	240	W	300	330
STEER						
DATE					AIRPATH	

On toggle switch for alternate static (if equipped):

On both flaps:

NO

STEP

On canopy lock
(inside and outside):

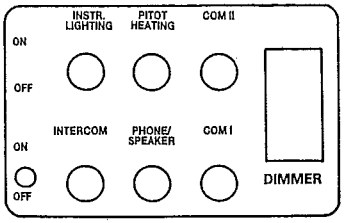
OPEN

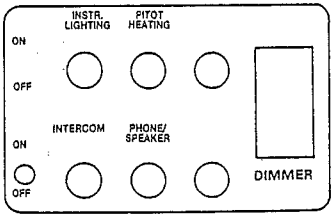
CLOSED

On both sides of the
rudder (bottom):

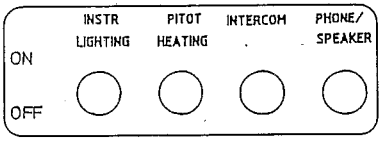
DO
NOT LIFT

RH instrument panel switch identification
for airplane to s/n 8088 (as equipped):

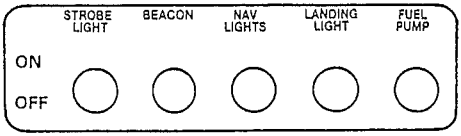


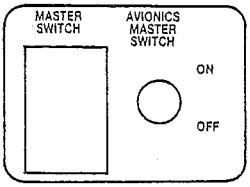


RH instrument panel switch identification
for airplane from s/n 8090 (as equipped):



LH instrument panel switch identification (as equipped)





All toggle switches are function-identified.

On brake fluid reservoir:

MIL-H 5606

On fuselage belly near the tank ground connection:

On instrument panel:

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

On instrument panel:

This airplane is certified for the following flight operations:

VFR day and night as well as CVFR (with required equipment). Flight into known icing conditions prohibited.

Control lock:

REMOVE LOCKING PIN
BEFORE STARTING ENGINE

On instrument panel (next to the fuel quantity indicator):

If the quantity indicator reads "zero" in level flight, the fuel remaining in the tank cannot be used safely in flight.

On the bottom of the fuselage close to the tail skid:
(only for system with pitot static tube at the fin)

Pitot - Static
Drain

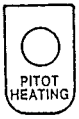
On hourmeter:

FLIGHT HOURS

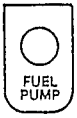
On engine hour meter:

ENGINE HOURS

On pitot heating control lamp (if equipped):



On fuel pump control lamp (if equipped):



On instrument panel (if a primer system is installed):

Primer

2.43 Colour

Painting of the GROB G 115 must accord to the colour specification GPS 1078/1.

Changing the paint colour and the paint thickness is only permissible after prior approval by the manufacturer of the airplane.

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Section 3

Emergency Procedures

Table of Contents (continued)

Table of Contents (continued)

3.1 General

This section contains procedures in the form of checklists and amplified emergency procedures for coping with an emergency situation.

Emergency situations due to aircraft or engine malfunctioning are extremely seldom, as long as the preflight inspection and maintenance tasks have been carried out properly. In flight emergencies due to inclement weather conditions are very seldom and can practically be precluded as long as the flight has been carefully planned in advance and changes in the weather duly anticipated.
Should, however, an emergency situation arise, the procedures must be in accordance with the directives of this section to the extent necessary to overcome the situation.

3.3 Airspeeds for Emergency Operations

	V_{IAS} [km/h]	(kts)
Engine Failure after Take Off		
Flaps retracted	125	(67)
Flaps in take off position	120	(65)
Maneuvering speed 850 kg (1874.0 lbs)	176	(95)
Maneuvering speed 800 kg (1763.7 lbs)	184	(99)
Best gliding speed (flaps retracted)		
850 kg (1874.0 lbs)	125	(67)
800 kg (1763.7 lbs)	120	(65)
Precautionary landing (power on)	120	(65)
Emergency landing (power off)		
Flaps retracted	125	(67)
Flaps extended (40°)	120	(65)

Caution!

The stall warning horn will not function, if the main switch is "OFF".

3.5 Emergency Procedures Check List

ENGINE FAILURE

During Take Off (not airborne)

1. Throttle	IDLE
2. Brakes	OPERATE AS NECESSARY

Preventive measures in case the aircraft is veering from the runway:

3. Mixture	IDLE CUT-OFF
4. Fuel cock	OFF
5. Ignition	OFF
6. Main switch	OFF

During Take Off (if airborne)

I. Engine power insufficient to continue flight

1. Speed	120 - 125 km/h (65 - 67 kts)
2. Fuel cock	ON
3. Both magnetos	ON
4. Electrical fuel pump	ON
5. Fuel pressure	CHECK
6. Throttle	MOVE

If there is no improvement

7. Mixture	IDLE CUT-OFF
8. Fuel cock	OFF
9. Ignition	OFF

If sure that the chosen landing area will be reached:

10. Flaps	40°
11. Emergency radio call	IF POSSIBLE
12. Main switch	OFF

Make emergency landing as straight ahead as possible!

II. Engine failure

1. Fuel cock	OFF
2. Throttle	FULL THROTTLE

Shortly before touchdown:

3. Flaps	40°
4. Mixture	IDLE CUT-OFF
5. Ignition	OFF
6. Main switch	OFF

In Flight

Restart of the failed engine:

1. Airspeed	130 km/h (70 kts)
2. Fuel cock	ON
3. Throttle	1/4 OPEN
4. Mixture	FULL RICH
5. Carburetor heat	ON PULL FULLY
6. Electrical fuel pump	ON
7. Ignition (if the propeller is not windmilling)	BOTH START

Engine Roughness

1. Carburetor heat	ON
2. Mixture	FULL RICH OR AS NECESSARY
3. Electrical fuel pump	ON
4. Magnetos	CHECK EACH IN TURN
5. If roughness not cured	LAND AS SOON AS POSSIBLE

EMERGENCY LANDINGS

Power Off Landing

1. Airspeed		
(flaps up)	125 km/h	(67 kts)
(flaps down)	120 km/h	(65 kts)

2. Fuel cock	OFF
3. Ignition	OFF
4. Mixture	IDLE CUT-OFF
5. Electrical fuel pump	OFF
6. Flaps	AS REQUIRED
7. Emergency radio call	IF POSSIBLE
8. Main switch	OFF

POWER ON LANDING

1. Emergency landing location	SEEK
2. Announce your emergency landing intention and the position of the landing location on the radio to a suitable authority, if possible.	
3. Speed	125 km/h (67 kts)
4. Flaps	12°
5. Fly over selected area, check prevailing conditions and over shoot suitability.	
6. Seat belts and harness	TIGHT
7. Flaps (final approach)	40°
8. Airspeed	120 km/h (65 kts)
9. Main switch	OFF
10. Touch down at min. speed	MAIN WHEELS FIRST
11. Ignition	OFF
12. Brakes	AS REQUIRED

DITCHING

1. Radio	MAYDAY
2. Heavy objects	SECURE
3. Flaps	40°
4. Seat belts and harness tight	CHECK
5. Approach in prevailing strong wind and high seas	AGAINST THE WIND
Approach in prevailing gentle wind and strong swell	PARALLEL TO THE SWELL
6. Touch down	AT MIN. SPEED
7. Canopy (flood cockpit, if necessary)	OPEN
8. Seat belts and harness	RELEASE
9. Airplane	ABANDON
10. Life jackets and dinghy	INFLATE

FIRE

Engine Fire During Start (not airborne)

1. Fuel cock	OFF
2. Throttle	FULL THROTTLE
3. Mixture	IDLE CUT-OFF
4. Electrical fuel pump	OFF
5. Ignition	OFF
6. Main switch	OFF
7. Combat fire with extinguisher	

Engine Fire in Flight

1. Fuel cock	OFF
2. Throttle	FULL THROTTLE
3. Mixture	IDLE CUT-OFF
4. Electrical fuel pump	OFF
5. Ignition	OFF
6. Cabin heating	OFF
7. Power off emergency landing	IMPLEMENT

Electrical Fire in Flight

1. Main switch	OFF
2. Avionic switch	OFF
3. All other switches (with the exception of the ignition switch)	OFF
4. Vents	CLOSED
5. Cabin heating	OFF
6. Fire extinguisher (if provided)	APPLY

Caution! Ventilate cabin after using extinguisher in closed cabin

If fire is extinguished and electric power is required to continue the flight:

7. Main switch	ON
8. Turn on all other switches in slow sequence until the short-circuit has been located.	

9. COM switch — OFF

10. Avionic switch — ON

11. Circuit breaker of damaged circuit
but do not turn on again — CHECK

12. Carefully open vents and cabin heating. If the fire breakout again close them immediately.

Cabin Fire in Flight

1. Main switch — OFF

2. Vents — CLOSED

3. Cabin heating — OFF

4. Fire extinguisher (if provided) — APPLY

Caution! **Ventilate cabin after using extinguisher in closed cabin**

5. Land as soon as possible and examine damage

Wing Fire in Flight

1. Position lights (if provided) — OFF

2. Strobe lights (if provided) — OFF

3. Perform drift or slip to keep flames away from cabin

4. Land as soon as possible

ICING

Accidental Intrusion into an Icing Zone

1. Pitot tube heating (if provided) ON
2. Return or change altitude to exit icing conditions
3. Cabin heating to windshield ON
4. Increase RPM to prevent icing on prop blades (monitor RPM)
5. Carburetor heat ON
6. Prepare for landing at nearest airport.
7. If there is fast icing, search for emergency landing location.
8. In case of heavy icing on wing leading edge, higher stalling speeds may be expected.

SPIN RECOVERY

1. Throttle IDLE
2. Rudder FULL OPPOSITE
3. Aileron NEUTRAL OR INTO SPIN DIRECTION
4. Elevator NEUTRAL

LANDING WITH FLAT MAIN LANDING GEAR TIRE

1. Carry out normal approach
2. Flaps 40°
3. Touch down on good tire first and keep flat tire from ground contact as long as possible.
4. Maintain direction by braking suitably with good tire.

ENGINE ROUGHNESS OR POWER LOSS

Fouled Ignition Plugs

1. Set engine power 75 % BHP
2. Set the mixture to the recommended "best power up to best economy" position
3. Observe exhaust- and cylinder-temperature
4. Check engine roughness after few minutes
5. Continue flight, if the engine is running smooth.
6. Land at the nearest airport, if the engine is running rough.

Magneto Failure

1. Use a richer mixture setting and check the engine characteristics.
2. Use different power settings and check engine characteristics.
3. Switch from "BOTH" to "L" and check engine roughness and/or misfiring.
4. Switch from "L" to "R" and check engine roughness and/or misfiring.
5. Use the good magneto.
6. Avoid power settings above 65 % BHP for a longer time.
7. Land at the nearest airport.

Low Oil Pressure

1. Check oil pressure

2. Check oil temperature

3. If the oil pressure is low (out of green arc) and oil temperature "NORMAL":
   - Land at the nearest airport.

   If a complete loss of oil pressure with increasing of oil temperature is observed:
   - Reduce engine power to a minimum.
   - Search an emergency landing field.
   - Use the minimum power to attain the emergency landing field.

ELECTRICAL SYSTEM FAILURE

1. Generator lamp	CHECK
2. Voltmeter (Normal value)	CHECK 12,5 through 14 V

Overvoltage (exceeding 16 V)

1. Avionic switch	OFF
2. All lamps (incl. landing lights, if installed)	ON
3. Electrical fuel pump	ON
4. Voltmeter	CHECK

5. As soon as voltage drops below 16 V, switch on avionics.

Excessive Charging

1. Alternator circuit breaker — PULL
2. Non-essential electrical equipment — OFF
3. Terminate flight as soon as possible

Alternator Failure

(Indicated by red low voltage warning light and by ammeter fluctuating and/or pointer is at discharged position)

1. Alternator circuit breaker — PULL
2. Turn off all non-essential electrical equipment
3. Terminate flight as soon as possible

Starter Relay Failure
(only if starter relay control lamp is equipped)

(Starter relay control lamp remains "ON" after the start-up procedure !)

<u>On ground</u>

1. Start procedure — ABORT
2. Starter relay — CHECK

<u>In flight</u>

Terminate flight as soon as possible and check for starter relay failure!

3.7 AMPLIFIED EMERGENCY PROCEDURES

ENGINE FAILURES

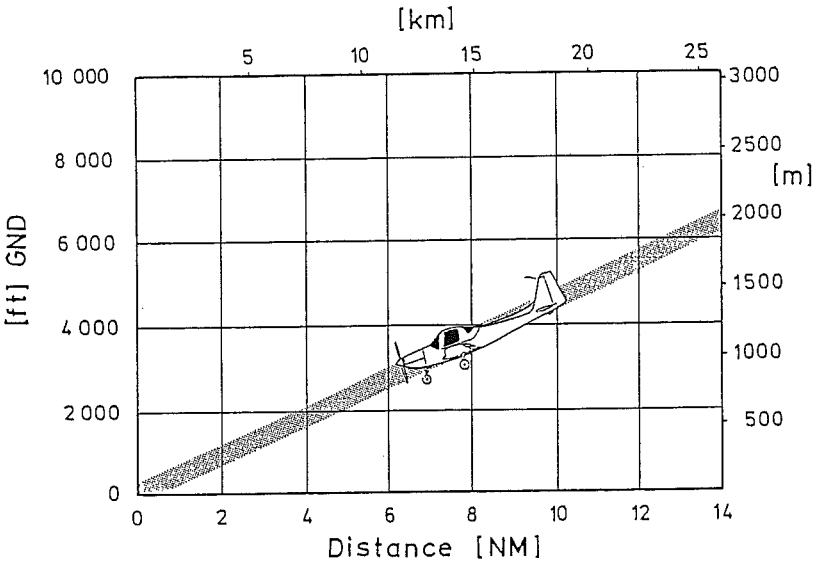
If engine failure occurs before take off, it is the most important thing to bring the airplane to a stop on the remaining runway. The check list procedures enhance safety, should an emergency of this kind occur.

If engine failure occurs after take off, the first requirement is to lower the nose, so as to maintain the airspeed and pass over to a glide flight attitude. In most cases you proceed to a straight ahead landing with slight and gentle deviations to avoid obstacles. Altitude and speed are only seldom sufficient to carry out the necessary 180° turn in glide flight to return to the runway. The check list procedures assume that sufficient time remains to switch off the fuel supply and ignition prior to touchdown.

If engine failure occurs in flight the best glide flight speed (see also Fig. 3.1) must be attained as quickly as possible. In glide flight approach to a suitable landing location attempt to establish the cause of engine failure. If time permits, attempt to restart the engine with the aid of the check list procedures. Should the engine fail to restart, execute a power off emergency landing.

Should the restart be successfull and the cause is not identified, further failures are likely and the continuation of the flight should be planned accordingly.

Fig. 3.1 Maximum Glide Distance



- Propeller not turning
- Flaps up
- Calm air

Best glide speed	
Airplane weight	V (IAS)
850 kg (1874 lbs)	127 km/h (69 kts)
800 kg (1764 lbs)	123 km/h (66 kts)
750 kg (1653 lbs)	119 km/h (64 kts)

EMERGENCY LANDINGS

If all attempts to restart the engine are in vain and an emergency landing is imminent, select a suitable landing location and prepare for landing in accordance with the check list procedures "Power Off Landing"

Before attempting to land with engine power outside of an airport, fly over the most suitable landing area at a safe height, but low enough to be able to inspect the condition of the field and to spot possible obstacles. Proceed in accordance with the check list "Power On Landing".

In preparing for ditching strap down heavy objects in the baggage compartment. Radio mayday on a frequency of 121.5 MHz indicating position and intended action. Set transponder, if provided, to 7700. Do not attempt to level out prior to touchdown, since it is difficult to assess the height of the aircraft above water.

During an emergency landing do not switch off the avionics switch and the main switch until an emergency landing is a dead certainty. Switching off too early will shut off the altimeter with coding device (if incorporated) and the electrical systems of the aircraft.

LANDING WITHOUT ELEVATOR CONTROL

The G 115 can be controlled from descent into the normal landing position simply by trimming the elevator which is possible in all flap positions. It is recommended to search for a landing area of good length and to execute a power approach at a speed of 2100 RPM. The complete procedure should be practised beforehand at a safe altitude.

LANDING WITHOUT AILERON CONTROL

If a aileron control failure occurs it is possible to enter and also to complete turns using the rudder, making sure that the speed does not drop below 65 kts. Should this happen nevertheless in entering a turn, increase speed prior to leaving the turn. In addition the throttle can be positioned to idle to accelerate leaving the turn. Avoid turn banking in excess of 30°. If a landing must be made without lateral control, the approach must be made on idle or without using full flaps, practising this procedure, of course, beforehand at a safe altitude.

FIRE

Although the possibility of an engine fire in flight is extremely remote, proceed in accordance with the check list should the situatuion arise and then proceed with an emergency landing. Never attempt to restart the engine under such conditions.

The first sign of a fire in the electric system is normally the smell of burning or smoldering insulation. Proceeding in accordance with the check list "Electrical Fire in Flight" is sufficient to remedy the fire.

ICING

Accidental Intrusion into an Icing Zone

Flying into icing conditions is generally forbidden. Should this happen accidentally, however, the situation can be best handled by proceeding according to the check list. The best thing to do, of course, is to return or to change altitude to avoid icing.

