

FLIGHT MANUAL

for the powered sailplane STEMME S10-VT

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This powered sailplane flight manual is FAA-approved for U.S. registered aircraft in accordance with the provisions of 14 CFR Section 21.29, and is required by FAA Type Certificate Data Sheet No. G 06 CE.

Translation of this document and conversion of technical data have been done by best knowledge and judgment.

Model: **STEMME S 10-VT**

Serial number: **11-**

TCDS-No.: FAA No. G 06 CE (EASA A.054 – former LBA No. 846

Registration:

This powered sailplane is to be operated in compliance with information and limitations contained in this manual.

Non-standard equipment or systems with effect to the contents of this manual, if installed, are entered in the table on page ii

Print info: 110 pages, 1/7,2/11,3/19,4/23,5/15,6/3,7/20,8/5,9/3

0.1 Record of Amendments

Any revision of the present manual must be recorded in the following table. Exempted are:

- Updated weighing data (page 6-2),
- Changes of arrangement of instruments on the instrument panel
- Data relating to the installation of alternative, supplemental or additional equipment (section 9-2 and 9-3)

The record of amendments (page ii-1 and ii-2, section 0.1) and the list of effective pages (page iii, Section 0.2) is assigned to the serial number. The indicated amendment no. in the headline of these pages **does not change** with entries after delivery of the powered glider.

Revisions of approved sections must be endorsed in the following list by the Luftfahrt-Bundesamt, FRG. Information as to which amendments **must** be included in the present Manual can be seen from the current Record of Airworthiness Directives and Service Bulletins (see Maintenance Manual, Annex B).

The new or amended text will be marked on the revised page by a black vertical line on the right hand margin; the Amendment Number and the date will be shown on the right hand side in the headline of the page.

The inspector certifies by his signature the correspondence of the Flight Manual and the following list with the a/c assigned to.

Am. No.	removed Pages	included Pages	Amendment Date	Reference	Date of Approval by the LBA	Date of inclusion	Signature
1	ii, iii, 4-5, 4-6	ii, iii, 4-5, 4-6	15.10.97	A31-10-026	24.03.1999		
2	ii, iii, 2-10, 3-0, 3-4, 3-5, 4-4, 4-7, 4-8, 4-17, 7-12	ii, iii, 2-10, 3-0, 3-4, 3-5, 4-4, 4-7, 4-8, 4-17, 7-12	01.12.97	A31-10-027	25.03.1999		
3	ii, iii, 1-3, 1-5, 2-3, 3-0, 3-4, 3-6, 3-10 to 3-18, 4-1 to 4-3, 4-7, 4-8, 4-10, 4-12, 4-14, 4-17, 4-19, 4-21, 5-11, 7-0, 7-1, 7-3, 7-4, 7-13, 7-16 to 7-18, 8-1	ii, iii, 1-3, 1-5, 2-3, 3-0, 3-4, 3-6, 3-10 to 3-18, 4-1 to 4-3, 4-7, 4-8, 4-10, 4-12, 4-14, 4-17, 4-19, 4-21, 5-11, 7-0, 7-1, 7-3, 7-4, 7-13, 7-16 to 7-19, 8-1	01.12.97	A31-10-028	16.07.2000		
4	ii, iii, 4-4, 7-5	ii, iii, 4-4, 7-5	18.03.1998	A31-10-029	12.09.1999		
5	ii, iii, 1-5 (1-5a), 2-3 (2-3a), 2-6, 3-5, 3-13, 3-14, 3-16, 4-0, 4-1, 4-5, 4-21, 5-11 (5-11a), 7-3 (7-3a), 7-7, 7-16 (7-16a), 7-18 (7-18a), 7-19 (7-19a), 8-2, 9-0, 9-1	ii, iii, 1-5, 2-3 (2-3a), 2-6, 3-5, 3-13, 3-14, 3-16, 4-0, 4-1, 4-5, 4-21, 5-11.1, 5-11.2, 7-3, 7-7, 7-16, 7-18, 7-19, 8-2, 9-0, 9-1	27.06.1999	A31-10-052	14.04.2000		
6	i, ii, iii, 2-1, 2-10 (2-10a)	i, ii, iii, 2-1, (2-2a), 2-10 (2-10a)	02.11.2001	A31-10-001_07a	22.11.2001		

Am. No.	removed Pages	included Pages	Amendment Date	Reference	Date of Approval by the LBA	Date of inclusion	Signature
7	ii,iii, 2-7, 2-8, 3-18, 4-12, 7-18	ii-1, ii-2, iii, 2-7, 2-8, 3-18, 4-12, 7-18	May 25. 2005	A31-10-001 Amend. 11a			
8	ii-2, iii, 2-3, 4-2...4-4, 4-7...4-10, 4-18...4-21, 7-1, 7-5, 8-2, 9-1	ii-2, iii, 2-3, 4-2...4-4, 4-7 / 4-7a... 4-10 / 4-10a, 4-18 / 4-18a... 4-21 / 4-21a, 7-1, 7-1a, 7-5, 7-5a, 8-2, 8-2a, 9-1	10.01.2014	A30-2013-028/ A34-10-097			

Am. No.	removed Pages	included Pages	Amendment Date	Reference	Approval		
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0.2 List of Effective Pages

This record is valid only for the Serial No. specified on the title page.

Page	LBA-appr.	Am. No.	Amendment Date
i		09	APR 04,2022
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2-2a*	X	6	02.11.01
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2-10*	X	6	02.11.01
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4-8a*	X	8	10.01.14
4-9*	X	8	10.01.14
4-9a*	X	8	10.01.14
4-10*	X	8	10.01.14
4-10a*	X	8	10.01.14
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4-12	X	7	25.05.05
4-13	X	09	APR 04,2022
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4-15	X		
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* Strike out if not applicable. For built in alternative equipment see section 9.2 (page 9-1).

0.3 Contents

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Section 1 - General

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1.1 Introduction

This flight manual was compiled to give pilots and instructors all necessary information for a safe, appropriate and performance-optimized operation of the motor glider.

The manual includes all the data required to be furnished to the pilot by JAR-22. It further contains a number of other data and operating hints which may be useful to the pilot from the manufacturer's point of view.

Pages identified by "LBA approved" are approved by the Luftfahrt-Bundesamt, Federal Republic of Germany. Pages modified later than 2012 (EASA-rules come into force) and marked with "LBA-approved" will be marked only with "Approved" after its revision.

"Approved" pages are printed on yellow and red paper. Red colour indicates the emergency procedures.

The operating instructions for the engine, type ROTAX 914 F2/S1 and for the propeller, type STEMME 11AP-V, are integrated in this Flight Manual. Thus the Operating Manual for the engine ROTAX 914 F2 is not required for a safe aircraft operation; nevertheless it is delivered with the powered glider since it contains some additional information. The engine model ROTAX 914 F2/S1, modified by STEMME, is different concerning structural design from data given in the Operating Manual for the ROTAX 914 F2, which is not representative in this respect.

There is no separate handbook for the propeller.

1.1.1 Conversion table

For the conversion of technical data the following factors have been used:

1 lb.	0.4536 kg	1 ftlb.	0.1356 Nm
1 dr.	1.772 g	1 hp	0.7457 kW
1 lbf = 1 lb.(wt)	4.45 N	1 kts	1.852 km/h
1 in.	25.4 mm	1 mph	1.609 km/h
1 ft.	0.3048 m	1 Imp.gal.	4.546 l
1 sqft.	0.0929 m ²	1 US gal.	3.785 l
100 fpm	0.5081 m/s	1 p.s.i.	0.06895 bar

1.1.2 Abbreviations

The following abbreviations are being used for clarity:

a/c	aircraft	MAP	manifold pressure
AGL	above ground level	OAT	outside air temperature
AOA	angle of attack	PIC	pilot in command
ASAP	as soon as possible	PPC	propeller pitch control
ASI	airspeed indicator	R/C	rate-of-climb
AUW	all-up-weight	RH	right hand
CB	circuit breaker	RPM	revolution per minute
CFRP	carbon-fibre-reinforced-plastic	RWY	runway
CG	centre-of-gravity	T/O	take-off
CHT	cylinder head temperature	TCU	turbo charger control unit
DCDI	dual capacity discharge ignition		
GFRP	glass-fibre-reinforced-plastic		
KIAS	knots indicated airspeed		
LH	left hand		

1.2 Certification Basis

The powered glider STEMME S10-VT is a derivative of the S10, which was certified by the Luftfahrt-Bundesamt on Dec. 31, 1990, Type Certificate No. 846.

This powered sailplane STEMME S10-VT was certificated by the Luftfahrt-Bundesamt in accordance with Joint Airworthiness Requirements for Sailplanes and Powered Sailplanes JAR-22 issue June 27, 1989 (Change 4 of the English original), including JAR 22.375 (Winglets), Amendment 22/90/1. The Type Certificate for the model S10-VT has been issued on Aug. 15, 1997. On 16 September 2005 the German LBA-TCDS has been transferred into an EASA Type Certificate (TCDS-No.: A.054).

Category of Airworthiness is "Utility".

Noise Certification Basis for the model S10-VT: "Laermschutzforderungen fuer Luftfahrzeuge (LSL)" (Noise Protection Requirements for Aircraft; German equivalent to and based on the ICAO, Annex 16), dated 1.1.1991, published in the "Bundesanzeiger Jahrgang 43, No. 54a, dated 19.03.1991". Noise certification is in accordance with Chapter X.

1.3 Warnings, Cautions and Notes

Remarks in the manual of particular importance to flight safety and handling have been specially marked by use of one of the following terms:

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

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

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

1.4 Description and Technical Data

The model STEMME S10-VT is a derivative of the S10 and differs from base type by:

- installation of the variable-pitch propeller type 11AP-V,
- installation of the turbocharged engine ROTAX 914 F2/S1,
- installation of the redesigned transmission system with a new frontal spur gear.

The STEMME S10-VT is a two-seat, self-launching powered glider, a carbon fiber design and a high performance aerodynamic layout. Seats are arranged side-by-side (forward of the wing) and are equipped with dual controls.

The wing is mounted to fuselage in the upper third. It consists of an inner wing with flaps and Schempp-Hirth air brakes and two outer wings with continuous ailerons. Flaps and ailerons of inner and outer wing are interconnected.

Tailplane is of "T"-tail design.

The two-wheel main landing gear can be retracted electrically, it contains hydraulic brakes.

The Engine of the STEMME S10-VT is based on the ROTAX 914 F2, for which the manufacturer ROTAX, Austria, received the certification. STEMME modified the arrangement of some accessories (induction and exhaust system including charger, engine mounts etc.) to adapt the systems to specific requirements of the S10-VT. These modifications are certified in the STEMME S10-VT as engine model ROTAX 914 F2/S1.

- Engine description: Four-cylinder, four-stroke opposed type Otto-engine, turbocharged with electronic charge-control (TCU=Turbocharger Control Unit); a central cam shaft and tappets-OHV; liquid cooled cylinder heads, cylinders cooled by ram air; dry-sump lubrication; Dual Capacity Discharge Ignition (DCDI); 2 CD-carburetors; integrated reduction gear with mechanical vibration absorber and overload clutch.

The engine is mounted in the fuselage in a central steel tubing frame near the a/c's CG. Engine power is transmitted via a propeller shaft made of composites and a helical spur gear to the variable pitch propeller in fuselage nose. During soaring, the propeller is folded and covered by a movable nose cone (propeller cone). Propeller pitch change from take-off into cruise position is accomplished by electrically heated expansion elements, and from cruise back to take-off position (elements unheated) by spring force.

Two fuel tanks are located at each end of the inner wing. They do supply the engine by use of electrically driven fuel pumps, one main and one auxiliary pump for each tank.

Technical data

Fuselage	Design	Front section CFRP-Kevlar-GFRP-structure, center steeltube frame, GFRP-fairing, tail boom with integrated vertical tail fin (CFRP)
	Length	27,6 ft / 8,42 m
	Height	5,74 ft / 1,75 m
	Width	3,87 ft / 1,18 m
Wing	Design	3 sections spar CFRP skin CFRP/GFRP-sandwich
	Span	75,46 ft / 23,00 m
	Wing area	201,6 sqft / 18,74 m ²
	Aspect ratio	28,22
	Dihedral (V-form)	0,75°
	Mean aerodynamic chord	2,86 ft / 0,873 m
	Wing profile	HQ 41/14,35
Airbrakes	Type	two-level Schempp-Hirth position outer part of inner wing
	Length	4,92 ft / 1,5 m
Horizontal tail	Design	web CFRP skin CFRP-Sandwich elevator GFRP-Sandwich
	Span	10,17 ft / 3,10 m
	Area	15,28 sqft / 1,46 m ²
	profile	FX71-L-150/25
Vertical tail	Design	web GFRP skin CFRP rudder GFRP-sandwich
	Span	5,25 ft / 1,60 m
	Area	16,25 sqft / 1,51 m ²
	profile	FX71-L-150/35
Masses	Max. T/O-mass	1874 lbs / 850 kg
	empty mass	1455 lbs / 660 kg (approx., min. equipment.)
	Max. wing loading	9,3 lbs/sqft / 45,36 kg/m ²
	certified CG range	10,0-16,5 in / 254-420 mm aft of Ref. plane

Engine	Model	4-cylinder 4-stroke-Otto-motor, opposed type turbocharger, electronic manifold control integrated reduction gear
	type	ROTAX 914 F2/S1
	engine-gearing ratio	$i = 0.4118$
	bore	3,13 in / 79,5 mm
	stroke	2,40 in / 61 mm
	displacement	73,9 cub.in / 1211 cm ³
	compression ratio	9,0
	drive shaft turns	anticlock (looking from front)
	max T/O power	113,2 hp / 84,5 kW at 5800 RPM
	max cont. power	98,4 hp / 73,4 kW at 5500 RPM
	fuel flow at T/O power (115%)	8,72 US gal./h / 7,26 Imp.gal/h / 33,0 l/h
	fuel flow at max cont. power (100%)	7,19 US gal./h / 5,98 Imp.gal/h / 27,2 l/h
	fuel flow at 75% power	5,34 US gal./h / 4,49 Imp.gal/h / 20,4 l/h
	specific fuel consumption at max. cont. power (100%)	0,454 lb/hph / 276 g/kWh
Propeller	design	2-blade folding propeller, CFRP blades propeller hub and blade susp. Forks aluminum pitch control with electr. heated thermo elements
	type	STEMME 11AP-V
	propeller diameter	5,35 ft / 1,63 m
	propeller blade angle (station 0,7)	17,65° in T/O 24,05° in cruise
	propeller blade pitch (station 0,7)	44,9 in / 114 cm (T/O position) 63,0 in / 160 cm (cruise position)
Front gear	type	helical spur gear aluminum alloy-housing elastic attachment in rubber elements
	type	STEMME 11AG
	drive shaft turns	counter-clockwise (looking from front)
	ratio of front gear	$i = 1,109$
Fuel system	Type	2 FRP-tanks at the outer end of the inner wing section 2 electrical fuel pumps for each tank (main and aux.)
	maximum fuel volume	2x11.9 US gal / 2x9.9 imp.gal / 2x45 l in wing tanks (optional: 2x15,8 US gal / 2x13,2 imp.gal / 2x60 l)
	unusable fuel	0,79 US gal. / 0,66 imp.gal / 3 l

1.5 Three View Plan

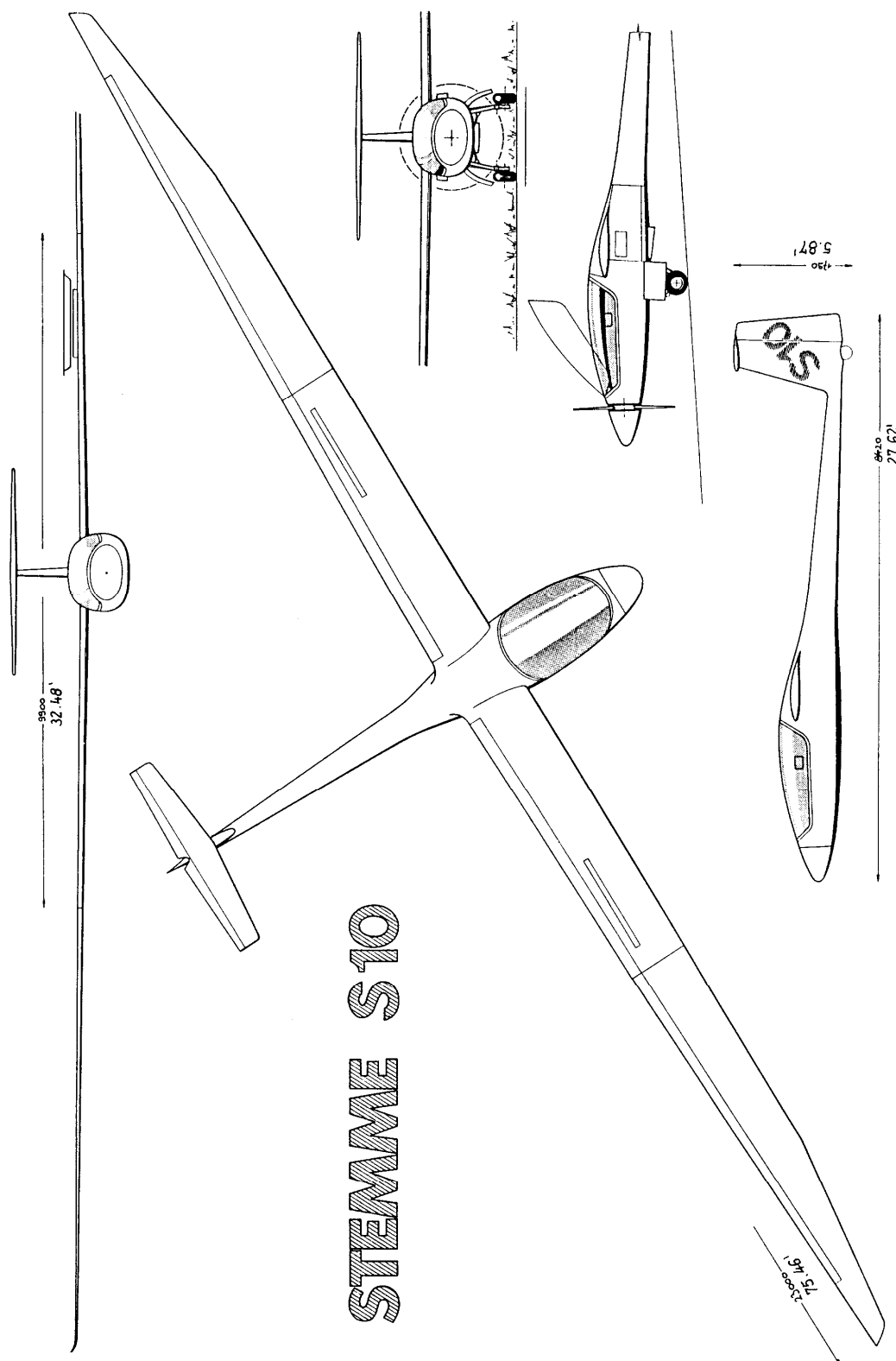


Fig. 1-1: 3-view-plan

Section 2 - Limitations

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2.1 Introduction

This section includes operating limitations, instrument markings and the information signs which are necessary for the safe operation of the powered glider, its engine, standard systems and standard equipment.

The operating limitations included in this section and in section 9 have been approved by the LBA.

2.2 Airspeed

Airspeed limitations and their meaning for operation of the a/c:

	Speed	IAS	Remarks
V_{NE}	Never exceed speed (maximum permissible airspeed in calm weather, with flap positions 0°, -5° and -10° only)	146 knots 168 mph 270 km/h	This speed must not be exceeded and control movement must be not more than $\frac{1}{3rd}$. It decreases with increasing altitude
V_{RA}	Maximum airspeed in rough air	97 knots 112 mph 180 km/h	Do not exceed this speed except in smooth air and then only with caution. Examples of rough air are lee-wave rotors, thunderclouds etc.
V_A	Design maneuvering speed	97 knots 112 mph 180 km/h	Above this limit the controls must not be moved fully or abruptly because the powered glider structure could be over-stressed under certain conditions.
V_{FE}	Permissible maximum airspeed for operation of flaps and with flaps extended: - positive position +5°, +10° - Landing position L (+16°)	97 knots 112 mph 180 km/h 76 knots 87 mph 140 km/h	This airspeed may not be exceeded during flap operation and with flaps in indicated position.
V_{LO}	Permissible maximum airspeed for the operation of the landing gear and with gear extended	76 knots 87 mph 140 km/h	This airspeed may not be exceeded during landing gear operation and with gear extended.
V_{PO}	Permissible maximum airspeed for engine start	76 knots 87 mph 140 km/h	Above this airspeed if propeller is folded engine may not be started.

2.3 Airspeed Indicator Markings

The following table gives the airspeed indicator markings and the meaning of the colors (AUW = all-up weight).

Marking	IAS (Value or Range)	Meaning
White arc	46-97 knots 53-112 mph 85-180 km/h	Positive flap operation range. (Lower limit is $1.1 V_{S0}$ in landing configuration with maximum AUW. Upper limit is the maximum airspeed with positive flap position.)
Green arc	49-97 knots 56-112 mph 90-180 km/h	Normal operating range. (Lower limit speed is $1.1 V_{S1}$ at max. AUW and most forward C.G. with flaps neutral; upper limit is rough air speed.)
Yellow arc	97-146 knots 112-168 mph 180-270 km/h	Maneuvers must be conducted with caution and only in smooth air.
L	76 knots 87 mph 140 km/h	Max. permissible airspeed with flaps in landing position and for landing gear operation.
Red line	146 knots 168 mph 270 km/h	Max. airspeed for all operations.
Blue line	62 knots 71 mph 115 km/h	Best rate of climb speed V_Y .
Yellow triangle	59 knots 68 mph 110 km/h	Approach speed at max. AUW.

2.4 Propulsion System and Fluids

2.4.1 Engine, Propeller, Fuel

Engine		
Manufacturer		BRP-Powertrain GmbH & Co. KG Gunskirchen, Austria
Engine modification		STEMME AG Strausberg, Germany
Engine / Model		ROTAX 914 F2/S1
Max. T/O RPM for 5 minutes		5800 RPM
Max. cont. RPM		5500 RPM
Idle RPM		1400 ... 1600 RPM
T/O power (ISA)		113,2 hp / 84,5 kW at 5800 RPM, 1300 hPa (38,4 in HG)
Max. cont. power (ISA)		98,4 hp / 73,4 kW at 5500 RPM, 1150 hPa (34,0 in HG)
Altitude band for const. power:	T/O power:	up to max. 8000 ft / 2450 m MSL
	MCP (max. cont. Power):	up to max. 16000 ft / 4500 m MSL
Max. cylinder head temperature:		135°C / 275°F
Oil temperature	maximum:	130°C / 266°F
	minimum:	50°C / 122°F
Temperatures for engine start-up	maximum:	50°C / 122°F
	minimum:	-25°C / -13°F
Oil pressure	minimum:	22 psi / 1,5 bar
	maximum pressure:	101,5 psi / 7,0 bar (peak press. for cold eng. start)
	Normal:	22-72,5 psi / 1,5 - 5,0 bar
Fuel pressure	maximum:	Airboxpressure + 5,08 psi / + 0,35 bar
	minimum:	Airboxpressure + 2,18 psi / + 0,15 bar
	normal:	Airboxpressure + 3,63 psi / 0,25 bar
Propeller		
Propeller-manufacturer		STEMME AG Strausberg, Germany
Propeller-type		11 AP-V
Data sheet-No.		32.100/3
Fuel System		
Maximum volume		2x11,9 US gal. / 2x9,9 imp.gal / 2x45 l (±5%) in wing tanks
Max available fuel quantity		22,99 US gal / 19,14 imp.gal / 87 l (±5%)
Unusable fuel		0,79 US gal / 0,66 imp. gal. / 3 l

2.4.2 Fluids

2.4.2.1 Fuel

It is recommended to use premium gasoline, unleaded, minimum RON 95. Suitable fuels:

EN 228 Super

EN 228 Super plus

According DOT: gasoline min. grade 1, AKI 90.0, acc. to Canadian General Standard Board CAN/CGBS-3.5 (Unleaded Automotive Gasoline)

According FAA: Standard Specification for Automotive Spark-Ignition Engine Fuel, ASTM D 4814

AVGAS 100LL.

When using AVGAS 100LL, valve seats are stressed by the high amount of lead and in addition combustion chambers will accumulate residues. Because of this, only in case of fuel vapor problems or if other fuel is not available, AVGAS should be used.

CAUTION: Engine manufacturer recommends, not to use AVGAS for an extended period, because an increased amount of residues may accumulate in the engine.

CAUTION: Danger of fuel vapor lock when using "winter"-fuel during summer time.

CAUTION: Use only the appropriate fuel, which is recommended for the climate zone

2.4.2.2 Coolant Fluid

Mixture of 80% concentrated antifreezing agent with anticorrosion additives and 20% water. Freezing point of this mixture is about -38°C / -34°F. "BASF Glysantin Antikorrosion" proved to be good; this or equivalent cooling fluid should be used.

CAUTION: To minimize the risk of residues, concentrated antifreezing agent without water added should only be used in case of coolant fluid evaporation after engine shut-down. Pure antifreezing agent starts freezing at -18°C / 0°F.

CAUTION: Check of the coolant fluid: The quantity in the overflow reservoir (lower left side in the wheel bay) must show to be between "min" and "max" markings. Missing coolant fluid in the reservoir must be added.

CAUTION: If the level of coolant fluid in the reservoir is below "min" marking, the proper supply of the breather valve is not guaranteed. In this case, it must also be made sure that there is no air in the coolant fluid system. This is checked by opening the locking cap on the supply tank (left side on fire-wall), add coolant fluid if necessary.

WARNING: Do not open the locking cap on the supply tank as long as the engine is not cooled down. The coolant fluid system is pressurized: Danger of burning by hot spraying fluid.

NOTE: If the engine is warm, the indicated quantity in the reservoir is noticeably higher. If the fluid quantity is too high, this means no danger to the system, but coolant fluid overflows from the reservoir into the gear bay.

2.4.2.3 Lubrication Fluids

Engine with integrated reduction gear

Use automobile engine oils of registered brand, with gear additives. These oils contain detergents. Do not use aircraft motor oil, neither with nor without additives.

Oil quantity: 0,8 US gal / 0,66 Imp gal / 3 l (minimum 0,53 US gal / 0,44 Imp gal / 2 l)

Oil consumption: max. 0,026 US gal/h / 0,022 Imp gal/h / 0,1 l/h

NOTE: Oil specification: Only use "SF" or "SG" oils according to the API-system with reduction gear additives "GL4" or "GL5"!

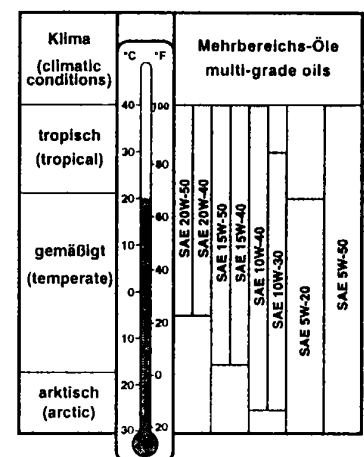
CAUTION: The reduction gear additives, specified "GL4" or "GL5", are required for a safe lubrication of the integrated reduction gear. Never use other oil additives!

NOTE: Full- or semi-synthetic oils are to be preferred because of the temperature stability and less residue formation.

CAUTION: A full synthetic oil in combination with AVGAS results in abnormally high abrasion and/or residues. During utilization of AVGAS, only semi-synthetic oils should be used.

a) *Viscosity:*

It is recommended to use multi-grade oils. Viscosity of multi-grade oils is less depending on temperature compared to single-grade oils. Multi-grade oils can be used all over the year; after an engine start at low temperatures the engine components are lubricated faster and at higher temperatures the oil is less light. Temperatures of next SAE-classes overlap, so for short-term temperature variations there is no need to change oil. The suitable oil grade can be chosen from the table.



Engine Oil Table

Front gear

Oil for front reduction gear must be according to specification MIL-L-2105C,D all year round.

NOTE: Oil specification: Only use "GL5" oils according to the API-system, i.e. ARAL reduction gear oil HYP 80W, 85W-90, 85W-140.

2.5 Power-Plant Instrument Markings

The following table shows the markings of the engine instruments and the meaning of the colors used.

Instrument	Red line = Minimum limit	Green arc = Normal Operating Range	Yellow arc = Caution Range	Red line = Maximum Limit
Tachometer ¹⁾ [rpm]	-	1400...5500	5500...5800	5800
Oil temperature ²⁾ [deg. C]	-	50...130	...50	130
[deg. F]		122...266	...122	266
Cyl. Head Temp. ²⁾ [deg. C]	-	50...135	-	135
[deg. F]		122...275		275
Oil pressure ³⁾ [p.s.i.]	22	22...73	73...102	102
[bar]	1,5	1,5...5,0	5,0...7,0	7
Fuel quantity gauge:	"0" at white line = empty Red point (beyond "full" mark) means: "no electrical connection"			

Notes:

¹⁾ reading error $\pm$ 50 RPM

²⁾ display in [°C]

³⁾ display in [bar]

2.6 Weights

maximum permissible take-off weight:	1874 lb. / 850 kg
maximum permissible landing weight:	1874 lb. / 850 kg
maximum weight: of all non-lifting parts:	1256.5 lb. / 570 kg (including load)
maximum weight in luggage compartment:	48.5 lb. / 22 kg

2.7 Center of Gravity

Independent of AUW the limits of the in-flight center of gravity are:

- forward limit: 10 in. / 254 mm aft of reference plane
- rear limit: 16.5 in. / 420 mm aft of reference plane

The reference plane is the vertical plane which contains the leading edge of the inner wing at given angle of the longitudinal axis. This is defined as the longitudinal inclination, at which the top edge of a wedge of 1.000:84, lying on the upper surface of the tail boom, is horizontal (see Maintenance Manual).

WARNING: The actual CG must not be aft of the certified most aft CG; at minimum permissible load, the CG is in limits. The minimum permissible load is given in the weighing logsheet and on a cockpit placard. Missing mass has to be compensated by installing ballast, see section 6.2 "Weighing Logsheet and permissible load limits".

2.8 Approved Maneuvers

The S10-VT is certificated in the category "utility, self-launching".

WARNING: Aerobatic maneuvers and cloud-flying are not certified!

