FLIGHT MANUAL

for Powered Sailplane

Model: **ARCUS T**

Serial-No.: **46**

Registr.-No.: **F-CLDB**

Date of issue: **October 2010**

Pages as indicated by „appr." are approved by

(Signature)

(Authority)

(Stamp)

(Original date of approval)

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

Approval of translation has been done by best knowledge and judgement.
In any case the original text in German language is authoritative.

0.1 Record of revisions

Any revisions of the present manual, except actual weighing data, must be recorded in the following table, and in the case of approved sections, be endorsed by the responsible airworthiness authority.

The new or amended text in the revised page will be indicated by a black vertical line in the left hand margin, and revision number and the date will be shown on the bottom left hand side of the page.

0.1 Erfassung der Berichtigungen / *Record of Revisions*

Lfd. Nr. der Berichti-gung	Ab-schnitt	Seiten	Datum der Berichti-gung	Bezug		Datum der Anerken-nung durch LBA/EASA	Datum der Ein-arbeitung	Zei-chen /Unter-schrift
Revision No.	*Affec-ted section*	*Affec-ted page*	*Date of issue*	*Reference*		*Date of Approval by LBA/EASA*	*Date of Insertion*	*Signa-ture*
				oder *or*				
1	 4	0.1.2 0.2.3 4.3.3 4.3.4	November 2011	**TM A532-1** Änderung des Flug-handbuchs und des Wartungshandbuchs Werk-Nr. 1 bis 32 **MASSNAHME 1** ***TN A532-1*** *Amendment of the Flight Manual and the Maintenance Manual* *S/N 1 through 32* ***ACTION 1***	**ÄB A532-1** Änderung des Flug-handbuchs und des Wartungshandbuchs ab Werk-Nr. 33			
	       2 4 6 7	0.1.2 0.2.2 0.2.3 0.2.4 0.2.5 0.2.6 0.2.7 2.8 2.12.2 2.15 2.16 4.4 4.5.3.3 4.5.5* 4.5.9.1 6.2.1 6.2.3 6.2.4 7.3.17 7.12.1 7.12.3 7.12.4 7.13.2	November 2011	**TM A532-1** Änderung des Flug-handbuchs und des Wartungshandbuchs Werk-Nr. 1 bis 32 **MASSNAHME 2** ***TN A532-1*** *Amendment of the Flight Manual and the Maintenance Manual* *S/N 1 through 32* ***ACTION 2*** * Austausch dieser Seite nur im Flug-handbuch in deut-scher Sprache **Exchange of this page only in the Flight Manual in German language*	***MB A532-1*** *Amendment of the Flight Manual and the Maintenance Manual* *S/N 33 and up*			

MB: *Modification Bulletin* – Änderungsblatt
TN : *Technical Note* – Technische Mitteilung

Hinweis: Nicht eingefügte Berichtigungen sind zu streichen.
Das Verzeichnis der Seiten ist gegebenenfalls handschriftlich zu aktualisieren

Note: Cross out revisions which are not included.
The list of effective pages must be amended by hand if necessary.

0.2 Verzeichnis der Seiten / List of affected pages

Abschnitt Affected section	Seite Affected pages	Ausgabe-Datum Date of issue	Bezug Reference
0	0.1.1 0.1.2		
	0.2.1 0.2.2 0.2.3 0.2.4 0.2.5 0.2.5 0.2.6 0.2.7 0.2.8		
	0.3.1		

0.2 Verzeichnis der Seiten / List of affected pages

Abschnitt Affected section	Seite Affected pages	Ausgabe-Datum Date of issue	Bezug Reference
1	1.1.1	October 2010	
	1.1.2	October 2010	
	1.2	October 2010	
	1.3	October 2010	
	1.4.1	October 2010	
	1.4.2	October 2010	
	1.4.3	October 2010	
	1.5	October 2010	
2	2.1.1	October 2010	
	2.1.2	October 2010	
	2.2.1	October 2010	
	2.2.2	October 2010	
	2.3	October 2010	
	2.4	October 2010	
	2.5	October 2010	
	2.6	October 2010	
	2.7	October 2010	
	2.8	November 2011	TN A532-1 / MB A532-1
	2.9	October 2010	
	2.10	October 2010	
	2.11	October 2010	
	2.12.1	October 2010	
	2.12.2	November 2011	TN A532-1 / MB A532-1
	2.13	October 2010	
	2.14	October 2010	
	2.15	November 2011	TN A532-1 / MB A532-1
	2.16	November 2011	TN A532-1 / MB A532-1

MB: *Modification Bulletin* – Änderungsblatt
TN : *Technical Note* – Technische Mitteilung

0.2 Verzeichnis der Seiten / List of affected pages

Abschnitt Affected section	Seite Affected pages	Ausgabe-Datum Date of issue	Bezug Reference
3	3.1.1	October 2010	
	3.1.2	October 2010	
	3.2	October 2010	
	3.3	October 2010	
	3.4	October 2010	
	3.5	October 2010	
	3.6	October 2010	
	3.7	October 2010	
	3.8	October 2010	
	3.9.1	October 2010	
	3.9.2	October 2010	
4	4.1.1	October 2010	
	4.1.2	October 2010	
	4.2.1.1	October 2010	
	4.2.1.2	October 2010	
	4.2.1.3	October 2010	
	4.2.2	October 2010	
	4.2.3.1	October 2010	
	4.2.3.2	October 2010	
	4.2.3.3	October 2010	
	4.3.1	October 2010	
	4.3.2	October 2010	
	4.3.3	November 2011	TN A532-1 / MB A532-1
	4.3.4	November 2011	TN A532-1 / MB A532-1
	4.3.5	October 2010	
	4.3.6	October 2010	
	4.4	November 2011	TN A532-1 / MB A532-1

MB: *Modification Bulletin* – Änderungsblatt
TN : *Technical Note* – Technische Mitteilung

0.2 Verzeichnis der Seiten / List of affected pages

Abschnitt Affected section	Seite Affected pages	Ausgabe-Datum Date of issue	Bezug Reference
4	4.5.1.1	October 2010	
	4.5.1.2	October 2010	
	4.5.1.3	October 2010	
	4.5.1.4	October 2010	
	4.5.2	October 2010	
	4.5.3.1	October 2010	
	4.5.3.2	October 2010	
	4.5.3.3	November 2011	TN A532-1 / MB A532/1
	4.5.3.4	October 2010	
	4.5.3.5	October 2010	
	4.5.3.6	October 2010	
	4.5.3.7	October 2010	
	4.5.3.8	October 2010	
	4.5.3.9	October 2010	
	4.5.3.10	October 2010	
	4.5.4.1	October 2010	
	4.5.4.2	October 2010	
	4.5.5	November 2011* October 2010**	TN A532-1 / MB A532-1
	4.5.6.1	October 2010	
	4.5.6.2	October 2010	
	4.5.6.3	October 2010	
	4.5.6.4	October 2010	
	4.5.6.5	October 2010	
	4.5.7.1	October 2010	
	4.5.7.2	October 2010	
	4.5.8	October 2010	
	4.5.9.1	November 2011	TN A532-1 / MB A532-1
	4.5.9.2	October 2010	
		* im Flughandbuch in deutscher Sprache *in the Flight Manual in German language* ** im Flughandbuch in englischer Sprache *in the Flight Manual in English language*	

MB: *Modification Bulletin* – Änderungsblatt
TN : *Technical Note* – Technische Mitteilung

0.2 Verzeichnis der Seiten / List of affected pages

Abschnitt Affected section	Seite Affected pages	Ausgabe-Datum Date of issue	Bezug Reference
5	5.1.1	October 2010	
	5.1.2	October 2010	
	5.2.1.1	October 2010	
	5.2.1.2	October 2010	
	5.2.2	October 2010	
	5.2.3	October 2010	
	5.2.4	October 2010	
	5.3.1	October 2010	
	5.3.2.1	October 2010	
	5.3.2.2	October 2010	
	5.3.2.3	October 2010	
	5.3.2.4	October 2010	
	5.3.3	October 2010	
6	6.1.1	October 2010	
	6.1.2	October 2010	
	6.2.1	November 2011	TN A532-1 / MB 532-1
	6.2.2	October 2010	
	6.2.3	November 2011	TN A532-1 / MB 532-1
	6.2.4	November 2011	TN A532-1 / MB 532-1
	6.2.5	October 2010	
	6.2.6	October 2010	
	6.2.7	October 2010	
	6.2.8	October 2010	

MB: *Modification Bulletin* – Änderungsblatt
TN : *Technical Note* – Technische Mitteilung

0.2 Verzeichnis der Seiten / List of affected pages

Abschnitt Affected section	Seite Affected pages	Ausgabe-Datum Date of issue	Bezug Reference
7	7.1.1	October 2010	
	7.1.2	October 2010	
	7.2.1	October 2010	
	7.2.2	October 2010	
	7.2.3	October 2010	
	7.2.4	October 2010	
	7.2.5	October 2010	
	7.2.6	October 2010	
	7.2.7	October 2010	
	7.2.8	October 2010	
	7.3.1	October 2010	
	7.3.2	October 2010	
	7.3.3	October 2010	
	7.3.4	October 2010	
	7.3.5	October 2010	
	7.3.6	October 2010	
	7.3.7	October 2010	
	7.3.8	October 2010	
	7.3.9	October 2010	
	7.3.10	October 2010	
	7.3.11	October 2010	
	7.3.12	October 2010	
	7.3.13	October 2010	
	7.3.14	October 2010	
	7.3.15	October 2010	
	7.3.16	October 2010	
	7.3.17	November 2011	TN A532-1 / MB A532-1
	7.3.18	October 2010	

MB: *Modification Bulletin* – Änderungsblatt
TN : *Technical Note* – Technische Mitteilung

0.2 Verzeichnis der Seiten / List of affected pages

Abschnitt Affected section	Seite Affected pages	Ausgabe-Datum Date of issue	Bezug Reference
7	7.4	October 2010	
	7.5	October 2010	
	7.6	October 2010	
	7.7	October 2010	
	7.8	October 2010	
	7.9.1	October 2010	
	7.9.2	October 2010	
	7.9.3	October 2010	
	7.10	October 2010	
	7.11.1	October 2010	
	7.11.2	October 2010	
	7.12.1	November 2011	TN A532-1 / MB A532-1
	7.12.2	October 2010	
	7.12.3	November 2011	TN A532-1 / MB A532-1
	7.12.4	November 2011	TN A532-1 / MB A532-1
	7.12.5	October 2010	
	7.12.6	October 2010	
	7.13.1	October 2010	
	7.13.2	November 2011	TN A532-1 / MB A532-1

MB: *Modification Bulletin* – Änderungsblatt
TN : *Technical Note* – Technische Mitteilung

0.2 Verzeichnis der Seiten / List of affected pages

Abschnitt Affected section	Seite Affected pages	Ausgabe-Datum Date of issue	Bezug Reference
8	8.1.1	Oktober 2010	
	8.1.2	Oktober 2010	
	8.2.1	Oktober 2010	
	8.2.2	Oktober 2010	
	8.3	Oktober 2010	
	8.4	Oktober 2010	
	8.5.1	Oktober 2010	
	8.5.2	Oktober 2010	
9	9.1.1	Oktober 2010	
	9.1.2	Oktober 2010	
	9.2		

0.3 Table of contents

Section 1

1.1 Introduction

The Flight Manual for this powered sailplane has been prepared to provide pilots and instructors with information for the safe and efficient operation of the Arcus T.

This manual includes all material required to be furnished to the pilot by "CS 22".

It also contains supplemental data supplied by the manufacturer of the powered sailplane.

1.2 Certification basis

This non-self launching powered sailplane, model designation

Arcus T

has been approved by the EASA in compliance with "CS 22", effective on November 14th, 2003.

The Type Certificate is No. **EASA.A.532** and was issued on

17.05.2011

Category of Airworthiness: UTILITY

1.3 Warnings, cautions and notes

The following definitions apply to warnings, cautions and notes used in this flight manual:

"WARNING"	means that the non-observation of the corresponding procedure leads to an immediate or major degradation of the flight safety
"CAUTION"	means that the non-observation of the corresponding procedure leads to a slow forming or minor degradation of the flight safety
"NOTE"	draws attention to any special item not directly related to safety, but which is important or unusual

1.4 Descriptive data

The Arcus T is a high performance two-seat powered sailplane, not capable of self-launching, constructed from fiber composite with flaps and features a T-tail.

Wing

The four piece wing including winglets has 4 distinct trapezoidal sections.
On the innermost section of each wing, the leading edge sweeps slightly forward, then from the second section on, the wing tapers more and more aft. The flaps span evenly along the entire length of the wing and simultaneously serve as ailerons. The 'Schempp-Hirth' style airbrakes have 3 panels and rise from the upper wing surface.

The water tanks are integrated in the wing and can hold approx. 185 Litres (48.9 US Gal., 40.7 IMP Gal.).
The wing skin is a CFRP foam sandwich, the wing spar caps are made from carbon fibre rovings and the spar shear web is a GFRP foam sandwich.

Fuselage

The cockpit is comfortable and features two tandem seats. The one-piece canopy hinges sideways and opens to the right. For high energy absorption the cockpit region is constructed as an aramid/carbon fibre laminate, which is reinforced by a steel tube transverse frame and a double skin on the sides with integrated canopy coaming frame and seat pan mounting flanges. The aft fuselage section is a pure carbon fibre (non-sandwich) shell of high strength, stiffened by CFRP-sandwich bulkheads and webs. The main wheel is retractable with shock absorber struts and features a hydraulic disc brake. The nose wheel (if installed) and tail wheel (or skid) are fixed.

Horizontal tailplane

The horizontal tailplane consists of a fixed stabilizer with elevator.
The stabilizer is a GFRP/foam-sandwich construction with CFRP-reinforcements, the elevator halves are a pure CFRP/GFRP shell.
The spring trim is gradually adjustable by a lever resting against a threaded rod.

Vertical tail

The fin and rudder are constructed as a GFRP/foam-sandwich.
Optionally a water ballast trim tank with a capacity of 11 Litres (2.9 US Gal., 2.4 IMP Gal.) is provided in the fin.

Controls

All controls are automatically hooked up when the Arcus T is rigged.

The "Turbo" auxiliary power system

The "turbo" is a unique concept, which was first developed to avoid tedious retrieves or to overcome no-lift conditions, but it also makes the search of thermals, soaring safaris and wave exploration flights from winch launch or aero tow possible.

Off-field landings may now be safely avoided, and even in the event of a system failure, the sink rate with the power plant extended is only about 276 to 315 fpm (1.4 – 1.6 m/s), so the "Arcus T" still has satisfactory performance.

Extending and retracting the power plant is very simple and is done with the aid of an electric spindle drive (actuator).

The two-stroke SOLO engine type "2350 D" is started by a windmill effect of the multi-blade folding propeller (OEHLER system). Throttle or choke are not required as the engine is preset to operate at maximum continuous power.

The engine is stopped by reducing the flying speed and switching off the ignition. With the engine control unit TB 06 the power plant automatically retracts part way after the ignition is switched off. When the engine has stopped completely the power plant fully retracts regardless of the position of the propeller blades as they fold up automatically.

With the engine control unit TB 06 only the ignition switch, RPM-indicator, decompression handle and fuel shut-off valve need to be observed.
Fuel contents are displayed in LITRES on the engine control unit.