SPIN RECOVERY (UNINTENTIONAL SPIN)

Intentional spins are prohibited with the G 115 ! Should a spin be entered unintentionally, the following procedure for spin recovery should be initiated:

1. Throttle — IDLE
2. Apply and maintain full rudder opposite the direction of rotation.
3. Aileron — NEUTRAL OR INTO SPIN DIRECTION
4. Elevator control — NEUTRAL UNTIL ROTATION STOPS

and then

5. Rudder — NEUTRAL

Ease back on control wheel to recover smoothly from the dive (Anticipated altitude loss during spin recovery is 1000 ft).

ENGINE ROUGHNESS OR POWER LOSS

Carburetor Icing

A sudden loss of engine power or engine roughness could be attributed to carburetor icing. To remove the ice switch to full power and apply full carburetor heat until engine returns to smooth operation. Then select carburetor heat OFF and reset the throttle. Should conditions require repeated use of carburetor heat in cruising, only use the preheat to prevent icing and lean mixture for smoothest engine operation.

Fouled Ignition Plugs

Slight engine roughness can be caused by one or more of the ignition plugs being coked or leaded up.
Remedy by turning the ignition switch briefly from the "BOTH" position to either "L" or "R". A perceptible drop in power when operating on a single magneto is a sign that an ignition plug or magneto is defective. Since an ignition plug defect is more probable, it is good practice to set the mixture to the lean value as recommended for cruising. Should this not remedy the situation within a few minutes, select a somewhat richer mixture to obtain smoother engine operation. If all else fails, get expert advice at the nearest airport and keep the ignition switch in the "BOTH" position, unless exceptional engine roughness necessitates using only a single magneto.

Magneto Failure

Sudden engine roughness or misfiring are usually a sign of a defective magneto. Switching the ignition switch from "BOTH" to either "L" or "R" will indicate which of the two magnetos is not working properly. Select differing power settings and enrich the mixture to establish whether continuous operation is possible using both magnetos (position "BOTH"). If this is not the case, switch to the good magneto and have repair done at the nearest airport.

Low oil pressure

If low oil pressure occurs in conjunction with normal oil temperature, this is indicating the possibility of the oil gauge or the relief pressure valve being defective. In this case, landing at the nearest airport is recommended to have the system inspected to find out the cause of the trouble. Should a complete loss of oil pressure occure together with an increase in oil temperature, this is reason enough to suspect an imminent engine power failure. Therefore, reduce engine power without delay and search for a suitable landing field for an emergency landing,using only the minimum power to attain the field.

ELECTRICAL SYSTEM FAILURE

Disturbances in the electrical system can be noticed by regularly refering to the ammeter and voltmeter readings, however, it is normally very difficult to find out the cause of such disturbances. The most probable cause for alternator failure is a separated alternator drive-belt or open circuits, although other factors may cause the failure too. For instance, a faulty voltage regulator may cause the trouble. Disturbances of this kind create an "electrical emergency" requiring emergency procedures without delay.

Electrical system failures usually fall under two categories:

- excessive charging or
- inadequate charging

The following sections describe how to remedy both of these problems.

Excessive Charging

After starting the engine and following higher electrical discharge at low engine speeds (e.g. during lengthy taxiing) the battery will be discharged to such an extent that it requires a higher than normal charging current during initial flights. However, after thirty minutes cruising the ammeter should read less than 10 amperes charging current. Should the reading remain above this value after this time, this means that the battery is getting overheated and the electrolyte is vaporizing too quickly. In addition, electronic components in the electrical system can suffer from the aircraft voltage being higher than usual. Should the ammeter read an excessive charging current, all nonessential electrical systems must be switched off; the alternator circuit breaker must be pulled and flight terminated as soon as possible.

Alternator Failure

When the red low voltage warning light is on, this means that the alternator is not working, i.e. the battery voltage then is dropping below 12.5 volt. In this case, all consuming devices not essential for safe flight operations must be switched off to save the battery. Current must be saved for later operation of the flaps. Terminate flight as soon as possible.

Starter Relay Failure
(only if starter relay control lamp is equipped)

Should the starter relay control lamp remain "ON" after the ignition sequence, the start-up procedure must be aborted and the starter relay has to be checked. Should a starter relay failure occur during flight, the flight must be terminated as soon as possible.

Auxiliary fuel pump failure
(only if fuel pump control lamp is equipped)

When the green auxiliary fuel pump control lamp is off, this may be an indication of an auxiliary fuel pump failure. Terminate flight as soon as possible and check for fault.

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Section 4

Normal Procedures

Table of Contents (continued)

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4.1 General

This section describes the recommended procedures for conduct of normal operations for the GROB G 115 and presents all of the required procedures.

Normal procedures associated with those optional systems and equipment which require handbook supplements are provided by section 9 "Supplements".

Pilots should familiarize themselves with the procedures given in this section in order to become proficient in normal operations of the airplane.

The first portion of this section consists of a short form checklist which supplies an action sequence for normal operations of the airplane.

The remainder of the section is devoted to amplified normal procedures which provide detailed information and explanations of the procedures and how to perform them. This portion of the section is not intended for use as an in-flight reference due to the lengthy explanations. The short form checklist should be used for this purpose.

4.3 Airspeeds for Normal Operations

Unless stated otherwise the following airspeeds apply to maximum permissible takeoff and landing weight, but can also be used for a lesser weight. To achieve the takeoff distances stated in section 5, however, the speed as indicated for the corresponding all up weight must be selected.

	V_{IAS}
Takeoff	
Climb speed under normal takeoff conditions up to 50 ft obstacle (flaps + 12°)	112 km/h (60 kts)
Best rate of climb speed (flaps 0°) at sea level V_y	127 km/h (69 kts)
Best rate of climb speed (flaps 0°) at 10 000 ft V_y	122 km/h (66 kts)
Best angle of climb speed (flaps 12°) at sea level V_x	105 km/h (57 kts)
Best angle of climb speed (flaps 12°) at 10 000 ft V_x	109 km/h (59 kts)
Landing	
Landing final approach speed under normal landing conditions (flaps 40°)	120 km/h (65 kts)
Minimum balked landing speed (flaps 40°)	100 km/h (54 kts)
Maximum demonstrated crosswind velocity at takeoff and landing	37 km/h (20 kts)

Cruise

Speed limit for operating in turbulent air: 250 km/h (135 kts)

Maximum maneuvering speed

850 kg (1874 lbs)	176 km/h (95 kts)
800 kg (1764 lbs)	184 km/h (99 kts)

Maximum flaps extended speed: 175 km/h (94 kts)

Limited Maneuvers

Normal	Entry Speed (km/h) [kts]
Lazy Eight	185 [100]
Chandelle	185 [100]
Steep turns up to 60°	185 [100]

Utility	Entry Speed (km/h) [kts]
Lazy Eight	185 [100]
Chandelle	185 [100]
Steep turns	185 [100]

Note

Do not make full or abrupt control movements above V_A !

4.5 Normal Procedures Checklist

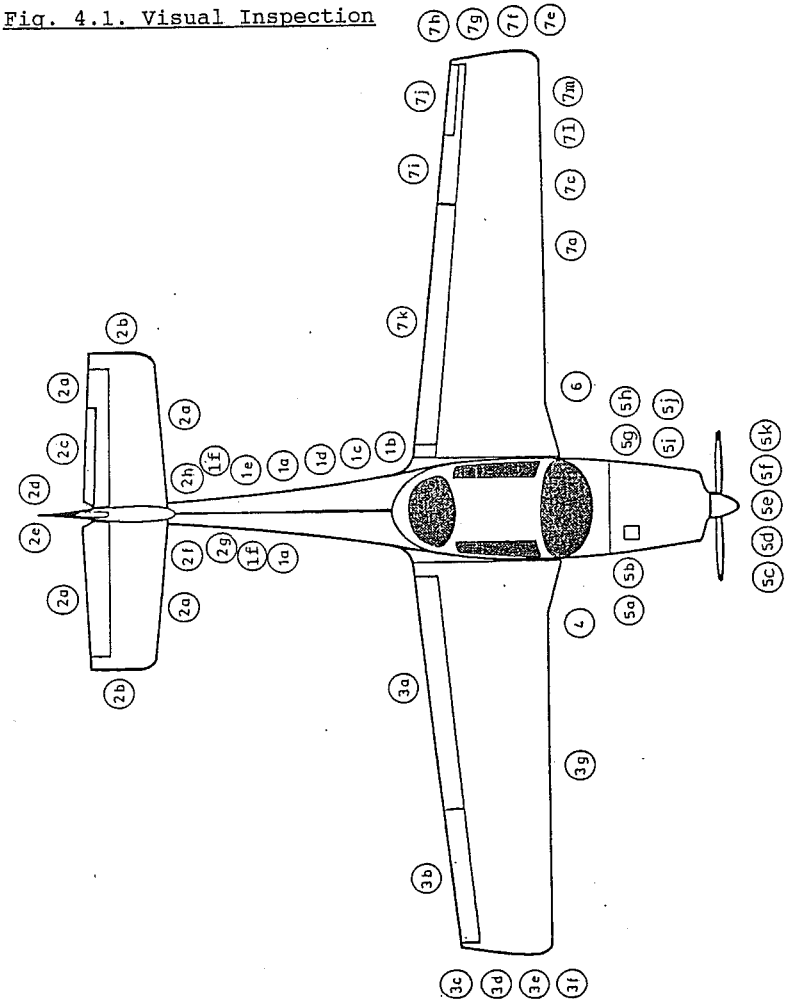
Preflight Inspection

I.Cockpit

a) Pilots license and papers	CHECKED
b) Checklist	IN COCKPIT
c) Control lock	REMOVE
d) Parking brake	ON
e) Ignition key	REMOVE
f) Windows	CHECK CLEAN AND UNDAMAGED
g) Circuit breakers	ON
h) All switches	OFF
i) Main switch	ON
j) Fuel quantity gauge	CHECK
k) Main switch	OFF
l) Throttle	IDLE
m) Mixture	IDLE CUT-OFF
n) Foreign objects	REMOVE
o) ELT (if installed)	READY FOR USE

II. Walk-around Inspection

Fig. 4.1. Visual Inspection



1. Fuselage

a) Damage	CHECK
b) Fuel tank sump	DRAIN
c) Fuel filler cap tight Fuel quantity (if sight glass is equipped)	CHECK CHECK
d) Fuel vent	CHECK
e) All antennas	CHECK
f) Drilled plates for static pressure	CHECK CLEAN BOTH

2. Empennage

a) Fins and control surfaces	CHECK
b) Mass balances	CHECK
c) Trim tab	CHECK
d) Beacon	CHECK
e) Position light (if provided)	CHECK

The following 3 steps are only valid, if the pitot-static-tube (combined tube) at the fin is installed; that's why 1.f), 7.l) and 7.m) is not applicable:

f) Pitot tube cap	REMOVE
g) Pitot tube	CHECK CLEAN
h) Pitot static system	DRAIN

3. Right wing

a) Flap and hinges	CHECK
b) Aileron and hinges	CHECK

c) Tie-down	REMOVE
d) Position light (if provided)	CHECK
e) Strobe light (if provided)	CHECK
f) Wing tip	CHECK
g) Wing surface	CHECK CONDITION
4. RH main landing gear	
a) Tire, wheel and brake	VISUAL INSPECTION
b) Chock block	REMOVE
c) Slip mark (red paint)	VISUAL INSPECTION
d) Wheel fairing	CHECK
e) Tire pressure	CHECK
5. Nose section	
a) Oil (minimum quantity 1.9 liters / 2 quarts)	CHECK QUANTITY
b) Cowling	PROPERLY SECURED
c) Air inlet filter	FREE CHECK CONDITION CHECK ATTACHMENT
d) Landing light (if incorporated)	CHECK
e) Propeller	CHECK
f) Spinner	CHECK FOR CRACKS
g) Nose gear strut	CHECK STROKE

h) Tire and wheel	VISUAL INSPECTION
i) Wheel fairing	CHECK
j) Tire pressure	CHECK
k) Towbar	REMOVE
6. Left main landing gear	
a) Tire, wheel and brake	VISUAL INSPECTION
b) Slip mark (red paint)	VISUAL INSPECTION
c) Chock block	REMOVE
d) Wheel fairing	CHECK
e) Tire pressure	CHECK
7. Left Wing	
a) Wing surface	CHECK CONDITION
b) Main switch	ON
c) Stall warning	CHECK FUNCTION
d) Main switch	OFF
e) Wing tip	CHECK
f) Tie-down	REMOVE
g) Position light (if provided)	CHECK
h) Strobe light (if provided)	CHECK
i) Aileron	CHECK
j) Aileron servo tab (deleted as of s/n 8032)	CHECK
k) Flap and hinges	CHECK

l) Pitot tube cap	REMOVE
m) Pitot tube	CHECK CLEAN

Before Engine Starting

1. Preflight check	COMPLETE
2. Fuel- and oil levels	CHECKED
3. Pedals	ADJUSTED
4. Seatbelts and harnesses	APPLIED AND FASTENED
5. Seatbelts and harnesses on empty seat	FASTEN
6. Canopy closed and locked	CHECK
7. Parking brake	SET (ON)
8. Primary flight controls	FREE TO MOVE PROPER OPERATION
9. Fuel cock	ON
10. Trim	FREE TO MOVE
11. Trim	NEUTRAL
12. Throttle, mixture	CHECK FREE MOVEMENT & TRAVEL
13. Operating levers	SET FRICTION BRAKE
14. Avionics main switch	OFF
15. Main switch	ON
16. Engine instrumentation	CHECK

17. Fuel availability for the planned flight	ADEQUATE

Engine Starting

1. Mixture	FULL RICH
2. Carburetor heat	COLD, PUSHED IN
3. Electric fuel pump	ON
4. Beacon	ON
5. Throttle	IDLE pump 2-3 times when engine cold then set to 1/4 travel
6. Primer button (if installed)	PUSH for approx. 5 sec

Note
The primer button may be operated a maximum of 3 times. If the engine fails to start switch off the ignition and turn the propeller by hand several times. Wait for 15 minutes and then repeat the starting procedure.

7. Propeller vicinity	CLEAR
8. Ignition	START, position to BOTH, as soon as engine running
9. Throttle	1000 - 1200 RPM ADJUST
10. Oil pressure	OIL PRESSURE MUST RISE WITHIN 30 SEC

Caution!
If oil pressure is not 1.7 bar (24.7 PSI) within 30 sec of engine running, shut off engine and do not repeat starting procedure until cause of trouble has been eliminated.

11. Electric fuel pump	OFF

Warm-up

1. When engine running smoothly speed	MAX. 1500 RPM
2. Ammeter	+ VE SIDE
3. Fully extend and retract flaps (indication and visual inspection checking at each stage flaps symmetry)	COMPLETED

Before Taxiing

1. Flight instrumentation	CHECK
2. Engine instrumentation	CHECK
3. Avionics main switch	ON
4. Avionics switch	ON
5. Avionics frequency, volume, test position	CHECK
6. Maneuvering area	CHECK
7. Parking brake	RELEASE

Taxiing

1. Nosewheel control	CHECK

Caution! When taxiing on surfaced taxiways it may be necessary to support the nose wheel by the toe-brakes.