2.9 Load Factors

The following load factors (related to earth gravity g) must not be exceeded:

a) Air-brakes stowed

up to maneuvering speed $V_A = 97 \text{ kts} / 180 \text{ km/h}$

positive 5,3 g, negative 2,65 g

up to maximum speed $V_{NE} = 146 \text{ kts} / 270 \text{ km/h}$

positive 4,0 g, negative 1,5 g

b) Air-brakes extended

up to maximum speed $V_{NE} = 146 \text{ kts} / 270 \text{ km/h}$

positive 3,5 g

c) Flaps in Landing position

up to maximum speed $V_{FE,+16^\circ} = 75 \text{ kts} / 140 \text{ km/h}$

positive 4,0 g

2.10 Flight Crew

The crew of the S10-VT consists of 2 persons; minimum crew is one person. When operated solo, the left seat is for the pilot in charge.

WARNING: Minimum load must be observed! To have at least the minimum load, it might be required to install ballast. See section 6.2 "Weighing Logsheet and Permitted Payload Range".

2.11 Kinds of Operation

The S10-VT is certificated for operation VFR at daytime with the required minimum equipment operable (see section 2.12, "Minimum Equipment List").

For VFR-Night flights a additional equipment is required within the provisions of the national law. Required base for VFR-Night Flights is the accomplishment of the STEMME SB A31-10-072.

CAUTION: Night flights are limited to the vicinity of active airfields that are approved for night flight operation (range of glide ratio).

2.12 Minimum Equipment List

Instruments and other components of the minimum equipment and the air navigation and communication equipment must be of accepted standards or type certificated. Parts provided by STEMME are listed in the Maintenance Manual.

S10-VT minimum equipment is:

- Airspeed Indicator up to 160 kts / 300 km/h with colored markings acc. section 2.3
- Altimeter
- Magnetic compass
- RPM-indicator with colored markings acc. section 2.4
- T/O-position-indicator (green lamp ON means, propeller blades in T/O-position)
- Engine-elapsed-time-indicator
- Oil pressure indicator
- Oil temperature indicator
- Fuel quantity indicator (right/left)
- Cylinder head temperature indicator
- Four-element straps (symmetric) in each seat
- Stall warning system
- Parachute or back-cushion (approx. 2 in / 5 cm compressed)

CAUTION: For structural strength reasons the weight of the equipped instrument panel may not exceed 26,5 lbs / 12 kg.
--

2.13 Towing by aircraft, winch launching

It is not allowed to tow the S10-VT by aircraft or launch by winch!

2.14 Other Limitations

Operation of the variable pitch propeller has been proved up to a temperature of +38°C / 100°F (OAT). Since operation of the pitching mechanism is influenced by OAT and starts actuating at 55°C / 131°F, indication of the green T/O-position light during take-off must be observed particularly at higher OAT's. T/O should not be attempted if the indicator is not illuminated (green).

The only permitted color for the aircraft exterior painting is white due to the necessity of protecting the structure from high temperatures caused by sunlight (approved up to +54°C / 129°F structural component temperature). For colored warning paintings the areas of the propeller dome and the wing tips and if optional installed the winglets are to be used.

For the glazing of the canopy only the use of material of an accepted type is permitted. The luminous transmittance value of these materials may not be less en 70 per cent and colors may not be falsified. These characteristics may not be reduced by the use of tinted canopies.

The luggage load must not exceed 22 lb. (10 kg) in each of the compartments at the sides of the cabin and 4.4 lb. (2 kg) in the center compartment. Single pieces weighing more than 1.1 lb. must be fastened securely and must load the bottom of the luggage compartment on a sufficient area.

2.15 Cockpit Placards

This section shows cockpit placards containing operation limits data.

Note: For further placards refer to the Maintenance Manual (Document No. A40-11-122)

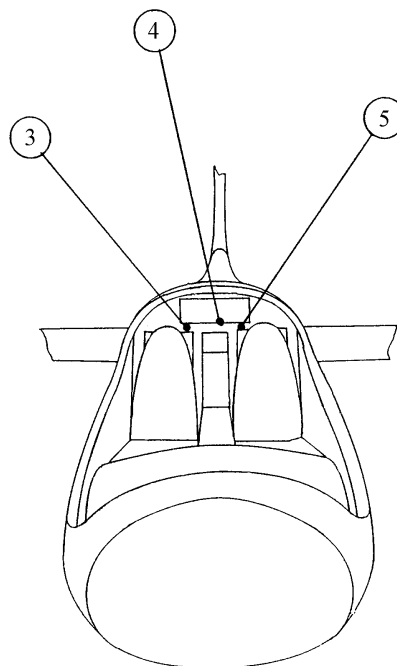
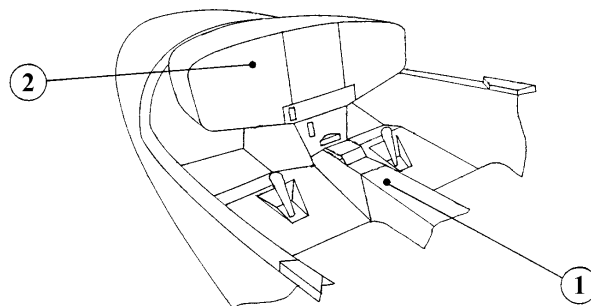


Fig. 2-1: Cabin placards

Manufacturer: STEMME AG, FRG			
Type: STEMME S10 / Model: S10-VT			
Serial no.:	11-	Year of Constr.:	
Certificated for:			
Never exceed Speed:	V_{NE}	146 kts	
Maneuvering Speed:	V_A	97 kts	
Maximum Speeds			
- Rough Air:	V_{RA}	97 kts	
- Land. Gear extended:	V_{LO}	76 kts	
- Inflight Engine start:	V_{PO}	76 kts	
- Flaps extended:			
	+5° / +10°	V_{FE}	97 kts
	L (+16°)	V_{FE}	76 kts
Empty Weight:			lbs
Max. Take-Off Weight:			1874 lbs
Min. Seat Load:		lbs, otherwise Ballast	
Max. Cockpit Load:			lbs
Tire inflation pressure Main Wheels:		46,5	p.s.i.
Tire inflation pressure Tail Wheel:		40,6	p.s.i.

1 - on Shaft Tunnel

[ft MSL]	[kts]
10.000	139
13.000	132
16.500	125
19.500	118
26.000	105
33.000	93
39.500	81

2 - Instrument Panel

(near airspeed indicator, dropped if marked inside the airspeed indicator)

Baggage
max. 22 lbs

3 and 4 - Baggage Comp.
(behind left and right seat)

Baggage
Only light Items
Total: max. 4,4 lbs

5 -Baggage Comp. (middle rear)

Fig. 2-2: Operation Limits Placards

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3.1 Introduction

Section 3 provides checklists and amplified procedures for coping with emergencies that may occur.

3.2 Canopy Jettison

- Canopy lock: OPEN (left **and** right lever)
- Red emergency handle PULL for canopy release (center of instrument console)
- The canopy is pushed upwards by a gas spring. If necessary push manually.

WARNING: The **rear canopy lock ("Röger"-hook)** must be locked when the canopy is jettisoned! It functions such that the canopy is only lifted at the front and is torn away by wind forces.

3.3 Bailing out

After canopy is released

- Central lock of safety-belts OPEN
- bail-out to the side, try to leave so as to clear below the wing to avoid collision with the tail.

NOTE: The fixed part of the cockpit edge is of strong structure without sharp edges; it should be used to pull out and to brace.

3.4 Stall Recovery

3.4.1 Powered configuration

Stall speed depends on flap deflection and actual weight and may occur in unaccelerated wings-level flight below 46 kts / 85 km/h (worse for flaps -10°, max weight), in turns the a/c should stall at higher speeds depending on g-force. In powered flight, stall onset is recognized by the acoustic stall warning.

If after stall-onset the angle of attack is further increased or a turn is initiated, a wing-drop may occur, and depending on CG, the a/c may spin.

Stall recovery:

- Elevator RELEASE forward
- Throttle FULL POWER
- Airspeed WAIT for increase
- Attitude CORRECT with rudder and aileron

WARNING: Altitude loss for recovery from stall in **level flight** may be up to **100 ft / 30m**, out of a **turn** up to **130 ft / 40 m** and for a **delayed reaction** up to **200 ft / 60 m**.

3.4.2 Glider configuration

Stall speed depends on flap deflection and actual weight and may occur in unaccelerated wings-level flight below 50 kts / 91 km/h (worse for flaps -10°, max mass), in turns the a/c will stall at higher speeds depending on g-force. When flying as a glider, stall onset is recognized by aerodynamic buffeting.

If after stall-onset (buffeting) the angle of attack is further increased or a turn is initiated, a wing-drop may occur, and depending on CG, the a/c may spin.

Stall recovery:

- Elevator RELEASE forward
- Airspeed WAIT for increase
- Attitude CORRECT with rudder and aileron

WARNING: Altitude loss for recovery from stall in **level flight** may be up to **100 ft / 30m**, out of a **turn** up to **130 ft / 40 m** and for a **delayed reaction** up to **200 ft / 60 m**.

3.5 Spin Recovery

If the a/c spins unintentionally, the procedures to recover are the same for the powered or unpowered (glider) configuration:

- Rudder DEFLECT fully against the direction of turn
- Aileron NEUTRAL
- Elevator RELEASE and PUSH forward beyond the neutral position
- Controls HOLD until spin stops, then
- Rudder NEUTRAL
- Recover to normal attitude, use elevator with caution during pull-out of dive

WARNING: Altitude loss between counteracting spin and level flight can be up to **330 ft / 100 m**.

WARNING: Spinning with flaps in "L" (+16°) can result in structural damage. If unintentionally the a/c spins with flaps in "L", **immediately retract flaps to 10° or less** and recover from spin by standard procedure.

CAUTION: In case the a/c spins unintentionally with the engine running, use standard recovery procedure **and reduce power to idle**.

NOTE: With a rear C.G. position spinning is accompanied by strong, oscillating pitching movements, about one oscillation per turn.

NOTE: With a forward CG, Spinning may change to a spiral dive; this can immediately be stopped by normal control technique.

3.6 Recovery from Spiral Dive

In middle and forward C.G. positions the aircraft has tendencies to go directly or after some spinning-turns into a spiral dive.

Spiral dive is stopped by the following maneuver:

- Aileron and Rudder STOP ROTATION (actuate opposite to direction of turn)
- Elevator PULL OUT of dive with caution

WARNING: Do not exceed $V_{NE} = 146 \text{ kts} / 168 \text{ mph} / 270 \text{ km/h}$ during pull out!

NOTE: If the aircraft stops spinning by itself, it can develop a spiral dive.

3.7 Engine Failure

3.7.1 Engine Failure during T/O

- If RWY-length is sufficient land straight ahead.

If a straight landing is not possible, the pilot has to decide depending on altitude, position and suitable landing fields etc. how to proceed.

- approach procedure DEFINE
- fire-cock CLOSE
- ignition OFF (switch to OFF)
- gear DOWN and LOCKED (2 green lamps)
- master switch OFF

CAUTION: If the situation allows switch OFF the master switch shortly before landing, because all electrical equipment is switched off - COM and gear are not available anymore.

CAUTION: If the gear was already selected UP and decision is to land with gear down, the master switch has to be ON until the green gear lights show the gear in down and locked position (both green gear lights ON).

CAUTION: If the gear was already selected UP and pilots decision is to land with gear retracted, the master switch has to be ON until the red flashing gear lights are extinguished.

If situation allows, gliding ratio and range can be improved by the following procedure, which also minimizes the risk of serious propeller and transmission system damage in case of a gear-up landing:

- propeller BRAKE and wait for folding
- propeller POSITION
- propeller-dome CLOSE

CAUTION: Due to the S10-VT configuration, there is almost no difference in a/c behavior with regard to propeller position in or out.

CAUTION: With the engine stopped and the propeller still windmilling, the rotating propeller causes much higher additional drag than the additional drag due to the open dome and the open cowl flaps. Therefore it is most important to stop the propeller until it automatically folds in, while the dome need not be closed, unless this does not over-stress the pilot during landing.

3.7.2 Engine Failure during flight

Normally the engine only stops in case of **fuel shortage** or if the **ignition** is switched **off**. Engine failure due to carburetor icing was not observed until now since carburetor-air is heated by turbocharger. Even with total electrical failure (if for example the engine master switch at the dome actuating handle fails) the engine does not stop because ignition circuits are separate.

After an engine failure in flight, the following restart-procedure is recommended:

- airspeed < 75 kts / 140 km/h
- fuel-cock OPEN
- fuel selector switch BOTH tanks
- auxiliary fuel pumps ON (green lamp ON)
- CB's for all fuel pumps CHECK o.k. (two for the main, and two for the auxiliary pumps)
- fuel pressure CHECK (red warning lamp not ON or FLASHING, see section 3.9.4-1)
- fuel quantity CHECK (fuel quantity indicators for both tanks)
- choke OFF
- throttle IDLE, max. 10%
- starter START (for a minimum of three seconds)

As soon as the engine starts firing, release start-key (it snaps from spring-loaded START-position to BOTH-position) to stop the starter. If the engine is not running after 10 seconds, wait for 2 minutes starter cool-down and repeat starting procedure.

If engine start unsuccessful:

- prepare for engine-off landing on next suitable landing field.

- **WARNING:** An unintentionally actuated starter during powered flight will cause the ignition to quit for three seconds, and consequently cause an engine failure. The engine can be immediately re-started by operating the starter again (for at least three seconds!).

CAUTION: Engine airstart: after an unsuccessful engine-start the propeller may turn with engine not running, because engine and propeller are isolated by a centrifugal clutch. A **running engine is indicated by the RPM-indicator** not by seeing the propeller turning.

CAUTION: An automatic electronic device adds the ignition with a time delay of three seconds after the starter is actuated, causing the propeller blades to be fully unfolded before the engine starts, and consequently reducing the loads for the propeller blades and their corresponding stops. The time delay starts from the beginning each time the starter is actuated, which means that the starter must always be operated for at least three seconds.

CAUTION: The engine may be restarted with the propeller either turning or folded (dome OPEN!).

CAUTION: Within 10 seconds after engine start, oil pressure must be within green range! If not, a serious engine problem may be the reason.

More information about engine starting is given in section 4.5.3.4 b).

3.7.3 Failure of engine-starter

If the engine-starter does not operate at an attempted airstart, the reason might be an incorrect locking of the propeller-dome in the open position, or failure of the engine master switch, connected to the propeller-dome-interlock. In this case proceed as follows:

- master CB CHECK o.k.
- master switch ON (Voltmeter must show correct voltage)
- handle for propeller-dome CHECK (pushed and LOCKED, push down handle against pressure-point, engine-instrumentation and lamps must be on, specially the red Charge-control lamp must be ON)

If engine-starter is still not operating, the engine master switch at the propeller-dome can be bypassed by:

- engine-back-up switch ON (guarded switch on right side of instrument panel)
- if unsuccessful prepare for power-off emergency landing

WARNING: With the engine-back-up switch ON the engine can be started, even with the propeller dome not or not completely open! This will seriously damage the propeller-dome and the propeller and can create consequential damages.

3.8 Fire

3.8.1 Fire in engine-compartment

The standard fire warning system generates an acoustic warning with the gear warning horn and optically with the red FIRE warning lamp. In case of inflight fire warning or smell of fire or smoke, the following procedure is recommended:

During flight:

Immediate reaction:

- fuel-cock CLOSE (turn)
- throttle FULLY OPEN (to discharge fuel lines and carburetor)

when engine has stopped:

- ignition OFF
- master switch OFF
- airspeed approx. 55 - 65 kts / 100 - 120 km/h
- propeller BRAKE and POSITION
- propeller-dome CLOSE
- cabin ventilation OPEN in case of smoke in cockpit (side-window and/or nozzle)
- emergency descent INITIATE as soon as possible, EXTEND air-brakes
- emergency landing PREPARE for next suitable terrain

CAUTION: Normally the propeller will continue turning with the engine not running, because engine and propeller are isolated by a centrifugal clutch. **A running engine is indicated by the RPM-indicator** not by observing the propeller turning.

WARNING: With the master switch in OFF, COM and all other electrical equipment is not available, including fire-warning system. To operate the gear prior to landing, the master switch must be selected ON for a short time or the landing gear must be operated manually (see section 3.9.4.19). Depending on situation and area it might be favorable to land with the gear up.

3.8.2 Electrical Fire

Inflight electrical fire:

- master switch OFF
- cabin ventilation OPEN (side-window and/or nozzle)
- throttle SET for level flight with approx. $v_y = 62 \text{ kts} / 115 \text{ km/h}$
- approach next suitable airfield
- gear EMERGENCY EXTENSION (see section 3.9.4.19)

WARNING: With the master switch in OFF, COM and all other electrical equipment is not available, including normal gear operation and fire-warning system. Engine ignition as well as the electrically driven main fuel pumps are independent on master switch position; if there is no fire in the engine bay, the engine can be operated to find an area for emergency landing and to set-up for landing. It has to be noticed, that engine instrumentation (except cylinder head temperature) is not available and that the propeller blades are moving into T/O-position within 2-5 minutes without indication. In addition, the electrically driven auxiliary fuel pumps as well as the control unit of the turbo-charger system (TCU) are switched off with the master switch; in this configuration RPM and manifold pressure have to be controlled manually within certified limits. For this reason a low power setting for level flight with about V_y is recommended.

Electrical fire on ground:

- master switch OFF
- fuel-cock CLOSE
- throttle FULL OPEN
- ignition OFF after the engine has stopped
- T/O ABORT (see section 3.9.1.1)

3.9 Other Emergencies

3.9.1 Take-off

3.9.1.1 T/O abort

If a take-off abort is urgently required **during take-off run** for technical reasons or flight safety, the following actions are recommended:

- Throttle IDLE
- Airbrakes EXTEND
- Elevator control PULL carefully to lower the tail
- Wheel brakes ACTIVATE with caution

In case of an engine failure **shortly after lift-off**, the recommended procedure is similar, but be sure to establish a stable attitude and maintain sufficient airspeed before an extension of the air-brakes. Push the stick as necessary to gain enough air-speed.

- throttle IDLE
- airspeed > 59 kts / 110 km/h (yellow triangle)
- airbrakes EXTEND as required
- landing normal FLARE and TOUCHDOWN
- elevator PULL carefully to lower the tail
- wheel brakes ACTIVATE with caution

If **runway remaining is too short to come to a normal stop** or if there are obstacles:

- fuel-cock CLOSE
- ignition OFF
- master switch OFF
- if necessary perform a ground loop to stop the a/c (see section 3.9.2.2)

3.9.1.2 Go-around with propeller in cruise position

If a go-around in landing configuration is necessary for reasons of safety with the propeller not as required in T/O-position (green pitch position indicator not ON) proceed as follows:

- throttle FULL POWER
- airbrakes IN and LOCKED
- airspeed 62 kts / 115 km/h (blue line)
- elevator PULL slightly to change to a shallow climb angle
- landing gear RETRACT
- flaps +5°
- propeller-pitch TAKE-OFF
- cowl flaps full OPEN

WARNING: Monitor max. 5800 RPM during climb. Correct RPM by throttle if necessary while propeller pitch control system (PPC) is moving propeller blades from cruise to T/O position.

3.9.2 Landings

3.9.2.1 landing outside of an airfield

If a landing outside of an airfield is required by technical malfunctions or by reasons of flight safety, special care must be taken to the suitability of the selected landing area and the character of soil at surface for the wheel load.

If the landing area is found to be suitable, a landing in **gliding configuration** is recommended as described in sections 4.5.3.4 a) and 4.5.4 b).

Landing on a soft surface, not able to support the load of the a/c, means a high risk. If this cannot be avoided, a landing with the landing gear retracted is considered to be of lower risk (see section 3.9.3.1).

Forced or emergency landings are always prepared by:

- loose items SECURELY FASTEN
- seat belts TIGHTEN

3.9.2.2 Intentional ground-loop

If it is realized in final phase of landing or landing roll and decided to ground-loop the a/c, the recommended procedure is:

- wheel brakes APPLY as hard as possible without nosing-over

Intime before collision with the obstacle, simultaneously:

- rudder FULL DEFLECTION
- aileron simultaneously FULL DEFLECTION to let down the wing (direction like rudder)
- elevator PUSH SHORTLY to lift the tail but not too hard to avoid nose-over

Note: The elevator should be deflected so, that the tail is lifted off the ground to reduce the risk of structural damage to the fuselage during yaw and skidding, but, on the other hand, the a/c must not nose-over, which would damage the propeller and the front section of the fuselage. The correct elevator deflection depends on deceleration while full braking. The more effective the braking and the softer the surface, the more elevator has to be aft.

3.9.3 Emergency landing

3.9.3.1 Emergency landing with landing gear retracted

In all cases in which serious landing gear malfunctions cannot be corrected and emergency deployment is not possible, as well as in unavoidable off-field landings with soft ground, a landing with retracted landing gear is recommended in the following sequences.

After gliding range to suitable airfield is secured, change to **gliding configuration**:

- Fuel cock CLOSE
- Ignition OFF (if possible wait until carburetor reservoirs are empty)
- propeller BRAKE and POSITION
- propeller-dome CLOSE

Before landing:

- loose items STOW and SECURE
- seat belts TIGHTEN
- Wing flaps +16° (L)
- master switch OFF
- approach path flat and smooth
- landing pull moderately for a smooth pull-out to avoid stalling, touch down in 2-point attitude, use only minor airbrakes.

CAUTION: Because of the long landing gear legs of the S10-VT pitch-angle and height above ground change remarkably compared to a landing with landing gear extended. In addition the ground clearance of the wing-tips is much less and it is very important to hold wings level at touch-down.

WARNING: The energy absorption capacity with retracted landing gear is much smaller than with extended landing gear. To avoid a stalled landing, it is recommended not to approach with minimum speed. The touch-down should be in a two-point-landing attitude (tail wheel & front cockpit floor).

3.9.3.2 Emergency landing with the landing gear not fully down and locked

Landings with only one wheel down and locked were demonstrated several times without damage to pilot and aircraft.

In all cases in which serious landing gear malfunctions cannot be corrected according to the procedures given in section 3.9.4.19 and the landing gear position indicator lights show only one landing gear leg Up or DOWN, try to get confirmation on this status by an external observer (ground station or another aircraft).

For a one-wheel landing the following actions are recommended (landing in **gliding configuration!**):

- be prepared for an unintended groundloop and uncontrollable yawing off the runway, plan for sufficient space
- loose items STOW and SECURE
- seat belts TIGHTEN
- fuel cock CLOSE
- ignition OFF (if possible wait until carburetor reservoirs are empty)
- propeller BRAKE and POSITION
- propeller-dome CLOSE
- Wing flaps position 16° (L)
- master switch OFF
- short final flat flight path
- landing FLARE cautiously, avoid stalled-landing
- lateral control maintain wings level as long as possible
- wheel brakes when the wing tends to drop and is not controllable anymore by full deflected aileron, APPLY FULL BRAKES and use FULL RUDDER against direction of yaw.

3.9.3.3 Emergency landing on water (ditching)

An emergency landing on water is accompanied with risks and should only be undertaken as a last option.

If a ditching is unavoidable, it is recommended to land in the **sailplane configuration** and, due to the special design of the landing gear, with the **landing gear retracted**. Cabin ventilation and emergency-window must be closed first.

Approach and landing:

- approach GLIDER CONFIGURATION
- landing gear UP
- ventilation, emerg.-window CLOSE
- final and touch-down MINIMUM SPEED

If the a/c dives after touch-down and does not rise to the surface soon and the front cockpit stays below the water surface, it is recommended to open emergency-window and ventilation to accelerate pressure balance because it could be impossible to open the canopy due to a high water pressure. If necessary, opening of the canopy can be improved by pulling the emergency canopy handle after opening the canopy locks and the "Röger"-hook (see section 3.2 "Canopy Jettison"):

- lateral canopy locks OPEN
- "Röger"-hook UNLOCK
- canopy emergency handle PULL (red handle on the instrument panel)
- ventilation, emerg.-window OPEN

NOTE: Experience shows, that gliders tend to submerge at touch-down instead of sliding on the water surface. When the cockpit is pressed below the water surface, mostly only for a short moment, it is almost impossible to open the canopy.

3.9.4 System malfunctions

At abnormal system behavior conduct checks as per sections 3.9.4.1 through 3.9.4.19. Before the next flight determine and eliminate the cause of the system failure acc. to the maintenance manual.

3.9.4.1 Red fuel-pressure warning lamp on or flashing

a) *Red fuel-pressure warning lamp steady on*

A steady red fuel-pressure warning lamp shows the fuel pressure to be below the allowable limit, unless there is a malfunction of the indicator or sensor.

The engine may stop due to low fuel pressure. Reason for low fuel pressure could be a malfunction in the fuel-supply, an engine defect, fuel-pressure control or fuel pumps.

Proceed as follows:

- fuel-cock OPEN
- fuel selector switch BOTH tanks
- auxiliary fuel-pumps ON (green lamp must be ON)
- CB's for all fuel pumps CHECK o.k. (two for the main, and two for the auxiliary pumps)
- fuel quantity CHECK (fuel quantity indicators for both tanks)
- Additionally, when only a low quantity of fuel is left: If necessary reduce power setting and airspeed, fly without bank or sideslip.
- if engine has stopped proceed with normal airstart (section 4.5.3.4 b))
- The S10-VT tends to slightly lower it's right wing during fast cruise at high power settings. The reason for this is the high engine torque caused by a high power setting, combined with a small rolling moment due to sideslip at high airspeed. A bank angle to the right makes the fuel supply from the right wing tank more difficult, resulting in possible fuel shortages, especially when the left fuel tank is already empty, or if there is only little fuel left and the fuel selector switch is in position "right tank".
- If fuel pressure can be restored by use of the auxiliary fuel pump(s), but drops again when deselecting the auxiliary fuel pump(s), most likely the main fuel pump(s) or the internal generator are malfunctioning. With the auxiliary fuel pump(s) continuously ON, it can be assumed that the flight can be completed as planned, but with a remaining risk of engine stopping.

If it is not possible to restore normal fuel pressure, a landing on the next suitable airfield has to be planned. A sudden engine-stop must be expected at anytime.

CAUTION: Engine airstart: The propeller may continue turning with the engine not running (following an unsuccessful engine airstart), because engine and propeller are isolated by a centrifugal clutch. A **running engine is indicated by the RPM-indicator** not by observing the propeller turning.

b) *Red fuel-pressure warning lamp flashing*

A flashing red fuel-pressure warning lamp indicates, that fuel pressure is above the upper limit, or indicator or sensor are malfunctioning. The engine may stop. The reason for high fuel pressure could be a problem of the fuel-pressure control unit of the engine, or of the fuel pumps. If the main and the auxiliary fuel pumps are working simultaneously, the auxiliary fuel pump(s) can be checked by deselecting them (red warning lamp stops flashing, if the auxiliary fuel pump(s) are the reason).

Prepare a landing on the next suitable airfield with this warning, an engine malfunction has to be expected at any time. Even with a flashing red fuel-pressure warning lamp, the auxiliary fuel pumps should be switched on prior to landing.

3.9.4.2 Green lamp for fuel auxiliary pump

The green lamp is a reminder for the operation of the fuel auxiliary pump(s), i.e. during cruise.

If the green lamp is not illuminated with the aux. fuel pump(s) switched ON, the pump(s) or the indication have a malfunction. Basically, this is not a flight critical item as long as the main fuel pump(s) are operating properly, and the fuel pressure remains within its limits.

When observing this:

- CBs for aux. fuel pumps CHECK
- fuel pressure MONITOR (red fuel pressure warning lamp OFF)

3.9.4.3 Red warning lamp for manifold pressure steady ON or flashing**a) *Red warning lamp for manifold pressure steady ON***

Maximum allowed manifold pressure was exceeded, procedure:

- manifold pressure (MAP) is not automatically controlled
- throttle REDUCE
- RPM and MAP CONTROL with throttle (red warning lamp must extinguish)
- RPM setting < 4500 RPM recommended
- limited engine power range has to be expected, manifold pressure control is not properly operating

The exceeding of maximum allowed engine limits must be documented in the a/c-logbook with details like nature of incident, date, duration and the degree of exceeding.

b) *Red warning lamp for manifold pressure flashing*

T/O-power was set for more than 5 minutes, procedure:

- throttle REDUCE to max. continuous power or less

CAUTION: The manifold pressure is not automatically limited or reduced.

The exceeding of 5 minutes must be documented in the a/c-logbook with date and duration of exceeding.

3.9.4.4 Yellow TCU-caution lamp flashes

A failure of sensors, sensor wiring, TCU or a leakage in the airbox are possible, procedure:

- RPM and MAP CONTROL with throttle (red MAP warning lamp must stay OFF).
Recommended < 4500 RPM

If manual control is not possible:

- TCU isolation switch UPWARDS (red, protected switch) to isolate wastegate actuator.
- limited engine power range has to be expected, manifold pressure control is not or not properly operating

Flashing of the yellow TCU caution lamp must be documented by the pilot in the a/c-logbook with details like nature of incident, date, duration and the degree of exceeding.

3.9.4.5 Red battery charge warning lamp for the external generator is ON

If the red battery charge control warning lamp for the external generator is ON, then the engine-driven generator with the master switch ON and the propeller-dome OPEN and LOCKED does not generate electrical energy. This is normal if the engine is not running or if the generator switch is OFF.

If the warning lamp is ON when the generator switch is selected ON and the engine is running, a malfunction must be expected and following procedure is recommended:

- external generator switch ON
- CB for external generator CHECK

If warning lamp is still ON:

- external generator switch OFF
- non-essential equipment OFF
- prepare to land on next suitable airfield

In case of a failed generator, the battery is the only source of electrical energy and will be discharged continuously; energy can be saved by switching OFF all non-essential electrical consumers, extending time for the most important systems. The system to control propeller-blade angle is automatically isolated, if generator is switched OFF or failed; this causes the propeller blades to move automatically within 2 to 5 minutes into T/O-position (propeller control lamp green); the propeller control switch is ineffective.

CAUTION: Cruising with propeller in T/O position (green lamp ON) results in lower cruising speed and reduced range. The engine continues running when the generator fails.

CAUTION: With the propeller in T/O position, the engine might, even at low altitude, turn too fast with power settings below 100%. The power must be reduced to keep engine RPM below the max continuous limit of 5500 RPM.

