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Airplane Flight Manual

GROB G 115D2

Issue : 1

Airworthiness category: Utility and Acrobatic

FAR compliance: FAR 23 incl. Amendment 32

This manual constitutes the approved airplane flight manual of the aircraft GROB G 115D2 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.: _____ Airplane Regist. No.: _____

Owner: _____

_____

_____

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

THIS LBA APPROVED HANDBOOK INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY THE FEDERAL AVIATION REGULATIONS AND ADDITIONAL INFORMATION PROVIDED BY THE MANUFACTURER AND CONSTITUTES THE FAA APPROVED AIRPLANE FLIGHT MANAUAL FOR U.S. REGISTERED AIRPLANES IN ACCORDANCE WITH 14 CFR SECTION 21.29.

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i. A.

17. FEB. 1994

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Revision No.	Date	Revised pages and text	German LBA approval:	Stamp and signature
1	01.03 1994	C,D,E,F, 1-3,1-4, 2-7,2-13,2-15, 2-17, 3-14,3-15,3-22, 4-1,4-2,4-6,4-7, 4-8,4-9,4-10, 4-11,4-12,4-13, 4-14,4-15,4-16, 4-17,4-18,4-19, 4-20,4-21,4-22, 4-23,4-24,4-25, 4-26,4-27,4-28, 4-29,4-30,4-31, 4-32,4-33, 5-18, 6-9,6-10,6-19, 6-20,6-21,6-22, 6-23, 7-4,7-5,7-7,7-8, 7-9,7-10,7-15, 7-17, 8-5, Suppl.I: 1-4,1-5,1-6.	15.03.94 i.A.	
2	22.03 1994	C,D,E,F, 2-3,2-14, 3-17, 4-12,4-22,4-30, 6-11,6-16,6-19, 6-22, 7-2,7-14.	23. MRZ. 1994 i.A.	

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3	18.04 1994	C2,D,E,F, 1-6, 2-7,2-10,2-12, 3-7,3-8,3-9, 3-10, 4-7,4-20,4-25, 4-33, 6-22, 7-3,7-6,7-11.	21.4.94	i.A. Feld
4	29.04 1994	C2,D, 2-3,2-11,2-19.	02.05.94	i.A. Feld
5	06.05 1994	C2,D,E,F, 2-7,2-12,2-13, 2-16,2-18, 3-7,3-8, 4-8,4-9,4-15, 7-9.	11.05.94	i.A. Feld
6	03.06 1994	C2,D,E,F, 2-15,2-17, 3-2,3-15, 6-16,6-19,6-21, 6-22, 7-1,7-13,7-15, 7-16,7-17,7-18, 7-19,7-20,7-21, 9-2, Supplement2		i.A. Feld 2.6.1994
7	18.07 1994	C2,D,E,F, 2-7, 3-12, 4-1,4-10,4-13, 4-14,4-15,4-16, 4-17,4-18,4-20 4-22,4-23,4-25, 5-18, 6-15,6-19,6-22, 7-9,7-15,7-16, 7-17, 9-2, Supplement3	27th of July 1994	i.A. Feld
8	10.10 1994	C2,D,E, 2-9, 4-5,4-13,4-15, 4-22,4-23.	26th of October 1994	i.A. Feld

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9	27.03 1997	C3,D,E,F, 2-7,2-8,2-9,2-16 3-15a,4-6,4-10, 4-11,4-21, 7-12,7-17,7-20	Nov. 10, 1994	i. A. Fell
10	12.12 1994	C3,D,E,F, 2-7,2-8,2-9,2-15, 2-16,3-15a,6-15, 7-4,7-9,7-14,7-16	March 29, 1995	i. A. Fell
11	15.09 1997	C3,D, **(refer to SB 1078-74)**	Nov. 18, 1997	i. A. Fell LUFTFAHRT-BUNDESAMT BRAUNSCHWEIG

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Section 1

General

1.1 Introduction

This manual is designed for as an operating guide for the pilot of the GROB G 115D2. It includes the material required to be furnished to the pilot by FAR PART 23. It also contains supplemental data supplied by the airplane manufacturer.

This manual must be read carefully by the owner and/or the pilot to become acquainted with proper aircraft operation. This manual is not designed as a substitute for adequate and competent flight instruction, knowledge of current airworthiness directives, applicable federal air regulations or advisory circulars. It is not intended to be a guide for basic flight instruction or a training manual and should not be used for operational purposes unless kept in a current status.

Assurance that the airplane is in an airworthy condition is the responsibility of the owner. The pilot in command is responsible for determining that the airplane is safe for flight. The pilot is also responsible for remaining within the operating limitations as outlined by placards, instrument markings, and this manual.

This manual has been divided into 9 numbered sections, each provided with a "fingertip" tab divider for quick reference. The limitations and emergency procedures have been placed ahead of the normal procedures, performance and other sections to provide each access to information that may be required in flight.

1.2 Warnings, Cautions and Notes

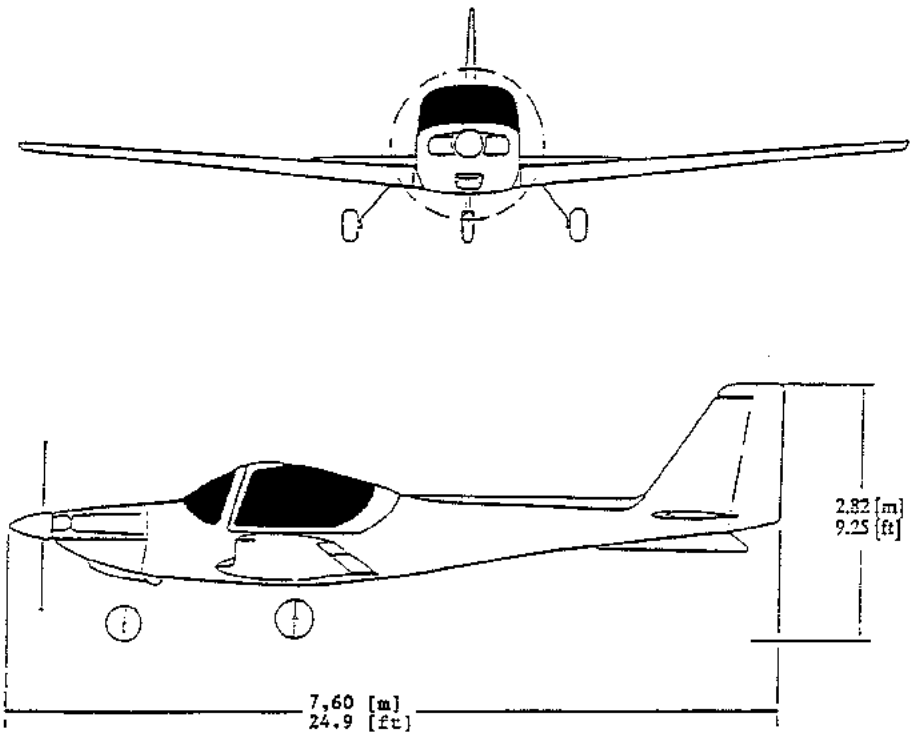
The following definitions apply to warnings, cautions and notes in the flight manual.

" **WARNING** "
means that the non-observation of the corresponding procedure leads to an immediate or important degradation of the flight safety.

" **CAUTION** "
means that the non-observation of the corresponding procedure leads to a minor or to a more or less long term degradation of the flight safety.

" **NOTE** "
draws the attention on any special item not directly related to safety but which is important or unusual.

1.3 Three-View



1.5 Dimensions

Overall dimensions	
Wing span	10,0 m (32.81 ft)
Max. Length	7,60 m (24.93 ft)
Max. height	2,82 m (9.25 ft)
Wing	
Airfoil	Eppler E 696
Wing area	12,21 m²; (131.43 sq.ft)
Dihedral	5 °
Angle of incidence	2 °
Ailerons	
Area	0,562 m² (6.1 sq.ft)
Flaps	
Area	1,146 m² (12.3 sq.ft)
Horizontal tail	
Airfoil	NACA 64010
Wing span	3,50 m (11.48 ft)
Area	2,723 m² (29.3 sq.ft)
Elevator surface	0,861 m² (9.3 sq.ft)
Vertical tail	
Airfoil	NACA 64009
Area	1,692 m² (18.2 sq.ft)
Rudder area	0,642 m² (6.9 sq.ft)
Landing gear	
Wheel track	2,50 m (8.2 ft)
Wheel base	1,61 m (5.3 ft)
Nose Wheel	5.00 - 5/6 PR
Main wheel	15x6.00 - 6

Deflections see maintenance manual !

1.7 Engine

AVCO LYCOMING, Model AEIO-320 D1B
4 Cylinder, direct drive, horizontally opposed, air-cooled

Displacement	319.8	cu.in.
Rated horsepower	160	HP
at rated speed	2700	RPM

1.9 Propeller

Two-blade fixed pitch propeller	HO 23 CHM-()188 156
Propeller manufacturer	Hoffmann

1.11 Fuel

Avgas 100 or 100 LL

Total fuel capacity	150	liters	1)
	39.63	U.S.gal.	
	33.00	Imp.gal.	
Wing tank fuel capacity each	75	liters	
Usable fuel	143	liters	
	37.77	U.S.gal.	
	31.46	Imp.gal.	
Sump tank fuel capacity	5.4	liters	

1) Nominal value

1.13 Oil

Oil capacity	8 quarts/7,6 liters
Minimum requirement	6 quarts/5,7 liters

The following engine oils may be used:

Average ambient air	MIL-L-6082 Grades	MIL-L-22851 Ashless Dispersant Grades
above 27°C (80°F)	SAE 60	SAE 60
above 16°C (60°F)	SAE 50	SAE 40 or SAE 50
-1°C(30°F)to 32°C(90°F)	SAE 40	SAE 40
-18°C(0°F)to 21°C(70°F)	SAE 20	SAE 30 or SAE 40
below -12°C (10°F)	SAE 20	SAE 30

Also comply with the rules at AVCO LYCOMING specification No. 301 and AVCO LYCOMING Service Instruction No. 1014, latest issue.
Engine must be run for a minimum of 50 hours on aviation oil as per MIL-L-6082. Change oil after first 25 operating hours.

Until oil consumption has stabilized cruising performance must not be reduced to below 75 % to protect the cylinder liners from damage.

First filling: Aviation Oil as per MIL-L-6082

1.15 Maximum Weights

max. takeoff weight (utility category)	990 kg	(2182 lbs)
max. takeoff weight (acrobatic category)	920 kg	(2028 lbs)
max. landing weight (utility category)	990 kg	(2182 lbs)
max. landing weight (acrobatic category)	920 kg	(2028 lbs)
Standard empty weight	650 kg	(1433 lbs)
max. useful load 1) (utility category)	340 kg	(749 lbs)
max. useful load 1) (acrobatic category)	270 kg	(595 lbs)
max. permissible baggage load	55 kg	(121 lbs)

1) at standard empty weight

WARNING
The current information of Section 6 "Weight and balance" is applicable for the preflight action.

Utility

Wing loading at max. takeoff weight	81,08 kg/m² (16.60 lbs/sq.ft.)
Power loading at max. takeoff weight	6,19 kg/HP (13.64 lbs/HP)

Acrobatic

Wing loading at max. takeoff weight	75,35 kg/m² (15.43 lbs/sq.ft.)
Power loading at max. takeoff weight	5,75 kg/HP (12.68 lbs/HP)

1.17 Symbols, Abbreviations and Terminology

a) General Airspeed Terminology and Symbols

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

KCAS - CAS, expressed in "Knots".

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

IAS - Indicated Airspeed is the speed of an airplane as shown on a pitot static airspeed indicator.

KIAS - Indicated Airspeed expressed in "Knots".

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

V_A - Maneuvering Speed is the speed below which application of full available aerodynamic control is unlikely to overstress the airplane.

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

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

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

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

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

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

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

b) Meteorological Terminology

ISA - International Standard Atmosphere in which:
- the air is a dry perfect gas;
- the temperature at sea level is 15°C (59°F);
- the pressure at sea level is 1013.2 hpa (mb) (29.92 inches HG);
- the temperature gradient from sea level to the altitude at which the temperature is -56.5°C (-69.7°F) is -0.00198°C (-0.003566°F) per foot and zero above that altitude.

OAT - Outside Air Temperature.

Indicated Pressure Altitude
- The number actually read from an altimeter when the barometric subscale has been set to 1013.2 hpa (mb) (29.92 in. HG).

Pressure Altitude
- Altitude measured from standard sea level pressure (29.92 in. HG or 1013.2 hpa (mb)) by a pressure or barometric altimeter. It is the indicated pressure altitude corrected for position and instrument error. In this handbook altimeter instrument errors are assumed to be zero.

Station Pressure
- Actual atmospheric pressure at field elevation.

Wind - The wind velocities recorded as variables on the charts of this handbook are to be understood as the headwind or tailwind components of the reported winds.

c) Power Terminology

Takeoff Power
- Maximum power permissible for takeoff.

Maximum Continuous Power
- Maximum power permissible continuously during flight.

Maximum Climb Power
- Maximum power permissible during climb.

Maximum Cruise Power
- Maximum power permissible during cruise.

CHT - Cylinder Head Temperature.

EGT - Exhaust Gas Temperature.

d) Airplane Performance and Flight Planning Terminology

Climb Gradient
- The demonstrated ratio of the change in height during a portion of a climb, to the horizontal distance traversed in the same time interval.

Demonstrated Crosswind Velocity
- The demonstrated crosswind velocity is the velocity of the crosswind component for which adequate control of the airplane during take-off and landing was actually demonstrated during certification tests.

e) Weight and Balance Terminology

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

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

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

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

C.G. Arm
- The arm obtained by adding the airplane's individual moments and dividing the sum by the the total weight.

C.G. Limits
- The extreme center of gravity locations within which the airplane must be operated at a given weight.

Usable Fuel
- Fuel available for flight planning (without reserve fuel).

Unusable Fuel
- Fuel remaining after a runout test has been completed in accordance with governmental regulations.

Standard Empty Weight
- Weight of a standard airplane including unusable fuel, full operating fluids and full oil according to the actual weighing report.

Maximum Takeoff Weight
- Maximum weight approved for the start of the takeoff run (according to the operating category of the aircraft).

1.19 Conversion Factors

MULTIPLY	BY	TO OBTAIN
atmospheres [atm]	760	mm Hg
	29.92	in. Hg
	1.0133	bar
	1.033	kg / cm^2
	14.70	lb./sq. in.
	2116	lb./sq. ft.
bars [bar]	0.98692	atm
	14.503768	lb./sq. in
centimeters [cm]	0.3937	in.
	0.032808	ft.
cubic centimeters [cm^3]	0.03381	fl. oz.
	0.06102	cu. in.
	3.531×10^{-5}	cu.ft.
	0.001	l
	2.642×10^{-4}	U.S. gal.
cubic feet [cu.ft.]	28317	cm^3
	0.028317	m^3
	1728	cu. in.
	0.037037	cu.yd.
	7.481	U.S. gal.
	28.32	l
cubic feet per minute [cu.ft./min.]	0.472	l/sec.
	0.028317	m^3/min.
cubic inches [cu.in.]	16.39	cm^3
	1.639×10^{-5}	m^3
	5.787×10^{-4}	cu.ft.
	0.5541	fl.oz.
	0.01639	l
	4.329×10^{-3}	U.S.gal.
	0.01732	U.S.qt.
cubic meters [m^3]	61024	cu.in.
	1.308	cu.yd.
	35.3147	cu.ft.
	264.2	U.S.gal.
feet [ft.]	30.48	cm
	0.3048	m
	12	in.
	0.33333	yd.
	1.894×10^{-4}	st. M.
	1.645×10^{-4}	NM

feet per minute [ft./min.]	0.01136	mph
	0.01829	km/h
	0.508	cm/sec.
	0.00508	m/sec.
gallons, Imperial [Imperial gal.]	277.4	cu.in.
	1.201	U.S.gal.
	4.546	l
gallons, U.S. liquid [U.S.gal.]	231	cu.in.
	0.1337	cu.ft.
	4.951×10^{-3}	cu.yd.
	3785.4	cm^3
	3.785×10^{-3}	m^3
	3.785	l
	0.83268	Imperial gal.
	128	fl.oz.
grams [g]	0.001	kg
	2.205×10^{-3}	lb.
grams per cubic centimeter [g/cm^3]	1000	kg/m^3
	0.03613	lb./cu.in.
	62.43	lb./cu.ft.
horsepower [hp]	33000	ft.-lb./min.
	550	ft.-lb./sec.
	76.04	m•kg/sec.
	1.014	PS
	0.7458	kW
horsepower, metric	75	m•kg/sec.
	0.9863	hp
	0.7355	kW
inches [in.]	25.40	mm
	2.540	cm
	0.0254	m
	0.08333	ft.
	0.027777	yd.
inches of mercury at O°C [in.Hg]	0.033421	atm
	0.4912	lb./sq.in.
	70.73	lb./sq.ft.
	345.3	kg/m^2
	2.540	cm Hg
	25.40	mm Hg
kilograms per cubic meter [kg/m^3]	0.06243	lb./cu.ft.
	0.001	g/cm^3

kilograms [kg]	2.204622	lb.
	1000	g
kilograms per square centimeter [kg/cm²]	0.9678	atm
	28.96	in.Hg.
	14.22	lb./sq.in.
	2048	lb.sq.ft.
kilograms per square meter [kg/m²]	2.896 x10^{-3}	in.Hg
	1.422 x10^{-3}	lb./sq.in
	0.2048	lb./sq.ft.
kilometers [km]	1 x 10^{-5}	cm
	3280.8	ft.
	0.6214	st. M.
	0.53996	NM
kilometers per hour [km/h]	0.9113	ft./sec.
	58.68	ft./min.
	0.53996	kts
	0.6214	mph
	0.27778	m/sec.
	16.67	m/min.
kilowatts [kW]	1.3596	PS
	1.341	hp
knots [kts]	1	nautical mph
	1.689	ft./sec.
	1.1516	statute mph
	1.852	km/h
	0.51444	m/sec.
liters [l]	1000	cm^3
	61.02	cu.in.
	0.03531	cu.ft.
	33.814	fl.oz.
	0.264172	U.S.gal.
	0.2200	Imperial gal.
	1.05669	qt.
liters per second [l/sec.]	2.12	cu.ft./min.
meters [m]	39.37	in.
	3.280840	ft.
	1.0936	yd.
	6.214 x10 $^{-4}$	st. M.
	5.3996 x 10^{-4}	NM
meter-kilograms [m•kg]	7.23301	ft.-lb.
	86.798	in.-lb.

meters per second [m/sec.]	3.280840	ft./sec.
	196.8504	ft./min.
	2.237	mph
	3.6	km/h
miles, statute [st.M.]	5280	ft.
	1.6093	km
	1609.3	m
	0.8684	NM
miles per hour [mph]	44.7041	cm/sec.
	4.470×10^{-1}	m/sec.
	1.467	ft./sec.
	88	ft./min.
	1.6093	km/h
	0.8684	kt
nautical miles per hour [NMph]	51.446	cm/sec.
	5.145×10^{-1}	m/sec.
	1.688	ft./sec.
	101.271	ft./min.
	1.852	km/h
millibars [mb]	2.953×10^{-2}	in.Hg
millimeters [mm]	0.03937	in.
millimeters of mercury at 0°C [mm Hg]	0.03937	in.Hg
nautical miles [NM]	6080	ft.
	1.1516	st. M.
	1852	m
	1.852	km
ounces, fluid [fl.oz.]	29.57	cm^3
	1.805	cu.in.
	0.0296	l
	0.0078	U.S.gal.
pounds [lb.]	0.453592	kg
	453.6	g
pounds per cubic inch [lb./cu.in.]	1728	lb./cu.ft.
	27.68	g/cm^3
pounds per square foot [lb./sq.ft.]	0.01414	in.Hg
	4.88243	kg/m^2
	4.725×10^{-4}	atm

pounds per square inch [psi oder lb./sq.in.]	5.1715	cm Hg
	2.036	in.Hg
	0.06804	atm
	0.0689476	bar
	703.1	kg/m²
quart, U.S.[qt.]	0.94635	l
	57.749	cu.in.
revolutions per minute [RPM or rev./min.]	0.1047	rad./sec.
square centimeters [cm²]	0.1550	sq.in.
	0.001076	sq.ft.
square feet [sq.ft.]	929	cm²
	0.092903	m²
	144	sq.in.
	0.1111	sq.yd.
	2.296×10^{-5}	acres
square inches [sq.in.]	6.4516	cm²
	6.944×10^{-3}	sq.ft.
square kilometers [km²]	0.3861	(st.M.)²
square meters [m²]	10.76391	sq.ft.
	1.196	sq.yd.
square miles [sq.mi.]	2.590	km²
yards [yd.]	0.9144	m
	3	ft.
	36	in.

Table of Contents

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 Utility Acrobatic	 212 (114) 237 (128)	Do not make full or abrupt control movements above this speed.
V_{FE} Max. Flaps Extended Speed	 208 (112)	Do not exceed this speed with the flaps extended.
V_{NE} Never Exceed Speed	 308 (166)	Do not exceed this speed in any operation.
V_{NO} Maximum Structural Cruising Speed	 248 (134)	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	95 - 208	51 - 112	Flap down Operating Range
blue radial line	145	78	Recommended climb speed
green arc	97 - 248	52 - 134	Normal Operating Range
yellow arc	248 - 308	134 - 166	Caution Range "only in smooth air"
red radial line	308	166	Never Exceed

2.7 Power Plant Limitations

a)	Number of engines	1
b)	Engine manufacturer	Lycoming
c)	Engine model	AEIO - 320 D1B
d)	Engine operating limits	
	Rated output power	160 HP/119.3 KW
	Rated output rotation speed	2700 RPM
	Max. continous horsepower	160 HP/119.3 KW
	Max. continous 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	0,97 bar	(14 PSI)
normal (green arc)	0,97 - 3,10 bar	(14 - 45 PSI)
maximum	3,10 bar	(45 PSI)

g) Oil temperature

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

h) suction indicator (if installed)

normal (green arc)	4.5-5.4 inch HG

i) Cylinder head temperature (if installed)

minimum	66 °C
normal (green arc)	66 - 260 °C
maximum	260 °C
For maximum engine service life avoid temperatures during continous operation	204 - 260 °C

j)	Fuel grade (min. 100 octane)	Avgas 100 or 100 LL
k)	Oil specification (see page 1 - 5)	MIL-L-6082 or MIL-L-22851
l)	Number of propellers	1
m)	Propeller manufacturer	Hoffmann
n)	Propeller model	HO 23 CHM-()188 156

o) Propeller diameter 1,88 m (6.17 ft)

p) Propeller pitch at 0,75•R 1,56 m (5.12 ft)

q) Propeller rotation speed limitations

during take-off 2700 RPM
maximum continuous 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
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)	0,97 (14)		0,97 - 3,10 (14 - 45)		3,10 (45)
Fuel capacity [ltr] (US.gal) (Imp.gal.)		0 - 22 (0 - 5.81) (0 - 4.84)			
Suction [inch HG](PSI)			4,5-5,4 (2.2 - 2.65)		
Cylinder head temperature [°C]		0 - 66	66-260		260
Voltmeter [V]		16 - 20	20-30	30-32	32
Amperemeter [A]	-20	-20 to -10	-10 to +10	10-20	20

2.13 Weight Limits

Maximum take-off and landing weight	Utility	990 kg	(2182 lbs)
	Acrobatic	920 kg	(2028 lbs)
Maximum baggage in baggage compartment		55 kg	(121 lbs)

Acrobatic and spin maneuvers are approved without baggage only!

2.15 Center of Gravity Limits

Acrobatic		Distance from Datum [mm] (ft)
forward limit		
at 920 kg (2028 lbs)	17.60 % l_μ	219 (.718)
at 750 kg (1653 lbs)	15.90 % l_μ	197 (.646)
aft limit		
at 920 kg (2028 lbs)	23.77 % l_μ	295 (.968)
at 750 kg (1653 lbs)	23.20 % l_μ	288 (.945)
Utility		
forward limit		
at 990 kg (2182 lbs)	18.30 % l_μ	227 (.745)
at 750 kg (1653 lbs)	15.90 % l_μ	197 (.646)
aft limit		
at 990 kg (2182 lbs)	24.00 % l_μ	298 (.978)
at 750 kg (1653 lbs)	23.20 % l_μ	288 (.945)

Datum: Wing leading edge = QE 2480
l_μ: Mean aerodynamic chord = 1,242 m (4.075 ft)
Horizontal reference : Canopy sill

2.17 Maneuver Limits

The approved flight maneuvers for the **Acrobatic-Category** are detailed listed in Chapter 4 " Normal Procedures ".
Entry speed according to flight maneuver !
Inverted flights are approved for a maximum of 3 min.

WARNING
At airspeeds in excess of V_A do not apply abrupt and full control inputs! Snap roll maneuvers are not approved !

Utility Category :
Flight maneuver : Lazy Eight / Chandelle / Steep turns
Entry Speed: 245 km/h [132 kts]
Intentional spins with flap setting at 0° are approved only.
Spins without wheel fairings are not approved.
Recommended entry speed: ≈ 100 km/h [54 kts]

2.19 Flight Maneuvering Load Factors

	Maximum load factor	
Acrobatic (920 kg) [2028 lbs]		
Flaps retracted	+ 6,00 g	- 3,00 g
Flaps extended	+ 3,80 g	
Utility (990 kg) [2182 lbs]		
Flaps retracted	+ 4,40 g	- 1,76 g
Flaps extended	+ 3,80 g	

2.21 Seating Capacity

Number: 2

The seat of the pilot in command is the left handand seat or may be determined by the owner of the aircraft ! If the aircraft is flying single-seating, use only the left seat.

2.23 Kinds of Operation Limits

VFR / IFR day and night (with required equipment).
Flights in known icing conditions are not approved.

Flights below -10°C (OAT) are not authorized, without cold weather kit connected. With this cold weather kit in use, the pilot should be aware that excess oil may be present in the engine compartement.

Compliance with cooling requirements according to FAR 23 have been demonstrated up to 40°C.

NOTE
The attitude indicator will show an incorrect or false indication during flight maneuvers (e.g. spinning). To achieve a faultless function of the instrument, a level flight of approx. 20 min. will be recommended. Check that the attitde indicator is stabilized. During this period of time use only the turn coordinator and/or the directional indicator. This is advisible during abnormal flight maneuvers (e.g. high rate of roll during turbulence).

The combination of the aircraft crew must refer to national regulations.
(in Germany: " Betriebsordnung für Luftfahrtgerät § 32 ")

Kinds of Operation Equipment List

This airplane may be operated in VFR/IFR day and night when the appropriate equipment is installed and operable.

It is not intented to install an autopilot for IFR operation. (in Germany:" observe § 32 [4] Luft BO ! ")

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 particular kind of operation indicated.

The ATA numbers refer to equipment classifications of Air Transport Association Specification Code 100.

	VFR-Day SR-SS	VFR-Night	IFR acc. FAR *	IFR-Day	IFR-Night
Communications (ATA-23)					
1. Communication Radio (VHF)	1	1	1	2	2
Electrical Power (ATA-24)					
1. Battery	1	1	1	1	1
2. D.C. Generator	1	1	1	1	1
3. D.C. Loadmeter	1	1	1	1	1
4. D.C. Generator Warning Light	1	1	1	1	1
Flight Controls (ATA-27)					
1. Flap System	1	1	1	1	1
2. Flap Position Indicator	1	1	1	1	1
3. Horizontal Stabilizer Trim System	1	1	1	1	1
4. Stall Warning Horn	1	1	1	1	1
Fuel (ATA-28)					
1. Fuel Boost Pumps	1	1	1	1	1
2. Fuel Quantity Indicator	1	1	1	1	1
3. Fuel Pressure	1	1	1	1	1
Ice and Rain Protection (ATA-30)					
1. Pitot Heat	0	0	1	1	1
2. Alternate Static Air Source	0	0	1	1	1
Instruments (ATA-31)					
1. Clock	0	0	1	1	1

	VFR-Day SR-SS	VFR-Night	IFR acc. FAR *	IFR-Day	IFR-Night
Lights (ATA-33)					
1. Cockpit and Instruments (Required Illumination)	0	1	1	0	1
2. Anti-Collision Light	3	3	3	3	3
3. Landing Light	0	0	0	0	2
4. Position Light	0	3	3	0	3
Navigation (ATA-34)					
1. Altimeter	1	1	1	2	2
2. Airspeed	1	1	1	1	1
3. Magnetic Compass	1	1	1	1	1
4. Outside Air Temperature	1	1	1	1	1
5. Attitude Indicator	0	0	1	1	1
6. Directional Indicator	0	0	1	1	1
7. Turn and Bank Indicator	0	0	1	1	1
8. Vertical Speed Indicator	0	0	1	1	1
9. ADF	0	0	0	1	1
10. Navigation Radio (VOR)	0	1	1	2	2
11. DME	0	0	0	1	1
12. Transponder (ATC)	0	1	0	1	1
Only for ILS-Approach:					
13. Localizer	0	0	0	1	1
14. Glide slope	0	0	0	1	1
15. Marker	0	0	0	1	1
Vacuum System (ATA-37)					
1. Suction or Pressure Gauge	0	0	1	1	1
Engine Indicating (ATA-77)					
1. Tachometer Indicator (Engine)	1	1	1	1	1
2. Cylinder Head Temperature	0	0	1	1	1
3. Carburetor Heat Temp.	0	0	0	1	1
4. Manifold pressure	0	0	0	0	0
5. Fuel flow & Fuel pressure	1	1	1	1	1
Engine Oil (ATA-79)					
1. Oil Temperature Indicator	1	1	1	1	1
2. Oil Pressure Indicator	1	1	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. * IFR-equipment and instrument requirements according to FAR Part 91 § 91.205 (b) through (f).