2. Braking action	CHECK
3. Compass	CHECK
4. Turn-and-bank indicator (if incorporated)	CHECK

5. Directional gyro (if incorporated)	CHECK

Ground Check

1. Parking brake	SET (ON)
2. Oil pressure (must be at least in yellow sector)	CHECK
3. Oil temperature (min. 40°C)	CHECK
4. RPM	2000 RPM
5. Carburetor heat	HOT FULLY OUT
6. Speed drop	MIN. 50 RPM
7. Carburetor heat	COLD FULLY PUSHED IN
8. Ignition switch set to L	SPEED MUST DROP
9. Ignition switch set to BOTH	2000 RPM
10. Ignition switch set to R	SPEED MUST DROP
Maximum speed drop **Minimum speed drop** **Maximum speed drop difference**	**175 RPM** **50 RPM** **50 RPM**
11. Ignition switch set to both	2000 RPM
12. Idling	700 - 800 RPM
13. Recommended speed	1500 RPM

Before Take Off

1.	Seatbelts/harness	FASTEN AND CHECK TIGHTNESS
2.	Canopy closed and locked	CHECK
3.	Fuel cock	ON
4.	Trim	SET FOR TAKEOFF
5.	Mixture	FULL RICH
6.	Flaps	12° (START)
7.	Carburetor heat	COLD FULLY PUSHED IN
8.	Electric fuel pump	ON
9.	Ignition key set to BOTH	CHECK
10.	Vacuum gauge (if incorporated)	IN GREEN RANGE
11.	Flight instrumentation	CHECK
12.	Engine instrumentation	IN GREEN RANGE
13.	All moveable surfaces for full deflection	CHECK
14.	Parking brake	RELEASE

Take Off

1.	Brakes	OPERATE
2.	Full throttle	MIN. 2350 RPM
3.	Brakes	RELEASE
4.	Nose gear relieve	AT MIN 40 km/h (22 kts)

5. Nose gear lift-off	at 95 km/h (51 kts)
6. Speed at flaps 12° at height of 15 m (50 ft)	112 km/h (60 kts)
7. Retract flaps	150 ft ABOVE GROUND
8. Speed at flaps 0°	130 km/h (70 kts)
9. Electric fuel pump	OFF (APPROX. 500 FT ABOVE GROUND)
Climb	
1. Full throttle	CHECK
2. Mixture	FULL RICH
3. Engine instrumentation	READ
4. Airspeed	SEE Fig. 5.13
5. Trim	SET
Cruise	
1. Speed	1800 - 2700 RPM
2. Normal max. power	MAX. 75 %
3. Mixture	ADJUST LEAN (DEPENDING ON ALTITUDE)
4. Trim	SET
5. Altimeter setting	CHECK
Descent	
1. Altimeter	SET

2. Power setting (avoid lengthy idle)	AS REQUIRED
3. Carburetor heat (as required)	HOT OR COLD

Before Landing

1. Seatbelts/harness	FASTEN TIGHT
2. Electric fuel pump	ON
3. Carburetor heat	HOT FULLY PULLED OUT
4. Mixture	FULL RICH
5. Flaps	EXTEND

Caution! Vmax with extended flaps

175 km/h (94 kts)

6. Recommended final approach speed with flaps 40°	120 km/h (65 kts)
7. Trim	SET

Balked Landing

1. Throttle	FULL THROTTLE
2. Mixture	FULL RICH
3. Carburetor heat	COLD FULLY PUSHED IN
4. Flaps	RETRACT TO 12°
5. Flaps when clear of obstacles	RETRACT TO 0°
6. Climb	V_Y

8. Ignition key	REMOVE
9. Main switch	OFF
10. Control lock	APPLY

Parking

1. Wheel chocks	APPLY
2. Tie-downs	SECURE
3. Pitot tube cap or Pitot static tube cap	INSTALL

Normal Landing

1. Flaps	40°
2. Airspeed to flair	120 km/h (65 kts)
3. Touchdown	MAIN GEAR FIRST AT LESS THAN 100 km/h (54 kts)
4. Nosewheel	KISS
5. Brakes	AS REQUIRED

After Landing

1. Electric fuel pump	OFF
2. Carburetor heat	COLD FULLY PUSHED IN
3. Flaps	RETRACT
4. Trim	SET TO TAKEOFF RANGE

Before Leaving the Airplane

1. Parking brake	SET
2. Avionics main switch	OFF
3. All electrical aircraft systems	OFF
4. Short circuit test	COMPLETE
5. Throttle	IDLE
6. Mixture	IDLE CUT-OFF
7. Ignition switch	OFF

4.9 Amplified Normal Procedures

Preflight Inspection

The airplane should be given a thorough preflight and walk around check. The preflight inspection is not a detailed mechanical inspection but merely serves as a guideline for the pilot to check the general condition of the airplane. These procedures can be amplified accordingly when deemed neccesary by the pilot. The preflight inspection should include at least the following:

- Check airworthiness of airplane
- Check papers for completeness and validity
- Computation of weight and C.G. limits
- Determination of take-off distance
- Determination of flight performance

The baggage should be weighed and properly stowed and strapped down.

The passenger should be instructed in the use of seatbelts and harnesses and in operating the ventilation. A no-smoking instruction should be made. The passenger should be warned of obstructing control, influencing the equipment and wrong operation of the canopy.

All factors which could have a bearing on safe flight operation should be taken into account before take-off including a full weather briefing and navigational preparation.

COCKPIT

Commence internal checking by removing the control lock and setting the parking brake. Remove ignition key if still inserted. Check for unobstructed visibility and clean windows. Check guide rails and lock mechanism of the canopy for proper functioning.

After switching on the main switch the fuel gauge reading must show a sufficient quantity (incl. an emergency supply) for the intended flight. Then return the master switch OFF, to save the battery.
Make sure that throttle and mixture are full aft (idle, idle cut-off) to prevent unintentional firing of the engine when checking the propeller.

Search cockpit for foreign objects both on the right-hand seat and in the baggage compartment. The floor of the baggage compartment must be firmly closed. If the right-hand seat is vacant, close and lock the seatbelt and harness.
If a passenger is on board, make sure his seatbelt and harness are properly closed. Check all control surfaces for freedom of movement and proper functioning (including deflection in the proper direction). Make sure passenger keeps away from the rudder pedals and the control wheel.

WALK-AROUND INSPECTION

Check fuselage for damage. Drain water from the lowest point of the fuel system (drain valve on the LH underside of the fuselage). To ensure satisfactory fuel tank venting make sure the vent pipe is unobstructed. Then check the fuel filler cap for tightness. Check fuel quantity through sight glass (if equipped), paying particular attention to an adequate fuel level.
Make sure all antennas are tightly in place.

Check fins and control sufaces for damage. Make sure horizontal tail is firmly in place. Operate both elevators and rudder to check freedom of movement, tolerance and hinge pins. Check elevator mass balance tips for damage.

Check connection and play of the trim tab. Check beacon and position light (if provided) for damage.

Check the pitot static system; there are two different systems applicable:

a) System with pitot static tube at the fin
If no ladder is available, press down on the fuselage at the curved intersection between fuselage and fin. Remove the pitot tube cap and ensure that the holes in the tube are clear and un-obstructed. Additionally drain off any water in the system by use of the drain valves located on the underside of the fuselage near the tail skid.

b) System with pitot tube at the wing, static pressure at fuselage
Check both drilled plates provided for pick-up of the static pressure are open and un-obstructed; these are located at the LH and RH side of the fuselage.
Remove the pitot tube cap at the left wing lower side and ensure that the tube is open and unobstructed.
This system requires no drainage.

Check right wing flap for damage. Inspect RH aileron for full freedom of movement, freedom of play, hinge pins and proper attachment of the actuator. Remove tie-down from tie-down point. Check position light and strobe light (if provided) for damage. Inspect wing tip and complete wing surface for damage.

Inspect RH landing gear strut, tire, wheel and brake disk for damage. Check tire and brake lining wear. Remove chocks and inspect slip mark. Inspect wheel fairing for secure fitting and damage. Check correct tire pressure (3.5 bar; 51 PSI).

Open the access hole in the top cowling and check the engine oil level (2 - 6 quarts = 1.9 - 5.7 liters). Note full range of the airplane requires 6 quarts (5.7 liters).

Check the cowling for damage and make sure it is firmly in place. Ensure that the air intake opening is free of debris and dirt and is undamaged. The air filter must be securely attached. If incorporated check the landing light for damage. Make sure that the propeller is securely attached. Inspect the blades of your propeller before each flight for nicks, cuts, and stone bruises. Also make sure the propeller spinner is tight and check for cracks. Excercise the stroke of the nose gear. Visually inspect nosewheel and nosewheel tire. Nosewheel tire pressure should be 2.5 bar (36 PSI). Check the nose gear fairing for damage and make sure it is firmly in place. Also remove towbar if necessary and stow safely.

Inspect LH main gear and LH wing same as for the right-hand side. To function check the stall warning switch on the main switch. Position inflow tab upwards - stall warning must sound. Return main switch OFF. In addition check the attachment and moveability of the servo tab (if incorporated) on the LH aileron. Check LH aileron and LH flap same as described for right-hand side.

Before Engine Starting

After completing the preflight inspection and checking the fuel- and oil level, enter the cockpit[1)] and set the pedals to a comfortable position. Fasten seatbelts and harnesses. If the RH seat is vacant, latch and secure this belt and harness also. Make sure the canopy is closed and locked. Then set the parking brake and check easy movement of the control surfaces and make sure that the deflection is in the correct direction. Check position of the fuel selector ("ON") and then check that trimming is possible over the full range before setting it to the range for take off. Check free movement and travel of throttle and mixture lever and set the friction brake. Make sure the avionics main switch is positioned "OFF". Switch on the main switch and check the engine instrumentation, paying particular attention to an adequate fuel level.

Engine Starting

Set mixture to full rich and push in the carburetor heat (cold). Switch on the electric fuel pump (if equipped: check control lamp on) and the beacon.
When the engine is cold move the throttle two to three times up to full throttle before setting it to roughly a quarter of its travel. If a primer system is installed press the primer button for approx. 5 sec..

Note

The primer button may be operated a maximum of 3 times. If the engine fails to start switch off the ignition and turn the propeller by hand several times. Wait for 15 minutes and then repeat the starting procedure.

Make sure that the propeller area is clear. Start engine by turning the ignition key to the "START" position. As soon as the engine is running return the ignition key to "BOTH". Using the throttle, adjust an engine speed of 1000 - 1200 RPM. Oil pressure must increase to min. 1.7 bar (24.7 PSI) within 30 seconds.
If it is suspected that the starter motor is still energized, put main switch "OFF" to prevent electrical fire.

Caution !

If the oil pressure does not attain 1.7 bar (24.7 PSI) within 30 sec. of starting engine, shut down engine and do not attempt to restart until the cause of the trouble has been eliminated.

Switch off the electric fuel pump when warming up.

1) If two heavy people stand simultaneously on the wing trailing edge of a fully tanked airplane by entering the cockpit the airplane may tip-up.

Warm-Up

As long as the engine has still not attained its operating temperature, do not exceed 1500 RPM. The ammeter must show a charging current, i.e. on the +VE side.
During warm-up extend and retract the flaps by using the flap switch and check the flap indication and actual flap position by observing from the cockpit.

Before Taxiing

Set flight instrumentation such as altimeter and directional gyro. Read the engine instrumentation regularly. Switch on the avionics main switch and the necessary avionics switches. Lock the necessary frequencies and set the volume, testing if necessary. Make sure the taxi area is clear and then release the parking brake.

Taxiing

During taxiing check nosewheel control and brake effectiveness. Check functioning of compass, turn and bank indicator and directional gyro.
Caution! When taxiing on surfaced taxiways it may be necessary to support the nose wheel by the toe-brakes.

Ground Check

Set the park brake and operate the brake pedals. The oil pressure must be at least in the yellow sector and the oil temperature must exceed 40°C. Set an engine speed of approx. 2000 RPM. Pull the carburetor heat knob to "HOT" and watch for drop in speed which must be at least 50 RPM. Return carburetor heat to "COLD". To check the LH magnetos turn the ignition key to position "L" and observe drop in speed. Return ignition key to the "BOTH" position and check that the original speed is reattained. Proceed accordingly to check the RH magneto.

Minimum speed drop must be 50 RPM, but not exceed a maximum of 175 RPM. The difference in the speed drop of the LH and RH magnetos must not exceed 50 RPM. Return ignition switch to "BOTH", set for idle and check the idling speed. Idling speed must be between 700 and 800 RPM. Then use the throttle to set a speed of 1500 RPM.

Before Take Off

Fasten seatbelts and shoulder harness (on empty seat also). Make sure the canopy is properly closed and locked. The fuel cock must be set to "ON", the trim in the take off range and the mixture set to "FULL RICH". Flap position for take off is 12°. The carburetor heat must be positioned "COLD" (fully pushed in). Switch electric fuel pump on and make sure that the ignition key is positioned to "BOTH". If a vacuum system is incorporated, its indicator should read the green sector. Recheck all flight and engine instrumentation before take off and exercise all control surfaces for full response, before finally releasing the parking brake.

Take Off

Precisely aim the aircraft on the runway in the direction of take off. Operate the brakes and apply full power. This must produce an engine speed of at least 2350 RPM. Then release the brakes and at a speed of 22 kts take the load off the nosewheel. Lift the nosewheel at a speed of 51 kts. Best climb speed for a flap position of 12° is 60 kts. When the airplane has attained a height of 150 ft above ground the flaps can be retracted. Best rate of climb speed in this flap position is at an airspeed of 70 kts. When the aircraft is approx. 500 ft above ground the electric fuel pump can be switched off.

Climb

Make sure the throttle is positioned to "FULL OPEN" and the mixture control to "FULL RICH". Regularly read the engine instrumentation. The airspeed for climbing should be according to chart on page 5-16. Trim the airplane accordingly.

Cruise

Set desired engine speed and power. This speed should not be allowed to drop below 1800 RPM or exceed the maximum of 2700 RPM. To avoid laboring the engine do not set the power to exceed 75 % over lengthy periods. Lean the mixture according to altitude. Trim the airplane as required and check the altimeter setting (standard setting?).

Descent

Set the altimeter to the QNH of the airfield. Select power and engine speed as required, avoiding lengthy idling. Exercise carburetor heat as required, noting that intermediate positions are possible.

Before Landing

Make sure seatbelt and harness are tight. Reduce airspeed to less than 94 kts. Switch on the electric fuel pump and pull the carburetor heat to the "HOT" position. Then position the mixture control to "RICH" and extend the flaps.

Caution! Vmax with extended flaps

175 km/h (94 kts)

The recommended final approach speed in the 40° flap position is 65 kts for normal landings. Under side wind or strong turbulence conditions as well as in rain or icy weather suitable higher speeds are necessary. Trim the airplane to the desired range.

Balked Landing

Set the throttle to full power and position the mixture control to "RICH". Fully press the carburetor heat control to "COLD" and set the flaps to 12° and then when clear of obstacles retract flaps to 0°.

Normal Landing

Position the flaps to 40°. The final approach speed until flare out should be 65 kts unless additional speed is required due to side wind, gusting, rain or icy weather. Touch down with the main landing gear first when the speed indicator reads less than 54 kts. Gently lower the nose and apply the brakes accordingly.

After Landing

Position the carburetor heat to "COLD" as soon as possible after landing to prevent debris gaining access to the engine. Switch off the electric fuel pump, retract flaps and retrim the airplane for the take off condition.

Before Leaving the Airplane

Before climbing out, set the parking brake and operate the brake pedals. Switch off the avionics main switch and all aircraft electrical systems. To carry out a short-circuit test select a speed of max. 1000 RPM and set the mixture control to FULL RICH. Then briefly turn the ignition switch to the "OFF" position before immediately returning it to the "BOTH" position. This must produce a clear tendency for the engine to stop. Then shut down the engine using the normal procedure by positioning the throttle to "IDLE CUT-OFF" and pulling the mixture control back to the "LEAN" position. When the engine has stopped, turn the ignition key to the "OFF" position and remove the ignition key. Then switch off the main switch and apply control lock.

Parking

If the airplane is to be parked for a lengthy peroid, chock the wheels and tie down the aircraft at the prescribed locations.

Stalls

An approaching stall is indicated by a stall warning horn and a stall warning lamp which are activated between 9.3 km/h (5 kts) and 18.5 km/h (10 kts) above stall speed. Mild airframe buffeting may also preceed the stall.

NOTE

The stall warning system is inoperative with the main switch OFF.

During preflight, the stall warning system should be checked by turning the master switch ON, lifting the detector and checking to determine if the horn is actuated. The main switch should be returned to the OFF position after the check is complete.

Limited Maneuvers

The airplane is approved for certain maneuvers, provided it is loaded within the approved weight and center of gravity limits (See Section 2 - Limitations).

The approved maneuvers are chandelles, lazy eights and steep turns.
Entry speeds, refer to Section 2 - Limitations.

Steep turns may be performed in the normal category provided a 60 degree angle of bank is not exceeded.

Before performing maneuvers, check for:

Fuel cock	ON
Electric fuel pump	OFF
Seatbelts and harnesses	APPLIED AND FASTENED
Seatbelts on empty seat	FASTENED
Canopy	CLOSED AND LOCKED
Loose objects	REMOVED

Aerobatic maneuvers incl. spins are not approved.

4.11 Mixture Setting

General:
Leaning the fuel mixture under admissible marginal conditions is necessary for full engine life, best performance, economic consumption and for safe operation of the engine, noting:

- Never exceed the maximum red line cylinder head temperature limit.
- For continuous operation cylinder head temperature should be maintained below 204°C (400°F).
- Maintain mixture control in "FULL RICH" position under normal conditions for rated take off, rated maximum continuous, climb and cruise powers above 75%.
- During take off from high elevation airport or during climb (as of approx. 5000 ft density altitude for the fixed pitch propeller version), roughness or loss of power may result from over-richness. In such a case adjust mixture control only enough to obtain smooth operation - not for economy. Observe instruments for temperature rise !
- Running the engine too rich will prove all the more unfavourable, the higher the altitude.
- Always enrich the mixture before increasing power.

Leaning procedures

1. Standard procedure with mixture control (75% power or less without flowmeter or EGT gage.)

- Slowly move mixture control from the "FULL RICH" position to the "LEAN" position until first indication of engine roughing.
- Then enrich for smooth engine running.

2. Alternative method (only in calm air!):

- For the fixed-pitch propeller version the mixture can be leaned by means of the engine speed indicator.
- Slowly move mixture control toward lean position while closely watching tachometer. Continue leaning until RPM decreases.
- At this point enrich until RPM just peaks.

Caution: Smooth engine running is always more important than the engine speed indication

3. Leaning with the EGT indication (if EGT indication provided)

- Above 75% power - Never lean beyond 150°F on rich side of peak EGT.
- 75% power and below - Operate at peak EGT.
- Always keep an eye on the cylinder head temperture!

Caution: Smooth engine running is always more important than the EGT readings

Table of Contents

Section 5

Performance

Table of Contents (continued)

5.1 General

The performance charts on the following pages are presented in such a way, so that they indicate the performance you can expect from the airplane under various conditions, whilst also facilitating complete and sufficiently accurate flight planning. The values in these charts were attained in flight testing with the airplane and engine in good operating condition and corrected to International Standard Atmosphere (ISA 15°C (59°F) and 1013.2 mb (29.92 in. HG) at sea level).

The performance charts do not take into account various pilots'experiences or bad condition of the airplane. The stated performances may be achieved, if the mentioned procedures are used and the airplane is in good condition.