3.9.4.6 Yellow caution lamp for the internal generator is ON

The yellow caution lamp ON during engine running indicates failure of the internal generator. This means no dangerous situation, because in this case the internal generator bus is supplied with energy from the main bus (battery and external generator). Procedure is:

- Continue flight with special attention on red battery charge warning lamp for the external generator.

WARNING: If the yellow caution lamp for the internal generator is ON and in addition the red battery charge warning lamp comes ON (→ section 3.9.4.5), the TCU and the fuel pumps are supplied only by the battery, which is not being charged. After discharge of the battery the engine will possibly fail, therefore in this case land on next suitable airfield.

3.9.4.7 Total electrical failure

Reason for a total electrical failure could be a short-circuit in one of the electrical systems. With this problem, COM - systems, electrically operated instruments including engine instruments (except CHT) are lost. Additionally the propeller-blade actuating system is not energized, which means, the propeller- blades move automatically within 2 - 5 minutes into T/O position; this is not indicated because the green lamp is not energized. Also, the electrically driven fuel auxiliary pump(s) and the TCU are not operating; RPM and manifold pressure have to be controlled manually within certified limits. Following procedure is recommended:

- master switch OFF
- all electrical systems switch OFF (generator, avionics, landing gear etc.)
- all system CB's CHECK, popped CB's should not be pushed in again
- master CB CHECK (PULL and PUSH in again)
- master switch ON

In case that the electrical system is serviceable now (the voltmeter displays normal voltage), you may try to switch on the systems again, if their corresponding CBs did not pop out. Other systems, where the CBs popped out, should not be activated before being checked, unless those systems are indispensable.

If unable to restore the electrical system, recommended procedure is:

- throttle SET for level flight with approx. $V_y = 62$ kts / 115 km/h
- prepare for safety landing on next suitable airfield
- landing gear EMERGENCY EXTENSION (manual operation, see section 3.9.4.19)

WARNING: Tachometer is not operating and engine RPM can only be set acoustically. Avoid engine overspeed conditions! Therefore and because the TCU may fail, the lower power setting required to fly level with V_y is recommended.

3.9.4.8 Loss of electrical energy for the TCU

When the TCU is not energized, because the electrical master switch or the engine master switch had to be switched OFF or the corresponding CB is u/s, procedure is:

- TCU isolation switch UPWARDS to isolate waste-gate actuator
- re-energize TCU electrical and/or engine master switch ON, resp. CB's CHECK
- TCU self-test WAIT for about 10 seconds until test passed
- TCU isolation switch DOWNWARDS, to activate waste-gate actuator
- if unable to restore electrical system, RPM and MAP are controlled manually. Recommended < 4500 RPM. Engine operating range is limited.

CAUTION: Before the electrical system is energized again, waste-gate actuator should be switched OFF, because otherwise it is cycled by TCU-self-test.

Exceeding of maximum allowed limits must be documented by the pilot in the a/c-logbook with details like nature of incident, date, duration and the degree of exceeding.

3.9.4.9 Sudden drop of MAP and RPM

When MAP and RPM suddenly drop, in correlation with **heavy noise or a bang**, it is most likely that the turbocharger is damaged. Recommended procedure:

- engine SHUT-DOWN as soon as practicable, change to glider configuration and look for safe landing area
- if safe landing is not possible, a limited engine operation might be possible; monitor engine instruments, specially oil pressure indication

When MAP and RPM suddenly drop, in correlation with the **yellow TCU caution lamp flashing**, most likely the TCU is failed. Procedure:

- be prepared for reduced engine power, because the waste-gate may not close (with an open waste-gate, about 88,5 hp / 66 kW engine power are available)

An exceeding of maximum allowed engine limits and/or the flashing of the yellow TCU caution lamp must be documented by the pilot in the a/c-logbook with details like kind of incident, date, duration and the degree of exceeding.

3.9.4.10 Sudden rise of MAP and RPM

When MAP and RPM suddenly rise and simultaneously the yellow **TCU-caution lamp starts flashing**, turbocharge control most likely is malfunctioning; procedure:

- RPM and MAP CONTROL MANUALLY with throttle (red MAP-warning light may not be ON), recommended < 4500 RPM
- engine power available expect limited engine power available, waste-gate may be fully closed and manifold control is only by throttle

When MAP and RPM suddenly rise and **RPM cannot be reduced by throttle**, most probably there is a disconnect in the throttle linkage. In this case, the mechanical carburetor input is moved by spring force to the 115%-position. It is recommended to climb to a safe altitude, change to glider configuration and land as glider on a suitable field; procedure:

- Airspeed 62 kts / 115 km/h
- Fuel-cock CLOSE
- After engine stops Ignition OFF
- After engine cool-down change to GLIDER CONFIGURATION (see section 4.5.3.4 a)) and land in glider configuration

WARNING: If the engine is restarted with throttle set for full-power, the power transmission system may be severely damaged.

An exceeding of maximum allowed engine limits and/or the flashing of the yellow TCU caution lamp must be documented by the pilot in the a/c-logbook with details like nature of incident, date, duration and the degree of exceeding.

3.9.4.11 Oscillating increase and decrease of MAP and RPM

A periodic increase and decrease of MAP and RPM is most likely caused by oscillations of the manifold-pressure control with the yellow TCU-caution lamp not ON; procedure:

- TCU-isolation switch UPWARDS briefly to isolate waste-gate actuator
- after max. 5 seconds TCU-isolation switch DOWNWARDS

Continue mission if system is operating normally; if not:

- TCU-isolation switch UPWARDS to deselect TCU-actuator
- RPM and MAP CONTROL MANUALLY, automatic manifold pressure control is not available, recommended setting < 4500 RPM.

CAUTION: When the TCU-actuator is switched OFF, limited engine power range has to be expected, manifold pressure can only be controlled manually.

Exceeding of maximum allowed limits and/or deselecting the TCU-actuator must be documented by the pilot in the a/c-logbook with details like kind of incident, date, duration and the degree of exceeding.

3.9.4.12 Exceeding of maximum allowed CHT

If max CHT was exceeded, the procedure is:

- cowl flaps fully OPEN
- throttle REDUCE as necessary for safe flight
- CHT MONITOR. If temperature does not decrease to below maximum, change to glider configuration when possible for safe landing (see section 4.5.3.4 a))
- prior to next flight check engine cooling system

Exceeding of maximum CHT must be documented by the pilot in the a/c-logbook with details like nature of incident, date, duration and the degree of exceeding.

3.9.4.13 Exceeding of maximum allowed oil temperature

If maximum oil temperature was exceeded, the procedure is:

- cowl flaps fully OPEN
- throttle REDUCE as necessary for safe flight
- oil temperature MONITOR. If oil temperature does not decrease to below maximum, change to glider configuration when possible for safe landing (see section 4.5.3.4 a))
- prior to next flight check engine oil system

Exceeding of maximum oil temperature must be documented by the pilot in the a/c-logbook with details like nature of incident, date, duration and the degree of exceeding.

3.9.4.14 Oil pressure below minimum during flight

If oil pressure is below minimum during flight, the procedure is:

- engine SHUTDOWN and change to glider configuration, if situation allows (see section 4.5.3.4 a))

If situation requires engine operation:

- engine power REDUCE to minimum required for safe flight
- be prepared for sudden engine stop anytime
- land as soon as practicable
- prior to next flight check engine oil system

If the oil pressure was below minimum, this must be documented by the pilot in the a/c-logbook with details like nature of incident, date, duration and the degree of exceeding.

3.9.4.15 Oil pressure below minimum on ground

If oil pressure is below minimum on ground, the procedure is:

- engine SHUTDOWN
- oil quantity CHECK
- type of oil in use CHECK
- oil system and engine CHECK prior to next flight

3.9.4.16 Exceeding of maximum allowed engine-RPM

If maximum engine RPM is exceeded, the procedure is:

- throttle REDUCE immediately until RPM is below max

CAUTION: Because of the manually controlled two-position propeller in combination with the turbocharged engine, a significant increase of RPM at constant power-setting has to be considered during climb (about 200 RPM per 1.000 m (60 RPM / 1000 ft, respectively). The throttle has to be set accordingly to avoid overspeeding the system.

Exceeding of maximum allowed engine-RPM must be documented by the pilot in the a/c-logbook with details like nature of incident, date, duration and the degree of exceeding.

3.9.4.17 Loss of propeller pitch-control

Loss of propeller pitch-control will most probably mean, that the blades change to T/O-position (low pitch). This is not a dangerous situation with the following actions:

- CB for propeller control CHECK
- red GEN-warning lamp CHECK OFF

If red battery charge warning lamp for the external generator is ON:

- switch for external GEN ON
- CB for external GEN CHECK IN

If no success, continue with propeller in T/O-position.

CAUTION: If external generator is not operating (switched off or failed), propeller blades will not actuate to cruise position.

CAUTION: During cruise with propeller in T/O-position, cruising speed is reduced as well as range (revise flight plan if necessary).

CAUTION: During cruise with propeller in T/O-position, the engine RPM may be too high, even with power settings below 100%. The throttle has to be set accordingly to maintain engine speeds below 5500 RPM (max. cont. RPM).

3.9.4.18 Propeller vibrations

Reasons for abnormal propeller vibrations can be local propeller damage or rough engine running. It is recommended to reduce RPM immediately in case of unusual propeller vibrations. If vibrations cannot be reduced, the following procedure is recommended:

- throttle IDLE
- ignition OFF
- fuel-cock CLOSE
- change to glider configuration (see section 4.5.3.4 a))
- land on next suitable field.

3.9.4.19 Landing gear malfunction - Emergency gear extension

If, after normal landing gear travel time (max 45 seconds), the gear is not down and locked, indicated by two green landing gear indicator lamps ON, following procedure is recommended:

- landing gear CB CHECK IN. Push in if necessary

If several times unsuccessful, retract the gear a bit and extend again. Check CB and push if necessary.

NOTE: Basically the landing gear can be retracted and extended from any position.

If it is not possible to get a safe gear-down indication (two green gear-down and locked lights), it is recommended to retract the gear as far as possible and then apply the **emergency landing gear procedure**:

CAUTION: For trouble-free emergency gear extension the following procedure must be performed!

- Main landing gear lever NEUTRAL
- Emergency landing gear handle 1 (RH side) PULL STRONG

Down-lock of the right gear is noticeable by a bang.

- Emergency landing gear handle 2 (LH side) PULL STRONG

Down-lock of the left gear is noticeable by a bang.

- normal landing gear lever DOWN to activate indication
- gear indication CHECK both green lamps ON
- If the system does not indicate BOTH GREEN, probably based on an electrical failure, the gear position should be checked by a ground observer.
- if the down-and-locked position cannot be confirmed or if unsure about the situation, it can be tried to lock the gear by side-slipping or by pulling g-loads within the limits.

If emergency landing gear procedure is unsuccessful, an emergency landing has to be performed according to section 3.9.3.1 or 3.9.3.2, respectively.

CAUTION: Landing gear retraction following an emergency extension is not possible in flight.

3.9.5 Flying under icing conditions

Flying under icing conditions is not allowed. If icing conditions are met unintentionally and could not be avoided, it must be considered that ice can buildup on wings, tail surfaces, flight controls and propeller. Outside-view can be heavily reduced by cockpit-icing.

An emergency descent to lower and warmer altitudes is recommended:

- throttle IDLE
- cowlings flaps OPEN to avoid freezing in closed position
- airbrakes OUT
- landing gear DOWN (do not exceed $V_{LO,LE} = 76 \text{ kts} / 140 \text{ km/h}$)
- flight controls MOVE to avoid icing and sticking

WARNING: Even a small amount of ice on the a/c-surface can increase stall speed remarkably and can change a/c-behavior, controllability and flutter. When ice, even light icing of parts of the a/c is expected, stall speed should be assumed to be 15 - 20% higher than for clean a/c.

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4.1 Introduction

Normal procedures for additional and optional equipment is described in section 9.

This section provides normal procedures for rigging and fueling, the daily and preflight inspection. In addition checklists as well as descriptions of the normal operating procedures and the recommended airspeeds are given.

4.2 A/C Assembly

4.2.1 Rigging and Derigging

- Prior to rigging clean and grease any connecting points of fuselage, wing, empennage and controls.
- Derigging is carried out in the reversal sequent of rigging.

4.2.1.1 Fuselage:

- Place fuselage on lowered landing gear. Check locking of folding struts of the landing gear legs.
- Select flap lever position "L".
- Remove side cowlings and wing fairings.

4.2.1.2 Wing

- Place inner wing on the fuselage. Take care not to jam fuel lines and connecting cables.
- Insert the four wing bolts with operating lever (on-board tools) against the stop in the bushings of the inner wing and secure with safety bolts and Fokker-needle and recheck.
- Connect the operating rods for flaps, ailerons and air-brakes on both sides with the proper locking bolt and secure with the attached spring pin through the control pinholes and recheck carefully.
- Connect the fuel lines of the wing tanks to their corresponding fuel lines in the fuselage by use of the two quick-connector fittings. To guarantee good sealing, the connecting elements must be clean.

CAUTION: Pay attention to correct (i.e. audible) engagement of the tank quick-connector fittings. Pull to test for secure fit!

- Insert plugs for the electrical connector of the fuel quantity transmitter into the bushing in the wing root rib; lock bayonet connector.
- Push left outer wing into the spar pocket of the inner wing until about 1,6 in. (about 40 mm) clearance.
- Connect aileron push rods and secure the push wedge of the quick connector with a spring pin through the control pinhole. If position lights are fitted, plug in connectors and recheck securely.
- Push in outer wing fully and observe the engagement of the wing shear pins in the bushings of the inner wing. When bolts are snugly fitted to the bushings, insert the main bolt fore-aft using the rigging tool and push until the safety pin is in line with the borehole in the main bolt. Remove the rigging tool.

CAUTION: The main bolts of the wing connection are secured by safety pins, which are flush to the upper wing surface in properly secured position. The safety pin must not protrude above the surface!

Install and secure right outer wing the same way.

CAUTION: Recheck all bolts, pins and safety devices for proper fitting and all flight controls for clearance and proper operation!

4.2.1.3 Horizontal Tail

The elevator is provided with an automatic connector. It is pushed from the front to the fuselage centering bolts until the front fitting tongue fits into the receptacle slot. Then unlock the receptacle with the on-board rigging tool, push the tailplane downwards into the fitting until the spring bolt is freed. The spring bolt must engage.

- The interlocking bolt must not stick out beyond the leading edge of the fin. Only then the connection is properly secured.
- Check correct fitting of the horizontal tailplane by pushing the leading edge upwards.

4.2.1.4 Fuselage Fairings

- Install side and upper fairings. Following this, engage the two bowden cables for the cowl flaps.

NOTE: Before installing fairings, the Daily Inspection (→ 4.3.1 and 4.3.2) has to be completed.

4.2.2 Fueling

Fuel is filled into the wing tanks via the filler caps in the outer area of the center wing. To open the tank caps the slotted screw is pushed in and turned to the left with a screw-driver; to close the cap, push and turn right the screw simultaneously.

Certified fuels see section 2.4.2 "Fluids", maximum fuel volume see section 2.4.1 "Engine, Propeller, Fuel".

WARNING: There must be **sufficient fuel in both tanks** for take-off. Do not perform a take-off when there is fuel in only one tank.

CAUTION: The S10-VT tends to slightly lower its right wing during fast cruise at high power settings, which makes the fuel supply from the right wing tank more difficult (→ 4.5.3.2 a)). For refuelling please consider that **the left tank should be at least as full as the right tank**.

NOTE: Fuel tank inlets are close to the upper part of the tanks; therefore wings must be level before opening the caps or when fueling to avoid an overflow of fuel overboard.

NOTE: At high temperatures or when high temperatures have to be expected, tanks should not be filled completely to allow for temperature expansion and to avoid overflow through the ventilation tube.

4.3 Daily Inspection

Before commencing flight duties the pilot responsible has to carry out a visual inspection of the a/c.

It is highly important to have the a/c properly checked following each rigging or working on the a/c or its systems. The daily check prior to the first flight of a day is obvious, many accidents could have been avoided, if a proper check would have been performed.

A first walk-around is to check the surfaces for cracks in coating, for local bucklings and for roughness. If something seems unusual ask a specialist. During walk-around check any drainage and ventilation holes and pick clean if necessary (see Maintenance Manual section 6.7).

Sequence for visual check (Ignition and master switch check OFF!):

4.3.1 Engine

- remove upper and both lateral portions of the cowlings;
- visual inspection of the engine - inspect cooling air ducts for foreign objects,
- check oil-, liquid cooling and fuel systems for leakage's (together with fuel supply lines from wing tank LH/RH, wing connection area, refer to 4.3.2);
- check level of cooling fluid in overflow reservoir when the system is cold; quantity should be between min and max marking; fill up if necessary; for details see section 2.4.2.2 "Coolant Fluid".
- check oil quantity between min and max marking and refill if necessary; for flight-times of more than 8 hours oil level should at least indicate middle between min and max marking; for details see section 2.4.2.3 Lubrication Fluids.
- reinstall side parts of engine cowlings and secure;
- cooling air flaps: check for proper function by operating the Propeller dome (move forwards and backwards several times);

- cowl-flaps: check for proper function by operating several times;
- check both fuel vent outlets: open and unobstructed (located at the lower side of the wing between inner and outer wing section);
- visual inspection of fuel contents through fuel cap;
- drain fuel system by pressing both drainers in the landing gear well. Drain into a suitable container as much fuel as is necessary to make sure that possible dirt and water has been removed, Collect drained fuel in a vessel and examine for water and dirt.
- check throttle and choke mechanisms for clearance and proper operation.

CAUTION: The a/c must have been parked wings level for sufficient time (some hours) before draining.

CAUTION: After having pushed the drain valves, check them for closed position and no leakage. A leakage could mean contaminated fuel.

CAUTION: Draining of fuel increases the danger of fire. Make sure before engine start up that immediate fire risk does not exist.

NOTE: The check for leakage of fuel lines shall be performed with fuel pressure. Therefore switch ON Master switch (CHECK landing gear lever DOWN and ignition OFF before), Fuel selector switch BOTH tanks and auxiliary fuel pumps ON (green status lamp ON). Perform inspection with fuel cock OPEN and CLOSED. There must not be any leakages.
After inspection switch OFF auxiliary fuel pumps and set Master switch OFF !

4.3.2 Wing connecting area

- Wing pins (4) properly secured (Fokker needles);
- flight controls connected secured by safety spring-pins - two connectors for ailerons, flaps and air-brakes;
- flight controls check for free movement;
- both fuel supply lines (right and left wing tank) connected and no leakage. Inspection for leakage according instruction under Note 4.3.1.
- both connectors for fuel quantity transmitters attached and secured;

CAUTION: In case that the fuel line of only one wing tank is properly connected, while the other is still disconnected, this might not be recognised before the disconnected tank is selected.

CAUTION: If a fuel quantity transmitter is not properly connected, the indicator points to the red mark above "full" mark meaning, the system is inop (not "overfilled"!)

- check for foreign objects
- re-install upper engine-cowling and check oil filler cap properly closed.

4.3.3 Propeller, Propeller Dome and Front Gear

- Check engine master switch for proper functioning: Are engine electrics switched off (read generator light extinguished and voltmeter reading "0"), when propeller dome operating handle is unlocked in the forward position of dome (and vice versa)?
- Visual inspection of propeller - central part and pitch control unit. Check for loose connections and local damages;
- Propeller blades can be moved freely from inner stop to outer stop?
- Propeller blades free of damage, protecting strip on leading edge in good condition?
- Check pitch control mechanism for ease of movability by extending one blade up to approx. 90° and pull blade tip in flight direction (induce force into the outer third of blade and give a slight support to blade root hinge). Doing so, the blade suspension is subject to a torque around its longitudinal axis and the control mechanism is forced to move the complete working travel. It must return easily to the initial position when the blade tip is released.
- Check clearance in power transmission path of pitch control mechanism by pushing blade tip (in 90° position) slightly in and opposite to flight direction. There must be no significant rotation of the suspension forks before the control mechanism starts moving. Check both blades one after the other.

- Extend blades successively into fully deployed position and check play of articulation needle bearing - in and against flight direction, as well as in pitch direction (check for torsion around longitudinal axis of blades). This is to check for unusual high abrasion of the blade hinge bearings. A total of 0,16 in. / 4 mm free motion at the blade tips is acceptable, in pitch direction the play must be nearly zero.
- Fold propeller. Push blade mounting at the hinge backward and forward with moderate force. By doing so observe (a) the variable pitch bearing and (b) the bearing in the gear. There must not be significant play in either of these bearings.
- Check front gear housing for leaks. A light film of oil on housing due to oil fume passing the circumferential joint is acceptable.
- Check oil quantity in front gear: oil quantity, wings level, must show between min and max marking. Fill up oil if required (specification see section 2.4.2 "Fluids").

NOTE: The described simple checks can only help to discover sudden, rough changes. Since the gearbox is able to move as a whole due its flexible suspension (shockmounts), exact results cannot be expected with these methods. For further information refer to the Maintenance Manual.

WARNING: The Front gear never may use more oil than what could have passed as oil fume from the circumferential joint. Reasons for a higher oil consumption during short operation time must be investigated and must be eliminated before continuing a/c-operation. In any case, the manufacturer must be informed.

4.3.4 Landing gear

- Air pressure: main wheels 46.5 ± 1.5 p.s.i. / 3.2 ± 0.1 bar
- tailwheel 40.6 ± 3.0 p.s.i. / 2.8 ± 0.2 bar
- Check tire slip marks and tread
- Check master switch ON, landing gear lever DOWN and both landing gear indicators "GREEN"
- Examine elements for emergency landing gear release: Check attachment of spindles to radius struts, locking plate attaching spring in correct position, cables drawn downward completely (min. 1,2 in. / 30 mm overhang), cable coverings unobstructed and free to move and not jammed or blocked.
- Examine position switches for foreign bodies and dirt. Position switch for gear down & locked is located on the radius strut and the one for gear retracted at the support plate on the forward frame strut.
- Check quantity of brake fluid. Brake fluid reservoir is located in the landing-gear bay, cabin rear wall.
- Check movement of both LG doors, specially condition and proper installation of cables, pulleys, strut and spring of the LH gear door.

4.3.5 Wings

- Check aileron, flaps and air brakes for condition, unobstructed movement and play (axial and radial; limits see maintenance manual section 7.3).
- Check inner-to-outboard wing connection - safety bolt must be flush with wing surface.

4.3.6 Empennage

- Check horizontal tail plane for proper rigging - front arresting bolt (colored red) must not protrude from leading edge of the vertical fin.
- Examine rudder and elevator for unobstructed movement, play (maintenance manual section 7.3) and damage.

4.3.7 Fuselage

- Examine for damage.
- Check static pressure ports on both sides of tail boom (and, if installed, at the left and right cockpit walls).
- Check pressure orifices of stall warning system on propeller-dome below pitot-static probe.

4.3.8 Cockpit

- Canopy emergency release locked (arresting bolt on central canopy mounting must be in marked position)
- Clean canopy with care. Examine cockpit for foreign objects and loose items.

4.4 Pre-Flight Inspection

4.4.1 Checks before entering cockpit

- Has daily inspection been carried out?
- Check oil quantity and replenish if necessary (use oil filler cap on the upper engine cowling).
- Check cooling-fluid quantity, replenish if necessary (visual check in gear bay).
- Check fuel content: insert dip stick (appr. 8 in. / 20 cm) into tank to the bottom, wings level. If **both** tanks indicate a readout of appr. 0.4 in / 10 mm, fuel content is sufficient for take-off and a minimum cruise time of 30 min; confirm indication on fuel quantity indicator in cockpit; close caps of tanks carefully.

• **CAUTION:** At flight attitude the Fuel Quantity Indicators will show less than at ground attitude.

- Insert pitot tube into the opening of the nose cone, twisting it slightly.
- Grease the opening from time to time with a thin coating of vaseline (to seal systems from each other).

CAUTION: It is recommended to secure the pitot tube with adhesive tape or with a suitable plastic sleeve of about 1 in. / 25 mm length. If the pitot tube is not installed, the air speed indicator will have a substantial under-read of up to 50% at speeds below 54 kts / 100 km/h!

To avoid damages of the pitot tube, after each flight, at least before parking, the pitot tube should be removed and stored at exposed position, (i. e. at Instrument panel). Reinstall directly before flight.

- Adjust separate backrests: At the same time unlock both lower arresting devices against spring force, evenly shift backrest to suitable position and allow locking. Unlock upper adjustment and allow locking at suitable position.

CAUTION: Do not shift lower arresting device too far forward or unevenly to avoid the device jump out of its guide and spring loaded parts fly off.

WARNING: Make sure that both, upper and lower arresting devices, are locked completely. Specially the lower LH and RH arresting devices must be locked in the same notch.

- Calculate T/O performance: T/O field length available, pressure altitude for the airfield, OAT compare with data in section 5.2.3.2. For high field elevation check RPM-limits for preliminary decision on T/O-procedure and calculate T/O field length required with corresponding T/O-Procedure.

CAUTION: Depending on selected T/O-procedure, T/O field length required can differ noticeably.

WARNING: T/O length given in section 5.2.3.2 are determined with a climb speed of $V_x = 56$ kts / 104 km/h and are shorter than those which have to be expected for a recommended initial climb according to section 4.5.2.3 with a climb speed of $V_y = 62$ kts / 115 km/h.

4.4.2 Check of flight controls and pressure probes

To check flight controls concerning function, stiffness, power transmission, backlash and deflection, an assisting person is needed. Flight control structure is checked by moving control elements, flap- and airbrake-handles while the assisting person is holding the relevant surface cautiously in position to check for mechanical failures. Deflections, specially aileron-flap-interconnect, and backlash are checked visually and by moving cautiously up and down. Also the pressure probes are checked for cleanness and damage.

Recommended sequence for outside-check:

LH airbrake	CHECK stiffness, backlash, full deflection
LH aileron, flaps 0°	CHECK stiffness, backlash, full deflection
LH flap	CHECK stiffness, backlash, movement from +16° to -10°
Elevator	CHECK stiffness, backlash, full deflection
Rudder	CHECK stiffness, backlash, full deflection
RH flap	CHECK stiffness, backlash, movement from +16° to -10°
RH aileron, flaps 0°	CHECK stiffness, backlash, full deflection
RH airbrake	CHECK stiffness, backlash, full deflection
Dynamic and static pressure	CHECK airspeed and R/C indicators when blowing slightly (and dry!) towards the end of the pressure tube

4.4.3 Checks before engine start

- Load and trim sheets COMPLETED and CHECKED
- Parachute/cushion INSTALLED and properly secured
- Seat belts FASTENED and TIGHT
- Back rest and
rudder pedals FIXED, comfortable position

• **WARNING:** Never unlock arresting device of back rest during flight

- Control elements
and instruments WELL WITHIN RADIUS of action
- Canopy LATCHED (left, right and top rear)
- Flight controls and flaps FREE movement
- Altimeter SET local pressure

4.5 Normal Operating Procedures and Recommended Airspeeds

4.5.1 Engine Start, Warm-up and Taxi Procedures

4.5.1.1 Engine start

- Parking brake SET (turn lever to ON position and operate brake afterwards)
- All switches OFF
- Engine back-up switch OFF (guarded position)
- TCU-isolation switch OFF (guarded position)
- Landing gear lever DOWN
- Master switch ON, (normal voltage indication, green gear lights ON)
- Propeller-dome handle OPEN and LOCKED, (TCU performs self-test, main fuel pump cycles, engine instruments are activated, red battery charge control lamp ON)

CAUTION: When the TCU is energized (master switch ON and propeller-dome OPEN and LOCKED), the TCU-warning and -caution lamps are automatically activated for about 1-2 seconds, then they extinguish again. If this is not observed, the TCU may have a malfunction.

- Cowling flaps fully OPEN
- Fire-warning TEST by pressing indicator (notice acoustic and optical warning)
- Propeller switch T/O position, check green position lamp ON
- Fuel-cock OPEN in vertical position
- Fuel selector switch BOTH tanks
- Auxiliary fuel pumps ON, green status lamp ON
- With cold engine - Choke ON

NOTE: If the engine is warm, do not use choke.

- Throttle IDLE (max 10%)
- Propeller area FREE of persons and obstacles
- Starter START (for a minimum of three seconds)
- As soon as the engine fires up, release starter key to disconnect the starter motor. If the engine does not fire after 10 seconds of starter operation, stop and wait for at least 2 minutes for starter to cool-down, then try again.

CAUTION: An automatic electronic device adds the ignition with a time delay of three seconds after the starter is actuated, which means that the starter must always be operated for at least three seconds. The time delay allows the propeller blades to be fully deployed before the engine starts, and consequently reduces the loads for the propeller blades and their corresponding stops. In case that the propeller blades are not fully unfolded after two seconds, the engine start-up should be aborted before the ignition comes on. In case of repeated problems to unfold the propeller blades in time, make sure that the spring load of the propeller blades is correct, and that the blades can be easily moved and folded (→ aircraft maintenance manual).

CAUTION: If the engine fires before the expected time delay of three seconds is over, i.e. in case of a malfunctioning electronic device, the following checks must be performed before the intended flight in accordance with the aircraft maintenance manual: → AMM section 5.3.13 item 5 for the retarder module, and → AMM section 5.3.15 items 3 through 5 for the propeller.

CAUTION: During a cold engine start-up, the power lever should be fully pulled back into position "power idle". In case of a warm engine start-up, it is possible to open the throttle slightly (add up to 10% power) to improve the engine start-up behavior.

- Engine RPM SET approx. 2000 RPM
- Oil pressure GREEN arc after 10 seconds

NOTE: Minimum oil pressure 22 psi / 1,5 bar; with cold engine at low RPM, up to 102 psi / 7 bar are normal.

WARNING: If the minimum oil pressure is not indicated within 10 seconds, stop engine immediately!

- Generator switch ON (red battery charge control lamp OFF)
- Auxiliary fuel pumps OFF (green status lamp OFF)
- Warnings and Cautions CHECK all OFF
- COM, NAV, gyros ON
- Choke OFF with increasing engine temperature (1-2 minutes should be sufficient)

4.5.1.2 Engine warm-up

- Cooling-air flaps CLOSE as required (position 1-5) for engine warm-up

NOTE: Only with cold OAT is it recommended to close cooling-air flaps; they should be opened at the latest when oil temperature attains 50°C / 122°F or CHT 100°C / 212°F /.

- Parking brake ON (lever in position ON and brake operated)
- Throttle 2500 RPM (after about 2 minutes 2000 RPM)
- Oil pressure GREEN ARC
- Engine temperatures WAIT for green range

CAUTION: To avoid engine damage, engine has to be warmed-up until minimum temperatures attained, before engine power is increased and RPM selected above values for the warm-up period.