2.25 Fuel Limitations

Total capacity (nominal value)	150 liters (39.63 US.gal.)/(33.00 Imp.gal.)
Wing tank capacity	each 75 liters (19.81 US.gal.)/(16.50 Imp.gal.)
Sump tank fuel capacity	5.4 liters (1.43 US.gal.)/(1.19 Imp.gal.)
Unusable fuel	7 liters (1.85 US.gal.)/(1.54 Imp.gal.)
Usable fuel	143 liters (37.77 US.gal.)/(31.46 Imp.gal.)
Tankasymmetry	max. 20 liters (5.28 US.gal.)/(4.40 Imp.gal.)

Never takeoff when fuel gauge indicaton of the tank in use is in yellow arc !

2.41 Placards

On LH cabin wall:

L i m i t a t i o n s	
Category	Acrobatic airplane
Max. weight	920 kg (2028 lbs)
Max. flight maneuvering load factors (flaps UP)	+6,00 g -3,00 g
(flaps DOWN)	+3,80 g
Never exceed speed V_{NE} [IAS]	308 km/h (166 kts)
Max. structural cruising speed V_{NO} [IAS]	248 km/h (134 kts)
Design maneuvering speed V_A [IAS]	237 km/h (128 kts)
Max. flaps extended speed V_{FE} [IAS]	208 km/h (112 kts)
Intentional spins without wheel fairings or with extended flaps are not approved !	

RH and LH on canopy frame:

NO SMOKING

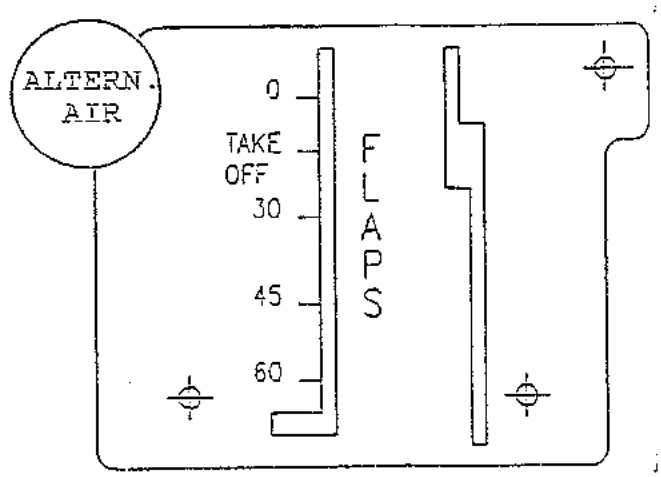
On instrument panel:

Design maneuvering speed V_A
Acrobatic: 237 km/h IAS
(128 kts)

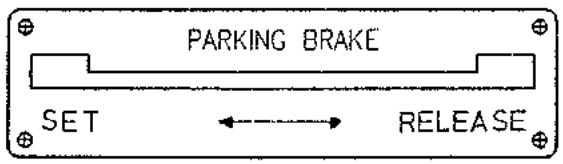
On instrument panel: e.g.

D - EECR

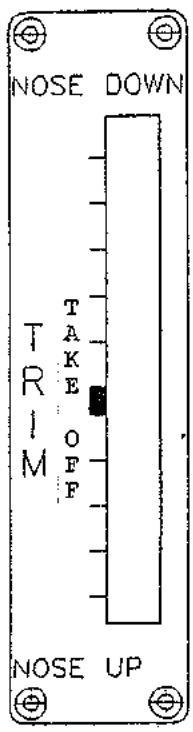
On flap indicator:
On alternative air:



On parking brake lever:



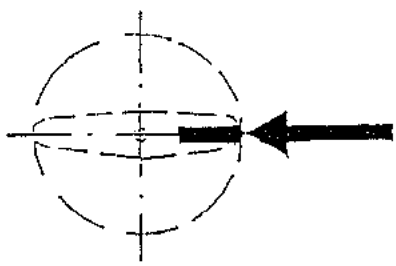
On trim indicator:



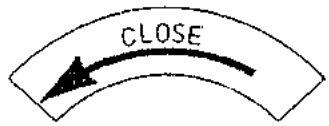
At the headset plugs
between the seats:

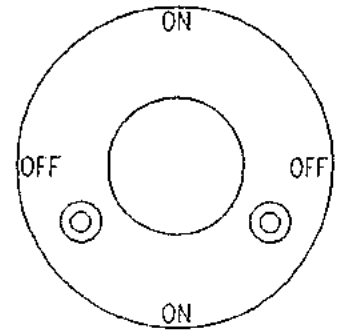
PILOT COPILOT

On fuel filler cap:

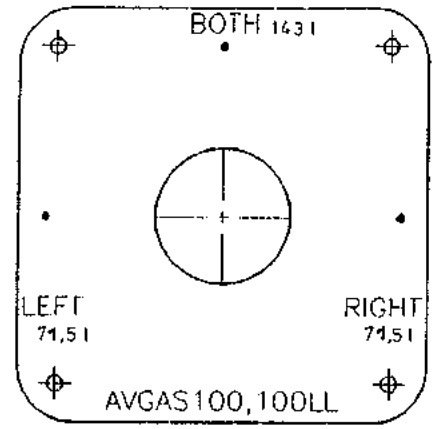


On fuel cock:





On fuel tank selector:



On baggage compartment:

Baggage max. 55 kg (121 lbs)
No baggage during acrobatics and spin maneuvers !

On access hole in the top cowling:

Oil capacity:	min. 5,7 Liter	(1.51 US.gal.) (1.25 Imp.gal.)
	max. 7,6 Liter	(2.0 US.gal.) (1.67 Imp.gal.)
Oil grades see airplane flight manual		

On external power plug:

External power supply 24 V DC

On fuel filler cap:

AVGAS 100, 100 LL
Total 75 liters
(19.81 US.gal.)
(16.50 Imp.gal.)

On main wheel fairing or on landing gear shock strut:

3,0 bar
(43.5 PSI)

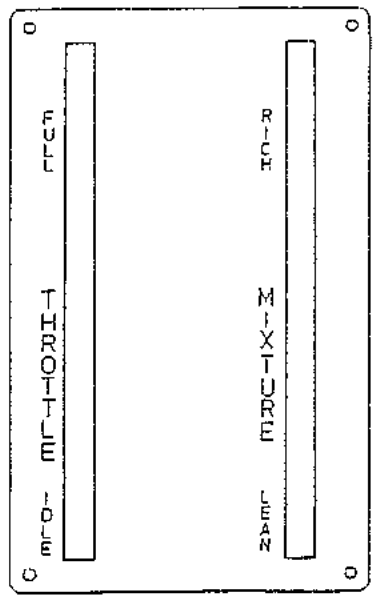
On nose wheel fairing or on nose wheel fork:

2,5 bar
(36 PSI)

On second throttle lever (if installed):

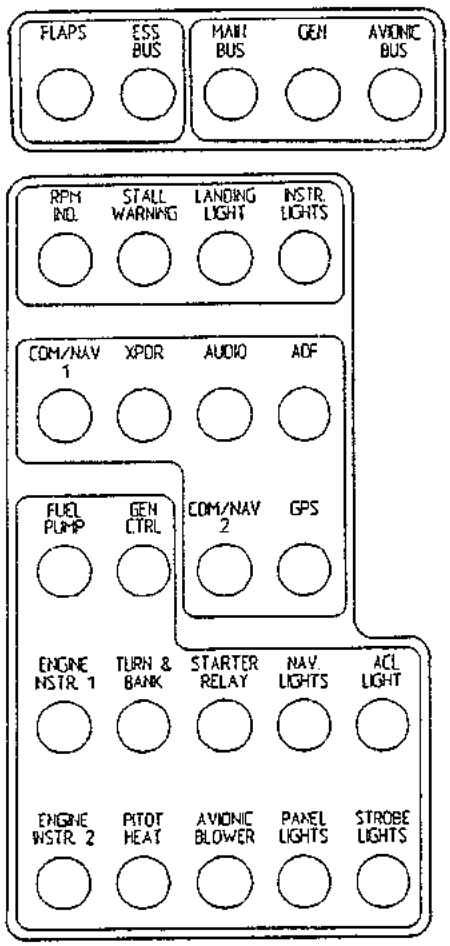
THROTTLE	
IDLE	FULL

On throttle and mixture:



On ignition switch:

At the circuit breaker panels:



Button on the magnetic compass:

Calibration was made with the radios ON !

Deviation table (in vicinity of magnetic compass):

TO FLY	N	30	60	E	120	150
STEER						
TO FLY	S	210	240	W	300	330
STEER						

DATE GROB

On toggle switch for alternate static (if equipped):

On both flaps:

NO STEP

On canopy lock (inside and outside):

OPEN CLOSED

On canopy lever (outside):

PULL TO OPEN

On both sides of the rudder (bottom):

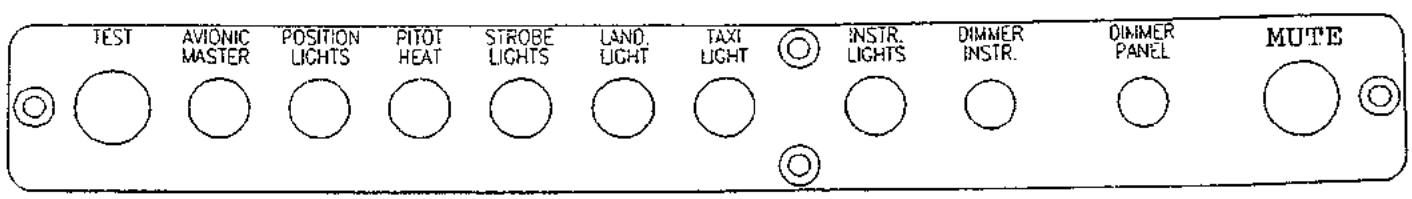
DO NOT LIFT

Near the VHF-Transceivers:

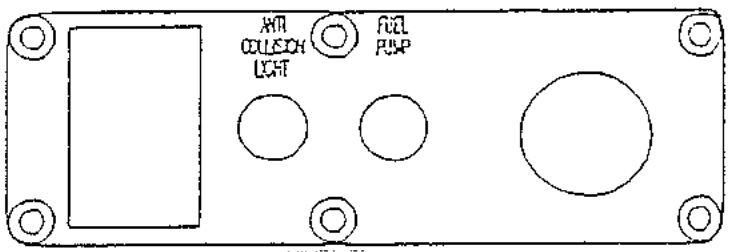
COM I COM II

Beside the lower instrument panel switches: ON OFF

Lower instrument panel switches/ identification (as equipped):



LH instrument panel switch identification (as equipped):



Above master switch:

MASTER SWITCH

All toggle switches are function-identified.

On brake fluid reservoir:

MIL-H 5606

On right hand cabin wall:

The markings and placards installed in this airplane contain operating limitations which must be complied with when operating this airplane in the ACROBATIC 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 right hand cabin wall:

This airplane is certified for the following flight operations:

VFR/IFR day and night.
(with required equipment).
Flights into known icing conditions are prohibited.

At the lower cowling near the exhaust:

Control lock:

REMOVE LOCKING PIN
BEFORE STARTING ENGINE

On hourmeter:

FLIGHT HOURS

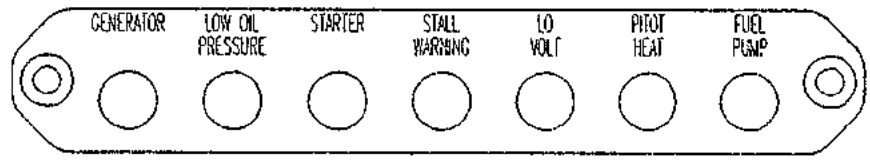
On engine hour meter:

ENGINE HOURS

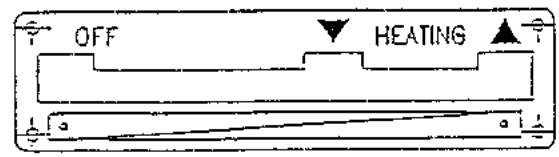
On GPS:
(standard in United Kingdom)

CLASS III
Radio apparatus designated as Class III is not approved for use in circumstances where a legal requirement exists for carriage of radio equipment.

On anunciator panel:



On heating lever:



On red emergency lever:

CANOPY JETTISON :
1. PULL RED HANDLE
2. CANOPY HANDLE FULLY BACK
3. PUSH CANOPY TO THE REAR TOP

On canopy RH/LH
(inner/outer side):

E X I T

On instrument panel:

SPIN RECOVERY :

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

On left canopy frame:

Acrobatic airplane	Entry Speed [kts]
Spin	54 - 97
Inverted Spin	81 - 97
Loop positive	119 - 132
Turn (hammerhead)	119 - 132
Immelmann	132
Split-S (nose raise 45°)	132
Split-S	86
Tail Slide	108 - 132

Acrobatic airplane	Entry Speed [kts]
Cuban-Eight	132
Slow Roll	127
Steep Turn	127
Aileron Roll	127
Barrel Roll (pos./neg.)	132
Lazy Eight	132
Chandelle	132
Knife Edge	127

On instrument panel:
(if gauge installed)

FUEL FLOW [US.gal/h] - Take off/climb V_Y - Standard altitude - Full throttle	
MSL	11.0
2000 ft	10.5
4000 ft	10.0
6000 ft	9.5
8000 ft	9.0

On instrument panel:

Never take-off if fuel gauge indication is in yellow arc !

Placards only for UTILITY-CATEGORY :

Design maneuvering speed V_A
Utility: 212 km/h IAS
(114 kts)

Limitations	
Category	Utility-airplane
Max. weight	990 kg (2182 lbs)
Max. flight maneuvering load factors (flaps UP)	+4,40 g -1,76 g
(flaps DOWN)	+3,80 g
Never exceed speed V_{NE} [IAS]	308 km/h (166 kts)
Max. structural cruising speed V_{NO} [IAS]	248 km/h (134 kts)
Design maneuvering speed V_A [IAS]	212 km/h (114 kts)
Max. flaps extended speed V_{FE} [IAS]	208 km/h (112 kts)
Intentional spins without wheel fairings or with extended flaps are not approved ! **For intentional spinning a MTOW of 920 kg (2028 lbs) may not be exceeded !**	

Approved flight maneuvers in the utility category:
Lazy Eight / Chandelle / Steep turns
Entry Speed: 245 km/h [132 kts]
Intentional spins with flap setting at 0° are approved only. Spins without wheel fairings are not approved. Recommended spin entry speed:
≈ 100 km/h [54 kts]
For intentional spinning a MTOW of 920 kg (2028 lbs) may not be exceeded !

2.43 Colour

Painting of the GROB G 115D2 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.

Table of Contents

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 rare, as long as the preflight inspection and maintenance tasks have been carried out properly. Inflight 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.

All data of this section are refered to a flight mass of 990 kg (2182 lbs) unless other masses are stated.

3.3 Airspeeds for Emergency Operations

	V_{IAS} [km/h]	V_{IAS} [kts]
Engine Failure after Take Off		
Flaps retracted	135	73
Flaps in take off position	130	70
Recommended gliding speed		
(flaps retracted / 990 kg / 2182 lbs)	135	73
Precautionary landing (power on)	130	70
Emergency landing (power off)		
Flaps retracted	135	73
Flaps extended (60°)	130	70

WARNING

The stall warning horn will not function with the master switch in position " OFF ".

3.5 Emergency Procedures Check List

ENGINE FAILURE

DURING TAKE OFF (roll)

1. Throttle	IDLE
2. Brakes	OPERATE AS NECESSARY

Actions in case the aircraft is departing from the runway:

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

DURING TAKE OFF (if airborne)

I. Engine power insufficient to continue flight

1. Airspeed	130 - 135 km/h (70 - 73 kts)
2. Fuel cock	ON
3. Fuel tank selection	CHECK
4. Both magnetos	ON
5. Electrical fuel pump	ON
6. Fuel pressure	CHECK
7. Mixture	CHECK
8. Throttle	CYCLE

If there is no improvement

9. Mixture	CUT-OFF
10. Fuel cock	OFF
11. Ignition	OFF

If sure that the chosen landing area will be reached:

12. Flaps	60°
13. Emergency radio call	IF POSSIBLE
14. Master switch	OFF

Make emergency landing straight ahead if possible!

II. Engine failure

1. Fuel cock	OFF
2. Throttle	FULL THROTTLE

Shortly before touchdown:

3. Flaps	60°
4. Mixture	CUT-OFF
5. Ignition	OFF
6. Master switch	OFF

IN FLIGHT

Restart of the failed engine:

1. Airspeed	MAINTAIN BLUE LINE MAX. 120 kts
2. Fuel cock	CHECK / ON
3. Fuel tank selection	CHECK / MOST CONTENT
4. Throttle	FULL OPEN
5. Mixture	CUT OFF
6. Electrical fuel pump	ON
7. Mixture	FULL RICH FOR 2 SEC. OR AS REQUIRED
8. Mixture	CUT OFF
9. Ignition If prop is not windmilling	BOTH START
10. During engine restart	MOVE MIXTURE TO RICH

11.	If engine runs stable, power and mixture setting	AS REQUIRED
12.	Electrical fuel pump	OFF

If rough running occures, switch electrical pump on and check cause after landing.

NOTE
In case of "high speed restart", set the throttle full idle and mixture in the normal range. If the prop has stopped, give an impulse with the starter.

Engine Roughness

1.	Alternative air	WARM (PULL)
2.	Mixture	FULL RICH OR AS NECESSARY
3.	Electrical fuel pump	ON
4.	Magnetos	CHECK
5.	If roughness not cured	LAND AS SOON AS POSSIBLE

EMERGENCY LANDINGS

POWER OFF LANDING

1.	Airspeed (flaps up) (flaps down)	 135 km/h (73 kts) 130 km/h (70 kts)
2.	Fuel cock	OFF
3.	Ignition	OFF
4.	Mixture	CUT-OFF
5.	Electrical fuel pump	OFF
6.	Flaps	AS REQUIRED
7.	Emergency radio call	IF POSSIBLE
8.	Master 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	135 km/h (73 kts)
4.	Flaps	15°/Flaps in START
5.	Fly over selected area, check prevailing conditions and over shoot suitability.	
6.	Seat belts and harness	TIGHT
7.	Flaps (final approach)	60°
8.	Airspeed	130 km/h (70 kts)
9.	Master switch	OFF
10.	Touch down at min. speed	MAIN WHEELS FIRST 108 km/h (58 kts)
11.	Ignition	OFF
12.	Brakes	AS REQUIRED

DITCHING

1.	Radio	MAYDAY
2.	Heavy objects	SECURE
3.	Flaps	60°
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	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.	Electrical fuel pump	OFF

3. Mixture	CUT-OFF
4. Throttle	FULL THROTTLE
5. Ignition	OFF
6. Master switch	OFF
7. Combat fire with extinguisher	

ENGINE FIRE IN FLIGHT

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

ELECTRICAL FIRE IN FLIGHT

1. Master switch	OFF
2. Vents	CLOSED
3. Cabin heating	OFF
4. Fire extinguisher (if provided)	APPLY

NOTE Ventilate cabin after using fire extinguisher in closed cabin. The canopy can be opened below 150 km/h (81 kts).

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

1. Avionics switch	OFF
2. All other switches, including all avionics switches (without the ignition switch)	OFF
3. Master switch	ON
4. Turn on all other switches as well as all circuit breaker in slow sequence until the short-circuit has been located.	

CABIN FIRE IN FLIGHT

1. Master switch OFF
2. Vents CLOSED
3. Cabin heating OFF
4. Fire extinguisher (if provided) APPLY

NOTE 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 installed) OFF
2. Strobe lights (if installed) OFF
3. Perform side slip to keep flames away from cabin
4. Land as soon as possible

ICING

INADVERTANT FLIGHT INTO ICING CONDITIONS

1. Pitot heat ON
2. Change heading and/or altitude to leave icing conditions
3. Cabin heating to windshield ON
4. Increase RPM to prevent icing on prop blades (monitor RPM)
5. Alternative air ON
   (Observe RPM !)
6. Prepare for landing at nearest airport.
7. If there is fast ice built up, search for emergency landing location.
8. In case of heavy icing on wing leading edge, higher stall speeds may be expected. The stall warning may give no or an incorrect warning.

LANDING WITH FLAT MAIN LANDING GEAR TIRE

1. Carry out normal approach
2. Flaps 60°
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.

SPIN RECOVERY

1. Rudder OPPOSITE TO SPIN DIRECTION
2. Aileron NEUTRAL OR INTO SPIN DIRECTION
3. Elevator NEUTRAL

ABANDONING THE AIRCRAFT BY PARACHUTE / CANOPY EMERGENCY JETTISON

1. Engine SHUT OFF
2. Red locking lever PULL
3. Open canopy handle and move it backwards and up through the 90° position as far as the stop (approx. 170° position). This releases the two front attachment points on the guide rail.
4. Push the canopy simultaneously backwards and upwards.
5. Safety harness RELEASE
6. Cockpit ABANDON

ROUGH ENGINE OR LOSS OF POWER

The cause of engine roughness is not normally obvious. The following list of possibilities should be checked in the order listed.

ICED AIR INTAKE FILTER

1. Alternative air WARM (PULL)
2. Mixture ADJUST

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 head 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. Adjust mixture setting.
7. Avoid extended use of power settings above 65 %
8. Observe CHT and EGT
9. Land at the nearest airport

BLOCKED FUEL-INJECTION-NOZZLE

1. Mixture ENRICH
2. Power ADJUST
   (Possible partial power setting)
3. 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 warning light	CHECK
2. Voltmeter (Normal value)	CHECK 24 through 28 V

OVERVOLTAGE (exceeding 30 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 30 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 generator 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. Reset alternator circuit breaker and terminate flight as soon as possible

MAIN BUS FAILURE

Should all indications show a Main Bus Failure, the Essential Bus and the Avionik Bus I are further activ.

STARTER RELAY FAILURE

(only if starter relay control lamp is installed)

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

On ground

1. Start procedure ABORT
2. Starter relay CHECK

In flight

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

Description of the electrical buses / Pull push circuit breakers

A description of the break down of each electrical bus and a function description after pulling a circuit breaker are as follows.
This description only supplies with the "Engine in operation" !

The circuit breakers, located in LH lower instrument panel, are of a push/pull-design. To interrupt pull and to reset push the circuit breaker.
The circuit breakers, located in the RH instrument panel, should be reset only. When interrupted a red-white ring on the circuit breaker is visible.

Break down of electrical bus :

Main Bus :
Fuel pump / Generator Control / Nav. Lights / Engine Instr.1 / Turn&Bank / Starter Relay / Engine Instr.2 / Pitot Heat / Avionic Blower / ACL Light / Panel Lights / Taxi Light / Avionic Bus / Generator.
Essential Bus :
Flaps / Essential Bus / RPM Indicator / Stall Warning / Landing Light / Instr. Lights / Low Volt Warning .
Avionic Bus I :
Main Bus / Avionic Bus / COM-NAV 1 / Transponder XPDR / Encoder / Audio / COM 1.
Avionic Bus II :
COM-NAV 2 / ADF / DME / GPS / COM 2.

Circuit breaker "Flaps" :
After pulling this circuit breaker, the flaps are inoperable.

Circuit breaker "Ess Bus" :
During full power supply this circuit breaker is still in a "Stand-by-mode".

Circuit breakers "Ess Bus & Avionic Bus" :
The Avionic buses I and II will be switched off.

Circuit breaker "Main Bus" :
After pulling the Main Bus-Circuit breaker, all electrical buses are supplied from the generator.

Circuit breaker "Generator" :
After pulling the Generator-Circuit breaker, all electrical buses are supplied from the battery .

Circuit breaker "Avionic Bus" :
The Avionic Bus I will be supplied with power; the Avionic Bus II will be switched off.

Circuit breakers "Main Bus & Generator" :
After pulling together the Main Bus- and the Generator-Circuit breakers, the Essential Bus and the Avionic Bus I will be supplied with power.

3.7 AMPLIFIED EMERGENCY PROCEDURES

ENGINE FAILURES

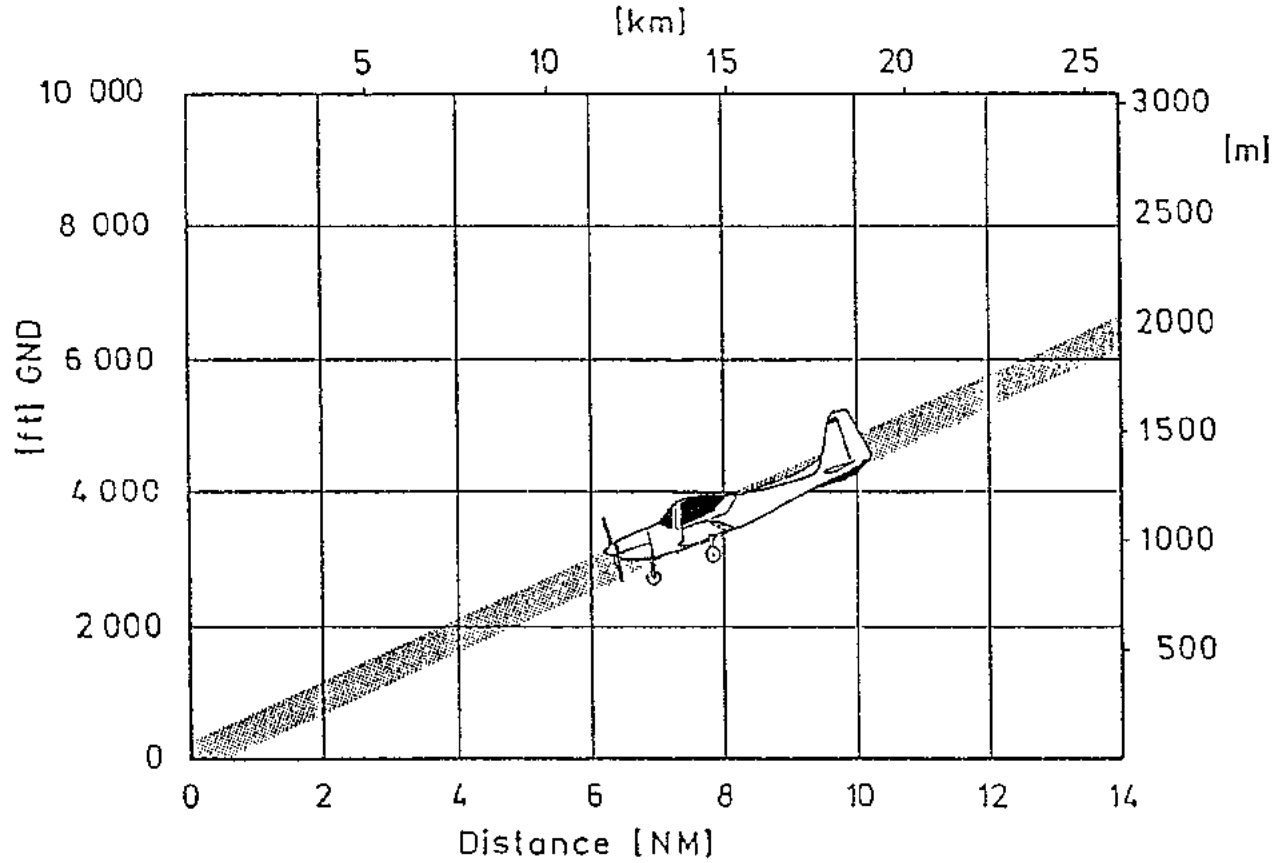
If engine failure occurs before take off, it is the most important thing to bring the airplane to a stop on the remaining runway. The check list procedures enhance safety, should an emergency of this kind occur.

If engine failure occurs after take off, the first requirement is to lower the nose, because speed may have been lost during recognition of the failure it may be necessary to lower the nose more than expected. It is vital to regain safe glide speed promptly.
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



- windmilling Propeller
- Flaps up
- Calm air
- Standard altitude

Best glide speed	
Airplane weight	V (IAS)
990 kg (2182 lbs)	135 km/h (73 kts)
920 kg (2028 lbs)	130 km/h (70 kts)
850 kg (1874 lbs)	125 km/h (68 kts)
800 kg (1764 lbs)	121 km/h (66 kts)
750 kg (1653 lbs)	118 km/h (64 kts)

EMERGENCY LANDINGS

If all attempts to restart the engine have failed 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. Transmit " Mayday " on a frequency of 121.5 MHz indicating position and intended action. Set transponder, if provided, to 7700. Do not attempt to flare 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 master switch until an emergency landing is a dead certainty. Switching off too early will shut off the altimeter with coding device (if installed) and the electrical systems of the aircraft.

LANDING WITHOUT ELEVATOR CONTROL

The G 115D2 can be controlled from a descending attitude into a normal landing attitude by use of the elevator trim. This applies to all flap settings; a flap setting of 60° is preferable. For landings with lost elevator control, it is recommended to choose an airfield with sufficient length. Execute an approach with a RPM setting of approx. 1500 RPM. Control flaring with elevator trim and reduce power to idle shortly prior to touch down or shortly thereafter. This ensures good controllability of the nosedown pitching moment resulting from the power reduction. This procedure should be practised beforehand at a safe altitude.