It should be noted that the performance chart data relating to range and endurance assume an emergency fuel supply sufficient for 45 minutes for the cruising performance indicated in each case. Cruising fuel consumption is based on the recommended lean mixture setting. A few non-determinals such as mixture setting procedure, operating condition of the engine and the propeller as well as turbulence can effect range and endurance. It is, therefore, important in computing the fuel quantity necessary for each flight to evaluate all available information.

5.3 Using the Performance Tables and Charts

To illustrate the effect of each variable, the performance data is presented in the form of tables and graphs adequately detailed to permit selection of values which are on the safe side.

Section 5.5 describes a detailed preflight action using the graphs.

5.5 Flight Planning Example

Loading Table

The first thing of a preflight action is to check whether payload and C.of G. are within the approved limits.

A detailed description of the necessary calculations is in section 6.7.

	Weight [kg] (lbs)	Arm [m] (ft)	Moment [kgm] (lbs-in)
Empty Weight	587.0 (1294)	0.22 (0.72)	129.14 (11209)
Pilot and Passenger	178.0 (392.4)	0.25 (0.82)	44.50 (3862.4)
Baggage (20 kg Maximum) (44.1 lbs)	19.0 (42.0)	0.90 (2.95)	17.10 (1484.2)
Fuel (91.7 l, 24.23 US.gal. 20.17 Imp.gal.)	66.0 (145.5)	0.89 (2.92)	58.74 (5098.4)
Total loaded airplane with max. fuel	850.0 (1874)	0.294 (0.965)	249.48 (21654)

The airplane is within the approved limits with a total weight of 850 kg (1874 lbs) and a C.G. of 294 mm (0.965 ft) [see Fig. 6.3 and Fig. 6.4].

Preconditions for the Proposed Flight:

	Airport of Departure	Airport of destination
Runway surface	flat, dry asphalted	
Pressure altitude	1000 ft	2500 ft
Temperature	30°C (86°F)	27°C (80.6°F)
Wind during climb, cruise and descent	calm	
Wind at take off and landing	13 km/h (7.0 kts) headwind component	
Side wind component at take off and landing	15 km/h (8.1 kts) (within the permissible range see page 5 - 14)	
Length of runway	850 m (2789 ft)	730 m (2395 ft)

Further Preconditions

Climb with full throttle to:	Flight Level 95
Cruising power:	55 %
Height-related temperature profile:	1000 ft + 30° C 9500 ft + 14° C (in between linearized approximation)
Distance from airport of departure to airport of destination:	420 km (227 NM)

The flight planning is shown in charts and tables on the following manual pages.

Planning Example

		Figure / Page	Distance [km] [NM]	Time [h:min]	Consumption [l] (GAL.US)
1. Calculation of takeoff					
- Pressure altitude at departure airport:	1000 ft				
- Outside air temperature:	+30° C				
Result: density altitude is:	3000 ft	5 - 11			
Ground roll in 3000 ft with 850 kg (1874 lbs) at 13 km/h (7 kt) headwind on dry asphalt:	370 m (1214ft)	5 - 15			
Total to 15 m (50 ft) obstacle:	630 m (2067ft)	5 - 15			
Fuel consumption for warm-up and take-off is:	2 l (0.53 US.GAL)	5 - 17			2 (0.53)
2. Calculation of climb:					
Distance to climb is 9500 ft minus 1000 ft =	8500 ft				
Climb power commences at:	3000 ft				
and is completed at:	11500 ft				
(Pressure altitude 9500 ft and temp. +14°C) DENSITY altitude difference:	8500 ft	5 - 11			
Time to climb from 0 - 11500 ft is:	29 min	5 - 17			
Time to climb from 0 - 3000 ft is:	5 min	5 - 17			
Result: 29 min - 5min =	24 min			0 : 24	
Fuel used for climb: (mixture for maximum power) from 0 - 11500 ft	13 l (3.4 GAL.US)	5 - 17			
from 0 - 3000 ft	2.5 l (0.66 GAL.US)	5 - 17			
Result: 13 l (3.4 GAL.US) - 2.5 l (0.66 GAL.US) =	10.5 l (2.77 GAL.US)				10.5 (2.77)
Climb distance is: from 0 - 11500 ft	60 km (32.4NM)	5 - 17			
from 0 - 3000 ft	9 km (4.8 NM)	5 - 17			
Result: 60 km (32.4 NM) - 9 km (4.8 NM)=	51 km (27.5NM)		51 (27.5NM)		
3. Calculation of descent:					
Destination airport pressure altitude:	2500 ft				
Destination airport temperature :	+27° C				
Distance to descent 9500 ft - 2500 ft =	7000 ft				
In economic descent an additional distance of 3.5 km (1.89 NM) can be added per 1000 ft difference in height, e.g. 7 * 3.5 km (1.89 NM) = In this case no additional fuel consumption need be assumed for descent.	24.5 km (13.2NM)		24.5 (13.2)		

Planning Example (continued)

		Figure Page	Distance [km] [NM]	Time [h:min]	Consumption [l] (GAL.US)
By rule of thumb descent can be commenced 7 * 3.5 km (1.9 NM) * 2 =	49 km (26.5NM)				
before the destination, as long as flight safety permits. The indicated airspeed during descent should be the same as in cruising. Adapt engine power so that descent can be made with constant angle of descent.					
Time to descend (neglecting integration since the deviation can be safely ignored): mean pressure altitude of descent: (9500 ft - 2500 ft) / 2 + 2500 ft =	6000 ft				
Air temperature at 6000 ft is thus resulting in a density altitude of:	21° C 8000 ft	5 - 11			
True airspeed for an airspeed reading of 154 km/h (83 kt) IAS = 153 km/h (82.6kt)* CAS at 8000 ft is:	172 km/h (93 kt)				
Resulting in an endurance of 49 km 49 km (26.5 NM) : 172 km/h (93 kt) =	0.285 h			0 : 17	
4. Calculation of cruise: True cruise speed at 55 % engine power, 9500 ft pressure altitude and an air temperature of 14°C:	181 km/h (98 kt)	5 - 20			
The indicated airspeed is:	154 km/h (83 kt)*				
RPM - reading at 55% engine power and 181 km/h (98 kt) TAS in pressure altitude of 9500 ft and air temperature of 14°C:	2560 RPM	5 - 19			
Cruise distance: Total:	420 km (227 NM)				
minus climb segment:	51 km (27.5NM)				
minus descent property 49 km (26.5 NM) - 24.5 km (13.2 NM) =	24.5 km (13.2NM)				
results in:	344.5 km (186 NM)		344.5 (186)		
Cruise fuel consumption at 55% engine power, recommended mixture (s.p. 4 - 29)	18.5 l/h (4.9 GAL.US/h)	5 - 18			
Cruise consumption duration incl. descent segment 344.5km : 181km/h = (186 NM : 98 kt)	1.9 h				
Fuel consumption 18.5 l/h * 1.9 h = (4.9 GAL.US * 1.9 h) =	35.2 l (9.3 GAL.US)				
or 344.5 km : 9.78 km/l =	35.2 l	5 - 18			35.2
Cruise time: 1.9h - (0.285 h : 2) =	1.75 h			1 : 45	

* for system pitot tube at the wing, static pressure at the fuselage: 151 km/h (82 kts)

Planning Example (continued)

		Figure / Page	Distance [km] (NM)	Flight - time [h:min]	Consumption [l] (GAL.US)
5. Calculation of emergency fuel supply for 45 min:					
Cruise fuel consumption at 55% power (recommended mixture s.p. 4 - 29) is:	18.5 l/h (4.9 GAL .US)	5 - 18			
Fuel consumption for 45 min is: 18.5 l/h * 0.75 h = (4.9 GAL.US * 0.75 h) =	14 l (3.7 GAL .US)				14.0 (3.7)
6. Calculation of landing:					
Air temperature at destination airport:	+27° C				
Pressure altitude at destination airport:	2500 ft				
Landing weight 850 kg - 34 kg = (1874 lbs - 75 lbs) = [34 kg (75 lbs) results from 47.7 l (12.6 GAL.US) without emergency fuel supply]	816 kg 1799 lbs				
Total distance to clear a 15 m (50 ft) obstacle with a headwind of 13 km/h (7 kt):	425 m (1394ft)	5 - 23			
Ground roll:	175 m (574 ft)	5 - 23			
Summary:			420 km (227 NM)	2 : 26	61.7 (16.3)

Takeoff distance: 630 m (2067 ft)

Landing distance: 425 m (1394 ft)

Takeoff - and landing distance are sufficient (these distances are well within the available field length see page 5 - 5).

Total distance: 420 km (227 NM)

Total flight time: 2 h 26 min

Average speed (incl. takeoff, climb, cruise, descent and landing) 172.8 km/h (93.3 kt)

Total fuel required: (incl. 45 min emergency supply) 61.7 Liter (16.3 GAL.US)

Fig. 5.0 Flight Planning Example

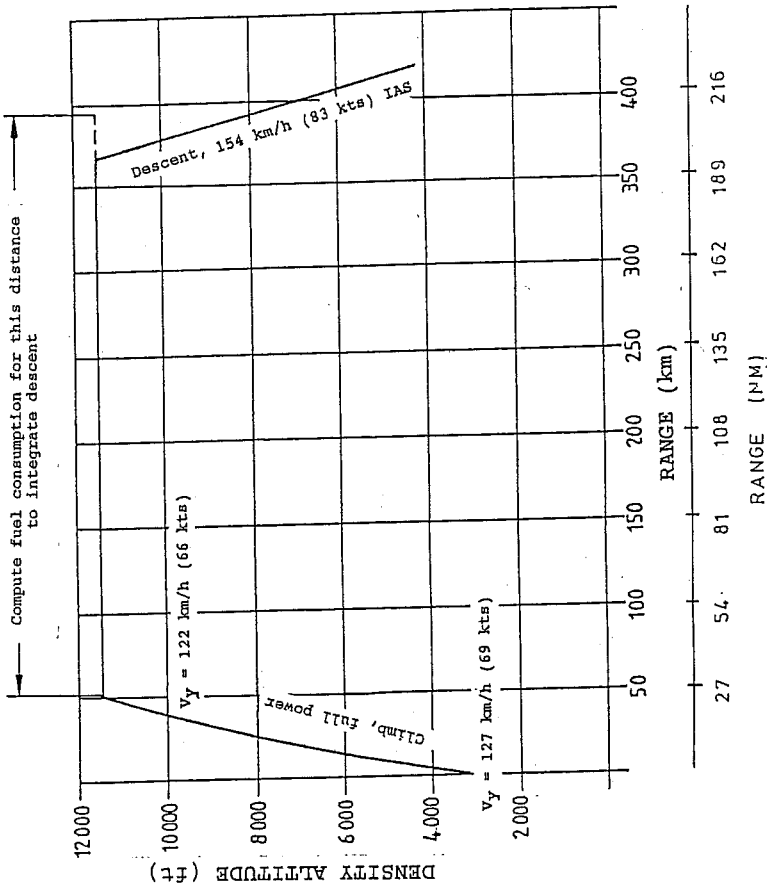
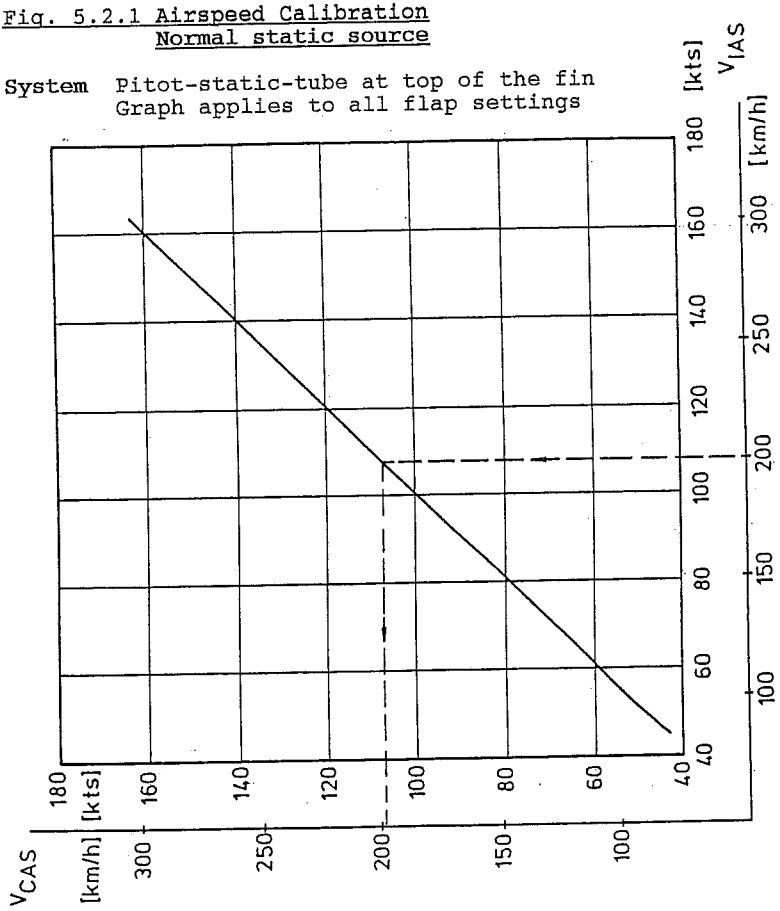


Fig. 5.2.1 Airspeed Calibration
Normal static source

System Pitot-static-tube at top of the fin
Graph applies to all flap settings



Example:

V_{IAS}	V_{CAS}
200 km/h	199 km/h
108 kts	107 kts

Fig. 5.2.1 Airspeed Calibration
Normal static source

System Pitot-tube at wing, static pressure at fuselage

Condition: idle, flaps 12° to 40°													
IAS [km/h]	100	120	140	160	175								
IAS [kts]	54.0	64.8	75.6	86.4	94.5								
CAS [km/h]	103	121	141	161	175								
CAS [kts]	55.6	65.3	76.1	86.9	94.5								

Condition: full throttle, flaps 12° to 40°													
IAS [km/h]	90	110	130	150	170	175							
IAS [kts]	48.6	59.4	70.2	81.0	91.8	94.5							
CAS [km/h]	90	109	129	149	169	174							
CAS [kts]	48.6	58.9	69.7	80.5	91.3	94.0							

Condition: power required for level flight, max. rated RPM dive full throttle climbing and idle, flaps 0°													
IAS [km/h]	100	120	140	160	180	200	220	240	260	280	303		
IAS [kts]	54.0	64.8	75.6	86.4	97.2	108.0	118.8	129.6	140.4	151.2	163.6		
CAS [km/h]	101	121	142	162	181	200	220	240	260	280	303		
CAS [kts]	54.5	65.3	76.7	87.5	97.7	108.0	118.8	129.6	140.4	151.2	163.6		

Fig. 5.2.2 Airspeed Calibration
Alternate static source

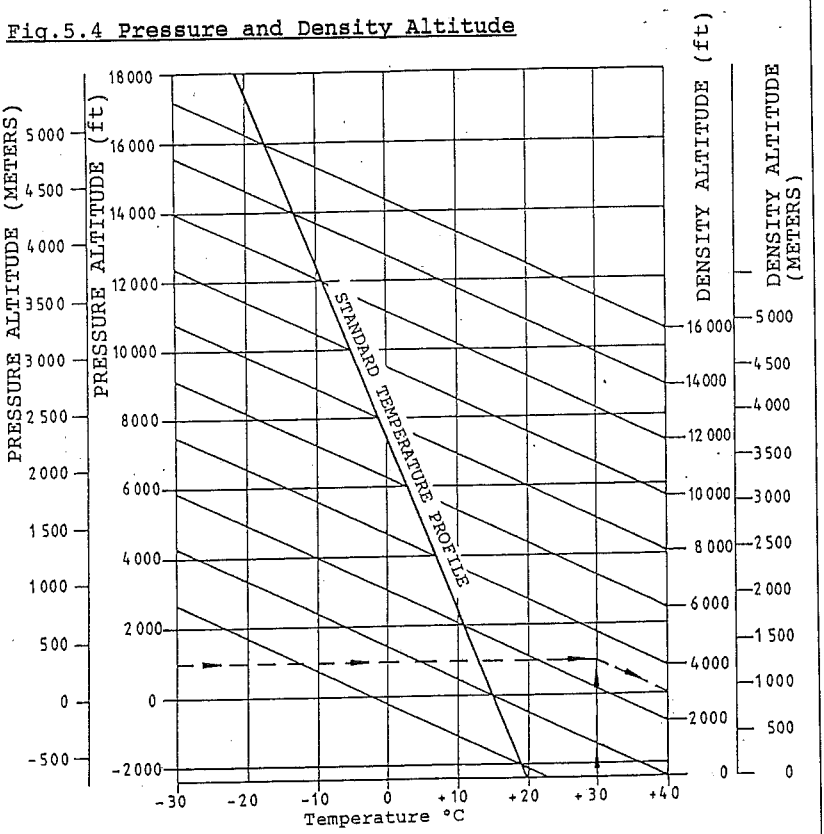
System valid for both systems

Condition: idle-full throttle, flaps 12° to 40°														
IAS [km/h]	90	110	130	150	170	175								
IAS [kts]	48.6	59.4	70.2	81.0	91.8	94.5								
CAS [km/h]	96	114	133	150	169	173								
CAS [kts]	51.8	61.6	71.8	81.0	91.3	93.4								

Condition: idle, flaps 0°														
IAS [km/h]	100	120	140	160	180	200	220	240	260	280	303			
IAS [kts]	54.0	64.8	75.6	86.4	97.2	108.0	118.8	129.6	140.9	151.2	163.6			
CAS [km/h]	104	123	142	160	179	196	216	237	258	278	302			
CAS [kts]	56.2	66.4	76.7	86.4	96.7	105.8	116.6	128.0	139.3	150.1	163.1			

