Pilot's Operating Handbook

ATOL LSA 650 Aurora

Valid for Model / Variant: ATOL LSA 650
Airplane Registration Number: ________________
Airplane Serial Number: ________________
Year of Manufacture: ________________

It is the owner's responsibility to maintain this handbook in a current status in accordance with the list of effective pages.

This hanbook is part of the above designated airplane. It includes the material to be furnished to the pilot as required by CS-LSA.

The "Airworthiness Limitations" section of the Pilot's Operating Handbook shall be complied with.

This handbook must be carried in the airplane at all times.

Original Issue - 22.9.2019

Approved by EASA: EASA approval no.
Published by: Atol Avion Oy

Log of Revisions

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1			
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6			
7			
8			

REVISION 0
Date: 23.3.2020
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List of effective pages - Approved data (part 1)

NOTE N, **R**, or **D** indicate pages which are New, Revised or Deleted respectively. Remove and dispose of superseded pages, insert the latest revision pages and complete the Record of Revisions as necessary.

The column "Approved by" which is only shown for approved pages shows either the approving authority (e.g. EASA) or, in case of minor changes according to DOA No. EASA.21J., "DOA".

page	approved by	rev no	remarks / effectivity
--------------- contents ---------------			
contents -i		0	
contents -ii		0	
contents -iii		0	
contents -iv		0	
contents -v		0	
contents -vi		0	
contents -vii		0	
contents -viii		0	
contents -ix		0	
contents -x		0	
contents -xi			
contents -xii			
contents -xiii			
		0	
--------------- section 1 ---------------			
1-1		0	
1-2		0	
1-3		0	
1-4		0	
1-5		0	
1-6		0	
1-7		0	
1-8		0	
1-9		0	
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1-11		0	
1-12		0	
1-13		0	
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1-17		0	
1-18		0	
--------------- section 2 ---------------			

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1-1			
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1-4			
1-5			

page	approved by	rev no	remarks / effectivity

List of effective pages - Manufacturer's data (part 2)

NOTE N, **R**, or **D** indicate pages which are New, Revised or Deleted respectively. Remove and dispose of superseded pages, insert the latest revision pages and complete the Record of Revisions as necessary.

page	rev no	remarks / effectivity

page	rev no	remarks / effectivity

Introduction

ATOL LSA 650 “Aurora” is designed and contructed by ATOL Avion Oy, Finland using following standards:

ASTM F2245-12d

Contact information of the aircraft manufacturer:

Atol Avion Oy / Ltd

Nahkimontie 1

96910 Rovaniemi, Finland

https://atolavion.com

6.4.3 Data Location and Contact information for recovery of certification documentation, should the original manufacturer lose its ability to support the make and model.

Section 1
GENERAL INFORMATION

Table of contents

1.1 GENERAL

This Pilot's Operating Handbook contains the information necessary for safe and efficient operation of the ATOL LSA 650 aircraft.

The user is assumed to have flying experience, therefore elementary instructions and basic principles have been omitted.

As new information becomes available, the Pilot's Operating Handbook will be revised.

A bar will be located along the right edge of the page to indicate where text has been added, revised or deleted.

Each page has in its bottom header; page number in format [section]-[page]. All pages will carry the revision number on the applicable page, next to the page number. Revision 0 is the original issue.

Date is the issue date of that revision. The List of Effective Page with approval defines the effective date up to the present revision.

1.2 ORGANIZATION OF THE HANDBOOK

The sections of the Handbook are largely independent with each section beginning with its own table of contents.

It is divided into an approved part consisting of sections 1 thru 5.1, 6 and 9, and into a non-approved part consisting of sections 5.2, 7, 8 and 10.

SECTION 1 General information and units of measurements presents information of general interest to the pilot, basic airplane data and conversion tables. In addition, it provides definitions and explanations of symbols, abbreviations, and terminology used in the Handbook.

SECTION 2 Limitations contains those limitations required by regulation or necessary for safe operation of the airplane and approved by the regulatory authority.

SECTION 3 Abnormal and/or Emergency Procedures contains the recommended procedures for dealing with various types of emergencies, malfunctions or critical situations.

SECTION 4 Normal Procedures contains the recommended procedures for normal ground, water and air operation of the airplane.

SECTION 5 Performance Data (approved part) Contains airworthiness and performance information necessary for preflight and inflight mission planning.
Subsection 5.1 contains approved data.
Subsection 5.2 contains non-approved data supplied by the aircraft manufacturer.

SECTION 6 Mass and Balance, Contains the definitions for various mass and balance locations and the procedure for the determination of the center of gravity. Appended to this section are the Mass and Balance Record form for maintaining a continuous record of changes in structure and equipment affecting the mass and balance, and the Equipment List form for the listing of optional equipment with data necessary for mass and balance computations.
Loading, Procedures and provisions for loading and securing the load in the airplane.

SECTION 7 System description.

SECTION 8 Handling, Servicing, Maintenance

SECTION 9 Pilot's Operating Handbook supplements – approved and non- approved data .
Subsection 9.0 contains an equipment compatibility matrix and additional performance data.
Subsection 9.1 contains approved Pilot's Operating Handbook Supplements (POHS) with instructions for special operations.
Subsection 9.2 contains non-approved Pilot's Operating Handbook Supplements (POHS) providing operating instructions of approved optional equipment.

SECTION 10 Safety and Operational Tips. Alphabetic index.

1.3 THREE VIEW DRAWING

Fig. 1-1 shows a three-view drawing of the airplane with its principal dimensions. For cabin dimensions see Fig. 6-5.

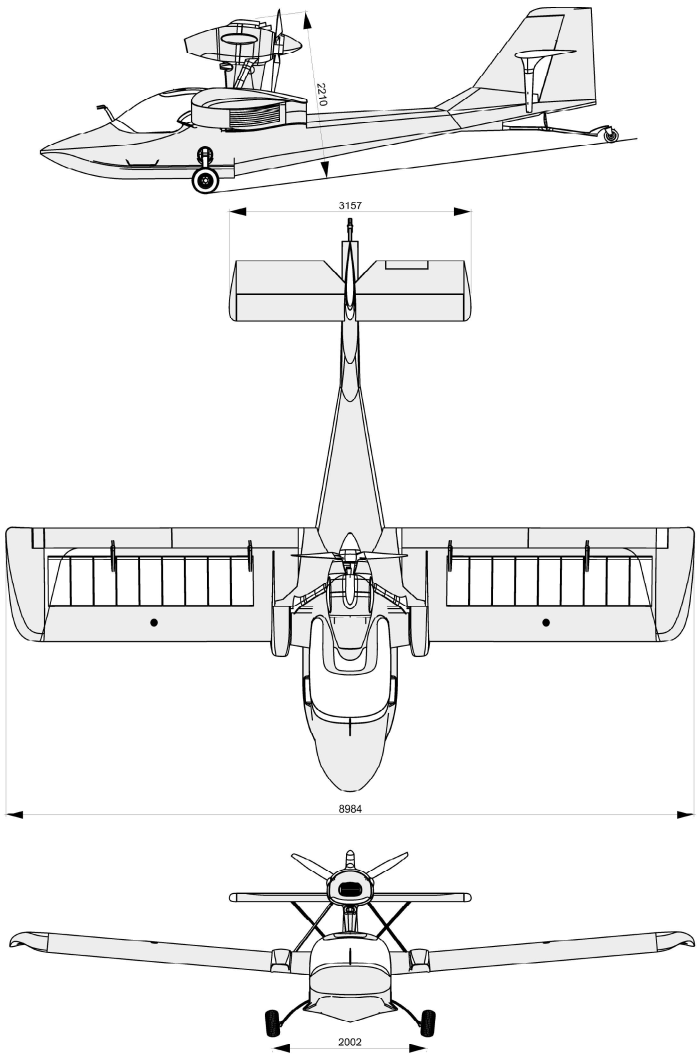

Fig 1-1 Principal dimensions

Overall

Wing span.. 9,00 m (29' 6")

Length... 7,28 m (23' 11")

Maximal height (on hard surface) ... ?? m

Wing

Wing profile ... NACA LS-0417(mod)
Wing area ... 13,4 m² (144 sqft)
diherdal angle ... +4,9°
angle of incidence ... wing root +6,4°

Aileron

Area ... 0,99 m² (10,7 sqft)
movement up ... 25°
down ... 10°

Landing flap

drive type ... electric /cable
area ... 0,93 m² (10,0 sqft)
deflection up ... -10°
down ... 0 to 40°

Horizontal tail

total area ... 2,10 m² (22,6 sqft)
angle of incidence ... -4,4°
span ... 2,85 m (9' 4")
movement up ... 25°
movement down ... 25°

Vertical tai

total area ... 1,69 m² (18,2 sqft)
movement left/right ... 25°

Langing gear

type ... repositionable tailwheel landing gear
main gear ... carbon spring leaf
wheel track ... 2,32 m (7' 7")
wheel base ... 1,46 m (4' 9")
nose wheel size / tire pressure ... 5,00-5 / 2,1 bar (30 psi)
main wheel size / tire pressure ... 6,00-6 / 1,5 bar (21 psi)
nose gear oleon pressure ... 1,4 bar (20psi)

1.4 REQUIRED DESCRIPTIVE DATA

The ATOL LSA 650 is a light single-engined amphibious seaplane with two seats. The pilot's seat is on the LH side.

The primary structure consists of wood composite design. The cabin is accessible through up and backward opening canopy.

The electrical 14 V DC system is supplied by one generators and the battery.

1.5 NOISE LEVELS

Noise levels based on a gross mass of 650 kg are;

Flight phase	Measurements according ICAO Annex 16 Chapter 10 [dB]	ICAO limits [dB]
Takeoff	??,?	77,1

1.6 ENGINE

The ATOL LSA 650 is powered by one Rotax 912 iS Sport 100 hp (73,5 kW) engine.

1.7 PROPELLER

Propeller is fixed pitch three/four/five blade of 1,7 m diameter. Propeller is made by: Ropelitehdas Oy

1.8 FUEL

The fuel system comprises of two fuel tanks, one in each wing, a collector tank in the fuselage, a fuel supply system with two fuel pumps and a monitoring system.

Normal tanks have volume of 85 liters (22,5 US gal) of which 80 liters (21 US gal) is usable. The collector tank volume is 9 liters (2,38 US gal).

1.9 OIL

Engine has dry sump oil system. Oil volume is 4 ltr (1,06 US gal)

1.10 MAXIMUM CERTIFIED WEIGHTS

Maximum takeoff weights 650 kg (1433 lb)

1.12 CABIN & ENTRY DIMENSIONS

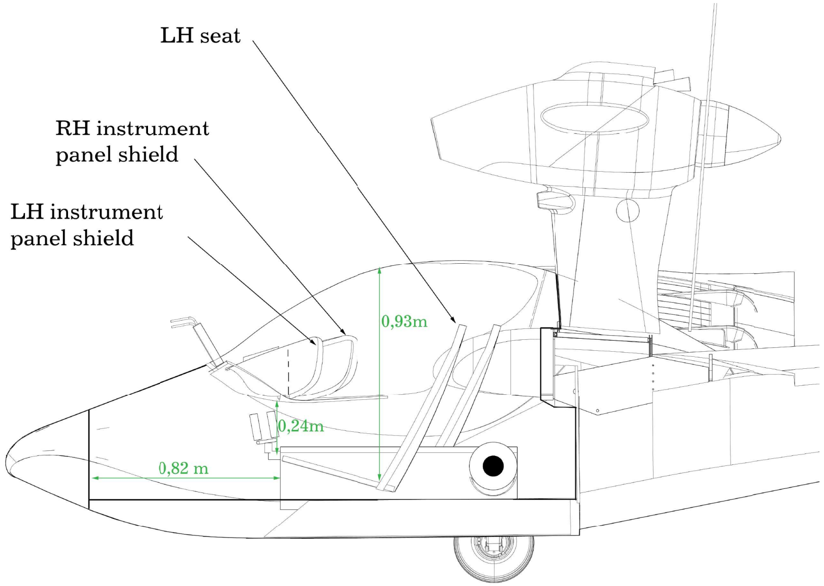

Fig 6-5 Cabin dimensions

1.13 SYMBOLS, ABBREVIATIONS & TERMINOLOGY

1.13.1 Warnings, Cautions and Notes

Throughout this Pilot's Operating Handbook WARNINGs, CAUTIONs and NOTEs are used to emphasize important and critical instructions.

WARNING

AN OPERATING PROCEDURE, TECHNIQUE, ETC. WHICH, IF NOT STRICTLY OBSERVED, COULD RESULT IN PERSONAL INJURY OR LOSS OF LIFE.

CAUTION

AN OPERATING PROCEDURE, TECHNIQUE, ETC. WHICH, IF NOT STRICTLY OBSERVED, COULD RESULT IN DAMAGE TO OR DESTRUCTION OF EQUIPMENT.

NOTE
An operating procedure, technique, condition, etc. which is essential to emphasize.

WARNINGs and CAUTIONs always precede and are located directly above the text to which they relate.

NOTEs are located directly below the text to which they apply.

1.13.2 Use of procedural terms

The procedural term usage and meaning are as follows:

“**Shall**” and “**Must**” have been used to express a mandatory requirement.

“**Should**” has been used to express non-mandatory provisions.

“**May**” has been used to express permissiveness.

“**Will**” has been used only to indicate futurity, never to express a mandatory requirement.

1.13.3 General airspeed terminology and symbols

CAS Calibrated Airspeed is indicated airspeed corrected for position and instrument error and expressed in knots.

IAS Indicated Airspeed is the speed shown on the airspeed indicator and expressed in knots.

TAS True Airspeed is the airspeed expressed in knots (unless otervise stated) relative to undisturbed air which is CAS corrected for altitude and temperature.

VA Manuevering Speed is the maximum speed at which you may use abrupt control travel.

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

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

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

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

VS0 Stalling Speed or the minimum steady flight speed at which the airplane is controllable in the landing configuration at the most forward center of gravity.

Vx Best Angle-of-Climb Speed is the speed which results in the greatest gain of altitude in a given horizontal distance.

Vy Best Rate-of-Climb Speed is the speed which results in the greatest gain in altitude in a given time.

1.13.4 Meteorological terminology

OAT Outside Air Temperature is the free air static temperature. It is expressed in either degrees Celsius (formerly Centigrade) or degrees Fahrenheit.

Standard Temperature Standard Temperature is 15°C at sea level pressure altitude and decreases by 2°C for each 1000 feet of altitude.

Pressure Altitude Pressure Altitude is the altitude read from an altimeter when the altimeter's barometric scale has been set to 1013 mb.

1.13.5 Engine power terminology

BHP Brake Horsepower is the power developed by the engine.

RPM Revolutions Per Minute is engine speed.

Static RPM Static RPM is engine speed attained during a full-throttle engine runup when the airplane is on the ground and stationary.

1.13.6 Airplane performance and flight planning terminology

Demonstrated Crosswind Velocity Demonstrated Crosswind Velocity is the velocity of the crosswind component for which adequate control of the airplane during takeoff and landing was actually demonstrated during certification tests. The value shown is not considered to be limiting.

Usable Fuel Usable Fuel is the fuel available for flight planning.

Unusable Fuel Unusable Fuel is the quantity of fuel that can not be safely used in flight.

g g is acceleration due to gravity.

1.13.7 Weight and balance terminology

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

Station Station is a location along the airplane fuselage given in terms of the distance from the reference datum.

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

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

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

CG arm Center of Gravity Ann is the arm obtained by adding the airplane's individual moments and dividing the sum by the total weight.

CG Limits Center of Gravity Limits are the extreme center of gravity locations within which the airplane must be operated at a given weight.

Standard Empty Weight Standard Empty Weight is the weight of a standard airplane, including unusable fuel, full operating fluids and full engine oil.

Basic Empty Weight This is the mass of the airframe, powerplant, interior accommodation, systems and equipments which are an integral part of a given version (without the usable fuel, but with full operating fluids in the closed systems, unusable and nondrainable fuel, and engine oil).
The basic empty mass is determined by weighing the airplane.
The consumption in flight of hydraulic fluid and engine oil causes negligible changes in mass and center of gravity.

Useful Load Useful Load is the difference between takeoff weight and the basic empty weight.

Gross (Loaded) Weight Gross (Loaded) Weight is the loaded weight of the airplane.

Maximum Takeoff Weight Maximum Takeoff Weight is the maximum weight approved for the start of the takeoff run.

Maximum Landing Weight Maximum Landing Weight is the maximum weight approved for the landing touchdown.

Tare Tare is the weight of chocks, blocks, stands, etc. used when weighing an airplane, and is included in the scale readings. Tare is deducted from the scale reading to obtain the actual (net) airplane weight.

Unusable And Non-drainable Fuel Fuel remaining in the tanks and systems after all the usable fuel has been consumed.

Usable Fuel Fuel available and usable in flight for the airplane.

1.13.8 General abbreviations

A	Ampere	a/c, acft	Aircraft
AC,ac	Alternating current		
AGL	Above ground level	ALT	Altitude
AMPS	Amperes		
AP	Autopilot; functionality of autopilot computer (APM) and associated software		
ASL	Above sea level	ATC	Air traffic control
BAT	Battery		
C.G., CG	Center of gravity		
CAS	Calibrated airspeed	COM	Communication (radio)
DA	Density altitude	DC	Direct current
DG	Directional gyro		
EASA	European Aviation Safety Agency		
EGT	Exhaust gas temperature		
FAA	Federal Aviation Agency (United States)	Fig.,fig.	Figure
fpm	Feet per minute	ft	Foot (feet)
GAL,gal	Gallon	GEN	Generator
GM	Gross mass	GPS	Global Positioning System
GS,gs	Ground speed		
h, hr	Hours of time	HDG	Heading, Heading hold mode
hPa	Hectopascal		

IAS	Indicated Air Speed		
ISA	International Standard Atmosphere		
KCAS	Knots calibrated airspeed	kg	Kilogram
KIAS	Knots indicated airspeed	km	Kilometer
kt	Knot	KTAS	Knots true airspeed
L, l, LTR, ltr	Liter	lb	Pound
LDG	Landing		
m	Meter		
mm	Millimeter		
MSL	Mean sea level	N	Newton
NAV	Navigation, Navigation system		
No., no.	Number	OAT	Outside air temperature
Pa	Pascal	PA	Pressure altitude
PAX	Passenger	pb	Push button
R/C	Rate of climb	R/D	Rate of descent
Rev.	Revision	RH	Right hand
RPM, rpm	Revolutions per minute	s, sec	Seconds of time
S/N	Serial number	SB	Service bulletin
SL	Sea level	T	Temperature
T/O	Takeoff	TAS	True airspeed
V	Volt	VFR	Visual flight rules
VHF	Very high frequency	VMC	Visual meteorological conditions
VNE	Never-exceed speed (velocity never exceed)		
VY	Best rate-of-climb speed		

1.13.9 Symbols

N	Greater than
P	Greater than or equal
M	Less than
O	Less than or equal
°C	Degrees Celsius (centigrade)
°F	Degrees Fahrenheit

1.14 UNITS OF MEASUREMENT

Units to be used in connection with this airplane are:

Unit	abbreviation	used for
Kilogram	kg	Weights, masses
Metre	m	dimensions, moment arm
Kiloponds per square centimetre	kp/cm² bar	Pressure
Liters	l	Volumes, oil, fuel quantity
Feet	ft	Altitude
square meter	m²	Area
nautical miles per hour, knots	kts	Speeds
Degrees Centigrade	°C	Temperature
Ampere	amps	Electrical current

1.15 UNITS CONVERSIONS

1.15.1 Conversion factors

The following conversion factors were used in this Handbook:

Pounds into Kilograms: .... Pounds x 0.4536 = Kilograms
Kilograms into Pounds: .... Kilograms x 2.20462 = Pounds
Feet into Meters: .... Feet x 0.3048 = Meters
Meters into Feet: .... Meters x 3.2808 = Feet

FUEL WEIGHT/VOLUME:

Car fuel density varies widely. Density of normal 98 octane fuel (EN228) can be from 0,720 kg/liter up to 0,775 kg/liter. Typical value for 98 octane fuel is 0,743 kg/liter. Density is usually given at temperature of 15 °C. Temperature does affect density. Use following table to estimate current density

temperature of fuel [°C]	Density grams / liter		
35	702	725	758
30	707	730	762
25	711	734	766
20	715	739	770
15	**720**	**743**	**775**
10	723	748	779
5	730	752	784
0	734	757	789
-5	739	762	793
-10	744	767	798
-15	749	771	803
-20	754	776	808
-25	759	782	813

Note: Aviation fuel 100LL has nominal density of 720 g/liter at 15 °C.

Example: Full tanks (85 liters) of aviation fuel Avgas 100LL has a mass of 61,2 kg. When filled with typical car fuel of density 0,75 kg/l, full tanks have a mass of 63,8 kg, 2,5 kg more.