CAUTION: To avoid engine and systems (in engine bay) overheat, extended ground runs with high power should not be performed, because sufficient cooling for extended high power settings is only achieved in flight.

NOTE: In case that the fuel line of only one wing tank is properly connected, while the other is still disconnected, this might not be recognised before the disconnected tank is selected. The proper function of the fuel system can already be checked during the warm-up or during taxiing by selecting the left and the right wing tanks separately (at least 2 minutes for each tank).

4.5.1.3 Taxiing

- Cowl flaps FULLY OPEN
- Parking brake RELEASE (turn lever to OFF position, use brake lever simultaneously if required)
- Directional control with RUDDER
- Taxi area OBSERVE
- Throttle AS REQUIRED
- Brakes AS REQUIRED

CAUTION: Seating position as well as wing span do not allow the crew to observe the outer wing outside of the leading edge sweep-back. This must always be considered during taxiing.

CAUTION: When taxiing slowly, operate wheel brakes with caution.

CAUTION: Depending on surface conditions and because of the large moment of inertia the function of the tailwheel steering is delayed.

CAUTION: To avoid damaging the propeller, taxi on surfaces with loose stones and gravel using low propeller RPM.

4.5.2 Take-off and Climb

WARNING: It is highly advised against T/O with wet wing or during rain (see section 4.5.7)!

4.5.2.1 Checks before take off

In run-up area:

- | | |
|----------------------|--|
| • Parking brake | SET (turn lever to ON position and operate brake afterwards) |
| • Choke | OFF (pushed in) |
| • Elevator | PULL to stop and hold |
| • Engine indications | CHECK green ranges |
| • Throttle | FULL POWER (115%), for high field elevation see remarks below |
| • Engine RPM | CHECK 5200 + 60 RPM per 1000 ft elevation ¹⁾ ± 200 RPM tolerance |

¹⁾ 5200 + 200 RPM per 1000 m, respectively

CAUTION: Because of the manually controlled two-position propeller in combination with the turbocharged engine, a significant increase of RPM with altitude at constant power-setting has to be considered (about 60 RPM per 1000 ft / 200 RPM per 1000 m). This rule-of-thumb is valid for ISA. **If actual temperature differs noticeably from ISA, at high field elevations > 6600 ft / 2000 m and if uncertain, refer to diagrams for 115% and 110% power settings in section 5.2.3.1.**

WARNING: At very high field elevations take care not to exceed max T/O RPM of 5800 RPM. Therefore it is recommended to **set 100%** (throttle on soft stop) for engine run-up on airfields **above about 6600 ft / 2000 m**. The RPM observed may not differ more than +/-200 RPM from the value, taken from second diagram in section 5.2.3.1, valid for 100% power setting.

CAUTION: The a/c should be **directed into the wind** for run-up and magneto-check to have a good airflow in the cowl flap area. In crosswind or tailwind conditions there is a inadequate cooling and engine temperatures can steadily increase.

CAUTION: Run-ups with high power settings should be reduced to a minimum. The S10-VT cooling system is designed for airborne operation, not for extended ground-runs with T/O or max continuous power setting.

- | | |
|---------------------|--|
| • Magneto check | SET 4150 RPM (mag switch position BOTH) |
| • Separate magnetos | CHECK RPM drop of rotational speed < 300 RPM
difference between M_1 and M_2 < 120 RPM |

NOTE: For correct magneto check wait until RPM with both magnetos is stabilized. Select left magneto and wait until RPM is stabilized before reading indicator. Select both and wait for stabilized RPM. Select right magneto and again let RPM stabilize before reading indicator.

WARNING: If RPM's during run-up or magneto check differ more than the limits given, T/O is not allowed, malfunction of engine or propeller must be expected.

- Canopy LOCKED (LH, RH, rear)
- Flap position CHECK +5°
- Air-brakes IN and LOCKED
- Cowl flaps OPEN
- Trim for climb speed V_y NEUTRAL, depending on load, slightly nose-up
- Warnings and cautions CHECK OFF
- Landing gear lever EXTEND (both green lamps ON)
- Engine instruments CHECK GREEN range
- Propeller position T/O (green lamp ON)
- Fuel quantity CHECK (sufficient fuel in **both** tanks)

WARNING: There must be **sufficient fuel in both tanks** for take-off. Do not perform a take-off when there is fuel in only one tank.

- Fuel-cock OPEN

CAUTION: Always check fuel cocks carefully to be open. When fuel cocks are closed, the engine will run for about 1 - 3 minutes. Closed fuel cocks may lead to a loss of engine power in the take-off phase.

- Fuel selector switch BOTH tanks
- Auxiliary fuel pumps ON (green lamp ON)
- Ignition switch BOTH
- Decide on **T/O procedure** due to conditions and **check field length** available and required.
- Parking brake RELEASE (turn lever to OFF position, use brake lever simultaneously if required)

CAUTION: Before taxiing from taxi-hold position to take off position, pay attention that the parking brake lever is in OFF position. The parking brake shall not be used on the runway anymore.

- Because the S10-VT has no constant speed propeller control and only the T/O-position of the propeller is to be used for takeoff, the power of the turbocharged engine, which is independent of density over a wide range, results in an increase of RPM vs. altitude at constant indicated speeds. To avoid engine overspeeds in T/O without active control of the power lever by the pilot, **three T/O-procedures** have been established for special pressure altitude ranges, which avoid engine overspeeding up to a safety altitude of about 500 ft / 150 m AGL while climbing with $v_y = 62$ kts / 115 km/h IAS.

The Decision on the T/O-procedure can be made with the **RPM observed while checking engine at 115% full power:**

static RPM at 115%	T/O procedure	Power setting for T/O
< 5500	No. 1	115% power setting
5500 - 5600	No. 2	100% power setting
> 5600 RPM	No. 3	T/O with reduced power for static 5400 RPM

4.5.2.2 Interpretation of the three T/O procedures

The three T/O procedures define throttle positions depending on pressure altitude and OAT, which can be maintained from brake-release until reaching a safety altitude of about 500 ft / 150 m without exceeding max T/O limit 5800 RPM at $v_y = 62$ kts / 115 km/h. For these three power settings, required ground runs and T/O distances as a function of pressure altitude and OAT are given in section 5.2.3.2 "T/O performance", though valid for a climb speed of $V_x = 56$ kts / 104 km/h only recommended for short airfields instead of V_y .

Basically T/O procedure is defined via static RPM for 115% power setting, using the RPM-limits of above. At very high airfields even static RPM (a/c stationary) at 115% may exceed 5800 1/min. In this case check engine at 100% and decide, using the diagram in section 5.2.3.1 valid for 100%, if T/O with 100% is either allowable or T/O-procedure No. 3 has to be used. Further, in any case of doubt, refer to RPM diagrams for 115% and 110% in section 5.2.3.1. These diagrams include RPM limit lines, which show if takeoff is allowable with 115% or with 100%, respectively.

T/O procedure 1: Static RPM at 115% power setting < 5500 RPM

Throttle is set to maximum T/O power 115%. T/O ground run and T/O distance (hard surface, no slope, no wind) see page 5-8 "T/O-distance (50 ft) and ground run with power setting 115%".

T/O procedure 2: Static RPM at 115% power setting 5500 - 5600 RPM

Throttle is set to maximum continuous power 100%. T/O ground run and T/O distance (hard surface, no slope, no wind) see page 5-9 "T/O-distance (50 ft) and ground run with power setting 100%".

T/O procedure 3: Static RPM at 115% power setting > 5600 RPM

Throttle is manually set to a position for static 5400 RPM, to be stabilized at the take-off point prior to brake release. T/O ground run and T/O distance (hard surface, no slope, no wind) see page 5-10 "T/O-distance (50 ft) and ground run with reduced power for 5400 RPM static".

WARNING: To avoid excessive RPM after T/O from high airfields in the first part of a climb with V_y , the correct static T/O power setting must be selected. **In case of doubt, diagrams in section 5.2.3.1 are effective**, giving static RPM's for 115% and 100% and RPM limits for T/O. If static full power check on a high altitude airfield was performed with 100% power setting, it can be decided with the observed RPM and the diagram for 100%, if a T/O with 100% power setting is allowed.

CAUTION: The throttle has two stops: a first stop which can be felt when moving the throttle straight forward - this is for the 100% power setting. To come to the second stop and 115%, the throttle lever must be pushed slightly to the left and then further forward beyond the first stop. The reduced power for high altitude take-off (T/O procedure 3) must be set manually until 5400 RPM are indicated on the tachometer.

CAUTION: T/O length can differ noticeably depending on T/O procedure!

4.5.2.3 T/O and climb

In T/O position:

- A/C on runway ALIGN
- Wheel brakes ACTUATE until a/c is stationary
- Throttle SET POWER according to selected T/O procedure
- Stabilized RPM WAIT (for reduced power T/O adjust for 5400 RPM)
- Wheel brakes RELEASE
- PITCH attitude PUSH slightly to lower the nose so as to lift-off at about 46 kts / 85 km/h, accelerate in ground effect to 62 kts / 115 km/h and maintain.

CAUTION: If the a/c tends to oscillate in pitch due to roughness of ground surface, hold elevator and do not try to counteract, as this might cause pilot-induced-oscillations.

CAUTION: The elevator down-spring effects a nose-down force, pushing the stick forward during T/O-roll and thus unloading the tail. With increasing airspeed the stick moves due to increasing aerodynamic forces towards a center position, which is ideally correct for lift-off and climb. If trim is set too much nose-down, there might be a tendency to lift the tail too much without pilot counteraction. Therefore pitch attitude must be controlled actively until lift-off.

- Climb speed 62 kts / 115 km/h for best rate of climb

WARNING: T/O length in section 5.2.3.2 are valid with airspeed for best angle-of-climb $v_x = 56$ kts / 104 km/h and are shorter compared to those which must be expected for a climb with best rate-of-climb speed $v_y = 62$ kts / 115 km/h.

NOTE: For an airfield with short runway or obstacles in departure sector, initial climb can be performed with $v_x = 56$ kts / 104 km/h (best angle-of-climb) to gain altitude on a shorter distance. T/O diagrams in section 5.2.3.2 are valid for this case. For safety reasons, the airspeed never should be chosen below $v_x = 56$ kts / 104 km/h, this would not reduce T/O field length.

CAUTION: Monitor oil temperature (max 130°C / 266°F) and CHT (135°C / 275°F) during climb. Increase airspeed if close to limits.

- Landing gear RETRACT at a safe altitude (red lights will flash during retraction)
- Landing gear lights OFF
- Landing gear lever in position RETRACT

NOTE: During gear retraction the red warning lamp appropriate for the moving gear leg, flashes (left side first, then right side). The gear is fully retracted when red gear lamps are OFF. The gear-CB's to the left of the gear lever should be checked additionally.

CAUTION: If the automatic circuit breaker of the landing gear releases during retraction, a not properly retracted position of the gear will not be indicated because both lights are not energized. On trying to deploy the landing gear, this might be noticed too late and could lead to a crash-landing.

- Auxiliary fuel pumps OFF (green status lamp OFF)
- T/O power REDUCE after max 5 minutes
- Max cont. Power SET (max 100%, max 5500 RPM)
- Cowl flaps ADJUST (recommended temperatures: OIL 90-110°C / 194-230°F,
CHT $\approx$ 100°C / 212°F)

CAUTION: Cowl flaps must be fully open as long as T/O power (115%) is set. For a long climb with reduced power setting (max continuous or less) cowl flap angle may be reduced if engine temperatures are well below limits. In this case, only the first two notches of the cowl flap handle should be selected. Engine temperatures must be checked carefully.

WARNING: Due to the combination of the fixed position propeller and the turbocharged engine, RPM must increase with altitude for constant power setting and constant IAS. Therefore, depending on pressure altitude and temperature, during climb with v_y it could be necessary to reduce power even immediately after T/O initial climb to avoid exceeding of max RPM. The RPM limits are 5800 RPM for 5 minutes and 5500 RPM continuously.

4.5.3 Cruise and cross-country flying

4.5.3.1 General remarks

Thanks to the unique propulsion concept of the S10-VT, flight characteristics are almost similar in the different configurations and in transitions. The powered glider S10-VT has good handling characteristics at all speeds and loadings and is as easy to fly as a glider as with the propeller system driving the a/c.

With CG in mid-range, trim is possible from approx. 50-124 kts / 90-230 km/h.

With aft CG, change of stick position with speed is small. However, a speed change can always be realized by positive stick forces.

System reliability is high, but it is not wise to rely on the assumption that the drive system will never fail. When flying in glider configuration, it is recommended to plan the flight as if there was no engine. In motorized flight be always prepared for an engine failure, with a safe possibility to land within your gliding range. In both cases, if the engine either refuses to start or simply quits, you may still land as a normal glider.

CAUTION: Areas and meteorological conditions, where lightning strikes could be expected must be avoided.

4.5.3.2 Powered flight

a) *Cruise*

To change configuration and to verify cruise conditions, proceed as follows:

- PPC switch CRUISE

CAUTION: If external generator is not in use (not ON or malfunctioning, red warning lamp ON) propeller will not change blade angle to cruise position.

NOTE: Propeller pitch change from T/O to CRUISE position takes, depending on OAT, 2 - 5 minutes. Cruise position is not verified by an indication.

CAUTION: During propeller blade angle transition, RPM changes at constant power setting. Specially during change from CRUISE to T/O, RPM must be monitored not to exceed the allowed limits (max continuous 5500 RPM), reduce power if necessary!

- Cowl flaps ADJUST (recommended temperatures:
OIL 90-110°C / 194-230°F, CHT ≈ 110°C / 230°F

CAUTION: Cowl flap angle can be selected by lever in 5 steps. The center (3.) notch is found to be a suitable position for good engine temperatures with normal cruise power.

CAUTION: Recommended temperatures are: oil 90-110°C / 194-230°F, CHT about 110°C / 230°F. Continuous oil temperatures below 90°C / 194°F may result in increased sedimentation in the engine and to condensed water in engine oil.

WARNING: Cowl flaps should not be kept fully closed during cruise (5th notch), because insufficient cooling air is streaming into the engine bay in this position. Lever position 5 should only be used during descent with reduced power and during engine warm-up on ground.

- Flaps SET, depending on speed position 0 to -10°
- Throttle SET cruise RPM, max 5500 RPM, recommended 4300 - 5000 RPM
- Fuel selector switch Fuel management as required (right, left, or both tanks)

CAUTION: The S10-VT tends to slightly lower its right wing during fast cruise. The reason for it is the high engine torque caused by a high power setting, combined with a small rolling moment due to sideslip at high airspeeds. A bank angle to the right makes the fuel supply from the right wing tank more difficult. The fuel of the right tank should therefore be used primarily, which means **there should always be more fuel in the left tank than in the right one**. With one tank completely emptied (especially with an empty left tank), or with little fuel left in both tanks and only one tank selected (especially with the fuel selector switch in position "right tank"), fuel shortages might possibly occur during fast cruise (→ 3.9.4.1 a)), "Red fuel-pressure warning lamp steady on").

For power settings, speeds, fuel consumption and other data refer to section 5.3.1 "Performance in powered-configuration"

WARNING: Engine RPM will rise at constant power setting with altitude at constant airspeed! Above about 6600 ft / 2000 m altitude (ISA) engine RPM would exceed the max continuous limit of 5500 RPM for 100% engine power. Therefore engine power must be reduced to keep engine RPM below max 5500 RPM.

b) Descent in powered configuration

Procedure with more than 50% MCP (Fast Speed Descent):

- PPC switch T/O or CRUISE AS REQUIRED (depending on airspeed)
- Throttle More than 50 %
- Flaps AS REQUIRED (depending on airspeed)
- Cowl-Flaps AS REQUIRED (depending on engine temperature)
- Attitude DOWN to achieve desired descent profile and airspeed

Procedure with less than 50% MCP (Deeper Descent):

- Airspeed Reduce by pitching up and slowly reduce engine power to
 - max. 140 kph/ 76 kt
 - PPC switch T/O or CRUISE AS REQUIRED
 - Throttle 50 % or less
 - Flaps AS REQUIRED (depending on airspeed)
 - Cowl-Flaps AS REQUIRED (depending on engine temperature)
 - Attitude DOWN to achieve desired descent profile and airspeed of max. 140 kph / 76kt
 - Airbrakes Extend as required
- and / or
- Landing Gear Extend as required

CAUTION: Flying with less than 50 % MCP and at the same time a higher airspeed than 140 km/h / 76kt will significantly increase the wear and the temperature of the clutch and its friction pads.

NOTE: Glider configuration is recommended for long time descents. For gliding flight refer to the corresponding chapter.

c) Slow flight and stall behavior in powered configuration

Approach to stall speed in powered configuration is indicated by an acoustic warning, set about 3-7 kts / 5-8 km/h above stall speed.

Speed has to be increased immediately at acoustic stall warning onset. Minimum speeds are given in section 5.2.2 a) "Stall and minimum speeds in powered-configuration" for unaccelerated straight and level flight.

Procedures to recover from unintended stall or spin are given in section 3.4 "Stall Recovery" and 3.5 "Spin Recovery".

4.5.3.3 Gliding Flight

a) *Glider configuration*

With the engine stopped, propeller blades folded and propeller-dome closed the S10-VT is a normal glider with flaps.

The S10-VT has good balanced flight characteristics and well harmonized flight controls. Bank can be changed from +45° to -45° within about 4,5 seconds without side-slipping (59 kts / 110 km/h, MTOW).

The speed-polar (envelope curve for optimal flap settings) is given in section 5.3.3 "Gliding Flight Polar".

b) *High speed*

Up to $V_{NE} = 145$ kts / 270 km/h the S10-VT is well controllable.

Above $V_A = 97$ kts / 180 km/h flight controls must not be deflected fully or abruptly.

At $V_{NE} = 145$ kts / 270 km/h the control movement must not be more than 1/3. Limit load factors are given in section 0.1.

If strong turbulence must be anticipated like in rotors of lee-waves, in thunderstorms or when passing mountain ridges, the maximum airspeed in rough air $V_{RA} = 97$ kts / 180 km/h must not be exceeded.

Airbrakes may be deployed up to $V_{NE} = 145$ kts / 270 km/h.

Flight path during dive at $V_{NE} = 145$ kts / 270 km/h, airbrakes fully extended, is about 30°.

WARNING: Above $V_A = 97$ kts / 180 km/h airbrakes should be deployed with caution, because of the high deceleration rate with airbrakes extension at high airspeeds. It has to be taken care that seat belts are well tightened and objects in cockpit area are properly secured.

c) *Slow flight and stall behavior in glider configuration*

Gliding and looking for thermals means flying at low speed.

When flying with forward CG, minimum airspeed can be limited by aft stop of elevator and only dynamic stalling is possible. Indication of stall in glider configuration is by aerodynamic buffeting (in level flight and in turns), when vortices of separated airflow of wing root area pass tail surface. This aerodynamic buffeting occurs about 3 - 7 kts / 5 - 8 km/h above stall speed. At first indication of stall warning (aerodynamic buffeting) release elevator forward to reduce angle-of-attack and increase airspeed.

If speed is not increased at stall warning onset and reduced further, the a/c may stall with a wing-drop. Up to wing-drop, aileron and rudder are effective and correct; controllability is restored immediately, even during stall, when elevator is released forward. An uncontrollable tendency to spin has not been observed.

WARNING: Altitude loss for recovery from stall in **level flight** may be up to **100 ft / 30m**, out of a **turn** up to **130 ft / 40 m** and for a **delayed reaction** up to **200 ft / 60 m**.

Minimum speeds are given in section 5.2.2 b) "Stall and minimum speed in glider-configuration" for unaccelerated straight and level flight. During turns, depending on bank and corresponding g-load, minimum speeds are higher. Example: minimum speed and stall during steady turns with 60° of bank and a g-load of 2, are expected to be higher by a factor of $\sqrt{2} \approx 1,4$ compared to unaccelerated level flight.

Procedures to recover from unintended stall or spin are given in section 3.4 "Stall Recovery" and 3.5 "Spin Recovery".

4.5.3.4 Change of a/c configurations (powered-, gliding flight)**a) Change from powered- to glider-configuration**

- Throttle IDLE
- Air speed REDUCE to approx. 54 kts / 100 km/h
- PPC switch T/O
- Cowl flaps FULLY OPEN

CAUTION: With cowl flaps fully open, the engine cools down fast and the risk of unintentionally overheating engine after engine restart is reduced. When reopening propeller-dome again, cowl flaps are moving to fully open position.

- Engine temperature WAIT for cool-down, CHT and oil temperature < 100°C / 212°F
- Ignition OFF (switch position OFF, tachometer reads "0" RPM)

WARNING: If the engine is operated with load, a sudden shut-down can result in overheat of the turbocharger system and damage it.

CAUTION: If the engine is shut-down without a sufficient cool-down period prior to shut-down, this can result in local overheat of the engine and cooling fluid can overflow. To avoid, engine should cool down with idle power until engine temperatures are <100°C / 212°F (CHT and oil temperature) before shut-down.

- Propeller-brake PULL until propeller stops

CAUTION: The propeller should not windmill for longer periods with the engine stopped because this would cause parts of the clutch to be excessively worn.

- Propeller positioning PULL handle slowly to its stop

CAUTION: If the propeller positioning handle is pulled too fast, the propeller may be driven passed the correct position for dome closure. If the propeller-dome cannot be closed, the propeller positioning must be repeated; never pull handle for closing propeller-dome quickly, if in doubt about correct propeller position repeat positioning.

- Generator switch OFF (red warning lamp ON)
- Fuel-cock CLOSE
- Electric equipment OFF, if not needed for gliding
- Cooling of engine bay WAIT for 3 minutes

CAUTION: Before cowl flaps are closed with the propeller-dome, the engine should cool down for three minutes after shut-down, cowl flaps fully open, to avoid overheat areas in engine bay.

- Propeller-dome CLOSE and LOCK (red generator warning lamp OFF)

NOTE: When closing and locking propeller-dome, besides engine instruments any electrical instruments except for radio and soaring computer are switched off by the electrical logic.

CAUTION: Specially during extended soaring only essential electrical equipment may operate. Engine restart and electrical landing gear operation is impossible with the battery discharged.

b) Change from glider- to powered-configuration

- Airspeed < 76 kts / 140 km/h (recommended 54 kts / 100 km/h)
- Fuel-cock OPEN
- Propeller-dome OPEN and LOCKED (engine instruments on)
- Cooling air flaps FULLY OPEN
- Propeller T/O position
- Fuel selector switch BOTH tanks
- auxiliary fuel pumps ON (green status lamp ON)
-
- Choke ON for cold engine
- Throttle IDLE (max 10%)
- Ignition START (for a minimum of three seconds)

NOTE: As soon as the engine fires up, release the starter key to disconnect the starter motor. If the engine does not fire after 10 seconds of starter operation, stop and wait for at least 2 minutes for the starter to cool down, then try again.

CAUTION: Engine airstart: The propeller may continue turning with the engine not running (following an unsuccessful engine airstart), because engine and propeller are isolated by a centrifugal clutch. A **running engine is indicated by the RPM-indicator** not by observing the propeller turning.

CAUTION: An automatic electronic device adds the ignition with a time delay of three seconds after the starter is actuated, which means that the starter must always be operated for at least three seconds. The time delay allows the propeller blades to be fully deployed before the engine starts, and consequently reduces the loads for the propeller blades and their corresponding stops.

CAUTION: If the engine fires before the expected time delay of three seconds is over, i.e. in case of a malfunctioning electronic device, the following checks must be performed before the next flight in accordance with the aircraft maintenance manual: → AMM section 5.3.13 item 5 for the retarder module, and → AMM section 5.3.15 items 3 through 5 for the propeller.

CAUTION: During a cold engine start-up, the power lever should be fully pulled back into position "power idle". In case of a warm engine start-up, it is possible to open the throttle slightly (add up to 10% power) to improve the engine start-up behavior.

CAUTION: If the drive system was not operated for > 5 minutes, propeller blades are in T/O-position regardless of actual switch position. If switch is in position cruise, pitch control mechanism begins to move blades with the engine start.

CAUTION: If engine starter does not operate for restart, refer to section 3.7.3.

WARNING: If OAT is extremely low, i.e. at high altitudes or in cold areas, battery capacity after longer soaring time might be too low for engine restart. Successful engine restart might only be possible at higher temperatures and lower altitudes. This must be taken into account for flight and route planning.

- Ignition switch BOTH
- Throttle about 2000 RPM
- Oil pressure GREEN ARC after max 10 seconds

NOTE: Minimum oil pressure 22 psi / 1,5 bar; with cold engine at low RPM, up to 102 psi / 7 bar are normal.

WARNING: If the minimum oil pressure is not indicated within 10 seconds, stop engine immediately!

- Generator switch ON (red warning lamp OFF)
- Fuel selector switch Fuel management as required (right, left, or both tanks)
- Auxiliary fuel pumps OFF (green status lamp OFF)
- Warning and caution lights OFF
- Electrical systems ON as required
- Choke OFF with increasing engine temperature (1-2 minutes should be sufficient)
- Engine warm-up at approximately 2500 RPM if the engine is cold

WARNING: The engine must be warmed-up at a reduced power setting. If either the power setting of a cold engine is too high, or the choke is still applied, the engine may run rough, splutter or even stop.

CAUTION: During engine warm-up, oil temperature and CHT have to be monitored continuously. In case of a malfunction of the cowl flaps, a danger of overheat and engine damage exists!

4.5.3.5 Flying in strong turbulence

When encountering areas with strong turbulence or crossing strong thermals airspeed must be reduced to below $V_{RA} = 97 \text{ kts} / 180 \text{ km/h}$.

4.5.3.6 Cold weather operation

Before operating the a/c in cold areas, an inspection is recommended. Specially cooling fluid and lubrication fluid must be checked (refer to section 2.4.2 "Fluids").

Engine starting at low OAT:

- Start engine with throttle IDLE (max 10%) and with choke ON (open throttle renders starting carb ineffective!)
- Be aware, no spark below crankshaft speed of 220 RPM!
- as performance of electric starter is greatly reduced when hot and the battery capacity is low at cold temperatures, limit starting to periods not much longer than 10 seconds. With a well charged battery, adding a second battery will not improve cold starts.

CAUTION: If water is in the fuel system, it will descend to the lowest areas of the fuel system and freeze at low temperatures. This can block fuel pipes, filters and orifices. Therefore it is highly important to drain the fuel system properly to remove contained water specially when low OAT must be expected. Refer to section 4.3 "Daily Inspection".

WARNING: If OAT is extremely low, i.e. at high altitudes or in cold areas, battery capacity might be too low to turn the engine with more than 220 RPM for ignition. Successful engine restart might only be possible at higher temperatures and lower altitudes. This must be taken into account for flight and route planning.

4.5.4 Approach

Landing can be done either in gliding or in powered configuration.

WARNING: Before landing check parking brake lever to be in OFF position. A landing with parking brake set ON results in uncontrollable braking and in worst case in a locking of the wheels.

a) Approach in powered-configuration

- PPC switch position TAKE-OFF

CAUTION: The change-over of propeller-blade pitch can take up to 5 minutes, therefore PPC has to be activated in time. If, in case of a go-around, the propeller is not in T/O position, be aware of a considerably reduced rate of climb.

Landing pattern should be arranged so, that landing could be performed with idle power. On downwind:

- Fuel cock OPEN
- Cowl flaps FULLY OPEN
- Wing flaps +5°
- Fuel selector switch BOTH tanks
- Auxiliary fuel pumps ON (green lamp ON)
- Throttle REDUCE as required
- Airspeed 59 kts / 110 km/h (yellow triangle on airspeed indicator scale)
- Landing gear selector DOWN (extension time about 30 seconds)
- Landing gear indicator CHECK 2 GREEN lamps
- Parking brake CHECK in OFF position

CAUTION: During gear extension the two landing gear lights flash RED (right first, then left). In case of lacking indication after selecting landing gear switch down, check CB (left side of switch) and push if necessary. If both indicator lights are not on and green after max 45 seconds, operate emergency gear extension (refer to 3.9.4.19).

NOTE: If airbrake handle is unlocked prior to gear-down indication, gear warning horn will sound and both gear warning lamps will flash RED until the landing gear is down and locked.

On final approach:

- Wing flaps L (+16°)
- Throttle IDLE
- Approach speed 59 kts / 110 km/h (yellow triangle on airspeed indicator scale)
- Propeller pitch indicator GREEN for T/O position
- Airbrakes AS REQUIRED

NOTE: It is recommended to arrange the approach so, that touch-down area can be reached with engine in idle. In this case flight path corrections are only done by applying airbrakes.

CAUTION: If propeller T/O-position is not indicated within an adequate time (max 5 minutes) by green lamp, propeller pitch position can be checked as follows:

- Airspeed 110 km/h / 59 kts
- Throttle FULL POWER but max 5500 RPM
- If 5400 RPM or more are attained, T/O blade-position most probably is reached.

WARNING: If propeller blades are not in T/O position, a considerably reduced rate of climb rate must be expected. In this case it is recommended to perform another pattern and to check PPC switch position and CB.

WARNING: If the a/c is wet and in rain increase approach speed by 10 %! (refer to section 4.5.7).

CAUTION: If strong turbulence or strong wind are encountered, select flap position +10° or +5° to achieve better effectiveness of lateral control. Increase approach speed by 10%.

b) Approach in glider-configuration

Landing pattern must be arranged so, that landing area can be reached in a safe flight path.

- Wing flaps +5°
- Airspeed 59 kts / 110 km/h (yellow triangle on airspeed indicator scale)
- Landing gear switch DOWN (extension time is about 30 seconds)
- Landing gear indicator both GREEN for down and locked
- Parking brake CHECK in OFF position

CAUTION: During gear extension the two landing gear lights flash RED (right first, then left). In case of lacking indication after selecting landing gear switch down, check CB (left side of switch) and push if necessary. If both indicator lights are not on and green after max 45 seconds, operate emergency gear extension (refer to 3.9.4.19).

NOTE: If airbrake handle is unlocked prior to gear-down indication, gear warning horn will sound and both gear warning lamps will flash RED until the landing gear is down and locked.

On final approach:

- Wing flaps L (+16°)
- Approach speed 59 kts / 110 km/h (yellow triangle on airspeed indicator scale)
- Airbrakes AS REQUIRED

NOTE: With airbrakes fully extended, propeller dome closed and 59 kts / 110 km/h glide ratio is about 1:7

WARNING: If raining increase approach speed by 10%! (refer to section 4.5.7 "Flight in Rain").