Condition: power required for level flight, max. rated RPM dive full throttle climbing, flaps 0°														
IAS [km/h]	90	110	130	150	170	190	210	230	250	270	290	303		
IAS [kts]	48.6	59.4	70.2	81.0	91.8	102.6	113.4	124.2	135.0	145.8	156.6	163.6		
CAS [km/h]	97	116	135	153	171	188	208	228	248	268	289	302		
CAS [kts]	52.4	62.6	72.9	82.6	92.3	101.5	112.3	123.1	133.9	144.7	156.0	163.1		

Fig.5.4 Pressure and Density Altitude

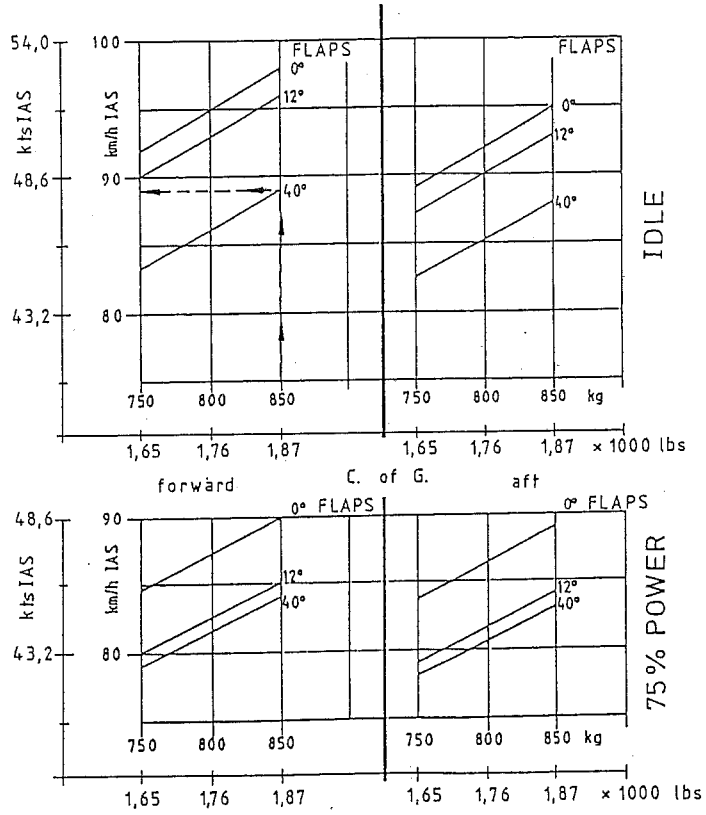


Example:

1. Set altimeter to 1013.25 hPa (29.92 in.HG) and read off pressure altitude (1000 ft).
2. Establish outside air temperature (+30°C)
3. Read off density altitude (3000 ft).

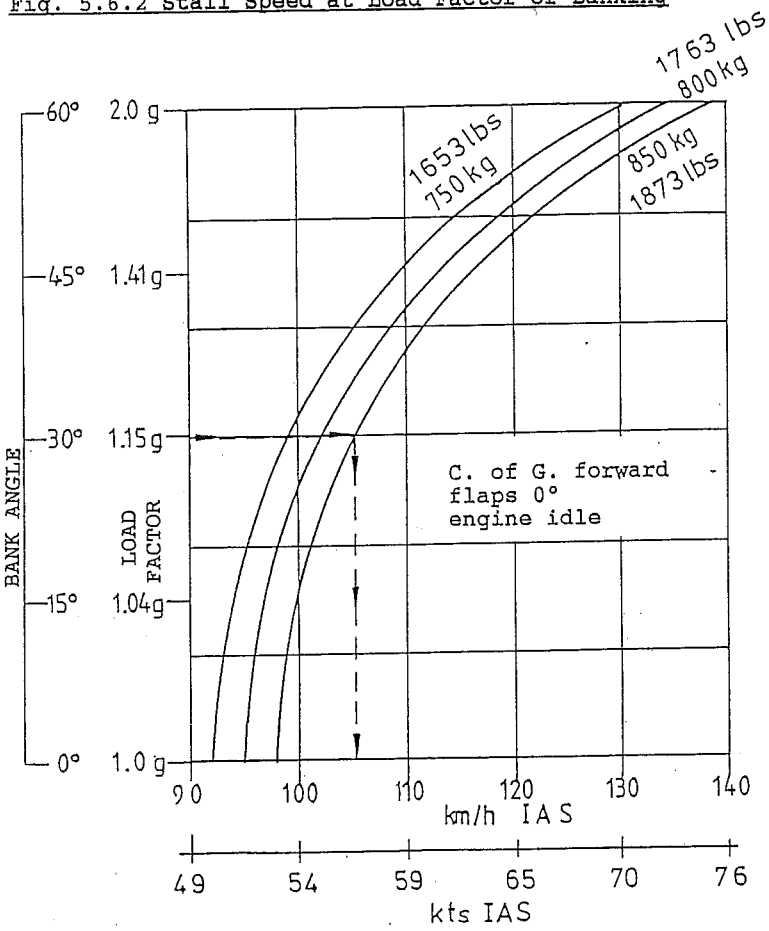
Result: The airplane has a power-related altitude of 3000 ft.

Fig. 5.6.1 Stall Speed at Various Flap Settings



Example: At a weight of 850 kg (1874 lbs), with engine idle and flaps at 40°, stall speed is 89 km/h (48 kts).

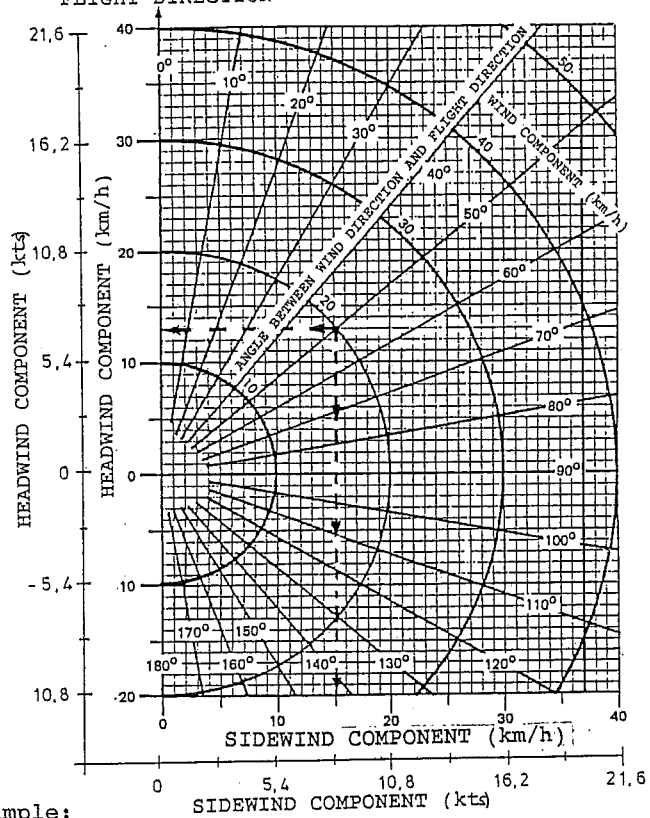
Fig. 5.6.2 Stall Speed at Load Factor or Banking



Example: Stall speed when banking 30° or 1.15 g respectively is 105 km/h (57 kts) for an aircraft weight of 850 kg (1874 lbs).

Wind Components

Demonstrated Side Wind Component: 37 km/h (20 kts)



Example:

Wind component:	20 km/h (10.8 kts)
Angle between wind direction and flight direction:	50°
Headwind component:	13 km/h (7.0 kts)
Sidewind component:	15 km/h (8.1 kts)

Fig. 5.13 Rate of Climb

Example: Pressure altitude 4000 ft, outside air temperature +15° C, aircraft weight 850 kg (1874 lbs).

Result: The climb speed is 2.4 m/s (472.39 ft/min).

Fig. 5.17 Time, Fuel and Distance to Climb

Consumption for warmup and takeoff: 2 liters (0.528 Gal.US)

Consumption during climb with best power setting:

MSL			
4500 ft	full throttle = 86 % :	33,5 liters/h	(8.85 Gal.US/h)
4500 ft	full throttle = 75 % :	29,1 liters/h	(7.69 Gal.US/h)
8800 ft	full throttle = 65 % :	25,0 liters/h	(6.60 Gal.US/h)
13000 ft	full throttle = 55 % :	21,0 liters/h	(5.55 Gal.US/h)

Example :

Climb from 0 - 11500 ft	
Time:	29 min
Fuel consumption:	13 liters (3.43 Gal.US)
Distance to climb:	60 km (32.38 NM)

Fig. 5.20A.1 Cruise (Fuel Consumption)

Prop. Sensenich 72CKS6-2-53

Aircraft weight 850 kg (1874 lbs), most forward C. G., flaps 0°, good condition of airplane, calm air, recommended mixture (see chapter 4.11)

75% POWER : 25.5 liters/h (6.74 Gal.US/h)
65% POWER : 22.0 liters/h (5.81 Gal.US/h)
55% POWER : 18.5 liters/h (4.89 Gal.US/h)
45% POWER : 15.0 liters/h (3.96 Gal.US/h)

(not incl. emergency supply)

Example: Pressure altitude 9500 ft, temperature +14°C, 55% power (power setting see Fig. 5.20A.2)

Result: Cruise distance 9.78 km/liters (20 NM/Gal.US)

Fig. 5.20A.2 Cruise (RPM)

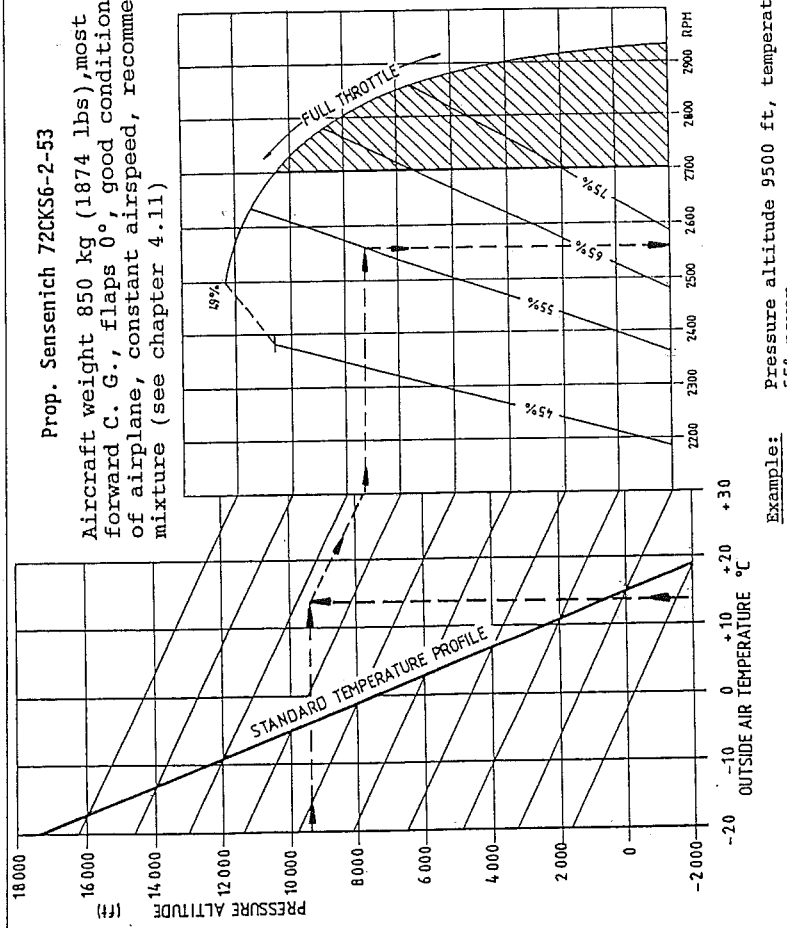
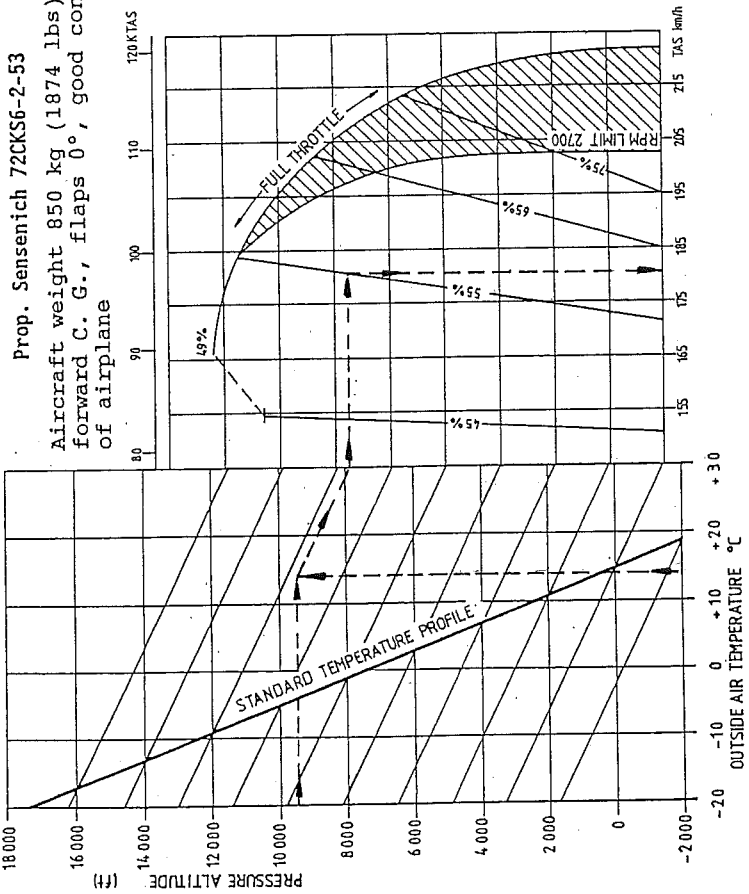


Fig. 5.20A.3 Cruise (True Airspeed)



Example: Pressure altitude 9500 ft, temperature +14°C, 55% power

Result: True airspeed 181 km/h (98 kt)

Fig. 5.21 Range Profile

Prop. Sensenich 72CKS6-2-53

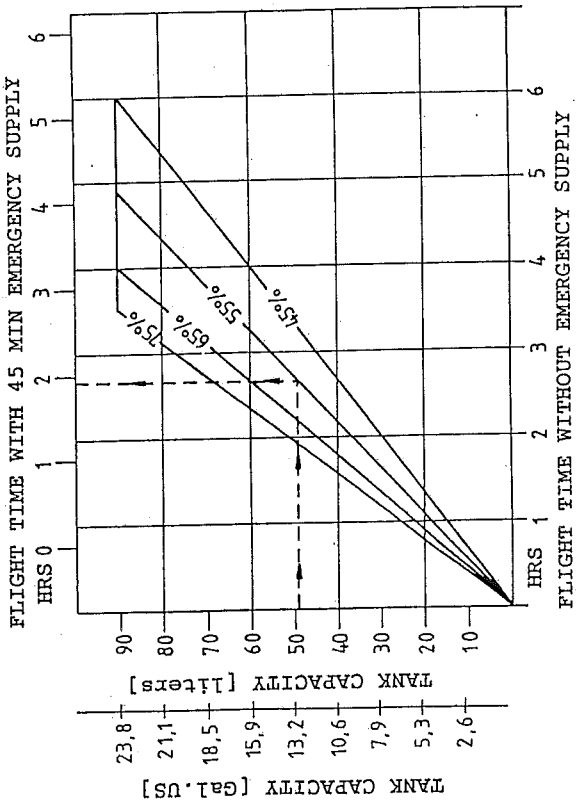
Aircraft weight 850 kg (1874 lbs), most forward C. G., flaps 0°, good condition of airplane, usable fuel: 91,7 liters, calm air, incl. 45 min. emergency supply, climb and descent to MSL in standard atmosphere, incl. warmup and takeoff
Mixture: during climb for best performance
during cruise recommended mixture (see chapter 4.11)

Example: Pressure altitude 6000 ft, temperature +20°C, 55% power

Result: Range is 714 km (385 NM)

Fig. 5.22 Endurance Profile

Condition: - cruise
- recommended mixture leaning (see chapter 4.11)



Example: Power setting 55%, fuel quantity 49.8 liters (13.16 Gal.US)

Result: Possible flight time is 1 h 56 min with 45 min emergency supply

Note

Datas for time to climb see Fig. 5.17

Fig. 5.27 Landing Distance

Paved, level, dry surface, idle, flaps 40°,
max. brake power (elevator held pulled), most
forward C. G.

Aircraft weight [kg]	[lbs]	Approach speed [km/h]	[kts]
850	1874	120.0 {118}	65 {64}
800	1764	116.5 {115}	63 {62}
750	1653	113.0 {111}	61 {60}
700	1543	109.0 {107}	59 {56}

Values in { } are valid for system pitot tube at the wing, static pressure at the fuselage

Example: Temperature 27° C, pressure altitude 2500 ft, aircraft weight 816 kg (1799 lbs), headwind component 13 km/h (7.0 kts)

Result : The ground roll is 175 m (574 ft), the landing distance over 15 m (50 ft) obstacle is 425 m (1394 ft)
Approach speed: 118 km/h (64 kts) IAS
{116 km/h (63 kts) IAS}

For grass runways add about 40% to ground roll. Increase this distance accordingly for wet grass, soft ground, snow, etc.