LANDING WITHOUT AILERON CONTROL

If an 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 130 km/h (70 kts). Should the airspeed decrease while in a turn, increase speed prior to leaving the turn. In addition the throttle can be positioned to idle to accelerate leaving the turn. Avoid bank angles in excess of 30°. If a landing must be made without lateral control, the approach must be made on idle power and without using full flaps. Such an approach should be exercised 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

INADVERTANT FLIGHT INTO ICING CONDITIONS

Flying into icing conditions is generally forbidden. Should this happen inadvertantly, however, the situation can be best handled by proceeding according to the check list. The best thing to do, of course, is to return, change heading and/or altitude to avoid icing.
Under an air temperature of -10°C the crankcase ventilation duct may ice up. This leads normally to an overload of the motor gaskets. Therefore the measures of the corresponding check-list must be applied under -10°C.

SPIN RECOVERY (UNINTENTIONAL SPIN)

Intentional spins without wheel fairings or with extended flaps are not approved.
Should a spin be entered unintentionally, the following procedure for spin recovery should be initiated:

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

and then

4. Rudder — NEUTRAL

Ease back on control stick to recover smoothly from the dive (Anticipated altitude loss during spin recovery is 300 m / 1000 ft).

ABANDONING THE AIRCRAFT BY PARACHUTE / CANOPY EMERGENCY JETTISON

The first action should be to close the throttle fully, then set the ignition to "OFF" and set the mixture lever to "FULL LEAN". The flaps can be used to reduce the airspeed if the speed is not too high. The actual jettisoning of the canopy and the subsequent abandonment of the aircraft is initiated by pulling the red locking lever. The canopy handle is then opened and pushed backwards and up through the 90° position as far as the stop (approx. 170° position). This releases the two front attachment points on the guide rail. The canopy must now be pushed backwards using some force and at the same time pushed up and away. The safety harness must then be released and the cockpit abandoned.

ROUGH ENGINE OR LOSS OF POWER

ICED AIR INTAKE FILTER

Inexplicable loss of power can be caused by ice in the air filter (monitor the RPM !)

Air filter icing : Operate the alternative air and leave it operated /set a suitable mixture.

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 everything 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. If this is not the case, switch to the good magneto and have repair done at the nearest airport.

BLOCKED FUEL-INJECTION-NOZZLE

In case of blocked fuel injection nozzles, as indicated by a rough running engine, enrich the mixture. Also, readjustment of the power setting or selection of partical power may become necessary. Land 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 occur 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

Trouble in the electrical system can be noticed by regularly monitoring 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 broken 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

Should the ammeter read an excessive charging current, the alternator circuit breaker must be pulled and flight terminated as soon as possible.

ALTERNATOR FAILURE

When the red generator warning light is on, this means that the alternator is not working. The battery voltage is dropping below 24 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 installed)

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 installed)

If the green auxiliary fuel pump control lamp is not illuminated with the switch in ON, this may be an indication of an auxiliary fuel pump failure. Terminate flight as soon as possible and check for fault.

Table of Contents

Section 4

Normal Procedures

Table of Contents (continued)

4.1 General

This section describes the recommended procedures for normal operations of the GROB G 115D2 and presents all of the required procedures.

Normal procedures associated with those optional systems and equipment which require handbook supplements are provided in 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.

All data of this section are refered to a flight mass of 990 kg (2182 lbs) unless other masses are stated.

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 Performance stated in section 5, however, the speed as indicated for the corresponding weight must be selected.

	V_{IAS} 990 kg (2182 lbs)
Takeoff	
Climb speed under normal takeoff conditions up to 50 ft obstacle (flaps 15°)	120 km/h (65 kts)
Best rate of climb speed (flaps 0°) at sea level V_Y	143 km/h (77 kts)
Best rate of climb speed (flaps 0°) at 10 000 ft V_Y	126 km/h (68 kts)
Angle of climb speed 1,3 V_{S1} (flaps 15°) at sea level V_X	120 km/h (65 kts)
Angle of climb speed 1,3 V_{S1} (flaps 15°) at 10 000 ft V_X	120 km/h (65 kts)
Landing	
Landing final approach speed under normal landing conditions (flaps 60°)	130 km/h (70 kts)
Minimum balked landing speed (flaps 60°)	116 km/h (63 kts)
Maximum demonstrated crosswind at takeoff and landing	37 km/h (20 kts)
Cruise	
Speed limit for operating in turbulent air	248 km/h (134 kts)
Maximum maneuvering speed 990 kg (2182 lbs)	212 km/h (114 kts)
Maximum flaps extended speed	208 km/h (112 kts)

4.4 Approved Maneuvers

Utility airplane

Utility	Entry Speed (km/h)	[kts]
Lazy Eight	245	[132]
Chandelle	245	[132]
Steep turns	245	[132]

Acrobatic airplane

Acrobatic	Entry Speed (km/h)	[kts]
Spin	100 - 180	54 - 97
Inverted Spin	150 - 180	81 - 97
Loop positive	220 - 245	119 - 132
Turn (hammerhead)	220 - 245	119 - 132
Immelmann	245	132
Split-S (nose raise 45°)	245	132
Split-S	160	86
Tail Slide	200 - 245	108 - 132
Cuban-Eight	245	132
Slow Roll	235	127
Steep Turn	235	127
Aileron Roll	235	127
Barrel Roll (pos./neg.)	245	132
Lazy Eight	245	132
Chandelle	245	132
Knife Edge **(only right side)**	235	127

WARNING
Do not make full or abrupt control movements above V_A !
Snap roll maneuvers are not approved !
Observe RPM limit (2700 RPM) during acrobatic maneuvers !
At airspeeds in excess of 180 km/h (97 kts) do not apply combined full control inputs (i.e. full rudder deflection combined with full elevator deflection).

WARNING

Do not fly more than ten seconds in the following attitudes :

1. Vertical flight, steep dive.
2. Inverted flight, steep dive.
3. Zero G periods.
4. Wing-down or knife-edge flights.

In these modes the oil system will not scavenge and engine damage can occur. Normally oil pressure will "flicker" from 10 to 30 psi when transitioning from upright to inverted flight; however, return immediately to normal attitude anytime oil pressure drops 20 psi below normal.
If inverted oil pressure fails to rise, land aircraft and troubleshoot inverted oil system.

4.5 Normal Procedures Checklist

Preflight Inspection

I.Cockpit

a) Pilots license and papers	CHECKED
b) Checklist	IN COCKPIT
c) Control lock	REMOVE

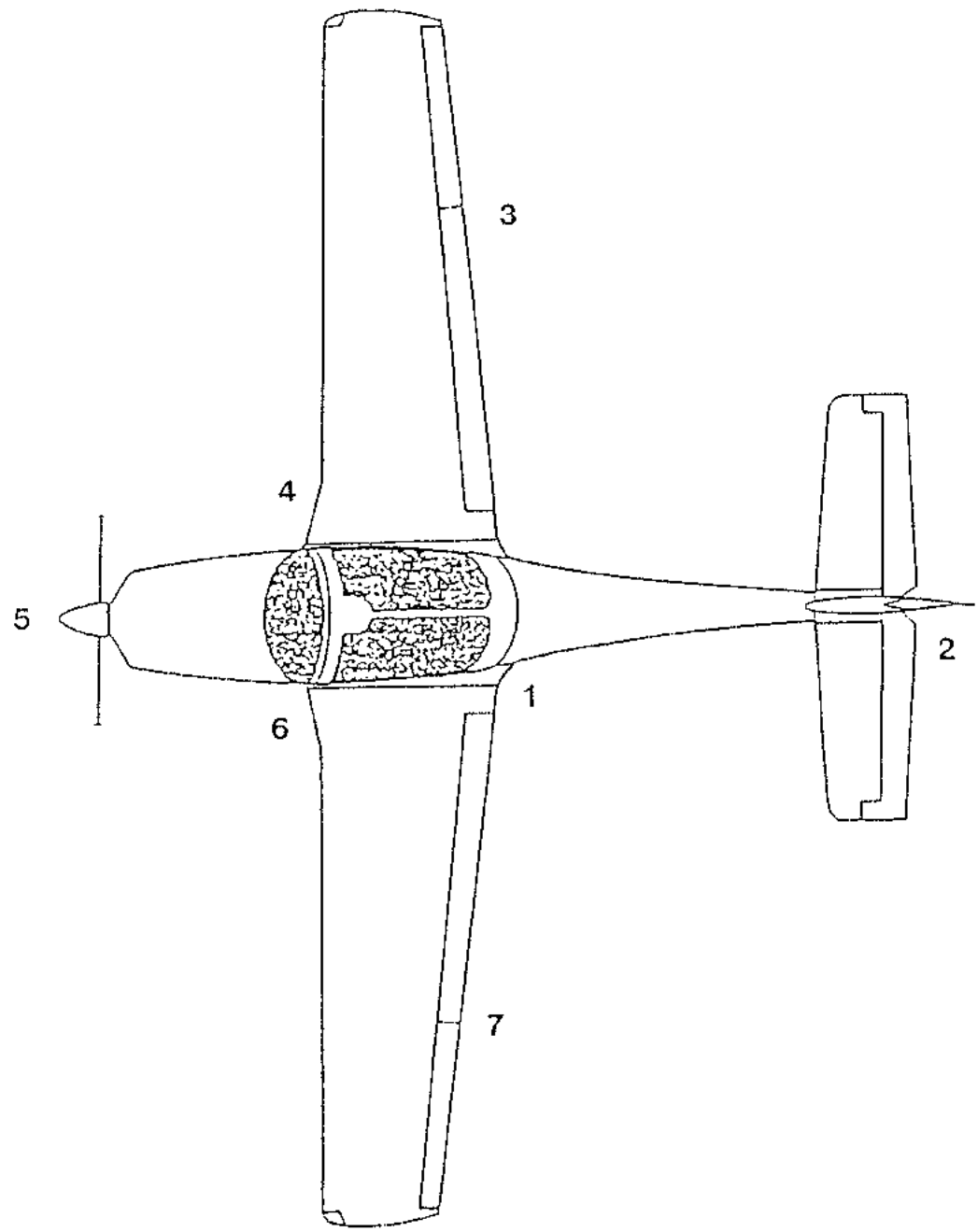
CAUTION
During acrobatic maneuvers the control lock and the towbar do not take up in plane !

d) Parking brake	ON
e) Ignition key	REMOVE
f) Windows	CHECK CLEAN AND UNDAMAGED
g) Circuit breakers	IN
h) All switches	OFF
i) Master switch	ON
j) Fuel quantity gauge	CHECK
k) Master switch	OFF
l) Throttle	IDLE
m) Mixture	CUT-OFF
n) Foreign objects	REMOVE
o) ELT (if installed)	POSITION "ARMED"

Green lamp on the remote control (if installed) must be shine!

II. Walk-around Inspection

Fig. 4.1. Visual Inspection



1. Fuselage

a) Damage	CHECK
b) All antennas	CHECK
c) Static pressure ports	CHECK BOTH CLEAN

2. Empennage

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

3. Right wing

a) Flap and hinges	CHECK
b) Aileron and hinges	CHECK
c) Tie-down	REMOVE
d) Position light (if installed)	CHECK
e) Strobe light (if installed)	CHECK
f) Wing tip	CHECK
g) Fuel vent	CHECK
h) Standing water in filler well Fuel quantity Fuel filler cap	REMOVE CHECK CHECK TIGHT
i) Wing surface	CHECK CONDITION

4. RH main landing gear

a) Tire, wheel and brake	VISUAL INSPECTION
b) Wheel chock	REMOVE
c) Slip mark (red paint)	VISUAL INSPECTION
d) Wheel fairing	CHECK
e) Tire pressure	CHECK

5. Nose section

a) Oil (minimum quantity 5.7 liters / 6 quarts)	CHECK QUANTITY
b) Cold weather kit	CHECK POSITION
c) Cowling	PROPERLY ATTACHED

d) Air inlet filter	FREE CHECK CONDITION CHECK ATTACHMENT
e) Landing light (if installed)	CHECK
f) Propeller	CHECK CONDITION
g) Spinner	CHECK FOR CRACKS
h) Nose gear strut	CHECK STROKE
i) Tire and wheel	VISUAL INSPECTION
j) Wheel fairing	CHECK
k) Tire pressure	CHECK
l) Towbar	REMOVE

6. Left main landing gear

a) Tire, wheel and brake	VISUAL INSPECTION
b) Slip mark (red paint)	VISUAL INSPECTION
c) Wheel chock	REMOVE
d) Wheel fairing	CHECK
e) Tire pressure	CHECK

7. Left Wing

a) Wing surface	CHECK CONDITION
b) Master switch	ON
c) Stall warning	CHECK FUNCTION
d) Pitot tube cap	REMOVE
e) Pitot tube	CHECK CLEAN
f) Pitot heat (Push test button at the anunciator panel !)	CHECK (if installed)
g) Master switch	OFF
h) Standing water in filler well Fuel quantity Fuel filler cap	REMOVE CHECK CHECK TIGHT
i) Fuel vent	CHECK

j) Wing tip	CHECK
k) Tie-down	REMOVE
l) Position light	CHECK
m) Strobe light	CHECK
n) Beacon (if installed)	CHECK
o) Aileron and hinges	CHECK
p) Flap and hinges	CHECK
q) Fuel tanks : RH wing	DRAIN
Sump tank	DRAIN
LH wing	DRAIN

Before Engine Start

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

WARNING
To avoid damage to the electronic equipment always switch off the avionics master switch during start up.

15. Master switch	ON

16.	Engine instruments	CHECK
17.	Fuel quantity for the planned flight	ADEQUATE
18.	Anunciator panel lamp test	CHECK

NOTE
During "lamp-test" all lights will illuminate with full brightness.

Engine Start

1.	Mixture	FULL RICH
2.	Throttle	FULL POWER
3.	Electrical fuel pump (Activity audible / light on / fuel pressure increase)	ON (approx. 2-4 sec.)

NOTE
If instrument panel lighting is switched ON, all green anunciator lights are dimmed.

4.	Electrical fuel pump	OFF
5.	Throttle	approx. 30%
6.	Mixture	FULL LEAN
7.	Pos.-light/Beacon/Strobe light	ON
8.	Electrical fuel pump	ON
9.	Brake pedals	PRESSED
10.	Propeller vicinity	CLEAR
11.	Ignition	START, position to BOTH, as soon as engine running
12.	Mixture	FORWARD UNTIL SMOOTH RUNNING
13.	Throttle	1000 - 1200 RPM ADJUST
14.	Oil pressure	OIL PRESSURE MUST RISE WITHIN 30 SEC

15. Electrical fuel pump — OFF, as soon as engine running stable

WARNING
If oil pressure reaches 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.

16. Anunciator Panel — CHECK

DURING ENGINE START:

Starter light — RED

NOTE
If the engine does not start, repeat the procedure.
If the engine is flooded, proceed as follows:

- Throttle — FULL POWER
- Electrical fuel pump — OFF
- Mixture — LEAN
- Elevator — PULL
- Brake pedals — PRESSED
- Operate the starter until the engine is running, then set the mixture lever forwards and pull back the throttle.
- If necessary, switch on the electrical pump immediately (precaution against the formation of vapor bubbles).

WARNING Make sure the aircraft is secure and that there are no obstacles in front of it !
The engine may excellerate immediately to full power.

Warm-up

1. When engine running smoothly — MAX. 1500 RPM
2. Ampere — POSITIVE SIDE
3. Fully extend and retract flaps (indication and visual inspection checking at each stage flaps symmetry) — COMPLETED
4. Anunciator Panel — NO RED LIGHTS

WARNING
No " RED-LIGHTS " must be illuminated ! If not, shut off engine and do not repeat starting procedure until cause of trouble has been eliminated !

Before Taxi

1. Flight instruments	CHECK / ADJUST
2. Engine instruments	CHECK
3. Avionics master switch	ON
4. Avionics switches	ON
5. Avionics frequency, volume, test position	CHECK
6. Maneuvering area	CHECK
7. Parking brake	RELEASE

Taxi

1. Nosewheel control	CHECK

CAUTION! When taxiing tight turns it may be necessary to assist the nose wheel by the toe-brakes.

2. Braking action	CHECK
3. Compass	CHECK
4. Turn-and-bank indicator (if installed)	CHECK
5. Directional gyro	CHECK
6. Attitude indicator	CHECK

Ground Check / Run Up

1. Parking brake	SET
2. Oil pressure (must be at least in yellow sector)	CHECK
3. Throttle	1800 RPM
4. Ignition switch set to L	RPM MUST DROP
5. Ignition switch set to BOTH	1800 RPM
6. Ignition switch set to R	RPM MUST DROP

Maximum RPM drop	**175 RPM**
Minimum RPM drop	**50 RPM**
Maximum RPM drop difference	**50 RPM**

7. Ignition switch set to BOTH	1800 RPM
8. Throttle (min. oil temperature 40°C)	IDLE / 700 - 850 RPM
9. Throttle, recommended	1100 - 1500 RPM

Before Take Off

1. Seatbelts and harnesses	FASTEN AND CHECK TIGHTNESS
2. Canopy closed and locked	CHECK
3. Fuel cock	ON
4. Trim	SET FOR TAKEOFF
5. Mixture	ADJUST
6. Fuel selector valve	MOST CONTENT OR BOTH

CAUTION Longer flight with fuel selector in "BOTH" can end up in significant fuel unbalance!

7. Flaps	15° (TAKE OFF)
8. Alternative air	COLD FULLY PUSHED IN AND TORQUE
9. Electrical fuel pump	ON
10. Ignition key set to BOTH	CHECK
11. Vacuum gauge (if installed)	IN GREEN RANGE
12. Flight instruments	CHECK
13. Engine instruments	IN GREEN RANGE (EXCEPT OIL IN YELLOW ARC)
14. Oil temperature (minimum 40°C or more !)	CHECK
15. All control surfaces for full deflection	CHECK
16. Parking brake	RELEASE
17. Tank asymmetry	MAXIMUM 20 ltr. (5.3 US.gal./4.4 Imp.gal.)

Take Off

1.	Brakes	HOLD
2.	Full throttle	MIN. 2200 RPM
3.	Mixture	FULL RICH

NOTE
For 5000 ft density altitude or above or high ambient temperatures, roughness or reduction of power may occur at full rich mixture. The mixture may be adjusted to obtain smooth engine operation.

4.	Brakes	RELEASE
5.	Nose gear relieve	AT MIN 60 km/h (32 kts)
6.	Nose gear lift-off	100 km/h (54 kts)
7.	Airspeed with flaps 15° at height of 15 m (50 ft)	120 km/h (65 kts)
8.	Flaps	RETRACT 150 ft ABOVE GROUND
9.	Speed with flaps 0°	145 km/h (78 kts)
10.	Electrical fuel pump	OFF (APPROX. 1000 FT ABOVE GROUND)

Climb

1.	Climb power	CHECK
2.	Mixture	FULL RICH

NOTE
For 5000 ft density altitude or above or high ambient temperatures, roughness or reduction of power may occur at full rich mixture. The mixture may be adjusted to obtain smooth engine operation.

3.	Engine instruments	CHECK
4.	Airspeed	BLUE LINE or higher
5.	Trim	SET
6.	Altimeter setting	CHECK

Cruise

1.	Power er	AS REQUIRED

2. Mixture	ADJUST
3. Trim	SET

Spin

SPIN ENTRY

1. Loose items	STOW
2. Seat belts and harnesses	TIGHTEN
3. Electrical fuel pump	OFF
4. Engine	IDLE
5. Wings	LEVEL
6. Recommended entry speed	≈ 100 km/h (54 kts) (max. 180 km/h [97 kts])
7. Rudder	FULLY IN DIRECTION
8. Elevator	FULL UP

DURING SPIN

1. Elevator	FULL UP
2. Aileron	NEUTRAL
3. Rudder	FULLY IN SPIN DIRECTION

RECOVERY

1. Rudder	OPPOSITE TO SPIN DIRECTION
2. Aileron	NEUTRAL OR INTO SPIN DIRECTION
3. Elevator	RELEASE FORCE

Descent

1. Altimeter	SET
2. Power setting (avoid lengthy idle)	AS REQUIRED
3. Mixture	ADJUST (see Chap.4.11)

4. Fuel tank selector	MOST CONTENT OR BOTH

Before Landing

1. Seatbelts and harnesses	FASTEN TIGHT
2. Electrical fuel pump	ON
3. Fuel selector valve	MOST CONTENT OR BOTH

CAUTION Longer flight with fuel selector in "BOTH" can end up in significant fuel unbalance!

4. Mixture	AS REQUIRED (see Chap.4.11)
5. Flaps	EXTEND

WARNING: V_{max} with extended flaps 208 km/h (112 kts)

6. Recommended final approach speed with flaps 60° (990 kg)	130 km/h (70 kts)
7. Trim	SET

Balked Landing

1. Throttle	FULL THROTTLE
2. Mixture	RICH
3. Flaps	RETRACT TO 0° or 15°
4. Climb	CHECK SPEED (blue line)

Normal Landing

1. Flaps	60°
2. Airspeed to flare	130 km/h (70 kts)
3. Touchdown	MAIN GEAR FIRST AT LESS THAN 108 km/h (58 kts)
4. Nosewheel	LOWER GENTLY
5. Brakes	AS REQUIRED

After Landing

1. Electrical fuel pump	OFF
2. Flaps	RETRACT

3. Trim	SET TO TAKEOFF RANGE

Before Leaving the Airplane

1. Parking brake	SET
2. ELT	CHECK FREQ. 121.5 MHz for unintentional function
3. Avionics master switch	OFF
4. All electrical aircraft systems	OFF
5. Short circuit test	COMPLETE (1000 RPM)
6. Throttle	IDLE
7. Mixture	CUT-OFF
8. Ignition switch	OFF
9. Ignition key	REMOVE
10. Fuel selector valve	MOST CONTENT
11. Master switch	OFF
12. Control lock	APPLY

Parking

1. Wheel chocks	POSITION
2. Parking brake	RELEASE
3. Tie-downs (if required)	SECURE
4. Pitot tube cap	APPLY

4.9 Amplified Normal Procedures

Preflight Inspection

The airplane should be given a thorough preflight and walk around check. These procedures can be amplified accordingly when deemed necessary by the pilot. The preflight inspection should include at leastast 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

Before refuelling, make sure that water that has collected near the tank filler is removed !

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

The passenger should be instructed on the use of safety harnesses and the ventilation system, and should be informed that smoking is prohibited. Warn the passenger not to obstruct the controls, not to touch the instruments and not to tamper with the canopy mechanism. If aerobatics are envisaged, remove all loose objects etc. from the passenger's person.

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

Check the cockpit for foreign objects both on the left and right-seat and in the baggage compartment. If the right seat is vacant, close and lock the seatbelt and harness.

WALK-AROUND INSPECTION

Check fuselage for damage. Check fins and control surfaces for damage. Make sure horizontal tail is firmly in place. Operate both elevators and rudder to check freedom of movement, free play and hinge pins secure. Check elevator mass balance tips for damage. Check connection and play of the trim tab. Check beacon and position light for damage. Make sure all antennas are tightly in place.

Check pitot static system :
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. The pitot heat system is not active on ground. To test the proper function of the system, press test button on anunciator panel approximately 5 to 10 seconds, the pitot tube should warm up.

Check right wing flap for damage. Inspect RH aileron for full freedom of movement, free play, hinge pins and proper attachment of the actuator. Remove tie-down from tie-down point.

Check position light and strobe light (if installed) 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 (3.0 bar; 43.5 PSI).

Open the access hole in the top cowling and check the engine oil level (5.7 - 7.6 liters = 6 - 8 quarts). For a flight of full range the engine requires 7.6 liters (8 quarts).

Check the cowling for damage and make sure it is firmly in place. Ensure that the air intake opening is free of debris an and dirt and is undamaged. The air filter must be securely attached. Check the landing light (if installed) for damage. Make sure that the propeller is securely attached. Check leading edge protection and propeller surface for damage and inspect the trailing edge for chipping. Also make sure the propeller spinner is tight and check for cracks.

Exercise 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 functionally check the stall warning and pitot heat switch on the master switch. Push the test button of the annunciator panel for a few seconds. The pitot tube must warm up. Position tab upwards - stall warning must sound. Return master switch OFF. Check LH aileron and LH flap same as described for right-hand side.

Before Engine Start

After completing the preflight inspection and checking the fuel and oil level, enter the cockpit and set the pedals to a comfortable position.

NOTE
If two heavy people stand simultaneously on the wing trailing edge the airplane may nose-up.

Fasten seatbelts ts 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 shutoff valve ("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. Make sure the avionics master switch is positioned "OFF". Switch on the master switch and check the engine instruments, paying particular attention to an adequate fuel quantity.

Engine Start

When starting the engine no difference is made between the warm-start- and the cold-start-procedure, if the check-list is applied.
Switch on the Position lights, Beacon and the Strobe lights. 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 master switch "OFF" to prevent electrical fire.

WARNING
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.

Warm-Up

Switch off the electrical fuel pump when warming 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 positive 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.

WARNING
If the engine shuts off after the first time the electrical fuel pump is switched off, a failure of the mechanical fuel pump might be the reason. Do not take off, before this malfunction has been eliminated !

Before Taxi

Set flight instruments such as altimeter, directional gyro and the attitude indicator. Read the engine instruments regularly. Switch on the avionics master switch and the necessary avionics switches. Set the necessary frequencies and adjust the volume, testing if necessary. Make sure the taxi area is clear and then release the parking brake.

Taxi

During taxi check nosewheel control and brake effectiveness. Check functioning of compass, turn and bank indicator and directional gyro.

CAUTION! When taxiing tight turns it may be necessary to assist the nose wheel by the toe-brakes.

Ground Check / Run up

Set the parking brake and pump the brake pedals once. The oil pressure must be at least in the yellow sector. Set an engine speed of approx. 1800 RPM. To check the magnetos turn the ignition key to position "L" and observe drop in RPM. Return ignition key to the "BOTH" position and check that the original speed is reattained. 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 850 RPM, if the oil temperature is min. 40°C. Then use the throttle to set a RPM of 1100-1500 RPM. Use the tank with the most content (take notice of the tank asymmetry !).

Before Take Off

Fasten seatbelts and shoulder harnesses (on empty seat also). Make sure the canopy is properly closed and locked. The fuel shut off valve must be set to "ON", the trim in the take off range and the mixture set "FOR SMOOTH OPERATION". Flap position for take off is 15°. The alternative air must be set to "COLD" (fully pushed) and secured. Switch electrical fuel pump "ON" and make sure that the ignition key is positioned to "BOTH". If a vacuum system is installed, its indicator should read the green sector. Recheck all flight and engine instruments. In case the engine was running only for a short time, check the attitude indicator is stabilized. The oil temperature must be exceed 40°C or more before take off. Exercise all control surfaces for full response, before finally releasing the parking brake. Set the fuel selector valve to "BOTH" or the most content fuel tank.

CAUTION Longer flight with fuel selector in "BOTH" can end up in significant fuel unbalance!

The maximum allowable fuel asymmetry is 20 liters (5.28 US.gal. / 4.40 Imp.gal.).

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 2200 RPM. Then release the brakes and at a speed of 60 km/h (32 kts) take the load off the nosewheel. Lift the nosewheel at a speed of 100 km/h (54 kts). Climb speed for a flap position of 15° is 120 km/h (65 kts).
When the airplane has attained a height of 150 ft above ground the flaps can be retracted. The recommended climb speed in flap position 0° is at an airspeed of 145 km/h (78 kts) [blue line] at lower altitude. When the aircraft is approx. 1000 ft above ground the electrical fuel pump can be switched "OFF".

Climb

Make sure the throttle is positioned to "FULL OPEN for max. climb" and the mixture to "FULL RICH" (MSL up to density altitude 5000 ft).
Regularly read the engine instrumentation. The airspeed for climbing should be according to chart on Fig. 5.3.8. Trim the airplane accordingly. Check the altimeter setting (standard setting ?).

Cruise

Set desired engine speed and power according to cruise charts. 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.

Descent

Set the altimeter to the QNH of the airfield. Select power and engine speed as required, avoiding lengthy idling.

Before Landing

Make sure seatbelt and harnesses are tight. Reduce airspeed to less than 208 km/h (112 kts). Switch on the electrical fuel pump. Then position the mixture control as required and extend the flaps.

WARNING V_{max} with extended flaps

208 km/h (112 kts) [Upper limit of white range]

The recommended final approach speed with a mass of 990 kg (2182 lbs) in the 60° flap position is 130 km/h (70 kts) for normal landings. Under cross wind or strong turbulence conditions as well as in rain or icy weather suitable higher speeds are necessary. Trim the airplane to the desired speed.

Balked Landing

Set the throttle to full power and the mixture according to the table. Set the flaps to 0° or 15° depending on flight altitude. Start transition to climb.

Normal Landing

Set the flaps to 60°. The final approach speed until flare out should be 130 km/h (70 kts) unless additional speed is required due to cross wind, gusts, rain or icy weather.

Touch down with the main landing gear first when the speed indicator reads less than 108 km/h (58 kts). Gently lower the nose and apply the brakes accordingly.

After Landing

Switch off the electrical fuel pump, retract flaps and retrim the airplane for takeoff condition.

Before Leaving the Airplane

Before climbing out, set the parking brake and pump the brake pedals once. Switch off the avionics master switch and all aircraft electrical systems. To carry out a magneto ground test select a speed of max. 1000 RPM. 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 pulling the mixture control fully back to the "CUT-OFF" position. When the engine has stopped, turn the ignition key to the "OFF" position and remove the ignition key. Then switch off the master switch and apply control lock.

Parking

If the airplane is to be parked for a lengthy period, chock the wheels and tie down the aircraft at the prescribed locations. Release the parking brake. Apply pitot tube cap.

Stalls

An approaching stall is indicated by the stall warning horn and a stall warning lamp which are activated between 19 km/h (10 kts) and 9.2 km/h (5 kts) above stall speed in calm air. Mild airframe buffeting may also preceed the stall. The loss of altitude at low altitude is approx. 300 ft. With increasing altitude, the losses will also increase.