CAUTION: If strong turbulence or strong wind are encountered, select flap position +10° or +5° to achieve better effectiveness of lateral control. Increase approach speed by 10%.

4.5.5 Landing, Taxi and parking**4.5.5.1 Landing**

On short final:

- Airbrakes AS REQUIRED
- Attitude maintain WINGS LEVEL
- Directional control stay on center-line
- Elevator APPLY for touch-down in three-point attitude

CAUTION: Do not flare too low (high landing gear)! Close to the ground maintain wings level and use rudder only for directional control. Reduce speed to the minimum until touch-down with main landing gear and tail wheel simultaneously in three-point attitude.

Roll out after touch-down:

- Airbrakes FULLY EXTENDED and HOLD
- Elevator HOLD on aft stop
- Wheel brakes AS REQUIRED with caution

CAUTION: During roll out apply rudder cautiously, sensitivity is increased because pedals actuate rudder and tailwheel.

CAUTION: Off-field landing: It is the pilot's decision on whether to land with landing gear up or down; decision depends on surface and status of selected area. Several landings wheels-up were performed on dry, solid, level and flat ground without any harm to the crew or damage to the a/c (crew had seat belts well fastened and tightened).

4.5.5.2 Taxi and ground operation:

If a/c was landed in glider-configuration, engine may be restarted to taxi to parking position:

- Fuel-cock OPEN
- propeller-dome OPEN and LOCK
- Cowl-flaps FULLY OPEN
- Fuel selector switch BOTH tanks
- Auxiliary fuel pumps ON
- Choke ON for cold engine
- Throttle IDLE (max 10%)
- Ignition START
- Oil pressure GREEN
- Auxiliary fuel pumps OFF

4.5.5.3 Parking and Shut-down

On park position:

- Parking brake SET (turn lever to ON position and operate brake afterwards)
- Throttle SET about 2200 RPM
- Cowl-flaps FULLY OPEN
- Engine cool-down WAIT for CHT and oil temperature < 100°C / 212°F

CAUTION: Engine cool-down: Shut-off the engine after engine temperatures are below 100°C / 212°F (CHT and OIL temperature), but maximum after 5 minutes; for cool-down set 2000 - 2500 RPM and open cooling air flaps fully. Normally, the engine is cooled-down during approach and taxi.

CAUTION: During cool-down run the a/c should be **directed into the wind** to have a good airflow in the cowl flap area. In crosswind or tailwind conditions cooling is inadequate and engine temperatures can steadily increase. If at high OAT's or poor wind conditions the engine temperatures do not decrease to below 100°C / 212°F the engine may be shut-down after 5 minutes cool-down run.

WARNING: If the engine is operated under load during shut-down, a sudden engine-stop may result in overheating and damaging turbocharger.

CAUTION: If the engine is shut-down without a sufficient cool-down period prior to shut-down, this can result in local overheat of the engine and cooling fluid can overflow.

- COM and NAV OFF
- Generator switch OFF
- Ignition OFF
- Fuel-cock CLOSE
- If parking area is not even WHEEL CHOCKS as required
- Cooling of engine bay WAIT for 10 minutes
- Propeller-dome CLOSE
- Airbrakes UNLOCK (in case of need)

CAUTION: Propeller-dome and with it cooling air flaps should be closed about 10 minutes after engine shut-down to avoid heat accumulation and local overheat.

4.5.6 High Altitude Flight

It must be considered, when flying at high altitude, that true airspeed (TAS) is higher than indicated airspeed (IAS).

Validation of flutter behavior of the type STEMME S10-VT has been performed at altitudes of 6600 ft / 2000 m MSL. Based on these tests the maximum permissible airspeed (never exceed speed) V_{NE} = 146 kts / 270 km/h (IAS) has been established between 0 and 6600 ft MSL.

In order to avoid exceeding of the maximum permissible **true airspeed** above 6600 ft / 2000 m MSL the maximum permissible **indicated airspeed** is reduced with increasing altitude. This is due to the installed airspeed indicator system, the reading of which depends on the pitot/static air pressure and thus also on the air density which decreases with increasing altitude. Based on the ICAO-Standard Atmosphere (ISA) reduction of V_{NE} (IAS) - deviating from the ASI marking - is as follows:

Flight Altitude		never exceed speed V_{NE}		
[ft MSL]	[m MSL]	[kts (IAS)]	[mph (IAS)]	[km/h (IAS)]
0 to 6500	0 to 2000	146	168	270
10.000	3.000	139	159	257
13.000	4.000	132	151	244
16.500	5.000	125	144	231
19.500	6.000	118	136	219
26.000	8.000	105	121	195
33.000	10.000	93	107	173
39.500	12.000	81	93	150

The above speed limits are to be observed with special care since freedom of flutter for the type STEMME S10 can be granted up to these limits only.

WARNING: If OAT is extremely low, i.e. at high altitudes or in cold areas, battery capacity might be too low to turn the engine with more than 220 RPM for ignition. Successful engine restart might only be possible at higher temperatures and lower altitudes. This must be taken into account for flight and route planning.

ROTAX indicates a minimum OAT for engine start of -25°C / -13°F

These limitations have to be considered both when planning the flight, and during engine restart after high altitude flight.

4.5.7 Flight in Rain

Rain, hoarfrost and ice on wing and control surfaces change aerodynamics of the aircraft, changing a/c performance, flight characteristics and controllability remarkably. Therefore, the following procedures after unintended flight into rain or icing area are recommended:

- Keep margin of at least 6 kts / 10 km/h above any given minimum speeds.
- Be aware that the climb rate decreases by up to 50%.
- Be aware that cruise speed decreases up to 30% with consequences to maximum range (replan flight).

WARNING: Take-off run can be increased up to 50% of the normal take-off run; therefore it is urged with emphasis, not to take off with wet wings and during rain.

4.5.8 Aerobatics

Aerobatics are not permitted.

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5.1 Introduction

Section 5 provides approved data for airspeed calibration, stall speeds, static engine RPM and T/O performance, as well as other data and additional information which do not require LBA approval.

Data in charts have been computed from actual flight tests with the powered sailplane and engine in good condition and using average piloting techniques.

5.2 Approved Data

5.2.1 Airspeed Indicator System Calibration

Following diagram shows airspeed system errors. Handbook data are given as indicated airspeed (IAS).

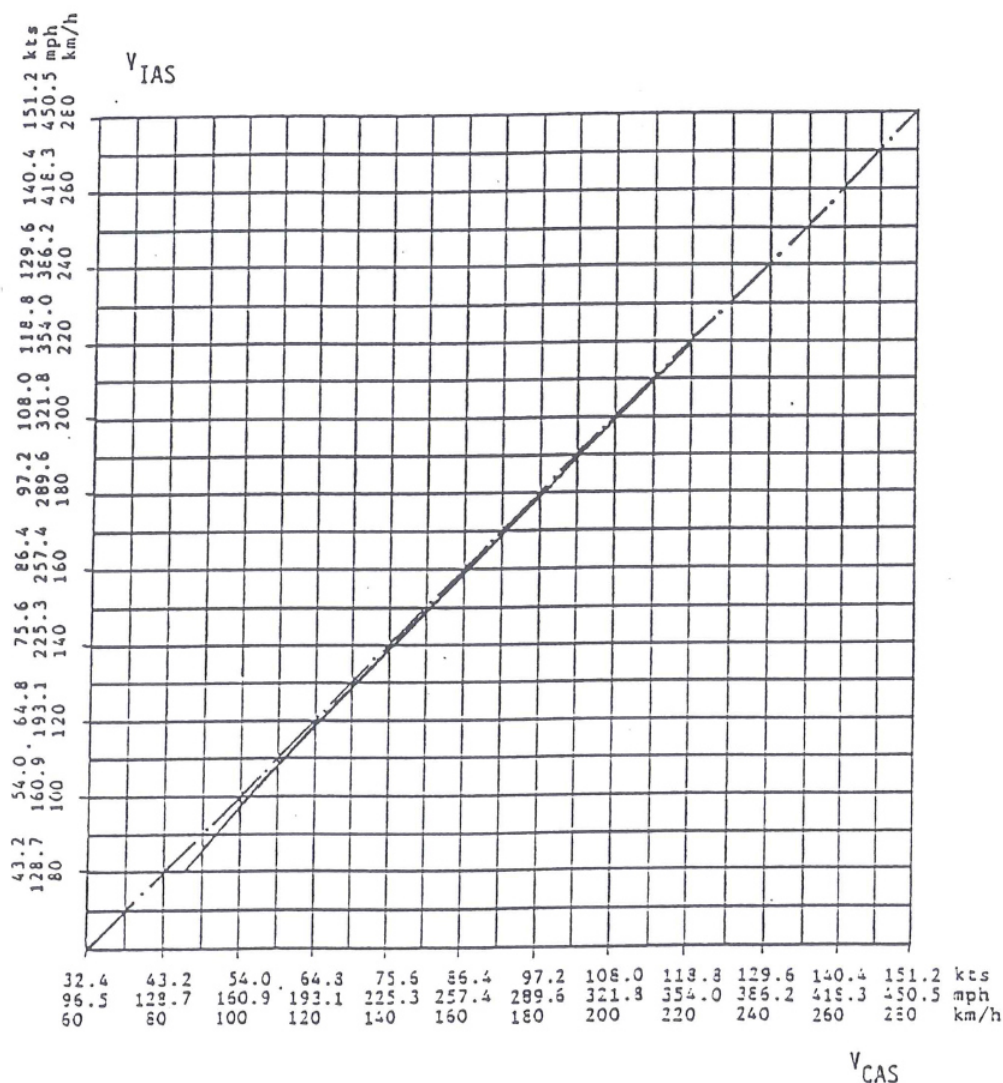


Fig. 5-1: Calibration curve in gliding configuration.

During powered flight there are only minimum changes.

V_{IAS} = Indicated Air Speed (airspeed shown on the installed ASI)

V_{CAS} = Calibrated Air Speed (airspeed shown on a system, corrected for instrument and pitot-static error))

5.2.2 Stall Speeds and Minimum Speeds

The stall / minimum speeds of the STEMME S10-VT depend on actual configuration. In this document, stall speed is defined as speed at stall-onset and minimum speed is the lowest attainable steady speed, at which the a/c is controllable, limited by aft elevator stop (stick). The following data are stall and minimum speeds established in **unaccelerated level flight at MTOW 1.874 lbs / 850 kg**.

CAUTION: Stall speed increases with weight and g-load. In turns stall speed depends on angle-of-bank and corresponding g-load.

a) Stall and minimum speeds in powered-configuration

The following table lists **stall speeds** in powered-configuration with **high engine power and aft CG**. These are the lowest stall speeds at max weight.

- Propeller in T/O position
- Throttle 90% power

Airbrakes	Wing Flaps	Landing Gear	Stall Speed	Remarks
IN	+16° (L)	UP	39 KIAS / 72 km/h	Stall
IN	+10°	UP	39,4 KIAS / 73 km/h	Stall
IN	0°	UP	40 KIAS / 75 km/h	Stall
IN	-10°	UP	43 KIAS / 80 km/h	Stall
OUT	+16° (L)	DOWN	39 KIAS / 72 km/h	Stall

The following table lists **minimum airspeeds** in powered-configuration, **idle power at forward CG**. These are the highest minimum speeds in powered-configuration.

- Propeller in T/O position
- Throttle Idle

Airbrakes	Wing Flaps	Landing Gear	Minimum Speed	Remarks
IN	+16° (L)	UP	42 KIAS / 78 km/h	elevator stop (full up)
IN	+10°	UP	43 KIAS / 80 km/h	elevator stop (full up)
IN	0°	UP	44 KIAS / 82 km/h	elevator stop (full up)
IN	-10°	UP	45 KIAS / 84 km/h	elevator stop (full up)
OUT	+16° (L)	DOWN	44 KIAS / 81 km/h	elevator stop (full up)

NOTE: Lower speeds with idle power can be attained with more aft CG, a/c will stall before reaching the aft stop for elevator.

CAUTION: The S10-VT is equipped with an acoustic stall warning which is only activated in powered configuration, onset is about 3 - 4 kts / 5 - 8 km/h before stalling.

WARNING: With a voltage < 11,5 VDC of the electrical system in powered-configuration, stall warning is unreliable and ASI must be carefully monitored; it is recommended to terminate the mission.

WARNING: Altitude loss for recovery from stall in **level flight** may be up to **100 ft / 30m**, out of a **turn** up to **130 ft / 40 m** and for a **delayed reaction** up to **200 ft / 60 m**.

b) Stall and minimum speed in glider-configuration

Following table lists **minimum airspeeds in glider-configuration at forward CG**. These are the highest minimum speeds in glider-configuration.

- Propeller folded, dome closed

Airbrakes	Wing Flaps	Landing Gear	Minimum Speed	Remarks
IN	+16° (L)	UP	44 KIAS / 81 km/h	elevator stop (full up)
IN	+10°	UP	44 KIAS / 82 km/h	elevator stop (full up)
IN	0°	UP	45 KIAS / 84 km/h	elevator stop (full up)
IN	-10°	UP	49 KIAS / 90 km/h	elevator stop (full up)
OUT	+16° (L)	DOWN	42 KIAS / 78 km/h	elevator stop (full up)

NOTE: Lower speeds can be attained with more aft CG, a/c will stall before reaching the aft stop for elevator.

CAUTION: In glider-configuration stall warning is only by aerodynamic buffeting, onset is about 3 - 4 kts / 5 - 8 km/h before stalling

WARNING: Altitude loss for recovery from stall in **level flight** may be up to **100 ft / 30m**, out of a **turn** up to **130 ft / 40 m** and for a **delayed reaction** up to **200 ft / 60 m**.

5.2.3 Take-Off Procedure

5.2.3.1 Engine Rotational Speeds

a) *Static RPM for run-up to check engine*

Engine RPM resulting from a power lever position depends on pressure altitude and OAT. The combination of turbo-charged engine and a non-constant speed propeller requires special attention concerning this behavior (see section 4.5.2.1 "Checks before take off").

NOTE: Actual pressure altitude can be read from altimeter by setting 1013 hPa / 29,92 in.

Following diagrams show "normal data" of static RPM for 115% (T/O power) and for 100% (max continuous power) as a function of pressure altitude and OAT for an engine in good condition.

Run-up (115% or 100%) must show RPM's within the **allowed tolerance of +/- 200 RPM** deviation from "normal" RPM indicated in the relevant diagram, otherwise an engine malfunction or wrong propeller-blade position must be expected and T/O is not allowed.

The diagram for 115% static RPM in case of doubt is a substitute for the rule-of-thumb given in section 4.5.2.1 for 115% setting (5200 + 60 RPM per 1000 ft / + 200 RPM per 1000 m elevation $\pm$ 200 RPM tolerance).

b) *Static RPM to decide on T/O procedure*

NOTE: Fixing the take-off throttle setting as defined by the three take-off procedures is described in section 4.5.2

The diagrams for 115% and 100% additionally show static RPM-limit lines. If a static RPM above the limit line is observed in the run up, engine overspeeding (> 5800 RPM) is to be expected during initial climb with V_y after T/O with 115% or 100%, respectively.

If in doubt, these RPM-limits for 115% and 100% must be used instead of the criteria "static RPM at 115%" given in section 4.5.2.1 (5500 RPM for T/O with 115% and 5600 RPM for T/O with 100%). If it is questionable after 115%-run up, if a 100%-T/O keeps in limits, run up with 100% and decide via the RPM-limit in the second diagram for 100%.

WARNING: T/O with full throttle (115% power) is not allowed if static RPM at full throttle exceeds RPM-limit in 115%-diagram.

WARNING: T/O with 100% power setting is not allowed if static RPM at 100% exceeds RPM-limit in 100%-diagram. In this case T/O with reduced power, established by a throttle setting for 5400 RPM static, is required.

*c) Example for use of RPM-diagrams*Engine RPM-check:

The first step, called "engine RPM-check", is to **determine the condition of the engine**.

In our example, we first use the "engine RPM-check" to determine whether the engine performs as good as expected, i.e. whether it is in a good condition or not. The criterion for the engine performance is its RPM. Determine the expected value by use of the rule-of-thumb for 115% (5200 RPM + 60 RPM per 1000 ft / $\pm$ 200 RPM tolerance), or more precisely, in accordance with the diagrams on page 5-6. The maximum permissible deviation of the measured engine RPM from its expected value is $\pm$ 200 RPM. In case that the deviation exceeds this tolerance, do not perform a take-off, because the engine or the propeller might have a serious malfunction.

With an altimeter setting of 1013 hPa / 29,92 in., the altimeter displays a pressure altitude of 4900 ft for the runway in our example. The OAT is +23°C / 73°F. The tachometer during a run-up with full throttle (115%, prop. in take-off position) shows 5600 RPM. Since the temperature is well above the ISA temperature (about +5 °C / 41 °F at 4900 ft), the pilot decides to check the actual engine performance by use of the more exact RPM-diagrams instead of using the rule-of-thumb.

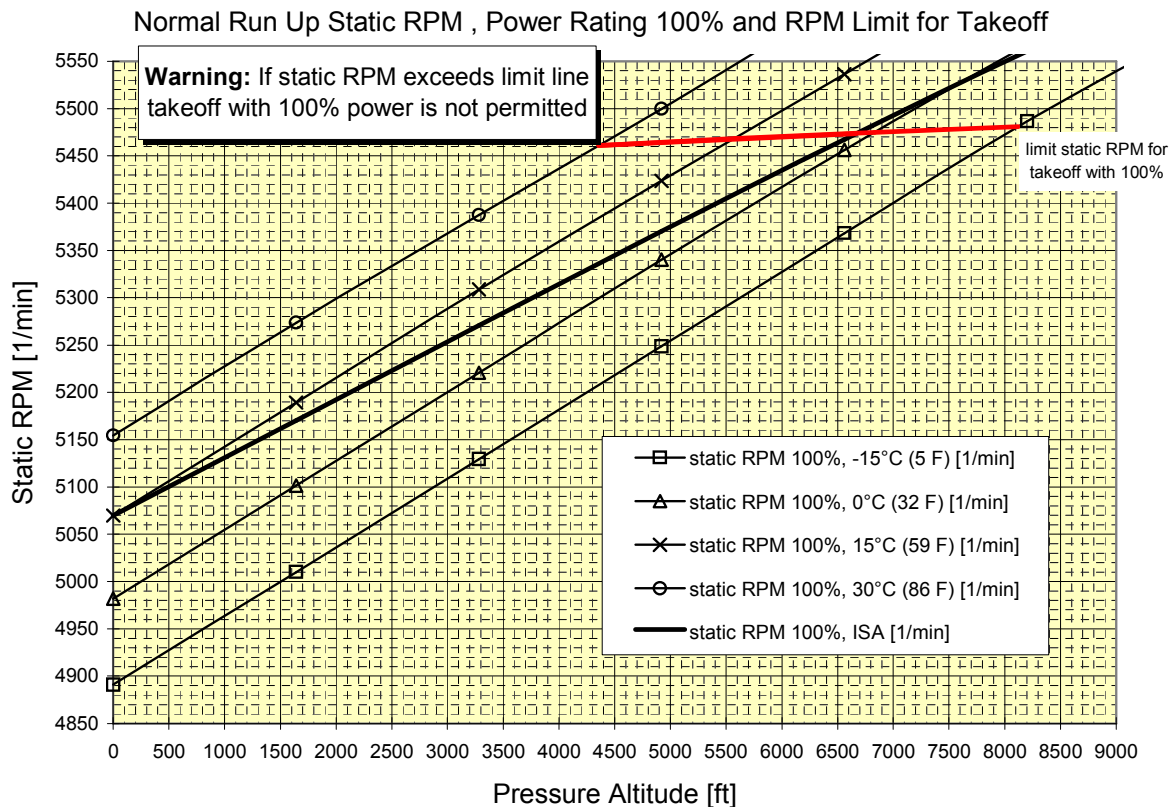
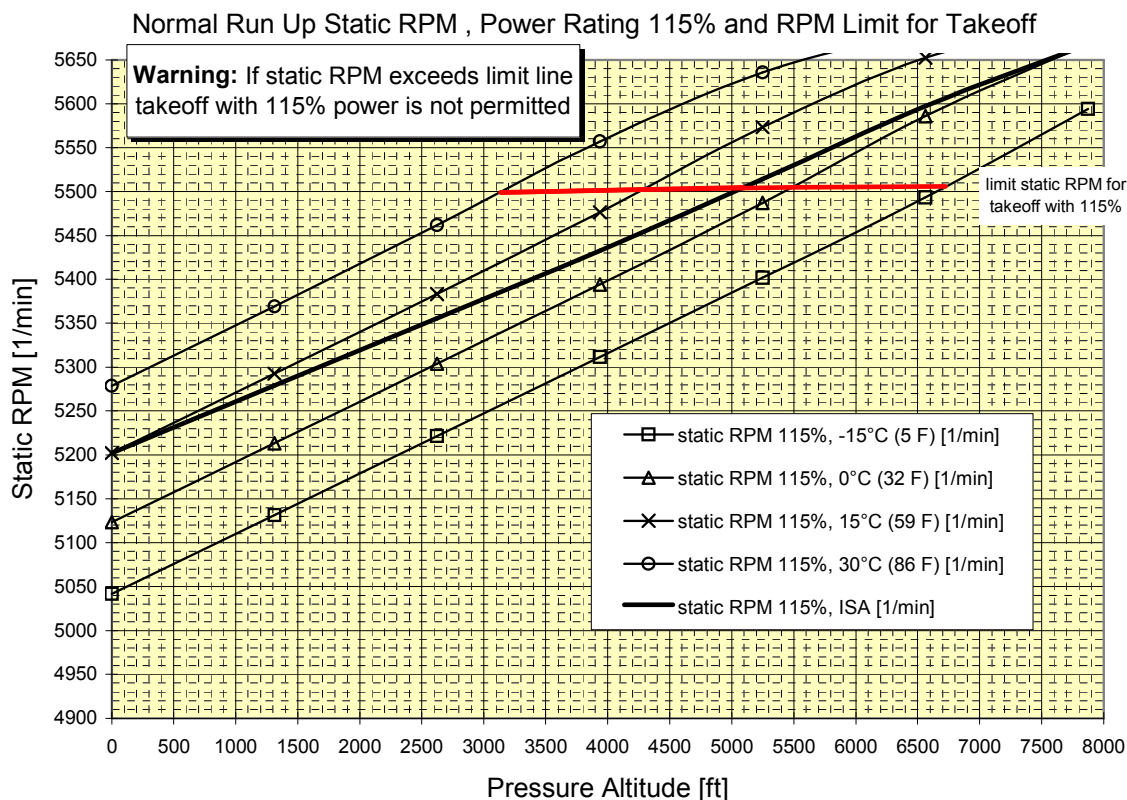
The precisely expected RPM can be determined from the diagrams on page 5-6, giving 5590 RPM for 4900 ft and +23°C / 73°F (read as the value halfway between the lines for 15 °C / 59°F and 30°C / 86°F OAT). The tolerance of $\pm$ 200 RPM gives a permissible RPM range of 5.390 - 5790 RPM. Consequently, the measured RPM of 5600 is within the tolerance, and the engine performs within its specified limits.

Setting of T/O power:

The second step is to **choose the take-off procedure**.

Our example shows now how to determine the take-off procedure under the actual conditions (like engine condition, field elevation, QNH and OAT, etc.). For this purpose the RPM from the previous "engine RPM-check" may either be used, or another run-up may be necessary, like in our example.

The previous run-up with full throttle (115%, prop. in take-off position) resulted in a RPM of 5600, which prohibits a take-off with full power (115%) according to T/O-procedure no. 1. In this case, coincidentally, the measured RPM is also the limit-RPM for a 100%-T/O (refer to section 4.5.2.1 page 4-11). To determine whether T/O-procedure no. 2 (100% power setting) is permissible, or if already T/O-procedure no. 3 must be applied (reduced power setting for a static RPM of 5400), another run-up is performed with 100%, resulting in a tachometer signal of 5450 RPM. This value is compared with the RPM-diagram for 100%, giving an RPM-limit of 5460 at 4.900 ft pressure altitude and an OAT of +23°C / 73°F. The measured 5450 RPM is slightly below the limit and a T/O with 100% power setting is permissible.



5.2.3.2 T/O performance

The following diagrams contain T/O ground run distances and T/O distances required to 50 ft / 15 m height (AGL) for power settings according to the three T/O-procedures described in section 4.5.2, via pressure altitude for differing, constant OAT's and, bold lined, for ISA-temperatures.

1. The Diagrams page 5-8 show T/O runs and T/O distances with full throttle, maximum take-off power (115%), respectively.
2. The Diagrams page 5-9 show T/O runs and T/O distances with throttle on first stop, maximum continuous power (100%), respectively.
3. The Diagrams page 5-10 show T/O runs and T/O distances with throttle settings for 5400 RPM static, reduced power, respectively.

The T/O distances indicated are valid for a S10-VT in a good condition, at the best angle-of-climb speed $V_X = 56$ kts / 104 km/h, and for:

TOW 1874 lbs / 850kg **no wind**
dry concrete runway surface **no slope**

The lines "limit RPM at V_Y " in the diagrams show pressure altitudes as a function of temperature, up to which an initial climb with V_Y up to about 500 ft / 150 m AGL is possible without exceeding the RPM-limit, assuming that the engine operates with "normal"-RPM's as shown in the diagrams in section 5.2.3.1. These lines are for information and preliminary decision for T/O procedure according to section 4.4.1 "Checks before entering cockpit". **Final Decision on T/O power setting is principally taken according to section 5.2.3.1 b)**, comparing actual static RPM's with RPM limits.

Additions to the **T/O ground run** have to be made for surfaces not comparable to an asphalt-runway. The following list shows additions according to AIP I and corresponding factors. If more than one item is relevant, the factors on the ground run have to be multiplied:

- Grass RWY, flat, dry, hard, short grass +20% or factor 1,2
- Grass, wet +10% or factor 1,1
- High growth of grass, max 3 in / 8 cm +20% or factor 1,2
- Soft ground +50% or factor 1,5
- Slush, standing water +30% or factor 1,3

WARNING: It is urgently advised, not to take-off in rain or with the wing wet (see section 4.5.7) !

Example for use of T/O-distance diagram:

The example from pg. 5-5 is continued: Pressure altitude 4900 ft / 1500 m, OAT +23°C / 73°F. For T/O 100% power setting was selected; RWY is level, dry with high grass, (max 3 in / 8 cm); no wind, TOW 1874 lbs / 850 kg

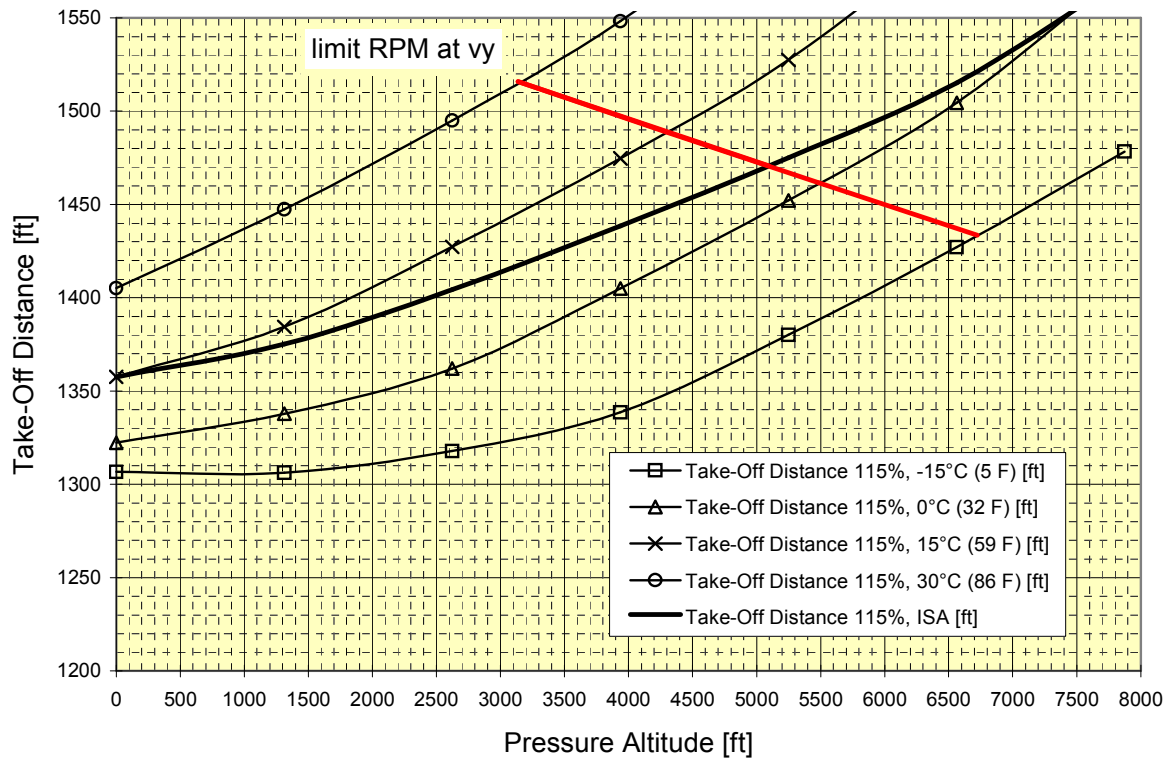
T/O distance for 100% power setting from diagram shows 1675 ft / 510 m to clear a 50 ft obstacle. The diagram for T/O run length shows 825 ft / 252 m.

T/O run has to be corrected for *Grass RWY* and for *high grass*; correction is $1,2 \times 1,2 \times 825 \text{ ft} = 1188 \text{ ft} / 363 \text{ m}$; this is 363 ft / 111 m more than on a dry asphalt-RWY. T/O distance for this case is 1675 ft + 363 ft = 2038 ft / 621m.