Table of Contents

Section 7

Airplane and System Description

Contents (continued)

7.1 General

This section contains the description of the airplane and its systems, operating instructions also being given for the latter. A few of the systems described here are special equipment and may not be included in your airplane. For details regarding additional special equipment systems or components please refer to section 9 of the airplane flight manual.

7.3 Airframe

The G 115 is a normal category airplane designed as a single-engine, two-seater low-wing aircraft with cantilever wings and a conventional empennage. The tricycle nose gear of the GROB G 115 is non-retractable. The G 115 is manufactured with newest knowledge to state-of-the-art requirements in industrial fiber reinforced plastic design, mainly involving glass-fiber reinforced plastic.

The semi-monocoque fuselage comprises a self-supporting glass-fiber reinforced plastic shell with frame and web members. The one-part canopy has generous wrap-around glazing to ensure an all-around view from the cockpit.

The cantilever wing of single-trapezoidal cross section has an I-beam main spar with spar caps of glass fiber roving. The wing shell is of honeycomb sandwich design. Interconnection of the wings is made via the spar stubs, bolted together with splice metal sheets. Each wing is attached to the fuselage by two necked-down bolts. The wing trailing edge carries conventional ailerons and flaps.

The aileron web and the shell have a glass fiber plastic honeycomb sandwich structure. The upper shell of the aileron is extended beyond the outbord web to take the mass balance and is configured as a horn. The structural configuration of the flaps is the same as that of the ailerons.

The conventional empennage comprises fin, rudder,tail-plane, elevator and elevator trim tab. The fin integrated in the fuselage mainly comprises the main and end spar in honeycomb sandwich design and a fiber-reinforced full laminate shell. The structural configuration of the tailplane is similar to that of the wings. The tailplane is attached to the fuselage by six shear force fittings. The structural configuration of elevator and rudder are similar to that of the ailerons. Elevator and rudder have horn balance.

The complete airframe is protected from moisture and ultraviolet radiation by an UP gel-coat, an acrylic filler which is finished with an acrylic lacquer.

7.5 Flight Controls

The flight control system of the GROB G 115 comprises conventional ailerons, rudder and the elevator. All flight control surfaces are mechanically actuated via push-pull rods, the ailerons and elevator being controlled by the control wheel and the rudder via rudder-toe brake pedals.

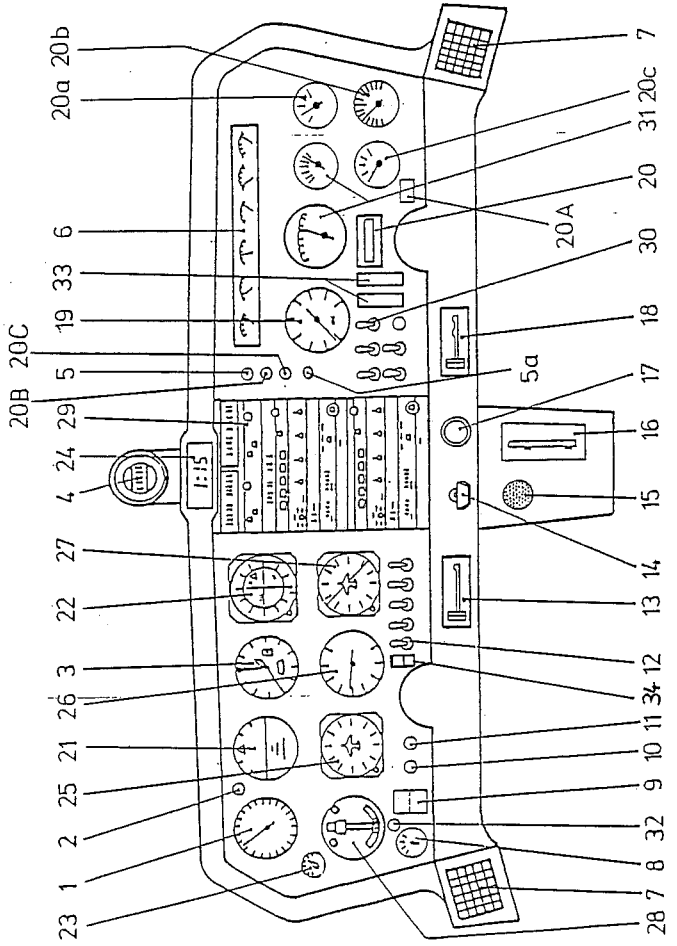
The G 115 has manual elevator trim, the corresponding trim tab being controlled by means of a hand wheel on the center instrument panel. Turning the trim wheel forward produces nose-down trimming of the airplane, turning the trim wheel aft produces nose-up trimming.

To boost the lateral control force an antiservo tab is incorporated in the LH aileron. On later models as of s/n 8032 a turbulator strip ahead of the ailerons replaces the antiservo tab.

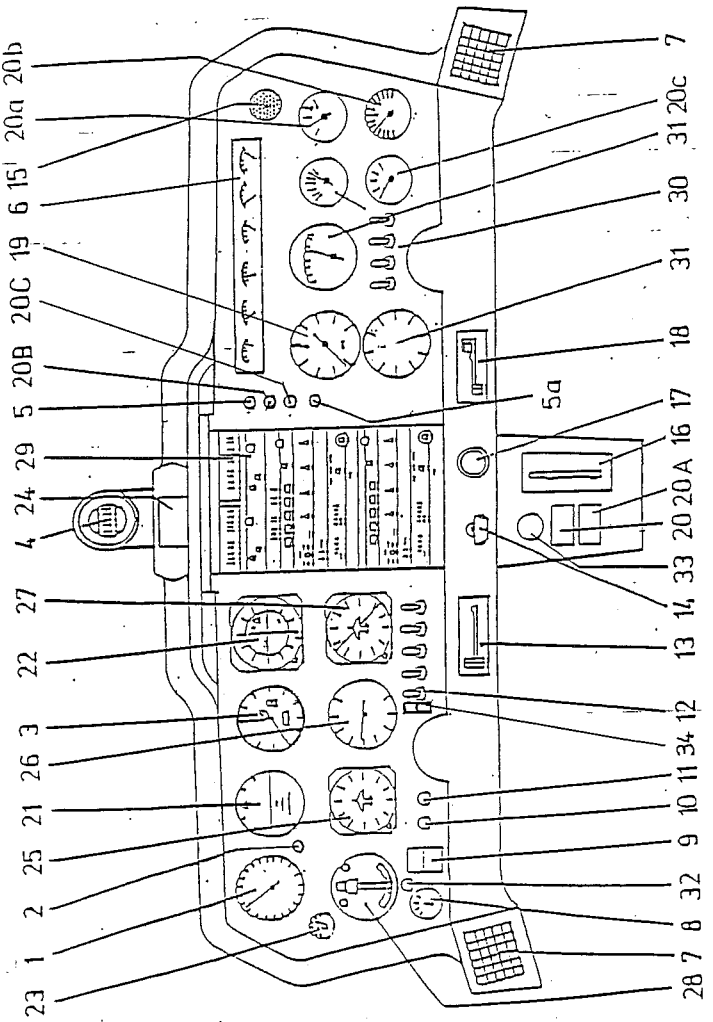
In the G 115 the aileron control is connected to the rudder control via a spring device. The device is installed in the centre console.
The correct functioning of the system may be checked on the ground by moving the rudder pedals; one should then note a small movement of the ailerons.

7.7 Instrument Panel

Instrument panel for airplanes to s/n 8088



Instrument panel for airplanes from s/n 8090



Standard Instruments

1 Airspeed indicator
2 Stall warning (lamp)
3 Altimeter
4 Compass
5 Alternator warning light
5a Starter relay control lamp[1)]
6 Engine instrumentation (fuel gauge, fuel pressure, oil temperature, oil pressure, voltage, amperemeter)
7 Cabin vent
8 Ignition switch
9 Main switch
10 Avionics main switch
11 Vacant
12 Toggle switch line (for ACL-wing, beacon, position light, landing light, fuel pump switch)
13 Parking brake
14 Flap control
15 Stall warning (horn)
16 Flap position indicator
17 Carburetor preheat
18 Cabin heating
19 Tachometer
20 Hourmeter
20a Cylinder head temperature gauge[2)]

20b OAT gauge[2)]

20c Carburetor heat gauge[2)]

20A Engine hour meter[3)]

20B Pitot heating control lamp[3)]

20C Fuel pump control lamp[3)]

1) standard only for Netherlands
2) standard only for Italy
3) standard only for Australia

Optional Instruments

21 Artificial horizon
22 VOR indicator
23 Suction gauge
24 Clock
25 Gyro
26 Rate of climb indicator
27 ADF indicator
28 Turn coordinator
29 Avionic line (COM, NAV, ADF, XPDR, DME, etc.)
30 Toggle switch line (for instrument lighting, pitot tube heating, intercom, speaker-phones selector, etc.)
31 Space for additional instruments
such as e.g. carburetor heat gauge, OAT gauge, cylinder head temperature gauge, EGT gauge, etc.
32 Push button primer system
33 Dimmer
34 Toggle switch for alternate static

Instrument panel for airplanes to s/n 8088

On the instrument panel (see fig. on page 7 - 5) the instruments are arranged around the flight instrumentation "T", the gyros (if incorporated) being located directly in front of the pilot one above the other and to the left and right of them the airspeed indicator and altimeter respectively. The remaining flight instruments surround this instrument T. On the LH, upper side of the instrument panel the stall warning lamp and the suction gauge (when a suction pump is incorporated) are arranged; at the LH bottom the ignition switch, main switch and the avionics main switch are located. A line of toggle switches for ACL wing, beacon, position lights, landing lights and the electric fuel pump are located at the bottom right in the LH section of the instrument panel, beside that is the toggle switch for the alternate static (optional). Whilst the avionics instruments are arranged in the center portion of the instrument panel, the RH side provides space for the alternator warning light, the starter relay control lamp, the pitot heating control lamp, the fuel pump control lamp, the tachometer, the hourmeter, the engine hourmeter, the dimmers, an additional line up to six switches for switching instrument lighting, pitot tube heating, intercom, speaker/phone and comI/comII selection and room for additional instruments.

The engine instrumentation including the fuel gauge is located to the right of the avionics instruments in the upper portion of the instrument panel. In the center of the lower instrument panel frame the controls are provided for parking brake valve actuation, flap switch, carburetor preheat knob and the control lever for cabin heating.

The part of the center panel directly adjoining the instrument panel locates the flap position indicator and the acoustical stall warning horn. The digital clock (optional) is integrated directly in the upper instrument panel frame. The magnetic compass is located on the panel frame in the center of the instrument panel.

Instrument panel for airplanes from s/n 8090

On the instrument panel (see fig. on page 7 - 6) the instruments are arranged around the flight instrumentation "T", the gyros (if incorporated) being located directly in front of the pilot one above the other and to the left and right of them the airspeed indicator and altimeter respectively. The remaining flight instruments surround this instrument T. On the LH, upper side of the instrument panel the stall warning lamp and the suction gauge (when a suction pump is incorporated) are arranged; at the LH bottom the ignition switch, main switch and the avionics main switch are located. A line of toggle switches for ACL wing, beacon, position lights, landing lights and the electric fuel pump are located at the bottom right in the LH section of the instrument panel, beside that is the toggle switch for the alternate static (optional). Whilst the avionics instruments are arranged in the center portion of the instrument panel, the RH side provides space for the alternator warning light, the starter relay control lamp, the pitot heating control lamp, the fuel pump control lamp, the tachometer, the acoustical stall warning horn, an additional line with four switches for switching instrument lighting, pitot tube heating, intercom and speaker/phone selection and room for additional instruments.

The engine instrumentation including the fuel gauge is located to the right of the avionics instruments in the upper portion of the instrument panel. In the center of the lower instrument panel frame the controls are provided for parking brake valve actuation, flap switch, carburetor preheat knob and the control lever for cabin heating.

The part of the center panel directly adjoining the instrument panel locates the flap position indicator, the hourmeter, the engine hourmeter and the dimmer.
The digital clock (optional) is integrated directly in the upper instrument panel frame. The magnetic compass is located on the panel frame in the center of the instrument panel.

7.11 Ground Control

The G 115 has a steerable, non-retractable nose gear. The nose wheel is connected to the rudder pedals thru a spring box. A conventional shimmy damper compensates any shimming tendency. To assist steering the separate wheel brakes can be included. The maximum steering angle of the nose wheel is ±27° (with modification according to SB 1078-19: ±47°). When towing the airplane by a towing vehicle make sure that this steering angle is not exceeded otherwise the nose gear could be damaged. The minimum turning circle is 8.0 m (26 ft) or 6.50 m (21 ft) measured over the wing tips, for full steering angle, brake actuation and assistance by engine power.

7.13 Wing Flaps

Extension and retraction of the flaps is done by means of a toggle flap control switch. To extend the flaps the switch must be pressed down until the desired flap position is attained. The take off and landing positions (12° and 40°) are clearly indicated by the indicator unit on the front center panel. Intermediate positions are possible during extension. Returning the flap control switch up results in full retraction of the flaps. Limit switches automatically interrupt the power to the electric motor, when the flaps attain the final position. Asymmetrical flap settings are eliminated by levers and pushrods interconnecting the flaps.

7.15 Landing Gear

The landing gear of the G 115 is a non-retractable tricycle landing gear with steerable nose wheel, two main wheels and fairings. Shock absorption is provided by the struts of the main gear and the gas strut of the nose gear.

Each main wheel has a hydraulically actuated single-disk brake on the inside. The hydraulic brakes are actuated by the toe brake pedals either by the pilot or the co-pilot.

The lever for actuating the parking brake is located at the RH side below the control wheel on the pilot's side To set the parking brake, move the parking brake lever to the "ON" position and pump both brake pedals until full resistance is felt. By positioning the parking brake lever to "OFF", the brakes are released.

The brake fluid reservoir is located on the RH fire wall side and is accessible by removing the upper cowling. The brake fluid level can be checked by means of the transparent reservoir. The brakes do not need adjusting. Brake lining wear is automatically compensated.

Note

Whenever the airplane is parked unsupervised, always chock the wheels and apply the parking brake.

7.17 Baggage Compartment

The baggage area extends from the rear of the pilot and co-pilot seats to the aft cabin frame. Loading the baggage area must be in accordance with the values as stipulated in section 6 "Weight and Balance". All baggage must be safeguarded by the GROB approved baggage net included in each airplane. For this purpose the baggage net must be secured to the strapping eyebolts incorporated in the baggage area floor.

Warning

Never accommodate children in the baggage area. Material which could be dangerous to the airplane or passengers must not be stowed in the airplane.

7.19 Seats and Safety Belts

The GROB G 115 is fitted out with comfortable seats, permitting even lengthy flight without tiring. Seats comprise the seatbacks, configured as a frame, four seat webs, the forward seat frame and the fully laminate seat buckets. All frames and webs are designed as glass-fiber reinforced plastic honeycomb sandwich structures and are firmly connected to the fuselage. Thus no seat adjustment feature is possible. Instead the pedals of the GROB G 115 can be continuously adjusted by means of two crank handles located on the forward seat frame. The adjustment controls of both pedal units operate independently of each other. Seats can be adapted to users by seat and seatback cushions available in different thickness.

Both seats are fitted out with 4-point safety belts with a quick-release lock. In the pulled position of the locking lever the remaining belts can be latched in place in the lock. Pressing the lever locks the lock. By opening the lever past the ratchet lock, all belts are released.

7.21 Canopy

The GROB G 115 has a rear-opening sliding canopy with generous glazing permitting an excellent view all round. The canopy lock is provided by an overhead latch located in the center of the canopy and can be locked from the outside. The actuating handle has two positions only, identified by OPEN/CLOSED both on the inside and outside of the canopy. Due to the deadpoint safety of the canopy lock, automatic or accidental opening is not possible. The handles incorporated on the top of the canopy facilitate entry into / out of and opening the canopy.

Note

Always make sure before taking off that the canopy is properly locked! Never open the canopy in flight.

An emergency window is provided in the canopy on both the pilot's and co-pilot's side.

In the G 115 the canopy serves as the emergency exit. In a case of emergency the canopy bubble can be smashed with an emergency hammer on board as standard and located on the center panel on the pilot's side.

7.23 Control Surface Lock

To protect the ailerons and the elevator from damage due to wind buffeting when the aircraft is parked, a handwheel locking feature is provided. This feature comprises a steel locking pin with a red warning sign reading "REMOVE LOCKING PIN BEFORE STARTING ENGINE". To attach the control lock, line up the hole in the top of the pilot's control wheel column guide on the instrument panel so that the locking pin can be inserted. When the locking pin is inserted the ailerons are in the neutral position and the elevator is locked in a slight nose down position. When the handwheel locking is correctly inserted the warning sign covers the ignition switch. When the aircraft is parked in areas subject to heavy winds or gusting, a rudder locking device must be applied over the fin and the rudder.

Warning

Always remove control lock devices prior to starting the engine!

7.25 Engine

The GROB G 115 is powered by a Lycoming 0-235-H2C four-cylinder, direct drive, horizontally opposed engine rated at 115 horsepower at 2800 rpm (sea level).

Engine controls are grouped together on the center panel. The knobs are configured according to the design specifications so that they can be identified by gripping. The central arrangement of the engine control lever facilities its use by both the pilot and co-pilot. An adjustable friction brake on the lefthand side of the levers prevents them from moving.