WARNING

The stall warning system is inoperative with the master 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 master switch should be returned to the OFF position after the check is complete.

Approved 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:

Spin / Inverted Spin / Loop positive / Hammerhead Turn / Immelmann / Split-S (nose raise 45°) / Split-S / Tail Slide / Cuban-Eight / Slow Roll / Steep Turn / Aileron Roll / Barrel Roll / Lazy Eight / Chandelle / Knife Edge (only right hand).
Inverted flights are approved for a maximum of 3 min. !

Entry speeds, refer to Section 2 - Limitations.

Before performing maneuvers, check for:

Fuel shutoff valve	:	ON
Fuel selection	:	MOST CONTENT
Fuel asymmetry	:	max. 20 liters (5.3 U.S.gal./4.4 Imp.gal.)
Electrical fuel pump	:	OFF
Seatbelts and harnesses	:	APPLIED AND FASTENED
Seatbelts on empty seat	:	FASTENED
Canopy	:	CLOSED AND LOCKED
Loose objects	:	STOWED
Baggage	:	NO BAGGAGE IN BAGGAGE COMPARTMENT !

ACROBATIC - MANEUVERS

General

Prior to intentional spinning the maximum weight of 920 kg (2028 lbs) (ACROBATIC- and UTILITY category) must not be exceeded!

Before starting acrobatic maneuvers, tighten the safety harnesses and make sure that all loose objects are securely stowed. Start the maneuvers at a safe height. The electrical fuel pump must be switched off and the flaps retracted.
During airspeed built-ups the RPM limit (red radial at 2700 RPM) must be observed, if necessary by power reduction. Shortly prior reaching the vertical in a climb full power must be swiftly applied.
The fuel flow should be set to "best power mix" (refer to cockpit decal).
If there is a danger of exceeding the max. allowable speed, close the throttle fully. Control surface deflections should be adapted to the situation.
The following rule applies for all pull-out radii up to V_A.
Leave the engine at full power to keep the pull-out radii as small as possible.
This applies especially when the aircraft is close to the ground: Pull-out radii at load factors around 6g are very small and high engine power is required to maintain this high load factors, even though the recovery arc is towards the ground.

1. SPIN

ENTRY

Slow the airplane with engine at IDLE and the wings level. At stall speed (approx. 100-180 km/h [54-97 kts] IAS) enter the spin by applying full rudder deflection into the desired spin direction and simultaneously pull the elevator full up with aileron in neutral position.

In a fully developed spin the aircraft rotates at a 2 sec. rate per turn.

DURING SPIN

During spinning, hold the stick in the full back position and keep the ailerons neutral. Full rudder deflection in direction of spin must be maintained.
The indicated airspeed will stabilize at:

- 111 - 160 km/h IAS (60 - 86 kts) IAS

RECOVERY

For spin recovery check throttle position is at IDLE.
Then deflect rudder fully opposite to direction of yaw rotation and put the elevator into the neutral position.
Apply no opposite aileron but hold control stick in neutral or in direction of spin. The control stick held in this position will greatly assist spin recovery even from the most extreme spin conditions (not described in this handbook). For the described normal spin, aileron in position NEUTRAL is sufficient to recover. For simpler handling, this position is preferable.
As soon as rotation has stopped, move all controls to neutral position and pull up smoothly.
The airplane will recover in about one additional turn within 1 - 2 sec.
If pulling out at 3g the maximum speed will be 240 km/h (130 kts) IAS. Apply normal power. For altitude loss refer to figure 4.1.

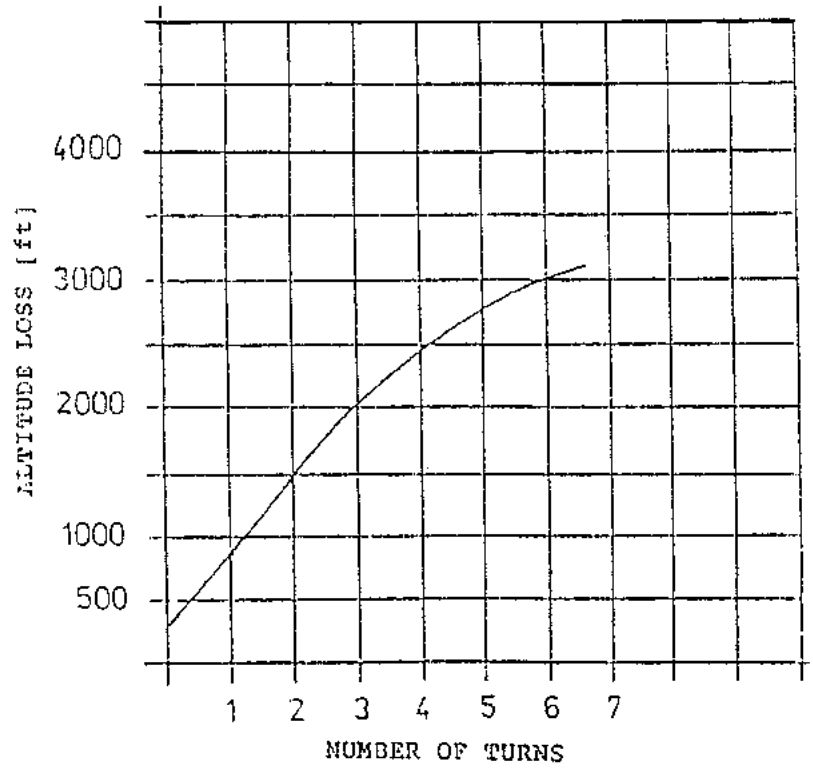
WARNING

- Do **not** attempt recovery with ailerons **against** spin direction or elevator up.
- With ailerons against spin direction and fully pushed elevator during the recovery, the airplane will continue to spin faster and flatter (despite fully opposite rudder).

- If engine stops during spin, recovery has to start immediately and the pilot has to act according to Section 3 " Restart of the failed engine " (if required, start engine with mixture lever in lean).
- During spin, the auxiliary fuel pump must not be switched on (flooding of injector !)
- The recovery sequence is important for certain types of spin. For this reason, never push the stick forwards before opposite rudder is applied.
- To recover from difficult types of spin, use the following procedure :
  - Opposite rudder
  - Full in-spin aileron
  - Stick fully back

  During the recovery phase (transition from a flat spin to a steep spin), move the elevators back to the neutral position to prevent the spin continuing in the opposite direction.
- Applying full power always encourages the aircraft's readiness to recover.

Fig. 4.1 Altitude Loss Including Recovery



NOTE

If the aircraft fails to recover, the recommended control position must be applied:
Rudder against yaw rotation, aileron neutral, elevator release force.
Fig. 4.1 shows maximum values for altitude loss obtained from flight test using the recommended spin and recovery procedure in airspace about 5000 ft MSL. At higher altitudes the altitude loss will be greater.

2. INVERTED SPIN (from inverted flight)

ENTERING THE SPIN

Entry speed	:	150 - 180 km/h (81 - 97 kts)
Engine	:	between IDLE and approx. 50% power
Control stick (elevator)	:	FULLY FORWARD
Rudder	:	FULL DEFLECTION
Ailerons	:	NEUTRAL OR OPPOSITE TO RUDDER

- Maintain the rudder position during the spin !

RECOVERY

Rudder	:	FULL DEFLECTION OPPOSITE TO DIRECTION OF SPIN
Elevator	:	NEUTRAL
Ailerons	:	NEUTRAL

- Pull out to normal attitude !

NOTE
The entry must be made dynamically and/or with engine power around 50% to get into the spin.
The aircraft spins at a rate of approx. 0.5 turn/sec. If the stick is pulled fully back during an inverted spin with out-spin aileron applied, the spin rate will increase. Recovery is quick and easy. The trim settings should be in the " TAKEOFF " position. A black-out is possible during recovery. Therefore appropriate physical condition is absolutely necessary.

For the following maneuvers a RPM of 2500 RPM, full throttle and "best power mix" should be maintained!

3. LOOP (positive)

Entry speed	:	approx. 245 km/h (132 kts)
Load factor	:	approx. + 3,5g

4. TURN (hammerhead)

Entry speed	:	approx. 245 km/h (132 kts)
Load factor	:	approx. + 5g
Start- and finish attitude	:	VERTICAL

Hammerhead turns can only be performed cleanly and precisely to the left (due to propeller vortex). When the first signs of instability due to lack of engine power occur, quickly apply full left rudder. As the aircraft turns, apply full opposite aileron and push the stick firmly forwards. Subsequently reducing engine power to approx. 30% will facilitate completion of the maneuver.

5. IMMELMANN

Entry speed : 245 km/h (132 kts)
Load factor : approx. + 4g

At the top of the loop, push hard to achieve an opposite course.

6. SPLIT "S" FROM A 45° CLIMB

Entry speed : 245 km/h (132 kts)
Load factor : approx. + 4g

Pull the aircraft quickly into a 45° climb, then apply full aileron until inverted. Convert speed to max. height and recover to normal attitude.

7. SPLIT "S" FROM LEVEL FLIGHT

Entry speed : 160 km/h (86 kts)
Load factor : approx. + 4g

Half roll from normal attitude to inverted. Recheck the speed when inverted (should be 160 km/h [86 kts]), then recover to the normal attitude.

8. TAIL SLIDE

Entry speed : 200 - 245 km/h (108 - 132 kts)
Load factor : approx. + 4g

Pull the aircraft quickly vertical and then close the throttle. Hold the controls firmly.

9. CUBAN - EIGHT

Entry speed : 245 km/h (132 kts)
Load factor : approx. + 3,5g

In a 45° inverted dive quickly apply full aileron. The aircraft rolls relatively slowly to normal attitude. Watch the speed ! For a successful cuban eight the recovery speed should be around 250 km/h (135 kts). If the speed is too high to apply full aileron, reduce the aileron deflection and throttle the engine.

10. SLOW ROLL

Entry speed : 235 km/h (127 kts)
Load factor : approx. + 1,5g to - 1,5g

Enter the maneuver from level flight and push hard when inverted. Experience has shown that beginners should lift the nose approx. 10° before rolling.

11. STEEP TURN

Entry speed : 235 km/h (127 kts)
Load factor : approx. + 4g to -3g

The elevator forces are high during negative steep turns. To maintain maximum effectiveness for down elevator, do not retrim to reduce the forces.

12. AILERON ROLL

Entry speed : 235 km/h (127 kts)
Load factor : approx. + 1,5g to 0g

Lift the nose into a 10° climb, then apply and hold full aileron until the wings are again level.

13. BARREL ROLL positive / negative

Entry speed : 245 km/h (132 kts)
Load factor : approx. + 3g to - 3g

For this maneuver, make sure the nose is lifted sufficiently. If there is a danger of exceeding max. allowable speed, close the throttle and adapt the control deflections to the situation.

14. LAZY EIGHT

Entry speed : 245 km/h (132 kts)
Load factor : approx. + 3g

15. CHANDELLE

Entry speed : 245 km/h (132 kts)
Load factor : approx. + 3g

16. KNIFE EDGE

Entry speed	:	235 km/h (127 kts)
Load factor	:	approx. + 2g

Continous knife edge is not possible. The maneuver must be terminated early to avoid high speeds. Knife edge is only permitted to the right to ensure that the oil pressure is maintained !

4.11 Mixture Setting

General:
Leaning the fuel mixture within approved 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 "best power mix" position under normal conditions for rated take off, rated maximum continuous, climb and cruise powers above 75% performance.
- During take off from high elevation airport or during climb (as of approx. 5000 ft density altitude), roughness or loss of power may result from over-richness. In such a case lean mixture control only enough to obtain smooth operation - not for economy (peak EGT).
- Running the engine too rich will prove all the more unfavourable, the higher the altitude.
- Always check 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 stroboscope.
   - Slowly move mixture control from the "FULL RICH" position toward "LEAN" position while closely watching tachometer. Continue leaning until RPM decreases.

- At this point enrich until RPM just peaks.

WARNING **Smooth engine running is always more important than the engine speed indication!**

3. Fuel flow method:

- Slowly move mixture control toward "FUEL FLOW RATED VALUE" (see table at the instrument panel).

WARNING **Smooth engine running is always more important than fuel flow indication!**

4. Leaning wi with the EGT indication (if EGT indication provided):

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

WARNING **Smooth engine running is always more important than the EGT readings !**

5. Leaning with the EGT indication (if single-EGT-indicaton is installed):

- In case of engine failures such as an asymmetric mixture or different fuel-injection-nozzles, these kind of measurement may give no or an incorrect test data.

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Section 5

Performance

5.1 General

The performance charts on the following pages are presented in a way, 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 by 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 hPa (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.

Cruising fuel consumption is based on the recommended lean mixture setting (best economy). Some non-determinable factors such as mixture setting procedure, operating condition of the engine and propeller as well as turbulence can effect range and endurance. Therefore, it is important to consider all available information when computing required fuel quantity for a flight.

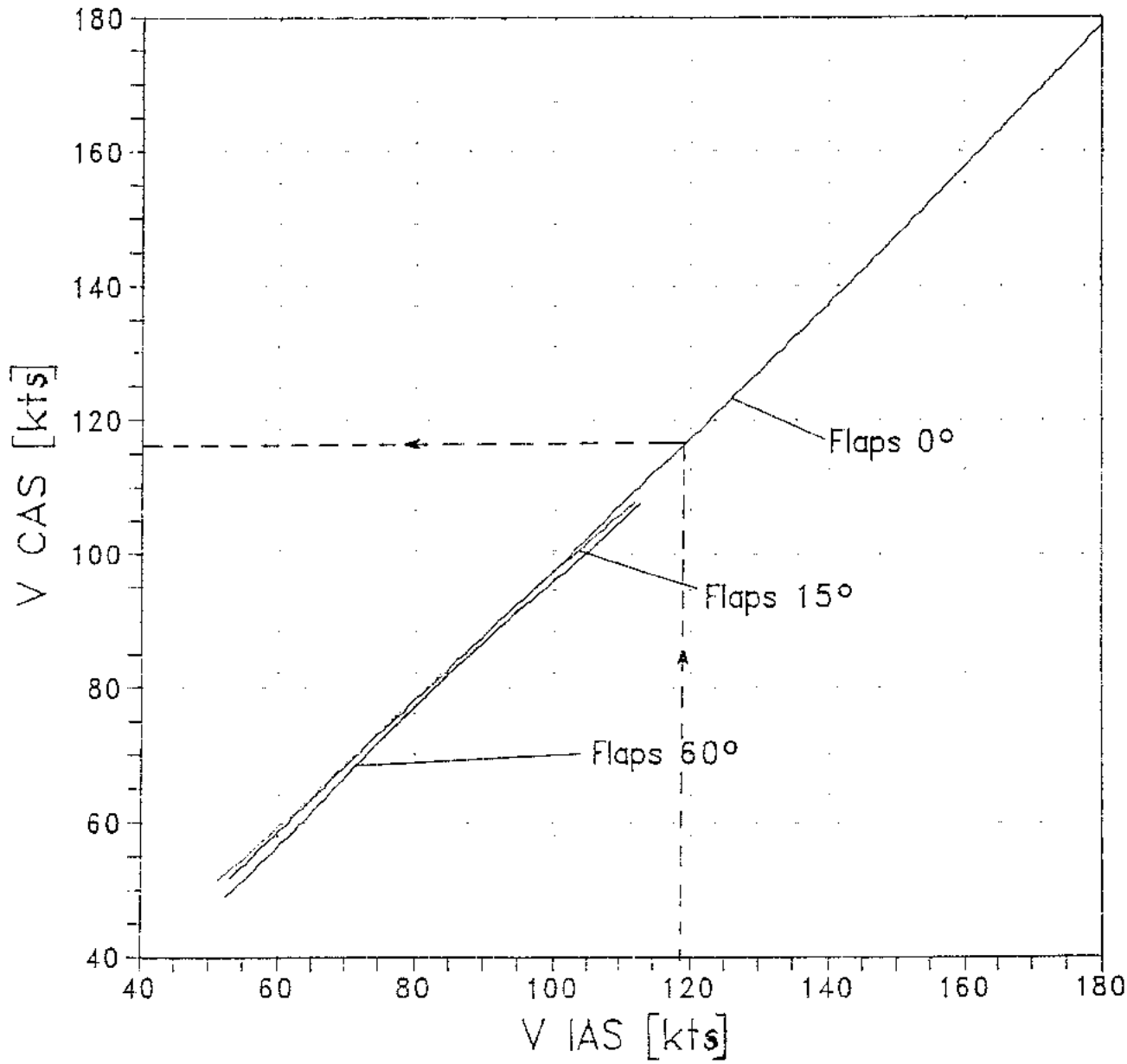
5.3 Using the Performance Tables and Charts

The performance data are presented in form of tables and graphs which consider the effect of each variable. Performance data are of sufficient detail to prepare flights with the required accuracy and to stay on the safe side.

As first step of a flight preparation it is important to confirm the weight and center of gravity being in limits. Refer to Section 6.7 for details.

Fig. 5.3.1 Airspeed Calibration Normal static source

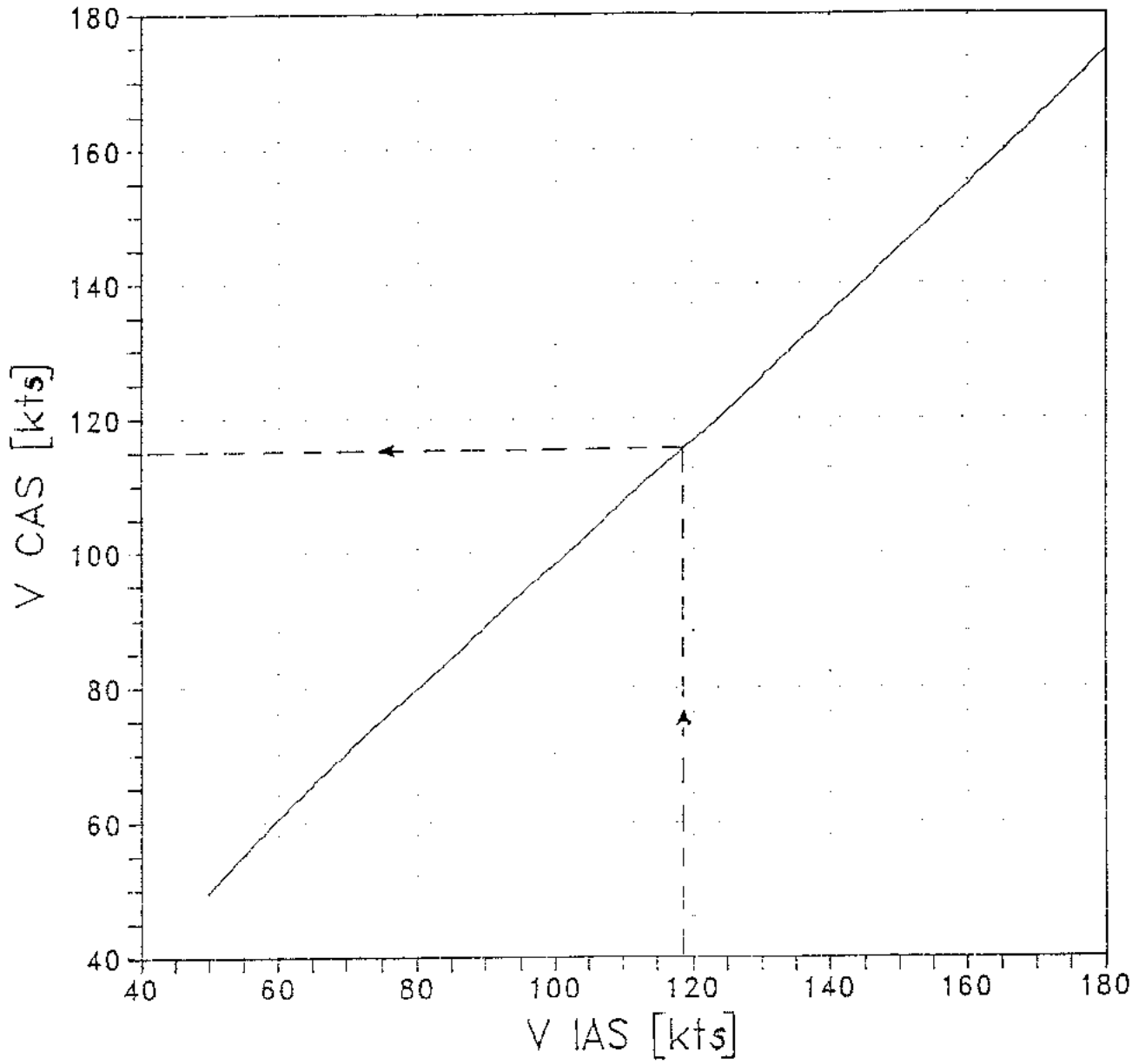
System Pitot-tube at wing, static pressure at fuselage



Example:

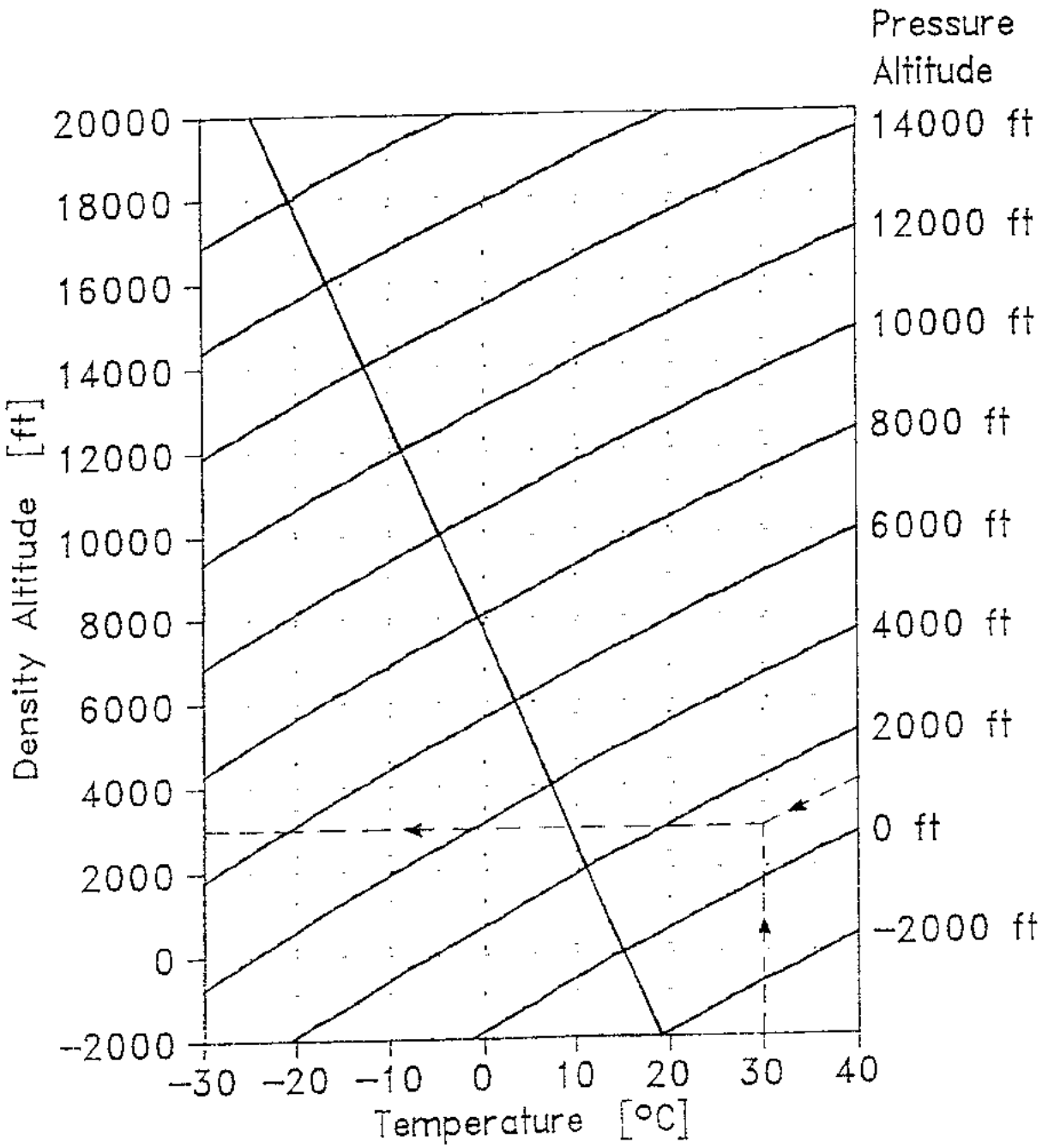
Flap setting 0°
V_{IAS} 119 kts
V_{CAS} 116 kts

Fig. 5.3.2 Airspeed Calibration
Alternate static source



Example: V_{IAS} 119 kts
V_{CAS} 115 kts

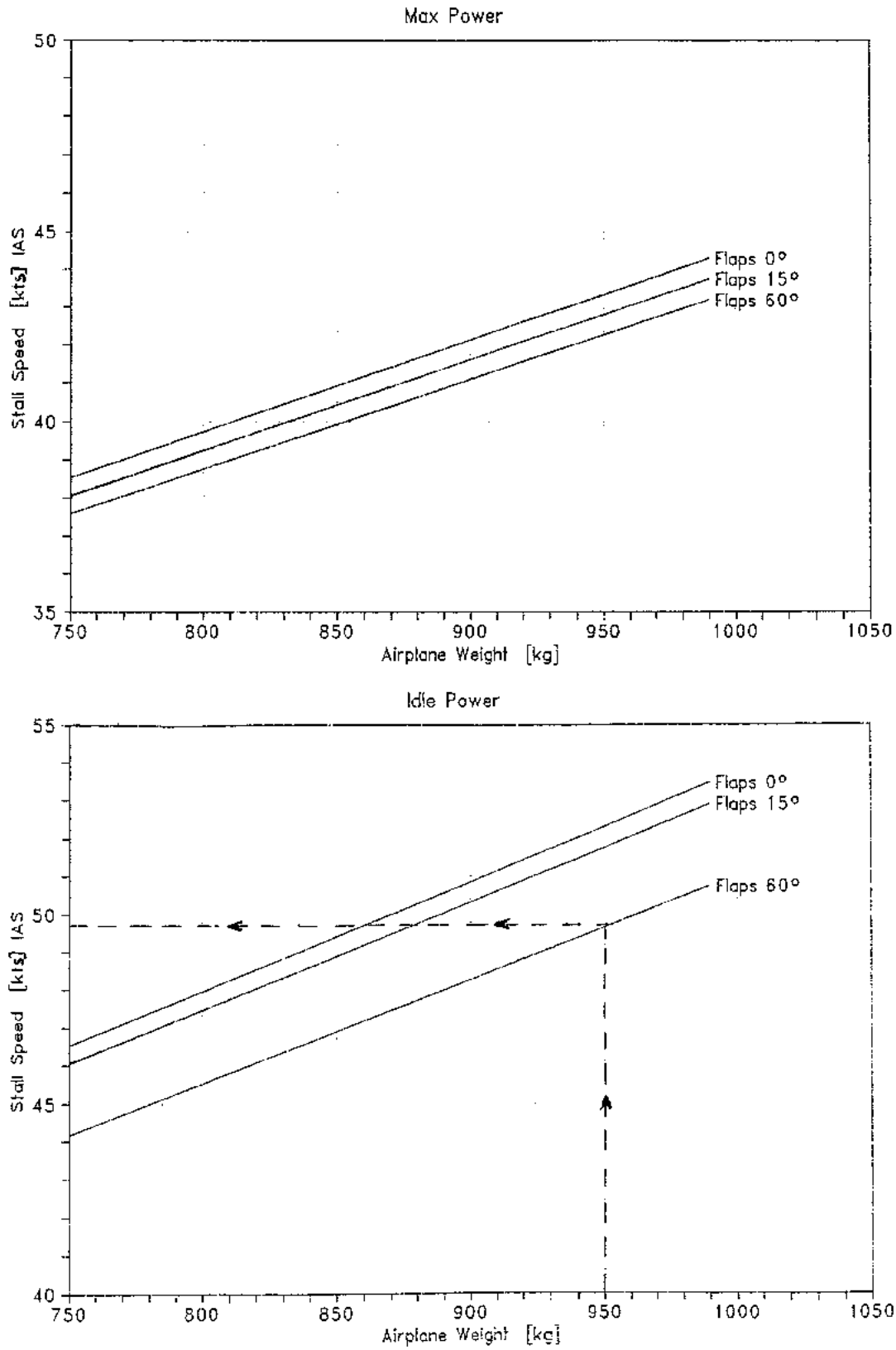
Fig.5.3.3 Pressure and Density Altitude



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).