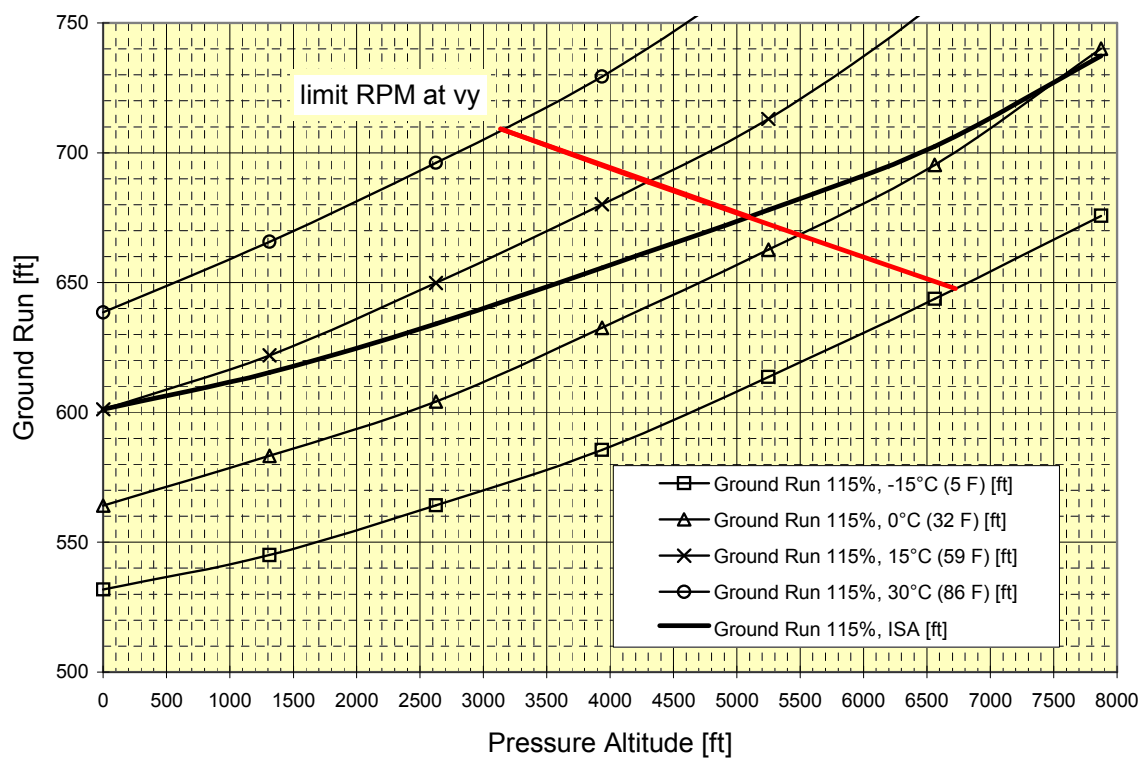
CAUTION: T/O distances in section 5.2.3.2 are valid for a T/O with climb speed $V_X = 56$ kts / 104 km/h and are shorter than those resulting from T/O with V_Y , as recommended in section 4.5.2.3.

a) T/O-distance (50 ft) and ground run with power setting 115%

Take-Off Distance to 50 ft Height AGL vs. Pressure Altitude, Power Rating 115%

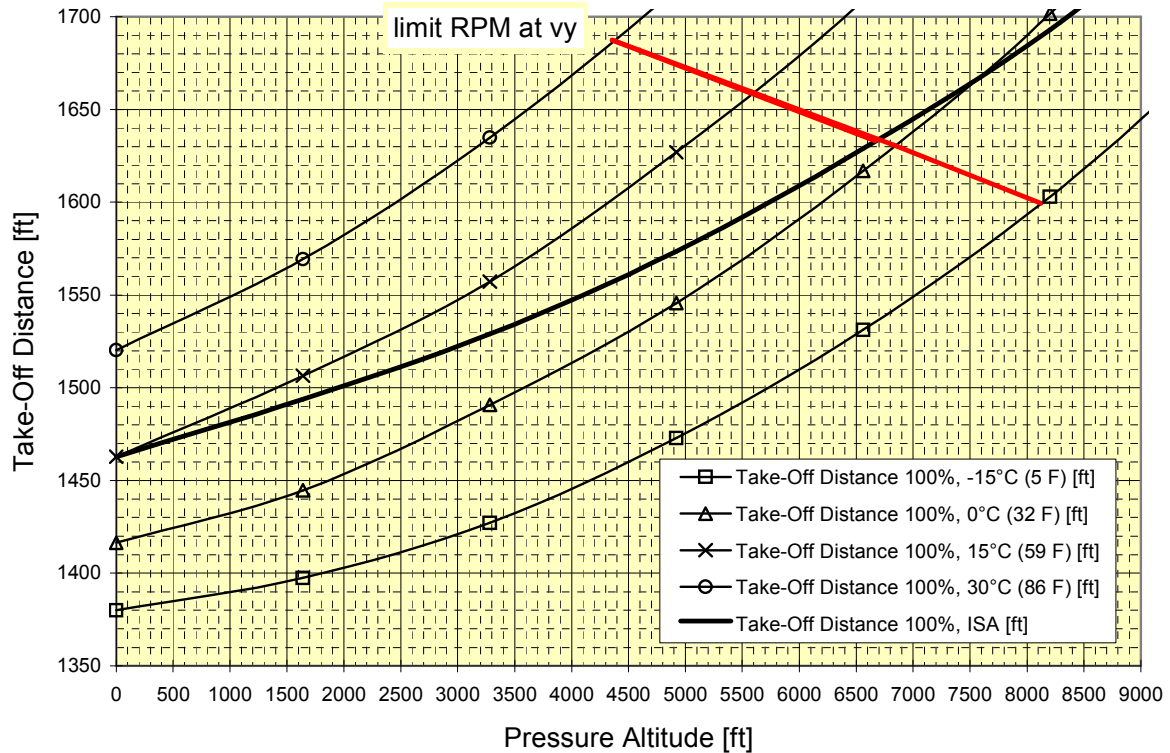


Ground Run vs. Pressure Altitude, Power Rating 115%

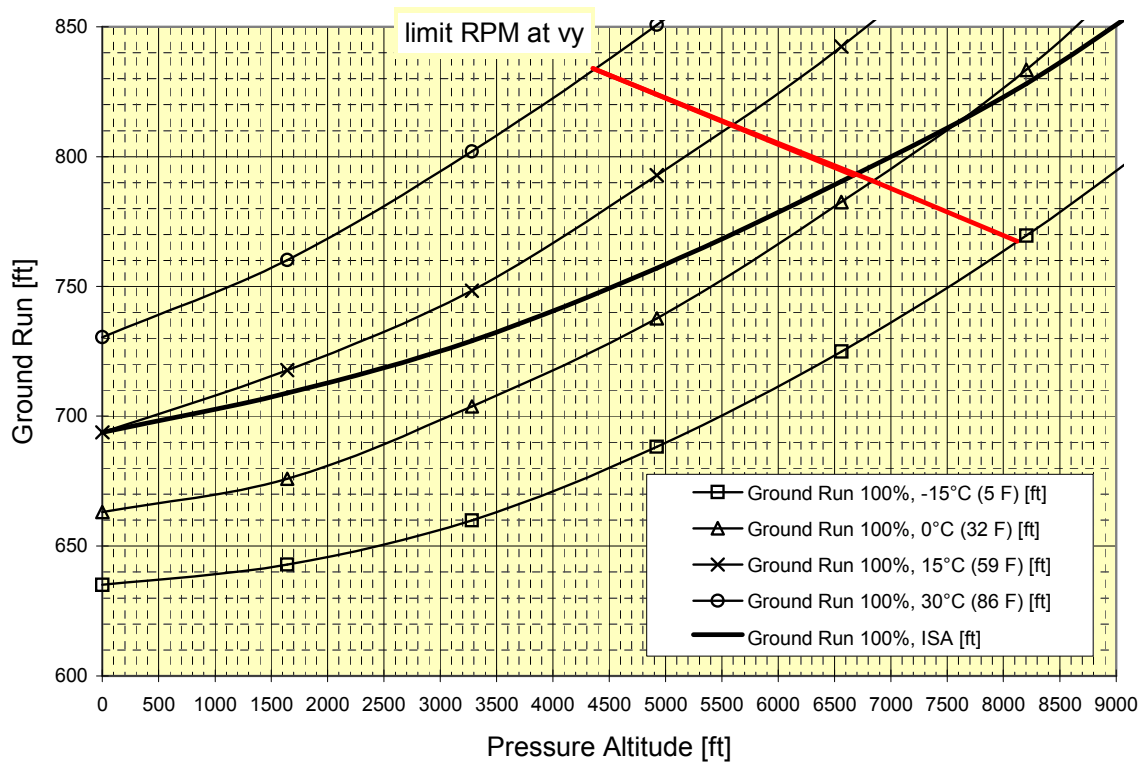


b) T/O-distance (50 ft) and ground run with power setting 100%

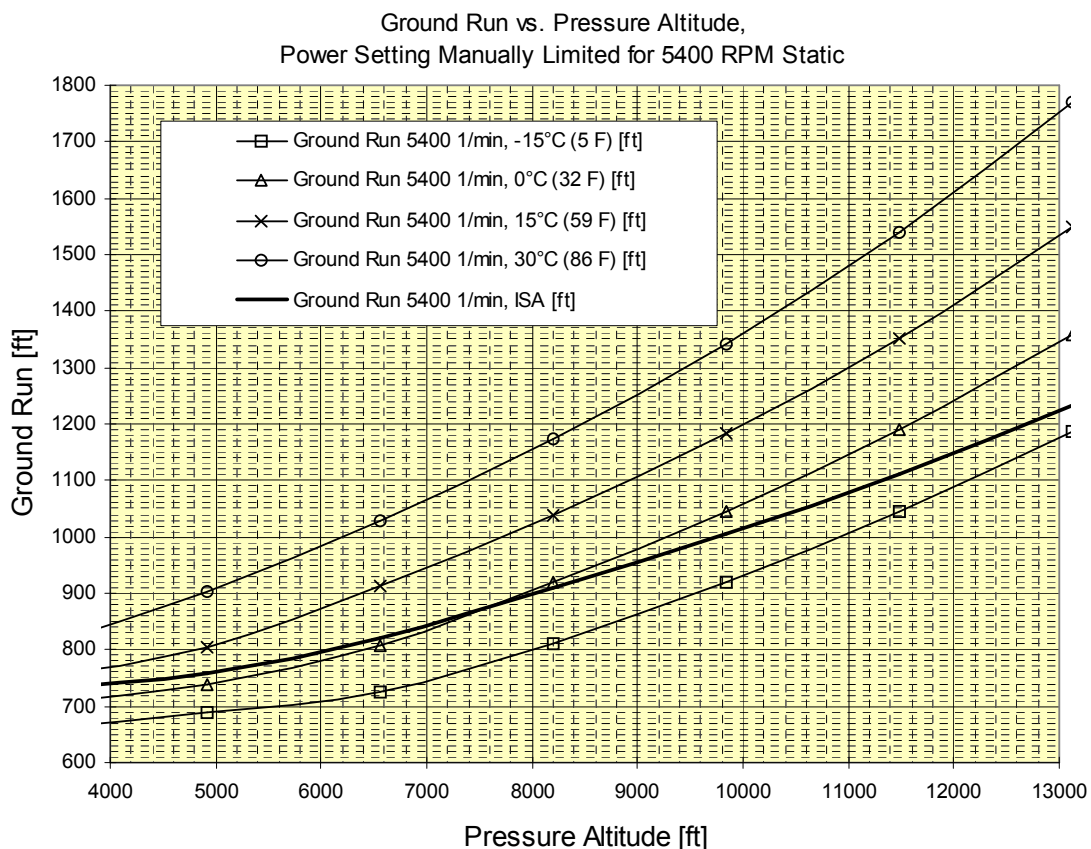
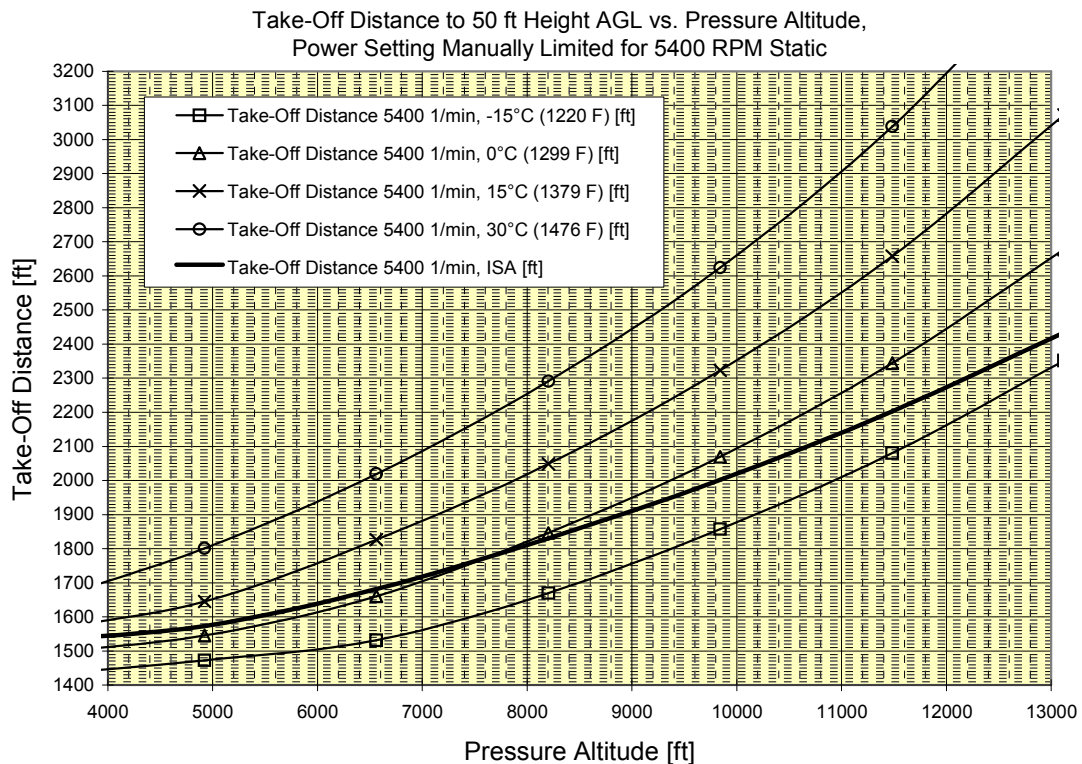
Take-Off Distance to 50 ft Height AGL vs. Pressure Altitude, Power Rating 100%



Ground Run vs. Pressure Altitude, Power Rating 100%



c) T/O-distance (50 ft) and ground run with reduced power for 5400 RPM static



5.3 Additional Information (non-approved)

5.3.1 Performance in powered-configuration

5.3.1.1 Cruising speed, fuel flow and endurance.

Following table may be filled by the holder/operator for the individual powered glider, based on sufficient statistical operation data. However, this table remains without obligation.

Approximate data (not binding) may also be obtained by the fuel consumption diagram on the following page. Deviations therefrom may occur at every single powered glider. They are caused by different carburettor adjusting, engine power, surface condition of the powered glider, etc., even those differences may be within the permitted tolerances. The data for this fuel consumption diagram (cruising configuration) has been obtained by flight measurements at one STEMME S10-VT (S/N 11-006) in the following configuration:

- Full opened cowl flaps (unfavourable setting),
- Landing gear UP,
- Flaps: -10° .

Fuel Consumption and Endurance Table for STEMME S10-VT

S/N: **11-**

maximum usable fuel quantity:

Propeller position	Density alt. ft / m	RPM [1/min]	v_{IAS} kts / km/h	v_{TAS} kts / km/h	Fuel flow US gal/h / Imp.gal/h / l/h	max. endurance ¹⁾ [h:min]
<i>Take-off</i>	3300 / 1000					
Cruise	3300 / 1000					
Cruise	3300 / 1000					
Cruise	3300 / 1000					
Cruise	3300 / 1000					
Cruise	3300 / 1000					
<i>Take-off</i>	6600 / 2000					
Cruise	6600 / 2000					
Cruise	6600 / 2000					
Cruise	6600 / 2000					
Cruise	6600 / 2000					
Cruise	6600 / 2000					
<i>Take-off</i>	9900 / 3000					
Cruise	9900 / 3000					
Cruise	9900 / 3000					
Cruise	9900 / 3000					
Cruise	9900 / 3000					
Cruise	9900 / 3000					

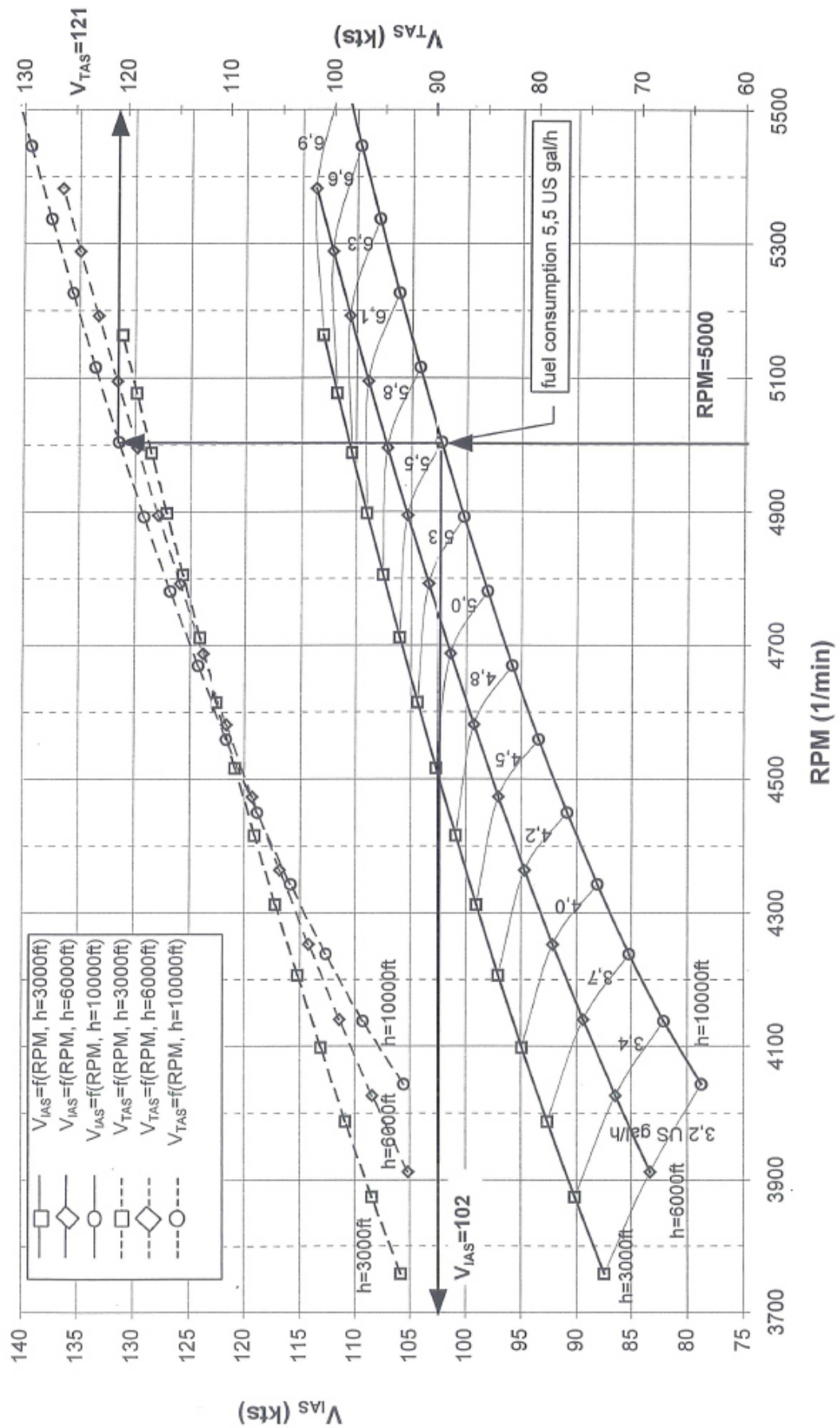
¹⁾ Maximum endurance (without reserve fuel) for a max. usable fuel quantity (see also section 2.4.1). The max. usable fuel quantity has to be measured for each individual powered glider because due to the FRP-built fuel tanks and due to not exactly horizontal levelled wings during refueling there may occur differences in the max. fuel quantity by $\pm 5\%$.

If tanks are not full, flight time available may be estimated:

$$\text{flight time available} \approx \text{max. flight time (refer to table/diagram)} \times \text{fuel available} / \text{max. usable fuel quantity}$$

Range without reserve fuel can be estimated with flight time available and true airspeed:

$$\text{Range} \approx \text{flight time available} \times v_{TAS} \text{ (refer to table/diagram)}$$



5.3.1.2 Climb performance

Following table indicates climb performance with max T/O weight and climb speed 62 kts / 115 km/h IAS:

Propeller position	Power setting	Density altitude ft / m	Rate-of-climb ft/min / m/s
Take-off	115%	0	
Take-off	115%	3300 / 1000	
Take-off	115%	4900 / 1500	
Take-off	100%	0	
Take-off	100%	3300 / 1000	
Take-off	100%	6600 / 2000	
Take-off	reduced (5500 RPM)	9900 / 3000	
Take-off	reduced (5500 RPM)	13000 / 4000	
Take-off	reduced (5500 RPM)	16500 / 5000	
Take-off	reduced (5500 RPM)	19500 / 6000	
Take-off	reduced (5500 RPM)	23000 / 7000	- reserved -
Take-off	reduced (5500 RPM)	26000 / 8000	
Cruise	115%	0	
Cruise	115%	3300 / 1000	
Cruise	115%	6600 / 2000	
Cruise	115%	9900 / 3000	
Cruise	100%	0	
Cruise	100%	3300 / 1000	
Cruise	100%	6600 / 2000	
Cruise	100%	9900 / 3000	
Cruise	100%	13000 / 4000	
Cruise	reduced (5500 RPM)	16500 / 5000	
Cruise	reduced (5500 1/min)	19500 / 6000	
Cruise	reduced (5500 1/min)	23000 / 7000	
Cruise	reduced (5500 1/min)	26000 / 8000	

Service ceiling (rate-of-climb 100 ft/min / 0,5 m/s) measured: _____ ft / _____ m

5.3.2 Max demonstrated crosswind component

Max demonstrated crosswind component for taxi, T/O and landing is 16 kts / 30 km/h.

5.3.3 Gliding Flight Polar

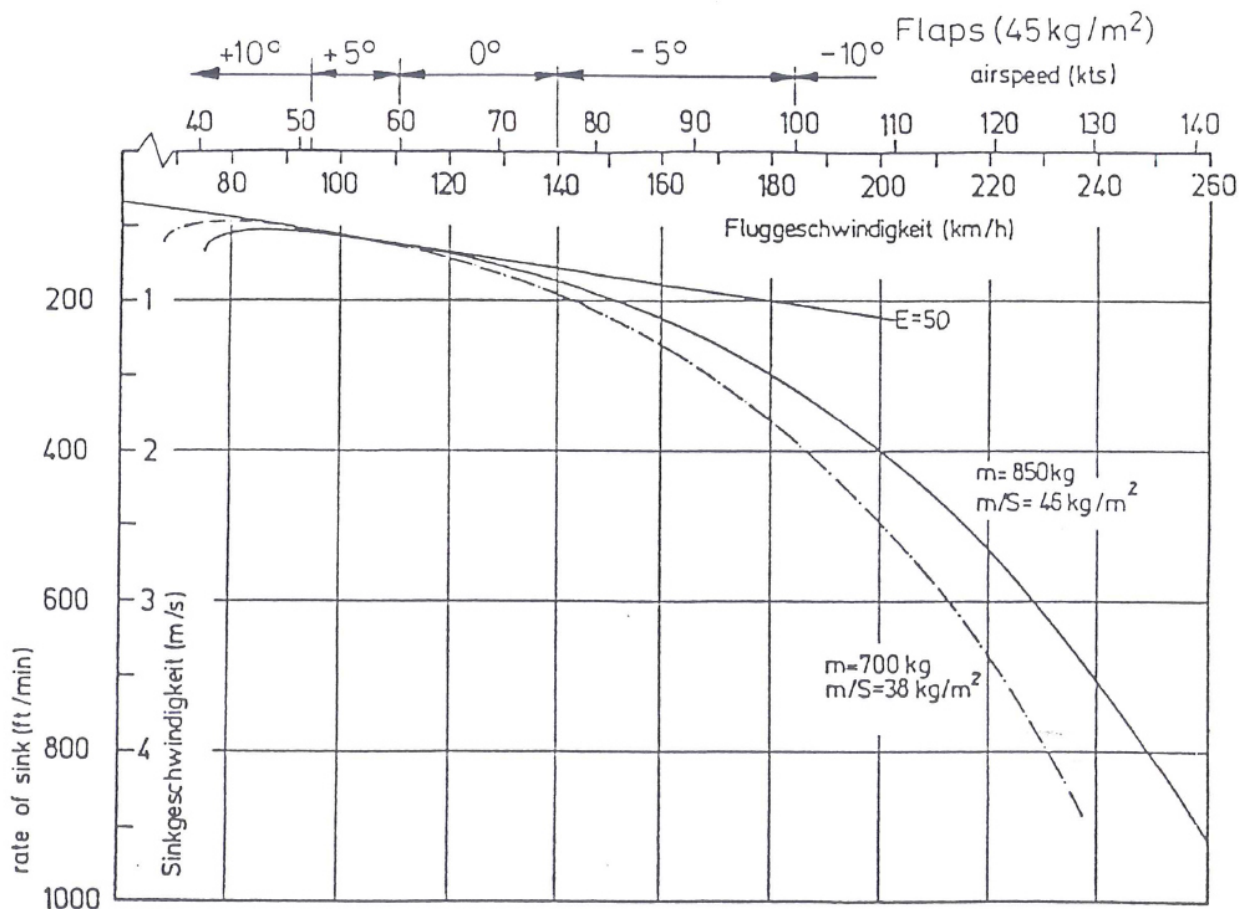


Fig. 5-2: Speed polars for wing loading 7.8 and 9.3 lb./sqft. (38 and 45 kg/m²)

5.3.4 Noise Data

Fly-over noise measurements according to the "Laermschutzforderungen fuer Luftfahrzeuge (LSL)" (Noise Protection Requirements for Aircraft; German equivalent to and based on the ICAO, Annex 16), dated 1.1.1991, published in the "Bundesanzeiger Jahrgang 43, Nr. 54a, dated 19.03.1991

Measured noise level according to **Chapter X: 71,3 dB(A)**. [Limit value LSL: 73.9 dB(A)]

Section 6 - Mass and Balance

6.1 Introduction

6-1

6.2 Weighing Logsheet and Permitted Payload Range

6-1

6.1 Introduction

This section contains the payload range within which the aircraft may be safely operated.

Procedures for weighing the powered glider, the calculation rule for calculating empty weight (instead of weighing after changes of equipment), CG and allowed payload range, a complete list of all equipment available for this aircraft and a list of equipment installed when weighed are contained in the Maintenance Manual.

The originals of the last weighing report and the corresponding equipment list are contained in Appendix C (service records) of the Maintenance Manual related to this individual serial number.

6.2 Weighing Logsheet and Permitted Payload Range

The weighing logsheet (see following page) indicates the maximum and minimum payload in the cockpit and the allowed total payload. The difference between the two values is the allowed fuel quantity. As far as the permitted load ranges are not exceeded, no pre-flight C.G. calculation is required.

The data contained in the table are calculated based on the most recent weighing report. It is valid only for the a/c with the serial number indicated on the title page of this flight manual.

Weighing Logsheet and Permitted Payload Range

Valid for Serial No. 11-							
Date of most recent weighing report	Empty mass [lbs] / [kg] ⁴⁾	Empty mass C.G. aft of datum [in] / [mm] ⁴⁾	Cockpit payload (occupants + baggage)		Total payload ³⁾ [lbs] / [kg] ⁴⁾	Examiner	
			minimum ¹⁾ [lbs] / [kg] ⁴⁾	maximum ²⁾ [lbs] / [kg] ⁴⁾		Date	Sign

- 1) With pilot weights (including parachute) between 121,5 lbs / 55 kg and the minimum cockpit payload stated above, ballast weights specified by manufacturer must be fitted on right hand rudder pedals **in foremost position**. Items of 6.6 lbs / 3 kg are available, each compensating a lack of 16,5 lbs / 7,5 kg of cockpit load at the pilot's position. As standard minimum cockpit payload is 155 lbs / 70 kg, two ballast weights are required with a pilot weight (including parachute) of 121,5 lbs / 55 kg.

WARNING: If the powered glider is trimmed for a minimum cockpit payload of more than 155 lbs / 70 kg, then more than two ballast weights are required if cockpit payload is less than the minimum cockpit load minus 33 lbs / 15 kg.

- 2) Is determined with the last weighing or using the calculation rule according to the maintenance manual. In each case total max. pilot mass 396 lb. / 180 kg, but not in excess of 242 lb. / 110 kg per seat (including parachute).
- 3) Total payload is cockpit payload plus mass of fuel. Determined during last weighing or, after changes of the weighing report, calculated according to calculating rule of the maintenance manual.
- 4) Please enter the value with correct unit.

Section 7 - Description of the S10-VT and its Systems and Equipment

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7.1 Introduction

This section provides description and operation advice of the powered glider and its systems and equipment. Section 9 includes flight manual supplements, if required, related to non-standard systems and equipment. For more information about components and systems see maintenance manual.

7.2 Cockpit Controls

a) Cockpit controls at the airframe

Following overview includes the controls at the airframe.

1.	Control Stick	Middle in front of each seat.
2.	Rudder Pedals	For each seat and adjustable. The pedals also steer the tail wheel, which is coupled to the rudder via spring device.
3.	Airbrake Lever	For each seat LH side. Blue lever at LH cockpit side and on the center console between seats.
4.	Flap Lever	For each seat LH side. Black lever at LH cockpit side and on the center console. Indication of settings (-10, -5, 0, +5, +10, L) in center console. Unlocking is by moving lever to the right against a spring force which locks the flap positions.
5.	Pedal Adjustment Handle	In front of each seat. Unlocking is by pulling the handle.
6.	Canopy Locks	Two white handles with red colored ring, one on left and one on right side of the canopy frame, to open and lock the canopy, and one white handle at rear top, which keeps hold of the rear canopy at the first moment of emergency canopy jettison ("Röger-Hook").
7.	Brake Lever	Lever on LH control stick, on RH stick optional. Separate lever for parking brake valve on the floor panel console in front of the LH control stick.
8.	Trim Lever	One green lever on center console between seats. To trim push down (unlock) and shift lever forward or aft. Locking is by a spring device.
9.	Throttle Lever	One black lever on center console with two forward stops (for max. continuous and max. T/O-power). It is coupled with a spring acting forward in direction FULL POWER. Its position is fixed by friction discs, which can be adjusted with a milled-nut on LH side of the center console.
10.	Choke Lever	Black lever on center console, RH side of the throttle lever. It is coupled with a spring acting rearward in direction CHOKE OFF. Its position is fixed by friction discs, which can be adjusted with a milled-nut on RH side of the center console.
11.	Propeller Pitch Control	Switch on center console. The forward position is the TAKE-OFF position. A green light next to the switch indicates, if propeller pitch (not switch) is in T/O-position.
12.	Fuel Cock	Red handle on the rear console between the seat back rests. Turning the handle into it's horizontal position (fuel cock CLOSED) cuts off the fuel supply for the engine.