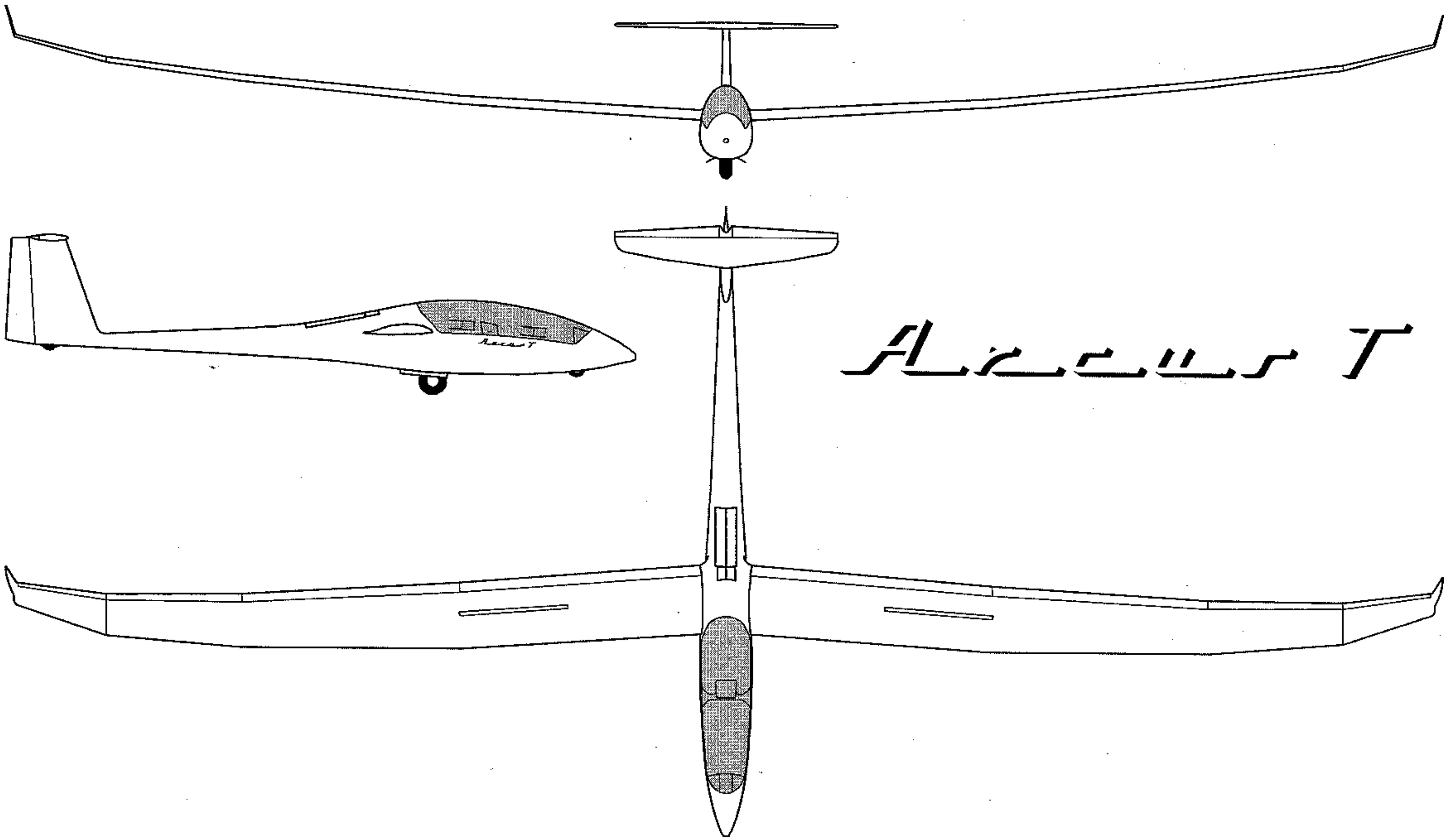
For flights in the plain sailplane configuration the power plant (engine and propeller) may be quickly removed, of course.

The remaining components of the propulsion system (central tank, spindle drive, engine pylon etc.) remain in the aircraft as the saving in weight is not worth the effort of removing/reinstalling them.

TECHNICAL DATA

Wing	Span	20.00 m	65.62 ft
	Area	15.59 m²	167.81 ft²
	Aspect ratio	25.7	
	MAC	0.824 m	2.70 ft
Fuselage	Length	8.73 m	28.64 ft
	Width	0.71 m	2.33 ft
	Height	1.00 m	3.28 ft
Weight (mass)	Empty mass from approx.	485 kg	1069 lb
	Maximum all-up mass	800 kg	1764 lb
	Wing loading	35.6 - 51.3 kg/m²	
		7.3 - 10.5 lb/ft²	

1.5 Three-side view



Section 2

2.1 Introduction

Section 2 includes operating limitations, instrument markings and basic placards necessary for safely operating the powered sailplane, its standard systems and standard equipment.

The limitations included in this section and in section 9 have been approved by EASA.

2.2 Airspeed

Airspeed limitations and their operational significance are shown below:

SPEED		(IAS)	REMARKS
V_{NE}	Never exceed speed in calm air. Flaps set at "0", "-1", "-2" ,"S"	280 km/h 151 kts 174 mph	Do not exceed this speed in any operation and do not use more than 1/3 of control deflection
V_{RA}	Rough air speed	180 km/h 97 kts 112 mph	Do not exceed this speed except in smooth air, and then only with caution. Rough air is met in lee-wave rotors, thunderclouds etc.
V_A	Maneuvering speed	180 km/h 97 kts 112 mph	Do not make full or abrupt control movements above this speed as the aircraft structure might get overstressed.
V_{FE}	Maximum “flap extended” speed Flaps set at "+2", "+1", "L"	180 km/h 97 kts 112 mph	Do not exceed this speed with the given flap setting.
V_T	Maximum speed on aerotow	180 km/h 97 kts 112 mph	Do not exceed this speed during an aerotow.
V_W	Maximum winch launch speed	150 km/h 81 kts 93 mph	Do not exceed this speed during a winch launch.
V_{LO}	Maximum landing gear operating speed	180 km/h 97 kts 112 mph	Do not extend or retract the landing gear above this speed.

Airspeed (contd.)

	Speed	(IAS)	Remarks
V_{max1}	Maximum speed with power plant extended and ignition „ON“	125 km/h 67 kts 78 mph	Do not exceed this speed with power plant extended and ignition switched ON
V_{max2}	ignition „OFF“	180 km/h 97 kts 112 mph	Do not exceed this speed with power plant extended and ignition switched OFF
V_{POmax}	Maximum speed for extending / retracting power plant	110 km/h 59 kts 68 mph	Do not extend / retract the power plant outside this speed range
V_{POmin}	Minimum speed for extending / retracting power plant	90 km/h 49 kts 56 mph	

2.3 Airspeed indicator markings

Airspeed indicator markings and their colour code significance are shown below:

MARKING	VALUE OR RANGE (IAS)	SIGNIFICANCE
White arc	88 - 180 km/h 48 - 97 kts 55 - 112 mph	Positive flap operating range (lower limit is the speed $1.1V_{S0}$ at maximum mass and in landing configuration; upper limit is the max. permissible speed with flaps extended positive).
Green arc	96 - 180 km/h 52 - 97 kts 60 - 112 mph	Normal operating range (lower limit is the speed $1.1V_{S1}$ at maximum mass, c/g at the most forward position and flaps at the neutral "0" position; upper limit is the max. permissible speed in rough air).
Yellow arc	180 - 280 km/h 97 - 151 kts 112 - 174 mph	Manoeuvres must be conducted with caution and operating in rough air is not permitted.
Red line at	280 km/h 151 kts 174 mph	Maximum permitted speed
Blue line at	95 km/h 51 kts 59 mph	Speed of the best climbing V_Y
Yellow triangle at	105 km/h 57 kts 65 mph	Approach speed at maximum mass without water ballast.

2.4 Power plant, fuel and oil

Engine manufacturer:	Solo Kleinmotoren GmbH. 71050 Sindelfingen, Germany
Engine model:	SOLO 2350 D
Engine power at MSL (ISA) and 6500 take-off and max. continuous RPM:	22 kW (30 hP)
Maximum engine RPM	6600 min^{-1}
Maximum cylinder head temperature (CHT):	275° C (527° F)
Fuel:	Two-stroke mixture, unleaded automobile gasoline at or above RON 95 or AVGAS 100 LL
Oil (lubrication):	Fuel / oil mixture, mixing proportion for "CASTROL Super TT" 30 : 1 (3.3 %)
Propeller manufacturer:	Technoflug Leichtflugzeugbau GmbH 78713 Schramberg-Sulgen
Propeller model:	OE-FL 5.110/83 av
Reduction ratio:	1 : 1.56
Maximum prop RPM:	4231min^{-1}
Fuel capacity:	See table below

	Litre	US Gal.	IMP Gal.
Capacity of central fuselage tank	15.9	4.20	3.50
Usable fuel	15.7	4.15	3.45
Non-usable fuel	0.2	0.05	0.04

2.5 Power plant instrument markings

Power plant instrument markings and their colour code significance are shown below:

Instrument	Red line = Minimum limit	Green = Normal Range	Yellow = Caution Range	Red = Maximum limit
Tachometer (RPM-Indicator)	--	green signal	yellow signal	--

2.6 Weights (masses)

Maximum permitted take-off weight (mass):	800 kg	(1764 lb)
Maximum permitted landing weight (mass):	800 kg	(1764 lb)
Maximum permitted take-off and landing weight (mass) w i t h o u t water ballast:		
Power plant installed:	785 kg	(1731 lb)
Power plant removed:	765 kg	(1687 lb)
Maximum permitted weight (mass) of all non-lifting parts:		
Power plant installed:	530 kg	(1169 lb)
Power plant removed:	460 kg	(1014 lb)
Maximum permitted weight (mass) in baggage compartment: (see page 7.8)	2 kg	(4 lb)

2.7 Centre of gravity

Centre of gravity in flight

Aircraft attitude:	Tail raised up such that a wedge-shaped block, 100 : 4.5, placed on the rear top fuse-lage, is horizontal along its upper edge
Datum:	Wing leading edge at root rib
Maximum forward c/g position:	50 mm (1.97 in.) aft of datum (power plant removed) 75 mm (2.95 in.) aft of datum plane (power plant installed)
Maximum rearward c/g position	290 mm (11.42 in.) aft of datum plane

It is extremely important that the maximum rearward c/g position is not exceeded.

This requirement is met when the minimum front seat load is observed.

The minimum front seat load is given in the loading table and is shown by a placard in the cockpit.

A lower front seat load must be compensated by ballast – see section 6.2 "Weight and Balance Record / Permitted Payload Range".

2.8 Approved manoeuvres

The powered sailplane model Arcus T is certified in category

UTILITY

Not capable of self-launching

The following aerobatic manoeuvres are only permitted

- without wing water ballast,
- up to a maximum all-up mass of 690 kg (1521 lb)
- with flap setting "0"
- with retracted or removed power plant

a) inside loops
b) stalled turns
c) lazy eight
d) spinning

It is recommended that in addition to the instrumentation recommended in section 2.12 an accelerometer (3 hands, resettable) is installed.

2.9 Manoeuvring load factors

The following manoeuvring load factors must not be exceeded:

a) With airbrakes locked and at V_A = 180 km/h, 97 kts, 112 mph

n = + 5.3

n = - 2.65

With airbrakes locked and at V_{NE} = 280 km/h, 151 kts, 174 mph

n = + 4.0

n = - 1.5

b) With airbrakes extended, the maximum manoeuvring load factor is

n = + 3.5

n = - 1.5

2.10 Flight crew

When flown solo, the Arcus T is controlled from the front seat.

Observe the minimum load on the front seat – if necessary, ballast must be installed to bring the load up to a permissible figure. See also section 6.2:

"Weight and Balance Record / Permitted Payload Range".

When flown with two pilots, the Arcus T can be operated from the rear seat as Pilot in command in compliance with the following requirements:

- All necessary control elements and instruments, including engine control unit, must be installed for the rear seat. The priority selector switch must be switched with the key up (engine control unit in the rear panel active).
- The responsible pilot needs sufficient experience and practice in flying from the rear seat
  The person in the front seat must be sufficiently pre-briefed in order that there is no negative affect on flight safety.
- No water ballast in the wings (because the water dump control is only accessible from the front seat)

2.11 Types of operation

With the prescribed minimum equipment installed (see page 2.12), the Arcus T is approved for

VFR-flying in daytime

Cloud flying

Restricted aerobatics

2.12 Minimum equipment

Instruments and other basic equipment must be of an approved type and should be selected from the list in the Maintenance Manual.

a) Normal operations

2 Airspeed indicator
(range up to 300 km/h, 162 kts, 186 mph)
with colour markings according to page 2.3

2 Altimeter

1 Outside air temperature indicator (OAT) with sensor
(when flying with water ballast – red line at + 2° C [35,6° F])

1 Magnetic compass

1 Engine control unit TB 06 indicating
- RPMs
- Fuel quantity
- Engine time

1 Rear-view mirror

2 Four-piece safety harnesses (symmetrical)

2 Automatic or manual parachutes

or

2 Back cushions (thickness approx. 8 cm / 3.15 in when compressed)

CAUTION:
The sensor for the OAT must be installed in the ventilation air intake.

For structural reasons the mass of each instrument panel with instruments in place must not exceed 10 kg (22 lb).

b) Cloud flying only permissible

- without wing water ballast
- up to a maximum all-up mass of 690 kg (1521 lb)

In addition to the minimum equipment listed under a) the following is required:

1 Turn & bank indicator with slip ball
1 Variometer
1 VHF-Transceiver

NOTE: From experience gained to date it appears that the airspeed indicator system installed remains fully operational when flying in clouds.

Recommended additional equipment for cloud flying:

1 Artificial horizon
1 Clock

c) Restricted aerobatics only permissible

- without wing water ballast
- up to a maximum all-up mass of 690 kg (1521 lb)
- with flap setting "0"
- with retracted or removed power plant

Recommended additional equipment for restricted aerobatics

1 Accelerometer (3 hands, resettable)

2.13 Aerotow and winch launch

Aerotow (power plant retracted)

Only permissible using the nose tow release!

Maximum towing speed:	180 km/h	(97 kts, 112 mph)
Weak link in tow rope:	max. 850 daN	(1911 lb)
Minimum length of tow rope:	30 m	(98 ft)
Tow rope material	Hemp or Nylon	

Winch launch (power plant retracted)

Only permissible using the c/g tow release !

Maximum launching speed:	150 km/h	(81 kts, 93 mph)
Weak link in winch cable:	max. 1000 daN	(2248 lb)

2.14 Other limitations

Below 2°C outside temperature no water ballast may be used!

Inspection program for the extension of the service time

1. Service Limits

   When the sailplane (or the powered sailplane) has reached a service time of 6000 hours, an inspection must be done in accordance with the inspection program mentioned under chapter 3.

   If the results of this inspection are satisfactory or if any defects found have been duly repaired, the service time of the sailplane (or powered sailplane) is extended by another 3000 hours to a total of 9000 hours (first step).

   The afore-said inspection program must be repeated when the sailplane (or the powered sailplane) has reached a service time of 9000 hours.

   If the results of this inspection are satisfactory or if any defects found have been duly repaired, the time in service may be extended by another 1000 hours to 10.000 hours (second step) after a further 1000 hours inspection to 11.000 hours (third step), and finally – after another 1000 hour inspection – to 12.000 hours (fourth step).