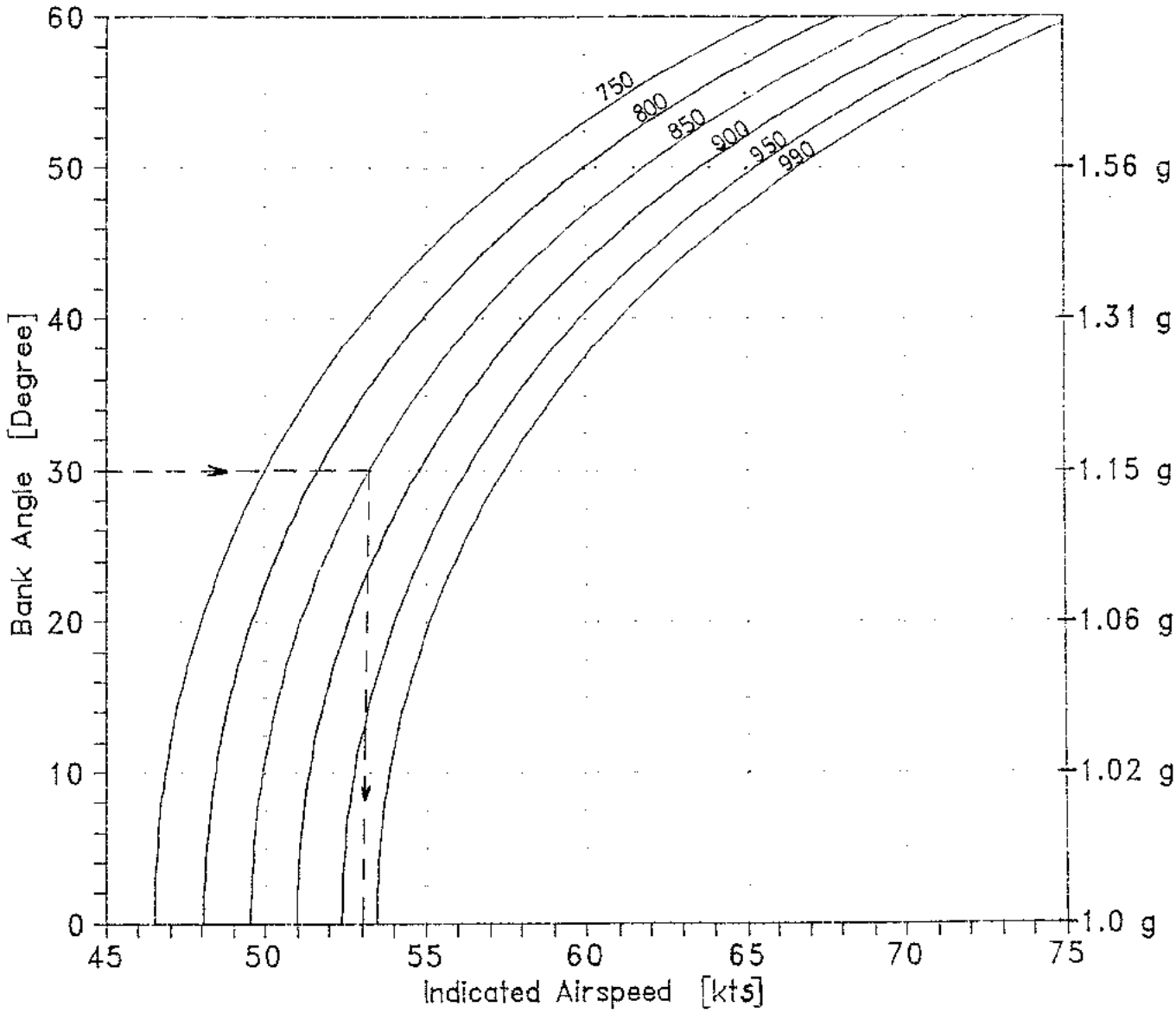
Result: The airplane has a power-related altitude of 3000 ft.

Fig. 5.3.4 Stall Speed at Various Flap Settings



Example: At a weight of 950 kg (2094 lbs), with engine idle and flaps at 60°, stall speed is approx. 50 kts.

Fig. 5.3.5 Stall Speed at Load Factor or Banking



Example: Stall speed when banking 30° or 1.15 g respectively is 99 km/h (53 kts) for an aircraft weight of 850 kg (1874 lbs).

Fig. 5.3.6 Wind Components

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

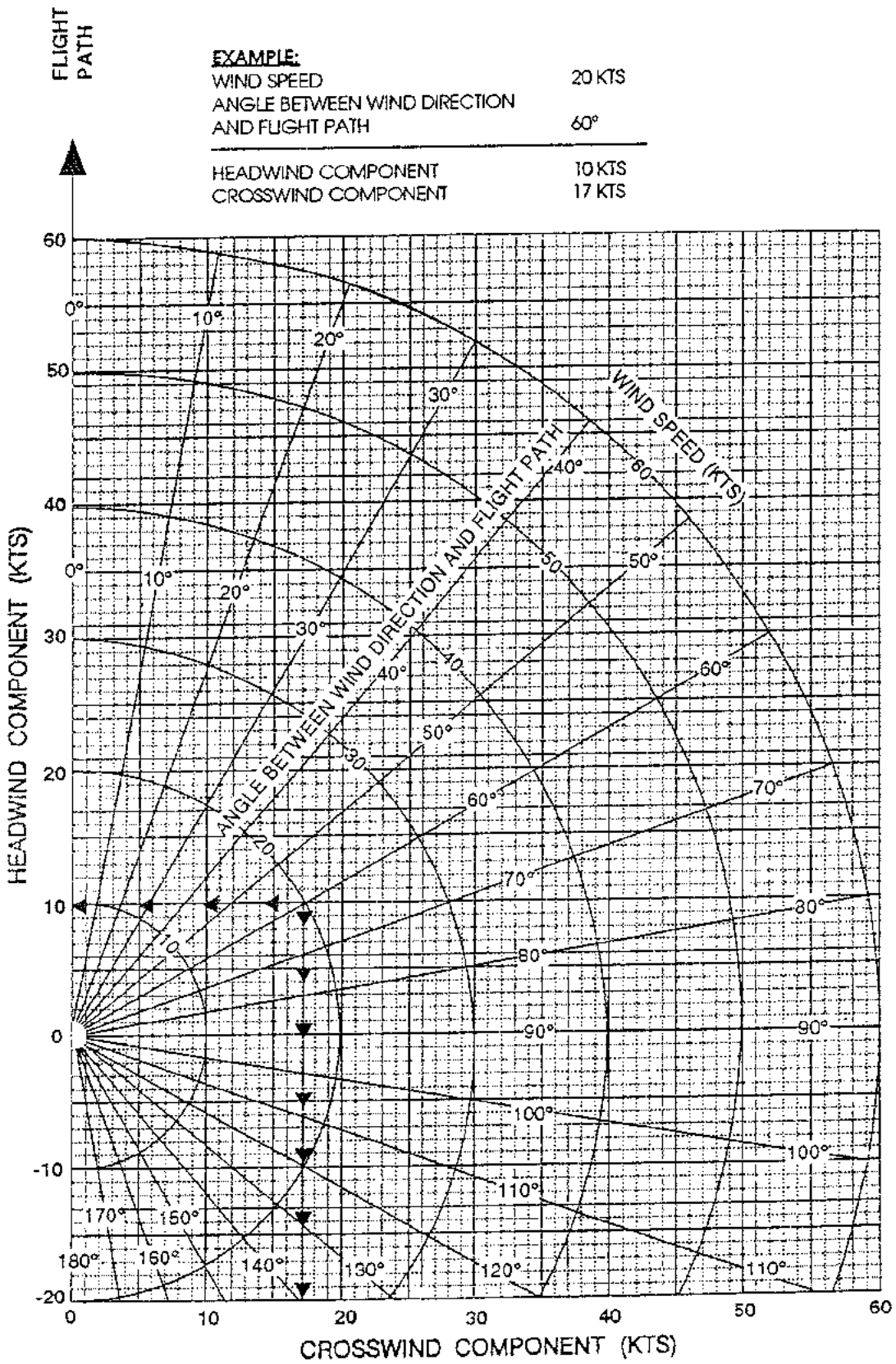
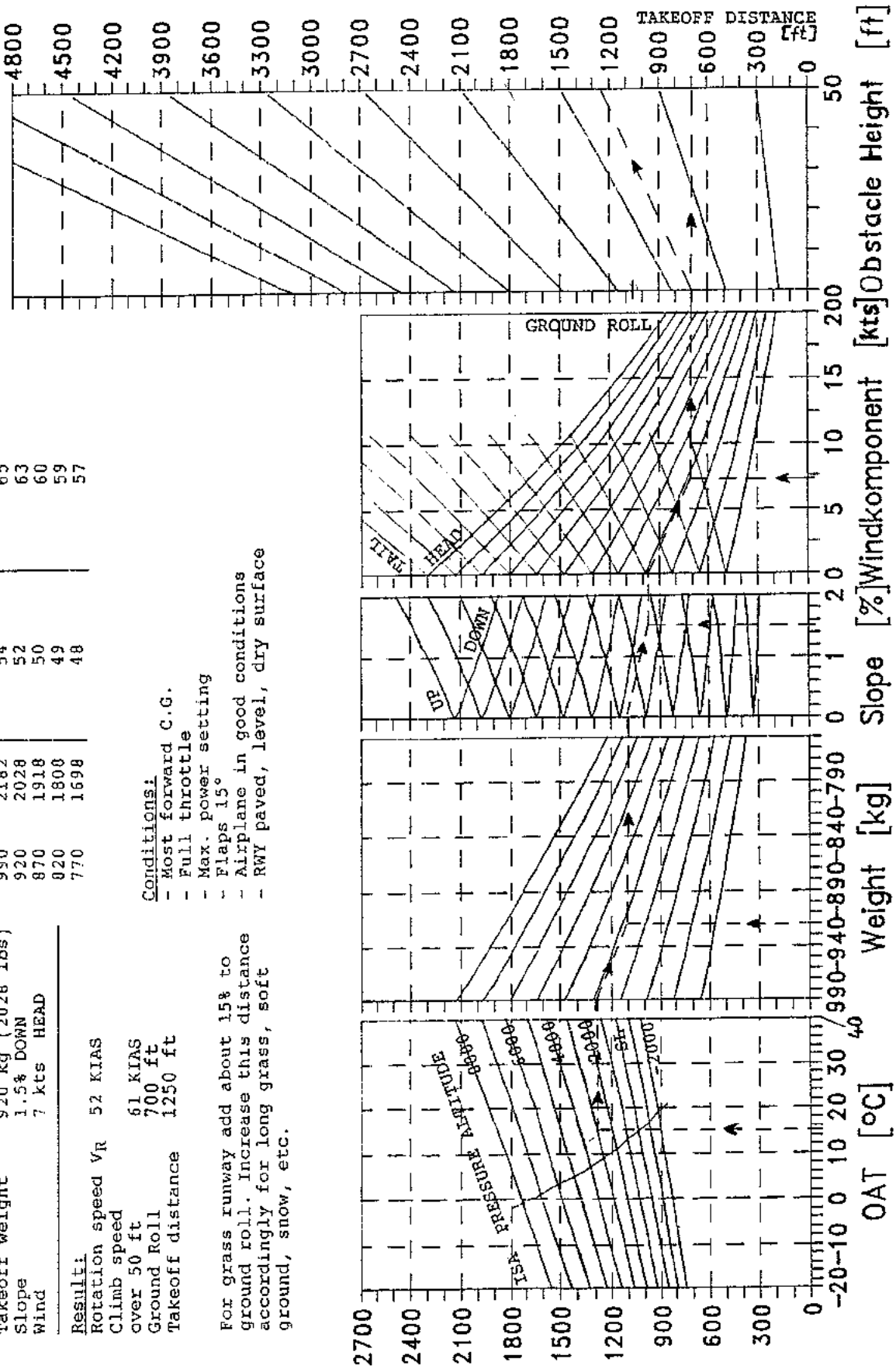


Fig. 5.3.7 Take Off Distance



Example:

OAT	+ 15°C
Pressure Altitude	3000 ft
Takeoff weight	920 kg (2028 lbs)
Slope	1.5% DOWN
Wind	7 kts HEAD

Result:

Rotation speed V_R	52 KIAS
Climb speed over 50 ft	61 KIAS
Ground Roll	700 ft
Takeoff distance	1250 ft

Takeoff Weight [kg]	Takeoff Weight [lbs]	Rotation Speed V_R (KIAS)	Climb Speed over 50 ft (KIAS)
990	2182	54	65
920	2028	52	63
870	1918	50	60
820	1808	49	59
770	1698	48	57

Conditions:
- Most forward C.G.
- Full throttle
- Max. power setting
- Flaps 15°
- Airplane in good conditions
- RWY paved, level, dry surface

For grass runway add about 15% to ground roll. Increase this distance accordingly for long grass, soft ground, snow, etc.

Fig. 5.3.8 Rate of Climb

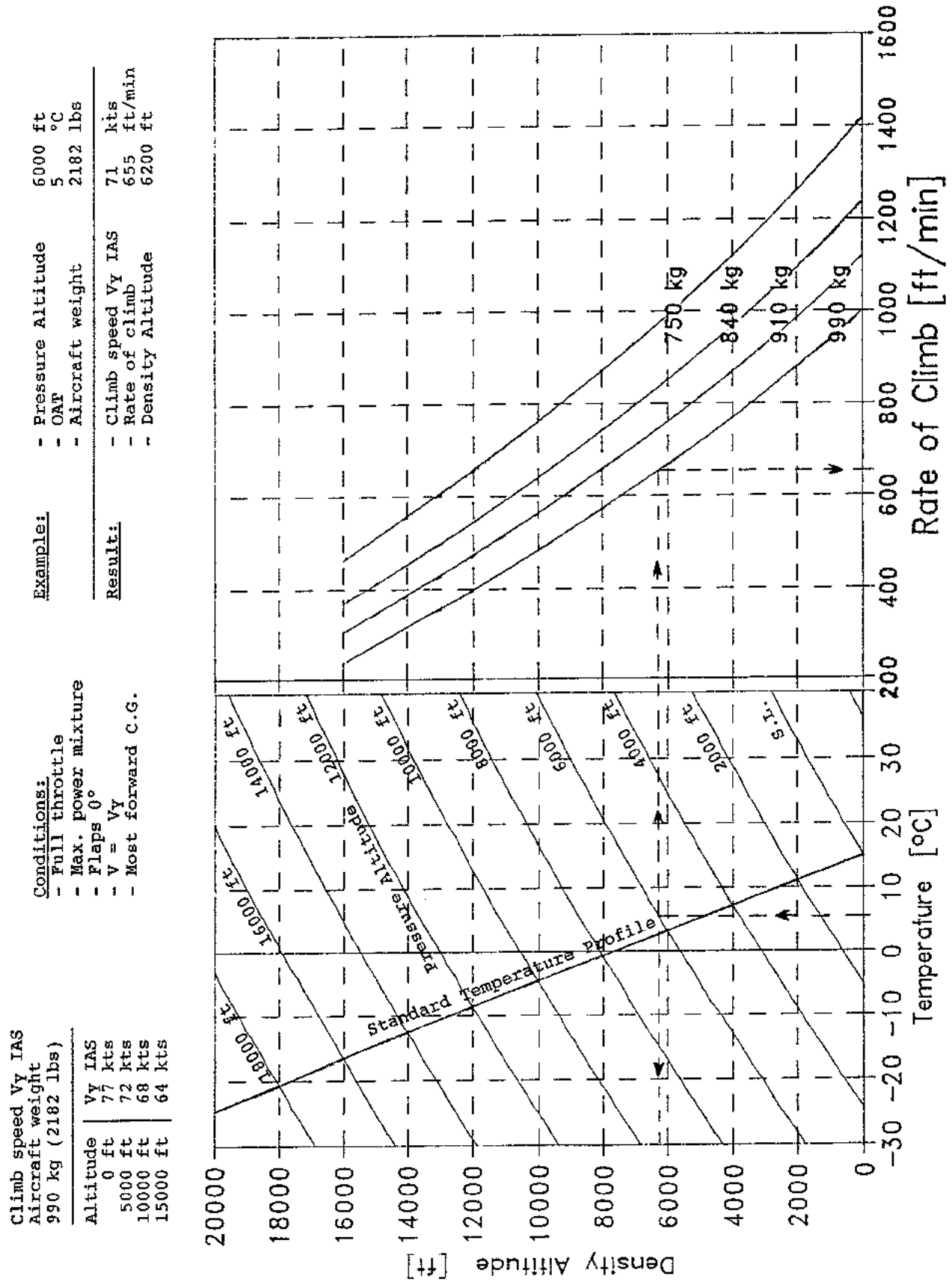
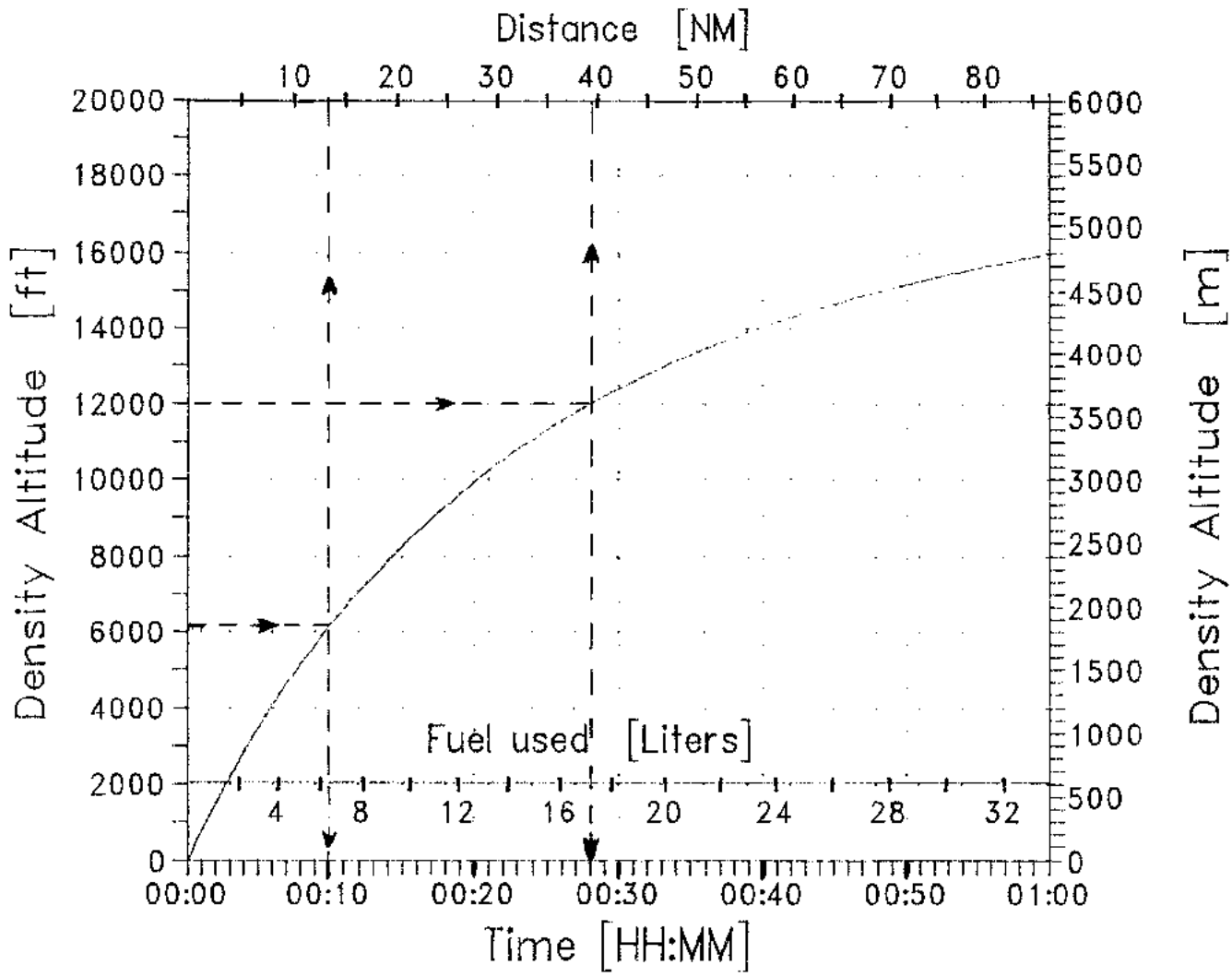


Fig. 5.3.9 Time, Fuel and Distance to Climb



Conditions:
- Full throttle
- Max. power mixture
- Flaps 0°
- V = V_Y
- Standard Atmosphere
- Max. Takeoff weight
- Most forward C.G.

Example: - Climb from 6200 ft DA to 12000 ft DA

Result:		
- Time to climb (28-10)	18.0	min.
- Fuel to climb (17.2-6.5)	10.7	ltr.
- Distance to climb (39.3-13.3)	26	Nm

Fig. 5.3.10 a) Cruise (Fuel Consumption / Best Economy)

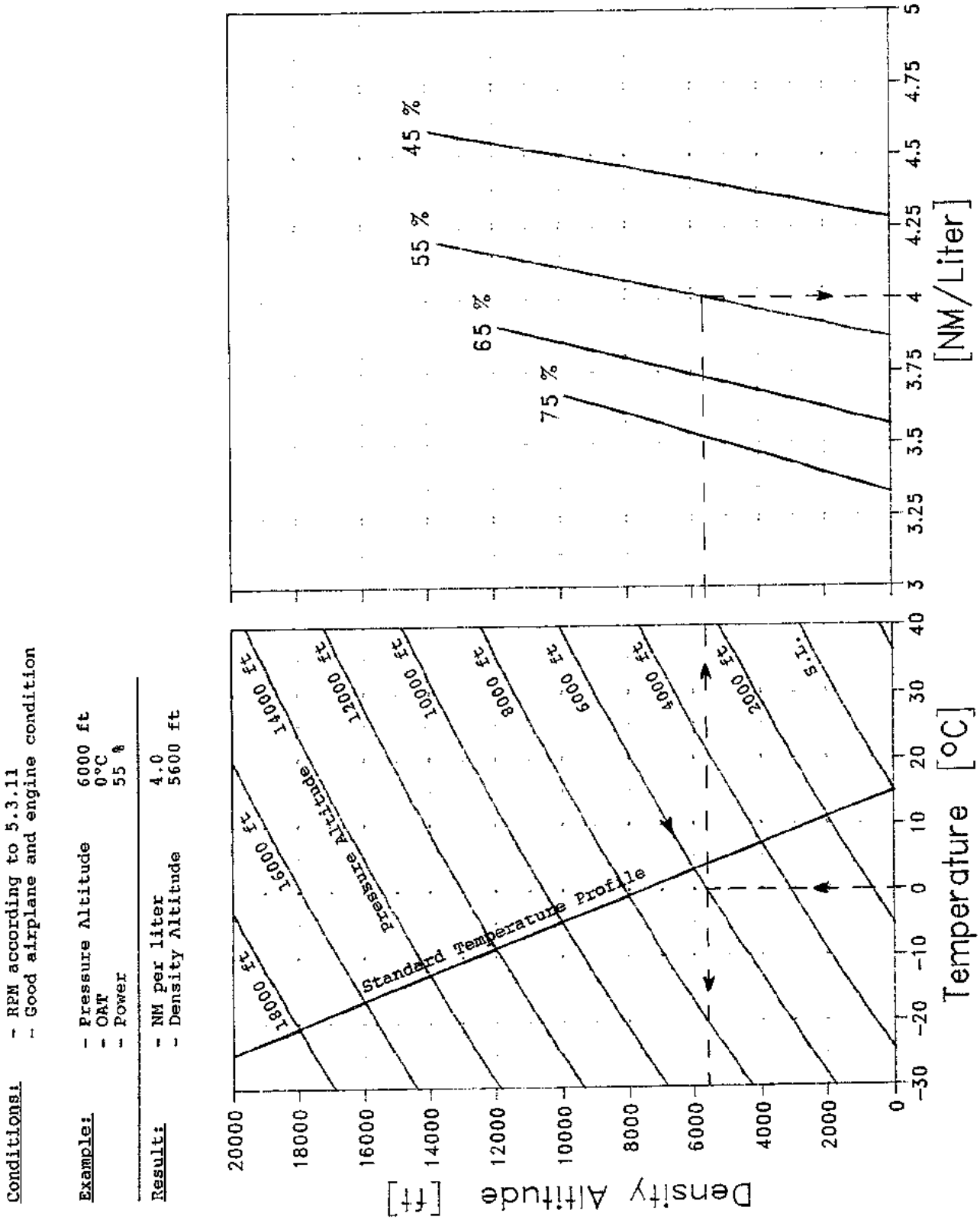


Fig. 5.3.10 b) Cruise (Fuel Consumption / Best Economy)

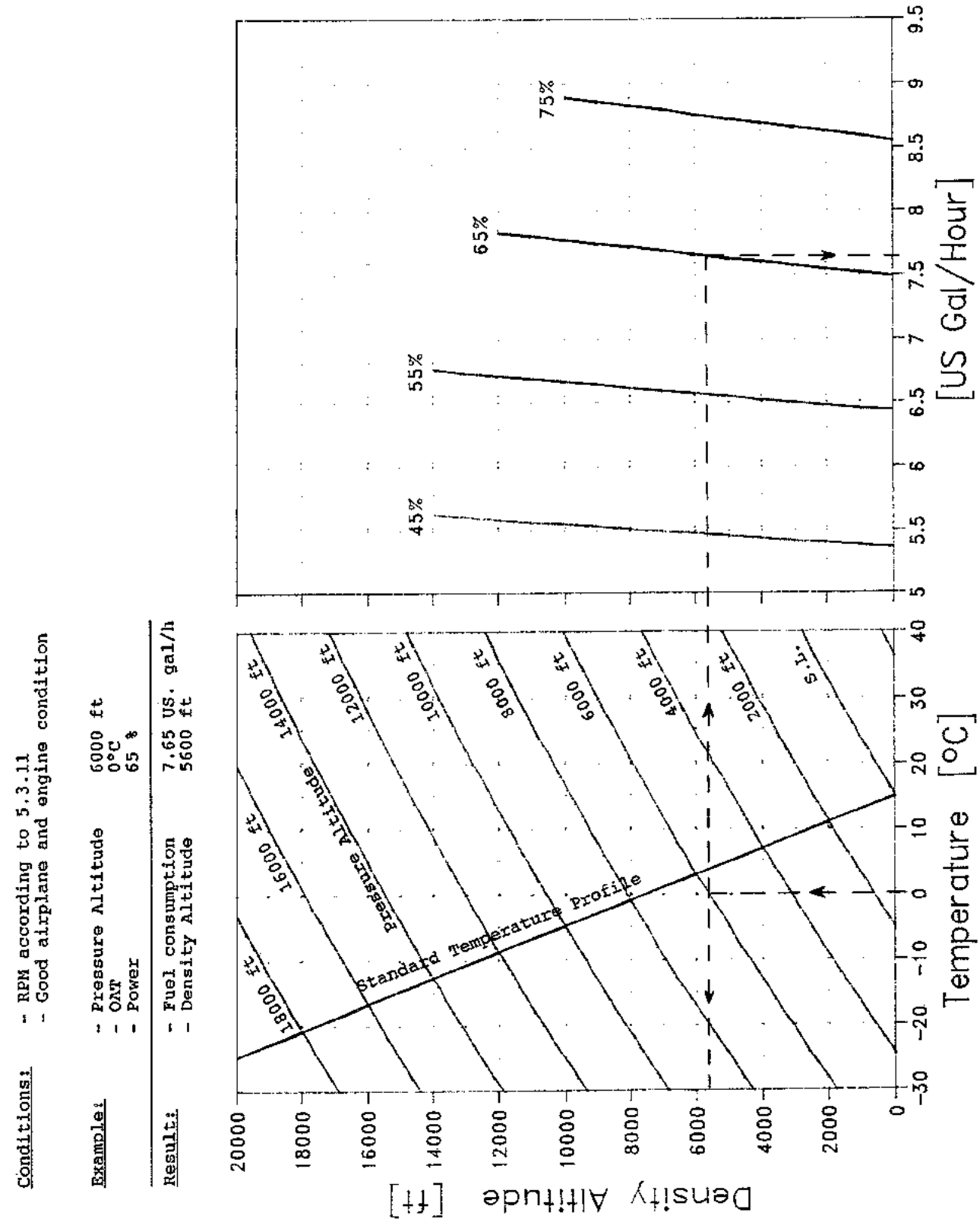


Fig. 5.3.11 Cruise (RPM)