1.15.2 Conversion tables

vertical speed

fpm	m/s	fpm	m/s
10	0,05	100	0,5
20	0,10	200	1,0
30	0,15	300	1,5
40	0,20	400	2,0
50	0,25	500	2,5
60	0,30	600	3,0
70	0,36	700	3,6
80	0,41	800	4,1
90	0,46	900	4,6
100	0,51	1000	5,1

Altitudes

feet	m	feet	m	feet	m	feet	m
1	0,3	10	3	100	30	1000	305
2	0,6	20	6	200	61	2000	610
3	0,9	30	9	300	91	3000	914
4	1,2	40	12	400	122	4000	1219
5	1,5	50	15	500	152	5000	1524
6	1,8	60	18	600	183	6000	1829
7	2,1	70	21	700	213	7000	2134
8	2,4	80	24	800	244	8000	2438
9	2,7	90	27	900	274	9000	2743
10	3,0	100	30	1000	305	10000	3048

pressure setting

Millibars	0	1	2	3	4	5	6	7	8	9
hPa	Inches Hg									
910	26,87	26,90	26,93	26,96	26,99	27,02	27,05	27,08	27,11	27,14
920	27,17	27,20	27,23	27,26	27,29	27,31	27,34	27,37	27,40	27,43
930	27,46	27,49	27,52	27,55	27,58	27,61	27,64	27,67	27,70	27,73
940	27,76	27,79	27,82	27,85	27,88	27,91	27,94	27,96	27,99	28,02
950	28,05	28,08	28,11	28,14	28,17	28,20	28,23	28,26	28,29	28,32
960	28,35	28,38	28,41	28,44	28,47	28,50	28,53	28,56	28,58	28,61
970	28,64	28,67	28,70	28,73	28,76	28,79	28,82	28,85	28,88	28,91
980	28,94	28,97	29,00	29,03	29,06	29,09	29,12	29,15	29,18	29,20
990	29,23	29,26	29,29	29,32	29,35	29,38	29,41	29,44	29,47	29,50
1000	29,53	29,56	29,59	29,62	29,65	29,68	29,71	29,74	29,77	29,80
1010	29,82	29,85	29,88	29,91	29,94	29,97	30,00	30,03	30,06	30,09
1020	30,12	30,15	30,18	30,21	30,24	30,27	30,30	30,33	30,36	30,39
1030	30,42	30,45	30,47	30,50	30,53	30,56	30,59	30,62	30,65	30,68
1040	30,71	30,74	30,77	30,80	30,83	30,86	30,89	30,92	30,95	30,98

1050	31,01	31,04	31,07	31,09	31,12	31,15	31,18	31,21	31,24	31,27

weights

kg	lbs	kg	lbs	kg	lbs	kg	lbs
1	2,20	10	22,0	100	220	1000	2205
2	4,41	20	44,1	200	441	2000	4409
3	6,61	30	66,1	300	661	3000	6614
4	8,82	40	88,2	400	882	4000	8818
5	11,02	50	110,2	500	1102	5000	11023
6	13,23	60	132,3	600	1323	6000	13228
7	15,43	70	154,3	700	1543	7000	15432
8	17,64	80	176,4	800	1764	8000	17637
9	19,84	90	198,4	900	1984	9000	19841
10	22,05	100	220,5	1000	2205	10000	22046

dimensions

inch	cm	inch	m	inch	m
1	2,5	10	0,3	100	2,5
2	5,1	20	0,5	200	5,1
3	7,6	30	0,8	300	7,6
4	10,2	40	1,0	400	10,2
5	12,7	50	1,3	500	12,7
6	15,2	60	1,5		
7	17,8	70	1,8		
8	20,3	80	2,0		
9	22,9	90	2,3		

Areas

sq ft	m^2	sq ft	m^2	sq ft	m^2	sq ft	m^2
1	0,09	10	0,9	100	9	1000	93
2	0,19	20	1,9	200	19	2000	186
3	0,28	30	2,8	300	28	3000	279
4	0,37	40	3,7	400	37	4000	372
5	0,46	50	4,6	500	46	5000	465
6	0,56	60	5,6	600	56	6000	557
7	0,65	70	6,5	700	65	7000	650
8	0,74	80	7,4	800	74	8000	743
9	0,84	90	8,4	900	84	9000	836

Speeds

mph	kts	km/h	mph	kts	km/h
10	9	16	56	49	90
11	10	18	57	50	92
12	10	19	58	50	93
13	11	21	59	51	95
14	12	23	60	52	97
15	13	24	61	53	98
16	14	26	62	54	100
17	15	27	63	55	101
18	16	29	64	56	103
19	17	31	65	56	105
20	17	32	66	57	106
21	18	34	67	58	108
22	19	35	68	59	109
23	20	37	69	60	111
24	21	39	70	61	113
25	22	40	71	62	114
26	23	42	72	63	116
27	23	43	73	63	117
28	24	45	74	64	119
29	25	47	75	65	121
30	26	48	76	66	122
31	27	50	77	67	124
32	28	51	78	68	126
33	29	53	79	69	127
34	30	55	80	70	129
35	30	56	81	70	130
36	31	58	82	71	132
37	32	60	83	72	134
38	33	61	84	73	135
39	34	63	85	74	137
40	35	64	86	75	138
41	36	66	87	76	140
42	36	68	88	76	142
43	37	69	89	77	143
44	38	71	90	78	145
45	39	72	91	79	146
46	40	74	92	80	148
47	41	76	93	81	150
48	42	77	94	82	151
49	43	79	95	83	153
50	43	80	96	83	154
51	44	82	97	84	156
52	45	84	98	85	158
53	46	85	99	86	159
54	47	87	100	87	161
55	48	89	101	88	163

Volumes

US gal	Liters	US gal	Liters	US gal	Liters
1	3,8	10	38	100	379
2	7,6	20	76	200	757
3	11,4	30	114	300	1136
4	15,1	40	151	400	1514
5	18,9	50	189	500	1893
6	22,7	60	227	600	2271
7	26,5	70	265	700	2650
8	30,3	80	303	800	3028
9	34,1	90	341	900	3407
10	37,9	100	379	1000	3785

Temperatures

°F	°C	°F	°C	°F	°C	°F	°C
-70	-56,7	-24	-31,1	22	-5,6	68	20,0
-68	-55,6	-22	-30,0	24	-4,4	70	21,1
-66	-54,4	-20	-28,9	26	-3,3	72	22,2
-64	-53,3	-18	-27,8	28	-2,2	74	23,3
-62	-52,2	-16	-26,7	30	-1,1	76	24,4
-60	-51,1	-14	-25,6	32	0,0	78	25,6
-58	-50,0	-12	-24,4	34	1,1	80	26,7
-56	-48,9	-10	-23,3	36	2,2	82	27,8
-54	-47,8	-8	-22,2	38	3,3	84	28,9
-52	-46,7	-6	-21,1	40	4,4	86	30,0
-50	-45,6	-4	-20,0	42	5,6	88	31,1
-48	-44,4	-2	-18,9	44	6,7	90	32,2
-46	-43,3	0	-17,8	46	7,8	92	33,3
-44	-42,2	2	-16,7	48	8,9	94	34,4
-42	-41,1	4	-15,6	50	10,0	96	35,6
-40	-40,0	6	-14,4	52	11,1	98	36,7
-38	-38,9	8	-13,3	54	12,2	100	37,8
-36	-37,8	10	-12,2	56	13,3	102	38,9
-34	-36,7	12	-11,1	58	14,4	104	40,0
-32	-35,6	14	-10,0	60	15,6	106	41,1
-30	-34,4	16	-8,9	62	16,7	108	42,2
-28	-33,3	18	-7,8	64	17,8	110	43,3
-26	-32,2	20	-6,7	66	18,9	112	44,4

-24	-31,1	22	-5,6	68	20,0	114	45,6

STANDARD ATMOSPHERE TABLE

Standard sea level conditions:
Temperature: 15°C (59 °F)
Pressure: 1013.25 hPa / mbar (29.921 inches Hg.)
Density: 1.225 kg/m³ (0.0023769 slugs/cu.ft.)

ALTI-TUDE (ft)	DENSITY RATIO σ	$\frac{1}{\sqrt{\sigma}}$	TEMPERATURE (°C)	TEMPERATURE (°F)	PRESSURE (hPa/mbar)	PRESSURE (Hg)	PRESSURE RATIO
0	1.0000	1.0000	15.000	59.000	1013.25	29.921	1.0000
1000	0.9711	1.0148	13.019	55.434	977.18	28.856	0.9644
2000	0.9428	1.0299	11.038	51.868	942.14	27.821	0.9298
3000	0.9151	1.0454	9.056	48.302	908.14	26.817	0.8962
4000	0.8881	1.0611	7.076	44.735	875.12	25.842	0.8637
5000	0.8617	1.0773	5.094	41.169	843.08	24.896	0.8320
6000	0.8359	1.0938	3.113	37.603	811.99	23.978	0.8014
7000	0.8106	1.1107	1.132	34.037	781.86	23.088	0.7716
8000	0.7860	1.1279	-0.850	30.471	752.63	22.225	0.7428
9000	0.7620	1.1456	-2.831	26.905	724.29	21.388	0.7148
10000	0.7385	1.1637	-4.812	23.338	696.82	20.577	0.6877
11000	0.7155	1.1822	-6.793	19.772	670.21	19.791	0.6614
12000	0.6932	1.2011	-8.774	16.206	644.40	19.029	0.6360
13000	0.6713	1.2205	-10.756	7.640	619.44	18.292	0.6113
14000	0.6500	1.2403	-7.737	9.074	595.23	17.577	0.5875
15000	0.6292	1.2606	-14.718	5.508	571.83	16.886	0.5643
16000	0.6090	1.2815	-16.699	1.941	549.14	16.216	0.5420
17000	0.5892	1.3028	-18.680	-1.625	527.23	15.569	0.5203
18000	0.5699	1.3246	-20.662	-5.191	505.99	14.942	0.4994
19000	0.5511	1.3470	-22.643	-8.757	485.48	14.336	0.4791
20000	0.5328	1.3700	-24.624	-7.323	465.63	13.750	0.4595

Fig. 1-10 Standard atmosphere table

1.15.3 WIND COMPONENT CHART

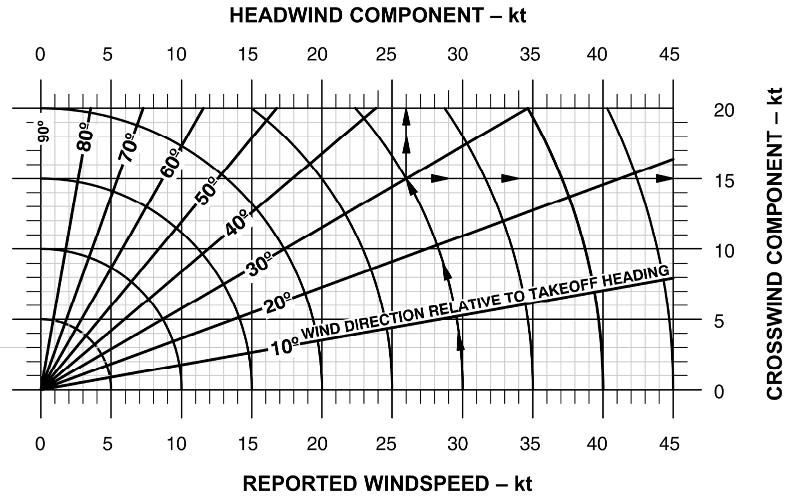

Fig. 1-11 Wind Component Chart

EXAMPLE:

Known:	Takeoff heading	270°
	Reported wind direction	240°
	Reported wind speed	30 kt
Determine:	a) Crosswind component	
	b) Headwind component	
Solution:	a) Crosswind component = 15 kt	
	b) Headwind component = 26 kt	

Wind direction relative to takeoff heading is 270° – 240° = 30°

Enter chart at reported wind speed (30 kt).

Move upward, following the shape of the curved lines to wind direction relative to takeoff heading (30°).

Move vertically upward (read 26 kt headwind component) and horizontally right (read 15 kt crosswind component).

End of Section 1

Section 2
LIMITATIONS

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WARNING

IF ANY LIMITATION HAS BEEN EXCEEDED, MAINTENANCE ACTION MAY BE REQUIRED AND NECESSARY BEFORE NEXT FLIGHT. ENTER DURATION AND AMOUNT OF EXCESS IN LOG-BOOK AND APPROPRIATE SYSTEM LOGBOOK (FOR EXAMPLE ENGINE LOGBOOK).

2.1 GENERAL

This airplane shall be operated in compliance with the limitations of this section.

For definitions of terms, abbreviations and symbols used in this section refer to Section 1.

2.2 AIRSPEED LIMITATIONS

NOTE

All airspeed values given in this Handbook are indicated airspeed (IAS) unless otherwise indicated.

Airspeed limitations and their operational significance are shown in figure 2-1.

	SPEED	CAS [kts]	REMARKS
VNE	Never Exceed Speed	105	Do not exceed this speed in any operation.
VNO	Maximum Structural Cruising Speed	89	Do not exceed this speed except in smooth air, and then only with caution.
VA	Maneuvering Speed:	89	Do not make full or abrupt control movements above this speed.
VFE	Maximum Flap Extended Speed	70	Do not exceed this speed with flaps down.

Figure 2-1. Airspeed Limitations

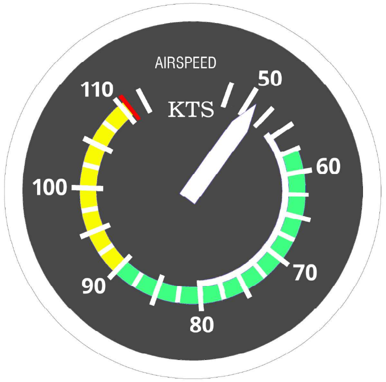
2.3 AIRSPEED INDICATOR MARKINGS

2.3.1 Analog instruments

Airspeed indicator markings and their color code significance are shown in figure 2-2.

MARKING	VALUE OR RANGE [kts]	SIGNIFICANCE
White Arc	45 - 70	Full Flap Operating Range. Lower limit is maximum weight Vso in landing configuration. Upper limit is maximum speed permissible with flaps extended.
Green Arc	45 - 89	Normal Operating Range. Lower limit is maximum weight VS at most forward C.G. with flaps retracted. Upper limit is maximum structural cruising speed.
Yellow Arc	89 - 105	Operations must be conducted with caution and only in smooth air.
Red Line	105	Maximum speed for all operations.

Figure 2-2. Airspeed Indicator Markings



2.4 POWER PLANT LIMITATIONS

Engine:.. Rotax 912 iS Sport
Power.............................. 100 hp (73,5 kW) / 2385 rpm start (max 5 min)
97 hp (72 kW) / 2260 rpm continuous
potkuri vai moottorikierrokset?

Note: Static rpm at full throttle in calm conditions should be between 2260 and 2320 rpm

Note: All rotational speed are propeller speed. Engine is running at higher speed due to 1:2,43 reduction gear.

Engine cooling fluid volume ....2,5 liters
Propeller model: XXXX
type:.. 3-bladed fixed
Diameter .... 1,7 m

Engine oil pressure

Minimum ....0,8 bar @ 1400 rpm
Continuous operation .... 2 to 5 bar @ > 1400 rpm
Maximum after cold start ....7.0 bar

Cylinder head temperature

Maximum .... 135 °C

2.5 ENGINE INDICATOR MARKINGS

2.5.1 Analog instruments

Instrument	green arc	yellow arc	red radial
	Normal operating range	caution range	limitation (min or max)
Revolutions (prop speed)	1700 - 2260 rpm	2260 - 2385 rpm	2385 rpm
Oil temperature	90 - 110 °C (194 - 230 °F)	-	50 °C (122 °F) 130 °C (266 °F)
Oil pressure	2 - 5 bar	0,8 - 2 bar (12-29 psi) 5-7 bar (73-102 psi)	0,8 bar (12 psi) 7 bar (102 psi)
Cylinder head temperature	-	-	135 °C (275 °F)
Fuel pressure	0,15 - 0,4 bar (2,2 - 5,8 psi)	-	0,15 bar (2,2 bar) 0,4 bar (5,8 psi)

2.6 MASS AND LOAD LIMITS

The maximum takeoff and landing gross mass.

2.6.1 Maximum gross mass

Maximum approved gross mass .... 650 kg (1433 lbs)

2.6.2 Loading limits

Weight in Baggage Compartment:

Baggage Area 1 ....Station 1,04 m (40,9 in)
.... , 30 kg (66 lbs)

Loading arrangements

Fig 6-3 Loading arrangement

Baggage loading and tie-down

Fig 6-4 baggage loading and tie-down rings

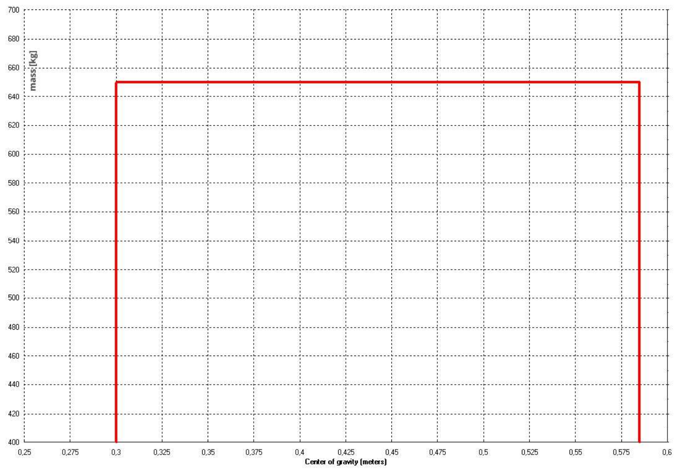
Note
A cargo tie-down net is provided to secure baggage in the baggage area. The net attaches to six tie-down rings. Two rings are located on the floor just aft of the seat backs and one ring is located two inches above the floor on each cabin wall at the aft end of the area 1. Two additional rings are located at the to, aft end of area 2. At least four rings should be used to restrain the maximum baggage load of 54 kg.

2.7 CENTER OF GRAVITY LIMITATIONS

C.G. range ....300 mm to 585 mm

Reference datum: ....Vertical plane at wing outer section root chord forward edge.
Root chord located 1000 mm from aircraft centerline.

Levelling means .... Vertical line at front face of main spar box at aircraft centreline.



2.8 MANEUVER LIMITS

This airplane is certificated in the normal category.

No aerobatic maneuvers are approved.

Warning:

Intentional spins are prohibited. Recovery from accidental spin - see emergency procedures section 3.

2.9 FLIGHT LOAD FACTOR LIMITS

Structural Flight Load Factors:

Flaps Up: ....+4.0g, -1.5g

Flaps Down: ....+3.5g, ... -0,0 g

Note:

Engine limitation is maximum negative G -0,5 g. All negative g's are limited to a maximum of 5 seconds.

2.10 MINIMUM FLIGHT CREW / MAXIMUM NUMBER OF OCCUPANTS

The minimum flight crew consists of one pilot.

The maximum number of occupants comprises up to 2 persons. Crew location +0,991 m.

2.11 KINDS OF OPERATION

The airplane in its basic configuration is certified for land and water operation under day Visual Meteorological Conditions (VMC).

The airplane is equipped for day VFR operations. NCO.IDE.A.100 ... 200 establishes the minimum required instrumentation and equipment for these operations. The reference to types of flight operations on the operating limitations placard reflects equipment installed at the time of Airworthiness Certificate issuance.

2.12 FUEL LIMITATIONS

2.7.1 Fuel specifications

NOTE: Specifications apply to the latest index, latest amendment in force.

Fuel conforming to the following specification is authorized for use:

2.7.1.1 Primary fuels

EN 288 super/super plus, minimum RON 95 (min AKI 91).

*2.7.1.2 Secondary f*uels

100LL Grade Aviation Fuel (Blue), UL91.

2.7.2 Fuel quantities

Fuel mass values are based on a fuel density of 0.75 kg/liter.

TANK	TOTAL FUEL		USABLE FUEL	
	liters	kilograms	liters	kilograms
standard tanks	85	63,75	80	60
collector tank	9	6,75	9	6,75
both	94	70,5	89	66,8

NOTE: Due to cross-feeding between fuel tanks, the tanks should be re-topped after each refueling to assure maximum capacity.

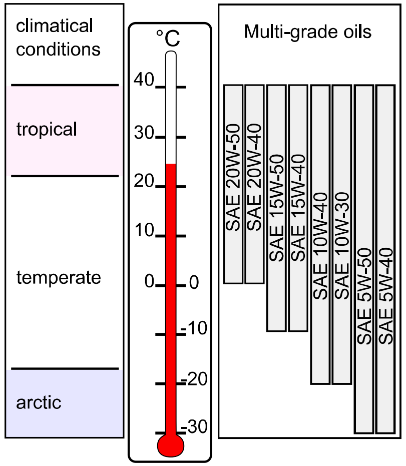
NOTE: Takeoffs have not been demonstrated with less than 8 liter total fuel (4 liters per tank).

NOTE: Fuel location + 1,067 m

2.13 OIL LIMITATIONS

2.13.1 Oil specifications

See table below



Use only oil with RON 424 classifications

Oil consumption max 0,06 l/h (0,13 liq pt/h)

2.13.2 Oil quantities

	Liters
Engine	3

Oil mass values are assumed as 1.0 kg/ltr.

2.14 AMBIENT AIR TEMPERATURE LIMITATIONS

Engine starting temperature limit (oil temperature)........................ -25 °C

2.15 ENVIRONMENTAL OPERATING CONDITIONS

2.15.1 Icing conditions

Flight into known icing conditions is prohibited.

2.16 PLACARDS AND DECALS

The following information is displayed in the form of composite or individual placards.

Placard:

(The "DAY -VFR" entry, shown on the example below, will vary as the airplane is equipped.)

In full view of the pilot:

This airplane is approved in the utility category and must be operated in compliance with the operating limitations as stated in the form of placards, marking and hand-books.

-------------- MAXIMUMS ----------------

Gross weight . . . . 650 kg (1433 lbs)
Maneuvering speed . . . . 89 kts
FLIGHT LOAD FACTOR
Flaps up . . . . +4,0 ... -2,0
Flaps down . . . . +3,4 ... 0,0

-------------- NO ACROBATIC MANEUVERS APPROVED ----------------

Intentional spins prohibited. Recovery from unintentional spin - see emergency procedures

Flight into known icing condition prohibited. This aircraft is certified for the following flight operations as of date of original airworthiness certificate:

DAY - VFR

Placard

In the baggage compartment:

max baggage 30 kg (66 lb) .

For additional loading instructions see Weight and Balance data.

Placard

Near fuel shutoff valve (standard tanks):

FUEL - 21 GALS - PUSH ON

Placard

Near fuel tank filler cap (standard tanks):

49 lts.

Fuel grades: Normal, Super, Super plus unleaded, min ROZ 95 or EN228 or AVGAS 100 LL

No mixed oil

Placard

Instrument panel near overvoltage light:

Over voltage

Placard

On cooling fluid tank or near cooling fluid filler cap:

2,5 lts Cooling fluid

Placard

On the instrument panel near the altimeter:

SPIN RECOVERY 1. VERIFY AILERONS NEUTRAL AND THROTTLE CLOSED 2. APPLY FULL OPPOSITE RUDDER 3. MOVE CONTROL STICK BRISKLY FORWARD TO BREAK STALL 4. NEUTRALIZE RUDDER AND RECOVER FROM DIVE

End of section 2

Section 3
EMERGENCY PROCEDURES

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Section 3
EMERGENCY PROCEDURES

3.1 GENERAL

This section contains the recommended procedures for managing various types of emergencies, malfunctions and critical situations.

Emergencies caused by airplane or engine malfunctions are extremely rare if proper preflight inspections and maintenance are practiced. Enroute weather emergencies can be minimized or eliminated by careful flight planning and good judgment when unexpected weather is encountered. However, should an emergency arise, the basic guidelines described in this section should be considered and applied as necessary to correct the problem.

WARNING

AFTER AN ACTUAL EMERGENCY OR MALFUNCTION MAKE AN ENTRY IN THE AIRPLANE LOGBOOK AND, WHEN NECESSARY, THE AFFECTED SYSTEM LOGBOOK (E.G. ENGINE LOGBOOK). MAINTENANCE ACTION MAY BE REQUIRED AND NECESSARY BEFORE NEXT FLIGHT.

For definitions of terms, abbreviations and symbols used in this Section, refer to Section 1.

Checklist items are written using following rules: items that explain action are in lowercase letters, if the target has label in the airplane that label text is written in UPPERCASE letter.

Checklist items are written with a easy to read font with bigger font size than normal text (as shown here).

3.1.1 Basic rules

These procedures deal with common emergencies. However, they do not prevent the pilot from taking additional action necessary to recover the emergency situation.

Although the procedures contained in this Section are considered to be sound, the pilot's judgement is of paramount importance when confronted with an emergency.

To assist the pilot during an inflight emergency, three basic rules have been established:

1. Maintain aircraft control
2. Analyse the situation
3. Take proper action

NOTE: It is impossible to establish a predetermined set of instructions which would provide a ready-made decision applicable to all situations.

3.1.2 Operating condition

The following terms are used in emergency procedures to describe the operating condition of a system, subsystem, assembly or component:

Affected **Fails to operate** in the normal or usual manner

Normal **Operates** in the normal or usual manner

3.1.3 Urgency of landing

The type of emergency and the emergency conditions combined with the pilot's analysis of the condition of the airplane and his proficiency are of prime importance in determining the urgency of a landing.

LAND IMMEDIATELY

The urgency of landing is paramount. Primary consideration is to assure survival of the occupants. Landing in trees or other unsafe areas should be considered only as a last resort.

LAND AS SOON AS POSSIBLE

Land without delay at the nearest adequate site (i.e. open field or open water area) at which a safe approach and landing can be made.

LAND AS SOON AS PRACTICABLE

The landing site and duration of flight are at the discretion of the pilot. Extended flight beyond the nearest safe landing area where appropriate assistance can be expected is not recommended.

3.2 AIRSPEEDS FOR EMERGENCY OPERATION

Engine Failure After Takeoff .... 58 kts
Maneuvering Speed:
650 kg .... 89 kts
600 kg .... ??? 78 kts
550 kg.. ??? 76 kts
Maximum Glide .... ??? 65 kts
Precautionary Landing With Engine Power .... 65 kts
Landing Without Engine Power:
Wing Flaps Up .... 58 kts
Wing Flaps Down 54kts

katsotaan sitten koelennoilla.