The throttle control is used to set the manifold pressure which is a measure of engine output power at constant speed.

The mixture control lever permits adjustment of the air to fuel ratio. In the fully forward position a rich mixture is set. The engine is shut down by placing the mixture lever fully aft (IDLE CUT OFF).

The majority of the engine instruments is located to the right of the avionics instruments in the top portion of the instrument panel. This cluster includes the following gauges: fuel quantity gauge, gauges for indicating oil temperature, oil pressure, fuel pressure and an ammeter. In conjunction with a voltmeter these instruments are incorporated in a multi-instrument.
The alternator warning light is located to the left of the multi-instrument, the tachometer below.
Running-in of the engine was done at the manufacturing company.
It is mandatory that you observe the instructions given in section 1 on page 1 - 6.

The oil necessary for lubricating the engine is furnished by the oil sump located underneath the engine. The oil sump capacity is 6 quarts/5.7 liters. The lube oil

level can be checked by means of an access hole in the the upper engine cowling. A dipstick as part of the filler cap indicates the lube oil level.

The danger of carburetor icing is eliminated by a carburetror heat system which is operated by means of the knob located above the flap position indicator. When the carburator heat knob is pressed the engine draws in air thru the air filter, when it is in the pulled position heated unfiltered air enters thru the exhaust heat exchanger. By turning the knob clockwise (not more than a quarter-turn) the knob control can be secured. Release by turning counter-clockwise by the same amount.
Carburetor heat must be used in accordance with the requirements of section 3 "Emergency Procedures" and section 4 "Normal Procedures".

The ignition switch is located on the left hand side, bottom section of the instrument panel and has the following switch positions:

"R" (magneto RH), "L" (magneto LH) and "BOTH" (both magnetos), "OFF" and "START".

When the starter has been operated, the spring-loaded switch returns to the "BOTH" position.

Optionally the airplane may be fitted with a primer system to attain reliable starting in cold weather.
The system is as follows:
A fuel line is taken from the electrical fuel pump to a valve which is opened electrically by the primer button positioned next to the ignition switch.
The valve will only operate when the fuel pump is on, when the electrical power is off the valve is closed.
When the valve is open fuel flows thru the supply lines to the fuel injectors of cylinders 1 and 2 (front left and right).
These injectors spray the fuel directly into the cylinder thru the inlet valves.

7.27 Propeller

The GROB G 115 has a Hoffmann two-bladed wood propeller HO 14-175 120 with a metal spinner as standard.
The airplane can also be fitted with a Sensenich 72CKS6-2-53 propeller (see Service Bulletin TM 1078-7).

7.29 Fuel System

The G 115 fuel is stored in a fuselage tank with a total capacity of 100 liters (91.7 liters usable). This aluminum tank is located between the seat frame and the aft cabin frame under the floor of the baggage area. The fuel cock is located on the center panel directly aft of the trim control wheel.

Fuelling the airplane is done via a filler cap integrated in the glass-fiber reinforced plastic structure and is located on the lefthand side of the airplane. A grounding connection is provided on the same side as the filler neck on the bottom of the fuselage. This connection is identified by a grounding logo.

Caution

Always ground the airplane via the grounding connection before fuelling!

Fuel flow to the engine passes from the fuel tank via the fuel shutoff valve, thru a fuel strainer, via the auxiliary electric fuel pump to the engine-driven fuel pump.

The fuel level in the tank is monitored by a fuel quantity sensor which signals the fuel gauge on the instrument panel. A sight glass for fuel quantity check could be installed as an option.

Note

Do not expect the fuel gauge to give a precise reading when the aircraft is yawing, side-slipping or in an unusual attitude!

The fuel tank of the G 115 is vented via the filler neck. The vent opening is located on the bottom of the fuselage and is configured so that the tank is always subject to slightly more than atmospheric pressure. As an additional safety feature the fuel tank is vented via the filler cap.

The fuel system features a drain valve at the bottom of the fuselage directly beneath the tank. Pushing the valve up is sufficient to drain water or sediment from the tank.

Note

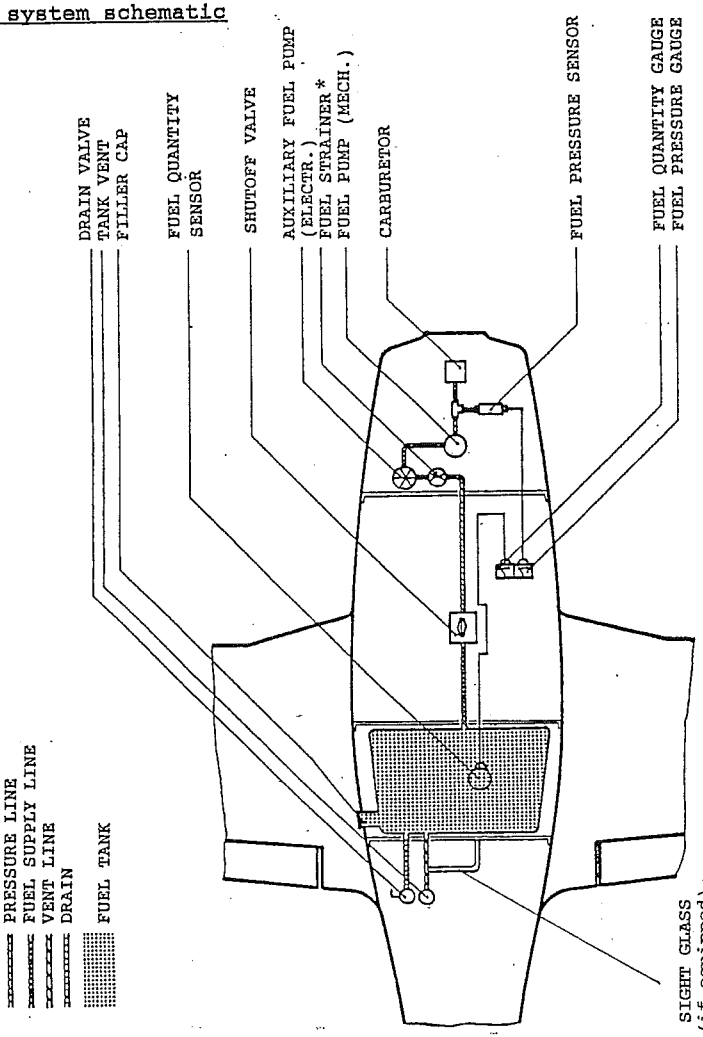
In making a fuel check a slight dis-colouration of the fuel may be observed - this is quite normal in new aircraft and will clear after a short period.

The auxiliary electric fuel pump is actuated by a toggle switch located above the parking brake lever. This pump must always be ON during take off and landing.
It is the responsibility of the pilot to make sure that the fuel gauge is functioning properly and with sufficient accuracy. The pilot should therefore make sure before taking off that an adequate fuel supply is available. Taking off is forbidden, when the fuel gauge indicator is in the yellow arc.

Note

Always fuel the airplane sufficiently for a safe flight!

Fuel system schematic



7.33 Brake System

The two main gear wheels of the airplane are fitted out with single-disk brakes. Separate hydraulic lines connect the master brake cylinders on the pilot's side via the parking brake valve. These cylinders are connected to the brake cylinders on the co-pilot's side by two further hydraulic lines. From these brake cylinders two hydraulic lines run to the brake fluid reservoir on the fire wall. The brake cylinders are directly connected to the rudder pedals.

To extend brake life proper maintenance of the braking system in accordance with specifications is mandatory and use the brakes as little as possible during taxiing and landing.

The following are indications of an imminent brake failure: gradual brake fading when the brakes are operated, noisy or rubbing brakes, soft or springy pedal action and excessive pedal travel and tired brake response. Should any of these signs occur, carry out brake system maintenance without delay. Should the brakes fade during taxiing or landing, briefly release the rudder pedals and then apply full foot pressure. Should the pedals tend to be springy or pedal travel become excessive brake pressure can be built up by pumping the pedals. Should one of the brakes fail or fade, use the other brake sparingly, whilst counteracting any swerve tendency by means of the rudder.

7.37 Electrical System

The electrical energy required for the 14 V DC system is generated by an engine-powered alternator. Max current output is 55 A as of 2100 RPM.

The battery box with the 12 V lead-acid accumulator is located on the RH side of the fire wall. The battery provides the current for starting and for all electrical consumers when the engine is OFF. Battery capacity is 18 Ah which is sufficient under normal flight conditions to provide emergency power (alternator failure) for a maximum of 1 h 27 min (23 Ah optional).

Caution

When the engine is OFF consumers must be switched off without delay to avoid discharging the battery. When the alternator is down all consumers which are not vital to safe continuation of flight should be switched off.

The power supply of all electric circuits is provided via busbars which are located in a fuse panel mounted between the pilot seat and the instrument panel on the lefthand wall of the fuselage.

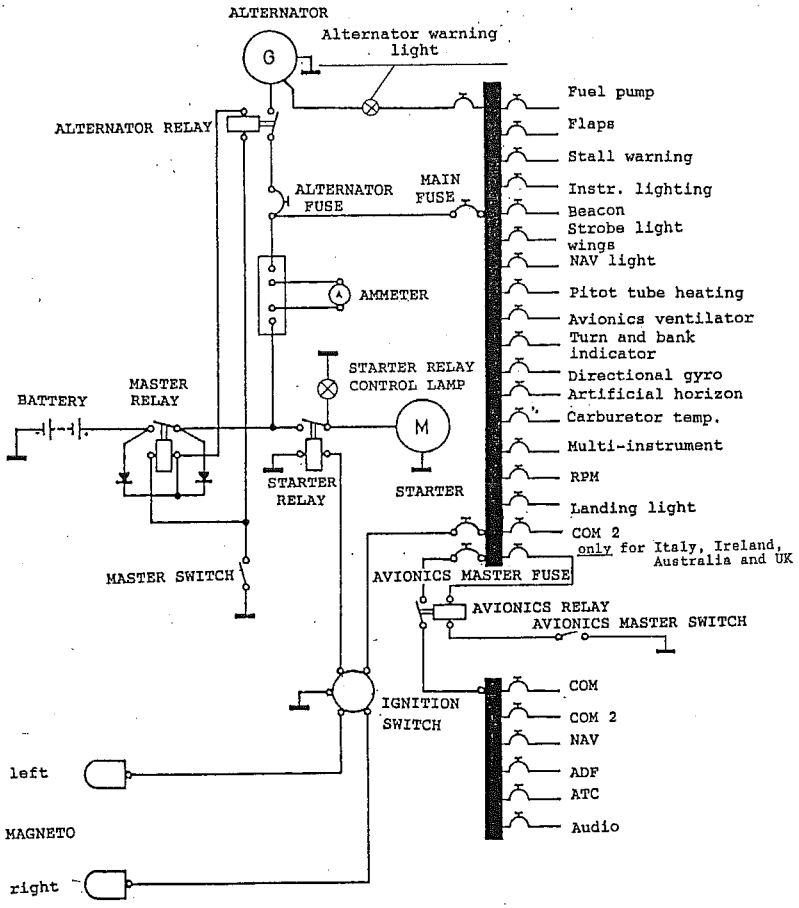
Main Switch

The main switch is a toggle switch located on the lefthand side of the instrument panel at the bottom, and the corresponding main switching relay located above the battery box on the fire wall frame. Switch positions are clearly identified. In addition the green lamp incorporated in the main switch will light up in the "ON" position. In the "OFF" position all consumers are isolated from aircraft power.
The avionics master switch is located directly alongside the master switch, on the right. The positions "ON" and "OFF" are identified on the instrument panel.

Caution

To avoid damage to the electronic equipment always switch off the avionics master switch during starting.

Electric System Schematic



Starter

The starter is relay-controlled and is actuated by the ignition switch. To switch on the starter circuit, position the ignition switch to "START".
Only if a starter relay control lamp is equipped:
After starting the STARTER RELAY CONTROL LAMP must go out, if it doesn't the MASTER SWITCH must be switched off and a check must be made of the STARTER RELAY and associated components.

Voltmeter and Alternator Warning Light

The voltmeter is integrated in the engine instrumentation. It indicates the charging level of the battery and proper functioning of the alternator. In the range 12.5 V - 14 V the alternator generates voltage. When the voltage drops below 12.5 V and the red alternator warning light is on, the generator is down. In this case, switch off all consumers not vital to safe continuation of flight.

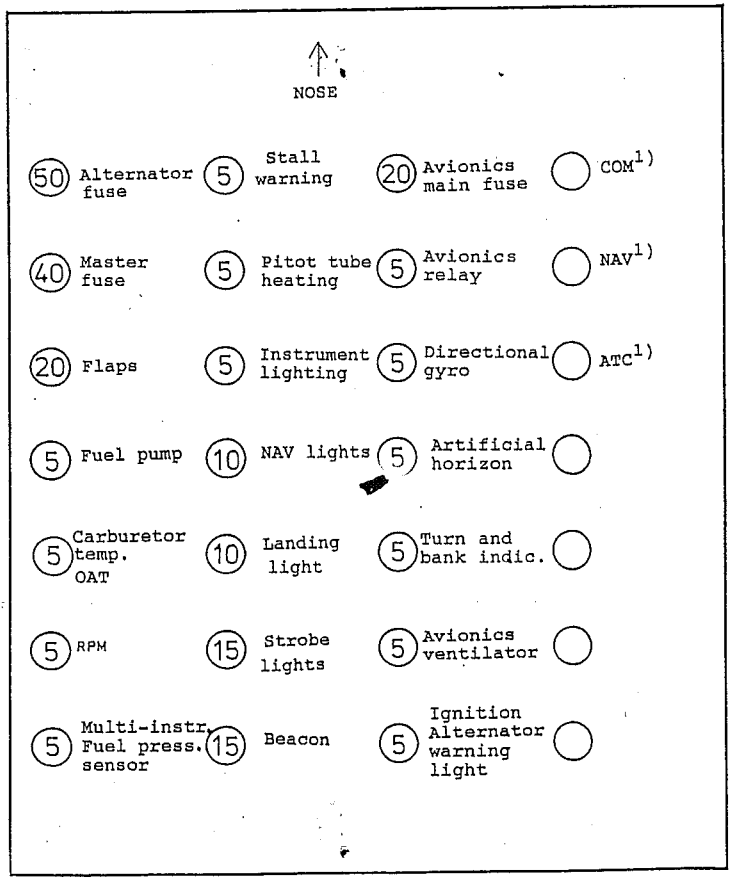
Caution

When the red alternator warning light is on, this means the alternator is not working.

Circuit breakers

All circuits are protected by circuit breakers, located in the circuit breaker panel.

Circuit Breaker Panel



1) depending on the equipment !

External Power Supply

The connection for connecting an external power supply is optional, and is located on the RH side lower cowling and and is equipped for 12 V. The external power connection is suitable for carrying out ground tests or to assist starting.

When connecting the external power supply first connect the cable clamps of the jump cable to the external power supply, making sure of correct polarity. Then position the avionics master switch OFF. The jump cable plug can then be inserted into the connector receptacle and the external power supply switched on. For engine starting procedure see section 4.

7.39 Lighting Systems

Interior Lighting

a) Lighting for airplanes to s/n 8088
(This description also covers lighting for flights in NVFR conditions which is a supplementary)

The toggle switch for activating the instrument lighting is located on the RH side of the instrument panel bottom left.
The lighting consists of postlights and integrated lamps as well as lamps on the instrument panel cover bottom, which beam in "white light".
A lamp installed in each control wheel directs light to the fuel cock and to the circuit breakers, and is actuated by a toggle switch situated in the centre of each control wheel. These lamps also "double" as map-lights.
A dimmer situated in the RH of the instrument panel controls the level of light given to the instrument panel.
The lamps in the control wheels are not adjustable.
For control of the level of light in NVFR-conditions the installation of two dimmers is requested (during installation of the additional NVFR lighting).
It is recommended that an additional light source independent of the airplane power supply (pocket lamp) is taken along at all times in case of a lamp failure.

b) Lighting for airplanes from s/n 8090
(This description also covers lighting for flights in NVFR conditions)

The toggle switch for activating the instrument lighting is located on the RH side of the instrument panel bottom middle.
The lighting consists of 5 postlights and one integrated lamp in each control wheel as well as 3 lamps on the instrument panel bottom, which beam in "white light".
A lamp installed in each control wheel directs light to the fuel cock and to the circuit breakers, and is actuated by a toggle switch situated in the centre of each control wheel. These lamps also "double" as map-lights.
A dimmer situated in the center panel controls the level of light given to the lamps in the instrument panel.
The integrated lamps in the control wheels are not adjustable.
It is recommended that an additional light source independent of the airplane power supply (pocket lamp) is taken along at all times in case of a lamp failure.

Exterior Lighting

The toggle switch for activating the exterior lighting is located on the LH side of the instrument panel bottom, right.
Each circuit is protected by a circuit breaker.
The exterior lighting comprises:

- Landing light (optional)
- Wing tip strobe lights and navigation lights (optional)
- Navigation light on the top of the rudder (optional)
- Beacon on the top of the rudder

7.43 Heating, Ventilating, Defrosting & Air Conditioning

When flying on cold days or at high altitudes the GROB G 115 can be operated with cabin heating. The exhaust heat exchanger supplies the warm air to the front area of the cabin thru three outlets. Two of the outlets provide a flow of warm air directly to the feet area of both seats, the third outlet furnishes warm air for the windshield defroster. During flight air is scooped via an opening on the cooling air inlet to the exhaust heat exchanger where it is warmed up for passing on to the warm air distribution box. From here the warm air is supplied to the outlets in the cabin and for windshield defrosting.