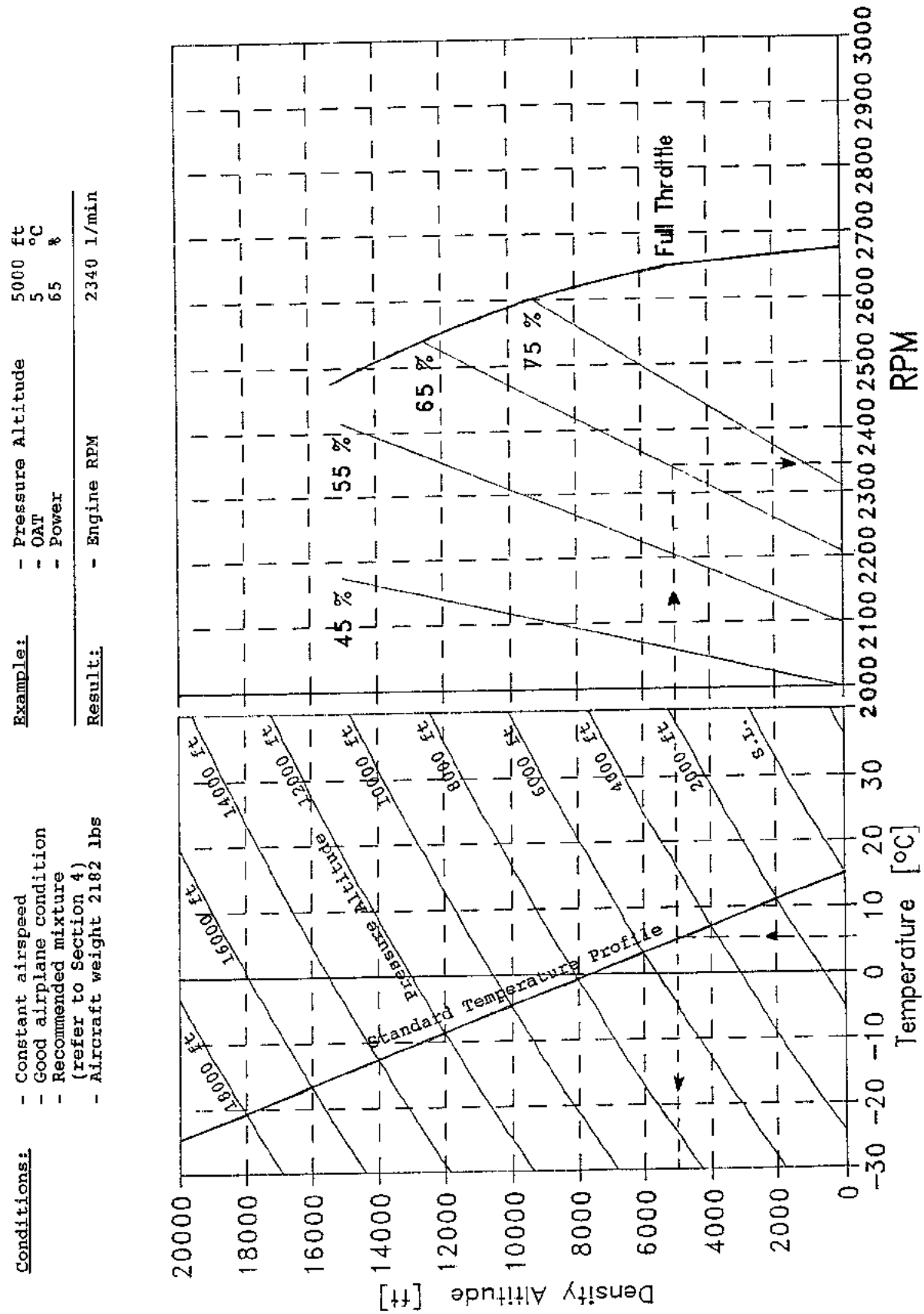


Fig. 5.3.12 Cruise (True Airspeed)

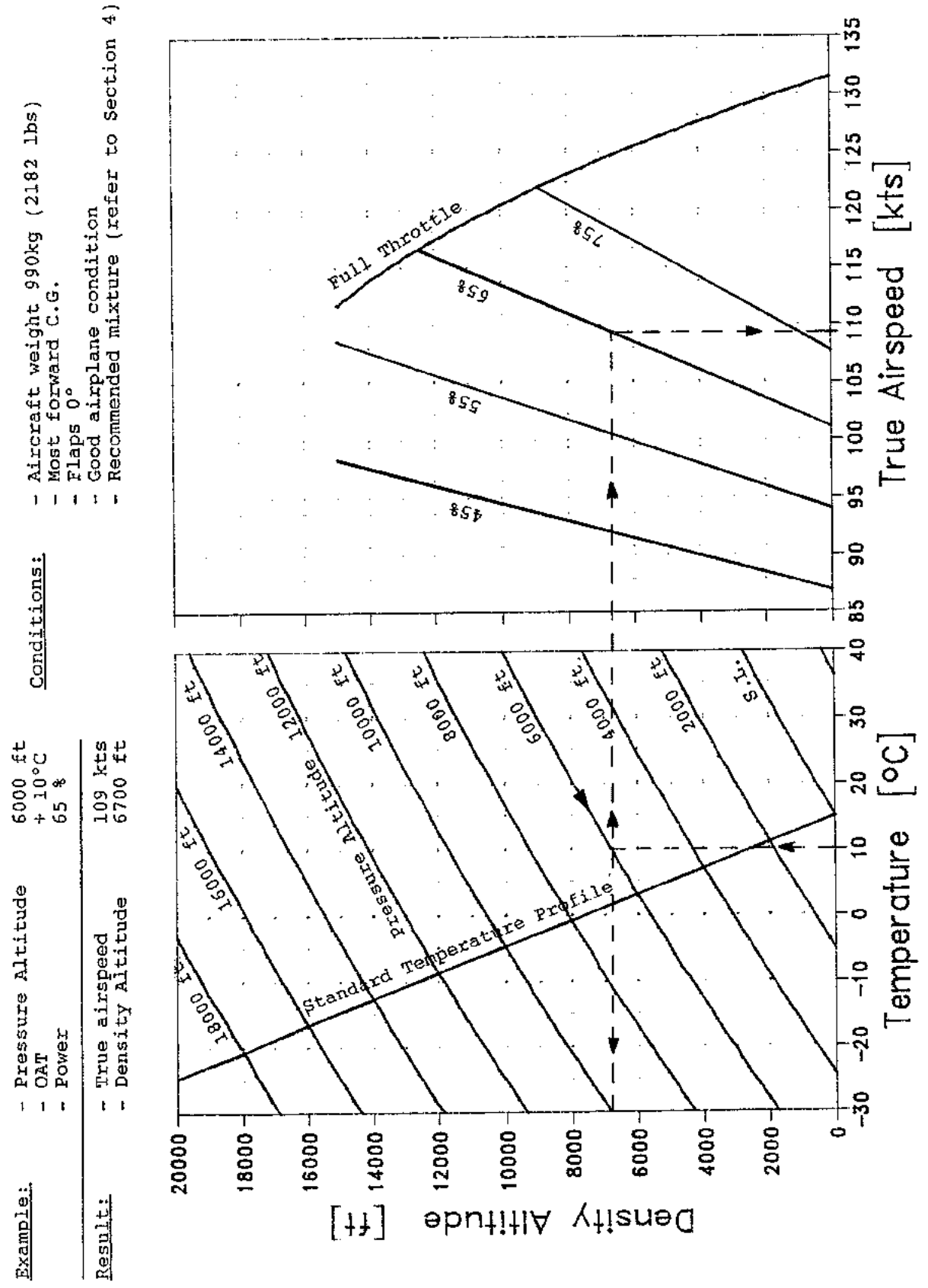


Fig. 5.3.13 Range Profile

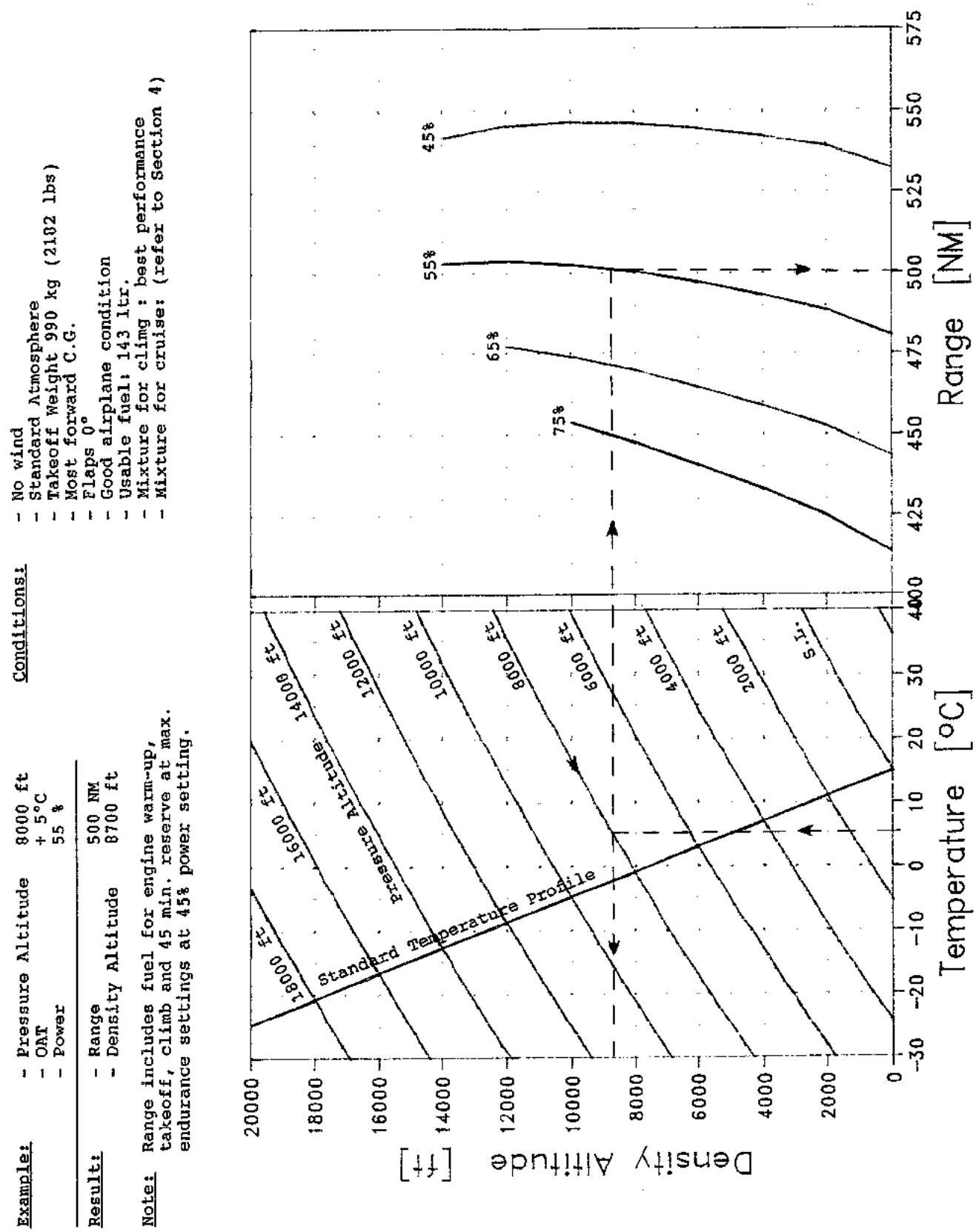
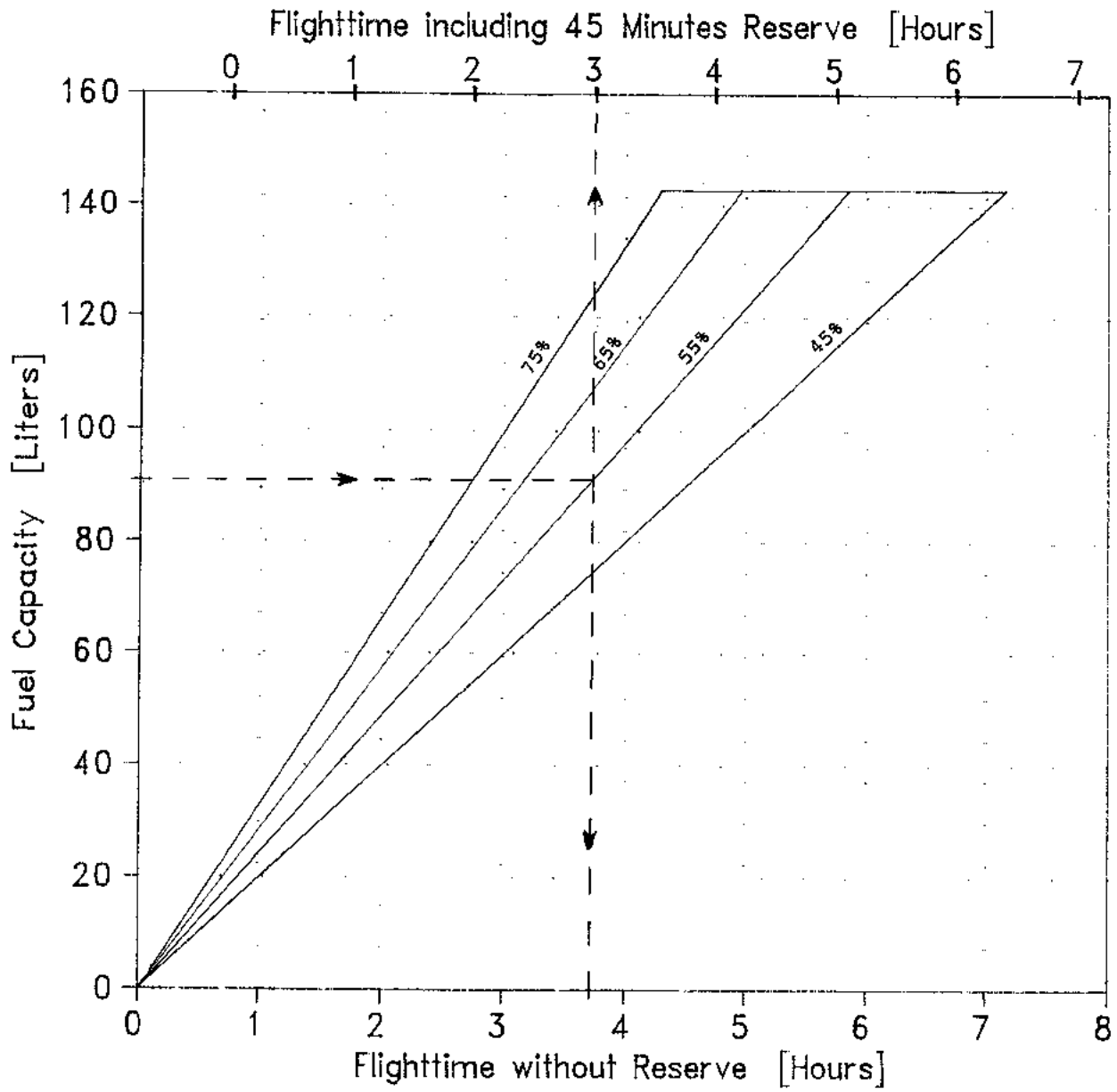


Fig. 5.3.14 Endurance Profile

Condition: - Cruise
- Recommended mixture for best economy

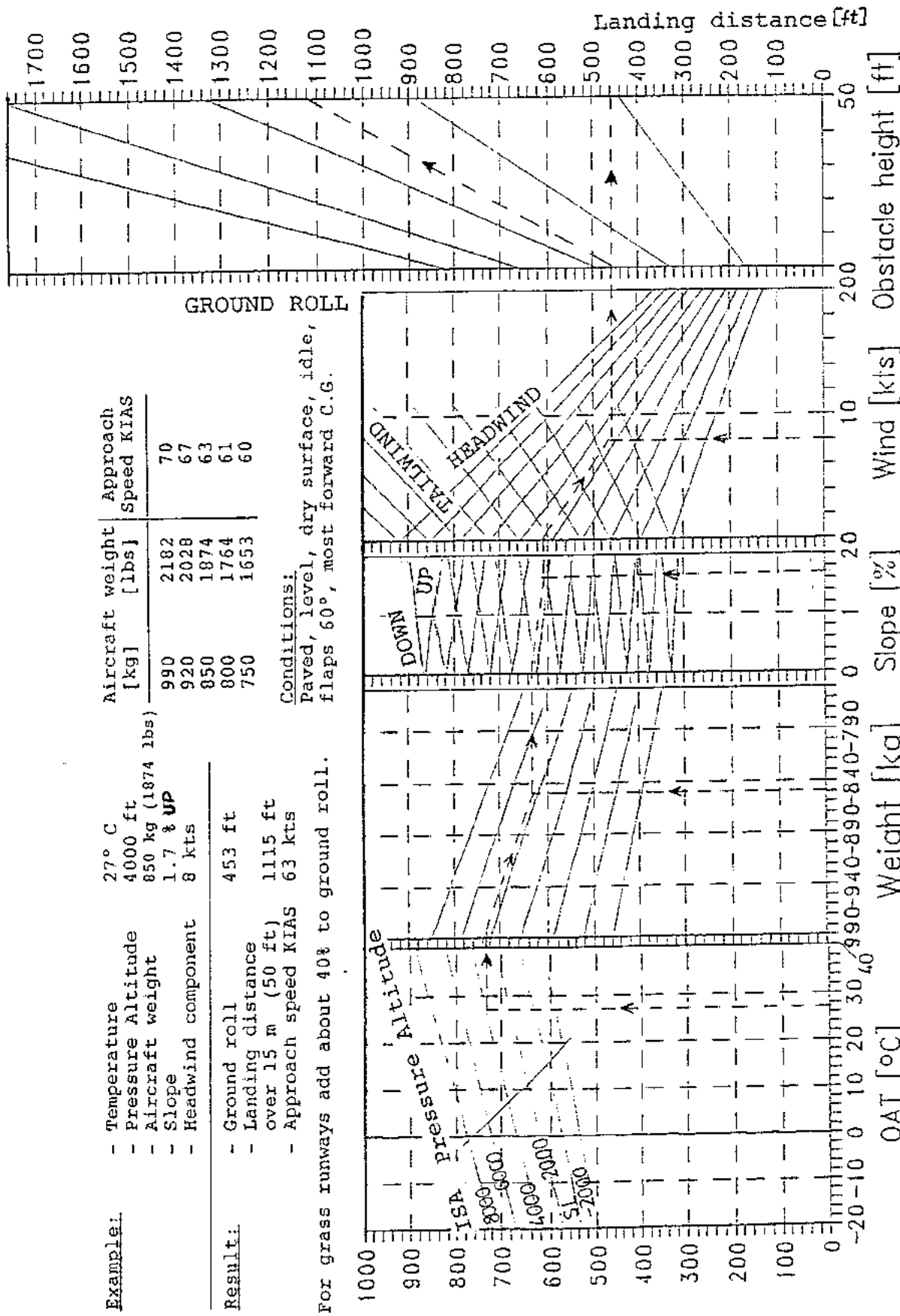


Example:	- Fuel	90 ltr.
	- Power	55 %
Result:	- Endurance with 45 min. reserve	3 h 00 min.
	- Endurance without reserve	3 h 45 min.

Note

Datas for time to climb see Fig. 5.3.9

Fig. 5.3.15 Landing Distance



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Section 6

Weight and Balance

6.1 General

In order to achieve the flight-performance, safety and good flight characteristics which are designed into the airplane, it must be flown with the weight and center of gravity position within the approved operating range.

The pilot in command must make sure of this before taking off, and also take into account that the center of gravity will shift with fuel consumption.

The approved center of gravity locations in flight are determined in section 2.

Airplane attitude: Bottom edge of canopy frame (fuselage) horizontal

Before the airplane will be delivered, it will be weighed, and basic empty weight and center of gravity location is computed (basic empty weight consists of the standard empty weight of the airplane plus the optional equipment installed at the delivery).

The empty weight and the corresponding center of gravity location are entered in the Weighing Form (see Fig. 6.1).

Whenever new equipment is added or any modification work is done, the mechanic or inspector responsible for the work is required to compute a new basic empty weight and center of gravity position through calculation or weighing. Then he has to write down the results in the Weight and Balance record.

A weight and balance calculation is always required to determine how much fuel or baggage can be boarded, so as to keep within allowable limits.

The following pages serve as prescribed forms used in the weighing and the calculation of the basic empty weight process, center of gravity and useful load.

Note that the useful load includes usable fuel, crew, passenger and baggage.

6.3 Airplane Weighing Procedure

Computing the center of gravity location requires establishing the basic empty weight center of gravity location by weighing. For this purpose the airplane is placed on 3 scales (2 under the main wheels, 1 under the nosewheel) so that the bottom edge of the canopy frame is horizontal.

When rolling the main wheels onto the scales make sure that the shock-absorbing struts do not put side-load on the scales which would otherwise result in an erroneous reading.

The datum level is the wing leading edge at a span of 1.15m [3.8 ft] (outside of the skew wing-fuselage transition). The distances a and b are determined using a plumb line. The empty weight is determined from the sum of the single weights G_2, G_{1ri} and G_{1le}.

Weight at nosewheel	G_2	=	kg [lbs]
Weight at RH main wheel	G_{1ri}	=	kg [lbs]
Weight at LH main wheel	G_{1le}	=	kg [lbs]
Empty weight G =	$G_{1ri} + G_{1le} + G_2$		
	G	=	kg [lbs]
Distance nosewheel - datum level	a	=	mm [in.]
Distance nosewheel - LH main wheel	b_{le}	=	mm [in.]
Distance nosewheel - RH main wheel	b_{ri}	=	mm [in.]

Empty weight C. G. position

$$x_S = \frac{G_{1le} \cdot b_{le} + G_{1ri} \cdot b_{ri}}{G} - a = \text{mm [in.] aft of datum}$$

Establishing the empty weight and the corresponding C. G. location is always done without baggage but with a full oil tank and with the unusable amount of fuel.

When computing the useful load it is important to ensure that the maximum permissible weight is not exceeded.

Following repairs, varnishing, installing additional equipment or at periodical times after the last weighing the new empty weight must be determined.

Empty weight, corresponding C. G. location and useful load must all be certified by the inspector in the Weight and Balance record.

Fig. 6.1 Weighing Form

B U R K H A R T G R O B
LUFT- UND RAUMFAHRT GmbH & Co. KG
LBA-No. I - B 21

WEIGHT AND BALANCE REPORT

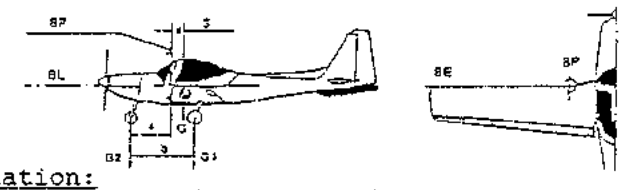
Date: _____

A/C Type: Reg.: _____ S/N : _____

Datum line/point (BE/BP): Wing leading edge at QE 2480 / BMET 1150
Level Means (BL): Edge of doorframe horizontal

Airworthiness category:	Gross weight [lbs]	Flight weight C.G. range from (inch)	up to (inch)
Normal (N)			
Utility (U)			
Acrobatic (A)			

Weighing:
Weighing condition:
with engine oil,
brake fluid
and unusable fuel.



Empty weight C.G. Determination:

Weighing point	Gross (lbs)	Tare (lbs)	Net (lbs)	Moment arm (inch)
G 1 LH				LH b =
G 1 RH				RH
G 2				a =

Empty weight centre of gravity (EWCG): _____ Empty weight

$$\frac{G1\ LH \times b\ LH + G1\ RH \times b\ RH}{G_{empty}} - a = x_s$$

_____ - _____ = _____ inch

Airworthiness category	Normal (lbs)	
Empty weight		
Max. payload		
Max. gross weight		
Empty weight momentum:		in.lbs

Equipment by weighing see equipment list of:

_____
Date

_____
(Stamp) Inspector

GROB Form F6/5G.Ki.

6.5 Weight and Balance Record

The basic empty weight and the corresponding C.G. location are the first entries made in the Weight and Balance record. This form is provided to present the current status of the airplane basic empty weight, empty weight C.G. location, empty weight moment and a complete history of previous structural or equipment modifications.

Any change to the permanently installed equipment or modification or aircraft repair which affects empty weight, empty weight C. G. or empty weight moment must be entered in the Weight and Balance record.

For the calculation of the gross weight and corresponding C.G. location or the weight moment respectively always use the basic empty weight, current empty weight C.G. location and the corresponding empty weight moment.

Fig. 6.2 Weight and Balance Record

GROB G 115C/D	Serial Number:	Registration No.:	Page Number:

Date	Item No IN	Item No OUT	Description of article or modification	Weight change Added (+) Wt. lbs	Arm inch	Moment /1000	Removed (-) Wt. lbs	Arm inch	Moment /1000	Running basic empty weight Wt. lbs	Moment /1000	Inspector/ Date and Stamp Inspec Date	Stamp

6.7 Weight and Balance Determination for Flight

The following information is intended to assist you in operating your GROB G 115D2 within the prescribed weight and center of gravity envelope. To determine the weight and center of gravity location for the flight use the graphs Fig. 6.3 "Center of Gravity Limits", Fig. 6.4 "Massmoment Limits", Fig 6.5 "Loading Diagram" and Fig. 6.6 "Calculation of Weight Breakdown" as follows:

First obtain the basic weight and the corresponding C.G. location of your aircraft from the weighing form and the Weight and Balance Record and enter them in the corresponding columns headed "Your Airplane" of Fig. 6.6 "Calculation of Weight Breakdown".

And then, using the "Loading Diagram" (Fig. 6.5) determine the moment of all payload items and enter these moments into the corresponding column of Fig. 6.6.

NOTE

The baggage indication applies to baggage stowed in the center of the baggage compartment. Loading conditions deviating from these assumptions must be taken into account accordingly by changing the arm entries. The moments of loads which may deviate from their indicated location in the aircraft according to the loading diagram, must be additionally computed on the basis of their actual weight and arm.

Add the weights and moments of each column (item 4 and item 6 in Fig. 6.6) and enter the resulting sums in Fig. 6.4 "Massmoment Limits" to check whether they are within the envelope so that the loading condition is permissible.