2. The relevant inspection program may be obtained from Schempp-Hirth, Flugzeugbau GmbH.

3. The inspections may only be accomplished by the manufacturer or by a certified repair station.

2.15 Limitations placards

PERMITTED ALL-UP MASS:	800 kg / 1764 lb		
MAXIMUM PERMITTED SPEEDS (IAS):	**km/h**	**kt**	**mph**
Flap setting 0, -1, -2, S	280	151	174
Flap setting +2, +1, L	180	97	112
Rough air speed	180	97	112
Maneuvering speed	180	97	112
Aerotowing speed	180	97	112
Winch launching speed	150	81	93
Landing gear operating speed	180	97	112
For power plant extension/retraction	110	59	68
Power plant extended, ignition ON	125	67	78
Power plant extended, ignition OFF	160	86	99
PERMISSIBLE MINIMUM SPEED (IAS):			
For power plant extension/retraction	90	49	56

Max. permitted speed			
Altitude [m]	V_{NE}(IAS) km/h	kt	mph
0	280	151	174
1000	280	151	174
2000	280	151	174
3000	280	151	174
4000	263	142	163
5000	245	132	152
6000	232	125	144
7000	220	119	137
8000	207	112	129
9000	195	105	121
10000	182	98	113

LOAD ON THE SEATS (crew incl. parachutes)				
SEAT LOAD	TWO PERSONS min.	TWO PERSONS max.	ONE PERSON min.	ONE PERSON max.
front seat load	70* kg 154* lb	115 kg 254 lb	70* kg 154* lb	115 kg 254 lb
rear seat load	at choice	115 kg 254 lb	———	———
valid for the following battery location(s):				
1 batt.	engine battery (E)			
2 batt.**	in front of rear stick mounting frame (C1, C2)**			
1 batt.**	in fin (F1)**			
Maximum load in the cockpit when the fuel tank is completely filled ***	232* kg / 512* lb			
The maximum load in the cockpit (load on both seats + baggage + trim ballast) must not be exceeded. If the front seat load is below the minimum front seat load: see instructions in the flight manual - section 6.2.				

Maximum fuel	kg	lb	Ltr.	US. Gal.	IMP. Gal.
	12	26.5	15.9	4.20	3.50

*) Values as an example, the actually applicable values - see log chart section 6.2 - must be entered.

**) Enter number of batteries installed at weighing and enlisted in equipment list.

***) With removed power plant the amendment "when fuel tank is completely filled" must be crossed out.

WEAK LINK FOR TOWING	
for Aerotow:	**max. 850 daN (1910 lb)**
for Winch launch:	**max. 1000 daN (2248 lb)**
TIRE PRESSURE	
Nose wheel :	**3.0 bar (43 psi)**
Main wheel :	**4.0 bar (57 psi)**
Tail wheel (if installed):	**3.0 bar (43 psi)**

A E R O B A T I C S	
WITH MAX. PERMITTED A.U. WEIGHT OF 690 kg / 1521 lb, WITHOUT WATER BALLAST AND WITH RETRACTED OR REMOVED POWER PLANT THE FOLLOWING MANEUVERS ARE PERMITTED:	
(A) Inside loops	**(C)** Lazy eight
(B) Stalled turns	**(D)** Spins
Operating Conditions: See Flight Manual	

Note:
Further placards are shown in the Maintenance Manual.

Section 3

3. Emergency procedures

3.1 Introduction

Section 3 provides check lists and amplifies procedures for coping with emergencies that may occur.

Emergency situations can be minimized by proper pre-flight inspections and maintenance.

3.2 Jettisoning the canopy

The canopy is to be jettisoned as follows:

Swing **b a c k** one of the red locking levers provided on the left side of the canopy frame up to the stop (approx. 90°) and swing canopy sideways fully open.

The canopy will then be torn out from its hinges by the airstream and get carried away.

3.3 Bailing out

If possible, first stop and retract engine, then jettison canopy (see section 3.2) and release harness.

When leaving the cockpit, the person in the front seat should bend his upper body slightly forward, grab the canopy coaming frame of the fuselage with both hands and lift himself up. The instrument panel is pushed up by the legs.

The person in the rear seat should grab the handels on either side of the instrument panel and use the canopy coaming frame or the arm rest of the seat pan for support.

Leave the cockpit to the left.

The rip cord of a manual parachute should be pulled at a safe distance and height.

3.4 Stall recovery

a) Power plant retracted

When stalling during straight and level fight or in a banked turn, normal flying attitude is regained by firmly easing the control stick forward and, if necessary, applying opposite rudder and aileron.

b) Power plant extended

With the power plant extended, there are no significant differences in the stall behaviour, but the turbulent airflow produced by the propeller superimposes any vibration in the controls.

Important Note:

If, on stalling, vibrations in the controls and in the cockpit become more pronounced, with the controls getting spongy and engine noise increasing, immediately release the back pressure on the stick and, if necessary, apply opposite rudder and aileron.

3.5 Spin recovery

A safe recovery from a spin is accomplished by the following method:

a) Hold aileron neutral

b) Apply opposite rudder
(i.e. against the direction of rotation of the spin).

c) Ease control stick forward until rotation ceases and the airflow is restored.

d) Level the wings, neutralize rudder, and pull gently out of dive.

With the center of gravity in the mid to rearward position, a steady spinning motion is possible.

After having applied the standard recovery method, the Arcus T will stop rotating after about ½ to ¾ turn, depending on the flap position.

The loss of height - from the point at which recovery is initiated to the point at which horizontal flight is first regained - can be up to 250 m (590 ft) and the recovery speeds are between 130 and 210 km/h (70 – 113 kts, 81 – 130 mph). Therefore, when recovering using a positive flap position, make sure the maximum speed for that flap setting is not exceeded. It is recommended for positive flap settings to change the flap setting to "0" during spin recoveries.

With the center of gravity in the foremost position, a steady spinning motion is not possible. The Arcus T stops rotating after a half to a full turn and usually ends in a spiral dive. In a spiral dive the sailplane accelerates very rapidly. Therefore a spiral dive should be ended immediately.

Recovery is by normal use of opposite controls.

Note: Spinning may be safely avoided by following the actions given in section 3.4 “Stall recovery”.

Recovery from a spin with a positive flap setting can be hastened by adjusting the flaps to a negative setting.

In extreme configurations outside the allowable limits (e.g. accidental extreme rearward c/g position or extreme asymmetric water ballast) it may be necessary, especially in positive flap settings, to change the flap setting to "S" to stop the rotation.

3.6 Spiral dive recovery

Depending on the use of the controls, a spin may turn into a spiral dive if the centre of gravity is in forward positions. This is indicated by a rapid increase in speed and acceleration.

Recovery from a spiral dive is achieved by easing the control stick forward and applying opposite rudder and aileron.

WARNING:

When pulling out of a dive, the permissible maximum speed of the respective flaps position and the permissible control surface deflections at V_A / V_{NE} are to be observed! (if necessary use flap position"0" when pulling out.)
See also page 2.2.

3.7 Engine failure (carburetor icing)

From experience gained to date, no carburetor icing has yet occured on this engine installation.

Should the engine fail in flight due to the lack of fuel or a defect, retract it as quickly as possible to avoid any unnecessary deterioration of the flight performance (for more precise data refer to section 5).

3.8 Fire

- CLOSE fuel shut-off valve
- Master switch "OFF"
- Ignition "OFF"

Leave power plant in extended position!

> WARNING:
>
> Discontinue flight and land immediately!
>
> Avoid any manoeuvres causing high stress on the fuselage !

3.9 Other emergencies

Flying with uneven water ballast

If, on dumping water ballast, the wing tanks are emptying unevenly or on one side only - which is recognized at lower speeds by having to apply opposite aileron for normal flying attitude -entering a stall must be avoided.

When landing in this condition, the touch down speed must be increased by about 10 km/h (5 kts, 6 mph) and the pilot must be prepared for the powered sailplane to veer off course as the heavier wing tends to drop somewhat sooner than normal (apply opposite aileron).

Jammed elevator or flap control

While jammed flaps will just result in a "fixed profile flight behaviour",
a jammed elevator control is more serious.

The pilot, however, should take into consideration that the powered sailplane is still controllable to at least some extent by using its flaps for longitudinal controls

Flap lever pulled back	=	slower
Flap lever pushed forward	=	faster

This may allow the pilot to move over to a more favourable bail-out area or he may even avoid an emergency exit.

Loss of directional control

Should a rudder control cable break in flight, the powered sailplane may quickly start yawing and rolling. An ensuing spiral dive, however, may possibly be avoided by resetting the flaps immediately at "O".

If the yawing/rolling motion cannot be stopped by normal opposite aileron, then briefly apply aileron in the direction of the roll so that the wing will level with the aid of the adverse aileron yaw.
Shallow turns can also be effected by using only the aileron in the described manner.

Emergency landing with retracted undercarriage

An emergency landing with the main wheel retracted is strictly not recom-mended because the energy absorption potential of the landing gear is much higher than that of the fuselage shell.

Should the wheel fail to extend, the powered sailplane should be landed at a flat angle, with flaps set at "L"' and without pan caking.

Ground-loop

If there is the danger of the powered sailplane overshooting the boundary of the landing field in mind, a decision whether or not to initiate a controlled ground loop should be made at least 40 m (131 ft) away from the boundary:

- If possible, always turn into the wind

and

- as the wing tip is forced down, push the control stick forward simultaneously.

Emergency water landing

From experience gained from composite sailplane landings on water following recommendations can be given:

Approach:

- landing pattern parallel to the shore
- undercarriage extended
- ventilation closed
- water ballast tanks valves closed
- main switch OFF

Landing:

- Touch down with minimum speed and airbrakes retracted.

Section 4

4. Normal operating procedures

4.1 Introduction

Normal procedures associated with optional equipment are found in section 9.

This section provides checklists and amplified procedures for conducting the daily and pre-flight inspection.

Furthermore this section includes normal operating procedures and recommended speeds.

4.2.1 Rigging and de-rigging

Rigging

The Arcus T can be rigged by two people if a wing stand or trestle is used under one wing tip.

Prior to rigging, all pins and their corresponding bearings on fuselage, wing panels and tailplane should be cleaned and greased.

Inboard wing panels

Unlock the airbrake lever and set water ballast control lever to "CLOSED" - flap position "L".

Insert the left wing panel first. It is important that the helper on the wing tip should concentrate on lifting the trailing edge of the wing panel more than the leading edge, so that the rear wing attachment pin does not jam into the fuselage bearing.

Check that the spar stub tip is located correctly in the cut-out on the far side of the fuselage (if necessary, tilt the fuselage or move the wing gently up and down to help it home).

Check that the angular levers on the wing root rib are properly inserted into their corresponding funnels on the fuselage.

Push the main wing pin in approx. 3 cm (1.2 in.) so that the wing panel is prevented from sliding out by the cut-out in the vertical rim of the GFRP-panel covering the front wing locating tube.
The wing tip can now be placed on a wing stand.

Next insert the right wing panel – the procedure is the same as for the left wing. As soon as the pin on the right wing spar stub has engaged in its corresponding bearing on the opposing wing panel (recognized by a sudden extension of the unlocked airbrakes), the right wing panel can be pushed fully home under some pressure.

If it is difficult / impossible to push fully home, remove the main wing pin and draw the panels together with the aid of the rigging lever (use flat side only).

Finally push the main wing pin fully home and secure its handle (depress locking pin and let it engage in the metal fitting on the fuselage inner skin).

Wing tip extensions (outboard. panels)

Insert the spar of the wing tip extension – with locking pin pushed down and aileron deflected upwards – into the spar tunnel of the corresponding inboard wing panel. When fully home, the spring-loaded pin must have engaged (snapped up) in the corresponding opening on the inboard wing panel(s). Make sure that the coupling lap on the lower side of the inner aileron has correctly slid under the adjacent outer aileron.

With the rigging pin, make sure the locking bolt is snapped.

Horizontal tailplane

Take the round-headed rigging tool (to be stored in the side-pocket) and screw into the front tailplane locating pin on the leading edge of the fin.
Thereafter slide the tailplane aft onto the two elevator actuating pins, pull rigging tool and its pin forward, seat stabilizer nose and push locating pin home into the front tailplane attachment fitting.

Remove rigging tool – locating pin must not protrude in front of the leading edge of the fin.

Check whether the elevator actuating pins are really located (by moving the elevator) and check that the nose of the stabilizer is properly mated with the top of the fin.

After rigging

Check – with the aid of a helper – the controls for full and free movement in the correct sense.

Use tape to seal off the wing / fuselage joint and the joint between main wing panels and their tip extension.

CAUTION: Do not seal off the aileron gap between inner wing and wing tip extension.

Seal off the opening for the front tailplane attachment pin and also the joint between fin and horizontal stabilizer (only necessary if there is no rubber sealing on the upper end of the fin).

Sealing with tape is beneficial in terms of performance and it also serves to reduce the noise level.

De-rigging

Remove all sealing tape from the wing/fuselage joint, the joint between main wing panels and their tip extension and from the fin/stabilizer joint.

Wing tip extensions (outbd. panels)

Push the locking pin down (using rigging pin) and carefully pull out each tip extension.

Horizontal tailplane

Using the threaded rigging tool, pull out the front tailplane attachment pin, lift the stabilizer leading edge slightly and pull the tailplane forward and off.

Main wing panels

Unlock airbrakes, set the water dump valve control lever to the "CLOSED" position and unlock the handle of the main wing pin.

With a helper on the tip of each wing panel, pull out the main wing pin till the last 20 to 30 mm (0.8 -1.2 in.) and withdraw the right wing panel by gently pulling and rocking it backwards and forwards if necessary.

Thereafter, remove the main wing pin and withdraw the left wing panel.

4.2.2 Refueling

Prior to filling the tank, always actuate the drain valve.

a) Refueling system not installed

The quick-disconnect coupling of the line routed to the central fuel tank is situated on the left hand side next to the front wing locating tube.
Using an electrical pump, the tank is easily filled from a suitable container by just connecting a hose featuring an appropriate fitting.

b) Refueling system in place (option)

The quick-disconnect coupling of the line routed to the central fuel tank is situated on the left hand side next to the front wing locating tube.
The tank is easily filled from a suitable container by connecting a hose featuring an appropriate fitting and by actuating the switch of the internal electrical fuel pump (installed next to the coupling).
When the fuel tank is filled, this pump must be switched off.

In either case there is no danger of spilling fuel because - thanks to the quick-disconnect coupling - the fuel line is closed automatically.

The amount of fuel in the tank can be seen on the Engine control unit TB 06 readout.

Calibrating the fuel quantity indicator

The number of litres indicated depends on the rating of the fuel used. After a change the indicator must be recalibrated. For recalibration make sure that the fuel tank in the fuselage is completely filled.

Calibration of the fuel quantity indication on the engine control unit TB 06:
Retract the engine completely. Then scroll with the menu button through the menu on the LCD display of the engine control unit until it shows "CAL_".
To start the calibration procedure, press the menu button for a minimum of 3s.
When the calibration process has been completed the display shows first the calibration factor (e.g. "C100") and then the fuel quantity in the fuselage tank.

If the calibration factor is not displayed the calibration procedure must be repeated.
When the calculated calibration factor shows a deviation of more than 30% from the original value, the calibration is invalid and the LCD-display shows the calibration error "E_CA". In this case the original calibration factor is still valid.

Important note:

A calibration with partial filled tank or no calibration after a change of the rated fuel leads to wrong indication up to 30%.
The displayed fuel content can be more than the actual fuel content!

4.2.3 Removal and reinstallation of the power plant

In order to allow the operation of the Arcus T in "plain sailplane configuration", its power plant is quickly removable.

The following components may be removed:

- Engine with propeller
- Power plant battery, located at the cockpit transverse steel tube frame (unless needed for the avionics)

The maximum saving in weight is approx. 34 kg (75 lb).
The influence on the c/g position is described in section 6 of the Arcus T Maintenance Manual.

Whenever the power plant is removed/reinstalled, the empty mass c/g position must be re-determined and, together with further data, be entered in the weight & balance log sheet by a licensed inspector.