CAUTION: Throttle positions for 115% and 100% can be selected by feeling. The first stop is the 100% throttle position. To select 115% the throttle lever must be moved through a throttle gate to the left and then pushed to the next stop.

b) Controls at instrument panel

The following overview includes controls at the lower area of the instrument panel. These elements are included in the picture of the instrument panel (see

Fig. 7-1 page 7-4):

1.	Emergency Canopy Release	Red pull-handle on LH side of the switch panel. It is pulled for emergency canopy jettison <u>after</u> opening the canopy locks on LH and RH side of the canopy frame.
2.	Cowl Flap Reduction	Black T-handle on LH side of the lower middle section of the instrument panel to reduce engine cooling in cruise condition. The foremost position means cowl flaps fully OPEN, 5 settings aft are available to reduce the opening of the cowl flaps.
3.	Propeller Dome Operation	Black handle in the middle foot of the instrument panel to open, close and lock the propeller dome, linked to the engine electric master switch. Unlock by lifting, lock by pushing down the handle. In the forward position (Dome OPEN) the engine master switch comes ON when dome is LOCKED.
4.	Propeller Brake	Black T-handle on RH side of the cowl flap reduction to brake the propeller to fullstop after engine switched off in flight. Braking is by pulling the handle.
5.	Propeller Positioning	Black T-handle on RH side of the propeller brake to position the propeller so as it fits into the propeller dome contour. Operation is by steady, not too fast pulling the handle to its stop.
6.	Air Vents	Two adjustable air vents for cockpit ventilation, one on LH and one on RH side of the Instrument panel, are provided.
7.	Canopy Ventilation	Knob on RH side of the ignition/starter switch to ventilate the canopy. The pulled position means canopy ventilation OPEN.

WARNING: The most closed position of cowl flaps (nodge 5) is only for low-power or idle-descent and for engine warm-up on ground. During all other operation cowl flap should be more open to allow for higher cooling air flow into engine bay.

7.3 Instrument Panel

The following description gives an overview of instruments, controls, monitor devices and CB's installed in the instrument panel. The positions of the elements is shown in the picture of the instrument panel (

Fig. 7-1 page 7-4), valid for the serial number as indicated on the title page of this flight manual.

The flight control instruments include at least one ASI (airspeed range 27 - 162 kts / 50 - 300 km/h), one Altimeter and one magnetic compass. These instruments are located directly in the view area of the PIC (in front of LH seat). Double-instrumentation is possible to provide an optimum view on flight control instruments from the RH seat (i. e. instruction flights).

Additional avionics may be installed on customer demands. Related Switches and CB's are always located in the same section of the instrument panel.

Engine monitoring includes at least:

- tachometer,
- oil pressure and oil temperature,
- cylinder head temperature (CHT) LH and RH,
- voltmeter and ammeter
- fuel quantity in LH and RH wing tanks
- Engine-elapsed-time-indicator

These instruments are located as a rule, with the exception of the engine-elapsed-time-indicator, in the RH area of the panel, if not installed (i. e. with double-instrumentation) in the centre area. The engine-elapsed-time-indicator is located on the centre console between the seats.

The red fire-warning lamp (test by pushing lamp for optic and acoustic signal) is adjacent to the engine instrumentation.

The following warning and monitoring lamps are combined in a group, arranged independently of its location on the instrument panel. They inform the pilot about the proper condition of the a/c at a glance. The group is always located at the upper instrument panel below the glareshield to allow for dazzle-free reading.

Arrangement from left to right is:

- A) red fuel pressure warning light,
- B) green status light indicating the operation of the auxiliary fuel pump(s),
- C) red warning light for manifold pressure (boost pressure),
- D) yellow caution light for malfunction of the TCU (Turbo Control Unit),
- E) red warning light for malfunction of the external generator (battery charge control),
- F) yellow caution light for malfunction of the internal generator.

The landing gear position and warning indication, consisting of two lamps, indicating the situation with green or red steady or flashing light, are also located below the glareshield.

The following CB's are combined in a group, arranged independently of its location at the panel:

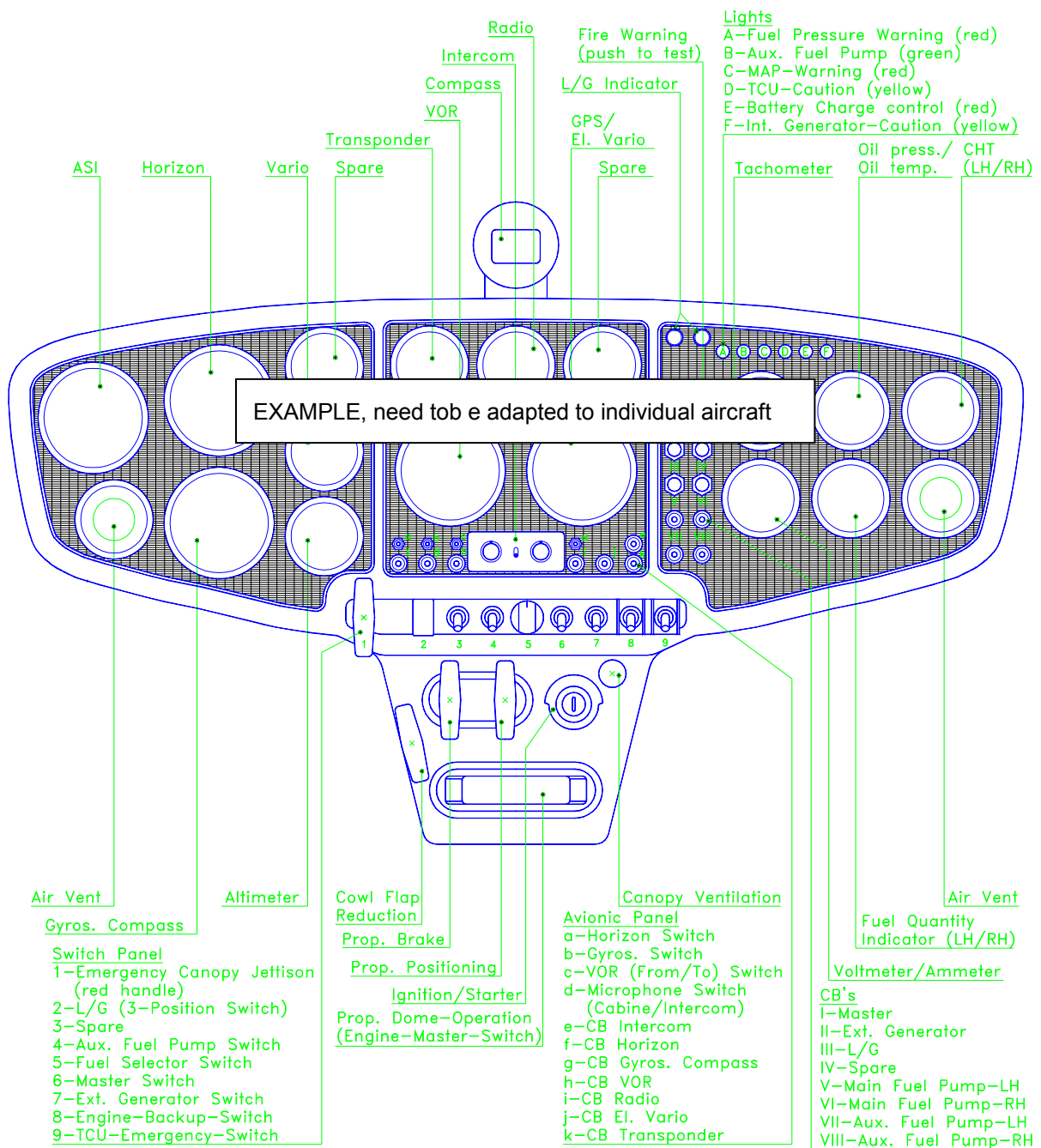
- master CB,
- landing gear CB,
- CB for external generator,
- CBs for the main and the auxiliary fuel pumps.

The **lower, central section** of the instrument panel comprises a row of levers and switches. Any switches are systematically arranged here, except for avionics and – if the optional auxiliary battery is installed – the push button to select voltmeter indication of the auxiliary battery. The red handle for canopy emergency jettison is installed LH of the row of switches. Sequence of levers and switches, starting from the left, is:

1. red handle for canopy emergency jettison,
2. 3-position lever for landing gear (down: lowering, centre: neutral (electrically de-energized), up: retraction),
3. spare, or optional battery selector switch (down: auxiliary battery selected, up: main battery selected),
4. switch for auxiliary fuel pump(s),
5. fuel selector turn switch with positions "left tank", "both tanks", and "right tank",
6. electric master switch,
7. switch for external generator,
8. engine-back-up switch to bypass engine master switch in case of malfunction of the microswitch at the propeller-dome (switch is guarded with a black protecting plate to prevent unintended operation).
9. TCU emergency switch to isolate wastegate actuator and TCU control in case of malfunction (switch is guarded with a red protecting plate to prevent unintended operation),

The control elements for propeller and propeller-dome (propeller brake, propeller positioning and propeller dome handle) are arranged below the row of switches in the centre console. In the same area the canopy ventilation knob and the ignition/starter switch (positions **OFF**, **Right**, **Left**, **BOTH** and **START**) are installed.

Following drawing shows layout and arrangement of the instrument panel of the serial number as indicated on the title page, including control elements, monitoring devices and CB's.

This page is valid for Serial Number: 

C:\PANEL\ST02A-E

Fig. 7-1 Arrangement of Elements on the Instrument Panel

7.4 Landing Gear

The landing gear (L/G) consists of a tail wheel and two retractable main landing gear legs, hinged at the center fuselage frame with the hinge axis in flight direction and locked in the extended position by means of an over-center locking strut ("elbow lever") for each leg. The wheel is mounted on a trailing arm that is supported against the leg's frame by a pre-loaded elastomeric spring for shock absorption purposes.

Retracting of the L/G legs and doors is managed by an electrically driven linear actuator for each leg that is built up around a high precision ball screw. Each of the linear actuators is hinged with the top end at the fuselage frame; the bottom end is coupled to the respective elbow strut by means of a locking mechanism which can be released for an emergency let-down by pulling a T-handle in the cockpit (one for each of the legs) and via a bowden cable. In case of an emergency let-down the two legs have to be released in succession (order is proposed, wrong order not critical), they then come out by gravitational force. Secure locking in the extended position is achieved by a spring that forces the elbow lever into its over-center position.

The actuators are controlled by stop switches, the switches for EXTENDED being integrated in the elbow struts and detecting the over-center position, those for RETRACTED mounted at the fuselage frame and detecting the top position of each L/G leg. All these switches are in duplicate, the second one giving the signal for the indication and warning system, which is processed by a TTL-logic and displayed by focused green and red LED's on the right face of the instrument panel (ref. to the Flight Manual).

Both LG doors are actuated by the landing gear legs. The RH landing gear door is coupled directly to the RH landing gear leg via a spring device. The LH door is controlled by a cable mechanism. During retraction, the LH landing gear leg starts closing the LH door by means of a cable so far as to allow retraction of the RH landing gear leg. The RH landing gear leg effects complete closing of the door via the cable during the last portion of its retracting. Opening of the LH door is by a spring loaded roller strut, which rolls on the LH door. It pushes the door to the outside against the cable to keep the door from waving, and is blocked with the landing gear retracted, thus locking the door. In closed position the doors are additionally locked at the rear by means of magnets.

The disk brakes on the main L/G wheels are operated hydraulically. The main cylinder for both the left and right wheel is located on the LH control stick, on RH stick optional. The pressure line from the main brake cylinder to the brake callipers of the wheel brake in the center fuselage are designed as metal-shielded brake hoses. The brake fluid reservoir is located in the landing-gear bay, cabin rear wall.

The parking brake valve to set and to release the parking brake is located on the floor panel console in front of the LH control stick. The parking brake valve is operated by a lever respectively rotary handle.

The tail wheel is without springing and guided in a trailing fork that is pivoted at its bottom in a thin section ball bearing, and at its top in a combined radial/axial sleeve bearing. The journal is constructed so that a certain friction damping is produced at the axial sleeve surfaces when loaded in axial direction in order to avoid tail wheel flutter whilst taxiing. For steering on the ground the tail wheel fork is coupled with the rudder by means of two pre-tensioned tensile springs.

7.5 Seats and Seat Belts

The seats are recessed into the bottom fuselage secondary structure (integrated seating) and have multiple adjustable back rests made of GFP.

Each seat is equipped with 4-point seatbelts and a central harness. The lap straps are supported at the sides of each seat. The shoulder harness is fastened to a tube behind each back rest.

Certified seat belts are indicated in the maintenance manual, section 9.1.

7.6 Pitot and Static Pressure System

Total pressure, static pressure and TEC (total energy compensated pressure) are measured with a pitot tube on the propeller-dome. The pressures are transmitted via pressure tubes to the instrument panel.

In addition, static pressure is measured on both sides of the tail boom and guided to the instrument panel, predominantly designed for airspeed indication. If possible, no further instruments should be connected, except for a coded altimeter, which may be installed in the forward tail boom.

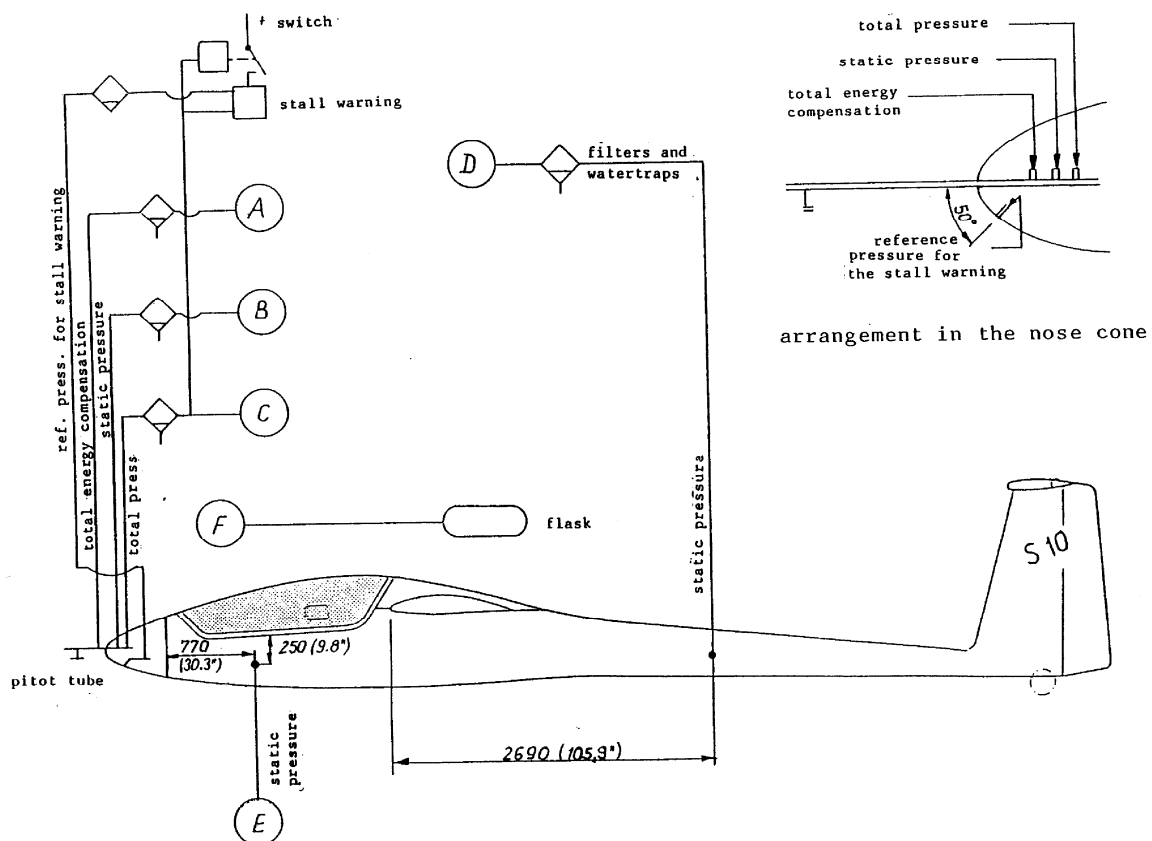
WARNING: Static pressure from the front pressure probe (propeller-dome) must not be used for airspeed indicator system, because speed indication will differ from the system calibration curve (see section 5.2.1, page 5-1).

Some devices (i.e. Bohli variometer) require additional static pressure probes near the widest section of the front fuselage. These are installed optionally only, if ordered with the initial equipment ex works.

Total pressure from the pitot tube and a reference pressure, taken from an inclined part of lower side of propeller-dome, are used to supply the stall warning system.

Any pressure transmission tubes are provided with water separator and filter elements. A filter for a coded altimeter is installed in the forward tail boom.

The following drawing (Fig. 7-2) shows the pitot and static pressure system of the S10-VT with the certified connections.



A: TEK-connection (pitot tube)
 B: static pressure connection (pitot-tube)

A: total pressure connection
 B: static pressure connection (both sides of tail boom)

A: static pressure connection (optional, both sides of cockpit)
 B: flask connection

Fig. 7-2 Pitot and static pressure system

Certified installations:

	Device	line	remarks
1	Altimeter	B	
2	Air speed indicator	C, D	
3	Variometer (except for Bohli 68 PVF1 and Bohli 68 PVF2)	A, F	jet compensated (TEK)
		B, F	not compensated
		E, F	not compensated
4	Variometer Bohli 68 PVF1 (without internal expansion diaphragm)	C, E, F	only, if no variometer acc. (3) installed
5	Variometer Bohli 68 PVF2 (with internal expansion diaphragm)	C, E	
6	E-variometer or gliding computer	B, C, (A) or: C, E, (A)	line A may be required depending on type
7	Coded altimeter	D	

7.7 Airbrakes

Double paddle Schempp-Hirth air brakes are fitted on the upper surface of the inner wing.

Airbrakes are driven by torsion-tubes with an over-centering mechanism in center fuselage. Interconnection of wing and fuselage parts of airbrakes drive is by inserting and securing coupling bolts for LH and RH airbrakes.

7.8 Baggage Compartment

Aft of each backrest a lower baggage compartment is installed, each may be loaded with up to 22 lbs / 10 kg if weight calculation allows.

Another baggage compartment is in the upper part of aft cabin spar, maximum load is 4,4 lbs / 2 kg. Do not load solid items and no objects with more than 1,1 lbs / 0,5 kg per piece unless secured.

7.9 Power-Plant

The turbocharged engine ROTAX 914 F2/S1 of the S10-VT is based on the ROTAX 914 F2, adapted for the specific requirements of the S10-VT. (Four-cylinder, four-stroke opposed type Otto-engine, turbocharged with electronic charge-control (TCU=Turbocharger Control Unit); a central cam shaft and tappets-OHV; liquid cooled cylinder heads, cylinders cooled by ram air; dry-sump lubrication; Dual Capacity Discharge Ignition (DCDI); 2 CD-carburetor; integrated reduction gear, mechanical vibration absorber and overload clutch).

Engine power is transmitted via the following elements, looking from the engine:

- Flywheel-clutch with overload protection and flexible couplings
- Drive-shaft with sliding element for linear displacement and flexible coupling
- Frontal spur reduction gear
- Variable pitch propeller STEMME 11AP-V with folding blades

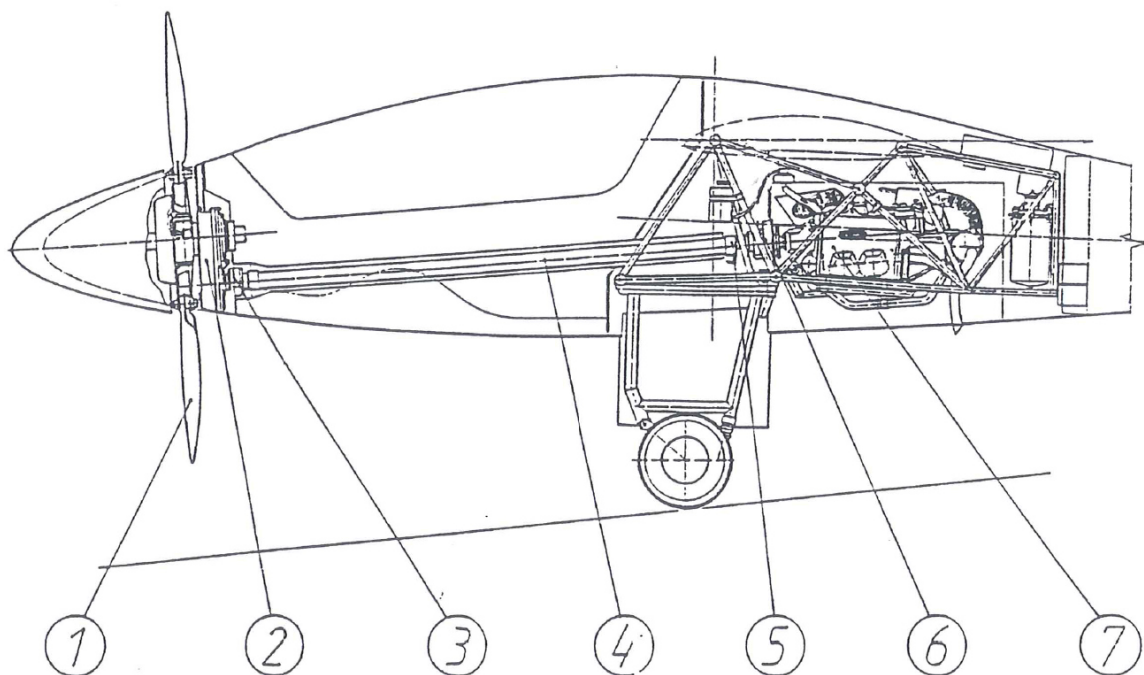


Fig. 7-3: Propulsion System Engine - Propeller

1. Retractable variable pitch propeller

Diameter unfolded 5,35 ft. / 1,63 m. Extension by centrifugal forces, folding by retraction springs; blade pitch actuation by electrically heated expansion elements; central body (hub and blade suspension) and pitch control mechanism are of aluminum alloy, blades are of fiber composite.

2. Gear

Helical spur gear, gear ratio: $i = 0,902$.

3. Flexible disk

for compensation of angle errors and angular movements.

4. Drive shaft

Carbon fiber composite, mass: about 6,6 lbs /

3 kg /, diameter: 2,6 in / 65 mm, length: 5,25 ft / 1,9 m, first critical bending freq. > 5200 RPM.

5. Splined sliding joint

for compensation of axial movements.

6. Bivalent centrifugal clutch

with servo effects. It damps starting shocks which could be critical for the extension of the propeller, protects against overload, and allows a de-coupled slow down of the folding propeller after shutting-down the engine.

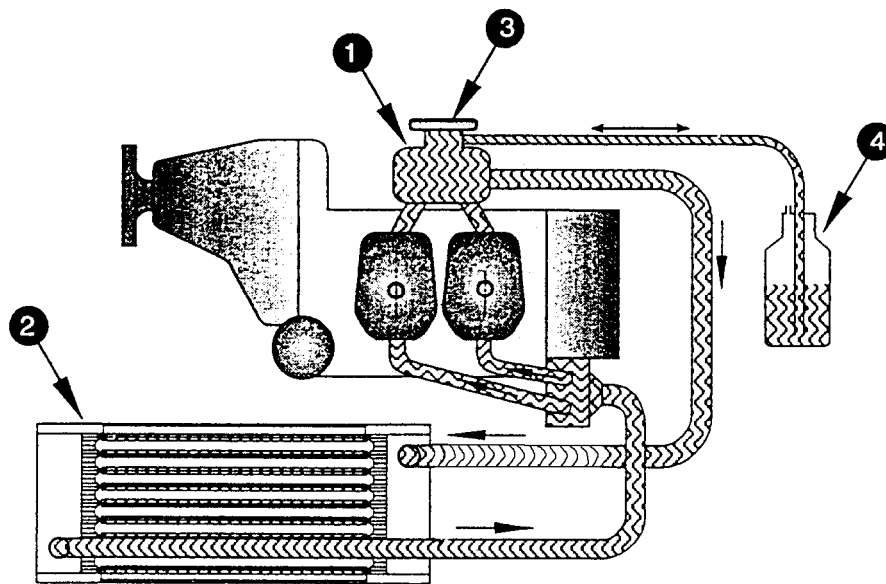
7. Engine

turbocharged, 4 cylinders, 4 stroke opposed-type engine, dual capacity discharge ignition, cylinder bodies ram-air cooled, cylinder heads liquid cooled; reduction gear ($i = 0,412$)

7.9.1 Engine

7.9.1.1 Cooling

Engine is cooled in different ways. Cylinder blocks are cooled by ram-air with cooling air flow from RH cooling air flap. Cylinder heads are cooled by liquid, radiator for heat transfer is installed behind LH cooling air flap. Heat transfer for engine oil is via a separate oil-cooler aft of RH cooling air flap.



1. Expansion reservoir

The expansion reservoir is installed on lower left side of fire-wall; it contains an over-pressure and breather valve, connected to the overflow container (4).

2. Radiator for liquid cooling

The radiator for liquid cooling is installed on LH side of center fuselage frame and is cooled by ram-air from LH cooling air flap.

3. Filling hole

The filling hole of the expansion reservoir (1) is closed and pressure-sealed by a filler cap on top; the cooling system is initially filled here, but not topped up.

4. Overflow container

The overflow container, installed in landing gear bay, is a buffer for cooling fluid expansion. Cooling fluid quantity is checked and topped up at the overflow container, marked "min" and "max".

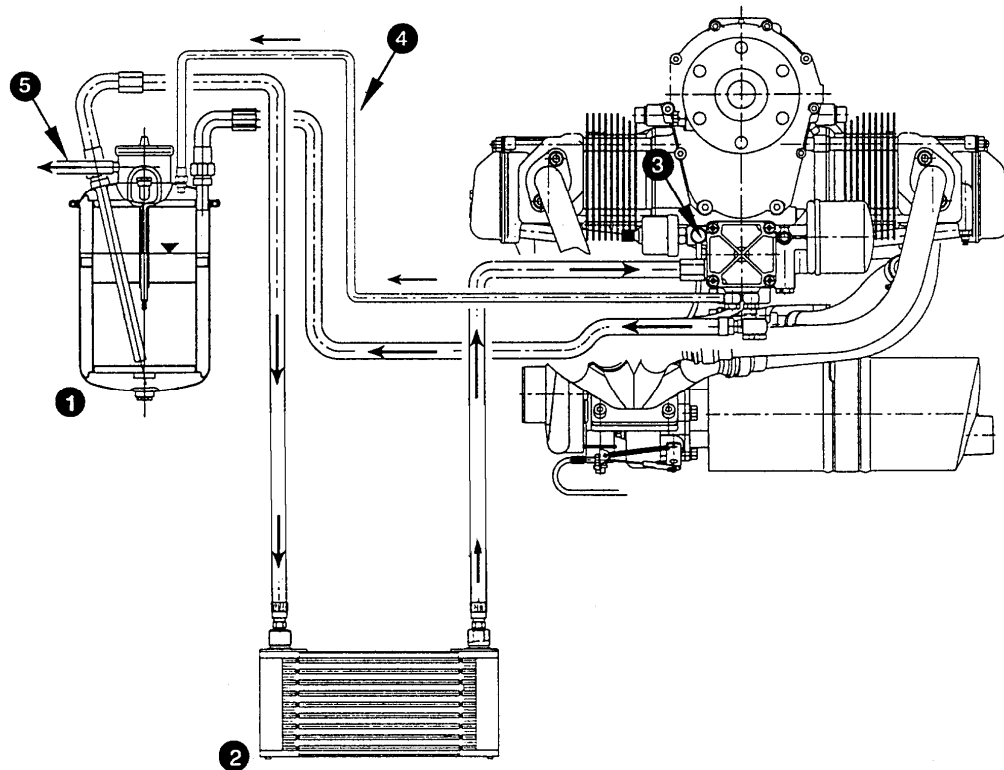
Cooling fluid circulation is a closed system. Fluid is pumped by a water-pump, driven in connection with the camshaft. Expansion reservoir has an over-pressure valve, releasing fluid to the overflow container in case of fluid expansion. When fluid cools down again, it is sucked back from overflow container. Cooling fluid system is self-ventilated via an expansion reservoir.

NOTE: Because of the pressure valve, missing cooling fluid in overflow container (4) cannot be replenished into expansion reservoir (1).

CAUTION: Do not open locking cap on expansion reservoir when engine is warm! Cooling fluid system is pressurized: Danger of burning by hot spraying fluid!

7.9.1.2 Lubrication system

The ROTAX 914 F2/S1 is equipped with a dry-sump pressure lubrication; main oil pump is integrated with pressure regulator and additional scavenge pump. The Oil pumps are driven by the camshaft.



1. Oil tank with filler neck
2. Oil-cooler
3. Oil supply pipe for turbocharger
4. Oil return pipe for turbocharger
5. Ventilation pipe

The Engine oil is sucked from oil tank through oil cooler and pumped through the oil filter to the different points of lubrication. Oil from points of lubrication flows to the bottom of the crankshaft housing and is pumped back to the oil tank by over-pressure in crankshaft housing.