3.3 FIRE AND SMOKE DRILLS

3.3.1 DURING ENGINE START ON GROUND

Unsuccesful start (in cold weather) can cause backfire and ignition of the fuel collected into intake manifolds. Follow these guidelines:

1. cranking .... continue,

to get a start which would suck the flames and accumulated fuel through the intake and into the engine.

If engine starts:

2. fuel selectors..OFF
3. throttle ....full (forward)
4. main switch ....OFF
5. lane A & B..OFF
6. canopy ....open

Do not attempt restart engine.

Exit from aircraft and inspect for damage.

If engine fails to start:

2. cranking ....continue

in an effort to obtain a start.

3. fuel valve..OFF
4. throttle ....full (forward)
5. fire extinguisher ....obtain

(have ground attendants obtain if not installed).

6. main switch ....OFF
7. lane A & B..OFF
8. canopy ....open

exit from aircraft

9. fire ....extinguish

using fire extinguisher, wool blanket, or dirt.

10. fire damage ....inspect

repair damage or replace damaged components or wiring before conducting another flight.

3.3.2 ENGINE FIRE IN FLIGHT

1. fuel selectors ....all CUT OFF
2. throttle ....full (forward)
3. electric fuel pumps ....OFF
5. main power switch ....OFF

6. airspeed ....80 ???? kts

If fire is not extinguished, increase glide speed to find an airspeed which will provide an incombustible mixture.

7. forced landing ....execute

(as described in Emergency Landing Without Engine Power).

3.3.3 ELECTRICAL FIRE IN FLIGHT

1. master switch .... OFF
2. all other switches
   (except lane A&B switch) .... OFF
3. vents/ cabin air/heat .... closed

if smoking does not dimish, then:

4. fire extinguisher .... activate

<u>*WARNING*</u>

After discharging an extinguisher within a closed cabin, ventilate the cabin.

If fire appears out and electrical power is necessary for continuance of flight:

5. master switch .... ON
6. circuit breakers .... check
   for faulty circuit, do not reset.
7. radio/electrical switches .... ON
   one at a time, with delay after each until short circuit is localized.
8. vents/cabin air/heat.............................. OPEN
   when it is ascertained that fire is completely extinguished.
9. land as soon as possible.

3.3.4 CABIN FIRE

1. master switch .... OFF
2. vents/ cabin air/heat .... closed
   to avoid drafts
3. fire extinguisher .... activate
   (if available)

<u>*WARNING*</u>

After discharging an extinguisher within a closed cabin, ventilate the cabin.

4. vents .... open
5. land the airplane as soon as possible to inspect for damage.

3.4 LIGHTNING STRIKES

A direct lightning hit to ATOL would most probably be non-survivable.
Do not fly near/under active thunderstorms!
This advice is for instance, if you accidentally encounter near miss of an

lightning strike.

On re-entering smooth air, the various systems should be checked functionally to he extent possible.

Functionally test radios, avionics and instruments to the extent possible.

Compare compass readings.

Check circuit breaker panel for tipped circuit beakers.

Lightning strike should be entered in the aircraft flight log stating:

- Observed damage or deficiencies.
- Landing gear and flap position at the time of strike.
- Which instruments and avionics have later been checked to function normally.

3.5 ENGINE FAILURE

3.5.1 ENGINE FAILURE DURING TAKEOFF RUN

1. throttle .... IDLE
2. brakes .... apply
3. ignition switch .... OFF
4. master switch .... OFF

3.5.2 ENGINE FAILURE IMMEDIATELY AFTER TAKEOFF

Reduced power

1. airspeed .... 65 - 70 kts

   if there is time, try following

2. throttle .... FULL (forward)
3. fuel shutoff valve .... ON
4. Lane A&B switch .... BOTH cycle
5. electric fuel pumps .... ON

If engine power is not enough for “normal landing”, make normal forced landing straight forward.

Forced landing with running engine

In most cases make forced landing ahead, with little or only minor alterations in heading.

When landing area is confirmed

1. airspeed
   flaps up .... 58 kts
   flaps down .... 54 kts
2. throttle .... as needed
4. flaps.. as needed
6. safety belts .... tighten

When landing assured

7. throttle .... close
8. fuel selector valve .... close
9. main switch... OFF
10. ignition .... OFF

Forced landing with stopped engine

1. airspeed
   - flaps up .... 58 kts
   - flaps down .... 54 kts
3. safety belts .... tighten
4. flaps.. as needed
5. main switch.. OFF
6. fuel valve .... close
7. Lane A&B switch .... OFF

3.5.3 ENGINE FAILURE DURING FLIGHT

Reduced power

1. throttle .... do not move
2. try following to find improvement in power:
   - i) electric fuel pump
   - ii) Lane A&B switch (turn OFF the on ON each separately)

If no improvement, reduce power if possible.
Land as soon as practicable.

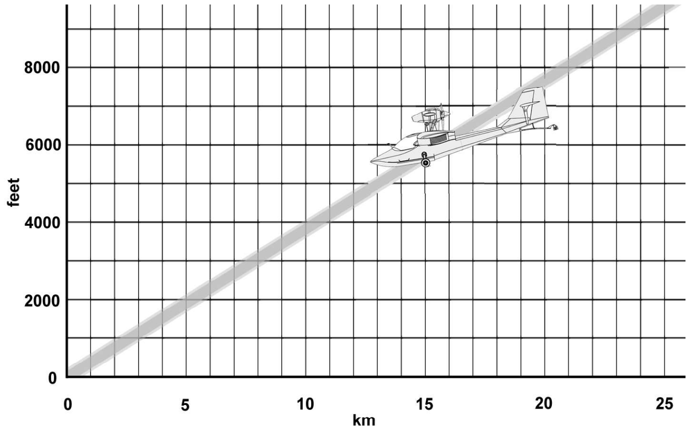


Figure 3-1. Maximum Glide, airspeed 54 IAS ????, propeller windmilling, flaps up, no wind.

3.5.4 LOSS OF OIL PRESSURE

Check oil temperature!

If oil pressure drops below green arc and oil temperature is normal:

LAND AS SOON AS PRACTICABLE in the nearest airfield or water area.

If oil pressure drops below green arc and oil temperature is rising:

1. reduce engine power to minimum
2. LAND AS SOON AS POSSIBLE
   and be prepared for total engine failure and subsequent forced landing

3.5.5 LOSS OF FUEL PRESSURE

1. electric fuel pumps .... ON
2. if fuel pressure warning light stays on:
   a) engine power to minimum needed to fly
   b) LAND AS SOON AS POSSIBLE
   and be prepared for engine stoppage and subsequent forced landing

3.5.6 RESTARTING ENGINE IN FLIGHT

Windmilling propeller

As long as airspeed is 62??? kts or more, propeller will stay windmilling.

1. airspeed (IAS) .... 70-80 kts

2. electric fuel pumps .... ON
3. Lane A&B switch .... ON
4. fuel valve .... ON
5. throttle .... 2 cm from full open

If engine does not start within 10 seconds perform cold start.

6. throttle .... idle (back)

Set engine power to minimum required and land as soon as possible and be prepared for total motor failure and subsequent forced landing.

Stopped propeller

1. electric fuel pumps .... OFF
2. main switch.. ON
3. electric fuel pumps .... ON
4. cold start
   a. throttle .... idle (back)
5. warm start:
   a. throttle .... 2 cm from full open
6. start switch .... start

Note: By increasing flight speed to about 85 kts propeller can be started to windmill and engine started without starter. Be prepared for altitude loss of at least 1000 ft during manouver.

When engine has started;

1. oil pressure .... check normal
2. oil temperature.................................... check normal
3. electric load .... switch ON as needed.

Reduce engine power to minimum required. Land at nearest airfield or suitable water area and be prepared for total engine failure and subsequent forced landing.

3.6 SYSTEM FAILURES

3.6.1 ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

OVER-VOLTAGE LIGHT ILLUMINATES

1. master switch .... OFF
2. master switch .... ON
3. over-voltage light .... check OFF

If over-voltage light illuminates again:

4. flight .... land as soon as practical

AMMETER SHOWS DISCHARGE

1. alternator .... OFF
2. nonessential Electrical Equipment .... OFF
3. flight .... land as soon as practical

3.6.2 RESETTING TRIPPED CIRCUIT BREAKERS

General:

There is a latent danger in resetting a circuit breaker tripped by an unknown cause because the tripped condition is a signal that something may be wrong in the related circuit. Until it is determined what has caused a trip to occur, pilot has no way of knowing the consequences of resetting a tripped circuit breaker.

On–the–Ground:

A circuit breaker tripped by an unknown cause may only be reset on the ground after maintenance has determined the cause of the trip and has determined that the circuit breaker may be safely reset. A circuit breaker may be cycled (tripped, pulled or reset) where it is required to be performed within approved maintenance inspection criteria, or as part of an approved trouble–shooting procedure, unless doing so is specifically prohibited. Resetting a circuit breaker tripped by an unknown cause should normally be a maintenance function conducted on the ground.

In–Flight:

A tripped circuit breaker shall not be reset in flight unless doing so is consistent with explicit procedures specified in the approved POH/Maintenance Manual, its supplements and checklists used by the crew members or unless, in the judgment of the pilot–in–command, resetting the circuit breaker is necessary for the safe completion of the flight. Crew members should limit resetting of circuit breakers to one in–flight reset where this action is required.

No attempt should be made to reset a circuit breaker if it trips a second time.

Logbook entry:

A detailed logbook write–up is a proven safety practice.

3.6.3 EMERGENCY DESCENT THROUGH CLOUDS

If conditions preclude reestablishment of VFR flight by a 180° turn, a descent through a cloud deck to VFR conditions may be appropriate. If possible, obtain radio clearance for an emergency descent through clouds. To guard against a spiral dive, choose an easterly or westerly heading to minimize compass card swings due to changing bank angles. In addition, keep hands off the control stick and steer a straight course with rudder control only. Occasionally check the compass heading and make minor corrections to hold an approximate course. Before descending into the clouds, set up a stabilized let-down condition as follows:

1. Reduce power to set up a 500 to 800 ft/min rate of descent.
2. Adjust the elevator trim for a stabilized descent at 80 kts.
3. Keep hands off control wheel.
4. Monitor cource and make gently corrections by rudder alone.
5. Check trend of compass card movement and make cautious corrections with rudder to stop turn.
6. Upon breaking out of clouds, resume normal cruising flight.

3.7 GUIDANCE FOR DIVERSION IN CASE OF SERIOUS TECHNICAL FAILURE

3.7.1 ROUGH ENGINE OPERATION OR LOSS OF POWER

SPARK PLUG FOULING

A slight engine roughness in flight may be caused by one or more spark plugs becoming fouled by carbon or lead deposits. This may be verified by turning the Lane A&B switch momentarily from both ON to either A or B only position. An obvious power loss in single ignition operation is evidence of spark plug or ignition system trouble. If the problem does not clear up in several minutes, determine if a different throttle setting will produce smoother operation. If not, proceed to the nearest airfield or suitable water area for repairs using the BOTH position of the ignition switch unless extreme roughness dictates the use of a single ignition position.

LOW OIL PRESSURE

If low oil pressure is accompanied by normal oil temperature, there is a possibility the oil pressure gage or relief valve is malfunctioning. A leak in the line to the gage is not necessarily cause for an immediate precautionary landing because an orifice in this line will prevent a sudden loss of oil from the engine sump. However, a landing at the nearest airport or suitable water area would be advisable to inspect the source of trouble.

If a total loss of oil pressure is accompanied by a rise in oil temperature, there is good reason to suspect an engine failure is imminent. Reduce engine power immediately and select a suitable forced landing field or water area. Use only the minimum power required to reach the desired touchdown spot.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

Malfunctions in the electrical power supply system can be detected by periodic monitoring of the ammeter and over-voltage warning light; however, the cause of these malfunctions is usually difficult to determine. A broken alternator wiring is most likely the cause of alternator failures, although other factors could cause the problem. Problems of this nature constitute an electrical emergency and should be dealt with immediately. Electrical power malfunctions usually fall into two categories: excessive rate of charge and insufficient rate of charge. The paragraphs below describe the recommended remedy for each situation.

INSUFFICIENT RATE OF CHARGE

If the ammeter indicates a continuous discharge rate in flight, the alternator is not supplying power to the system and should be shut down since the alternator field circuit may be placing an unnecessary load on the system. All nonessential equipment should be turned off and the flight terminated as soon as practical.

Conclusion

The final responsibility for the disposition of the aircraft rests with the Commander. To continue the flight, in case of serious technical failure, beyond the nearest airport, which meets the operational requirements, is only justified if all relevant safety factors are considered, and the continuing of the flight is considered safer. These factors shall include the following:

- Nature of the malfunction and the possible technical difficulties which may be encountered if the flight is continued;
- Relative flight times to suitable airports or landing area for diversion;
- Weather conditions enroute and at destination and diversion location.

The safety of the aircraft and the persons within has the greatest priority and must be satisfactory before maintenance or economical aspects.

3.8 WINDSHEAR

Definition of windshear

WINDSHEAR is a rapid variation in the direction and velocity of wind at very low altitude. WINDSHEAR may or may not be accompanied by a DOWNBURST or MICROBURST (violent downward blasts of air).

A MICROBURST with a low or zero wind variation may also be encountered.

These phenomena are generally called WINDSHEAR.

The main cause of WINDSHEAR is thunderstorm cells.

INSTRUCTIONS FOR THE PILOT If WINDSHEAR IS ANTICIPATED:

- DO NOT TAKE-OFF - WAIT.
- DO NOT LAND - WAIT OR FLY TO AN ALTERNATE AIRPORT.

If a WINDSHEAR is encountered, 30 seconds to 1 minute maximum will be required to cross it.

Pilot reaction time must be very low - 3 to 5 seconds - as studies of accidents that have occurred or been avoided show. If the pilot takes 15 seconds or more to understand the situation, it will be too late.

1 - During or after take-off

1 If acceleration is much too low before rotation, abort take-off.
2 If acceleration is too low above rotation, abort takeoff is possible, and land.
Respect the stall audio warning.
3 After take-off: do not reduce power, increase if possible.
ABSOLUTELY DO NOT LET THE AIRPLANE DESCEND, even if the indicated airspeed should drop.
Respect the stall audio warning.

2 - During approach and landing

As soon as a windshear encounter is imminently anticipated, DECIDE TO APPLY POWER FOR GO-AROUND:

maximum power .... set

Level off and ABSOLUTELY DO NOT LET THE AIRPLANE DESCEND, using the elevators.

Respect the stall audio warning.

COMMENTS

1 - Monitor acceleration time: if a lag of 15 kts or more is noted, abort take-off.
During the take-off run, acceleration can be normal relative to the ground but too low relative to the air (IAS). In case of possible WINDSHEAR, it is therefore advisable to monitor acceleration time.
2 - Maximum power: lever fully forward
Do not hesitate to pull back the control column sufficiently, up to the stall audio warning if necessary.
3 - Maintain maximum power:
It is not recommended to remain at the stall audio warning limit: the only aim is to prevent the airplane from descending.
If the airplane accelerates, more the better, as energy is accumulating.
During these maneuvers, it may be necessary to use unusual pitch attitudes: 20 to 30° depending on the weight and the configuration of the airplane.

3 -WINDSHEAR

Windshear is occasionally preceded by an opposite phenomena, consisting of a negative wind gradient and upward winds. In this case the IAS increase abruptly by 10, 20 kts or more and the airplane is found to be

above the glide slope.
The mistake not to make at this point is to reduce power whilst pitching down (to retrieve the glide slope). The airplane would, in this case, be in the worst conditions for a WINDSHEAR encounter.

IT IS PREFERABLE TO APPLY POWER FOR GO-AROUND IMMEDIATELY AT THIS POINT

The airplane would in this case be in the same configuration as after take-off, but with a much lower weight and therefore a much better acceleration margin.

It only remains to prevent the airplane from taking a negative rate of climb which would be catastrophic at very low altitude.

3.9 EMERGENCY LANDING/DITCHING

3.9.1 EMERGENCY LANDING WITHOUT ENGINE POWER (on LAND)

1. airspeed .... 75 kts (flaps UP)
   70 kts (flaps DOWN)
2. throttle .... full back
3. fuel shutoff valve .... OFF
4. Lane A&B switch .... OFF
5. wing flaps .... as required
   (30° recommended)
6. master switch .... OFF
7. touchdown .... slightly tail low
8. brakes .... apply heavily

3.9.2 PRECAUTIONARY LANDING WITH ENGINE POWER (on LAND)

Select field and make normal landing circuit to it to investigate conditions.

1. airspeed .... 65-75 kts flaps up
2. wing flaps .... 20°
3. airspeed .... 60 -70 kts
   flaps down
4. selected field .... fly over

   note terrain and obstructions, then retract flaps upon reaching a safe altitude and airspeed.

   Prepare for landing, tighten seatbelts, brief passenger, inform ATC if possible.
5. airspeed .... 65-75 kts flaps up
6. wing flaps .... 20°
7. airspeed .... 60 -70 kts flaps down
8. radio and electrical switches .... OFF

9. wing flaps .... 30° (on final approach)
10. airspeed .... 63 kts
11. master switch .... OFF
12. doors .... unlatch prior to touch-down
13. touchdown .... slightly tail low
14. Lane A&B switch .... OFF
15. brakes .... apply heavily

3.9.3 PRECAUTIONARY LANDING ON WATER

1. radio .... TRANSMIT MAYDAY on 121.5 MHz

   giving location an intentions.
2. approach
   high winds, heavy seas .... into the wind
   light winds, heavy swells .... parallel to swells
3. wing flaps .... 30°
4. power .... establish 300 ft/min descent at 63 kts
5. touchdown .... as normal water landing
6. canopy .... unlatch

   but not before speed has slowed down
7. airplane .... evacuate

   If necessary, if aircraft is upright an there is no fire, it is probably the safest place
8. life vests .... inflate

LANDING ON CALM WATER

The rate of descent should be kept to a minimum at the instant of touch-down. The angles of roll and yaw should be kept to a minimum.

LANDING ON WAVES

Avoid water entry in the trough or the rising face of a wave. The landing should be made so that the airplane contacts the crest or back of a wave.

3.10 CONTINGENCY PROCEDURES

3.10.1 INADVERTENT ICING ENCOUNTER

1. Turn back or change altitude to obtain an outside air temperature that is less conducive to icing.

2. Pull cabin heat control full out to obtain maximum defroster air temperature. For greater air flow at reduced temperatures, adjust the cabin air control as required.
3. Open the throttle to increase engine speed and minimize ice buildup on propeller blades.
4. Plan a landing at the nearest airport. With an extremely rapid ice build-up, select a suitable "off airport" landing site.
5. With an ice accumulation of 5 mm or more on the wing leading edges, be prepared for significantly higher stall speed.
6. Leave wing flaps retracted. With a severe ice build-up on the horizontal tail, the change in wing wake airflow direction caused by wing flap extension could result in a loss of elevator effectiveness.
7. Open left window and, if practical, scrape ice from a portion of the windshield for visibility in the landing approach.
8. Perform a landing approach using a forward slip, if necessary, for improved visibility.
9. Approach at 75 - 85 ktsh depending upon the amount of ice accumulation.
10. Perform a landing in level attitude.

3.10.2 RECOVERY FROM A SPIRAL DIVE

If a spiral is encountered, proceed as follows:

1. Close the throttle.
2. Stop the turn by using coordinated aileron and rudder control to wings level attitude.
3. Cautiously apply elevator back pressure to slowly reduce the airspeed to 80 kts.
4. Adjust the elevator trim control to maintain a 80 kts glide.
5. Keep hands off the control stick, using rudder control to hold a straight heading.
6. Clear engine occasionally, but avoid using enough power to disturb the trimmed glide.

3.10.3 SPINS

Should, an inadvertent spin occur, the following recovery procedure should be used:

1. **PLACE AILERONS IN NEUTRAL POSITION.**
2. **RETARD THROTTLE TO IDLE POSITION.**
3. **APPLY AND HOLD FULL RUDDER OPPOSITE TO THE DIRECTION OF ROTATION.**
4. **JUST AFTER THE RUDDER REACHES THE STOP, MOVE THE CONTROL WHEEL BRISKLY FORWARD FAR ENOUGH TO BREAK THE STALL.**

   Full down elevator may be required at aft center of gravity loadings to assure optimum recoveries.
5. **HOLD THESE CONTROL INPUTS UNTIL ROTATION STOPS.**

   Premature relaxation of the control inputs may extend the recovery.
6. **AS ROTATION STOPS, NEUTRALIZE RUDDER, AND MAKE A SMOOTH RECOVERY FROM THE RESULTING DIVE.**

NOTE

If disorientation precludes a visual determination of the direction of rotation, the symbolic airplane in the turn coordinator may be referred to for this information.

End of section 3

Section 4
NORMAL PROCEDURES

Table of contents

Normal procedures

4.1 INTRODUCTION

This Section contains instructions and recommended procedures which are peculiar to the operation of this airplane.

For definition of terms, abbreviations and symbols used in this Section refer to Section 1.

4.1.1 General

The preflight check shall be accomplished prior the first flight of the day and after each change of pilot in command.

The preflight check shall be made according to this checklist.

Items that need to be checked each flight before takeoff are described in a separate preflight checklist.

4.1.2 SPEEDS FOR NORMAL OPERATION

Unless otherwise noted, the following speeds are based on a maximum weight of 650 kg (1433 lbs) and may be used for any lesser weight.

katsotaan miten koelennot näyttää

Takeoff:

Normal Climb Out .... 51 kts

Short Field Takeoff, Flaps 10°, Speed at 50 Feet.................... 51 kts

Climb, Flaps Up:

Normal .... 59 kts

Best Rate of Climb, Sea Level .... 54 kts

Best Rate of Climb, 10,000 Feet .... 54 kts

Best Angle of Climb, Sea Level thru 10,000 Feet....................51 kts

Landing Approach:
- Normal Approach, Flaps Up .... 58 kts
- Normal Approach, Flaps 30° .... 54 kts
- Short Field Approach, Flaps 40° .... 51 kts

Balked Landing:
- Maximum Power, Flaps 20° .... 55 kts

Maximum Recommended Turbulent Air Penetration Speed:
- 650 kg (1433 lbs) .... 89 kts
- 600 kg .... kts
- 552 kg .... kts

Maximum Demonstrated Crosswind Velocity .... 10?? kts

4.2 PREPARATION FOR FLIGHT

4.2.1 Flight Planning

Refer to Section 4 and 5 to determine required fuel, airspeeds and power settings for takeoff, climb, cruise, hovering and landing data necessary to accomplish the mission.

4.2.2 Mass and Balance

The takeoff and anticipated landing gross mass and balance should be obtained before takeoff and checked against mass and load limits and center of gravity restrictions (see Section 2).

4.3 PREFLIGHT CHECK

4.3.1 General

The preflight check is not a detailed mechanical inspection, but essentially a visual check of the airplane for correct condition.

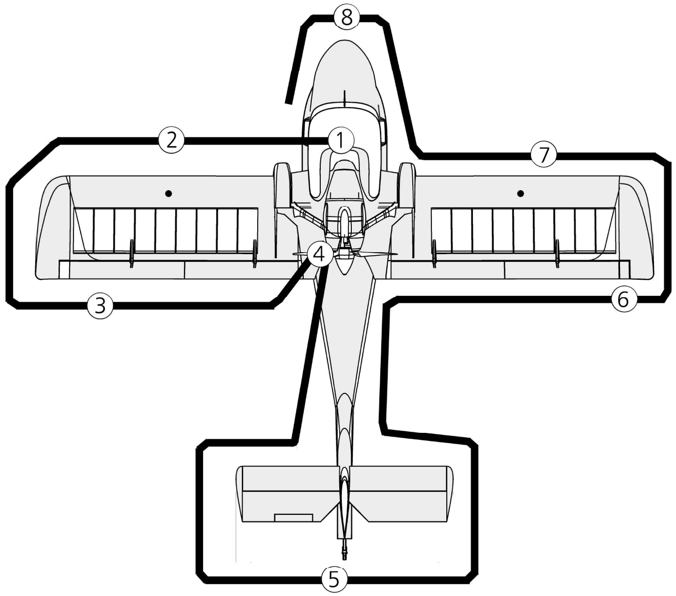
When unusual local conditions dictate, the extent of this check shall be increased as necessary to promote safe operation.