Fig. 6.3 Center of Gravity Limits

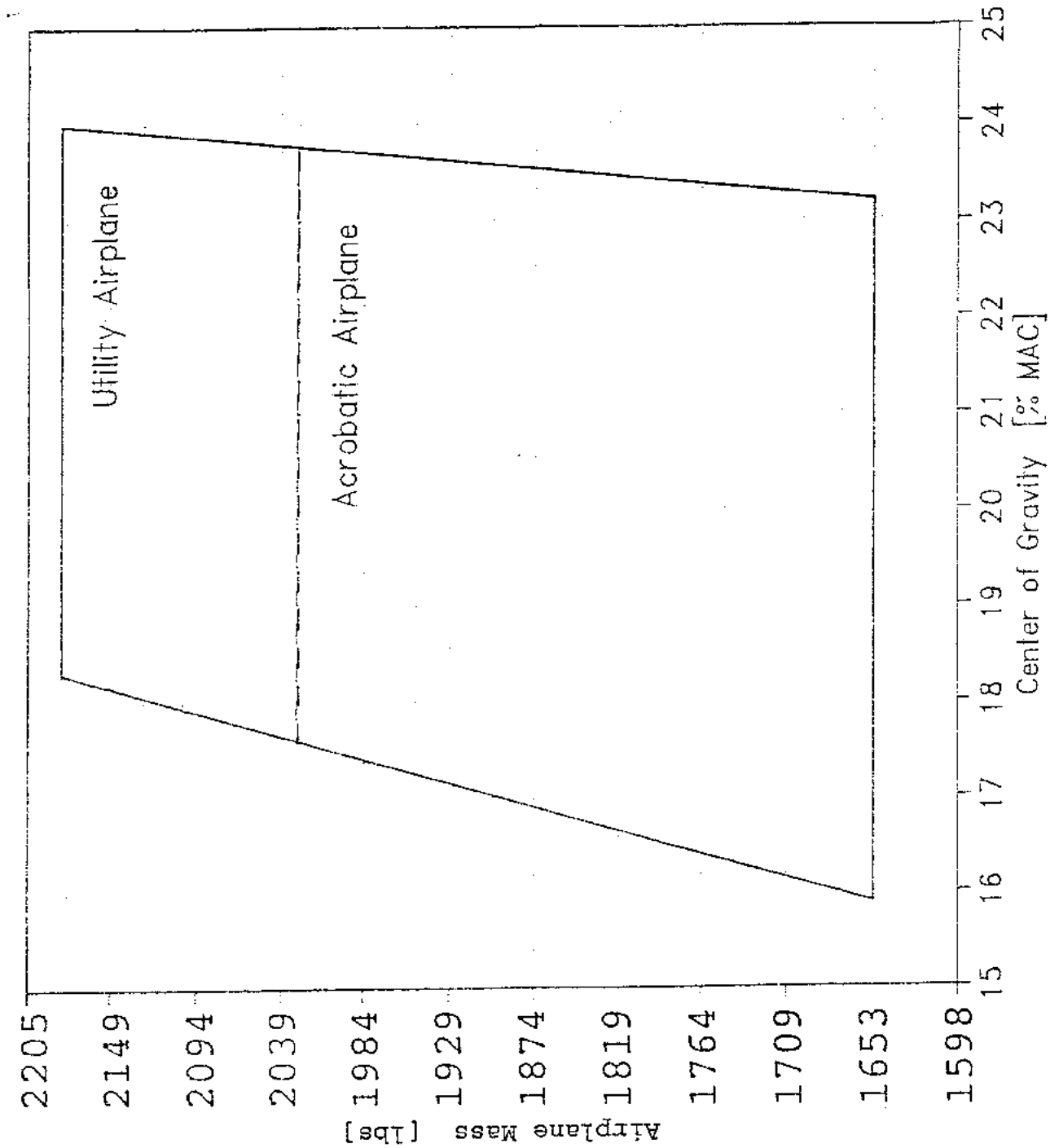


Fig. 6.4 Massmoment Limits

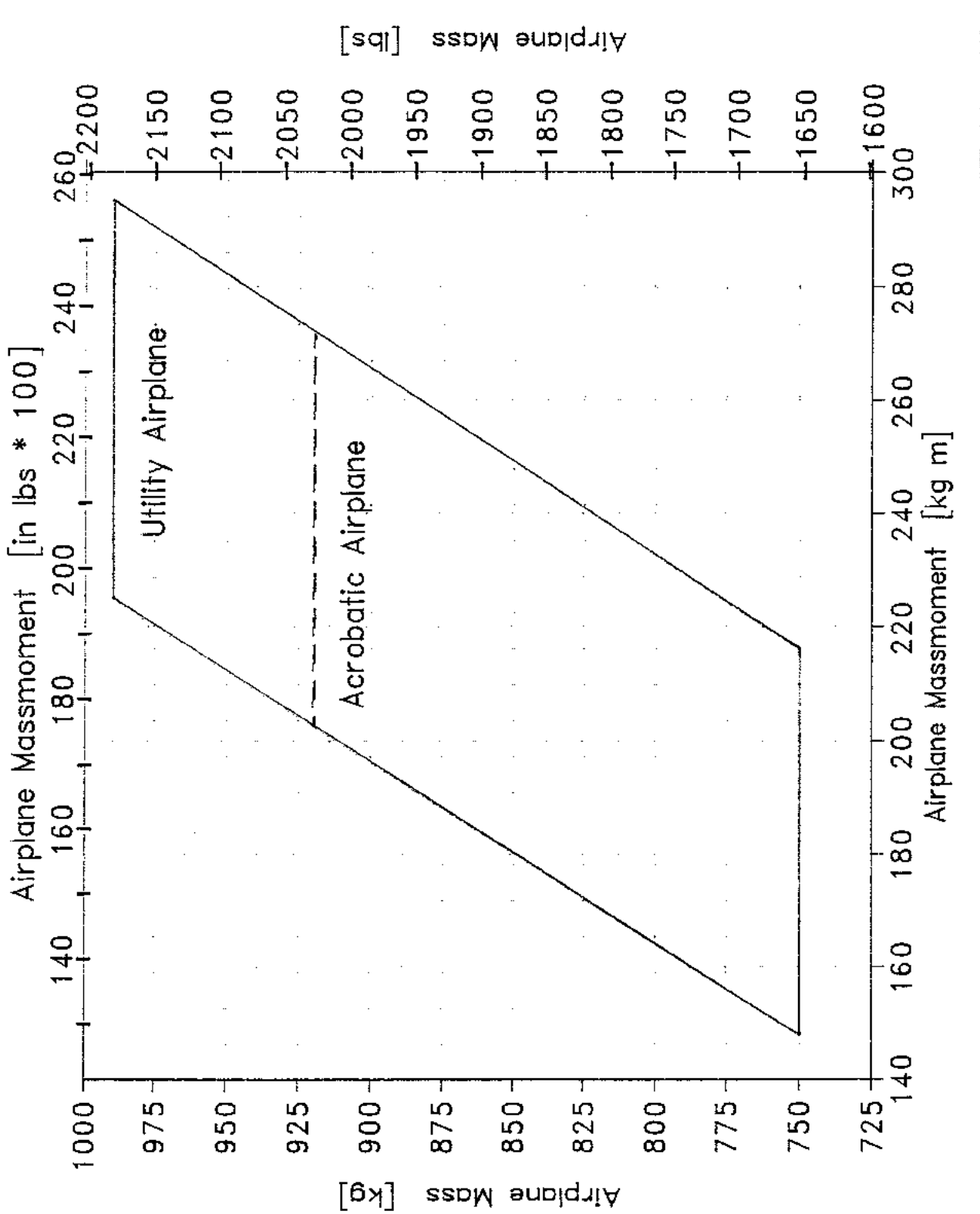


Fig. 6.5 Loading Diagram

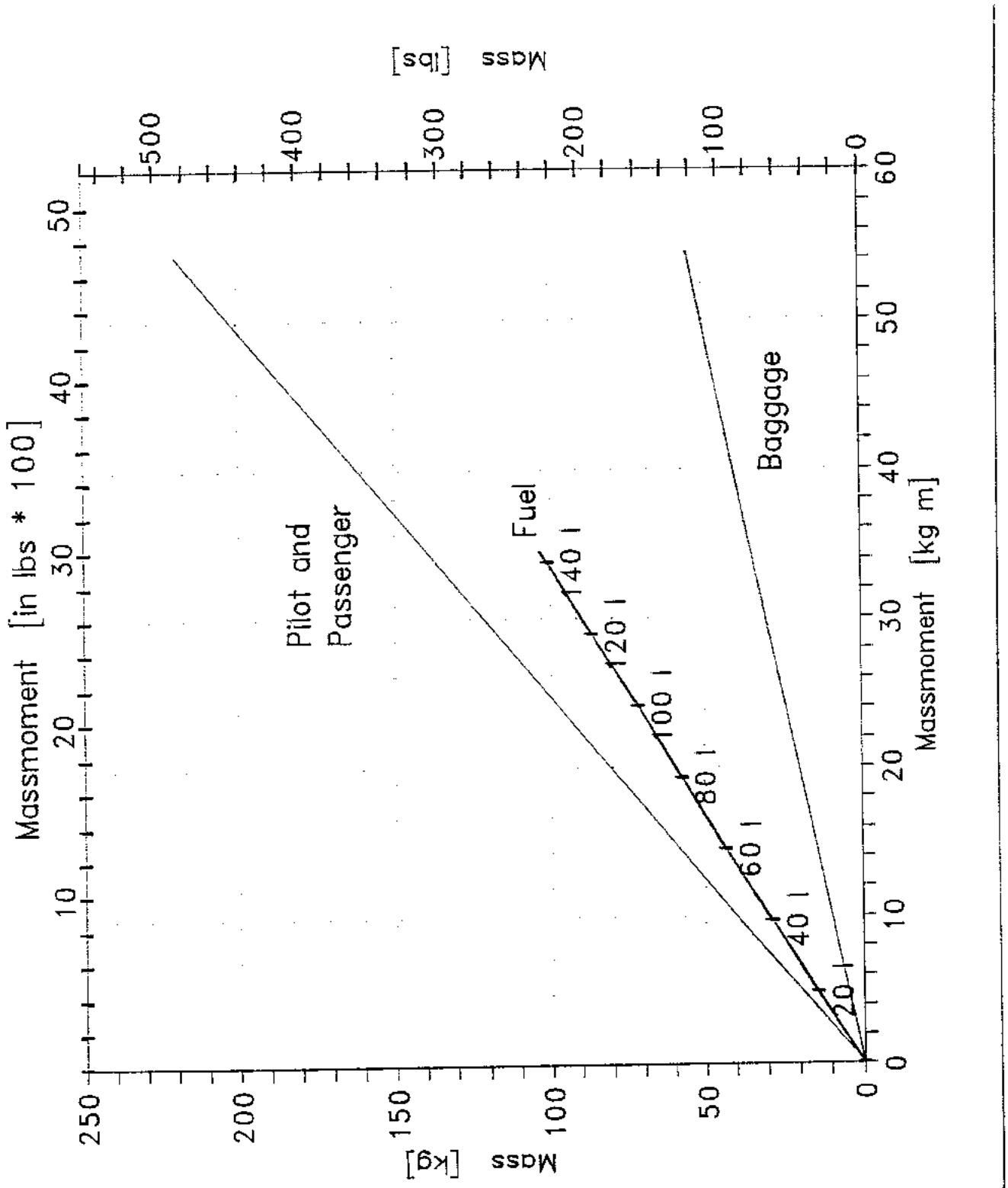


Fig. 6.6 Calculation of Weight Breakdown

CALCULATING USEFULE LOAD	SAMPLE AIRPLANE (EXAMPLE)		YOUR AIRPLANE	
	MASS kg (lbs)	MOMENT kg m (lbs in)	MASS kg (lbs)	MOMENT kg m (lbs in)
1. Basic empty weight (use the values for your airplane as currently equipped incl. nonusable fuel and full oil capacity)	697.80 (1538.4)	157.73 (13691)		
2. Pilot and passenger (Arm: 0.25 m / 9.84 in)	160.00 (352.74)	40.00 (3472)		
3. Baggage (Arm: 0.99 m / 38.98 in)	35.00 (77.16)	34.65 (3008)		
4. Total weight and total moment but fuel tank empty (total of 1. thru 3.)	892.80 (1968.3)	232.38 (20170)		
5. Usable fuel (0.72 kg/l = 6.0 lbs/US.gal.) Maximum 143 l = 37.8 US.gal. Example: 135 l = 35.7 US.gal. (Arm: 0.335 m / 13.19 in)	97.20 (214.29)	32.56 (2826)		
6. Total weight and total moment with full tank (total of 4. thru 5.)	990.00 (2182.59)	264.94 (22996)		
7. Find the computed values for the total weight 990 kg (2182.59 lbs) and the total moment 264.94 kg m (22996 lbs in) in C.G. envelope graph. Since they are within the envelope, the loading condition is permissible.				

The Center of Gravity envelope of the G 115D2 is such, that the landing C.G. (even after consumption of all usable fuel) will be within the approved envelope if the take-off C.G. has been within the limits.

6.9 Equipment List

The following is a list of equipment available at this time. All of the items installed in your airplane are identified in the corresponding column.

The present equipment list contains the following details:

- The item number consists of a letter identification for the associated group and a sequence number.

Letter identification is as follows:

A	Avionics
E	Electrical
F	Landing gear
I	Instrumentation
T	Engine
Z	Airframe

- The column "Code" identifies whether the equipment item is a mandatory, standard or optional equipment item according to the following abbreviations:

A	Mandatory equipment item
B	Standard equipment item
C	Optional equipment item
D	Additional optional equipment item
E	Loose item of equipment, not included in the airplane empty weight.

NOTE

When an optional equipment item is installed, this must be in agreement with the corresponding installation drawing, equipment instructions or in compliance with special approval of the Civil Aviation Authorities.

The columns "Weight" and "Arm" list the weight and and C.G. location relative to the datum of the equipment item, positive relating to distances aft of the datum, and vice versa.

Equipment List

Date of installation :	Stamp of Inspector:

Item No.	Code	Item, Manufacturer, Type	Mark if instl.	Weight (lbs)	Arm (ft)
A 1	B	ADF Antenna, KING KA 0044B		2.799	+4.724
A 2	B	ADF Antenna, BECKER ANT 2070		3.748	+4.724
A 3	B	ADF Indicator, KING KI227		0.683	-0.951
A 4	B	ADF Indicator, BECKER ID 2070		1.102	-0.951
A 5	B	ADF Receiver, BECKER ADF 2070		2.205	-0.951
A 6	B	ADF Receiver, BECKER ADF 2079		2.205	-0.951
A 7	B	ADF-Receiver, KING KR 87		3.197	-0.951
A 8	B	ATC Transponder, BECKER ATC 2000		2.646	-0.951
A 9	D	Audio Control Console KING KA 134		1.700	-0.951
A 10	D	Audio Control Console, KING KMA 24H		1.700	-0.951
A 11	D	Audio Control Marker Receiver KING KMA 24		1.697	-1.148
A 12	D	Audio Control Panel AEE ACP 2700		.....	-0.951
A 13	B	Avionic Blower, KING KA 33		1.257	-1.148
A 14	B	Blindencoder, ACK A-30		0.397	-0.951
A 15	A	COM-1 Antenna, Dittel SPERRTOPF		0.573	+15.42
A 16	D	COM-2 Antenna, Command Ind. CI 122		0.485	+2.854

Equipment List

Item No.	Code	Item, Manufacturer, Type	Mark if instl.	Weight (lbs)	Arm (ft)
A 17	B	COM/NAV 1 Receiver, KING KX 155-35		4.739	-0.951
A 18	D	COM/NAV 2 Receiver, KING KX 155-34		4.739	-0.951
A 19	A	COM, BECKER AR3201		1.984	-0.951
A 20	D	COM BECKER AR 4201		.....	.....
A 21	D	COM/NAV, KING KX 125		3.880	-0.951
A 22	D	DC/DC Converter AEE SR 6900		0.360	-0.951
A 23	D	DME Antenna, KING KA 60		0.022	-0.984
A 24	D	DME KING, KN 63		2.799	-0.951
A 25	D	DME, KING KN 62A		2.601	-0.951
A 26	D	DME Indicator, KING KDI 572		0.794	-0.951
A 27	D	ELT, POINTER 3000		1.900	-0.951
A 28	D	ELT, ACK E-01		3.300	-0.951
A 29	D	Flux Transmitter, KING KMT 112		0.331	-0.951
A 30	D	Glide slope, KING KN 75		1.600	-0.951
A 31	D	GPS Antenna MOTOROLA EK 568		0.265	-0.951
A 32	D	GPS Antenna, SENSOR SYSTEM S67-1575-39		0.313	.....
A 33	D	GPS GARMIN 100 AVD		1.700	-0.951
A 34	D	Gyro Mount, KING KG 102A		9.400	-0.951
A 35	D	HSI, KING KI 525A		9.500	-0.951
A 36	B	Marker Antenna, Command Ind. CI-102		0.595	-0.754

Equipment List

Item No.	Code	Item, Manufacturer, Type	Mark if instl.	Weight (lbs)	Arm (ft)
A 37	D	Marker Receiver, KING KR 21		0.600	.....
A 38	B	NAV Antenna, Command Indust. CI 157P		0.353	+4.101
A 39	D	RMI Indicator, KING KI229		2.866	-0.951
A 40	D	Slaving Unit, KING KA51B		0.198	-0.951
A 41	B	Transponder Antenna, KING KA 60		0,022	-4.724
A 42	B	Transponder, KING KT 76A		3.108	-0.951
A 43	D	Universal Converter, KING KN 72		1.323	-0.951
A 44	D	VOR/LOC Indicator, KING KI 203		1.609	-0.951
A 45	D	VOR/LOC Indicator, KING KI 208		1.000	.....
A 46	B	VOR/LOC/GS Indicator, KING KI 204		1.697	-0.951
A 47	D	Intercom-Unit SIGTRONICS SPA-400		.....	.....
A 48	D	NAV-Receiver BECKER NR 3301S		.....	.....
A 49	D	Power-Converter BECKER VR 2011		.....	.....
A 50	D	GPS TRIMBLE TNL 2000 A/C (only for VFR)		.....	.....
A 51	D	GPS/COM KING KLX 135 (only for export)		.....	.....
A 52	D	Blindencoder (only for export) AMERI-KING AK 350		.....	.....

Equipment List

Item No.	Code	Item, Manufacturer, Type	Mark if instl.	Weight (lbs)	Arm (ft)
E 1	A	ACL Light, WHELEN A470A-D-W		0.300	+15.42
E 2	A	ACL Power Supply, WHELEN A490 T, DF-14/28		1.200	+15.42
E 3					
E 4	A	Batterie, GILL G-243		27.99	+3.592
E 5	A	Engine run hour counter, KÜBLER HK 15.20.52		0.110	-0.951
E 6	C	External Power Connector, AIRCRAFT 4621B		0.816	+5.807
E 7	A	Flap Motor, MOTION 85262		4.189	+2.526
E 8		Flight hour counter, KÜBLER HK 15.20.52		0.110	-0.951
E 9					
E 10	A	Generator, BOSCH 28V 10/35A 0120 488 269		9.259	-5.233
E 11	A	Generator Control Lamp BOSCH 0 310 152 006		0.044	-0.754
E 12	D	Hi&Lo Volt Indicator, BOSCH 0 310 152 006		0.044	-0.754
E 13	A	Ignition Switch, TELEDYNE/ BENDIX 10-357200-1		0.353	-0.754
E 14	B	Landing Light 100W GENERAL ELECTRIC GE 4591		0.441	-5.315
E 15					.....
E 16	A	Master Switch, HERTH&BUSS 70.579.481		0.066	-0.754

Equipment List

Item No.	Code	Item, Manufacturer, Type	Mark if instl.	Weight (lbs)	Arm (ft)
E 17	B	NAV Light left, WHELEN W1285-PR-28		0.200	+0.230
E 18	B	NAV Light right, WHELEN W1285-PG-28		0.200	+0.230
E 19	A	NAV+STROBE Light left, WHELEN A650-PR-D-28		0.400	-0.754
E 20	A	NAV+STROBE Light right, WHELEN A650-PG-D-28		0.400	-0.754
E 21	A	Pitot Heat Tube, AERO INSTR. AN5812-1 (24 VDC)		0.838	+0.328
E 22	B	Position Light Tail, WHELEN A500A-H-D-28		0.307	+16.72
E 23	A	Stall Warning Light, BOSCH 0 310 152 006		0.044	-0.754
E 24	A	Stall Warning Horn, BÜRKLIN 36M434		0.044	-0.441
E 25	B	Taxi Light 150W General Electric GE 4626		0.441	.....

Equipment List

Item No.	Code	Item, Manufacturer, Type	Mark if instl.	Weight (lbs)	Arm (ft)
F 1	A	Brake Calliper, Cleveland 30-63a with Linings		1.378	+2.051
F 2	A	Brake Fluid Aeroshell Fluid 41			
F 3	A	Main Wheel Rim, CLEVELAND 6.00-6 40-97a incl. Brake Disc		6.063	+1.804
F 4	A	Main Wheel Tire, Goodyear Flight Special II 15x6.00-6 P/N 156 E 61-3		7.275	+1.804
F 5	A	Main Wheel Fairing		3.307	+1.804
F 6	A	Main Wheel Tube, Goodyear G15x6.00-6 reg Tube TR20		1.499	+1.804
F 7	A	Master Brake Cylinder Cleveland 10 - 30		1.389	-2.428
F 8	A	Nose Wheel Rim, Tost		3.042	-3.494
F 9	D	Nose Wheel Rim, 115C-5205		.....	-3.494
F 10	A	Nose Wheel Tire, Goodyear 380x150/15x6.00-5 6PR		4.960	-3.494
F 11	D	Nose Wheel Tire, Goodyear 5.00-5/6PR 505C61-8		4.960	-3.494
F 12	A	Nose Wheel Tube, Goodyear 5.00 - 5 Tube TR 67		1.499	-3.494
F 13	A	Nose Wheel Fairing		2.646	-3.494
F 14	A	Parking Brake Valve, Cleveland 60 - 5		0.331	-2.723
F 15	A	Supply Bin, FAG 2334845		0.419	-3.117

Equipment List

Item No.	Code	Item, Manufacturer, Type	Mark if instl.	Weight (lbs)	Arm (ft)
I 1	D	Accelerometer, App.-GAUTING Typ 470L P/N 620747-1		0.660	-0.951
I 2	A	Accelerometer 3", BENDIX 10-101		.....	-0.951
I 3	A	Air Vakuum Pump, SIGMA-TEK 1U128-006		2.200	.....
I 4	A	Airspeed Indicator, WINTER 6FMS5 6523396		0.992	-0.951
I 5	A	Altimeter 1 UNITED INSTR. 5934()-()		1.543	-0.951
I 6	D	Altimeter 1 UNITED INSTR. 5934()-()-L		1.543	-0.951
I 7					
I 8					
I 9	D	Ampere & Volts Indicator, IGVA 3101000		0.353	-0.754
I 10	D	CHT & Fuel pressure Indicat. ICFP 3105000		0.353	-0.754
I 11	A	Clock, BENZ-MICRO		.....	.....
I 12	D	Clock, SINN NABO 25/8		0.882	-0.951
I 13	A	Directional Gyro Air, SIGMA-TEK 1U262-001-52		2.400	.....
I 14	D	Directional Gyro Air, SIGMA-TEK 1U262-002-51		2.400	.....
I 15	D	Directional Gyro Air R.C.ALLEN RCA11A-13		2.888	-0.951
I 16	A	Directional gyro R.C.ALLEN RCA 11A-8		2.646	-0.951

Equipment List

Item No.	Code	Item, Manufacturer, Type	Mark if instl.	Weight (lbs)	Arm (ft)
I 17	D	Electrical Horizon R.C.ALLEN RCA26BK-9		2.712	-0.951
I 18	D	Horizon Air Driven R.C.ALLEN RCA22-41		2.756	-0.951
I 19	A	Horizon Air Driven R.C.ALLEN RCA 22-40		2.756	-0.951
I 20	D	Horizon Air Driven KING KG 258		2.756	-0.951
I 21	D	Horizon Air, SIGMA-TEK 23-501-06-19		1.800	-0.951
I 22	D	Horizon Air, SIGMA-TEK 1U-149-010-3		1.800	-0.951
I 23	A	Kompass Lighted, AIRPATH C2300L4		0.882	-0.754
I 24	A	Manifold Pressure & Fuel flow Indicator, SIGMA-TEK 1U028-005-28		.....	-0.951
I 25	D	Manifold Pressure & Fuel flow Indicator, SIGMA-TEK 1U028-005-60		.....	-0.951
I 26	D	Manifold pressure & fuel flow gauge R.C.ALLEN 21-1000-3		1.000	-0.951
I 27	D	Manifold pressure & fuel flow Indicator UNITED INSTR. UI-6333 Code H54		1.200	-0.951
I 28	D	OAT & EGT Indicator, IOET 3108000		0.371	-0.754
I 29	D	Oel pressure & Oel temperat. Indicator IOTP 3104000		0.362	-0.754
I 30	A	RPM Indicator, MOTOMETER 646.012.9994		0.772	-0.853

Equipment List

Item No.	Code	Item, Manufacturer, Type	Mark if instl.	Weight (lbs)	Arm (ft)
I 31	D	Suction Indicator SUP.INC. 4101-0001		0.110	-0.951
I 32	A	Suction Indicator VARGA ENTERPRISES, INC. 5001		0.110	-0.951
I 33	A	Suction filter AIRBORNE 1J7-1		0.419	-0.951
I 34	A	Suction regulator AIRBORNE 2H3-12		0.353	-0.951
I 35	D	Tank left/right Indicator, IFFQ 3102000		0.369	-0.754
I 36	B	Turn Coordinator, R.C. ALLEN RCA 82A.11		1.250	-0.951
I 37	D	Turn Coordinator, S-TEC 6407-XX		.....	-0.951
I 38	D	Turn & Slip Indicator, R.C. ALLEN RCA 56-3		1.300	-0.951
I 39	A	Vertical Speed Indicator UNITED INSTR. 7000		0.992	-0.951
I 40	D	Vertical Speed Indicator UNITED INSTR. 7000-L		0.992	-0.951
I 41	D	Airspeed Indicator, SIGMA-TEK EA 5175-06L		0.992	-0.951

Equipment List

Item No.	Code	Item, Manufacturer, Type	Mark if instl.	Weight (lbs)	Arm (ft)
T 1	A	Air Filter, 115C-6600.14		0.198	-4.396
T 2	A	Engine Lycoming AEIO-320 D1B		306.0	-4.560
T 3	A	Exhaust System, ROLA VI B5 115C-6401/-6402		13.23	-4.462
T 4	A	Fuel pump, WELDON B-8120-H		1.808	+0.427
T 5	A	Fuel Pressure Sensor, MOTOMETER 675.003.1002		0.220	-2.772
T 6	A	Fuel Quantity Sensor MOTOMETER 608.010.1003		0.331	+2.887
T 7	A	Fuel Shutoff Valve, 115-6249		0.168	+0.754
T 8	A	Oilcooler, 115C-6045		.....	.....
T 9	A	Oil Pressure Sensor MOTOMETER 675.004.1018		0.220	-5.381
T 10	A	Oil Temperature Sensor VDO TM 014-4		0.066	-3.445
T 11	D	Oil Temperature Sensor MOTOMETER 642.009.1014		0.066	-3.445
T 12	A	Propeller, Hoffmann HO 23 CHM-()188 156		.....	-6.004
T 13	D	Starter, B+C, BC 315-100-4		.....	.....
T 14	A	V-Belt, Lycoming 76026		0.176	-5.495

Equipment List

Item No.	Code	Item, Manufacturer, Type	Mark if instl.	Weight (lbs)	Arm (ft)
Z 1	D	Alternate Static System 115-6207		0.265	-2.789
Z 2	E	Back Pad, Grob			
Z 3	B	Defroster Nozzles, VW 443 819 635 01C or -636 01C		0.088	-1.378
Z 4	A	Emergency Hammer, 274004 3C		0.485	-0.656
Z 5	D	Fire Extinguisher TOTAL EHAL		4.629	+2.297
Z 6	B	Handle, VW KA 15-959 659 251 857 607 01C			
Z 7	A	Harnesses, Schugu FAG-7H/O AUTOFLUG AFG 0178943		2.094	+2.231
Z 8	D	Heating Mixing Box, 115-6030		3.836	-3.379
Z 9	D	Legstrap, Bogu FAG-7D/O AUTOFLUG AFG 0525734		0.243	+2.231
Z 10	B	Pitot Tube Cap		-	-
Z 11	A	Seatbelts, Bagu FAG-7D/O AUTOFLUG AFG 0478931		3.086	+0.919
Z 12	E	Seat Pad, Grob complete		5.622	+1.411
Z 13	B	Side Fairing,			-1.476
Z 14	B	Textile,			
Z 15	B	Vent Nozzles Wemac 2550		0.022	-0.787

Table of Contents

Section 7

Airplane and System Description

7.1 General

This chapter 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 115D2 is an utility/acrobatic category airplane designed as a single-engine, two-seater low-wing aircraft with cantilever wings and a conventional empennage. The tricycle gear of the GROB G 115D2 is non-retractable. The G 115D2 is manufactured with newest knowledge to state-of-the-art requirements in industrial fiber reinforced plastic design, mainly involving glassfiber 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 a two-part generous wrap-around glazing.

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, except the tank section, which consists of a PVC foam sandwich. 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 shell has an aramide fiber glass plastic honeycomb sandwich structure, the web consists of glass fiber plastic honeycomb sandwich. The aileron are balanced by a horn which also holds the mass balancing lead. The structural configuration of the flaps is the same as that of the ailerons.

The conventional empennage comprises fin, rudder, tailplane, 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 three fittings. The structural configuration of elevator and rudder are similar to that of the ailerons. Elevator and rudder have horn balance.

The spin fin consists of a GRP-honeycomb-sandwich and is attached to the fuselage by means of screws. The installed grinding disk protects the spin fin from damage.

The complete airframe is protected from moisture and ultraviolet radiation by an UP gel-coat which is finished with a two-component-polyurethan-lacquer.

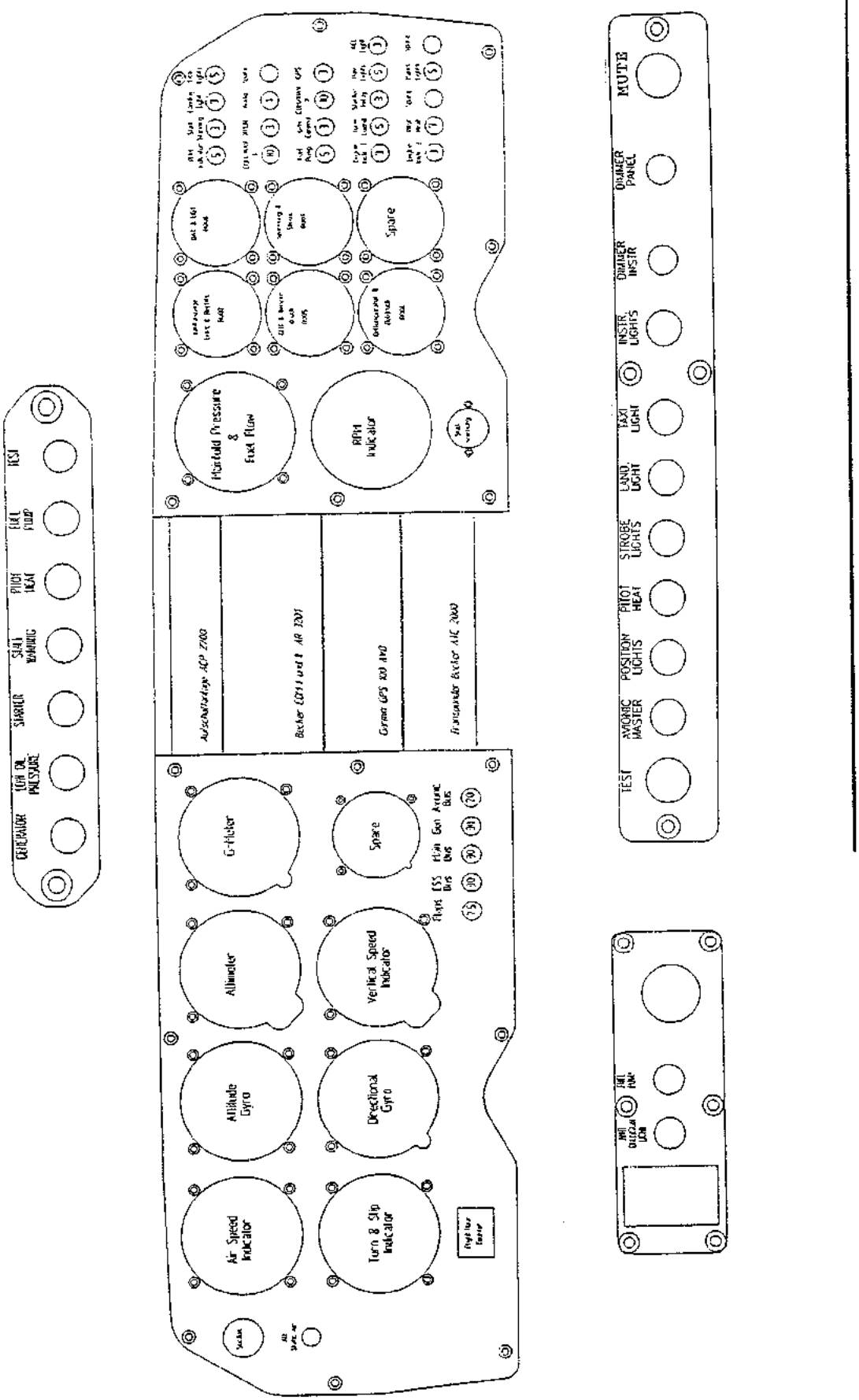
7.5 Flight Controls

The flight control system of the GROB G 115D2 comprises conventional ailerons, rudder and elevators. All flight control surfaces are mechanically actuated via push-pull rods, the ailerons and elevators being controlled by the control stick and the rudder via rudder toe brake pedals.

The G 115D2 has manual elevator trim, the corresponding trim tab being controlled by means of a hand wheel on the center console. Turning the trim wheel forward produces nose-down trimming of the airplane, turning the trim wheel aft produces nose-up trimming.