Removing the power plant

- Remove the power plant battery from transverse frame (unless needed for the avionics)
- Disconnect the fuel line and impulse line from diaphragm pump
- Detach the engine wiring by disconnecting 6 wires from the terminal and 3 wires from the ignition control at the front former inside the engine bay – make a note of the correct position of each cable, see also maintenance manual Diagram 9a respectively Diagram 9b.
- Cut the cable ties used for the attachment of the wiring
- Remove the screw between lower and right cooling baffle
- Remove the decompression valve actuating lever and interconnecting link (see page 4.2.3.3)
- Remove the nuts from the four bolts attaching the engine to the pylon (see page 4.2.3.3)
- Disconnect the cooling baffle from the left side of front cylinder head
- Disconnect the arresting wire from both pylon sides
- Lift engine (with propeller) free from pylon

Reinstalling the power plant

- Seat the engine (prop mounted) onto the pylon - together with the rubber shock mounts (vibration isolators, two per lug).

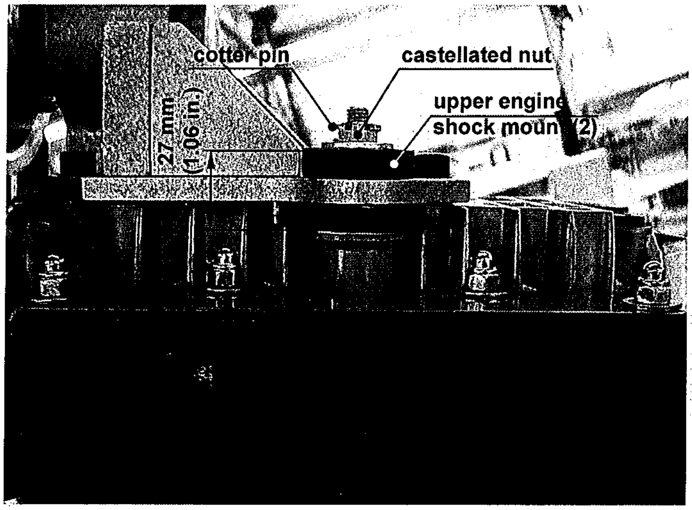
  Tighten the upper castellated nuts such that the spacing between the shock mounts is

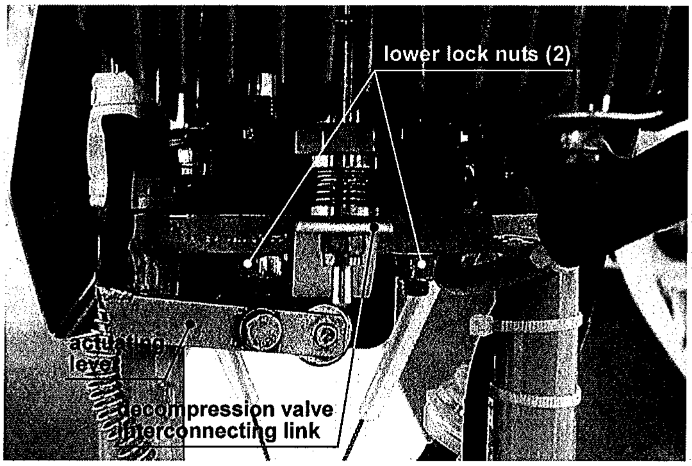
  27 mm (1.06 in.)

  as shown on page 4.2.3.3.

- Secure the castellated nuts using cotter pins
- Install and tighten the lower stop nuts
- Route the arresting wire through its guides and reattach on each side of the pylon
- Reinstall the cooling baffle on the left side to the cylinder head and reconnect the lower and the right cooling baffle
- Reinstall decompression valve interconnecting link and actuating lever (see page 4.2.3.3)
- Reconnect the engine wiring
- Reconnect the fuel line and impulse line to the fuel pump
- Reattach wiring and lines to the pylon (using cable ties as before)
- Conduct an inspection according to section 4.3 b)
- Reinstall the power plant battery (if it was removed from its tray on the cockpit transverse frame)

Power plant attachment

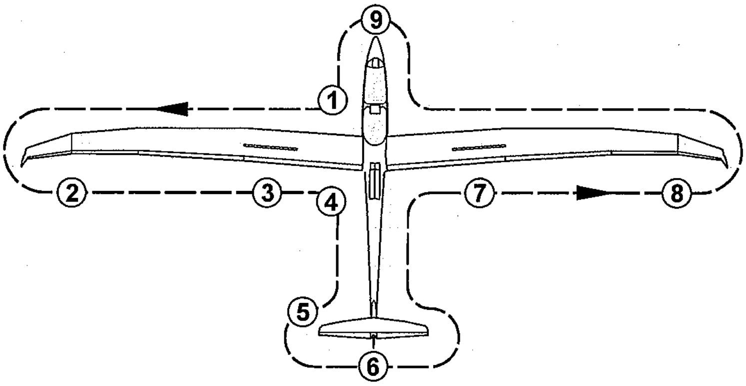




4.3 INSPECTION

Daily inspection

The importance of inspecting the powered sailplane after rigging and before the day's flying cannot be over-emphasized, as accidents often occur when these daily inspections are neglected or carried out carelessly.



When walking around the Arcus T, check all surfaces for paint cracks, dents and unevenness. In case of doubt, ask an expert for advice.

(1) a) Open canopy

b) Check that the main wing pin is properly secured

c) Make a visual Check of all accessible control circuits in the cockpit

d) Check for full and free movements of the control elements

e) Check batteries for firm attachment and accordance with the loading chart

f) Check for the presence of foreign objects

g) Check fuel quantity

h) (reserved)

i) Check tire pressure:

Nose wheel:	3.0	bar	(43 psi)
Main wheel:	4.0	bar	(57 psi)

j) Check tow release mechanism(s) for proper condition and function

(2) a) Check upper and lower wing surface for damage

b) Clean and grease water ballast dump valves (if necessary)

c) Check wing tip extensions for proper connection

d) Check that the flaperons are in good condition and operate freely. Check for any unusual play by gently shaking the flaperons.
Check flaperon hinges for damage

(3) a) Check airbrakes for proper condition, fit and locking

(4) a) Check fuselage for damage, especially on the under side

b) Check that the STATIC pressure ports for the ASI on the tail boom (1.02 m / 3.35 ft forward of the base of the fin) are clear

Visual inspection of the power plant

Completely extend the power plant with the manual operation switch

CAUTION: IGNITION MUST BE SWITCHED OFF !

c) Check propeller hub and propeller blades for damage, such as cracks in the blade root.
Check propeller blades for ease of movement. Each blade should unfold automatically when it is in the bottom position, otherwise the bearing at the blade root should be lubricated with thin oil.

d) Check power plant for loose bolts and nuts, check all locks and stops

e) Check exhaust system and engine pylon for cracks, especially at the welding joints

f) Check cooling baffles for cracks and correct attachment

g) Check rubber elements of the engine mounting and exhaust

h) Check components, lines, hoses, pipes and wires etc. for chafing marks

i) Check condition, function and tension of engine arresting wires, engine door operating cables and door actuating mechanism

j) Check condition of the retaining elastic band and that it is hooked up to the engine arresting wires

k) Pull back the decompression handle and hold - prop must rotate freely.
Release the handle and check that the actuating lever on the pylon returns to its stop.
The gap between the decompression valve interconnecting link and the actuating lever on the pylon must be at least 2.0 mm (0.08 in.)

(5) a) Check condition of tail skid or wheel.

If the latter is installed, check the tire pressure:

3.0 bar (44 psi)

b) Should a total energy compensation probe be used, mount it and check the line (when blowing gently from the front to the probe, the variometer(s) connected should read "climb")

c) Check that the fin-mounted PITOT tube is clear. When blowing gently into this probe, the ASI must register (with pneumatic valve set at "Power off")

d) Check that the opening for the fuel tank vent line (at the upper end of the fin) is clear

Should a water ballast fin tank be installed (option):

e) Check that the fin tank spill holes are clear

f) Check water ballast level in fin tank (in case of doubt, discharge ballast)

g) Check that the dump hole for the fin tank in the tail wheel fairing (if installed) is clear

(6) a) Check correct battery installation in vertical tail according to loading chart

b) Check horizontal tailplane for proper attachment and locking

c) Check elevator and rudder for free movement

d) Check trailing edge of elevator and rudder for damage

e) Check elevator and rudder for any unusual play by gently shaking the trailing edge

(7) See (3)

(8) See (2)

(9) Check that the pitot pressure head in the fuselage nose is clear. Gently blowing into the head should produce a reading on the airspeed indicator (with pneumatic valve set at "POWER ON")

After heavy landings or after the Arcus T has been subjected to excessive loads, the resonant wing vibration frequency should be checked (its value to be extracted from the last inspection report for this serial number).

Check the entire powered sailplane thoroughly for surface cracks and other damage. For this purpose it should be de-rigged.

After a cartwheel or ground loop it is especially important to check the aft tail boom and the area transitioning to the vertical stabilizer for damage including delaminated ribs internally. This can be checked by firmly supporting the wings, and forcefully moving the top of the fin left and right to check if there is unusually large movement, any bulges or any cracking or grinding noises observable.

If damage is discovered (e.g. surface cracks in the fuselage tail boom or tailplane, or if delamination is found at the wing roots or at the bearings in the root ribs), then the powered sailplane must be grounded until the damage has been repaired by a qualified person.

4.3 b) Inspection after re-installing the power plant

After re-installing the power plant, the following checks are to be carried out:

- Check for correct spacing of the upper rubber engine shock mounts (vibration isolators).
  Check that the engine mounting bolts and nuts are properly secured (see also page 4.2.3.2).
- With completely extended power plant the engine arresting wires must be under about the same tension
- Check function of the stop switch for the extended position (for details see page 5.8.1 and 5.8.2 in the maintenance manual)
- While extending the power plant, check the clearance of the tip of the forward directed propeller blades, especially with the longest blades. The blades must not jam on the small engine bay doors.
- Fuel line connected ?
- Impulse line connected to fuel pump ?
- Engine wiring connected correctly to terminal inside the engine bay?
- Engine wiring properly secured to pylon?
- Cooling baffles properly fixed, left cooling baffle free from the fixing bolt of the engine arresting wire?
- Engine wiring clear (i.e. no jamming by pylon) and without tension during extension/retraction?
- Decompression valves moving with sufficient ease? (no jamming of the metal link)
- With decompression handle released, a gap of at least 2.0 mm (0.08 in.) must exist between the link and the actuating lever
- Fresh "Weight & Balance Report" established and seat load placard amended to show revised values ? (see section 6)

In addition to the above, an inspection of the power plant must be carried out in compliance with section "Daily Inspection".

4.4 Pre-take-off inspection

CHECK LIST BEFORE TAKE-OFF
O Water ballast in fin tank correctly filled (if installed) ? Dump all water ballast in case of doubt !
O Loading charts checked ?
O Parachute securely fastened ?
O Safety harness secured and tight ?
O Seat back, head rest and pedals in comfortable position ?
O All controls and instruments easily accessible ?
O Airbrakes checked and locked ?
O All control surfaces checked with assistant for full and free movement in correct sense ?
O Controls free ?
O Trim correctly set ?
O Flaps set for take-off ?
O ASI switched to pitot head in fin ?
O Canopy closed and locked ?

4.5 Normal operating procedures and recommended speeds

4.5.1 Methods of launching

Aerotow

ONLY PERMISSIBLE WITH NOSE TOW RELEASE IN PLACE
AND POWER PLANT RETRACTED

Maximum permitted towing speed:

V_T = 180 km/h (97 kt, 112 mph)

For aerotow only the nose tow release may be used -
hemp and nylon ropes of between 30 and 40 m length (98-131 ft)
were tested.

Prior to take-off set elevator trim as follows:

- Rearward c/g positions: Lever full forward
- Other c/g positions: Lever 1/3 of its travel from forward

As the tow rope tightens, apply the wheel brake gently (by actuating the stick-mounted lever) to prevent the Arcus T from over running the rope.

In crosswind conditions, keep in mind that at the beginning of the take off roll, there is an increase of the lift generated on the downwind wing from the tug's prop wake, which drifts with the wind. Therefore it may be necessary to hold downwind aileron to start.

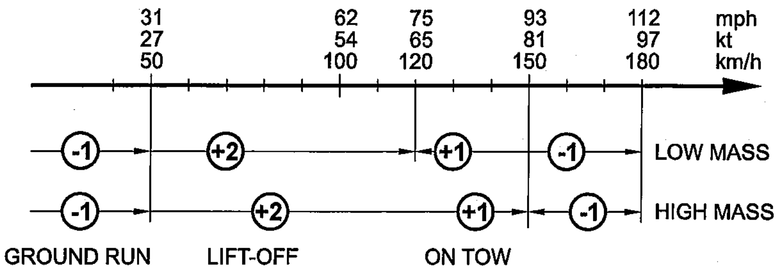
For intermediate to forward c/g positions the elevator control should be slightly back for the ground run; in the case of rearward c/g positions it is recommended that neutral elevator is maintained until the tail lifts.

After lift-off the elevator trim can be set for minimum control stick loads.

An aerotow can be made with a flap setting of "+2". Although it is recommended, especially in a crosswind takeoff or on rugged surface, to start the takeoff roll with a flap setting of "-1 or -2", when sufficient aileron control is attained, at about 50 km/h (26 kts, 30 mph), the flap position should be moved to "+2" for lift off. With a negative flap setting during takeoff roll the effectiveness of the ailerons will be increased and it will be easier to keep track behind the towplane.

After lift off at 80 to 90 km/h (43-49 kts, 50-56 mph) – depending on loading and flap setting – the trim can be set so that minimal force is felt in the elevator control.
Normal towing speed is 110 to 130 km/h (59-70 kts, 68-80mph) with a flap setting "+2". At higher flying masses the towing speed is about 120 to 140 km/h (65-76 kts,75-87 mph).

At higher towing speeds, negative flap settings as far as flap setting "S" can be used. The flap setting can be chosen so that pleasant high control forces can be adjusted with the trim.



Only small control surface deflections are normally necessary to keep position behind the tug.

In gusty conditions or when flying into the propeller slip stream of a powerful tug correspondingly greater control stick movements are required.

The undercarriage may be retracted during the tow; this is not, however, recommended at low altitude, as changing hands on the stick could easily cause the Arcus T to lose station behind the tug.

When releasing the tow rope, pull the yellow T-shaped handle fully multiple times and turn only after the rope has definitely disconnected.

Winch launch

ONLY PERMISSIBLE WITH C/G TOW RELEASE IN PLACE
AND POWER PLANT RETRACTED

Maximum permitted launching speed:

V_W = 150 km/h (81 kts, 93 mph)

For winch launching only the c/g tow release and the flap settings "+1" or "+2" must be used.

With only one seat occupied and no water ballast or with an aft cg, a flap setting of "+1" should be used.
With both seats occupied or when water ballast is used, a flap setting of "+2" should be used.

Prior to take-off set elevator trim as follows:

• Rearward c/g Positions	Lever full forward
• Intermediate c/g Positions	Lever full forward
• Forward c/g positions	Lever neutral

As the cable tightens, apply the wheel brake gently (by actuating the stick-mounted lever) to prevent the Arcus T from overrunning the winch cable.

Ground run and lift-off are normal - there is no tendency to veer-off or to climb excessively steeply on leaving the ground. Depending on the load on the seats, the Arcus T is lifted off with the control stick pushed slightly forward in the case of aft c/g positions and pulled slightly back with the c/g in a forward position. After climbing to a safe height, the transition into a typical steep winch launch attitude is effected by pulling the control stick slightly further back.

At normal all-up masses, i.e. both seats occupied, the launch speed should not be less than 100 km/h (54 kts, 62 mph). At maximum takeoff mass, the launch speed should not be less than 110 km/h (59 kts, 68 mph).

Normal launch speed is about 110 to 120 km/h (59-65 kts, 68-75 mph) with two occupants. At maximum take off mass this speed is about 125 km/h (67 kts, 78 mph).

At the top of the launch the cable will normally back-release automatically; the cable release handle should, nevertheless, be pulled firmly multiple times to ensure that the cable is actually gone.

CAUTION:

Winch launching at the maximum permitted all-up mass should only be done if there is an appropriately powerful winch and a cable in perfect condition available.