Heating system with variable heat control:

At this system the warm air from the exhaust heat exchanger is conducted to the mixing box. As the mixing box is also supplied with cold air, it is possible to regulate the temperature of the air leaving this mixing box.

The control for adjusting the heating system is located to the right of the carburetor heat control. When heated air is to be supplied to the cabin outlet openings, push the heating slider control to the latch identified by an arrow. If windshield defrosting is required, push the heating control full right to latch (identified by an arrow pointing upwards). Intermediate positions are also possible.

From the air inlets (NACA inlets) at the base of the windshield on both sides of the fuselage, fresh air flows to the adjustable air nozzles. These nozzles are located on the left and right in the instrument panel frame and supply the cabin with fresh air.

7.51 Pitot Static System

The pitot-static system supplies static and total pressure to operate the airspeed indicator, the altimeter and the optional vertical speed indicator.

There are two different systems:

a) System with pitot-static-tube at the fin

Both the static pressure and the total pressure are sensed by a heatable (optional) pitot-static tube located at the top of the fin. The toggle switch for activating the pitot-heating is located on RH side of the instrument panel bottom left. Included in delivery is a protective cap for the pitot-static tube. Make sure that this is in place to protect the pitot-static tube whenever the G 115 is moored outdoors or when in the hangar for a longer period of time.
To drain the pitot-static hoses two drain valves are provided on the bottom of the fuselage close to the tail skid.

During each preflight check the pitot-static system should be drained and the pitot-static tube checked for cleanliness or blockage respectively.

b) System with pitot-tube at wing, static pressure at fuselage

The total pressure is sensed by a heatable pitot-tube located at the left wing lower side. The heating equipment should only be operated in probable icing conditions. A complete functional check during preflight check is not possible. The heating is being activated only in flight via a switch which depends on the pitot-pressure (built as a protection from overheating). The toggle switch for activating the pitot-heating is located on RH side of the instrument panel in the middle.
The static pressure is sensed at the LH and RH side of the fuselage via a drilled plate. Included in delivery is a protective cap for the pitot-tube. Make sure that this is in place to protect the pitot-tube whenever the G 115 is moored outdoors or when in the hangar for a longer period of time.

To drain the system there is no additional work necessary. The pitot-tube is provided with a water baffle plate with drain holes, the plates for the static pressure are protected against rain by means of their configuration.

During each preflight check the pitot-tube and the plates should be checked for cleanliness or blockage respectively.

Note

Partially or totally blocked pitot-static hoses will result in incorrect instrument readings.

Alternate Static System (optional)

If this system is equipped:

The use of this system is recommended if the normal static system is out of action. The pick-up point takes place by means of combined over- and underpressure tubes in the engine compartment (attached to the fire wall). The airspeed calibration described by means of tables in section 5 page 5 - 12.

The alternate static system is operated by a toggle switch which is installed in the LH side of the instrument panel.

7.53 Vacuum System

The vacuum system (optional) is designed to operate the air-driven gyro instruments.
An engine-mounted suction pump generates the necessary vacuum pressure via a controller. This pressure can be monitored on the suction gauge located on the LH edge of the instrument panel. Instruments are protected from soilage by filters. Should the vacuum pressure slightly drop after being constant for a long period, dirty filters can be the cause. These filters are located on the equipment panel beneath the instrument panel.

7.70 Emergency Locator Transmitter Type EAGLE EB-2BCD

The Emergency Locator Transmitter (ELT), when installed, is mounted on the luggage shelf behind the co-pilot's seat in the direction indicated on the top of ELT (DIRECTION OF FLIGHT).
The ELT is a autonomous unit and operates on a battery. It transmits signals on two emergency frequencies (121.5 MHz and 243.0 MHz) simultaneously with a transmitting range of 200 miles (320 km) line of sight via a flexible rubber antenna.
The ELT is operated by a 4 position selector switch:

- TEST: For checking the functioning of the transmitter the antenna must be removed and the selector switch must be placed to TEST position. Flashing of the TEST LIGHT indicates functioning of the ELT. Perform only short tests!
- OFF: In the OFF position the transmitter is inactive. The ELT should be switched off during shipment, storage, changing the battery and after the rescue.
- ARM: The ARM position allows the unit to be set to the automatic mode so that it will transmit after activation by impact and will continue to transmit until the switch is manually moved to the OFF position or until the battery is flat.
- ON: This position is provided for the manual activation of the transmitter. For using the ELT in the portable mode remove it from the bracket.

CAUTION

To rearm the ELT after an activation the selector switch should be placed in the ARM position and should be pressed in momentarily (PUSH TO RESET).

The ELT should be checked during the preflight ground check to make sure that it has been not accidentally activated. Check by tuning a radio receiver to 121.5 MHz If there is an oscillating sound, the locator may have been activated and should be turned off immediately (OFF).

The battery replacement date is marked on the ELT label. The battery must be replaced on or before this date. The battery must also be replaced if the transmitter has been used in an emergency situation or if the accumulated test time exceeds one hour, or if the unit has been inadvertently activated for an undetermined time.

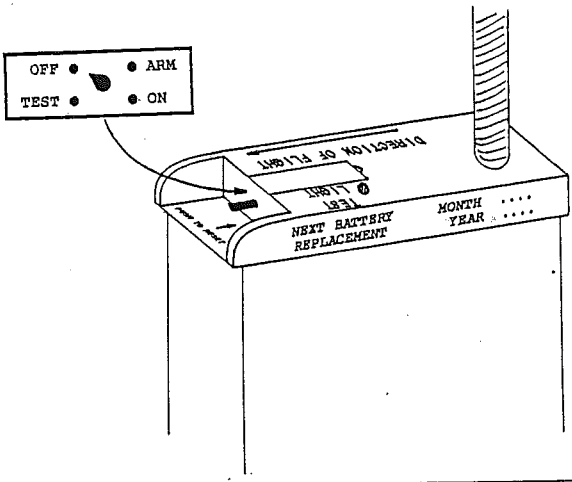
NOTE

The ELT has to be removed from the airplane if it is parked for long periods of time in a hot environment (more than 40°C (104°F)) to avoid dimishing the battery shelf life.

NOTE

If for any reason a test transmission is necessary, the test transmission should be conducted only in the first five minutes of any hour and limited to three audio sweeps. If tests must be made at any other time the tests should be coordinated with the nearest FAA tower or flight service station.

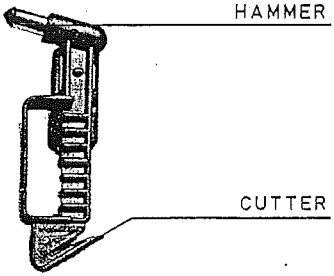
Emergency Locator Transmitter (ELT)



7.71 Emergency Tool

An emergency hammer with harness cutter is installed on the left side of the middle console which is near at hand for the pilot and which can be pulled out of the holding device, if required.
If it is not possible to open the sliding canopy in an emergency, the glass has to be smashed with the carbide tip of the emergency hammer whereby smashing of the glass should be started at the emergency window.

A harness cutter is on the lower end of the emergency tool with which the harness can be cut through, in case harness buckle cannot be opened.



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Section 8

Handling, Servicing and Maintenance

8.1 General

This section provides general guidelines relating to the handling, servicing and maintenance of the GROB G 115.

Every owner should stay in close contact with the GROB G 115 manufacturer to obtain the latest information pertaining to the aircraft. For this purpose GROB from time to time issues Service Bulletins and Service Letters relating to the aircraft.

Service Bulletins are of special importance for the safety of the aircraft and should be complied with promptly. These are sent to the latest registered owners, authorized work-shops and dealers and contain information on material source and work-shops that are authorized to carry out the instructions.

Should deficiencies materialize during operation of the aircraft, detrimenting its airworthiness, the civil aviation authorities publish airworthiness directives (ADs) in the "Aviator's News" describing the mandatory changes, usually with reference to a service letter of the manufacturer (German LBA legislation § 14 Luft BO).

In this case your GROB G 115 may only be flown if the prescribed procedures have been properly implemented in accordance with the deadline given in the AD, except for checking purposes.

Service letters deal with product improvements and service hints pertaining to the aircraft, so that the owner is able to keep the aircraft up to date with the latest changes. This information is automatically sent to dealers, work-shops and occasionally (at the factory's discretion) to the latest registered owners.

Any correspondence regarding the GROB G 115 should include the airplane model and serial number to ensure proper response.

For maintenance and servicing of the GROB G 115 a maintenance manual and an illustrated parts catalog are available from the manufacturer. A revision service is also available for both items listed.

Servicing and maintenance information of the GROB G 115 is based on the civil aviation authority requirements of the Federal Republic of Germany and, therefore, airplanes registered in other countries must comply according to the authority requirements of this country.

8.3 Preventive Maintenance

To ensure operational reliability every aircraft must be put thru the prescribed preventive maintenance and inspected in accordance with authority requirements.

Regular inspections must be carried out every 50 or 100 operating hours. In addition, a first inspection is necessary after 25 operating hours. The work required in each case is described in the GROB G 115 maintenance manual.

The German civil aviation authority legislation (§ 27 LuftGerPO) requires annual inspection of the aircraft by an authorized aviation work-shop or an authorized aircraft inspector for validation of the airworthiness certificate.

In case that the GROB G 115 is operated commercially it must undergo an additional inspection each 100 hour of operation besides the annual inspection.

On request, the German civil aviation authority will publish airworthiness directives (see also chapter 8.1) affecting an aircraft or parts thereof. It is the owner's responsibility to make sure that the procedures demanded in these instructions are implemented within the prescribed periods and the aircraft reinspected if necessary. It is therefore mandatory that the owner maintains regular contact with the manufacturer or an authorized aviation work-shops, to keep himself informed of all valid airworthiness directives.

In addition, it should be noted that individual parts of the aircraft (e.g. engine, magnetos, propeller) require overhauling following the prescribed operating hours. Details relating to this can be found in the maintenance manual or in the manual of the subsystem involved.

To keep track of the operating hours the owner is obliged to keep a logbook indicating last overhaul (TBO- time between overhaul) entries. This logbook shall also record all maintenance work carried out.

The prescribed inspection procedures and the maintenance work including minor repairs can be carried out by qualified mechanics, as long as they have the ability to perform the work and the aircraft is not used for commercial transportation (§ 9 LuftBo). In this case all inspections can be carried out together in accordance with the inspection procedures for aviation equipment (not the 100 hour inspections) at the annual inspection.

All maintenance work must be carried out in accordance with the instructions of the maintenance manual. When in doubt, always contact the manufacturer or an authorized aviation work-shop.

8.5 Alterations or Repairs to Airplane

All and any alterations to the aircraft require local CAA and manufacturer approval. However, an alteration which has no effect on the airworthiness and is implemented by conventional means (minor alteration) can be carried out without prior CAA approval as long as the alteration is in accordance with the alteration procedures as specified by the CAA.

Any alteration of the aircraft which could affect its airworthiness or necessitating a change in the operating instructions or the operating limits of the aircraft or cannot be carried out by conventional procedures (major alteration) must be implemented by agencies having CAA approval in accordance with the inspection ordinance for aviation equipment. This alteration is permitted only in accordance with technical documents which were a component of the supplementary type certification.

A supplementary type certification is not required when the major alteration is limited to individual items. Prior to implementing a major alteration, German CAA requirements call for substantiating the airworthiness in accordance with § 41 of the inspection ordinance for aviation equipment (§ 13 LuftBO).

Within the maintenance framework minor repairs can be carried out to remedy indicated complaints or establish deficiencies which can be implemented by simple means.

Should your G 115 be damaged to an extent which cannot be satisfactorily repaired within the maintenance framework, a major repair is necessary (§ 8 LuftBO). Such repair work must be carried out by an authorized aviation work-shop which shall always require approval of the manufacturer.

When in doubt with regard to aircraft damage always contact the manufacturer.

8.9 Ground Handling

The dimensions of the GROB G 115 can be seen from the three view (page 1 - 3).

Caution

To ensure safe ground clearance of the propeller, care must be taken to the recommended maintenance procedure for the landing gear and correct tire pressures.

Towing

When towing the aircraft with a towing vehicle exercise maximum care since turning the nose gear beyond its steering radius of ±27° (with modification according to SB 1078-19: ±47°, refer to chapter 7.11) will result in damage to the nose gear and steering mechanism.

The airplane can be moved on a flat, smooth surface by a single individual using the towbar which must be attached to the towing lugs on the nose gear.

Where maneuvering space is limited, two persons can turn the airplane by the wheels of the main gear, this requiring one person to push the wing nose or to keep hold of the wing tip whilst the other person operates the towbar.

Caution

Never use force on the propeller or on the control surfaces. Never apply weights to the tailplane for the purpose of lifting the nosewheel. Also note that towing is not good practice when landing gear movements are obstructed by snow and sludge.

Parking

The parking brake lever is located on the RH side, below the LH control wheel. To set the parking brake, position the parking brake lever to the "ON" position and pump the toe brake pedals until solid resistance is felt. Positioning the parking brake lever to "OFF" releases the brakes.

Note

If the airplane is parked unsupervised, instead of setting the park brake, chock the wheels, since a change in the weather could result in the brakes being released or being subjected to excessive high pressure.

Taxiing

When taxiing the GROB G 115 can easily be steered by means of the steerable nosewheel. To achieve a tight turn, the toe brake pedals can be used to brake the corresponding wheel of the landing gear.
To prevent propeller ground contact, take caution when taxiing over uneven ground.
propeller ground contact. Apart from this, loose stones, gravel or any loose material may cause damage to the propeller blades at high speeds.

Mooring

To moor the airplane head it into the wind. Four tie-down rings are provided on the airplane: one each under the wings, one at the nosewheel fitting and one on the fuselage (in front of the tail skid). To moor the airplane proceed as follows:

1. Apply the control lock
2. Chock wheels fore and aft
3. Secure plastic or chain tie-down ropes of adequate strength to the aircraft at the tie-down rings on the nosewheel fitting and the wing adapters. In addition the tail skid may be used as a tie-down point.
4. Release parking brake

Jacking

For wheel or tire change the G 115 must be jacked up at the prescribed locations. For a detailed description see GROB G 115 maintenance manual.

8.11 Servicing

Engine Air Filter

A Purolator PM 1711 air filter is incorporated downstream of the air intake scoop in the bottom cowling half for easy replacement.

This filter should be changed every 100 hours. When the airplane is operated in dusty locations, check and replace the air filter more often.

Brakes

Both landing gear wheels of the GROB G 115 are equipped with Cleveland disk brakes. The brake system is filled with brake fluid as per MIL-H 5606. Check brake fluid level every 50 operating hours. The brakes do not require adjustment. Changing the disk brake linings is described in the maintenance manual.

Tires

Tire size for the main gear is 380 x 150/15 x 6.00-5 and for the nose gear 5.00-5. The tire pressure for the main wheels is 3.5 bar (51 PSI) and for the nose wheel 2.5 bar (36 PSI).

Oil

The oil capacity of the Lycoming engine is 5.7 liters, and the minimum quantity required is 1.9 liters. Before long flights the oil should always be replenished up to the top level. Change oil every 50 hours of operation.
Every 50 hours of operation the oil filter should be changed.
Engine oils must comply with AVCO LYCOMING specification No. 301 and AVCO LYCOMING Service Instruction No. 1014, latest issue (see also section 1, page 1 - 5).

Fuel

The G 115 has a fuselage tank of 100 liters capacity. The tank system can be drained via a drain valve which is located directly under the tank at the bottom of the fuselage. Draining the tank should be done before each first flight of the day and after fuelling, paying particular attention to dirt in the fuel. Drain until fuel emerges clean. Should dirty fuel still emerge from the drain valve after one minute, have the fuel system inspected.

Caution

After draining make sure that there is no danger of fire from fuel spillage when starting the engine.

Aviation grade fuel: Avgas 100 or 100 LL

8.13 Cleaning and Care

Exterior Cleaning

As with any composite airplane having mainly laminar flow conditions, keeping these surfaces clean is of major importance to aircraft performance. For this reason all exterior surfaces of the aircraft, in particular the wing leading edges must always be clean.

Cleaning is best accomplished with an ample supply of water, admixed with a light solvent, if required. In order to remove especially heavy dirt from the wing leading edges due to insect splatter and the like, it is good practice to undertake cleaning immediately after the flight, since deposits of this kind are more difficult to remove when dry.

Roughly once a year the surface should be treated with a paint cleaner or a non-silicone car polish and repolished to high gloss.

Caution

Never use cleaning agents containing silicone!

Canopy

To clean the canopy plexiglass proceed in the same way as for exterior cleaning of the G 115, but pay particular attention to using ample water applied with clean sponges and leathers, otherwise even the smallest dust particles will tend to scratch the glazing.

Caution

Never polish plexiglass dry!

Dull or scratched canopy sections can be returned to their transparent state by treating with specially formulated plexiglass cleaning agents.

Caution

Always keep canopy clean and remember that a dirty canopy impairs the view and thus flight safety.

Engine

Use a cold solvent to clean the engine and make sure that no solvent can enter the magnetos, alternator, starter, suction pump and air intakes.

Caution

Do not operate the engine until excess solvent has evaporated or otherwise been removed.

Painted Exterior Surfaces

Changing the paint coat is only permissible after prior approval by the manufacturer!