In the G 115D2 the aileron control is connected to the rudder control via a spring device. The device is installed in the center 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 layout for VFR equipment

- Airspeed indicator
- Altimeter
- Compass
- Alternator warning light
- Starter relay control lamp
- Engine instrumentation (fuel gauge, fuel pressure, oil temperature, oil pressure, voltage, amperemeter)
- Cabin vent
- Ignition switch
- Master switch
- Avionics master switch
- Toggle switch for alternate static
- Toggle switch line (for ACL-wing, beacon, position light, landing light, fuel pump switch)
- Parking brake
- Flap control
- Stall warning horn
- Stall warning lamp
- Flap position indicator
- Cabin heating
- Tachometer
- Hourmeter
- Engine hour meter (standard only for Australia)
- Pitot heating control lamp
- Fuel pump control lamp
- Artificial horizon
- VOR indicator
- Suction gauge
- Clock
- Gyro
- Rate of climb indicator
- ADF indicator
- Turn coordinator
- Avionic support for:
  Audio panel, COM I, COM II, NAV I, NAV II, ADF, Transponder, DME, GPS
- Dimmer for instrument lighting
- NAV II - indicator
- Dimmer for instrument panel lighting
- Toggle switch for instrument-/panel lighting
- Test button for pitot-static heating
- Toggle switch for pitot-static heating
- Exhaust gas temperature gauge (EGT)
- Cylinder head temperature gauge (CHT)
- Outside air temperature gauge (OAT)
- Push button primer system

7.11 Ground Control

The G 115D2 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 ±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 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 the flap control switch. The retracted, take off and landing positions (0°, 15° and 60°) are clearly indicated by the indicator unit on the front center panel. All three positions can be pre-selected with the flap lever. 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 115D2 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 copilot.

The lever for actuating the parking brake is located at the LH side below the instrument panel 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 ng 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 release the parking brake.

Temperature changes may cause a release of the brake or an excessive increase of the brake system pressure.

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. Acrobatic and spin maneuvers are approved without baggage only !

7.19 Seats and Safety Belts

The G 115D2 is fitted out with comfortable seats, permitting even lengthy flights 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 G 115D2 can be continuously adjusted by means of two hand wheels located on the floor. 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 5-point safety belts. A second lap safety belt is optional equipment. For attaching the AUTOFLUG harnesses insert belt and harness fittings in the buckle. Turning the buckle all belts are released.

7.21 Canopy

The G 115D2 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. 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
Before every takeoff, make sure the sliding canopy is correctly locked ! The canopy must not be opened in flight.

The canopy on the G 115D2 serves as an emergency exit. A canopy emergency jettison system ensures that the aircraft can be abandoned quickly. Unlocking the red locking lever, opening the canopy handle and moving it back into the 170° position will release the two attachment points on the guide rail. The canopy is then jettisoned by pushing it back and up simultanteneously and following the slipstream to carry it away. The canopy can also be smashed in an emergency using a hammer. This is part of the standard equipment and is installed on the pilot's side of the center console.

7.23 Control Surface Lock

To protect the ailerons and the elevator from damage due to wind buffeting when the aircraft is parked, a control stick locking feature is provided.
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.

NOTE

The guide groove of the control surface lock must be attached in the two mechanical sleeves of the lower support of the instrument panel.

CAUTION

During acrobatic-maneuvers the control surface lock and the towbar do not take up in plane !

7.25 Engine

The GROB G 115D2 is powered by a Lycoming AEIO-320 D1B four-cylinder, direct drive, horizontally opposed engine rated at 160 horsepower at 2700 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. A high lean position is indicated by a detent. This position is not a lean-limit ! The engine is shut down by placing the mixture lever fully aft (CUT OFF).

The " Mixture-Lean-Stop - device " (optional according to SB 1078-45) will prevent an unintentional engine shut down. The mixture setting near the "stop" is below "best power mix". In this position the engine can be operated for short periods. In order to shut down the engine or to operate in the near of "Peak-EGT", the stop pin of the mixture lever is to be deactivated. The mixture-lean-stop - device is recommended for take-off, landing, climb, traffic pattern and the mixture lever is set according to the instructions in chap.4.

A second throttle-lever is located in the LH side of the instrument panel. The bowden control cable of this lever is in synchronism with the "main throttle lever".

The majority of the engine instruments are located to the right of the avionics instruments in the RH portion of the instrument panel.

The alternator warning light is located to the left of these instruments, the tachometer below.

The cold weather kit provides two positions for the overboard breather line. The positions are:
- Acrobatic position
- Low temperature position

During the post flight inspection excess engine oil should be cleaned from the engine compartement.

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 - 5.

The oil necessary for lubricating the engine is furnished by the oil sump located underneath the engine. The oil sump capacity is 7.6 liters (8 quarts). The lube oil level can be checked by means of an access hole in the upper engine cowling. A dipstick as part of the filler cap indicates the lube oil level.

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

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

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

7.27 Propeller

The GROB G 115D2 has a Hoffmann two-bladed-fixed-pitch-propeller HO 23 CHM-()188 156.

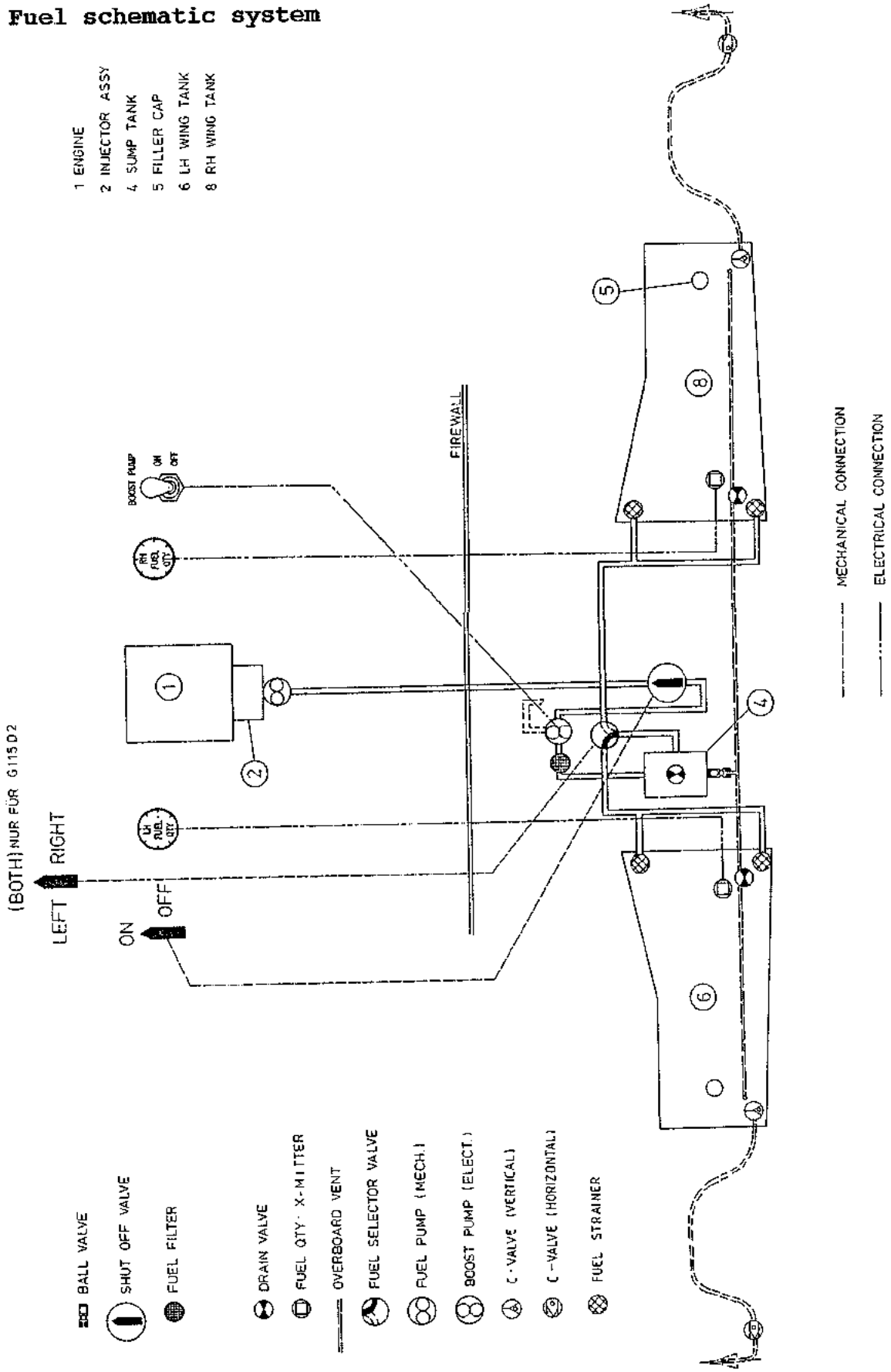
7.29 Fuel System

The G 115D2 fuel supply consists of two wing tanks with a total capacity of 150 ltrs. (39.63 U.S.gal / 33.00 Imp.gal), 143 ltrs. (37.77 U.S.gal / 31.46 Imp.gal) are usable. The fuel quantity indicator is gauged in 1/4 | 1/2 | 3/4 | 1/1 (1/1 ≙ 75 ltrs.). The operating levers for the fuel cock and the tank selector valve are installed in the center console directly behind the trim control wheel. In order to have a sufficient supply fuel for all attitudes during aerobatic flight, a sump tank with a capacity of 5.4 liters (1.43 U.S.gal./1.19 Imp.gal.) is installed. This fuel is sufficient for a flight time of approx. 3 minutes. Refuelling is carried out through a filler neck integrated into the GRP structure on the top of the wing.

WARNING
Before refuelling, electrically ground the aircraft using a ground connection (engine exhaust).
There must be absoluty no potential difference !

Observe the following when refuelling from canisters or similar containers:
- use a metal funnel (connect the ground)
- cancel out any electrical potentional difference between the person refuelling and the aircraft potentional (eg. touch the canopy frame with one hand for at least one sec.)

Fuel schematic system



Fuel flow to the engine passes from the wing tank via the fuel shutoff valve, via the auxiliary electric fuel pump to the engine-driven fuel pump. In each pump a fuel strainer is integrated.

The auxiliary electric fuel pump is actuated by a toggle switch located beside the ignition switch. This pump must always be ON during take off and landing.

The fuel level in the tank is monitored by a fuel quantity sensor which signals the fuel gauge on the instrument panel.

NOTE
Do not expect the fuel gauge to give a precise reading when the aircraft is in an unusual attitude (e.g. yawing, sideslipping or spinning) or in climb or descent attitude. The fuel gauge was calibrated with the aircraft on flat ground. Use the fuel quantity gauge only in level flight !

The fuel tank of the G 115D2 is vented via the filler neck. The vent opening is located on lower side of the wing at the aileron section and is configured so that the tank is always subject to slightly more than atmospheric pressure.

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.

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.

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.

7.37 Electrical System

The electrical energy required for the 28 V DC system is generated by an engine-powered alternator. Max. current output is 35 A as of 1800 RPM.

The battery box with the 24 V lead-acid accumulator is located on the RH side of the rear main frame. The battery provides the current for starting and for all electrical consumers when the engine is OFF. Battery capacity is 10 Ah which is sufficient under normal flight conditions to provide emergency power (alternator failure and/or main bus failure) for a maximum of 45 min.

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 essential 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 circuit breaker panel in the instrument panel.

Master switch

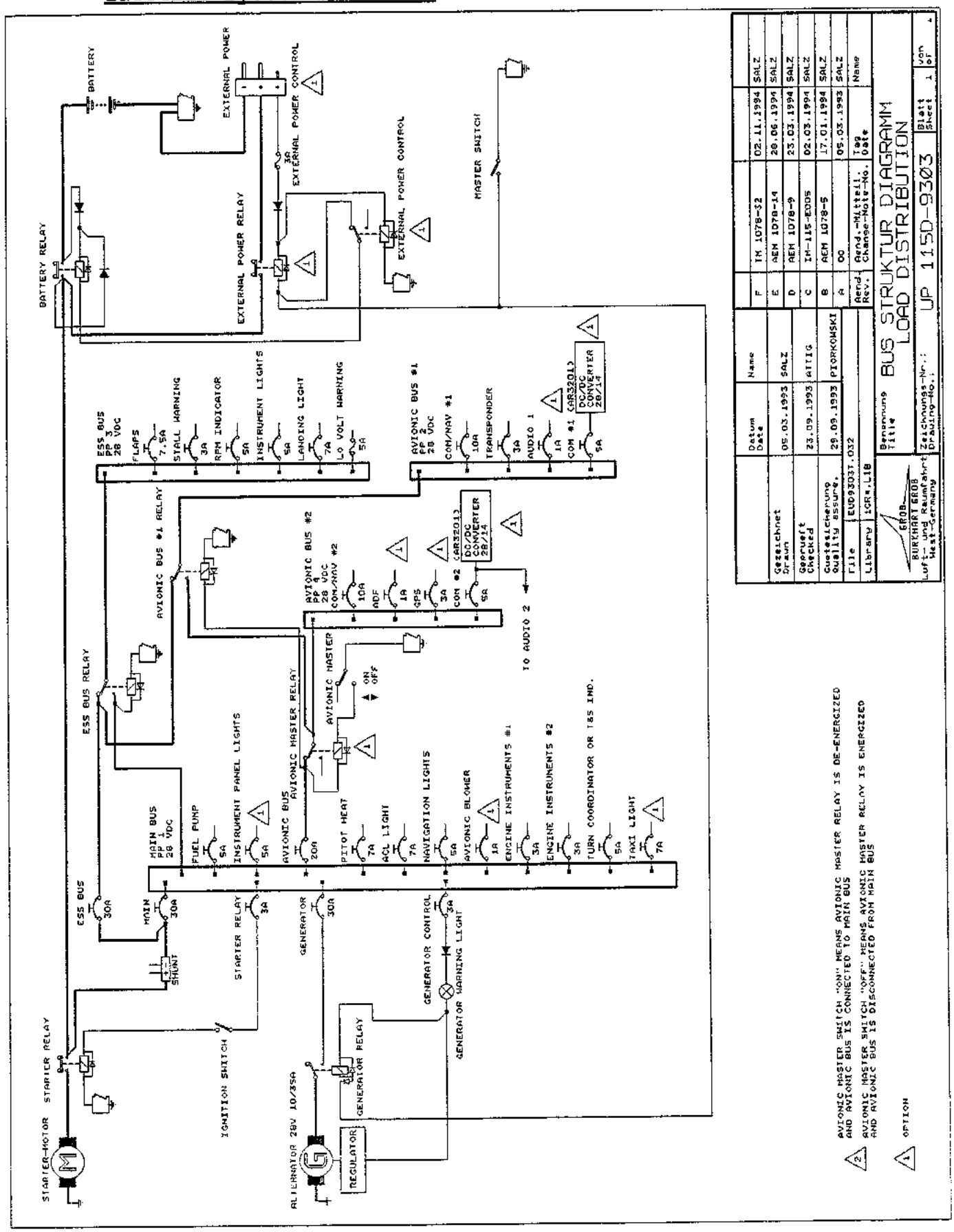
The master switch is a toggle switch located on the left-hand side of the instrument panel at the bottom, and the corresponding master switching relay located above the battery box. Switch positions are clearly identified. In addition the green lamp incorporated in the master switch will light up in 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.

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

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.

Electric System Schematic



Voltmeter, Ammeter and Alternator Warning Light

The voltmeter is integrated in the engine instruments. It indicates the voltage level of the battery and proper functioning of the alternator. The charging current is indicated by the ammeter, which is also integrated in the engine instruments.
In the range 24.5 V - 28 V the alternator generates voltage. When the voltage drops below 24.5 V and the red alternator warning light is on, the generator is down. In this case, the ammeter show a negative current flow. If this happened, switch off all consumers not essential to safe continuation of flight.

WARNING
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.
The circuit breakers, located in LH lower instrument panel, are of a push/pull-design. To interrupted pull and to reset push the circuit breaker.
The circuit breaker, located in RH instrument panel, will be reseted only. When interrupted a red-white ring at the circuit breaker is visible.

NOTE

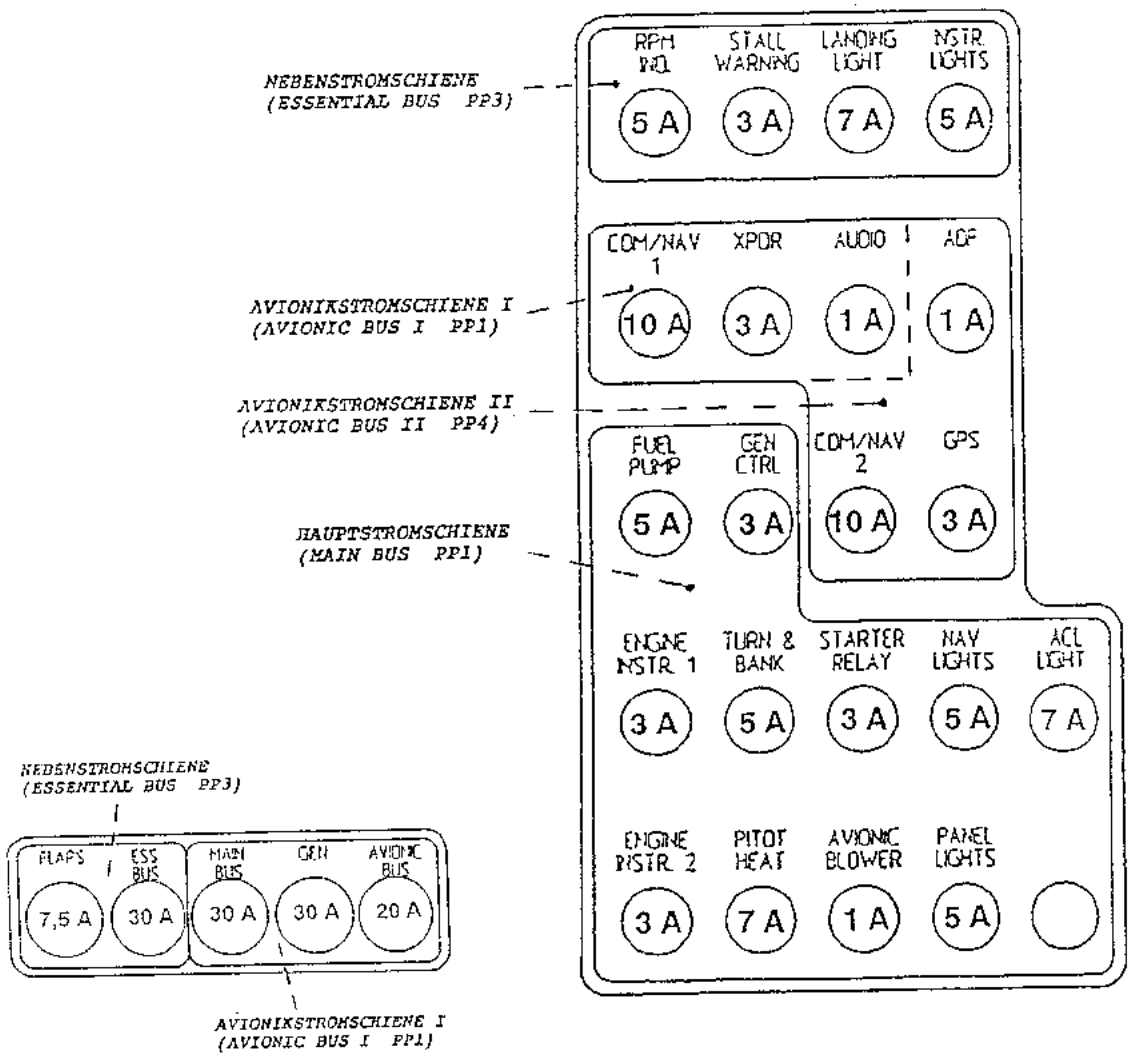
Circuit breaker "ENGINE INSTR. I" is reserved for :
- Volt / Ampere - Fuel quantity LH/RH tanks
- Oilpressessure - Oiltemperature

Circuit breaker "ENGINE INSTR. II" is reserved for :
- OAT - EGT - CHT - Fuelpressure

Description of the Essential/Avionic Bus switch-over-from-system

In the case od a Main Bus failure (e.g. short circuit), the Essential Bus and the Avionic Bus I will be directly connected to the battery, without pilot's action.
In this case all important electrical systems and avionic equipments remain active.
The result of this switch-from-over-system is that the Main Bus and the Avionic Bus II are deactivated.

Circuit Breaker Panels



Load Bus Schematic

External Power Supply

The connection for connecting an external power is located on the RH side of the fuselage near the wing root trailing edge section and is equipped for 24 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

The toggle switch for activating the instrument lighting is located on the RH side of the switch panel.

The lighting consists of integrated lamps as well as lamps on the instrument panel cover bottom, which beam in "white light". Two dimmers situated in the switch panel controls the level of light given to the lamps in the instruments and the lamps on the instrument panel cover bottom.

Additional to the instrument lighting a "swan neck lamp" is standard equipment and is installed between the seats.

To allow a safe operation of the aircraft also during failure of any lights, it is recommended to have a light source (i.e. flash light) on board which is independent of the airplane power supply.

Exterior Lighting

The toggle switch for activating the exterior lighting is located in the center of the lower instrument panel.
Each circuit is protected by a circuit breaker.
The exterior lighting comprises:

- Navigation lights in each wing tip and at the rudder.
- Beacon on the top of the rudder (optional).
- Strobe light in each wing tip and at the rudder.
- Landing light (optional)
- Taxi light (optional).

7.43 Heating, Ventilating, Defrosting & Air Conditioning

When flying on cold days or at high altitudes the GROB G 115D2 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. As the mixing box is also supplied with cold air, it is possible to regulate the temperature of the air leaving this mixing box. From here the warm air is supplied to the outlets in the cabin and for winwindshield defrosting.
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.

To ventilate the baggage compartment two loudspeaker covers are installed in the rear cockpit frame.

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.

The total pressure is sensed by a heatable pitot tube located at the left wing lower side. The heating equipment should only be op operated in probable icing conditions. A functional check during preflight check is performed as follows:

a) Push the anunciator panel TEST button which is also used for instrument lighting test for approx. 10 sec..
   Pitot heat switch position has no effect on the test.
b) Check current decrease of ammeter ≈ 5 - 10 ampere.
c) Hand-check heated pitot tube immediately after the functional test.

The heating is being activated in flight via a switch which depends on the pitot pressure (built as a protection from overheating). The switch for activating the pitot heating is located on LH side of the lower instrument switches panel in the middle.

The static pressure is sensed at the LH and RH side of the fuselage via drilled plates. 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 115D2 is moored outdoors or in a 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 is by means of combined and adjustable over and underpressure tubes in the engine compartment (attached to the fire wall).
The airspeed deviation of this system is less than ± 5 kts of the calibrated airspeed (refer to section 5 Fig. 5.3.2)

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 ACK E-01

The Emergency Locator Transmitter (ELT), when installed, is mounted at the rear baggage bulkhead on the LH side in the direction indicated on the top of ELT (DIRECTION OF FLIGHT).
The ELT is a autonomous unit and operates on his own 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 his antenna.
The ELT is operated by a 3 position selector switch:

- **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.
- **ARMED:** The ARM position allows the unit to be set to the automatic mode so that it will transmit after activation by impact.
- **ON:** This position is provided for the manual activation of the transmitter.

WARNING
To rearm the ELT after an activation the selector switch should be placed in the OFF position and then in the ARMED position.

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).

CAUTION (if installed)
The " **REMOTE - TEST** " must be done every three months according to the Operation Manual E-01 ELT / Section 8. Position " ARMED ": Green lamp means normal operation / red lamp means transmission operation (emergency service !).

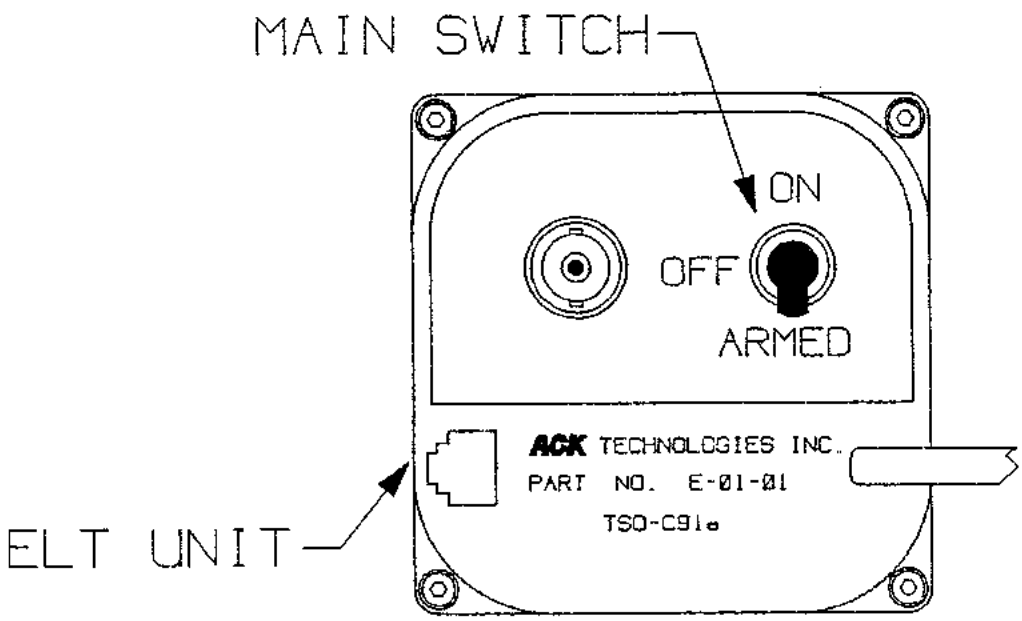
The battery replacement date is marked on the ELT label. The battery must be replaced on or before this date. The battery must also be replaced if the transmitter has been used in an emergency situation or if the accumulated test time exceeds one hour, or if the unit has been inadvertently activated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

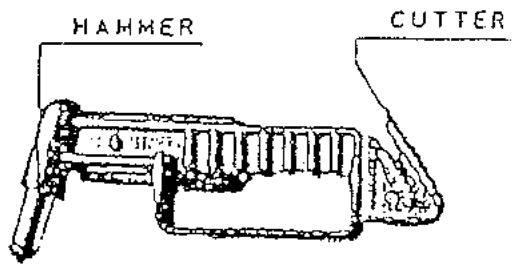
If for any reason a test transmission is necessary, the test transmission should be conducted only in the first five minutes of any hour and limited to three audio sweeps. If tests must be made at any other time the tests should be coordinated with the nearest FAA tower or flight service station.

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



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Section 8

Handling, Servicing and Maintenance

8.1 Introduction

This section contains factory recommended procedures for proper ground handling, routine care and servicing of your GROB G115D2.

It is recommended that all aircraft undergo a regular inspection each 50, 100 or 200 hours of operation. The scope of the respective inspection interval is given in chapter 05-20 of the G115D2 Maintenance Manual. In addition, a first inspection is necessary after 25 operating hours. Annual inspections must be performed according to the national requirements. All inspections must be performed by a designated representative of the FAA or the Aviation Authority of the country in which the aircraft is licensed.

The FAA or the Aviation Authority of the country in which the aircraft is licensed may require other inspections by the issuance of airworthiness directives applicable to the airplane, engine, propeller and other components. It is the responsibility of the owner/operator to ensure compliance with all applicable airworthiness directives and, when the inspections are repetitive, to take appropriate steps to prevent inadvertent noncompliance.

Scheduling of **ALL** maintenance is the responsibility of the aircraft operator. A general knowledge of the aircraft is necessary to perform day-to-day service procedures and to determine when unusual service or shop maintenance is needed.

Service information in this section of the manual is limited to service procedures which the operator will normally perform or supervise. For U.S. registered aircraft reference should be made to FAR Part 43 for information regarding preventive maintenance which may be performed by a U.S. licensed pilot.

It is wise to follow a planned schedule of lubrication and preventive maintenance based on climatic and flying conditions encountered in your locality.

Should an extraordinary or difficult problem arise concerning the repair or upkeep of your G 115D2, consult the GROB representative in your country or Burkhart Grob Luft- und Raumfahrt, Am Flugplatz, 86874 Tussenhausen-Mattsies, Germany.

All correspondence regarding your airplane should include the model and the serial number. These numbers can be found on the identification plate of the airplane.

Publications

The following publications are available:

1. Flight Manual GROB G 115D2
2. Maintenance Manual GROB G 115C and G 115D
3. Service Bulletin
4. Service Information

NOTE
Service and maintenance information of the GROB G 115D2 is based on the civil aviation authority requirements of the Federal Republic of Germany. Therefore, airplanes which are registered in other countries must comply according to the authority requirements of that country.

8.2 Ground Handling

The scale down dimensions of the GROB G 115D2 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 ± 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.
Never pull at the spinner.

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 G 115D2 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.
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 115D2 must be jacked up at the prescribed locations. For a detailed description see G 115D2 maintenance manual.

8.3 Servicing

Engine Air Filter

An air filter is incorporated downstream of the air intake scoop in the bottom cowling half for easy replacement.

This filter should be changed every 200 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 115D2 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 15x6.00-6 and for the nose gear 5.00-5/6PR. The tire pressure for the main wheels is 3.0 bar (43.5 PSI) and for the nose wheel 2.5 bar (36 PSI).

Oil

The oil capacity of the Lycoming engine is 7.6 liters / 8 quarts, and the minimum quantity required is 5.7 liters/ 6 quarts. 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 115D2 fuel is stored in two wing tanks with a total capacity of 150 ltrs. (39.63 U.S.gal / 33.00 imp.gal), 143 ltrs. (37.77 U.S.gal / 31.46 Imp.gal) are usable. 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

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 115D2, 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!