Furthermore, there is not much point in launching by winch for a soaring flight if the release height gained is less than 300 m (984 ft).

In case of doubt, reduce the all-up mass.

WARNING:	It is explicitly advised against winch launching with a tail wind!

CAUTION:

Prior to launching by winch, it must be ensured that the crew is properly seated and able to reach all control elements.

Particularly when using seat cushions it must be made sure that during the initial acceleration and while in the steep climbing attitude the occupants are not able to slide backwards and up.

4.5.2 Take-off and climb

The Arcus T is a powered sailplane that is N O T capable of self- launching, which - like a pure glider - must either be launched by winch or aerotow (with its power plant retracted - see section 4.5.1).

WARNING: Do not attempt to take-off on own power !

4.5.3 Flight / Cross country flight

a) Power plant retracted

The Arcus T has pleasant flight characteristics and can be flown effortlessly at all speeds, loading conditions (with or without water ballast), configurations, and c/g positions.

With a mid-point c/g position the maximum speed range covered by the elevator trim is from about 70 km/h (38 kts, 43 mph) (flap **L**) to about 200 km/h (108 kts, 124 mph) (flap **S**).

Flying characteristics are pleasant and the controls are well harmonized. Turn reversal from + 45° to - 45° can be accomplished without any noticeable skidding. Ailerons and rudder may be used to the limits of their travel.

All-up mass	600 1323	kg lb
Flaps at	**L**	
Speed	98 53 61	km/h kts mph
Reversal time	4.8	sec

Note:

Flights in conditions conducive to lightning strikes must be avoided.

High speed flying

At high speeds up to V_{NE} = 280 km/h (151 kts, 174 mph) the Arcus T is easily controllable.

Full deflections of control surfaces may only be applied up to V_A = 180 km/h (97 kts, 112 mph).

At V_{NE} = 280 km/h (151 kts, 174 mph) only one third (1/3) of the full deflection range is permissible. Avoid especially sudden elevator control movements.

In strong turbulence, i.e. in wave rotor, thunderclouds, visible whirlwinds or when crossing mountain ridges, the speed in rough air V_{RA} = 180 km/h (97 kts, 112 mph) must not be exceeded.

With the c/g at an aft position, the control stick movement from the point of stall to maximum permissible speed is relatively small, though the change in speed will be noticed through a perceptible change in control stick loads.

The airbrakes may be extended up to V_{NE} = 280 km/h (151 kts, 174 mph). However, they should only be used at such high speeds in an emergency or if the maximum permitted speed is being exceeded inadvertently.

When extending the airbrakes suddenly, the deceleration forces are noticeable.

WARNING:

Consequently it is wise to check in advance that the seat harnesses are tight and that the control stick is not inadvertently jarred forwards when the airbrakes are extended. There should be no loose objects in the cockpit. At speeds above 180 km/h (97 kts, 112 mph) extend the airbrakes only gradually (allow 2 seconds).

WARNING:

It is strictly noted that in a dive with the airbrakes extended, the Arcus T has to be pulled out less abruptly (maximum 3.5 g) than with retracted brakes (5.3 g), see section 2.9 "Manoeuvring Load Factors". Therefore pay attention when pulling out with airbrakes extended at higher speeds!

A dive at V_{NE} with the airbrakes fully extended is limited to an angle to the horizon of 38° at maximum permitted all-up mass of 800 kg (1764 lb).

At an all-up mass of up to 690 kg (1521 lb) an angle to the horizon is more than 45°.

Optimum flap positions

The camber-changing flaps alter the wing section such that the laminar bucket is always well suited to the actual flying speed.

Use of flaps for	flaps at	units	AUW = 625 kg 1378 lbs	AUW = 800 kg 1764 lbs
Low speed flying (straight and level)	L	km/h kts mph	83 45 52	94 51 58
	+2	km/h kts mph	83 – 90 45 – 49 52 - 56	95 – 100 51 – 54 58 - 62
	+1	km/h kts mph	90– 105 49 – 57 56 - 65	100 – 120 54 – 65 62 - 75
Best L/D	0	km/h kts mph	105 – 130 57 – 70 65 - 81	120 – 150 65 – 81 75 - 93
Flying between thermals and high speed flying	-1	km/h kts mph	130 – 155 70 – 84 81 - 96	150 – 180 81 – 97 93 - 112
	-2	km/h kts mph	155 – 175 84 – 94 96 - 109	180 – 195 97 – 105 112 - 121
	S	km/h kts mph	175 – 280 94 – 151 109 - 174	195 – 280 105 – 151 121 - 174

For a speed polar diagram refer to section 5.3.2.

For circling in smooth thermals flap setting "+2" is recommended; in turbulent thermals, which require a quick aileron response or while climbing in slow straight flight, flap setting "+1" is advantageous. Near the lower end of the optimum circle in thermal speeds the pilot may even use flap setting "L", especially at high all-up masses and in updrafts with hardly any variation in flying speed. Best glide and moderate inter-thermal speeds are covered by flap setting "0" and "-1".

Low speed flight and stall behaviour
(power plant retracted)

In order to become familiar with the powered sailplane it is recommended to explore its low speed and stall characteristics at a safe height. This should be done using the various flap settings while flying straight ahead and also in a 45° banked turn.

Wings level stall

The first signs of a stall usually occur 5 to 10 km/h (3-5 kts, 3-6 mph) above stalling speed. It begins with a slight rolling motion and vibration in the controls. If the stick is pulled further back, these effects become more pronounced, the ailerons get spongy and the powered sailplane sometimes tends to slight pitching motions (speed increases again and will then drop to stalling speed).

> NOTE
>
> Before reaching a stalled condition, depending on C.G. position, the ASI reading drops quickly by 5 to 10 km/h (3-5 kts, 3-6 mph) and starts oscillating because of the turbulent airflow affecting the pitot pressure head.

When reaching a stalled condition with the c/g in middle and rearward positions, the stick reaches the stop and the powered sailplane remains in deep stall or drops the wing respectively the nose.

A normal flight attitude is regained by easing the stick firmly forward and, if necessary, applying opposite rudder and aileron.

The loss of height from the beginning of the stall until regaining a normal level flight attitude is up to 60 m (200 ft)

In the case of forward c/g positions and stick fully pulled back, the powered sailplane just continues to fly in a mushed condition without the nose or wing dropping.

Normal flying attitude is regained by easing the stick forward.

Turning flight stalls
(Power plant retracted)

When stalled during a coordinated 45° banked turn and a forward c/g, the Arcus T - with the control stick pulled fully back -will continue to fly in a stalled condition.
With aft c/g during the turning stall, the inside wing will drop and the nose will drop below the horizon. The stall can be stopped immediately by relieving the back pressure on the control stick.
There is no uncontrollable tendency to enter a spin. The transition into a normal flight attitude is conducted by an appropriate use of the controls.

The loss of height from the beginning of the stall until regaining a normal level flight attitude is approx. 150 m (492 ft).

Influence of water ballast

Apart from higher stall speeds - caused by the higher mass in flight - water ballast in the wing tanks has no negative influence on the stall characteristics.

With water ballast in the fin tank, stall characteristics are like those found in an aft c/g position.

4.5.3 Flight (incl. in-flight engine stop/start procedure)

b) Power plant extended (Power plant operation)

For a full description of the engine control unit TB 06 see section 7 of the flight manual.

The power plant should only be extended and started where there is suitable landing terrain within gliding range (with power plant extended, L/D is only about 19 : 1).

Below 300 m (1000 ft) AGL, starting attempts should be avoided in order to have safe height left for planning the approach pattern in case the engine fails to run !

For proper starting procedure, refer to the accompanying check list. Proceed as follows:

1. Open fuel shut-off valve, switch ASI to pitot pressure head in fuselage nose and extend power plant via the ignition switch at a flying speed of about 90 to 100 km/h (49-54 kts, 56-62 mph).
   The electric fuel pump is automatically switched on before the engine is fully extended.

2. When the engine is fully extended pull back the "DEKO"- handle (thus opening the decompressions valves) and hold it – the propeller starts rotating.
   Should one or more blades fail to unfold, wag the rudder repeatedly to assist the blade(s) in unfolding.

3. Once all prop blades are in their proper position, accelerate to a speed of about 100 km/h (54 kts, 62 mph). On reaching this speed, release "DEKO"-handle suddenly – the engine will fire.
   To assist the pilot when starting the engine, the engine control unit displays the RPMs alternating with "dECO", until the minimum RPM for a successful start of a fully functional engine under normal operation conditions is reached.

4. Let the rpms build up then reduce speed to 90-100 km/h and enter the climb.

5. The electrical fuel pump is switched off automatically when the engine speed is above 4000 RPM for at least 10s.

Starting the engine in flight (continued)

The loss of height, from the moment of extending the engine until it runs, is approx. 40 m (131 ft).

Should the prop stop spinning after the "DEKO"-handle was released, pull it back again, accelerate to a higher speed (approx. 105 km/h, 57 kts, 65 mph) and repeat the starting procedure.

WARNING: OBSERVE THE REQUIRED MINIMUM ALTITUDE !

CHECK LIST
EXTENDING AND STARTING THE POWER PLANT

- O **OPEN** fuel shut-off valve
- O Switch ASI to pitot head in nose
- O Set flaps at **+2**
- O Set speed to **90-100 km/h (49-54 kt, 56-62 mph)**
- O Ignition **ON**
- O *Only in manual operation:* ***EXTEND*** *power plant*
- O When power plant is fully extended:
  PULL decompression handle and **HOLD**
- O Accelerate to about **100 km/h (54 kt, 62 mph)**
- O **RELEASE** decompression handle
  WITH ENGINE RUNNING:
- O Climb at **90-100 km/h (49-54 kt, 56-62 mph)**

STOPPING AND RETRACTING THE POWER PLANT

- O Set flaps at **+2**
- O Reduce speed to about **90-100 km/h (49-54 kt, 56-62 mph)**
- O Ignition **OFF**
- O *Only in manual operation:*
  RETRACT power plant **for 3 seconds**
- O *Only in manual operation:*
  WHEN PROP HAS STOPPED: RETRACT *power plant fully*
- O Switch ASI to pitot head in fin
- O **CLOSE** fuel shut off valve

Note:
Engine restart was tested up to an altitude of 3300 m.

Power plant operation (ctd.)

For performance data with power plant extended refer to section 5.3.2.

Power plant operation only at flap setting **"+2"**.

The best climb rate is achieved at a speed of 90 to 95 km/h (49-51 kts, 56-59 mph).
The higher the flying speed, the lower is the rate of climb - zero climb is attained at V_H = approx. 120 km/h (65 kts, 77 mph), that is in level flight (normal operating range up to V_H).

Between V_H and the maximum permitted speed with ignition switched on = V_{max1}, the Arcus T is descending. (Caution range: With the engine running, a constant operation between V_H and V_{max1} = 125 km/h (67 kts, 78 mph) is not permitted). Slow down immediately.

If the maximum permitted speed with ignition switched on V_{max1} is exceeded, either reduce the flying speed or switch off the ignition.

With power plant extended and ignition switched "off", the maximum permitted speed V_{max2} is 180 km/h (97 kts, 112 mph).

There is no difference in the handling qualities between flying the Arcus T on its own power or with its engine retracted ("clean" configuration).

The stall speeds are as shown in section 5.2.2.

Stopping the engine and retracting the power plant with the engine control unit TB 06 (see check list on page 4.5.3.6)

To stop the engine, reduce the speed to about 90 – 100 km/h (49 – 54 kts, 56 - 62 mph) and switch off the ignition. The engine then retracts automatically to the intermediate position where it rests until the engine has stopped. After the engine has stopped the power plant automatically travels to the fully retracted position.

The ASI may now be switched back to the Pitot pressure head in the fin.

Close the fuel shut-off valve.

Automatic control of engine speed (RPM)

In order to reduce the increase of the engine speed as flying speed increases, the number of ignition impulses is electronically lowered on exceeding the speed for best climb V_Y so that the engine is throttled down.

Automatic ignition cut-off device

As a safety device the ignition of both cylinders is cut off just prior to reaching the maximum permitted propeller speed.

Normally the ignition is cut-off after reaching the maximum permitted speed V_{max1} (i.e. at about 125 km/h, 67 kt, 78 mph). The ignition nevertheless may also be cut off at lower speeds due to gusts, causing an increase of the RPM.

Once the ignition has been cut off, reduce the flying speed quickly to 95 km/h (51 kt, 59 mph) through 105 km/h (57 kt, 65 mph) so that the ignition is activated automatically.
Then the engine will run within its normal operating range.
Or switch the ignition off when the engine will not be further used.

If the automatic retraction of the power plant shall be avoided when the ignition is switched off you simultaneously have to press the manual operation switch up for a short time (<3s) when you switch off the ignition.

WARNING:

The ignition cut-off device is a safety measure.

Operating the "Arcus T" with the ignition cut-off device constantly in action is not permitted.

Leave this speed range immediately by reducing the flying speed or switch off the ignition.

IMPORTANT NOTE

In case of defective engine speed measurement (error message "E_dS", no RPM indication in the LCD display) the automatic ignition cut-off device is inactive.

In this case the flying speed has to be reduced below 115 km/h (62 kt, 71 mph) immediately to operate the engine within the certified limits or the ignition has to be switched off manually.

Prior to the next flight with engine operation the engine speed measurement system has to be repaired!

The use of the engine in rain must be avoided, as this may damage the propeller.

Cruising on own power

As clearly shown by the figures of section "Flight Performances", the longest range results from the

"sawtooth" - method,

which consists of the following flight sections being repeated as required:

- a climb at a speed of 90 to 95 km/h (49 - 51 kts, 56 - 59 mph)
- a glide in "clean" sailplane configuration.

Thereby the height to be consumed in glide should not be less than 500 m (1640 ft).

The maximum range in glide is achieved at a speed of about 105 to 115 km/h (57 - 62 kts, 65 - 71 mph), resulting in an average speed of about 100 km/h (54 kts, 62 mph).

Should the "sawtooth" method be impracticable due to low cloud ceiling or because of airspace restrictions, then cruising in level flight at a speed of about 120 km/h (65 kts, 75 mph) is also possible.

The range, however, is then considerably less - see section 5.3.2.

For cruising flight, the "sawtooth"-method should always be preferred. Besides the longer range, the crew is exposed to much less engine noise (RPMs in climb are less than in level flight).

Low speed flight and stall behaviour

(power plant extended)

Compared with the stall behaviour in "clean" configuration (power plant retracted), there are only small differences when aircraft stalls from straight and level or from turning flight.
When stalling with running engine (ignition on) the noise of the power plant increases considerably.

WARNING:

When stalling with extended power plant and ignition off the turbulent airflow produced by the propeller superimposes the vibration in the controls, so that in this case a stall warning is not noticeable.

4.5.4 Approach

a) Power plant retracted

Normal approach speed with airbrakes fully extended, flap position L and wheel down is 95 km/h (51 kts, 59 mph) without water ballast and flown solo, or 105 km/h (57 kts, 65 mph) at maximum permitted all-up mass.

The yellow triangle on the ASI at 105 km/h (57 kts, 65 mph) is the recommended approach speed for the maximum all-up mass without water ballast
(785 kg (1731 lb) with engine installed / 765 kg (1687 lb) with removed engine)

The airbrakes open smoothly and are very effective. The landing flare with the airbrakes fully opened, must be flown with care and very precisely. It is not recommended to leave the airbrakes fully opened while flaring. There is no noticeable change in trim.

During approach and landing flap setting +2 can also be used. Other than a 5 km/h (3 kts, 3 mph) speed increase, there are no other differences in the landing characteristics.

Side slipping is also a useful aid for landing. It is possible to maintain a straight line with the rudder deflected up to about 30 - 50 % of its travel resulting in a yaw angle of about 25° and a bank angle of about 10 - 20°.
The rudder must be held with perceptible counter-pedal pressure because of the control force reversal.
To return to level flight, normal opposite controls are required.