4.3.2 Exterior Check

The exterior check is laid out as a walk-around check, starting forward right at the pilot’s door, proceeding clockwise to the tail, to the left hand side (including the upper and lower areas of the airplane) and is completed at the airplane nose area.

NOTE

- *The airplane shall be headed preferably into the wind.*
- *The area around the airplane should be clear of all foreign objects.*
- *When the battery is used, the operation of electrical equipment should be kept to a minimum.*



NOTE: Visually check airplane for general condition during walk-around inspection. In cold weather, remove even small accumulations of frost, ice or snow from wing, tail and control surfaces. Also, make sure that control surfaces contain no internal accumulations of ice or debris.

Figure 4-1. Preflight Inspection

In all positions check for any abnormality, if any found consult nearest professional mechanic. (??)

Before first flight of a day and after each refuelling, use sampler cup and drain small quantity of fuel, check if clean and waterfree.

When removing any caps, cover or similar, verify after check the closing. When checking for quantity, pressure or position of an item refer to relevant section in POH.

Before check:

1. airplane and mission forms and documents ... check, complete, valid
2. weight, CG .... calculate, check
3. covers and tie-downs .... removed
4. ice and snow (if any) .... removed
5. ground handling accessories .... removed

CHECKLIST PROCEDURES

1 cabin

1. control lock .... remove
2. ignition switch .... OFF
3. main power switch (in eng comp) .... ON
4. battery power cut-off .... push ON
5. master switch .... ON
6. fuel indicators .... check quantity
7. master switch .... OFF
8. fuel shutoff valves .... push all ON
9. canopy... check

2 left wing leading edge

1. gear & tyre .... check
2. wing leading edge .... check
3. fuel cap & fuel qty & fuel drainage .... open/check/close

3 left wing trailing edge

1. aileron & flaps .... check
2. wing mechanism lock .... check

4 engine

1. engine pylon .... check
2. propeller .... rotate, check
3. engine oil .... check

Turn the propeller slowly by hand in direction of engine rotation several times to pump oil from the engine into the oil tank.

It is essential to build up compression in the combustion chamber. Maintain the pressure for a few seconds to let the gas flow via the piston rings into the crankcase. The speed of rotation is not important but the pressure and the amount of gas which is transfered into the crankcase is.

This process is finished when air is returning back to the oil tank and can be noticed by a gurgle from the open oil tank.

Oil level should be between min and max lines of the dipstick. Volume between lines is one liter. Fill if needed.

Maximum allowed oil consumption is 0,06 liter/hour.

4) oil tank cover .... close

NOTE: The oil level should be in the upper half (between the “50%“ and the “max“ mark) and should never falls below the “min“ mark. Prior to long flights oil should be added so that the oil level reaches the “max“ mark.

5. engine coolant level .... check

Control of the coolant level can be made on cold engine only.

6. rear fuselage .... check

5 empennage

1. stabilisers, control surfaces .... check
2. tail wheel, wires, attachment .... check
3. elevator mechanism locs .... check
4. tie downs .... remove
5. elevator, rudder, freedom of movement .... check
6. right side of rear fuselage................................ check
7. right side of engine pylon .... check

6 right wing trailing edge

1. Wing mechanism lock .... check
2. aileron & flaps .... check

freedom of movement and security

7 right wing leading edge

1. wing leading edge.. check
2. fuel cap & fuel qty & fuel drainage .... open/chk/close
3. fuel filler cap... close and check tight
4. gear & tyre .... check

8 bow / nose

1. fuselage .... check
2. forward compartment, hatch .... check, secure
3. tie downs removed, fwrd comp locked.......... check
4. bilge pumps tubes .... check
5. pitot & static source.. check

4.3.3 Interior Check

1. preflight inspection .... complete
2. fuel shutoff valve .... ON
3. radios, electrical equipment .... OFF
4. circuit breakers .... check in
5. all switches .... OFF or NORM

4.4 ALTIMETER SETTING

Before takeoff, the pressure scales of all altimeter shall be set and checked.

If it appears that an erroneous QNH/QFE value has been obtained, check the QNH/QFE value.

4.5 STARTING ENGINE

4.5.1 Before starting engine

1. passagers .... briefed
2. seats, seat belts & harnesses .... chk
3. eletrics .... OFF
4. breakers .... chk/set ??
5. landing gear .... DOWN
   on land

4.5.2 Starting Engine

1. fuel selector .... all OPEN
2. throttle position .... set, 2 cm open
3. main power .... ON
4. beacon .... ON
5. prop clear… .... check visually ?? miten
6. fuel pump 1 .... ON
7. LANE A & B .... ON
8. pre heat / glow .... ON
9. start engine .... push
10. throttle .... 1000 rpm
11. engine instruments .... check

oil pressure, check min 0,8 bar, below 1400 rpm
during cold start should not go above 7,0 bar
normal range 1,5 - 5,0 bar

4.5.3 After Engine Starts

1. avionics .... ON/set
2. radio & trpd .... ON/set
3. instruments .... set
3. beacon .... ON
4. engine warm up .... min 50° C
5. flight controls .... free

4.6 TAXING

4.6.1 Checks

Check during land taxing:

1. directional indicator .... shows sensible headings
2. slip indicator .... show correct slip during turns
3 brakes .... work correctly

Taxing can be used for engine warming up period.

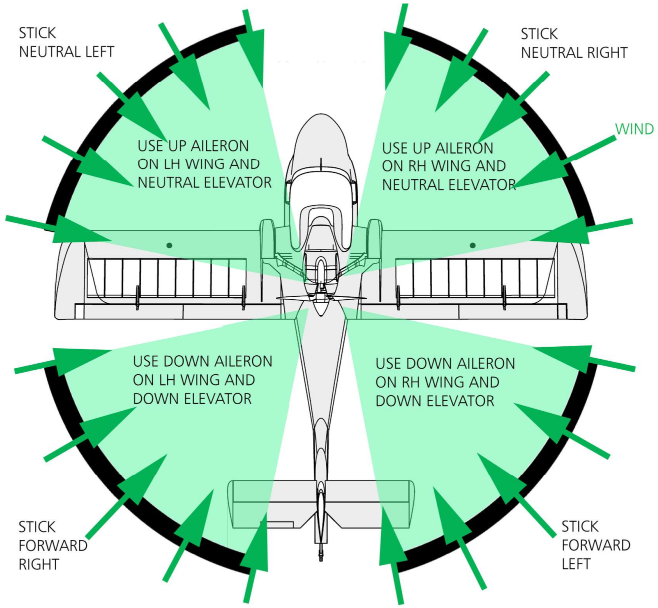
Note: until engine oil temperature reaches 50 °C (120 °F) rpm are limited to max 2000/1000 rpm.

Check during water taxing:

1. water rudder .... DOWN
2. directional indicator .... shows sensible headings
3. slip indicator .... show correct slip during turns
4 bilge pumps .... cycle ON/OFF check functioning
6 bilge pumps .... ON
7 landing gear .... UP

4.6.2 Amplified procedures taxiing

When taxiing, it is important that speed and use of brakes be held to a minimum and that all controls be utilized (see Taxiing Diagram, figure 4- 2) to maintain directional control and balance.



Note *Strong quartering tail winds require caution. Avoid sudden bursts of the throttle and sharp braking when taxing airplane. Use the steerable tail wheel and rudder to maintain direction.*

Figure 4-2. Taxiing Diagram

4.7 PRE-TAKEOFF CHECK

4.7.1 Checklist

1. canopy .... closed
   check locking
2. seat belts & harness .... secured
3. flight controls .... free
4. flaps .... set
5. trim .... set
6. flight & engine instruments .... check
7. fuel .... check hana vai määrä??

on land

8.	brakes	ON
9.	flight controls	full aft

on water

8.	landing gear	DOWN
9.	flight controls	full aft

land and water:

10.	throttle up 4000rpm	check
11.	LANE selector switch A	OFF observe rpm drop
12.	LANE selector switch A	ON
13.	LANE selector switch B	OFF observe rpm drop
14.	LANE selector switch b	ON
15.	throttle	4000 rpm
16.	aux fuel pump	OFF (max 5 sec) observe fuel pressure
17.	aux fuel pump	ON
18.	main fuel pump	OFF (max 5 sec) observe fuel pressure
19.	main fuel pump	ON

on water

20.	landing gear	UP

(rpm drop with either ignition circuit should not exceed 250 rpm).

Some engine readings are not available when performing LANE check.

Lane A = OFF, coolant temp, EGT, ambien temp, throttle level position are not working,

Lane B = OFF, oil temp, oil pressure are not working.

Fuel pressure must stay within limits during test.

If oil temperature is below 50°C, warm engine now until 50°C is reached.

4.8 TAKEOFF

4.8.1 NORMAL TAKEOFF, Land

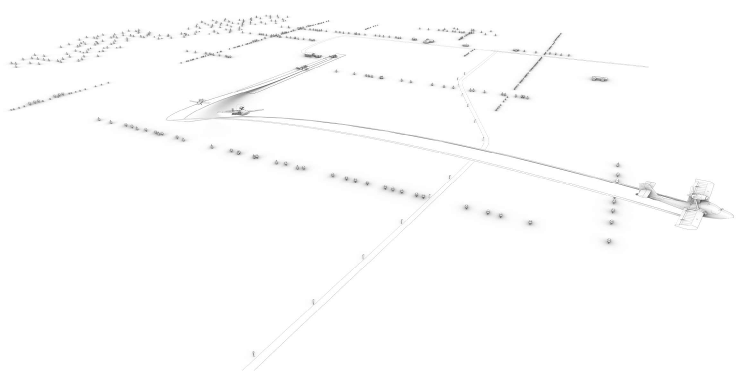
1.	line up	check wind
2.	wing flaps	up
3.	elevator trim	takeoff setting
3.	engine instruments	no warning lights
4.	transponder	ALT

5. fuel pumps.. both ON
6. throttle .... full OPEN
7. elevator control .... slightly forward to raise tail

lifting off below 50 kts can extend takeoff run a lot.

8. airspeed.. 55 kts
7. elevator control .... back pressure to lift off
8. climb speed .... 65 kts

until all obstacles are cleared. Then select climb speed using data in section 4.

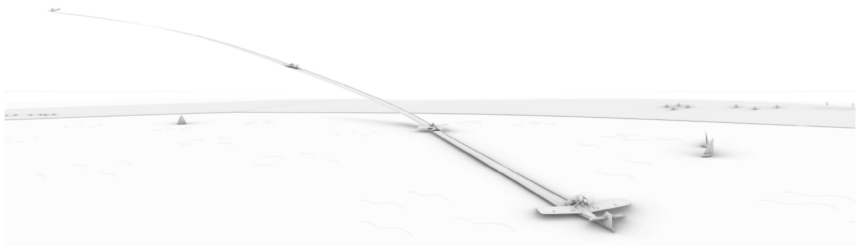


4.8.2 NORMAL TAKEOFF, Water

1. line up .... check wind, review climb path
2. wing flaps .... up
3. elevator trim .... takeoff setting
4. engine instruments.. no warning lights
5. transponder .... ALT
6. fuel pumps.. both ON
7. water rudder... UP
8. elevator control .... full aft
9. throttle .... gently full OPEN
10. elevator control .... move forward when nose stops rising to attain planing attitude (on the step)
11. airspeed.. 40-50 kts

12. elevator control .... apply light back pressure to lift off
13. climb speed .... 65 kts

until all obstacles are cleared. Then select climb speed using data in section 4.



4.8.3 Amplified procedures TAKEOFF

WING FLAP SETTINGS

Normal takeoffs are accomplished with wing flaps 0°- 10°. Using 10° wing flaps reduces the total distance over an obstacle by approximately 10%. Flap deflections greater than 10° are not approved for takeoff. If 10° wing flaps are used for takeoff, they should be left down until all obstacles are cleared and a safe flap retraction speed of 69 kts is reached.

On a short field, 10° wing flaps and an obstacle clearance speed of 62 kts should be used. This speed provides the best overall climb speed to clear obstacles when taking into account turbulence often found near ground level.

Soft or rough field takeoffs are performed with 10° wing flaps by lifting the airplane off the ground as soon as practical in a slightly tail-low attitude. If no obstacles are ahead, the airplane should be leveled off immediately to accelerate to a higher climb speed.

Takeoffs into strong crosswinds normally are performed with the minimum flap setting necessary for the field length, to minimize the drift angle immediately after takeoff. The airplane is accelerated to a speed slightly higher than normal, then pulled off abruptly to prevent possible settling back to the runway while drifting. When clear of the ground, make a coordinated turn into the wind to correct for drift.

USE OF POWER

After full throttle is applied, adjust the throttle friction lock clockwise to prevent the throttle from creeping back from a maximum power position. Similar friction lock adjustment should be made as required in other flight conditions to maintain a fixed throttle setting.

POWER CHECK

It is important to check during start that engine is producing full power. During take-off run observe that at full throttle and rpm setting engine is producing 2280 - 2320 rpm.

4.9 Noise abatement

4.9.1 Guidelines for low noise operations

The following guidelines are used to operate the ATOL LSA 650 in noise sensitive areas. These guidelines are recommendations only. The flight procedures remain under the pilot's responsibility, according to local regulation restrictions and Pilot's Operating Handbook limitations.

4.9.2 General

- Adopt a flight path as far as possible from sensitive areas.
- For flights over sensitive areas prefer a flight path along the noisiest route (motorway, railway, etc.).

4.9.3 Operating in sensitive areas

Take–off and climb from runway in sensitive area:

Climb with Take-off Power maintaining Vy for the best rate of climb.

Overflights:

- If possible increase the height above ground level to lower the noise effect.
- Where possible fly at least 1000 ft AGL.

4.9.4 Take–off and landing from/to a runway in a non sensitive area but adjacent to neighbouring sensitive areas (seaside areas for example)

- If possible select a take–off flight path opposite to the sensitive area. Accelerate until Vy is reached, then start to climb at Vy with max power in order to achieve the best rate of climb.
- If possible for landing adopt a flight path facing the sensitive area. Select Vy, with a rate of descent close to 500 ft/min. Final approach according to Normal Procedures.

4.9.5 Atmospheric wind effect

Adopt a flight path leading to the downwind side of the sensitive area.

4.10 ENROUTE OPERATION

4.10.1 EN ROUTE CLIMB

1. airspeed .... 65 kts

   NOTE *If a maximum performance climb is necessary, use speeds shown in the Rate Of Climb chart in Section 5.*

2. throttle .... 5500 rpm
3. landing gear .... UP
4. flaps .... UP
5, elevator trim .... set

4.10.2 CRUISE

1. throttle .... 1700-2260 rpm

see section 5 for cruise settings

2. elevator trim .... set

4.10.3 ENROUTE CLIMB

Normal climbs are performed with flaps up and full throttle and at speeds 5 to 10 kts higher than best rate-of-climb speeds for the best combination of performance, visibility and engine cooling. If an obstruction dictates the use of a steep climb angle, the best angle-of-climb speed should be used with flaps up and maximum power. Best rate of climb speed is 67 kts at sea level and decreases to 63 kts at 7500 ft altitude.

Climbs at speeds lower than the best rate-of-climb speed should be of short duration to improve engine cooling.

4.10.4 CRUISE

Normal cruising is performed between 55% and 75% power. The engine rpm and corresponding fuel consumption for various altitudes can be determined by using the data in Section 5.

The data in Section 5 shows the increased range and improved fuel economy that is obtainable when operating at lower power settings. The use of lower power settings and the selection of cruise altitude on the basis of the most favorable wind conditions are significant factors that should be considered on every trip to reduce fuel consumption.

4.11 DESCENT, PRE-LANDING CHECK

1. altimeter .... set (QNH / QFE)
2. electric fuel pumps .... ON
3. verify planned landing surface:

land

a. landing gear .... DOWN

water

b. landing gear .... UP

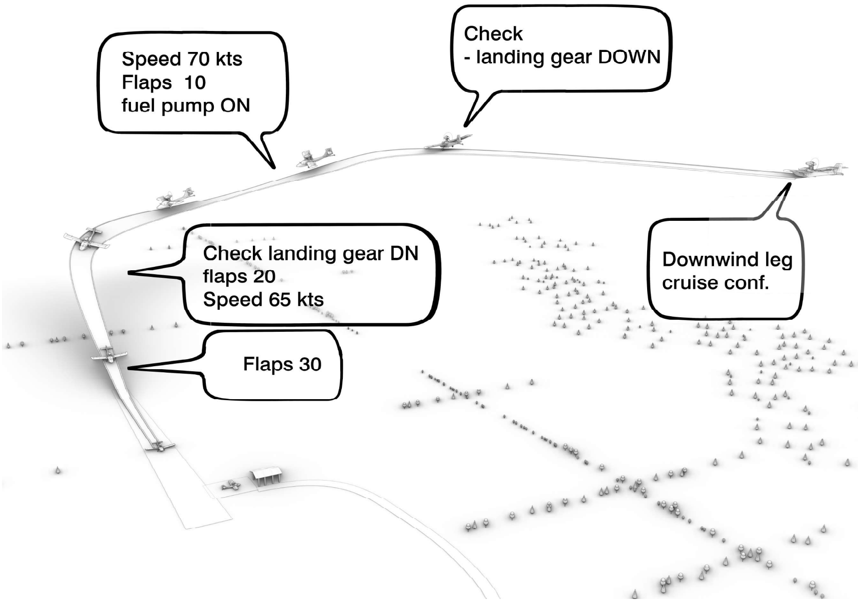
4.12 APPROACH AND LANDING

4.12.1 APPROACH FOR LANDING, Land

1. downwind leg .... check field clear
2. landing gear .... DOWN
3. fuel pumps 1&2 .... ON
4. wingtip floats.. UP
5. speed.. 60 kts
6. base leg / flaps 10
7. fuel pump .... ON
8. final leg / flaps... 20
9. speed.. 55 kts

4.12.2 NORMAL LANDING, Land

1. threshold / flaps... 30
2. speed.. 55 kts
3. touchdown .... main wheels first
4. landing roll .... steer with rudder
5. braking .... minimum required



4.12.3 AFTER TOUCHDOWN

1. wing flaps .... retract
2. transponder .... STFBY
3. electric fuel pump .... OFF
4. canopy... OPEN
   (max speed 11 kts)

4.12.4 APPROACH FOR LANDING, Water

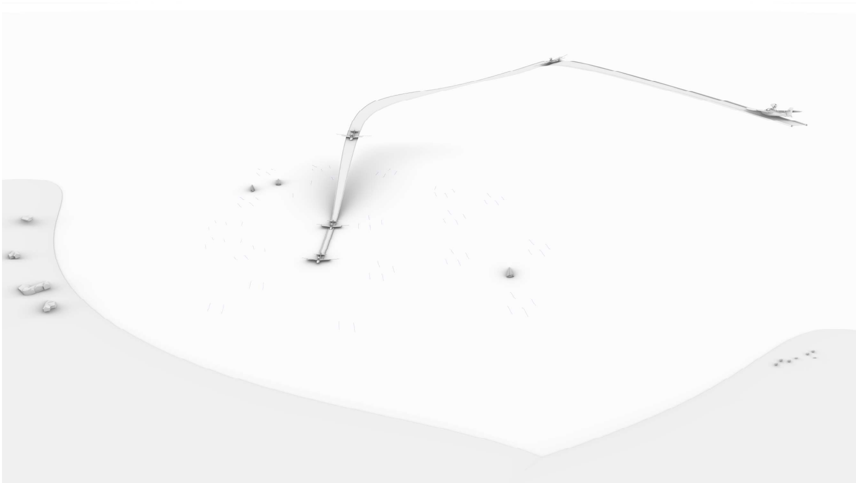
1. downwind leg .... check field clear
2. landing gear .... UP
3. water rudder.. UP
4. fuel pumps 1&2 .... ON
5. wingtip floats.. DOWN
6. speed.. 60 kts
7. base leg / flaps 10
8. fuel pumps.. ON
9. final leg / flaps 20
10. speed.. 55 kts

4.12.5 NORMAL LANDING, Water

1. threshold / flaps... 30
2. speed.. 55 kts
3. touchdown .... level attitude
4. elevator .... keep nose up

   speed; when dropping from step

5. water rudder.. DOWN



4.12.3 LANDING AMPLIFIED PROCEDURES

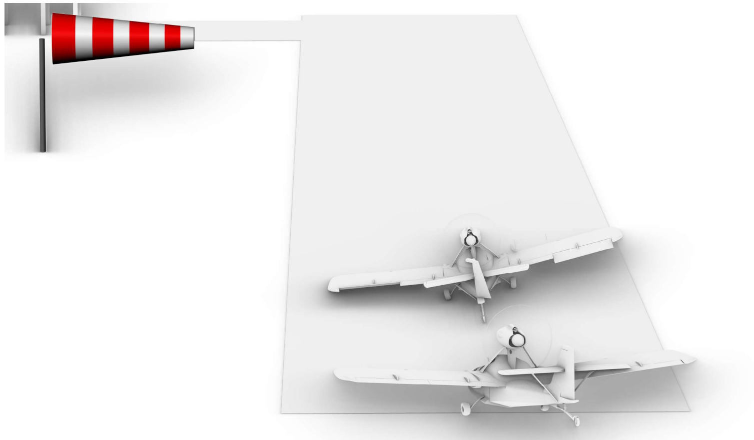
LANDING

Normal landing approaches can be made with power-on or power-off at speeds of 70 - 80 kts with flaps up, and 60-70 kts with flaps down. Surface winds and air turbulence are usually the primary factors in determining the most comfortable approach speeds.

Actual touchdown should be made with power-off and on the main wheels first. The nose wheel should be lowered smoothly to the runway as speed is diminished.

CROSSWIND LANDING

When landing in a strong crosswind, use the minimum flap setting required for the field length. Use a wing low, crab, or a combination method of drift correction and land in a nearly level attitude.



BALKED LANDING

In a balked landing (go-around) climb, the wing flap setting should be reduced to 20° immediately after full power is applied. Upon reaching a safe airspeed, the flaps should be slowly retracted to the full up position.

4.13 Missed approach

1. throttle .... full OPEN
4. wing flaps .... retract to 20°
5. airspeed .... 63 kts
6. wing flaps .... retract (slowly)

4.14 ENGINE SHUTDOWN

1. wing flaps .... UP
3. parking brake .... set
5. throttle... idle

6. radios, electrical equipment .... OFF
7. lane B switch .... OFF
8. lane A switch .... OFF
9. fuel pumps... OFF
10. main power switch .... OFF

4.15 POSTFLIGHT CHECK

1. main power.. OFF
2. Master Power switch .... OFF
3. fuel cut offs.. OFF
4. flight control lockpin .... installed
5. canopy.. close
6. covers .... as req
7. tie down... as req
8. flight details .... recorded in journey log

4.16 COLD WEATHER OPERATION

Prior to starting with temperatures below freezing, it is advisable to pull the propeller through several times by hand to "break loose" or "limber" the oil, thus conserving battery energy.

NOTE When pulling the propeller through by hand, treat it as if the ignition switch is turned on. A loose or broken ground wire on either ignition could cause the engine to fire.

Engine preheat is generally required with outside air temperatures is below -18°C and is recommended when temperatures are below -7 °C.

Note1: Engine start is not recommended when oil temperature is below -20 °C.

Note2: When engine oil is cold, oil pressure will be high during warm up period. This is normal.
Allowed maximum oil pressure at start and warming period is 7,0 bar.