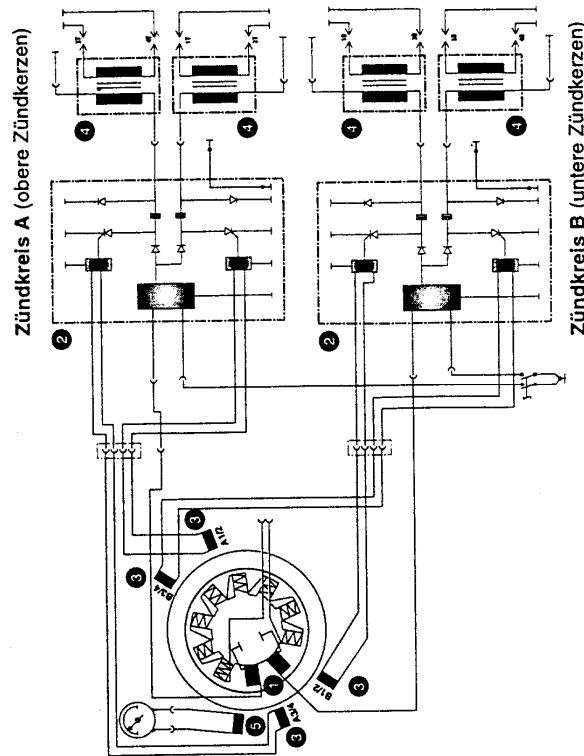
Turbocharger bearings are lubricated and cooled by separate oil line from main oil pump. Turbocharger has a separate scavenge pump to return oil to tank.

Oil tank is ventilated by a ventilation line at the tank.

Sensor for oil temperature is installed at oil pump socket and senses oil pump inlet temperature.

7.9.1.3 Ignition system

The ROTAX 914 F2/S1 is equipped with a contactless dual capacity discharge ignition (DCDI) system with an integrated generator. Ignition system is free of scheduled maintenance and requires no external energy.



1. High voltage coil
2. Electronic module
3. Ignition unit
4. Ignition voltage transformer
5. Sensor for RPM signal

Two independent high voltage coils on generator stator, one for each ignition circuit, are installed in the crankshaft housing. Energy is accumulated in capacitors on the electronic module. For ignition, 2 of the 4 externally arranged sensors control discharge of capacitors via primary coil of the dual ignition transformers. The sequence of firing is 1-4-2-3.

An automatic electronic device is connected to the keyed ignition/starter switch. It adds the ignition with a time delay of three seconds after the starter is actuated, causing the propeller blades to be fully unfolded before the engine starts, and consequently reducing the loads for the propeller blades and their corresponding stops. An abort of the start-up sequence causes the electronic device to reset. It is therefore not possible for the engine to fire within any start-up sequence before the three seconds time delay has expired.

7.9.1.4 Turbocharger and -Control Unit

The ROTAX 914 F2/S1 is equipped with an exhaust-turbocharger, extracting kinetic energy from exhaust gas to compress intake-air.

Turbocharger RPM and pressure in airbox (manifold pressure), is controlled by deflection of wastegate, discharging turbocharger outlet pressure to engine exhaust gas system. The electric servo drive, actuating wastegate, is controlled by the electronic turbocharger control unit (TCU). Manifold pressure is controlled by position of carburetor flap, actuated by pilot's throttle lever.

WARNING: Close to max T/O position, between power settings for 108 and 110%, manifold pressure is increased non-linearly. In this range, exact power setting is not possible and control system and engine RPM may oscillate. Range between 110 and 115% corresponding to throttle settings between first and second stop should be avoided. For selection of max T/O power, throttle should be moved steadily and not slowly.

To avoid engine damage, manifold pressure is reduced automatically in case of excessive RPM or intake air temperature.

Manifold pressure control is monitored by red warning lamp for high manifold pressure and yellow caution lamp for TCU malfunction. After switching on electrical system, both lamps are on for 1-2 seconds during system self-test.

CAUTION: If self-test is unsuccessful, one or both lights stay on, the engine must not be operated.

Yellow caution lamp for TCU:

- OFF: Turbocharger operable
- Flashing: Turbocharger not operable, refer to section 3.9.4.4

Red warning lamp for manifold pressure:

- OFF: Engine is operated in limits
- ON: Permitted manifold pressure is exceeded, refer to section 3.9.4.3 a)
- Flashing: 5 minutes T/O-power setting is exceeded, refer to section 3.9.4.3 b)

CAUTION: If red manifold pressure warning lamp comes on, reduce power immediately!

7.9.2 Drive Shaft and Front Gear

Propeller hub is bolted to the drive shaft of front gear. Front gear is a helical gear in cast-metal housing, ratio 1,109 (see page 7-9); it is bolted to an aluminum structure, supported by 4 silent blocks in front frame.

The oil of the front gear can be checked by an inspection glass with MIN/MAX markings. The filler hole on the front side is closed by a screw. The oil must be changed in accordance with the maintenance manual, section 7.4.12. Under normal circumstances it is not necessary to fill up the oil before the next scheduled oil change.

WARNING: The front gear never may use more oil than what could have passed as oil vapor from the circumferential joint. A higher oil consumption during short operation time must be investigated and must be eliminated before continuing a/c-operation. In any case, the manufacturer must be informed.

Power transmission from engine to front gear is with a drive shaft, made of carbon-fiber-composites (see page 7-9). A flexible disk is installed for compensation of angle errors and angular movements and at aft end are splines to allow for compensation of axial movements. Engine and drive shaft are isolated by a bivalent centrifugal clutch with servo effects. It damps shocks during engine starting, it protects against overload and it is a freewheel.

7.9.3 Variable Pitch Propeller

7.9.3.1 General

The two-blade variable pitch propeller 11AP-V has two operating positions: TAKE-OFF and CRUISE. Once rotation has stopped, the blades fold inwards at any blade angle; folded propeller must be brought into a certain position before the propeller-dome can be closed by retracting the nose-cone. In this configuration the STEMME S10-VT is prepared for high-performance gliding.

Propeller-blade angles, TAKE-OFF (low pitch) and CRUISE (high pitch), allows an adaption to different flight conditions and improves powered flight performance, like shorter take-off distances, higher climb rates and higher cruise speeds.

7.9.3.2 Principle of Operation

The Propeller hub is pivoted to allow for variation of blade angle; the blade attachment and actuating mechanism are made of high strength aluminum alloy.

The Blades are actuated electrically from T/O to cruise position. Electric power (8 Amp.) is transferred via double sliding contact rings to the rotating propeller and heats up two thermo-elements which expand above a certain temperature. These actuate two pistons with a mechanism to turn the propeller blades.

High pitch position (CRUISE) is sustained by a position-dependent two-point regulator for the heating circuit and is supported by two fly-weights, the force of which increases with propeller rpm. The temperature corresponding to the cruise position is about 70°C / 158°F, limited to 85°C / 185°F by means of a protection circuit.

Returning of blade pitch after switching to TAKE-OFF (or de-energizing heating-elements) starts with cooling down of thermo-elements and is terminated at 55°C / 131°F; it takes about 1 to 4 minutes depending on OAT and propeller rpm. It is achieved by springs, supported by aerodynamic forces which always try to turn the blades to low pitch, the moment depending on RPM. Aerodynamic forces plus spring always tend to turn blades towards low pitch, and only a relatively small actuator forces are needed to shift and sustain cruise position.

Heating circuits are disconnected by PPC switch or by a limit switch for "propeller-dome open but not locked". This guarantees that propeller-blades are in take-off position when required, independent of actual PPC switch position.

The maximum time required for full change in pitch position in each direction in an OAT range between -30°C and +38°C / -22°F and +100°F remains below 5 min. Experience in service showed under all normal atmospheric conditions a mean time for the full pitch travel of 2½ min. with only little divergence.

7.9.3.3 Design

Propeller hub, blade suspension forks and, for most part, pitch control unit, are machined of aluminum alloys. Protection against corrosion is achieved by anodization. Blades are suspended in full needle bearings, fork pivot bearing for blade angle variation is a combination of two grooved full ball bearings for shear forces and an axial needle bearing.

Propeller blades are made of fiber reinforced plastic (FRP), constructed of two composite shells. Shear forces, centrifugal forces and bending moments are transferred by a double-spar to the suspension eye at the blade root. Spar flanges are of carbon rovings and are integral part of the shells, the four webs are of GFRP. In the root area spar rovings are looped around the eye bushing for best transition of forces from blade to suspension hub. Protection against erosion is achieved by means of an impact resistant resin coating at the leading edge (gluing is made of same material) and, additionally, a PU-tape on leading edge of the blade. Ventilation is provided by a small opening in blade tips.

Folding of blades is accomplished by a coupling lever and torque springs, located in the hinge axis. The required bias of springs is achieved by pre-loading before final fastening.

The entire pitch control mechanism is located in front of propeller-blade plane. Attachment to blades is achieved by two couplings which allow fine adjustment of pitch angle and ensure synchronization of the two blades.

7.9.3.4 Special Remarks on Operation

Change in propeller pitch from TAKE-OFF to CRUISE and back is controlled by heating (or cooling down respectively) of two thermo-elements, with a characteristic influenced by OAT. External temperature-isolation is optimized so that time required for full change of pitch for each direction and under any OAT within the specified range of -30°C to +38°C / -22°F to +100°F does not exceed 5 minutes.

On a standard day (+15°C / +60°F) times required for change in pitch in both directions have been found on repeated tests to be about 2½ min.

To avoid a go-around in landing configuration but with propeller in cruise position, propeller pitch control is to be switched to TAKE-OFF at least 5 minutes before entering airfield traffic pattern. The green take-off position indicator light should be illuminated before entering airfield traffic pattern.

Additionally the procedures described in sections 3 and 4 must be followed.

7.9.3.5 Limits and Technical Data

• Max. propeller RPM	2650 RPM
• Max. engine RPM	5800 RPM
• OAT range (full pitch change in ≤ 5 min)	-30°C to +38° / -22 to +100°F
• Range of pitch angle	6,4°
• Voltage	min. 12 V, max. 14,7 V
• Current required	max. 10 Amp.
• CB for propeller blade control	15 Amp

7.9.3.6 Protective Circuits

Protection of battery discharge: Power supply for heating circuit is monitored by a power relay which is actuated by D_F (regulator circuit) of the generator. System layout is such that under the most probable malfunctions of charging circuit propeller blade is not actuated into cruise position in order to avoid battery discharging.

Protection against overheating: Maximum temperature of thermo-elements is limited to 85°C / 185°F by means of a protective circuit with an NTC-Resistor integrated in actuation element.

Protection against radio interference: Radio interference which may be caused by commutator is prevented by an interference suppresser condenser.

Test circuit: A test circuit can be activated by pressing a push button at front bulkhead with master switch ON. Doing so, propeller pitch control is operated on ground and with the engine stopped from battery in order to verify correct functioning of variable pitch propeller.

7.10 Fuel system

7.10.1 Fuel system related controls and indication system

The S10-VT's cockpit provides the following fuel system related controls and indication systems:

- The **fuel-cock** (horizontal "CLOSED"; vertical "OPEN") is located on the rear center console.
- The **fuel selector switch** (with positions "LEFT", "BOTH", and "RIGHT") and the **switch for the auxiliary fuel pumps** (with positions "ON" and "OFF") are located within the row of other switches on the lower part of the instrument panel.
- The **red fuel pressure warning light**, as well as the **green status light for the operation of the auxiliary fuel pumps**, are located within the row of other lights on the upper part of the instrument panel. A steady red light indicates that the difference between fuel and airbox pressure is below its lower limit, and the red light is flashing when the differential pressure exceeds its upper limit. The green auxiliary pump status light is burning as long as the aux. pumps are working.
- The **fuel quantity indicators** for the two wing tanks can be found on the instrument panel.
- The four fuel pumps (two main plus two auxiliary pumps) have separate **circuit breakers**, which are also located on the instrument panel.

7.10.2 Fuel system design

The general design of the fuel system is symmetrical.

Fuel system of the wing

Both wing tanks are located in the outer sections of the inner wing. The ends of the vent lines are located at the lower, outer ends of the inner wing. The filler caps can be found on the upper part of the inner wing, right above the wing fuel tanks. The fuel lines of both tanks do accommodate a strainer. Quick-mount connectors are located between the fuel lines of the wing and their corresponding mates of the fuselage.

Fuel system of the fuselage

Beginning at the quick-mount connectors, the fuel flows through a water separating device with sump, the fine filters, the electrical fuel pumps, and the fuel cock to a pressure regulating device of the engine. A fuel return line delivers surplus fuel back to the fuel pumps. Contaminated fuel (i.e. particles, water, etc.) from the sumps can be drained by use of the two drainers in the landing gear bay.

There are two fuel pumps for each wing tank; a main and an auxiliary pump. The main and the aux. pump are in series, while parallel to each pump is a check valve. Depending on the position of the fuel selector switch, the engine gets its fuel from either the right or the left tank separately, or from both tanks simultaneously. The main pumps are always working when the engine is operative (propeller dome is pushed forward and locked, or engine back-up switch is "ON"), the auxiliary pumps do only run when the aux. pumps are switched on.

7.10.3 Electrical layout and operation of the fuel pumps

For normal operation, the auxiliary pumps are switched off, and only the main pump(s) of the selected tanks are working. The main pumps are supplied by the internal generator of the engine, or the main battery respectively:

- The right main pump works with the fuel selector switch in position "RIGHT" or "BOTH" tanks.
- The left main pump works with the fuel selector switch in position "LEFT" or "BOTH" tanks.

The auxiliary fuel pump(s) can be added if necessary, for example during take-off and landing. They are supplied by the external generator, or the main battery respectively:

- The right aux. pump works with the fuel selector switch in position "RIGHT" or "BOTH" tanks, and the aux. pump switch in position "ON".
- The left aux. pump works with the fuel selector switch in position "LEFT" or "BOTH" tanks, **and** the aux. pump switch in position "ON".

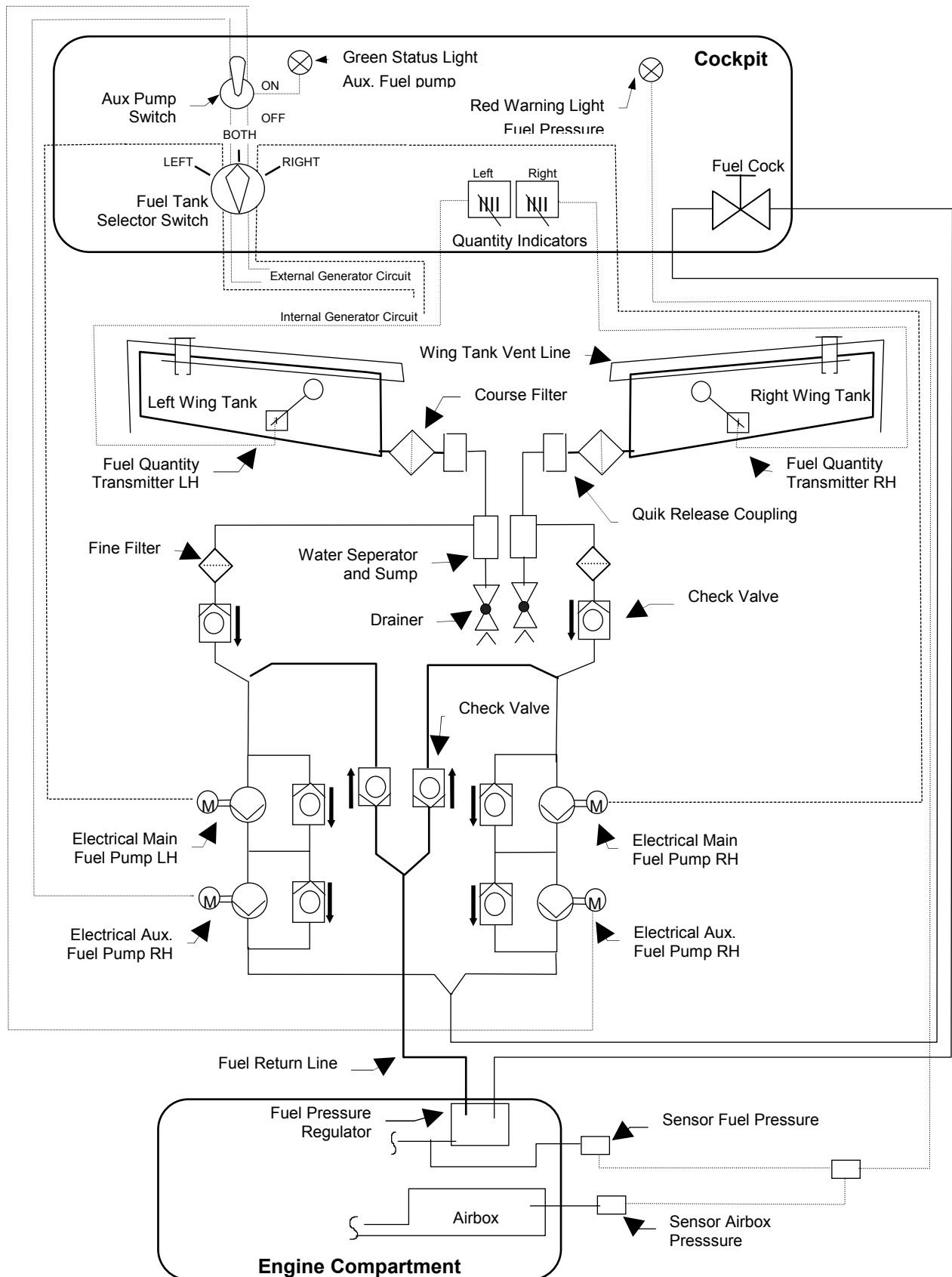


Fig. 7-7: Diagram of the fuel system

7.11 Electrical System

The electrical system is supplied by a main battery and a 600 Watt, belt driven external generator, mounted to the engine. The internal generator supplies only TCU and main fuel pump. The main battery is placed in the forward end of the tail boom, aft of the engine.

The auxiliary battery (optional equipment) will be fitted in the vertical fin below the stabiliser. It is provided for electrical supply of the avionics, in particular during gliding flight.

Any electrical consumers are protected by automatic circuit breakers. The primary circuits of the relays are protected by fuses located under the glareshield.

In addition to the following descriptions of switching functions refer to section 7.3 "Instrument Panel".

Master Switch: Disconnects all power supply from the main bus bar.

Subsequent switches:

Engine bus master switch: Connects or disconnects any electrical engine equipment except for main fuel pump to or from battery and generator: starter, propeller pitch control, engine instrumentation etc. Engine master switch is coupled to propeller-dome lock such that, with the propeller dome in OPEN position, it is automatically operated when propeller-dome actuating handle is unlocked (OFF) or locked (ON).

Engine bus back-up switch: Connects main bus to engine bus and enables to restart engine in flight in case of a malfunction of engine master switch. It is protected against unintended operation by secured plate.

Ignition key: Positions of ignition key: OFF RIGHT LEFT BOTH START

The ignition switch selects the two ignition systems and the electric starter motor.

TCU isolation switch: Isolates, if selected if necessary, the wastegate actuator from the TCU. Isolation is only necessary in case of TCU malfunction; therefore TCU switch is protected. Normal wastegate operation is in lower, protected switch position, isolation is with switch up.

Fuel selector switch

- left position: fuel pumps for the left tank selected
- center position: fuel pumps for both tanks selected
- right position: fuel pumps for the right tank selected

Auxiliary fuel pump(s): This switch selects the auxiliary fuel pumps. They are operating simultaneously with the main fuel pumps to increase redundancy, or if the fuel pressure is low. Operating auxiliary fuel pumps are indicated by a green status light on the instrument panel.

Landing gear selector:

- upper position: Gear retraction
- center position: system not energized
- lower position: Gear extension

PPC switch:

TAKE-OFF / CRUISE (propeller pitch control);
In CRUISE position current flow is depending on OAT to hold propeller blades in cruise position. In TAKE-OFF position or when main bus is not energized propeller blades are pushed by spring force into TAKE-OFF position. When the propeller blades have reached the allowable pitch range for take-off, this (not the switch position!) is indicated by green light below switch, if master switch and engine master switch are ON (engine bus energized).

Battery selector switch:
(only when optional auxiliary
battery is installed)

Switches avionics bus from main battery to auxiliary battery.
If in up position MAIN BATTERY is selected, closing and locking propeller dome switches off any electrical instruments except for radio and soaring computer. If in down position AUXILIARY BATTERY is selected, any avionics switched on keep operating, supplied by the auxiliary battery.

Section 8 - Handling, Servicing and Maintenance

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8.3 Modifications and Repairs	8-1
8.4 Ground Handling / Road Transport	8-2
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8.1 Introduction

This section deals with manufacturer's recommended procedures for proper ground handling, servicing and maintaining of the S10-VT. It also lists certain inspection and maintenance requirements which must be observed if the powered glider is to retain that new-plane performance and reliability.

CAUTION: It is highly advised to follow the lubrication schedule as listed in the maintenance manual, section 6.5, and to carry out preventive maintenance more frequently if unfavorable climatic or environmental conditions are encountered.

8.2 Inspection Periods

Maintenance activities are described in Maintenance Manual S10-VT (STEMME Doc. Nr. A40-11-122). For a new a/c first inspection is after 25 h of operation and thereafter following maintenance and inspection schedules are effective:

Airframe: (refer to Maintenance Manual STEMME S10-VT)	shortest interval: 100h
Engine: (refer to Maintenance Manual STEMME S10-VT)	shortest interval: 100h
Power Transmission System: (refer to Maintenance Manual STEMME S10-VT)	shortest interval: 100h
Variable Pitch Propeller: (refer to Maintenance Manual STEMME S10-VT)	shortest interval: 100h

To assure continued airworthiness, and independent of the operating hours of the a/c, at least one annual type 3 inspection (→ Maintenance Manual S10-VT) must be carried out.

All inspections of the a/c must be performed by a authorized personnel, and according to the local requirements of the country where the a/c is registered.

In Germany, for example, an "annual inspection" (type 3) carried out by authorized personnel and confirmed by a certified inspector is required. Prerequisite for the "annual inspection" is the completion of all the maintenance items and checks according to the S10-VT's Maintenance Manual, sections 5.2 and 5.3.

8.3 Modifications and Repairs

Details of who is authorized to perform modification and repair works on the powered sailplane and information on the limits between minor and major repairs can be found in the FAR pt. 43. These regulations are to be respected with first priority.

For standard maintenance and minor repairs please refer to the Maintenance Manual, Doc. No. A40-11-122.

a) Modifications

It is essential that the responsible FAA office be contacted **prior to** any modifications on the powered sailplane to ensure that the airworthiness of the aircraft is not compromised. In any case, the manufacturer has to comment on the request for modification and to agree.

b) Repairs

Before commencing flight duties, especially after a non-operation period, a thorough inspection of the powered glider should be performed, refer to section 4.3 "Daily Inspection". Check surfaces for cracks in coating, for local bucklings, roughness, holes and delamination of coatings and structure.

If something seems unusual or the significance of any damage is questionable, a specialist for CRFP/GFRP should always be consulted. Minor damage without influence on the airworthiness may be repaired by a qualified person. Definitions to decide on grade of damage are given in the supplement "Repair Instructions" to the maintenance manual.

Any "major damage" must be repaired by appropriately rated repair stations only. Do contact the manufacturer concerning major repairs.

WARNING: Repair work or embellishment at control surfaces have an influence on airworthiness, if masses and moments are not kept within approved limits (refer to maintenance manual section 6.4).

8.4 Ground Handling / Road Transport

a) Towing / Pushing

Due to the big wing span, it is recommended to have a person for checking clearance of wing tips.

If the S10-VT is towed by car, only use properly fixed and suitable towing equipment, move slowly and do not make tight turns to reduce loads on tail wheel and aircraft structure. If the S10-VT is towed by rope, it is recommended to fix it on both landing gear struts and to have someone prepared to decelerate and stop the a/c.

- Pushing backwards: Directional control at rudder and push only at inner wing.

b) Storing:

The S10-VT should only be stored in well ventilated rooms. A closed, weatherproof trailer or container must be provided with sufficient ventilation ports or facilities. Take care for stress-free support of the a/c and components.

c) Parking

If the a/c is not derigged for a year, connection bolts, nuts and elements at fuselage, wing and empennage have to be properly protected for corrosion. Dust covers should be commonplace for high quality surfaces and materials like at the S10-VT. When parked outside, the a/c should be securely tightened to ground or sufficient ballast.

- Tightening: Insert eye-bolts in inlets under the ends of the inner wing.
- Parking: SET parking brake (turn lever to ON position and operate brake afterwards).
- Hangaring: Unlock airbrakes (for relieving the airbrake push rods); unlock parking brake and fix the powered glider with wheel brake blocks (when parking will last longer proceed like with hangaring).

CAUTION: Wings should be level for parking; otherwise there may be some leakage through tank vents.

d) Preparation for Transportation on Road

Especially the one-piece inner wing must be carefully supported in a trailer because of its high weight. If the inner wing is transported upright, supported on nose, at least three wide supporting areas well adapted to wing section shape are recommended. Fuel from wing tanks must be drained for transportation on road and filled into approved fuel containers (refer to relevant regulations). The best way to empty wing tanks is with an optional device (available from STEMME) for the quick release coupling.

If the fuselage is transported with wheels retracted, it must be supported in a wide-area, well shaped supports below cockpit rear frame and also close to the tail wheel.

It is recommended to transport the horizontal tail surface in well shaped supports.

All supports should be covered by soft material (i.e. carpet) to protect the high quality a/c surfaces and components.

- Road transport: see manual for trailer.

8.5 Cleaning and Care

The surface of plastic-aircraft should be maintained in spite of sturdiness and strength. For cleaning and maintenance, the following procedures should be used (for additional information refer to maintenance manual):

- Surfaces should be cleaned periodically with clear water, sponge and skin cloth, especially leading edges of wing and empennage, if possible after each flight. To remove mosquitoes, insects and dirt catapulted by the propeller, special mosquito-sponges are recommended;
- Keep pitot and static ports clean of dirt and water, clear water drain holes regularly;
- Do not use cleaning additives too often;
- Polishing medium free of silicon can be used;
- Fuel and alcohol may be used temporarily; it is not recommended to use any dilution liquid; never use chlorinated hydrocarbon (Tri, Tetra, Per a.m.)!
- Best method to polish surfaces is to use a buffing machine in greater periods (approx. every ½ year).

WARNING: Before starting to work with a buffing machine, handling should be explained by a specialist. Wrong direction of turning of buffing wheel can result in heavy damage especially at the sensitive trailing edges of wings and tail surfaces. Never hold buffing machine too long at one point - this will heat up the area and can damage surface and structure!

- Canopy can be cleaned preferably with special cleaning fluid for plexi-glass but also with pure water. Never rub dry on plexi-glass, use a wet, clean, soft skin cloth!
- The a/c should be protected against moisture; if water penetrated parts of the a/c, it should be stored in a dry environment and components should periodically be turned around.
- It is suggested not to store the a/c outside unnecessarily, since the paint can become brittle and crack due to UV radiation.

WARNING: Composite structure, exposed to sun radiation, must have a white surface, except for identification, caution and warning markings. Other colors than white may result in excessive heating up of surface and structure, which could reduce structural strength of components.

8.6 Engine - Troubleshooting

WARNING: Only qualified mechanics, trained for this engine, are authorized for engine-repair or maintenance. If the following procedures are unsuccessful, an authorized service station should be consulted. The engine must not be operated before repair.

No engine starting:

- Propeller-dome LOCK propeller-dome
- Fuel-cock OPEN fuel-cock
- Fuel-quantity CHECK and REFUEL
- Starter RPM too low CHECK battery voltage
- Engine too cold PREHEAT engine, use high quality engine oil, allow starter to cool down after prolonged operation

Rough engine running after warm-up:

- Choke CLOSE choke, check mechanism

Oil pressure too low:

- Oil quantity CHECK, refill if required

Engine firing after shut-down:

- Engine overheated COOL-DOWN at about 2000 RPM

Oil quantity increasing:

- Oil temperature too low ADJUST cowl flaps for normal oil temperatures in flight

Engine knocks when loaded

- Fuel quality REFUEL with higher antiknocking rating or higher octane number

Problems at cold environment:

- Starter RPM too low PREHEAT engine
- Battery voltage low INSTALL a fully charged battery or
- CONNECT suitable external power source
- Oil pressure high NORMAL up to 101 psi / 7 bar or when cold
- CHANGE oil if necessary
- Oil pressure low
 after cold start? SHUT-DOWN engine and PREWARM oil
 (viscosity is too high in suction-line at low temperature)

Section 9 - Supplements

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9.1 Introduction

This section contains appropriate supplements required, if various items of optional equipment are installed in the individual powered glider, that are not part of flight manual (section 1 to 8). With these supplements, the pilot is provided with additional information and instructions required for safe and efficient operation.

The installation of alternative, supplemental or additional equipment is normally based on a Service Bulletin (SB). The pertinent supplemental information will be issued in the form of a flight manual insert and in the case of a retrofit will be supplied together with the retrofit kit. The supplement is to be filed following the cover page of Section 9.3.

The accomplishment of any SB having an effect on the flight manual is to be attested **prior to next flight** in the aircraft log book and in the record of accomplished SBs/ADs by an approved holder of an Inspection Authorization. This signature also covers a review of the Flight Manual.

9.2 Installation of Alternative Equipment

A special case is the installation of equipment and systems alternative to the standard build version which affects parts of the flight manual (section 1 to 8) and where the installation is not based on a Service Bulletin. In such cases, approved alternative pages are inserted into the individual flight manual to replace the original corresponding pages. Thus the flight manual represents the precise build specification of each individual STEMME S10-VT.

The page numbers of the alternative pages are designated by the suffix 'a' and are part of the whole approved flight manual document.

The following table records the build specification and hence the applicable 'suffix a' pages. The installed alternative equipment has to be ticked and countersigned by an approved inspector and the List of Effective Pages (section 0.2, page ii) has to be updated. This procedure must be done ex works as well as on subsequent installation.

Alternative Equipment of STEMME S10-VT, S/N 11-				
*	Description	Alternative Page	Date	Signature of Inspector
	2 x 60 litre fuel wing tanks (instead of standard 2 x 45 litre)	2-3a		
	Wide Wheel/Tyre 6.00–5 (instead of standard 5.00–5)	2-10a, 4-4a		
	Auxiliary Battery for soaring within vertical tail fin	4-16a		
	Hydromechanical Brake system (former design, not for retrofitting)	4-7a ... 4-10a, 4-18a ... 4-21a, 7-1a, 7-5a, 8-2a		

* please tick pertinent items

9.3 Supplemental and Additional Equipment

Supplemental and additional equipment have no influence on the contents of Sections 1 through 8 of the Flight Manual. They may, however, require additional instructions, which have been inserted into this Flight Manual following this page and entered in the list below.

Manual supplements by the STEMME Company are always based on a Service Bulletin. The document numbers of a flight manual supplement and associated SB are always identical except for the prefix (A31--- Service Bulletin, A36--- supplement to manual).

[illegible]