CAUTION:

With rudder fully deflected, side slips in a straight flight path are not possible
- the sailplane will slowly turn in the direction of the displaced rudder.
- Side slipping causes the ASI to read lower than the actual speed.
- During side slip with water ballast some water escapes through the vent hole of the water tank filler cap of the lower wing. Prolonged slips with water ballast are therefore not recommended.

WARNING:

Both the performance and the aerodynamic characteristics of the ARCUS T are affected adversely by rain or ice on the wing.
Be cautious when landing!
Increase the approach speed at least 5 to 10 km/h (3-5 kts, 3-6 mph).

b) Power plant extended

With power plant extended (ignition OFF), the Arcus T can be landed in the same manner as in "clean" configuration (power plant retracted). However, on approach, it must be taken into account that the flight performance is deteriorated due to the extended engine and prop:

All-up weight (mass)	600 kg 1543 lb	800 kg 1764 lb
Approach speed	95 km/h 51 kts 59 mph	105 km/h 57 kts 65 mph
Rate of descent Approx.	1.4 m/s 276 fpm	1.5 m/s 295 fpm
L/D approx.	19	19

However, the performance, though reduced, is sufficient to conduct approaches with the same techniques as in "clean" configuration.

> WARNING:
>
> Be cautious when extending the airbrakes!
> Due to the additional drag of the extended power plant, more forward stick must be applied to maintain the recommended approach speeds.

4.5.5 Landing

For off-field landings the undercarriage should always be extended; the impact absorption is much higher and therefore the crew is much better protected, especially from vertical impacts on landing.

Main wheel and tail wheel should touch down simultaneously.

During the landing roll, aileron control can be improved by setting the flaps forward to setting "0" or "+1".

To avoid a long ground run, make sure that the sailplane touches down at minimum speed.

A touch-down at a speed of 90 km/h (49 kts, 56 mph) instead of 75 km/h (40 kts, 47 mph) means that the kinetic energy to be dissipated by braking is increased by a factor of 1.44, increasing the rollout distance considerably.

The landing run can be considerably shortened by using the wheel break, the elevator control should be kept fully back.

4.5.6 Flight with water ballast

Water ballast is required for reaching the maximum permitted all-up mass.

Wing ballast tanks

The water tanks are integral compartments in the nose section of the main wing panels.

The tanks are to be filled with plain water only, through round openings in the upper wing surface featuring a strainer.

Tank openings are closed with plugged-in filler caps having a 6 mm (0.24 in.) female thread for lifting and venting. Lifting these caps is done with the aid of the tailplane rigging tool.

WARNING:
As the threaded hole in the filler cap also serves for venting the tank, it must always be kept open!
Never place tape over the hole.

Each wing tank has a capacity of approx. 92 Litres (24.30 US Gal., 20.24 IMP Gal.).

Dumping the water from full tanks takes approx. 3.5 minutes.

When filling the tanks it must be ensured that the maximum permitted all-up mass is not exceeded - see page 6.2.5.

The tank on either side must always be filled with the same amount of water to prevent any lateral imbalance.

Before taking off with partially full tanks, ensure that the wings are held level to allow the water to be equally distributed so that the wings are balanced.

Because of the additional mass in the wing panels, the wing tip runner should continue running for as long as possible during the launch.

Water ballast is dumped through an opening on the lower side of the main wing panels, 3.75 m (12.30 ft) away from the inbd. root rib.
When dumping water, make sure that water is flowing at the same rate from both wings (see below). If that is not the case, stop dumping in order to avoid unbalanced wings.

The dump valves are hooked up automatically on rigging the powered sailplane (with, ballast control knob to be set at "CLOSED).

Thanks to baffles inside the ballast tanks there is no perceptible movement of the water ballast when flying with partially filled tanks.

When flying at maximum permitted all-up mass, the low speed and stall behaviour of the Arcus T is slightly different from its flight characteristics without water ballast:

The stall speeds are higher (see section 5.2.2) and for correcting the flight attitude larger control surface deflections are required. Furthermore, more height is lost before a normal flight attitude can be regained.

WARNING:

In the unlikely event that the tanks empty unevenly or that only one of them empties (recognized by having to apply significant opposite aileron during straight flight, particulary at low speed), it is necessary to fly somewhat faster to take into account the higher mass and also to avoid stalling the Arcus T.

During the landing run the heavier wing should be kept somewhat higher (if permitted by the terrain) so that it touches down only at the lowest possible speed.
This reduces the danger of the Arcus T veering off course.

Water ballast fin tank (optional)

To ensure optimum performance in circling flight, a forward centre of gravity, caused by water ballast in the wing nose and/or by a crew member in the rear seat, may be compensated by carrying water ballast in the fin tank.

For details concerning the quantities to be filled refer to page 6.2.8.

The water ballast tank is an integral compartment in the fin with a capacity of 11.0 kg/Litres (2.91 US Gal., 2.42 IMP Gal.). This tank is filled as follows (with the horizontal tailplane in place or removed):

Set elevator trim to the rear.
Insert one end of a flexible plastic hose (outer diameter 8.0 mm/0.31 in.) into the tube (internal diameter 10.0 mm/0.39 in.) protruding from the rudder gap at the top of the fin on the left hand side. The other end of this hose is then connected to a suitable container which is to be filled with the required amount of clean water.

The fin tank has eleven (11) spill holes, all properly marked, on the right hand side of the fin, which indicate the water level – see accompanying sketch.

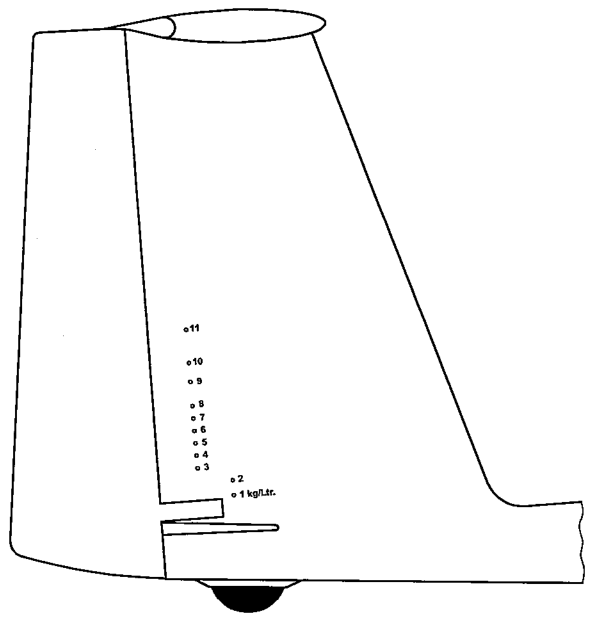
The venting of the tank is through the uppermost 11.0 kg/Litres hole (which always remains open – even with a full tank).

The ballast quantity to be filled depends on the water load in the wing tanks and/or on the load on the aft seat – see loading table on page 6.2.8.

Before filling the tank always tape closed one hole less than the load required, measured in kg/Litres.

If, for instance, a fin ballast load of 3.0 kg /Liters is required, only the lower two holes (1 and 2) are taped closed, any excessive water then escapes through the third spill hole, thus preventing overloading.

The tank label is on the right hand side of the fin.



Water is dumped from the fin tank through an opening on the underside of the fuselage tail boom - adjacent to the rudder.

The fin tank dump valve is linked to the torsional drive for the valves in the main wing panels so that these three tanks are always emptying simultaneously.

The time required to dump the ballast from a full fin tank is about two (2) minutes, therefore draining the full tanks of the main wing panels always takes longer.

Contd. on page 4.5.6.5

GENERAL

WARNING:

1. On longer flights at air temperatures near 0° C (32° F), water ballast must always be dumped when reaching a temperature of 2° C (36° F).

CAUTION:

2. There is little point in loading much water ballast if the average rate of climb expected does not exceed 1.0 m/s (197 fpm).
   The same applies to flights in narrow thermals requiring steep bank angles.

3. If possible, all water ballast should be dumped before conducting an off-field landing.

4. Before the wing water tanks are filled, it should be checked (with dump valves opened) that both drain plugs rise up equally.
   Clean and grease the plugs and their seats.
   Close the dump valves with the lever in the cockpit and check the tight sealing of both valves.
   Slightly dripping leakages can be corrected by pulling the drain plugs home with the threaded tool used to attach the horizontal tailplane.

WARNING:

5. Never pressurize the tanks - for instance by filling them directly from a water hose – and always pour in clean water only.

6. The Arcus T, should never be parked with full ballast tanks if there is any danger whatsoever of them freezing.
   Even in normal temperatures the parking period with full tanks should not exceed a few days.
   Optimally, for parking, all water ballast should be completely drained and filler caps removed to allow the tanks to dry out.

7. Before the fin tank is filled, check that those spill holes not being taped closed are indeed clear.

4.5.7 High altitude flight

When flying at high altitude it should be noted that true airspeed (TAS) increases in relation to indicated airspeed (IAS). This difference does not affect the structural integrity or load factors, but to avoid any risk of flutter, the following indicated values (IAS) must not be exceeded

Altitude		V_{NE} (IAS)			Altitude		V_{NE} (IAS)		
m	ft	km/h	kts	mph	m	ft	km/h	kts	mph
0-2000	0-6562	280	151	174					
3000	9843	270	146	168	7000	22966	220	119	137
4000	13123	263	142	163	8000	26247	207	112	129
5000	16404	245	132	152	9000	29528	195	105	121
6000	19685	232	125	144	10000	32808	182	98	113

Flying at temperatures below freezing point

When flying at temperatures below 0° C (32° F), as in wave or during the winter months, it is possible that the usual ease and smoothness of the control circuits is reduced.
It must therefore be ensured that all control elements are free from moisture so that there is no danger of them freezing solid. This applies especially to the airbrakes!

From previous experience, it has been found to be beneficial to cover the mating surfaces of the airbrakes with "Vaseline" along their full length so that they cannot freeze together. Furthermore the control surfaces should be moved frequently.

When flying with water ballast observe the instructions given in section 4.5.6.

Note:

From many years of experience, the polyester finish on this aircraft is known to become very brittle at low temperature.

Particularly when flying in wave at altitudes in excess of about 6000 m (approx. 20000 ft), where temperatures below - 30°C (- 22°F) may occur, the gel-coat, depending on its thickness and the stressing of the aircraft's components, is prone to cracking!

Initially, cracks will only appear in the polyester coating, however, with time and changing environment, cracks can eventually reach the Epoxy/glass cloth matrix.

Cracking is obviously enhanced by quick descents from high altitudes with associated very low temperatures.

WARNING:

For the preservation of a proper surface finish free from cracking, the manufacturer strongly advises against high altitude flights with temperatures below - 20°C (- 4°F)!

Also, a steep descent with the airbrakes extended should only be conducted in case of emergency (instead of the airbrakes the undercarriage may also be extended to increase the rate of sink).

4.5.8 Flight in rain

When flying the "Arcus T" with a wet surface or in rain, the water drops adhering to the wings cause a deterioration of its flight performance which cannot be expressed in numerical values due to the difficulties involved with such measurements. Often the air mass containing the moisture is also descending so that - compared with a wet powered sailplane in calm air - the sink rates encountered are higher.

Flight tests in rain, conducted by the manufacturer, did not reveal any significant differences in the stalling behaviour or stalling speeds.

It cannot be excluded, however, that excessive alterations of the airfoil (as caused by snow, ice or heavy rain) may result in higher minimum speeds.

Do not fly into rain areas with the motor extended and running because there is a danger that the propeller blades could be damaged.

Approach in rain: See page 4.5.4

4.5.9 Aerobatics

Only allowed **without** water ballast in the wings, up to an all-up mass of **690 kg (1521 lb)**, with flap position "0" and with **retracted or removed power plant:**

The following aerobatic manoeuvres are allowed:

(a) inside loop
(b) stall turn
(c) lazy eight
(d) spinning

WARNING:

The Arcus T is a high performance powered sailplane.
Therefore the Arcus T will gain speed very rapidly in dive.
Aerobatic manoeuvres with the Arcus T should only be performed if you can handle these aerobatic manoeuvres safely with similar sailplane types or if you've been briefed in detail by a pilot experienced in aerobatic manoeuvres with the Arcus T.
The permitted operating limits, see section 2, must be observed.

Compensation for the influence of the pilot in the rear seat on the centre of gravity of the powered sailplane for aerobatic manoeuvres is allowed.

Inside loop

Enter manoeuvres at a speed between 180 km/h and 210 km/h (recommended). The speed during the recovery of this manoeuvre should remain in the same speed range.

The load factor during the manoeuvre depends on the selected entering speed. The higher the entering speed is, the lower the needed maximum load factors are.

Lazy eight

Enter manoeuvre at a speed of about 180 km/h. After pulling up in a 45°-climb enter the turn at about 120 km/h. The speed during recovery: about 180 km/h.

Stalled turn

Enter manoeuvre at a speed between 180 km/h and 210 km/h. Pull up continuously into the vertical climb.

It is recommended to enter the manoeuvre at a speed of 200 km/h because then you will have more time to establish the vertical climb and you will not have to apply the maximum permitted load factor.

Contd.

During the vertical climb you can let the outside wing drag, so to speak. At an indicated airspeed of about 140 km/h to 150 km/h, apply continuous but smooth full rudder deflection in the desired direction, respectively against the dragged wing. During the turn apply aileron deflection in the opposite direction, to turn as cleanly as possible in one plane.
If you have induced the turn too late or too weakly, the turn may no longer be able to be executed as planned and the powered sailplane will fall backwards or sideward. If this occurs, the control surfaces could slam to one side and be damaged as the sailplane accelerates backwards. This must be avoided. Hold all the control surfaces firmly to their stops to avoid this knock over. Once the sailplane is moving in a forward direction again, roll level and pull out to recover to normal flight.

Spinning

Stationary spinning is possible with middle to rear centre of gravity positions and is only allowed with flap position **"0"**.

Spinning is induced with the standard method:

Stall the powered sailplane slowly until the first signs of separated airflow can be recognized, i.e. vibration in the controls. Then jerkily pull back the control stick and apply full rudder deflection into the desired direction of rotation. Depending on the position of the centre of gravity, the pitch attitude will differ widely.

Spinning is terminated with the standard method:

Apply full rudder deflection in the opposite direction as that of the rotation and neutralize elevator deflection. After the rotation has stopped return all control surfaces to neutral and pull out into normal flight.
The loss of height during the recovery to normal flight is about 100m (300ft.), the maximum speed is about 180 km/h.

With forward centre of gravity positions no stationary spinning is possible. The sailplane will switch over into a spiral dive very rapidly. This has to be stopped immediately. With middle centre of gravity positions stationary spinning is possible if induced with the standard method. But if the spinning is induced with rudder deflection into the direction of rotation and aileron deflection against the direction of rotation, then the sailplane will switch over into the spiral dive after a half to one turn. The spiral dive has to be ended immediately.

You can detect the spiral dive because of the increase of the indicated airspeed and the increasing load factor on the pilots.

It is not recommended to attempt a spin with a forward centre of gravity because the spin will change to a spiral dive almost immediately upon being initiated.

Section 5

5.1 Introduction

This section provides approved data for airspeed calibration, stall speeds and non-approved additional information.

The data in the charts has been computed from actual flight tests with a Arcus T in good condition and using average piloting techniques.