After a suitable warm-up period (2 to 5 minutes at 1000 rpm), accelerate the engine several times to higher engine rpm. If the engine accelerates smoothly and oil pressure remains normal and steady, the airplane is ready for takeoff (when oil temperature has risen to min 50 °C).

end of section 4

Section 5
PERFORMANCE

Table of contents

5.1 Approved performance data

5.1.1 INTRODUCTION

Performance data charts on the following pages are presented so that you may know what to expect from the airplane under various conditions, and also, to facilitate the planning of flights in detail and with reasonable accuracy. The data in the charts has been computed from actual flight tests with the airplane and engine in good condition and using average piloting techniques.

It should be noted that the performance information presented in the range and endurance profile charts allows for 20 minutes reserve fuel based on 45% power. Fuel flow data for cruise is based on the recommended lean mixture setting. Some indeterminate variables such as mixture leaning technique, fuel metering characteristics, engine and propeller condition, and air turbulence may account for variations of 10% or more in range and endurance. Therefore, it is important to utilize all available information to estimate the fuel required for the particular flight.

5.1.1.2 USE OF PERFORMANCE CHARTS

Performance data is presented in tabular or graphical form to illustrate the effect of different variables. Sufficiently detailed information is provided in the tables so that conservative values can be selected and used to determine the particular performance figure with reasonable accuracy.

5.1.1.3 SAMPLE PROBLEM

The following sample flight problem utilizes information from the various charts to determine the predicted performance data for a typical flight. The following information is known:

AIRPLANE CONFIGURATION

Takeoff weight	692 kg
Usable fuel	85 liters (22.5 Gallons)

TAKEOFF CONDITIONS

Field pressure altitude	1500 Feet
Temperature	28°C (16°C above standard)
Wind component along runway	12 Knot Headwind
Field length	3500 Feet

5.2 DENSITY ALTITUDE

The density altitude chart (Figure 5-7) expresses density altitude in terms of pressure altitude and temperature, as well as the true airspeed factor $1/S\sigma$ as a function of density altitude.

EXAMPLE: (see Figure 5-7)

Determine:
- Density altitude (DA)
- True airspeed factor
- True airspeed (TAS)

Known:		
	OAT	–14 °C
	Pressure altitude	5000 ft
	CAS	100 kt

Solution: DA = 2700 ft; $1/S\sigma$ = 1.04; TAS = 104 kt;

1. Enter chart at known OAT (–14 °C)
2. Move vertically upwards to known pressure altitude (5000 ft).
3. Move horizontally left and read density altitude (2700 ft).
4. Move horizontally right and read true airspeed factor (1.04).
5. Multiply the known calibrated airspeed (100 kt) by true airspeed factor ($1/S\sigma$ = 1.04) to obtain true airspeed.
6. TAS = CAS x $1/S\sigma$ = 100 x 1.04 = 104 knots

fig 5-7 DENSITY ALTITUDE CHART

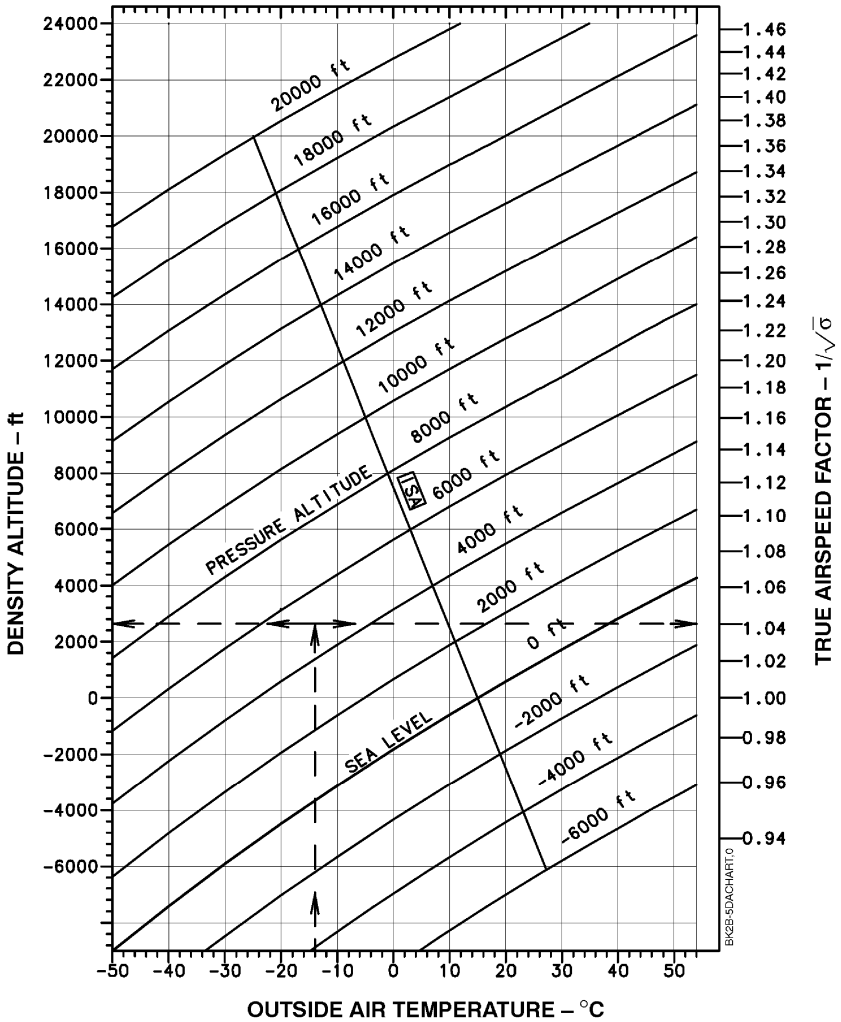


Fig. 5-7 Density - Altitude chart

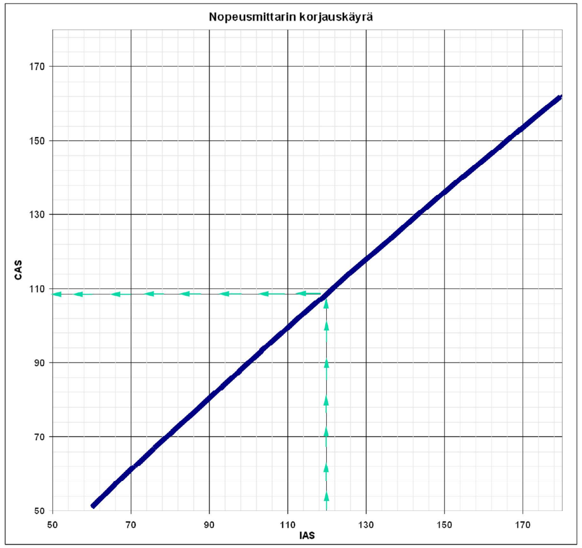
5.3 AIRSPEED SYSTEM CALIBRATION

CONDITION:

Power required for level flight or maximum rated RPM dive.

FLAPS UP											
IAS mph	40	50	60	70	80	90	100	110	120	130	140
CAS mph	49	57	65	73	82	91	100	110	119	129	139
FLAPS FULL											
IAS mph	40	50	60	70	80	90	100	-	-	-	-
CAS mph	46	55	63	72	81	89	98	-	-	-	-

Figure 5-1. Airspeed Calibration



5.4 TEMPERATURE CONVERSION CHART

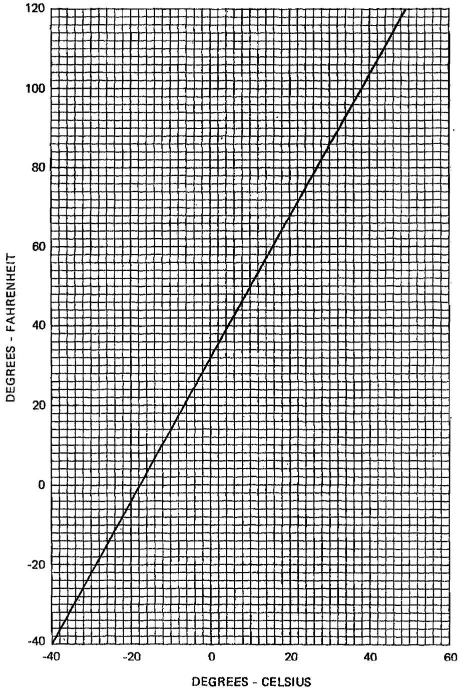


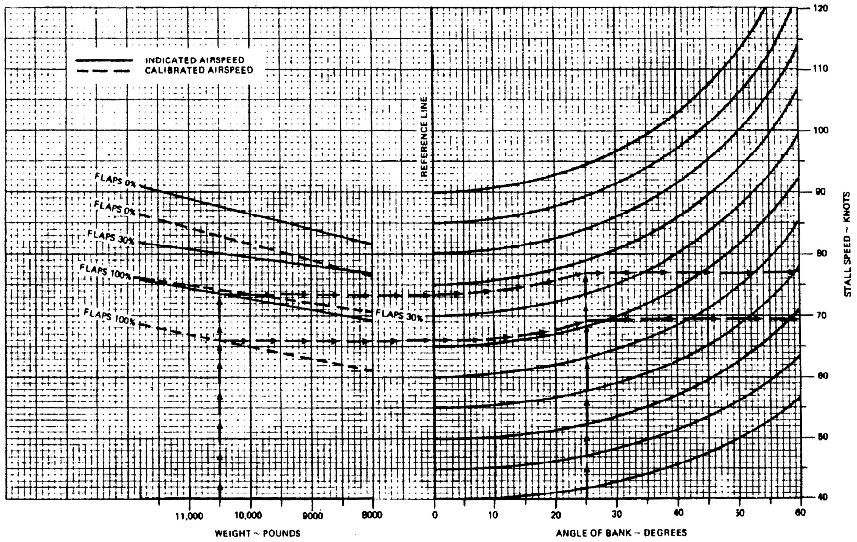
Figure 5-2. Temperature Conversion Chart

5.5 STALL SPEEDS

CONDITIONS: Power Off, weight 726 kg
speeds IAS mph

WEIGHT kg	FLAP DEFLECTION	ANGLE OF BANK			
		0°	20°	40°	60°
		mph IAS	mph IAS	mph IAS	mph IAS
726	UP	47	50	58	76
	10°	43	46	51	67
	40°	42	44	49	64

Figure 5-3. Stall Speeds



5.6 TAKEOFF

The takeoff distance chart, figure 5-4, should be consulted, keeping in mind that the distances shown are based on the short field technique. Conservative distances can be established by reading the chart at the next higher value of altitude and temperature. For example, in this particular sample problem, the takeoff distance information presented for a pressure altitude of 4000 feet and a temperature of ISA + 22°C should be used and results in the following:

Ground roll	387 m
Total distance to clear a 50-foot obstacle	770 m

These distances are well within the available takeoff field length. However, a correction for the effect of wind may be made based on Note 3 of the takeoff chart. The correction for a 12 knot headwind is:

$$\frac{12\ \text{kts}}{9\ \text{kts}} \times 10\ \% = 13\ \%\ \text{decrease}$$

This results in the following distances, corrected for wind:

Ground roll, zero wind	387 m
Decrease in ground roll (387 m x 13%)	50 m
Corrected ground roll	337 m
Total distance to clear a 50-foot obstacle, zero wind	770 m
Decrease in total distance (770 m x 13%)	100 m

Corrected total distance to clear 50-foot obstacle 670 m

If the available runway is not clearly longer than this, interpolation of values is needed. In this case you have to use distances of 0 ft and 4000 ft, and at temperatures of ISA and ISA +22 °C.

At ISA

at 0 ft	Ground roll = 216 m	total distance = 426 m
at 4000 ft	Ground roll = 308 m	total distance = 609 m

Interpolating for 1500 ft at ISA:

$$x_{roll} = \frac{H}{H2-H1} \cdot (x_{roll-2} - x_{roll-1}) + x_{roll-1}$$

$$x_{roll} = \frac{1500ft}{4000ft-0ft} \cdot (308m - 216m) + 216m = 251m$$

$$x_{to15} = \frac{H}{H2-H1} \cdot (x_{ro15-2} - x_{ro15(-1)}) + x_{to15-1}$$

$$x_{to15} = \frac{1500ft}{4000ft-0ft} \cdot (609m - 426m) + 426m = 495m$$

At ISA+22 °C

at 0 ft	Ground roll = 263 m	total distance = 516 m
at 4000 ft	Ground roll = 387 m	total distance = 770 m

Interpolating for 1500 ft at ISA +22°C:

$$x_{roll} = \frac{H}{H2-H1} \cdot (x_{roll-2} - x_{roll-1}) + x_{roll-1}$$

$$x_{roll} = \frac{1500ft}{4000ft-0ft} \cdot (387m - 263m) + 263m = 310m$$

$$x_{to15} = \frac{H}{H2-H1} \cdot (x_{ro15-2} - x_{ro15(-1)}) + x_{to15-1}$$

$$x_{to15} = \frac{1500ft}{4000ft-0ft} \cdot (770m - 516m) + 516m = 611m$$

For ISA +16 °C:

$$x_{roll} = \frac{\Delta T}{\Delta T2-\Delta T1} \cdot (x_{roll-2} - x_{roll-1}) + x_{roll-1}$$

$$x_{roll} = \frac{16°C}{22°C-0°C} \cdot (310m - 251m) + 251m = 294m$$

$$x_{to15} = \frac{\Delta T}{\Delta T2-\Delta T1} \cdot (x_{ro15-2} - x_{ro15(-1)}) + x_{to15-1}$$

$$x_{to15} = \frac{16°C}{22°C-0°C} \cdot (611m - 495m) + 495m = 479m$$

These are for calm wind conditions. So we need also wind correction as before:

$$\frac{12\ \text{kts}}{9\ \text{kts}} \times 10\ \% \;=\; 13\ \%\ \text{decrease}$$

Roll distance: 294m-0,13*294m = 256 m

total distance: 579m -0,13*579m = 504 m

5.7 LANDING

A procedure similar to takeoff should be used for estimating the landing distance at the destination airport. Figure 5-1.0 presents landing distances for various airport altitude and temperature combinations using the short field technique.

Field pressure altitude	2000 Feet
Temperature	25°C
Field length	3000 Feet

Deviation from ISA +16 °C

Total distance to clear a 50-foot obstacle

346 m +(16°C/33°C)*0,1*346 m = 363 m

Ground roll

143 m +(16°C/33°C)*0,1*143 m = 150 m

A correction for the effect of wind may be made based on Note 2 of the landing chart using the same procedure as outlined for takeoff.

5.8 TAKEOFF DISTANCE, land

CONDITION: Flaps 10°
Paved, Level, Dry Runway
take-off weight 650 kg

Full Throttle Prior to Brake Release
Zero Wind

NOTES:

1. *Normal technique as specified in Section 4.*
2. *Speed at 50 ft 55 kts (IAS)*
3. *Decrease distances 10% for each 9 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots.*
4. *For operation on a dry, grass runway, increase distances by 15% of the "ground roll" figure.*

	Sea Level			4000 ft			8000 ft		
	OAT	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	OAT	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	OAT	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
difference from ISA °C	°C	m	m	°C	m	m	°C	m	m
-33	-18	158	314	-26	221	438	-34	312	621
0	+15	216	426	+7	308	609	-1	456	915
+22	+37	263	516	+29	387	770	+21	589	1204

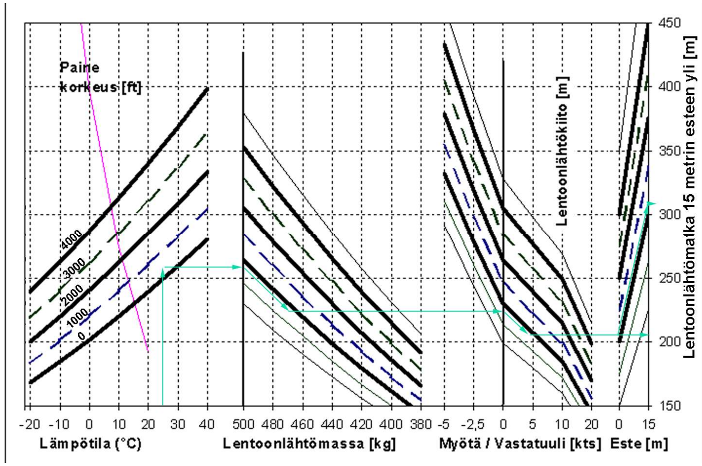


Figure 5-4. Takeoff Distance

5.9 TAKEOFF DISTANCE, water

CONDITION: Flaps 10° — Full Throttle
wave heights <0,1 m — Zero Wind
take-off weight 650 kg

5.10 RATE OF CLIMB

MAXIMUM

CONDITIONS: Flaps Up   Full Throttle

650 kg (1433 lbs)

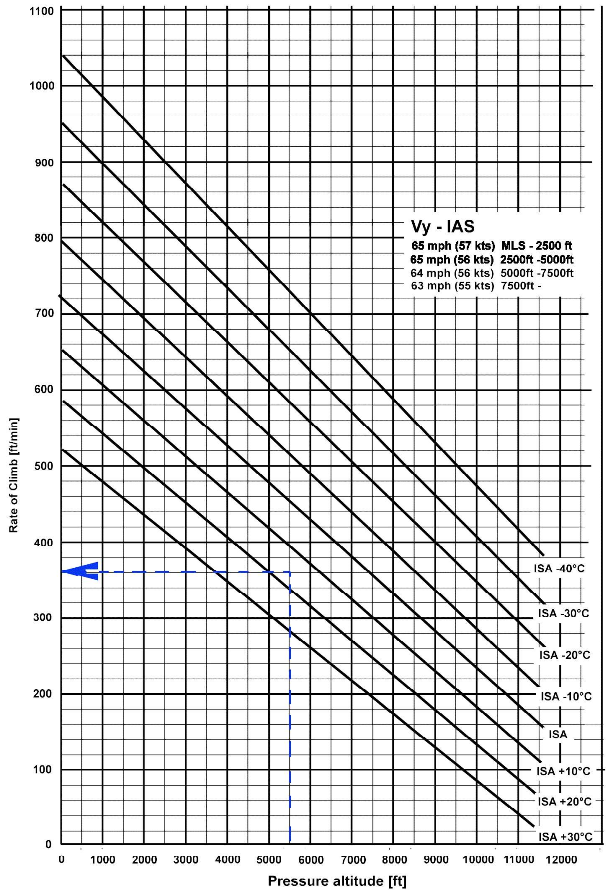


Figure 5-5. Rate of Climb

Example:

mass:	650 kg	pressure altitude 5500 ft
OAT:	20 °C	-> roc 360 fpm, Vy 65 mph (56 kts)

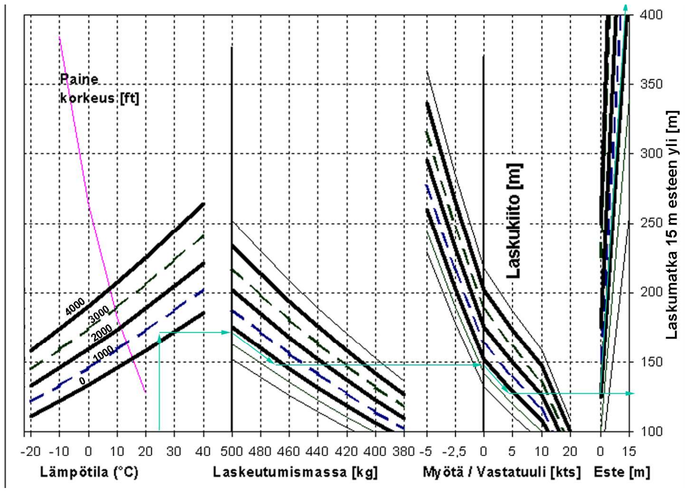
5.11 LANDING DISTANCE, land

CONDITIONS:

Flaps 40° | Power Off
Maximum Braking | Paved, Level, Dry Runway
Zero Wind

NOTES:

1. *Normal technique as specified in Section 4.*
2. *Decrease distances 10% for each 9 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots.*
3. *For operation on a dry, grass runway, increase distances by 45% of the "ground roll" figure.*
4. *For each 33° when temperature is over ISA increase distances by 10%.*



WEIGHT kg	SPEED AT 50 FT kts	Sea level 15°C		2500 ft 10°C		5000 ft 5°C		7500 ft 0°C	
		GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
650	55	136	328	143	346	151	364	159	383

Figure 5-10. Landing Distance

5.12 LANDING DISTANCE, land

CONDITIONS:

Flaps 40°	Power Off
Maximum Braking	Paved, Level, Dry Runway
Zero Wind	

NOTES:

1. *Normal technique as specified in Section 4.*
2. *De*

End of section 5.1

Section 5.2
NON-APPROVED PERFORMANCE DATA

Table of contents

5.2.1 INTRODUCTION

Performance data charts on the following pages are presented so that you may know what to expect from the airplane under various conditions, and also, to facilitate the planning of flights in detail and with reasonable accuracy. The data in the charts has been computed from actual flight tests with the airplane and engine in good condition and using average piloting techniques.

It should be noted that the performance information presented here does not allow any reserve fuels. Some indeterminate variables such as, fuel metering characteristics, engine and propeller condition, and air turbulence may account for variations of 10% or more in range and endurance. Therefore, it is important to utilize all available information to estimate the fuel required for the particular flight.

5.2.1.1 USE OF PERFORMANCE CHARTS

Performance data is presented in tabular or graphical form to illustrate the effect of different variables. Sufficiently detailed information is provided in the tables so that conservative values can be selected and used to determine the particular performance figure with reasonable accuracy.

5.2.1.2 SAMPLE PROBLEM

The following sample flight problem utilizes information from the various charts to determine the predicted performance data for a typical flight. The following information is known:

AIRPLANE CONFIGURATION

Takeoff weight	650 kg (1433 lbs)
Usable fuel	80 liters (21.5 Gallons)

CRUISE CONDITIONS

Total distance	260 Nautical Miles
Pressure altitude	5500 Feet

Temperature	17°C (13°C above standard)
Expected wind enroute	10 Knot Headwind

5.2.1.2 CRUISE, example

The cruising altitude should be selected based on a consideration of trip length, winds aloft, and the airplane's performance. A typical cruising altitude and the expected wind enroute have been given for this sample problem. However, the power setting selection for cruise must be determined based on several considerations. These include the cruise performance characteristics presented in figure 5-9.

For pressure altitude of 5500 ft at 20 °C (16°C over ISA) gives density of 7000 ft (fig 5-7 section 4)

power setting	55% (2050 rpm / 21,5 inHg)
speed	86 kts
range available	412 nm
endurance	4,9 h (without reserves)
consumption	17,4 l/h

From climb charts

time to altitude	10 min
Distance travelled	11 nm
Fuel used	9,5 liters

5.2.1.3 FUEL REQUIRED, example

The total fuel requirement for the flight may be estimated using the performance information in figures 5-9. For this sample problem, a climb to 6000 feet requires 9,5 liters of fuel. The corresponding distance during the climb is 11 nautical miles. These values are for a temperature +16 °C.

Headwind of

The resultant cruise distance is:

Total distance	260 nm
Climb distance	-11 nm
Cruise distance	249 Nautical Miles

With an expected 10 knot headwind, the ground speed for cruise is predicted to be:

84
-10
74 Knots

Therefore, the time required for the cruise portion of the trip is:

249 Nautical Miles / 74 Knots = 3.4 Hours

The fuel required for cruise is:

3.4 hours x 17,4 liters/ hour = 58,5 liters

The total estimated fuel required is as follows:

Engine start, taxi, and takeoff	4
Climb	5,5
Cruise	58,5
Total fuel required	68 liters

This will leave a fuel reserve of:

85
-68
17 liters

17 liters corresponds of 1 hour reserve.

Once the flight is underway, ground speed checks will provide a more accurate basis for estimating the time enroute and the corresponding fuel required to complete the trip with ample reserve.

5.2.2 TIME, FUEL, AND DISTANCE TO CLIMB

time to climb

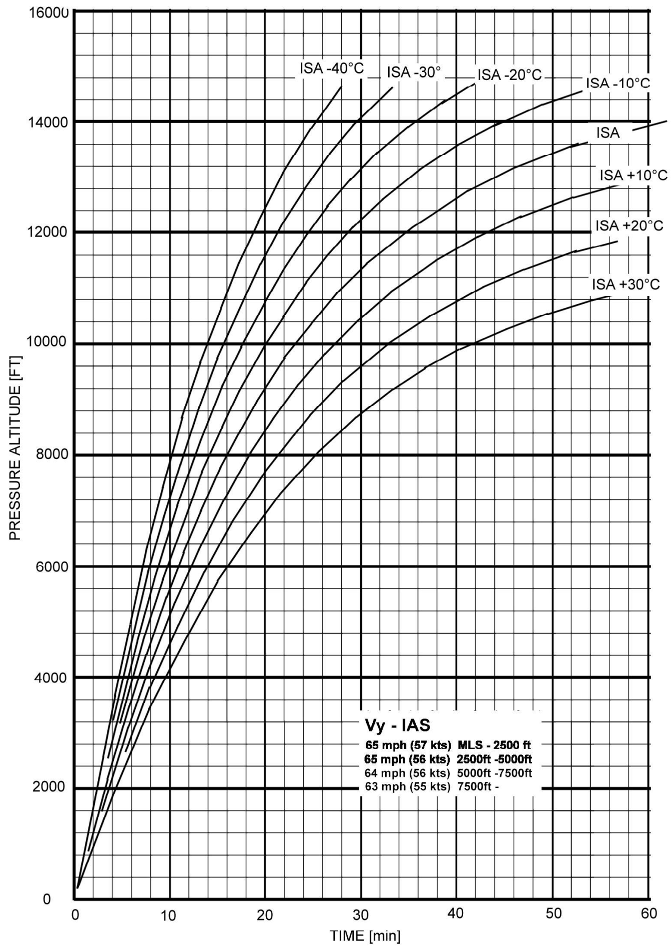


Fig 5-6 Time used during climb

DISTANCE TO FLY

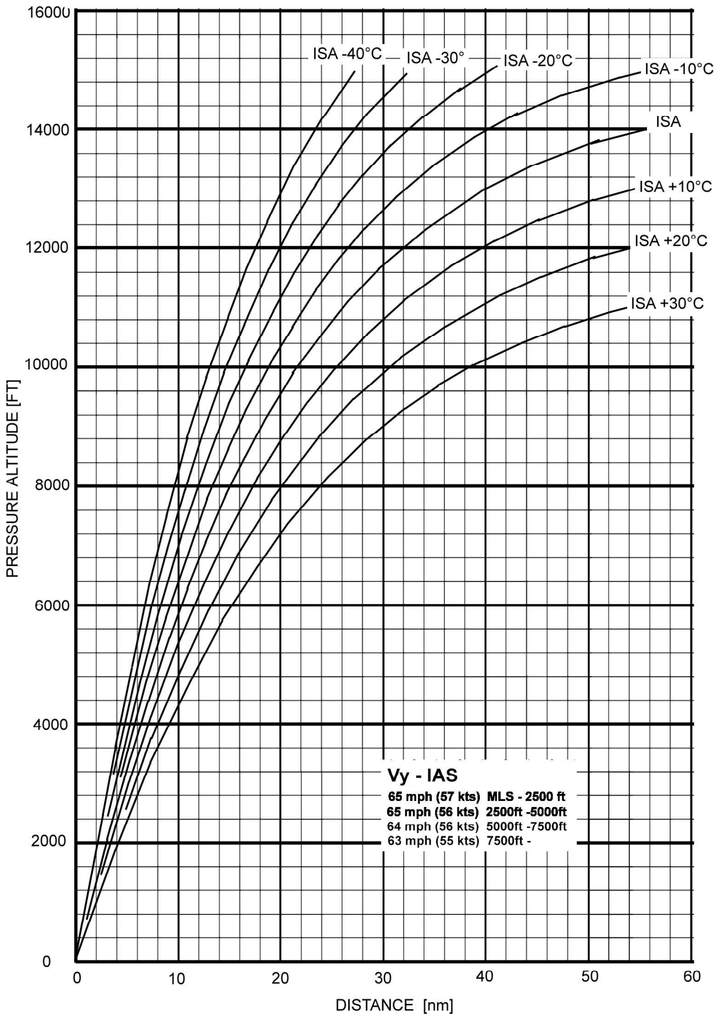


Fig 5-7 Distance travelled during climb

FUEL USED TO ALTITUDE

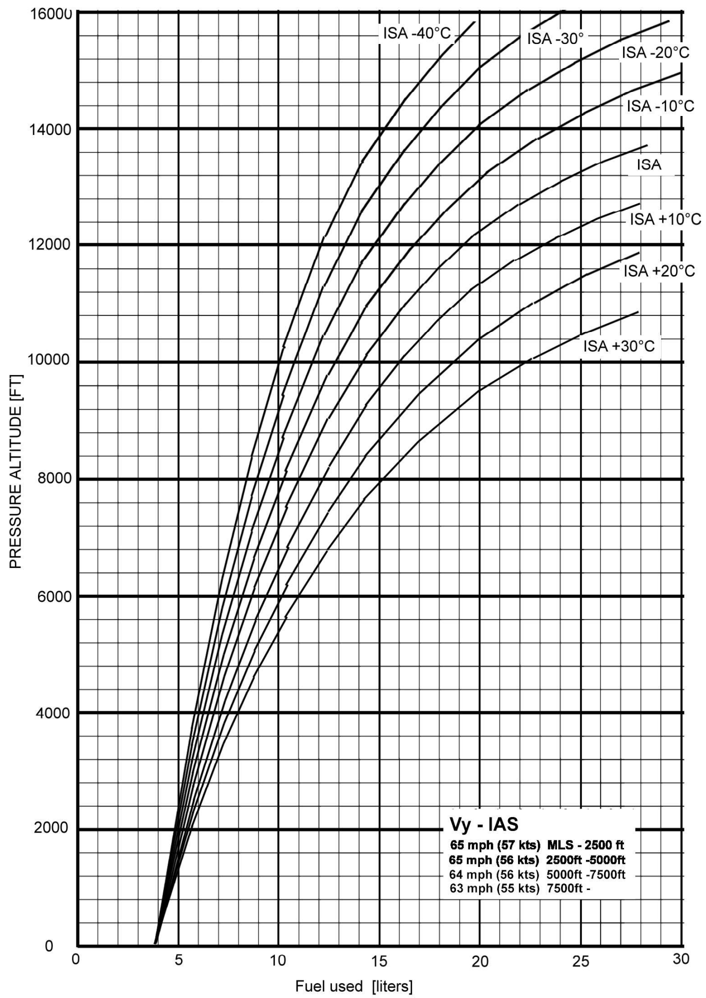


Fig 5-8 Fuel used during climb

Note: For start and taxi 4 liter is reserved

5.2.3 CRUISE PERFORMANCE

CONDITIONS: 650 kg (1433 lbs), gear UP

NOTE: No allowance for start / reserves in endurance or range.

Density altitude	2000 ft	OAT	11 °C			Endurance	Range
% P	[rpm]	MP [inHg]	TAS [mph]	TAS [kts]	Q [lts/h]	[hours]	[nm]
max	2260	27,7	113	98	26,8	3,2	310
85	2260	26,7	111	96	22,4	3,8	365
85	2200	25,7	106	92	18,4	4,6	424
65	2000	24,7	100	87	16	5,3	461
55	1900	24	93	81	14,4	5,9	476

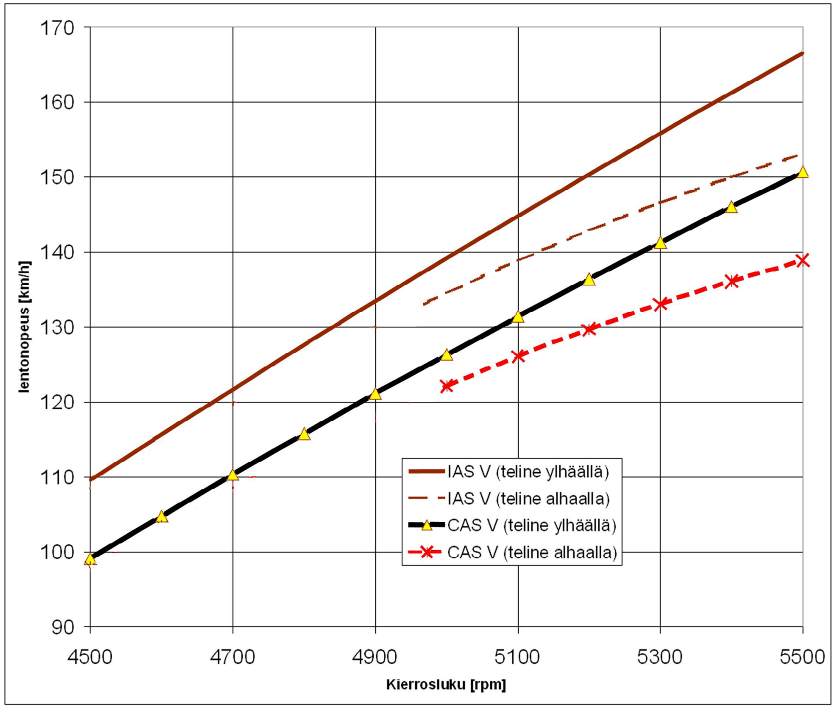
Density altitude	4000ft	OAT	7 °C			Endurance	Range
% P	[rpm]	MP [inHg]	TAS [mph]	TAS [kts]	Q [lts/h]	[hours]	[nm]
85	2260	25,7	112	97	25,2	3,4	327
75	2260	24,3	106	93	19,6	4,3	405
65	2100	23,3	102	88	16,8	5,1	447
55	1900	23,3	95	82	15,6	5,4	447

Density altitude	6000ft	OAT	3 °C			Endurance	Range
% P	[rpm]	MP [inHg]	TAS [mph]	TAS [kts]	Q [lts/h]	[hours]	[nm]
75	2260	23,3	110	95	23,2	3,7	349
65	2200	22,7	104	90	19,6	4,3	390
55	2000	22	96	84	16,8	5,1	423

Density altitude	8000ft	OAT	-1 °C			Endurance	Range
% P	[rpm]	MP [inHg]	TAS [mph]	TAS [kts]	Q [lts/h]	[hours]	[nm]
71	2260	22	109	95	23	3,7	351
65	2200	21,7	105	92	21,2	4	367
55	2100	21	96	85	18	4,7	401

Density altitude	10000ft	OAT	-5 °C			Endurance	Range
% P	[rpm]	MP [inHg]	TAS [mph]	TAS [kts]	Q [lts/h]	[hours]	[nm]
65	2260	20,3	107	93	22,4	3,8	354
55	2200	19,7	99	86	19,2	4,4	383

Figure 5-9. Cruise Performance



End of section 5.2

Section 6
MASS AND BALANCE

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6.1 INTRODUCTION

This section describes the procedure for establishing the basic empty weight and moment of the airplane. Sample forms are provided for reference. Procedures for calculating the weight and moment for various operations are also provided.

It should be noted that specific information regarding the weight, arm, moment and installed equipment list for this airplane can only be found in the appropriate weight and balance records carried in the airplane.

6.1.1 Airplane weighing procedures

Note

Only an approved maintenance organisation has authority to perform weighing!

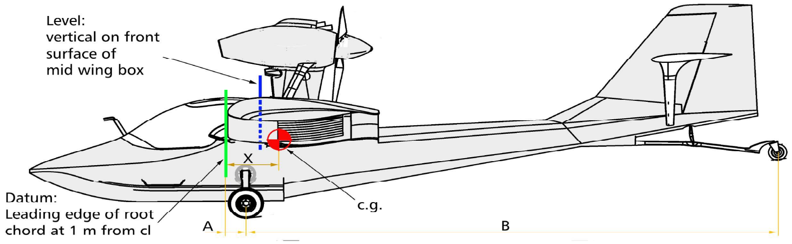
1. Preparation:
   a. Inflate tires to recommended operating pressures.
   b. Remove the fuel tank sump quick-drain fittings and fuel line drain plug to drain all fuel.
   c. Check that oil level is full. If not, add for full oil.
   d. Move sliding seats to the most forward position.
   e. Raise flaps to the fully retracted position.
   f. Place all control surfaces in neutral position.
2. Leveling:
   a. Place scales under each wheel (500# minimum capacity for scales).
   b. Lower or raise the tail sheel to center bubble on level (see figure 6-1).
3. Weighing:
   a. With the airplane level and brakes released, record the weight shown on each scale. Deduct the tare, if any, from each reading.
4. Measuring:
   a. Obtain measurement A by measuring horizontally (along the airplane center line) from a line stretched between the main wheel

centers to a plumb bob dropped from the firewall.

b. Obtain measurement B by measuring horizontally and parallel to the airplane center line, from center of nose wheel axle, left side, to a plumb bob dropped from the line between the main wheel centers. Repeat on right side and average the measurements.

5. Using weights from item 3 and measurements from item 4, the airplane weight and C.G. can be determined.

6. Basic Empty Weight may be determined by completing figure 6-1.



Scale Position	Scale Reading	Tare.	Symbol	Net Weight
Left Wheel			L	
Right Wheel			R	
Nose Wheel			N	
Sum of Net Weights (As Weighed)			W	

$$X = ARM = (A) - \frac{(N) \times (B)}{(W)}$$

$$X = (\qquad) - \frac{(\qquad) \times (\qquad)}{(\qquad)} = (\qquad) \text{ in}$$

Item	Weight (kg) X C.G. Arm (m) = Moment/1000(kgm)		
Airplane Weight (From Item 5, page 6-3)			
Add Oil:			
No Oil Filter (6 Qts at 7.5 Lbs/Gal)		-14.7	
With Oil Filter (7 Qts at 7.5 Lbs/Gal)		-14.7	
Add Unusable Fuel:			
Std. Tanks (1.5 Gal at 6 Lbs/Gal)		40.0	
L.R. Tanks (1.5 Gal at 6 Lbs/Gal)		40.0	
Equipment Changes			
Airplane Basic Empty Weight			

Figure 6-1. Sample Airplane Weighing

6.1.2 Weight and balance

The following information will enable you to operate your ATOL within the prescribed weight and center of gravity limitations. To figure weight and balance, use the Sample Problem, Loading Graph, and Center of Gravity Moment Envelope as follows:

Take the basic empty weight and moment from appropriate weight and balance records carried in your airplane, and enter them in the column titled YOUR AIRPLANE on the Sample Loading Problem.

NOTE

In addition to the basic empty weight and moment noted on these records, the C.G. arm (fuselage station) is also shown, but need not be used on the Sample Loading Problem. The moment which is shown must be divided by 1000 and this value used as the moment/ 1000 on the loading problem.

Use the Loading Graph to determine the moment/ 1000 for each additional item to be carried; then list these on the loading problem.

NOTE

Loading Graph information for the pilot, passengers and baggage is based on seats positioned for average occupants and baggage loaded in the center of the baggage areas as shown on the Loading Arrangements diagram. For loadings which may differ from these, the Sample Loading Problem lists fuselage stations for these items to indicate their forward and aft C.G. range limitation (seat travel and baggage area limitation). Additional moment calculations, based on the actual weight and C.G. arm (fuselage station) of the item being loaded, must be made if the pbsition of the load is different from that shown on the Loading Graph.

Total the weights and moments/ 1000 and plot these values on the Center of Gravity Moment Envelope to determine whether the point falls within the envelope, and if the loading is acceptable.

Figure 6-3. Loading Arrangements

Figure 6-4. Baggage Loading and Tie-Down

Figure 6-5. Internal Cabin Dimensions

6.2 BASIC EMPTY MASS CENTER OF GRAVITY

Basic Empty Weight This is the mass of the airframe, powerplant, interior accommodation, systems and equipments which are an integral part of a given version (without the usable fuel, but with full operating fluids in the closed systems, unusable and nondrainable fuel, and engine oil). The basic empty mass is determined by weighing the airplane.
The consumption in flight of hydraulic fluid and engine oil causes negligible changes in mass and center of gravity.

6.3 LOADING EXAMPLE

The following example shows the method of calculation of the longitudinal center of gravity.

6.3.1 Loading example for C.G.

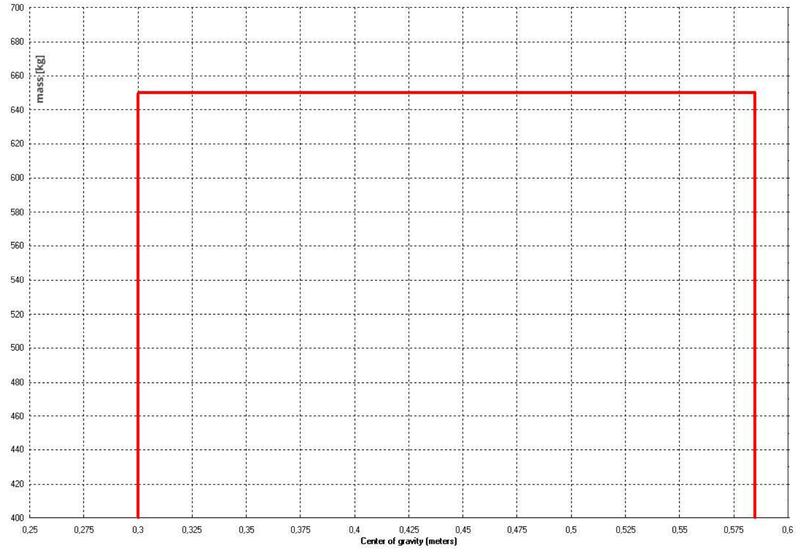
SAMPLE LOADING PROBLEM	SAMPLE AIRPLANE		YOUR AIRPLANE	
	Weight (kg.)	Moment (kgm)	Weight (kg.)	Moment (kgm)
1. Basic Empty Weight (Use the data pertaining to your airplane as it is presently equipped. Includes unusable fuel and full oil)	499	410,3		
2. Usable Fuel (At ,75 kg/l, station 1,067 m) Standard Tanks (8 l Maximum)	73,5	78,4	-	
Reduced Fuel (As limited by maximum weight)				
3. Pilot and Passenger (Station 0,991)	80	79,3		
4. Baggage - Area 1 (Station 1,63 m, 54 kg Max.)	30	48,9		
5. Baggage - Area 2 (Station 2,13 m, 18 kg max .)	-			
6. TOTAL WEIGHT AND MOMENT	642,5	616,9		
7. Locate this point (682,5 at 616,9) on the Center of Gravity Moment Envelope, and since this point falls within the envelope, the loading is acceptable.				

Figure 6-6. Sample Loading Problem

NOTES:

Line representing adjustable seats shows the pilot or passenger center of gravity on adjustable seats positioned for an average occupant. Refer to the Loading Arrangements Diagram for forward and aft limits of occupant C.G. range.

Figure 6-7. Loading Graph



Fugure 6-9 Center of Gravity Limits

6.4 Loading

- All hand baggage, cargo and mission related equipment shall be adequately and securely stowed during flight

6.4.1 Loading procedures and equipment

- There are six tie down rings in baggage compartment. When attaching cargo use quick fix cargo belts as required.

End of section 6

Section 7
AIRPLANE SYSTEMS

Table of contents

7.1 GENERAL

This section provides description and operation of the airplane and its systems. Some equipment described herein is optional and may not be installed in the airplane.

This chapter is numbered according to ATA-100 system. Due to this convention, numbering does not use all numbers.

7.21 ENVIRONMENTAL / AIR CONDITIONING

7.21.1 Cabin heating, ventilating and defrosting system

The temperature and volume of airflow into the cabin can be regulated to any degree desired by manipulation of the push-pull CABIN HT and CABIN AIR control knobs (see figure 7-8).

Heated fresh air and outside air are blended in a cabin manifold at the bottom of engine pylon by adjustment of the heat and air controls; this air is then vented into the cabin from outlets in the cabin manifold near the pilot's and passenger's feet. Windshield defrost air is also supplied by a duct leading from the manifold.

Full ventilation air may be obtained by utilization of the adjustable ventilators near the upper left and right corners of the windshield, and by pulling the CABIN AIR control knob out. The CABIN HT control knob must be pushed full in.

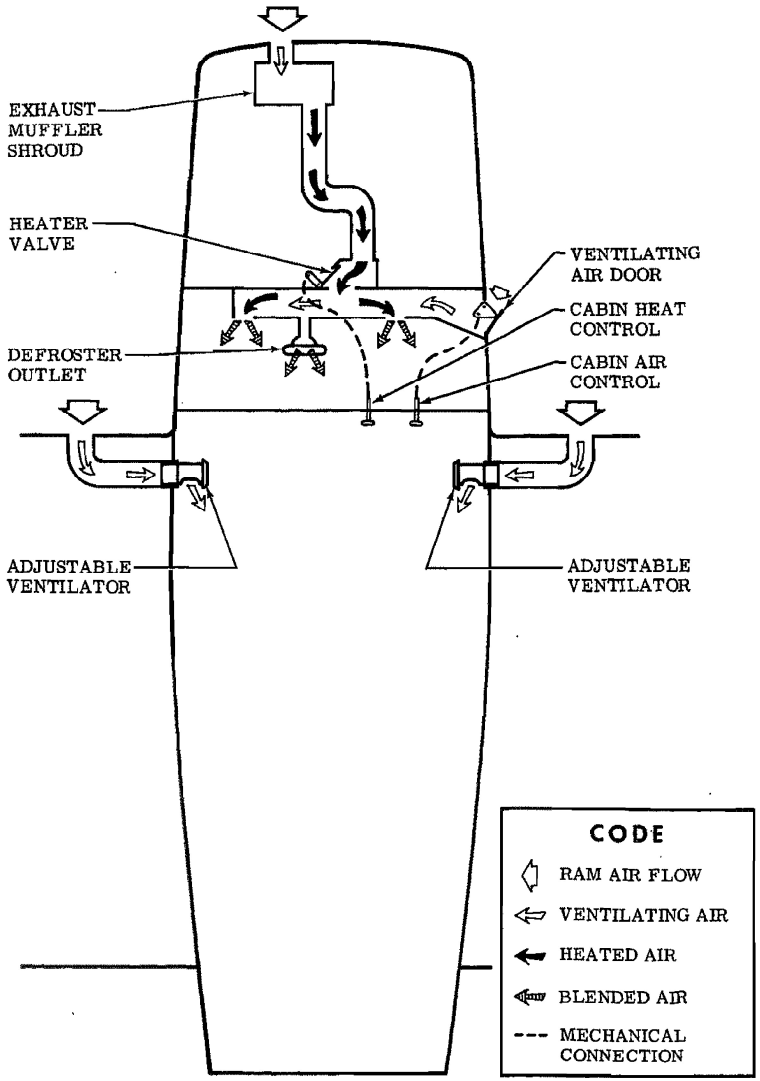


Figure 7-8. Cabin Heating, Ventilating, and Defrosting System

7.23 COMMUNICATIONS

7.23.1 Avionics support equipment

The airplane may, at the owner's discretion, be equipped with various types of avionics support equipment such as an audio control panel. The following paragraphs discuss these items.

AUDIO CONTROL PANEL

Operation of radio equipment is covered in Section 9 of this handbook. When one or more radios is installed, a transmitter/ audio switching system is provided (see figure 7-10). The operation of this switching system is described in the following paragraphs.