5.2 Approved data

5.2.1 Airspeed inidicator system calibration

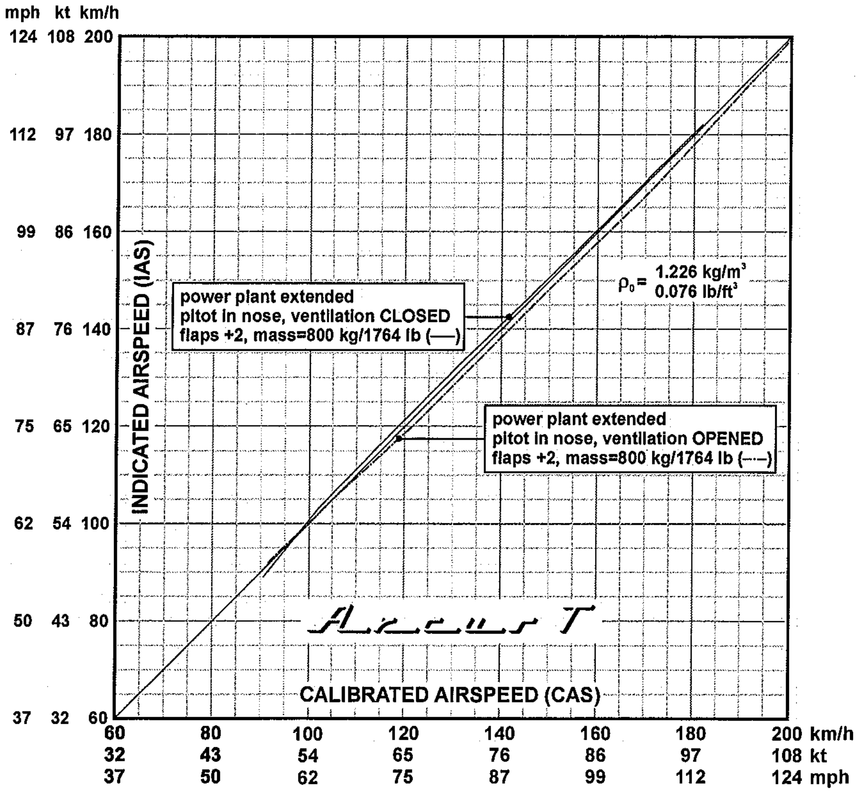
Errors in indicated airspeed (IAS) caused by Pitot/Static pressure errors may be read off from the calibration chart below and on page 5.2.1.2. These charts are applicable to free flight.

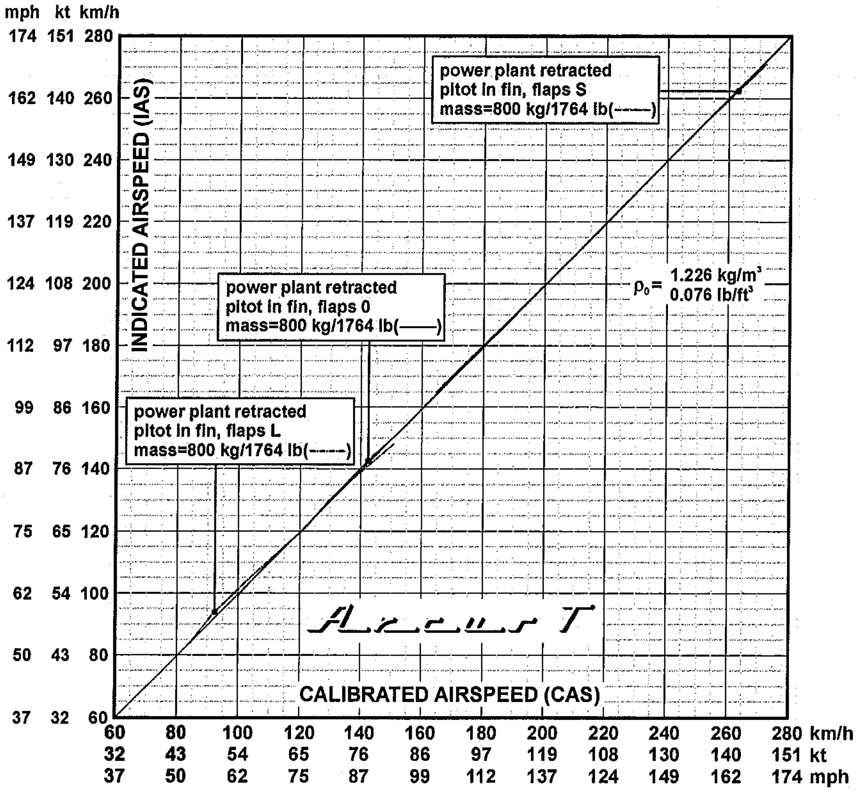
PITOT pressure source:

- power plant retracted: Fin (lower tube)
- power plant extended: Fuselage nose cone

STATIC pressure ports: Fuselage tail boom, approx. 1.02 m (40.16 in.) forward of the base of the fin

All airspeeds shown in this manual are indicated airspeeds (IAS) as registered by the airspeed indicator.




mph kt km/h
174 151 280
162 140 260
149 130 240
137 119 220
124 108 200
112 97 180
99 86 160
87 76 140
75 65 120
62 54 100
50 43 80
37 32 60
INDICATED AIRSPEED (IAS)
power plant retracted
pitot in fin, flaps S
mass=800 kg/1764 lb(------)
power plant retracted
pitot in fin, flaps 0
mass=800 kg/1764 lb(——)
power plant retracted
pitot in fin, flaps L
mass=800 kg/1764 lb(-----)
ρ0 = 1.226 kg/m³
0.076 lb/ft³
Arcus T
CALIBRATED AIRSPEED (CAS)
60 80 100 120 140 160 180 200 220 240 260 280 km/h
32 43 54 65 76 86 97 119 108 130 140 151 kt
37 50 62 75 87 99 112 137 124 149 162 174 mph

5.2.2 Stall speeds

The following stall speeds (IAS) at various flap settings were determined in straight and level flight:

Configuration		POWER PLANT RETRACTED	
All-up mass (approx.)		800 kg 1764 lb	800 kg 1764 lb
C/G position (aft of datum)		50 mm 2 in.	290 mm 11 in.
Stall speed, airbrakes closed			
flaps at "+2"	km/h kts mph	82 44 51	69 ± 2 37 ± 1 43 ± 1
flaps at "0"	km/h kts mph	85 46 53	69 ± 2 37 ± 1 43 ± 1
flaps at "S"	km/h kts mph	90 49 56	80 ± 2 43 ± 1 50 ± 1
airbrakes extended			
flaps at "L"	km/h kts mph	80 ± 2 43 ± 1 50 ± 1	73 ± 2 39 ± 1 45 ± 1

Configuration		POWER PLANT EXTENDED	
All-up mass (approx.)		800 kg 1764 lb	800 kg 1764 lb
C/G position (aft of datum)		75 mm 2.5 in.	290 mm 11 in.
Stall speed, airbrakes closed, full speed			
flaps at "+2"	km/h kts mph	80 43 50	76 42 47
airbrakes extended standing prop			
flaps at "L"	km/h kts mph	82 44 51	82 44 51

Airspeed indication near the stall speed oscillating especially with rearward c/g positions.

The loss of height from the beginning of the stall until regaining a normal level flight attitude is up to 60 m (197 ft).

5.2.3 Take-off distances

Taking-off on own power is n o t permissible - the Arcus T is only capable of self - sustaining.

5.2.4 Additional information

None

5.3 Non-approved additional- information

5.3.1 Demonstrated crosswind performance

The maximum crosswind velocity, at which take-offs and landings have been demonstrated, is

20 km/h (11 kts).

5.3.2 Flight polar

All values shown below refer to MSL (0 m) and 15° C (59° F).

a) Power plant retracted (or removed)

All-up weight (mass)	**620 kg** **1367 lb**	800 kg 1764 lb
Wing loading	**kg/m²** **lb/ft²**	
Minimum rate of sink	**m/s** **fpm**	
Best L/D		
at a speed of	**km/h** **kts** **mph**	

b) Power plant extended – iginition switched OFF

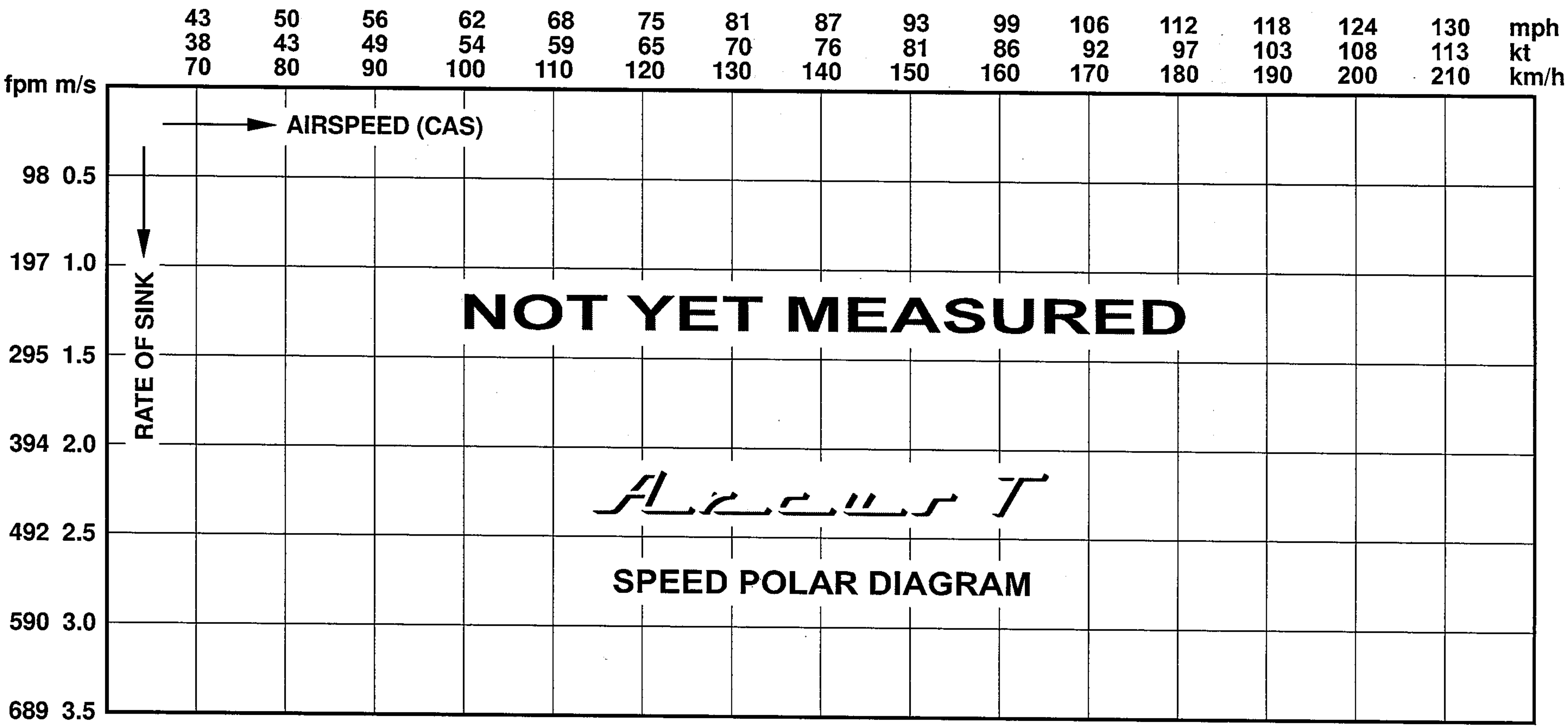
(engine not running)

All-up weight (mass)	800 kg 1764 lb
Rate of sink approx.	1.5 m/s 295 fpm
at a speed of approx.	105 km/h 57 kts 65 mph
Best L/D (-)	19

Power plant extended – maximum power applied

All-up weight (mass)	680 kg 1499 lb	800 kg 1764 lb
Best rate of climb	1.05 m/s 207 fpm	0.60 m/s 118 fpm
at a speed of	90 km/h 49 kts 56 mph	95 km/h 51 kts 59 mph

A level flight attitude is attained at a speed V_H = 120 km/h (65 kts, 75 mph).


43 50 56 62 68 75 81 87 93 99 106 112 118 124 130 mph
38 43 49 54 59 65 70 76 81 86 92 97 103 108 113 kt
70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 km/h
fpm m/s
98 0.5
197 1.0
295 1.5
394 2.0
492 2.5
590 3.0
689 3.5
AIRSPEED (CAS)
RATE OF SINK
NOT YET MEASURED
Arcus T
SPEED POLAR DIAGRAM

Range (in calm winds)

a) Values below refer to level, flight at max. continuous power:

Cruising speed approx.: 120 km/h (65 kts, 75 mph)

Fuel consumption approx.: 16.00 Litre/h
4.23 US Gal./h
3.52 IMP Gal./h

Usable fuel: Litre	US Gal.	IMP Gal	Endurance	Range
15.7	4.15	3.45	0:59 min	118 km (64 nm)

b) The following values are based on the "sawtooth"-method (see page 4.5.3.7) at an all-up mass of 680 kg and 800 kg and the climb effected at max. continuous power:

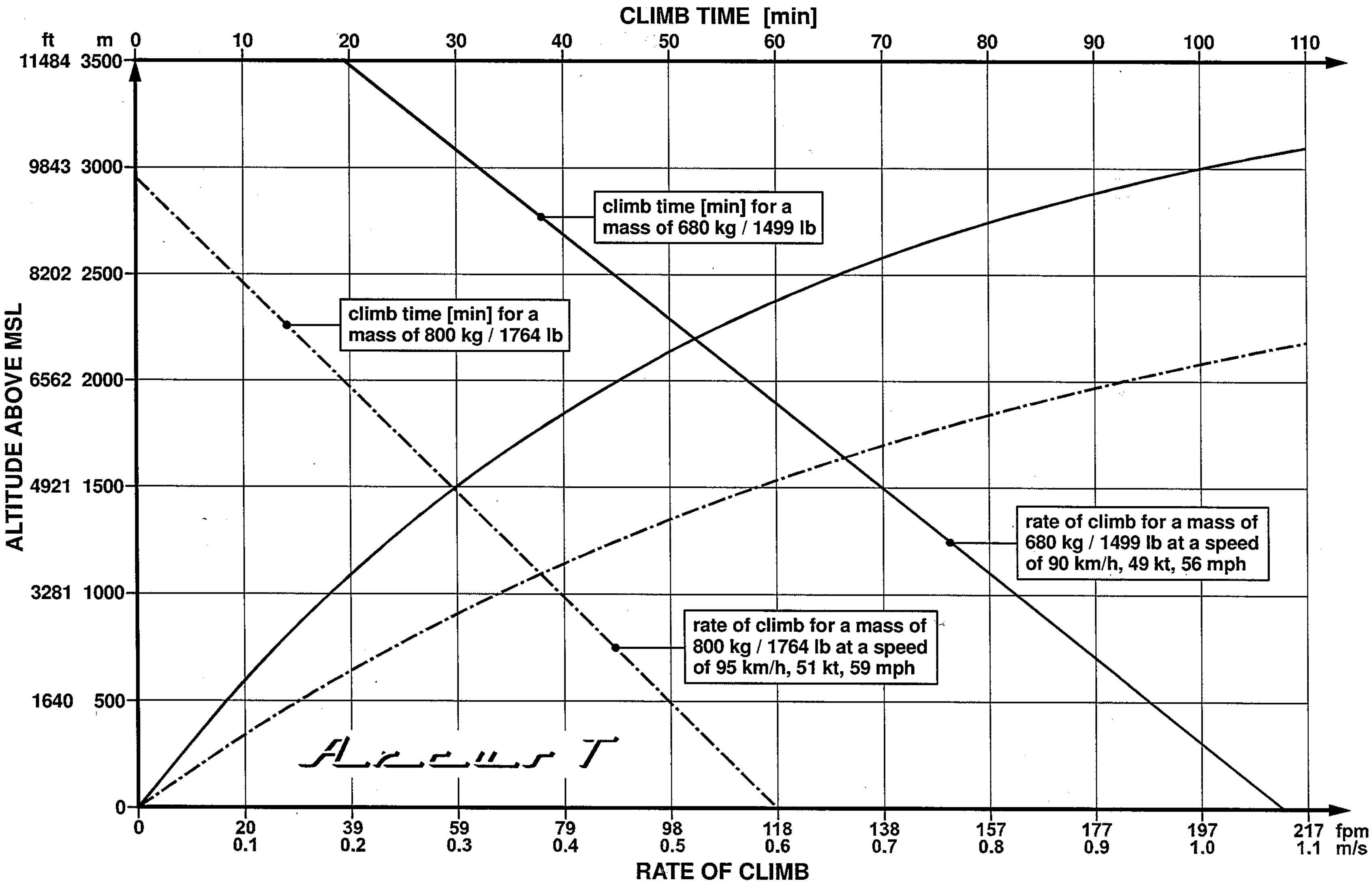
Average cruising speed approx.: 100 km/h (54 kts, 62 mph)

Fuel consumption approx.: 16.00 Litre/h
4.23 US Gal./h
3.52 IMP Gal./h

Usable fuel: Litre	US Gal.	IMP Gal.	All -up mass	Endurance	Range
15.7	4.15	3.45	800 kg 1764 lb	0:59 min	150 km (81 nm)
			680 kg 1499 lb		210 km (113 nm)

The range determined is based on climbs between 500 m and 1500 m (1640 - 4921 ft) above MSL.