7.24 ELECTRICAL POWER

7.24.1 Electrical system

Electrical energy (see figure 7-7) is supplied by a 14-volt, direct-current system powered by an engine-driven, 40-amp alternator and a 12-volt, 24-amp hour battery located on the right forward side of the firewall. Power is supplied through a single bus bar; a master switch controls this power to all circuits, except the engine ignition system, clock, or flight hour recorder (if installed). The flight hour recorder receives power through activation of an oil pressure switch whenever the engine is operating, and the clock is supplied with current at all times. All avionics equipment should be turned off prior to starting the engine or using an external power source to prevent harmful transient voltages from damaging the transistors in this equipment.

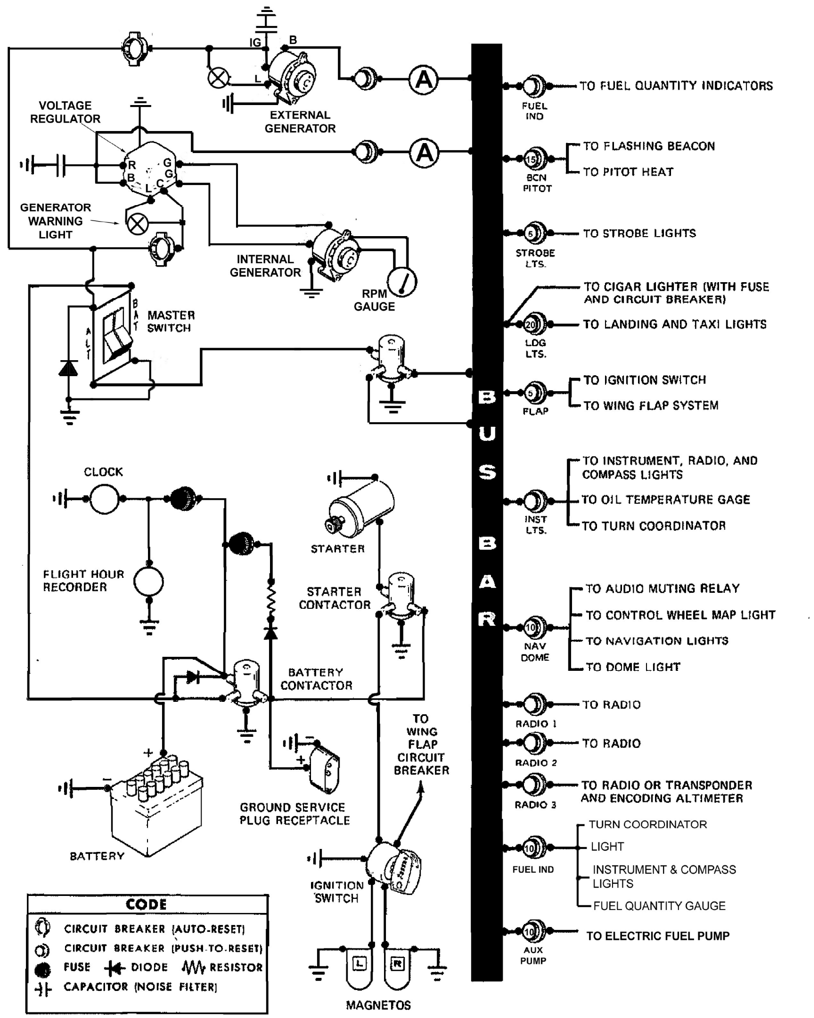


Figure 7-7 Electrical system

7.24.2 Master switch

The master switch is a split-rocker type switch labeled MASTER, and is

ON in the up position and OFF in the down position. The right half of the switch, labeled BAT, controls all electrical power to the airplane. The left half, labeled ALT, controls the alternator.

Normally, both sides of the master switch should be used simultaneously; however, the BAT side of the switch could be turned ON separately to check equipment while on the ground. The ALT side of the switch, when placed in the OFF position, removes the alternator from the electrical system. With this switch in the OFF position, the entire electrical load is placed on the battery. Continued operation with the alternator switch in the OFF position will reduce battery power low enough to open the battery contactor, remove power from the alternator field, and prevent alternator restart.

7.24.3 Ammeter

The ammeter indicates the flow of current, in amperes, from the alternator to the battery or from the battery to the airplane electrical system. When the engine is operating and the master switch is turned on, the ammeter indicates the charging rate applied to the battery. In the event the alternator is not functioning or the electrical load exceeds the output of the alternator, the ammeter indicates the battery discharge rate.

7.24.4 Over-voltage sensor and warning light

The airplane is equipped with an automatic over-voltage protection system consisting of an over-voltage sensor behind the instrument panel and a red warning light, labeled HIGH VOLTAGE, under the ammeter.

In the event an over-voltage condition occurs, the over-voltage sensor automatically removes alternator field current and shuts down the alternator. The red warning light will then turn on, indicating to the pilot that the alternator is not operating and the battery is supplying all electrical power.

The over-voltage sensor may be reset by turning the master switch off and back on again. If the warning light does not illuminate, normal alternator charging has resumed; however, if the light does illuminate again, a malfunction has occurred, and the flight should be terminated as soon as practical.

The warning light may be tested by momentarily turning off the ALT portion of the master switch and leaving the BAT portion turned on.

7.24.5 Circuit breakers and fuses

Most of the electrical circuits in the airplane are protected by "push-toreset" circuit breakers mounted under on the instrument panel. Electrical circuits which are not protected by circuit breakers are the battery contactor closing (external power) circuit, clock circuit, and flight hour recorder circuit. These circuits are protected by fuses mounted adjacent to the battery.

7.24.6 Ground service plug receptacle

A ground service plug receptacle may be installed to permit the use of an external power source for cold weather starting and during lengthy maintenance work on the electrical and electronic equipment. The receptacle is located behind a door on the left side of the fuselage near the aft edge of the cowling.

Just before connecting an external power source (generator type or battery cart), the master switch should be turned ON. This is especially important since it will enable the battery to absorb transient voltages which otherwise might damage the transistors in the electronic equipment.

The battery and external power circuits have been designed to completely eliminate the need to "jumper" across the battery contactor to close it for charging a completely "dead" battery. A special fused circuit in the external power system supplies the needed "jumper" across the contacts so that with a "dead" battery and an external power source applied, turning the master switch ON will close the battery contactor.

7.25 EQUIPMENT/FURNISHINGS

7.25.1 Instrument panel

The instrument panel (see figure 7-2) is designed to place the primary flight instruments directly in front of the pilot. The gyro-operated flight instruments are arranged one above the other, slightly to the left of the control column. To the left of these instruments are the airspeed indicator, turn coordinator. Suction gage for gyro instruments is on far right edge of panel. The clock, altimeter, rate-of-climb indicator, and navigation instruments are above and/or to the right of the control column. Avionics equipment is stacked approximately on the centerline of the panel, with space for additional equipment on the lower right side of the instrument panel. The right side of the panel also contains the tachometer, manifold pressure gage, ammeter, and additional instruments such as a flight hour recorder. A subpanel, under the primary instrument panel, contains the fuel pressure, fuel quantity indicators and engine oil pressure, oil temperature and CHT gages.

The electrical switches, panel and radio light rheostat knob, ignition and master switches, circuit breakers and parking brake control are located below pilots control wheel. The engine controls, wing flap switch, and cabin air and heat control knobs are to the right of the pilot, along the upper edge of the subpanel. Directly below these controls are the elevator trim control wheel, trim position indicator.

For details concerning the instruments, switches, circuit breakers, and controls on this panel, refer in this section to the description of the systems to which these items are related.

Figure 7-2. Instrument Panel

1	Turn Coordinator	30
2	Airspeed Indicator	31

3	Directional Indicator	32	Cabin Heat Control Knob
4	Attitude Indicator	33	Cabin Air Control Knob
5	Airplane Registration Number	34	Co-pilot headset plugs
6	Clock	35	Elevator Trim Control Wheel
7	Rate-of-Climb Indicator	36	Carburetor Heat Control Knob
8	Encoding Altimeter	37	Parking Brake Knob
9	VOR / GS Indicator	38	Electric Fuel pump pushbutton
10	Rear View Mirror and Control	39	Ignition Switch
11	Tachometer	40	Master Switch
12	maniford pressure gauge	41	Pilot headset plugs
13	Suction gauge	42	battery circuit breaker
14	Ammeter	43	Radio Dial Lights Rheostat
15	Fuel Pressure gauge	44	Instrument Panel Lights Rheostat
16	Tank Fuel Quantity Indicators (Left Right)	45	Cabin light switch
17	Oil Pressure Gage	46	Pitot heat switch
18	Oil Temperature Gage	47	Nav light switch
19	Cylinder Head temperature	48	Beacon switch
20	Generator 1 warning light	49	Taxi light switch
21	Generator 1 warning light	50	Landing light switch
22	Fuel Pressure warning light	51	Fuses (8 ea)
23	Generator 1 Circuit Breaker	52	VHF radio
24	Generator 2 Circuit Breaker	53	VOR nav
25	Generator 1 Circuit Breaker	54	Transponder
26	Generator 2 Circuit Breaker	55	GPS
27	Wing Flap Switch	56	
28	Wing Flap Position Indicator	57	
29	Throttle (With Friction Lock)	58	Intercom controls

Figure 7-2. Instrument Panel (Sheet 2 of 2)

7.25.2 Baggage compartment

The baggage compartment consists of the area from the back of the pilot and passenger's seats to the aft cabin bulkhead Access to the baggage compartment is gained from within the airplane cabin. A baggage net with six tie-down straps is provided for securing baggage and is attached by tying the straps to tie-down rings provided in the airplane. When loading the airplane, children should not be placed or permitted in the baggage compartment, unless a child's seat is installed, and any material that might be hazardous to the airplane or occupants should not be placed anywhere in the airplane. For baggage area dimensions, refer to Section 6.

7.25.3 Seats

The seating arrangement consists of two separate adjustable seats for the pilot and passenger and, if installed, a child's seat in the rear cabin area. The pilot's and passenger's seats are available in two designs: four-way and six-way adjustable.

Four-way seats may be moved forward or aft, and the seat back angle changed. To position either seat, lift the lever under the inboard corner of the seat, slide the seat into position, release the lever, and check that the seat is locked in place. To adjust the seat back, pull forward on the knob under the center of the seat and apply pressure to the back. To return the seat back to the upright position, pull forward on the exposed portion of the seat back frame. Both seat backs will also fold full forward.

The six-way seats may be moved forward or aft, adjusted for height, and the seat back angle changed. Position either seat by lifting the tubular handle under the inboard front corner of the seat bottom and slide the seat to the desired position. Release the lever and check that the seat is locked in place. The seats may be raised or lowered two inches, in one inch steps, and should be adjusted prior to flight. To raise or lower either seat, pull forward on a "T" handle under the seat near the inboard corner, force the seat down against spring tension or allow spring tension to raise it to the desired position, release the "T" handle, and then allow the seat to move until it locks in place. Seat back angle is adjustable by rotating a lever on the rear inboard corner of each seat. To adjust either seat back, rotate the lever aft and apply pressure against the back until it stops moving; then release the lever. The seat back may be returned to the upright position by pulling forward on the exposed portion of the lower seat back frame. Check that the release lever has returned to its vertical position. Both seat backs will fold full forward.

A child's seat is available for installation in the rear of the cabin. The seat back is secured to the cabin sidewalls, and the seat bottom is attached to brackets on the floor. This seat is non-adjustable.

7.25.4 Seat belts and shoulder harnesses

Both seat positions are equipped with seat belts (see figure 7-4). The pilot's and passenger's seats are also equipped with separate shoulder harnesses.

SEAT BELTS

The seat belts used with the pilot's seat, passenger's seat are attached to fittings on the floorboard. The buckle half of the seat belt is inboard of each seat and has a fixed length; the link half of the belt is outboard and is the adjustable part of the belt.

To use the seat belts for the pilot's and passenger's seats, position the seat as desired, and then lengthen the link half of the belt as needed by grasping the sides of the link and pulling against the belt. Insert and lock the belt link into the buckle. Tighten the belt to a snug fit by pulling the free end of the belt. The seat belt for the child's seat (if installed) is used in the same manner as the belts for the pilot's and passenger's seats. To release the seat belts, grasp the top of the buckle opposite the link and pull upward.

SHOULDER HARNESSES

Each shoulder harness is attached to a rear above the wing center spar.

The shoulder harnesses are used by fastening and adjusting the seat belt first. Then, lengthen the harness as required by pulling on the connecting link on the end of the harness and the narrow release strap. Snap the connecting link firmly onto the retaining stud on the seat belt link half. Then adjust to length. Removing the harness is accomplished by pulling upward on the narrow release strap and removing the harness connecting link from the stud on the seat belt link. In an emergency, the shoulder harness may be removed by releasing the seat belt first and allowing the harness, still attached to the link half of the seat belt, to drop to the side of the seat.

Adjustment of the shoulder harness is important. A properly adjusted harness will permit the occupant to lean forward enough to sit completely erect, but prevent excessive forward movement and contact with objects during sudden deceleration. Also, the pilot will want the freedom to reach all controls easily.

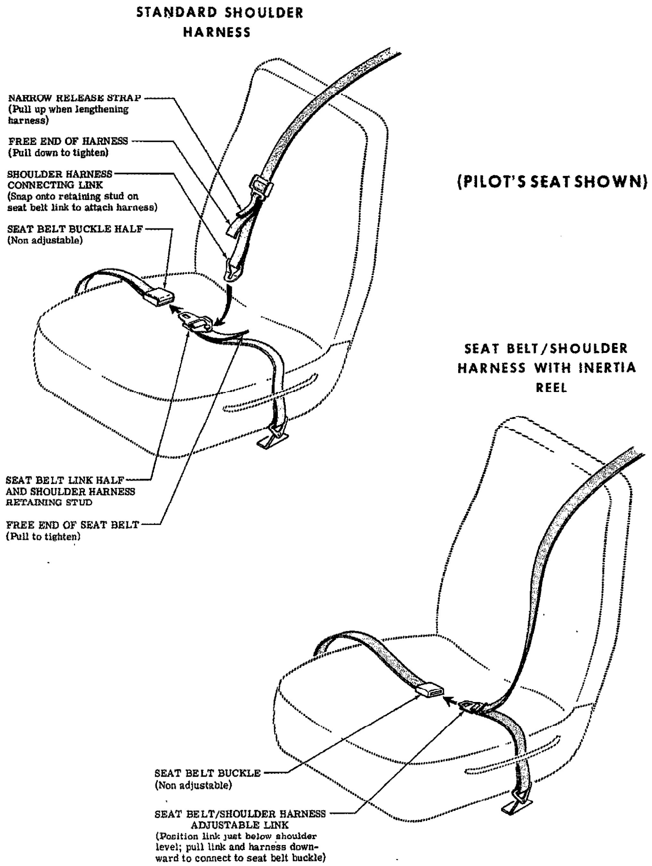


Figure 7-4, Seat Belts and Shoulder Harnesses

7.25.5 emergency equipment

The airplane is normally equipped with:

- safety belts with shoulder harness, equipped with a single point release;
-

7.27 Flight Controls

7.27.1 FLIGHT CONTROL SYSTEM

The airplane's flight control system (see figures 7-1 .. 7-3) consists of conventional aileron, rudder, and elevator control surfaces. The control surfaces are manually operated through mechanical linkage using a control wheel for the ailerons and elevator, and rudder/brake pedals for the rudder.

Extensions are available for the rudder/ brake pedals. They consist of a rudder pedal face, two spacers and two spring clips. To install an extension, place the Clip on the bottom of the extension under the bottom of the rudder pedal and snap the top clip over the top of the rudder pedal. Check that the extension is firmly in place. To remove the extensions, reverse the above procedures.

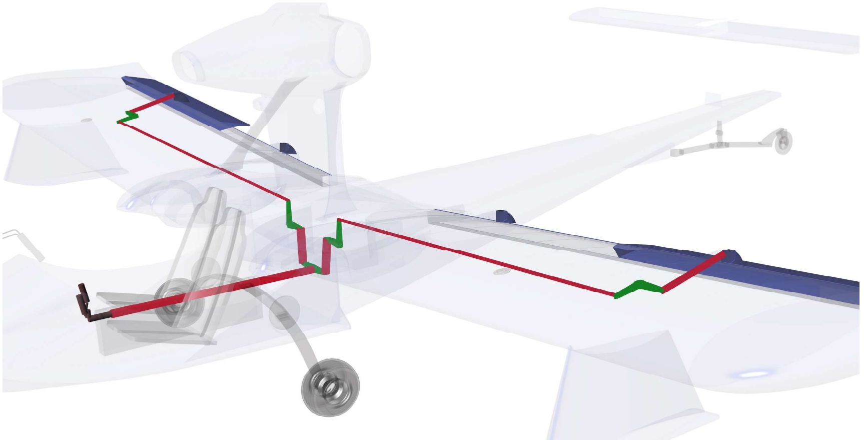


Figure 7-1. Aileron Control System

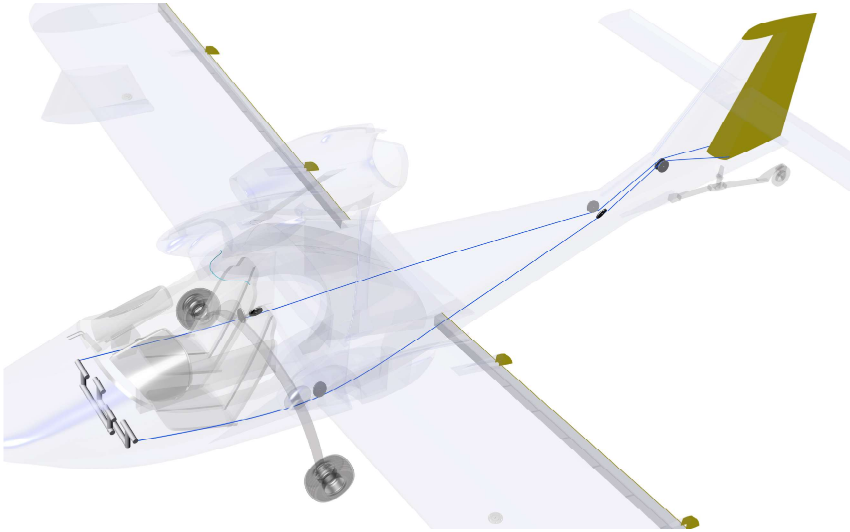


Figure 7-1. Rudder Control System

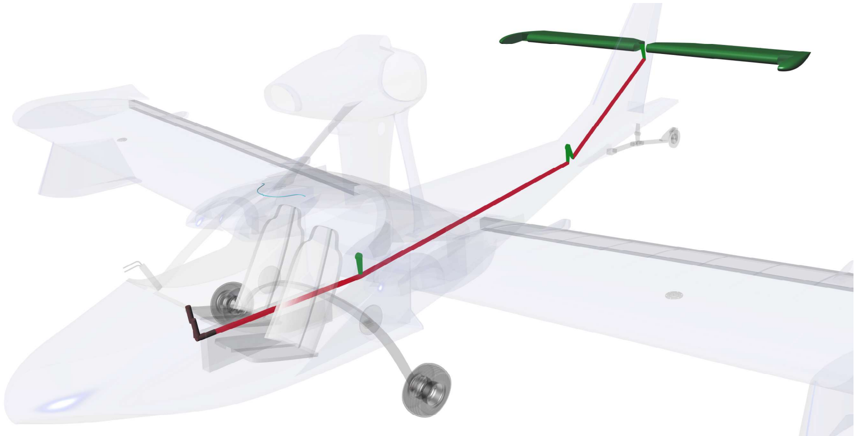


Figure 7-3. Elevator Control System

TRIM SYSTEM

A manually-operated elevator trim tab is provided. Elevator trimming is accomplished through the elevator trim tab by utilizing the vertically mounted trim control wheel. Forward rotation of the trim wheel will trim nose-down; conversely, aft rotation will trim nose-up.

7.27.2 Control locks

A control lock is provided to lock the ailerons and elevator control surfaces in a neutral position and prevent damage to these systems by wind buffeting while the airplane is parked. The lock consists of a shaped steel rod with a red metal flag attached to it. The flag is labeled CONTROL LOCK, REMOVE BEFORE STARTING ENGINE. To install the control lock, align the hole in the top of the pilot's control wheel shaft with the hole in the top of the shaft collar on the instrument panel and insert the rod into the aligned holes. Proper installation of the lock will place the red flag over the ignition switch. In areas where high or gusty winds occur, a control surface lock should be installed over the vertical stabilizer and rudder. The control lock and any other type of locking device should be removed prior to starting the engine.

7.27.3 Wing flap system

The wing flaps are of the single-slot type (see figure 7-4), and are extended or retracted by positioning the wing flap switch lever on the instrument panel to the desired flap deflection position. The switch lever is moved up or down A scale and pointer on the left side of the switch lever indicates flap travel in degrees. The wing flap system circuit is protected by a 15-ampere circuit breaker, labeled FLAP, on the right side of the instrument panel. Electrical actuator moves flaps.

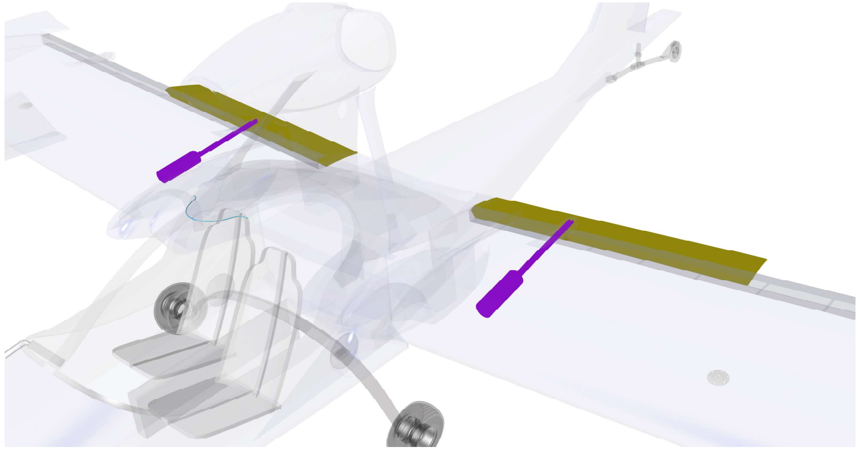


Figure 7-4. Wing Flap System

7.28 FUEL SYSTEM

The airplane may be equipped with either a standard fuel system (see figure 7-6). Both systems consist of two vented fuel tanks (one in each wing), feeder tank in fuselage, a fuel shutoff valve, fuel strainer, two electrica fuel pumps, and fuel injection system. Refer to figure 7-5 for fuel quantity data for both systems.

FUEL QUANTITY DATA (liters)			
TANKS	TOTAL USABLE FUEL ALL FLIGHT CONDITIONS	TOTAL UNUSABLE FUEL	TOTAL FUEL VOLUME
STANDARD (49 liters each),	93 liters	7 liters	98 liters

Figure 7-5. Fuel Quantity Data

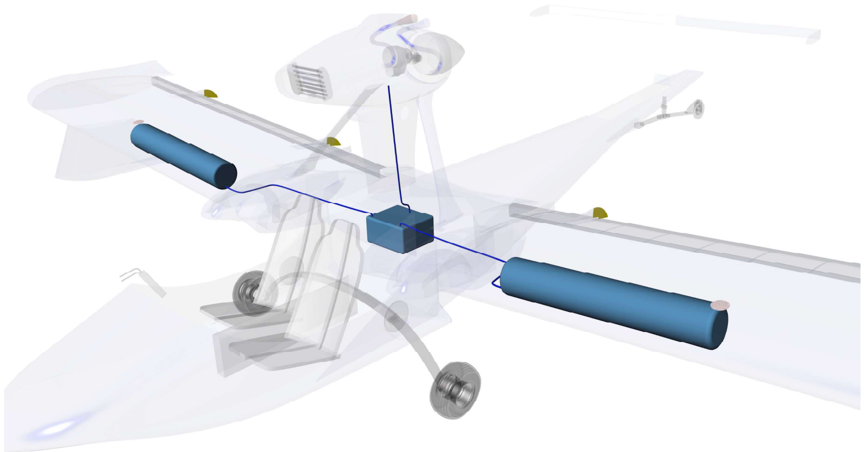


Figure 7-6. Fuel System

Fuel flows by gravity from the two wing tanks to a fuel feeder tank below engine pylon. With the valve in the ON position, fuel flows through a strainer to the carburetor. From the carburetor, mixed fuel and air flows to the cylinders through intake manifold tubes. The manual primer draws its fuel from the fuel strainer and injects it into the cylinder intake ports.

Fuel system venting is essential to system operation. Blockage of the venting system will result in a decreasing fuel flow and eventual engine stoppage. Venting is accomplished by an interconnecting line from the right fuel tank to the left tank. The left tank is vented overboard through a vent line which is equipped with a check valve, and protrudes from the bottom surface of the left wing near the wing strut attach point. The right fuel tank filler cap is also vented.

Fuel quantity is measured by two float-type fuel quantity transmitters (one in each tank) and indicated by two electrically-operated fuel quantity indicators on the lower left portion of the instrument panel. An empty tank is indicated by a red line and the letter E. When an indicator shows an empty tank, approximately 3 liters remains in either a standard or long range tank as unusable fuel. The indicators cannot be relied upon for accurate readings during skids, slips, or unusual attitudes.

The amount of unusable fuel is relatively small due to the dual outlets at each tank. The maximum unusable fuel quantity, as determined from the most critical flight condition, is about 6 liters total. This quantity was not exceeded by any other reasonable flight condition, including prolonged 30 second full-rudder sideslips in the landing configuration. Takeoffs have not been demonstrated with less than 8 liters total fuel (4 liters per tank).

The fuel system is equipped with drain valves to provide a means for the examination of fuel in the system for contamination and grade. The system should be examined before the first flight of every day and after each refueling, by using the sampler cup provided to drain fuel from the wing tank sumps, and by utilizing the fuel strainer drain under an access panel on the right side of the engine cowling. The fuel tanks should be filled after each flight to prevent condensation.

7.31 INDICATING / RECORDING SYSTEMS

7.31.1 Stall warning system

The stall warning system should be checked during the preflight inspection by placing a clean handkerchief over the vent opening and applying suction. A sound from the warning horn will confirm that the system is operative.

7.32 LANDING GEAR

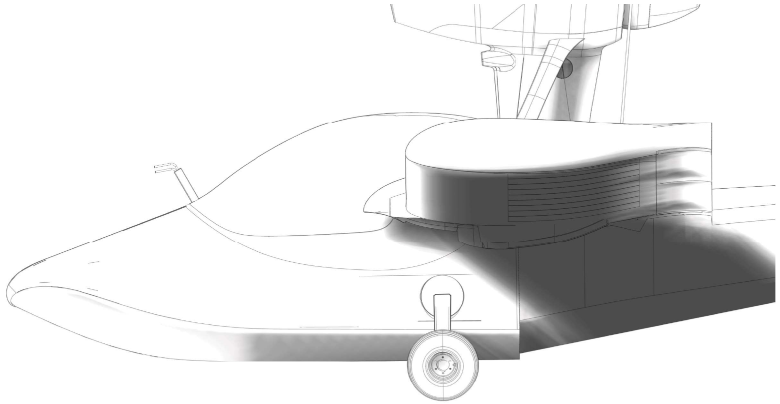
7.32.1 Landing gear system

The landing gear is of the tailwheel type with a steerable tail wheel and two main wheels. Shock absorption is provided by the carbon fibre main landing gear legs. Each main gear wheel is equipped with a hydraulically actuated disc-type brake on the inboard side of each wheel.

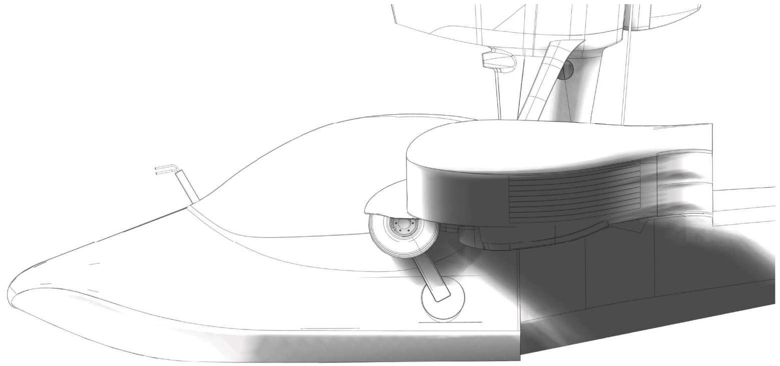
Wheel pressures:

	tyre size	pressure
main wheel	6.00-6 4 ply	1,5 bar (21 psi)
tail wheel	1.00-2 4 ply	2,1 bar (30 psi)

Main gear is retractable. Both wheels and spring are rotated about traversal axis. A electric motor situated on LH side of the LG cross tube provides power. Switch for Gear is situated on center panel.



Main gear down



Main gear up

A fairing is provided for main gear wheel in the leading edge of wing center section.

7.32.2 Ground control

Effective ground control while taxiing is accomplished through tail wheel steering by using the rudder pedals; left rudder pedal to steer left and right rudder pedal to steer right. When a rudder pedal is depressed, a spring-loaded steering bungee (which is connected to the nose gear and to the rudder bars) will turn the tail wheel through an arc of approximately 8.5° each side of center. By applying either left or right brake, the degree of turn may be increased up to 30° each side of center.

Moving the airplane by hand is most easily accomplished by pushing, use the wing root as push points. Do not use the vertical or horizontal surfaces to move the airplane.

The minimum turning radius of the airplane, using differential braking and tail wheel steering during taxi, is approximately 7,5 meters. To obtain a minimum radius turn during ground handling, the airplane may be rotated around either main landing gear by pushing tailcone just forward of the vertical stabilizer to unlock tail wheel centering lock.

7.32.3 Brake system

The airplane has a single-disc, hydraulically-actuated brake on each main landing gear wheel. Each brake is connected, by a hydraulic line, to a master cylinder attached to each of the pilot's rudder pedals. The brakes are operated by applying pressure to the top of either the left (pilot's) or right (copilot's) set of rudder pedals, which are interconnected. When the airplane is parked, both main wheel brakes may be set by utilizing the parking brake which is operated by a knob on the lower left side of the instrument panel.

For maximum brake life, keep the brake system properly maintained, and minimize brake usage during taxi operations and landings.

Some of the symptoms of impending brake failure are: gradual decrease in braking action after brake application, noisy or dragging brakes, soft or spongy pedals, and excessive travel and weak braking action. If any of these symptoms appear, the brake system is in need of immediate attention. If, during taxi or landing roll, braking action decreases, let up on the pedals and then re-apply the brakes with heavy pressure. If the brakes become spongy or pedal travel increases, pumping the pedals should build braking pressure. If one brake becomes weak or fails, use the other brake sparingly while using opposite rudder, as required, to offset the good brake.

7.33 LIGHTS

7.33.1 Exterior lighting

Conventional navigation lights are located on the wing tips and top of the rudder and a flashing beacon is mounted on top of the vertical fin. The switches are ON in the up position and OFF in the down position.

The flashing beacon should not be used when flying through clouds or overcast; the flashing light reflected from water droplets or particles in the atmosphere, particularly at night, can produce vertigo and loss of orientation.

The high intensity strobe lights will enhance anti-collision protection. However, the lights should be turned off when taxiing in the vicinity of other airplanes, or during night flight through clouds, fog or haze.

7.33.2 Interior lighting

Instrument and control panel lighting is provided by flood lighting and integral lighting.

7.34 NAVIGATION / PITOT STATIC

7.34.1 Pitot-static system and instruments

The pitot-static system supplies ram air pressure to the airspeed indicator and static pressure to the airspeed indicator, rate-of-climb indicator and altimeter. The system is composed of an unheated pitot tube mounted on the top of canopy front end.

AIRSPEED INDICATOR

The airspeed indicator is calibrated in knots. Limitation and range markings include the white arc (49 to 100 mph), green arc (56 to 120 mph), yellow arc (120 to 162 mph), and a red line (162 mph).

For best accuracy, the indicated airspeed should be corrected to calibrated airspeed by referring to the Airspeed Calibration chart in Section 4.

RATE-OF-CLIMB INDICATOR

The rate-of-climb indicator depicts airplane rate of climb or descent in feet per minute. The pointer is actuated by atmospheric pressure changes resulting from changes of altitude as supplied by the static source.

ALTIMETER

Airplane altitude is depicted by a barometric type altimeter. A knob near the lower left portion of the indicator provides adjustment of the instrument's barometric scale to the current altimeter setting.

7.37.2 Attitude indicator

An attitude indicator is available and gives a visual indication of flight attitude. Bank attitude is presented by a pointer at the top of the indicator relative to the bank scale which has index marks at 10°, 20°, 30°, 60°, and 90° either side of the center mark. Pitch and roll attitudes are presented by a miniature airplane in relation to the horizon bar. A knob at the bottom of the instrument is provided for in-flight adjustment of the miniature airplane to the horizon bar for a more accurate flight attitude indication.

7.37.3 Directional indicator

A directional indicator is available and displays airplane heading on a compass card in relation to a fixed simulated airplane image and index. The directional indicator will precess slightly over a period of time. Therefore, the compass card should be set in accordance with the magnetic compass just prior to takeoff, and occasionally re-adjusted on extended flights. A knob on the lower left edge of the instrument is used to adjust the compass card to correct for any precession.

7.52 CANOPY

7.52.1 Entrance

Entry to, and exit from the airplane is accomplished through rearward opening canopy (refer to Section 6 for cabin and canopy dimensions). The canopy has a recessed exterior and interior handle, a canopy stop mechanism, and an openable window.

To open the canopy from outside the airplane, utilize the recessed canopy handle near the aft edge of canopy. Grasp the forward edge of the handle and pull out. To close or open the canopy from inside the airplane, use the recessed door handle and arm rest. Canopy should be checked for security prior to flight, and should not be opened intentionally during flight.

NOTE Accidental opening of a canopy in flight due to improper closing, increases drag dramatically. Aircraft can be steered, but landing must be made to location very near.

Exit from the airplane is accomplished by grasping the forward edge of the door handle and pulling. To lock the airplane, lock the canopy from the inside by lifting up on the lever near the aft edge of the door, close the left cabin door, and using the ignition key, lock the door.

Canoy is equipped with openable slide windows.

7.53 FUSELAGE

7.53.1 Airframe

The airplane is an all-wood composite, two-place, shoulder-wing, single-engine airplane equipped with tailwheel landing gear.

The construction of the fuselage is a conventional with bulkhead, stringer, and skin design referred to as semimonocoque. Major items of structure are the front and rear carry-through spars to which the wings are attached, a bulkhead and forgings for main landing gear attachment at the base of the rear door posts, and a bulkhead with attaching plates at the base of the forward door posts for the lower attachment of the wing struts. Engine mount pylon is located at rear part of wing.

The cantivel wings, containing the fuel tanks, are constructed of a front and rear spar with ribs. The front of structure is covered with plywood skin.

Conventional hinged ailerons and single-slotted flaps are attached to the trailing edge of the wings.

The empennage (tail assembly) consists of a conventional vertical stabilizer, rudder, horizontal stabilizer, and elevator. The vertical stabilizer consists of a spar, ribs, a wraparound skin panel, formed leading edge skin. The rudder is constructed of a formed leading edge skin containing hinge halves, a wraparound skin panel and ribs, and a formed trailing edge skin with a ground adjustable trim tab at its base. The top of the rudder incorporates a leading edge extension which contains a balance weight. The horizontal stabilizer is constructed of a forward spar, main spar, a wrap-around skin panel, and formed leading edge skins. The horizontal stabilizer also contains the elevator trim tab actuator. Construction of the elevator consists of a main spar, left and right wrap-around skin panels The leading edge of both left and right elevator tips incorporate extensions which contain balance weights.

7.61 PROPELLER

The airplane is equipped with a two/three/four-bladed, ground adjustable propeller. See propeller manual for instructions for care.

7.72 ENGINE

The airplane is powered by a horizontally-opposed, four-cylinder, overhead-valve, water/air-cooled, carbureted engine with adry sump oil system. The engine type is a Rotax 912 iS and is rated at 100 horsepower at 5800 engine rpm. Engine has 1:2,43 reduction gear for propeller.

7.74 IGNITION-STARTER SYSTEM

The engine is provided with two independent ignition systems. The two magnetos are independent from the power supply system, and are in operation as soon as the propeller RPM is greater than 100. This ensures safe engine operation even in case of an electrical power failure

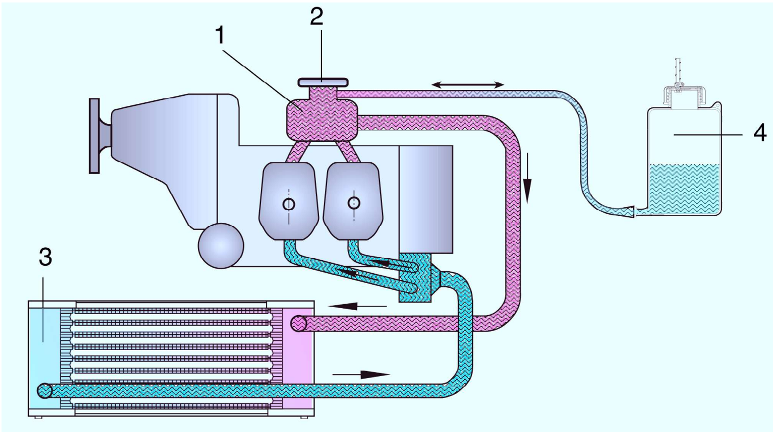
Ignition and starter operation is controlled by a rotary type switch located on the left subpanel. The switch is labeled clockwise, OFF, R, L, BOTH, and START. The engine should be operated on both magnetos (BOTH position) except for magneto checks. The R and L positions are for checking purposes and emergency use only. When the switch is rotated to the spring-loaded START position, (with the master switch in the ON position), the starter contactor is energized and the starter will crank the engine. When the switch is released, it will automatically return to the BOTH position.

7.75 AIR

7.75.1 Air induction system

The engine air induction system receives ram air through an intake in the lower portion of the engine cowling. The intake is covered by an air filter which removes dust and other foreign matter from the induction air. Airflow passing through the filter enters an airbox. After passing through the airbox, induction air enters the two carburetors which are on top of the engine, and is then ducted to the engine cylinders through intake manifold tubes. In the event carburetor ice is encountered or the intake filter becomes blocked, alternate heated air can be obtained from the muffler shroud through a duct to a valve, in the airbox, operated by the carburetor heat control on the instrument panel. Heated air from the muffler shroud is obtained from an unfiltered outside source. Use of full carburetor heat at full throttle will result in a loss of approximately 100 to 200 rpm.

7.75.2 Cooling system



Part	Function
1	Expansion tank
2	Pressure cap
3	Radiator
4	Overflow bottle

7.76 ENGINE CONTROLS SYSTEM

7.76.1 Engine controls

Engine, power is controlled by a throttle located on the lower center portion of the instrument panel. The throttle operates in a conventional manner; in the full forward position, the throttle is open, and in the full aft position, it is closed. A friction lock, which is a round knurled disk, is located at the base of the throttle and is operated by rotating the lock clockwise to increase friction or counterclockwise to decrease it.

7.77 ENGINE INSTRUMENTS

Engine operation is monitored by the following instruments: oil pressure gage, oil temperature gage, cylinder head temperature, manifold pressure and a tachometer.

The oil pressure gage, located on the subpanel. The gage is operated by an electrical-resistance type pressure sensor which receives power from the airplane electrical system. Gage markings indicate that minimum idling pressure is 25 PSI (red line), the normal operating range is 60 to 90 PSI (green arc), and maximum pressure is 100 PSI (red line).

Oil temperature is indicated by a gage located on the subpanel. The gage is operated by an electrical-resistance type temperature sensor which receives power from the airplane electrical system. Oil temperature limitations are the normal operating range (green arc) which is 38°C (100°F) to 118°C (245°F), and the maximum (red line) which is 118°C (245°F).

Right of oil temperature is cylinder head temperature gage. The gage is operated by an electrical-resistance type temperature sensor which receives power from the airplane electrical system.

The engine-driven tachometer is located near the upper portion of the right instrument panel. The instrument is calibrated in increments of 100 RPM and indicates propeller speed. An hour meter below the center of the tachometer dial records elapsed engine time in hours and tenths. Instrument markings include a normal operating range (green arc) of 1900 to 2550 RPM, and a maximum (red line) of 2550 RPM.

Right of tachometer is engine manifold pressure gage.

7.78 EXHAUST SYSTEM

Exhaust gas from each cylinder passes through riser assemblies to a muffler and tailpipe on the right side of the engine. The muffler is constructed with a shroud around the outside which forms a heating chamber for carburetor heat and cabin heater air.

7.79 OIL

7.79.1 Engine oil system

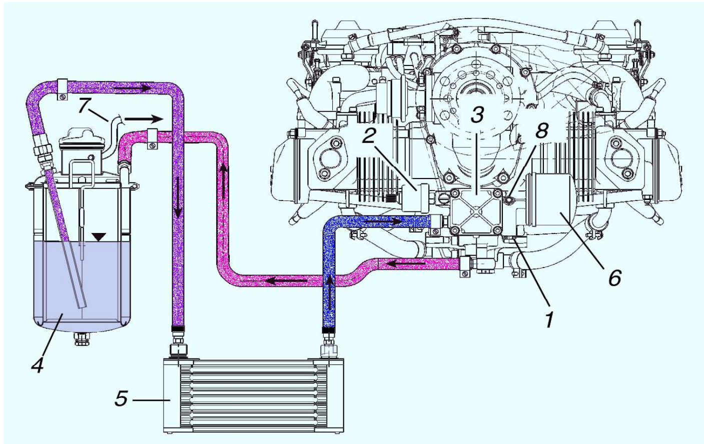
The engines are provided with a dry sump forced lubrication system with a main oil pump with integrated pressure regulator (1) and oil pressure sensor (2). The oil pump (3) sucks the motor oil from the oil tank (4) via the oil cooler (5) and forces it through the oil filter (6) to the points of lubrication in the engine.

The surplus oil emerging from the points of lubrication accumulates on the bottom of crankcase and is forced back to the oil tank by the piston blow-by gases.

The oil pumps are driven by the camshaft.

The oil circuit is vented via bore (7) on the oil tank.

The oil temperature sensor (8) for reading of the oil inlet temperature is located on the oil pump housing.



Part	Function
1	Pressure regulator
2	Oil pressure sensor
3	Oil pump
4	Oil tank
5	Oil cooler
6	Oil filter
7	Venting tube
8	Oil temperature sensor

End of section 12

Section 8
Handling, Servicing and Maintenance

Table of contents

8.1 INTRODUCTION

8.2 TOWING

The airplane is most easily and safely maneuvered by hand with tow-bar attached to the tail wheel.

8.3 PARKING, MOORING

For short time parking, the airplane must be positioned in a headwind direction, the parking brake must be engaged, the wing flaps must be in the retracted position and the wheels must be chocked.

For extended and unattended parking, as well as in unpredictable wind conditions, the airplane should be anchored to the ground or placed in a hangar.

8.4 WASHING AND CARE

To achieve long life for the aircraft, a clean external surface is most important. Aircraft collects insects and they decrease aircraft performance, just like ice.

For this reason it is highly recommended that the airplane, especially the leading edge of the wings are kept clean at all times.

For best results, the cleaning is performed using a generous amount of water. If necessary, a mild cleaning agent can be added. Excessive dirt such as insects etc. are best cleaned off immediately after flight, because once dried they are more difficult to remove.

Approximately once a year, the surface of the airplane should be treated and buffed using a silicon free automotive polish.

Cleaning of a plexiglass canopy is essential for good visibility. While cleaning the plexiglass be careful not to scratch them. If scratched, the vision will be reduced.

In principal the same rules should be applied to clean the canopy as for the outside surface of the airplane. To remove excessive dirt, plenty of water should be used; make sure to use only clean sponges and chamois.

Even the smallest dust particle can cause scratches.

In order to achieve clarity, plastic cleaners may be used according to the manufacturer's instructions. Do not wipe in circles, but only in one direction.

The interior should be cleaned using a vacuum cleaner. All loose items (pens, bags etc.) should be properly stored and secured. All instruments must be cleaned using a soft dry cloth. Plastic surfaces should be wiped clean using a damp cloth without any cleaning agents.

8.5 REFUELLING

For approved fuels, see section Limitations.

8.6 CHECKING ENGINE FLUIDS

For approved engine fluids, see section 2 Limitations.

End of section 8

Section 9
Supplements

Table of contents

9.1 GENERAL

(a) This Section of the Pilot's Operating Handbook shall contain the appropriate Supplements (operating information) necessary to safely and efficiently operate the airplane when equipped with the various optional systems and equipment not provided with the standard airplane.

(b) Supplements may be prepared by the Handbook producer, supplied to the Handbook producer by the equipment supplier and inserted, as supplied, into the Handbook, or supplied to the airplane owner when he purchases new equipment after the airplane (and Handbook) has been delivered.

The content of this Section of the Specification should be interpreted so as to foster the goal of providing the necessary information to the pilot

(c) The Table of Contents required by paragraph 0.9 of this Specification may be in the form of a log (or list) of the Supplements. A log of additions of or revisions to Supplements, if needed ,may be incorporated into this Section instead of the Log required by paragraph 0.43 of this specification.

9.2 SUPPLEMENT SCOPE

Each Supplement shall normally cover only a single system, device, or piece of equipment such as an autopilot, electric trim or an area navigation system.

9.3 SUPPLEMENT ISSUANCE

All Supplements for any particular airplane shall be issued by one or the other of the methods below:

(a) All Supplements may be issued to all owners of the airplane model covered by the Handbook. This method is recommended as minimizing errors of distribution, and also informs owners of the availability of systems and equipment.

(b) Supplements may be issued only to owners of airplanes equipped with the subject systems or equipment. This results in tailored Pilot's Operating Handbook and considerable record keeping;

9.4 SUPPLEMENT IDENTIFICATION

Unless the Supplements are integrated within this Section of the Handbook (and thus derive their approval from approval of the Handbook), each Supplement shall have a cover or title page with the unique supplement identification, date of issue (or revision, it appropriate) and signature and title of the certificating or approving authority.

9.5 LIST OF SUPPLEMENTS

End of section 8

Section 10
Safety and operational tips

Table of contents

10.1 GENERAL

A Safety and Operational Tips section may be incorporated in the Handbook. It may contain:

Safety information of a general nature, such as--

(1) kinds of information and rules to be found in FAA publications;

(2) how to conduct various airplane inspections;

(3) medical problems and information (vertigo, hypoxia, fatigue, affects of scuba diving, etc.); and

(4) any other information that would enhance the safe use of the airplane.

(5) Child restraint systems:

A small child should use an approved child restraint seat. The child should not be held or share a seat belt with another person.

Acceptable child restraint seats are defined in publications such as Advisory Circular 91-62.

Operational tips of a general nature, such as -

(1) general weather information and sources and how to use the information;

(2) general fuel conservation information (such as why it pays to keep the exterior of the airplane clean);

(3) tips on operating in mountainous areas (or in desert areas or on grass or gravel runways, etc.); and

(4) any other information that would enhance the operational use of the airplane.

End of section 8