Climb performance: See diagram on page 5.3.2.4
Maximum altitude that can be sustained: 2700m with 800 kg all-up mass


CLIMB TIME [min]
0
10
20
30
40
50
60
70
80
90
100
110
ft m
11484 3500
9843 3000
8202 2500
6562 2000
4921 1500
3281 1000
1640 500
0
ALTITUDE ABOVE MSL
climb time [min] for a mass of 680 kg / 1499 lb
climb time [min] for a mass of 800 kg / 1764 lb
rate of climb for a mass of 680 kg / 1499 lb at a speed of 90 km/h, 49 kt, 56 mph
rate of climb for a mass of 800 kg / 1764 lb at a speed of 95 km/h, 51 kt, 59 mph
Arcus T
0
20 0.1
39 0.2
59 0.3
79 0.4
98 0.5
118 0.6
138 0.7
157 0.8
177 0.9
197 1.0
217 1.1
fpm m/s
RATE OF CLIMB

5.3.3 Noise data

At 300 m (984 ft) AGL, the measured fly-over noise level of the Arcus T is

57.3 dB(A)

and is thus far below the noise level limit of 65.3 dB(A).

The Arcus T therefore complies with the revised Aircraft Noise Protection Requirements: Lärmschutzforderungen für Luftfahrzeuge (LSL), effective on January 1st, 1991, with changes, effective on April 6th, 1993.

It is recommended to wear a head set while the engine is running.

Section 6

6.1 Introduction

This section contains the seat load range within which the Arcus T may be safely operated.

Procedures for weighing the powered sailplane and the calculation method for establishing the permitted payload range and a comprehensive list of all equipment available are contained in the Arcus T Maintenance Manual.

The equipment actually installed during the last weighing of the powered sailplane is shown in the "'Equipment List" to which page 6.2.3 and 6.2.4 refer to.

6.2 Weight and balance record / Permitted seat load range

The following loading chart, page 6.2.3 (power plant installed) or 6.2.4 (power plant removed) shows beneath others the empty mass, the maximum and minimum load on the seats and the maximum load in the fuselage.

These charts are established with the aid of the last valid weighing report - the required data and diagrams are found in the Maintenance Manual.

Both loading charts (weight & balance log sheets) are only applicable for this particular Arcus T, the serial number of which is shown on the title page.

A front seat load of less than the required minimum
is to be compensated by ballast - there are three (3) methods:

1. By attaching ballast (lead or sand cushion) firmly to the lap belt mounting brackets.

   Optional trim ballast mounting provision(s)

2. a) By installing ballast (by means of lead plates) at the base of the front instrument panel (for further information refer to page 6.2.2)

   b) By attaching, ballast (in addition to method 2 a) by means of lead plates to the front control stick mounting frame on the starboard side near the base of the instrument panel (for further details refer to page 6.2.2).

3. When flown with two occupants, the minimum load on the front seat can be reduced by 25% of the load on the rear seat. This reduction of the minimum load on the front seat is allowed only if the nose heavy moment of the load in the rear seat is not compensated by water ballast in the fin.

Altering the front seat load by using trim ballast

Optional trim ballast mounting provision

On request the Arcus T is equipped with one or two mounting provisions for trim ballast, thus allowing a reduction of the placarded minimum front seat load (when flown solo) as shown in the table below.

a) Trim ballast mounting provision below the front instrument panel:

This tray holds up to three (3) lead plates with a weight of 3.7 kg / 8.2 lb each. Plates are made to fit only into this tray.

Lever arm of trim ballast plates:

2153 mm (7.06 ft) ahead of datum

b) Trim ballast mounting provision on front stick mounting frame on the starboard side:

This tray holds up to three (3) lead plates with a weight of 3.9 kg / 8.6 lb each. Plates are made to fit only into this tray.

Lever arm of trim ballast plates:

1953 mm (6.41 ft) ahead of datum

WHEN FLOWN SOLO: Difference in seat load as compared with placarded front seat minimum		Number of lead plate required:
up to 5,0 kg (11 lb) less	see a)	1
up to 10,0 kg (22 lb) less		2
up to 15,0 kg (33 lb) less		3
up to 20,0 kg (44 lb) less	see b)	4
up to 25,0 kg (55 lb) less		5
up to 30,0 kg (66 lb) less		6

WEIGHT AND BALANCE LOG SHEET (loading chart) FOR S/N 46...
POWER PLANT INSTALLED

Date of weighing:		19.12.13							
Empty mass [kg]		507,6							
Equipment list dated		19.12.13							
Installed batteries 2)		count		count		count		count	
		1	E	1	E	1	E	1	E
		1+1	C1/C2		C1/C2		C1/C2		C1/C2
		1	F1/[redacted]		F1/F2		F1/F2		F1/F2
Empty mass c/g position aft of datum		542,0							
Max. load [kg] in fuselage		238,7							
Load [kg] on the seats (crew including parachute):									
Front seat load when flown solo:	max.	115		115		115		115	
with two occupants:	max.	115		115		115		115	
Rear seat load with two occupants:	max.	115		115		115		115	
Water ballast fin tank installed (YES / [redacted])									
Front seat load regardless of load on rear seat	min. 1)	75							
Inspector Signature / Stamp		LBA Ausweis-Nr. 3073 Klasse 3							

1) **Warning:**
If a fin tank is installed, the pilot must either dump all water ballast prior of take-off, or ensure that the ballast quantity in the fin tank is compensated by an appropriate load in the wing tanks and/or on the rear seat.

2) Installed batteries (see page 7.12.2):

(E) engine battery
(C1/C2) batteries in front of rear stick mounting frame
(F1/F2) batteries in fin

For the determination of the water ballast quantity permitted in the wing tanks refer to page 6.2.5.

For the determination of the water ballast quantity permitted in the fin tank refer to page 6.2.6 through 6.2.8.

WEIGHT AND BALANCE LOG SHEET (loading chart) FOR S/N ....
POWER PLANT REMOVED

Date of weighing:									
Empty mass [kg]									
Equipment list dated									
Installed batteries [2]		count		count		count		count	
			E		E		E		E
			C1/C2		C1/C2		C1/C2		C1/C2
			F1/F2		F1/F2		F1/F2		F1/F2
Empty mass c/g position aft of datum									
Max. load [kg] in fuselage									
Load [kg] on the seats (crew including parachute):									
Front seat load when flown solo:	max.	115		115		115		115	
with two occupants:	max.	115		115		115		115	
Rear seat load with two occupants:	max.	115		115		115		115	
Water ballast fin tank installed (YES / NO)									
Front seat load regardless of load on rear seat	min.[1]								
Inspector Signature / Stamp									

1) **Warning:**

If a fin tank is installed, the pilot must either dump all water ballast prior of take-off, or ensure that the ballast quantity in the fin tank is compensated by an appropriate load in the wing tanks and/or on the rear seat.

2) Installed batteries (see page 7.12.2):

(E) engine battery
(C1/C2) batteries in front of rear stick mounting frame
(F1/F2) batteries in fin

For the determination of the water ballast quantity permitted in the wing tanks refer to page 6.2.5.

For the determination of the water ballast quantity permitted in the fin tank refer to page 6.2.6 through 6.2.8.

Maximum water ballast load

Maximum all-up mass including water ballast:	800 1764	kg lb
C/G position of water ballast in wing tanks (forward of datum):	17 0.70	mm in.
Total capacity of wing tanks:	185	Litre (48.9 US. Gal /40.7 IMP Gal)

Table of water ballast loads at various empty masses and seat loads:

Empty mass + fin ballast + fuel		LOAD ON THE SEAT (kg / lb)																																
		kg 70		lb 154	kg 80		lb 176	kg 100		lb 220	kg 120		lb 264	kg 140		lb 308	kg 160		lb 353	kg 180		lb 396	kg 200		lb 441	kg 220		lb 485	kg 230		lb 507
kg	lb																																	
410	903	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	170	44.9	37.4	160	42.3	35.2
420	925	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	180	47.6	39.6	160	42.3	35.2	150	39.6	33.0
430	947	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	170	44.9	37.4	150	39.6	33.0	140	36.9	30.8
440	969	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	180	47.6	39.6	160	42.3	35.2	140	36.9	30.8	130	34.3	28.6
450	991	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	170	44.9	37.4	150	39.6	33.0	130	34.3	28.6	120	31.7	26.4
460	1013	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	180	47.6	39.6	160	42.3	35.2	140	36.9	30.8	120	31.7	26.4	110	29.1	24.2
470	1035	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	170	44.9	37.4	150	39.6	33.0	130	34.3	28.6	110	29.1	24.2	100	26.4	22.0
480	1057	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	180	47.6	39.6	160	42.3	35.2	140	36.9	30.8	120	31.7	26.4	100	26.4	22.0	90	23.8	19.8
490	1079	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	170	44.9	37.4	150	39.6	33.0	130	34.3	28.6	110	29.1	24.2	90	23.8	19.8	80	21.1	17.6
500	1101	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	180	47.6	39.6	160	42.3	35.2	140	36.9	30.8	120	31.7	26.4	100	26.4	22.0	80	21.1	17.6	70	18.5	15.4
510	1101	185	48.9	40.7	185	48.9	40.7	185	48.9	40.7	170	44.9	37.4	150	39.6	33.0	130	34.3	28.6	110	29.1	24.2	90	23.8	19.8	70	18.5	15.4	60	15.9	13.2
520	1147	185	48.9	40.7	185	48.9	40.7	180	47.6	39.6	160	42.3	35.2	140	36.9	30.8	120	31.7	26.4	100	26.4	22.0	80	21.1	17.6	60	15.9	13.2	50	13.2	11.0
530	1169	185	48.9	40.7	185	48.9	40.7	170	44.9	37.4	150	39.6	33.0	130	34.3	28.6	110	29.1	24.2	90	23.8	19.8	70	18.5	15.4	50	13.2	11.0	40	10.6	8.8
540	1191	185	48.9	40.7	180	47.6	39.6	160	42.3	35.2	140	36.9	30.8	120	31.7	26.4	100	26.4	22.0	80	21.1	17.6	60	15.9	13.2	40	10.6	8.8	30	7.9	6.6
		Litre	US Gal.	IMP Gal.	Litre	US Gal.	IMP Gal.	Litre	US Gal.	IMP Gal.	Litre	US Gal.	IMP Gal.	Litre	US Gal.	IMP Gal.	Litre	US Gal.	IMP Gal.	Litre	US Gal.	IMP Gal.	Litre	US Gal.	IMP Gal.	Litre	US Gal.	IMP Gal.	Litre	US Gal.	IMP Gal.
		WATER BALLAST IN WING TANKS																																

Note:
When determining the max. permitted wing water ballast load, allowance must be made for water ballast in the fin tank (see page 6.2.7 and 6.2.8) and fuel , i.e. this load must be added to the empty mass shown on the above table.
Empty mass as per page 6.2.3 resp. 6.2.4, fin ballast as per page 6.2.8.

Water ballast in (optional) fin tank

In order to shift the centre of gravity close to its aft limit (favourable in terms of performance), water ballast may be carried in the fin tank (m_{FT}) to compensate for the nose-heavy moment of:

- water ballast in main wing panels (m_{WT})
  and/or
- loads on the aft seat (m_{P2})

Compensating water ballast in main wing panels

The determination of the ballast quantity in the fin tank (m_{FT}) is done with the aid of the diagram shown on page 6.2.8.

Compensating loads on the aft seat

Pilots wishing to fly with the centre of gravity close to the aft limit may compensate the nose-heavy moment of loads on the aft seat with the aid of the diagram shown on page 6.2.8.

Note: When using fin ballast to compensate for the nose - heavy moment of wing ballast and loads on the aft seat, then both values resulting from the diagrams on page 6.2.8 must be taken into account.

The maximum amount of water ballast, available for compensating the above mentioned nose-heavy moments, is 11 Litres (2.91 US Gal., 2.42 IMP Gal.), which is the maximum capacity of the fin tank.

WARNING:

Compensation for masses exceeding the placarded minimum front seat load by the use of water ballast in fin tank is n o t allowed!

If the influence of the load on the rear seat is taken into account for the minimum load on the front seat, the nose-heavy moment of the load on the rear seat may not be compensated with water ballast in the fin tank.

Water ballast in (optional) fin tank

> **IMPORTANT NOTE**
>
> When determining the maximum usable load in the fuselage, the quantity of water ballast in the fin does not need to be taken in account because of flight mechanic reasons.

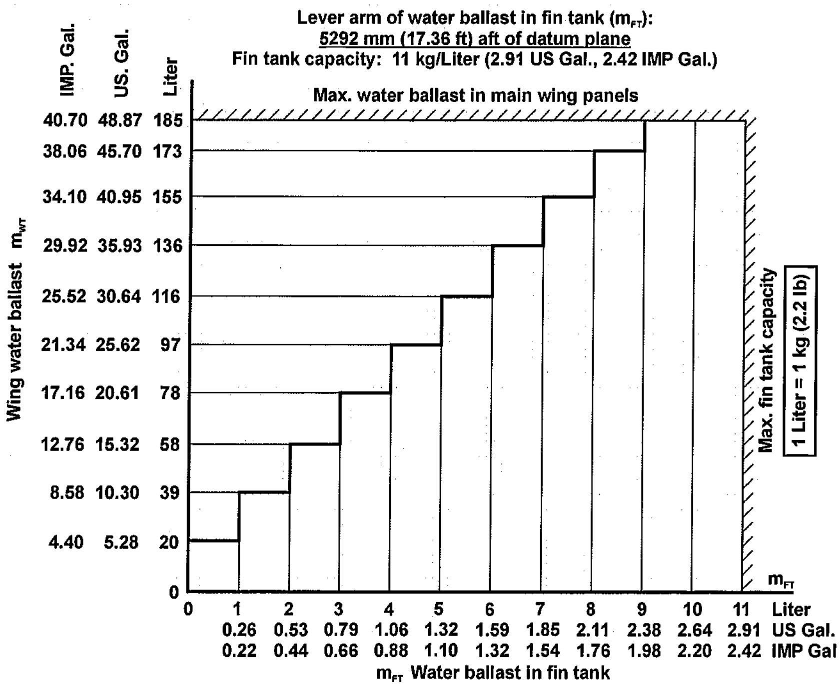
In order to avoid exceeding the maximum permitted all-up weight (mass), the ballast in the fin tank must also be taken into account when determining the maximum allowable ballast quantity for the wing tanks.

Example:

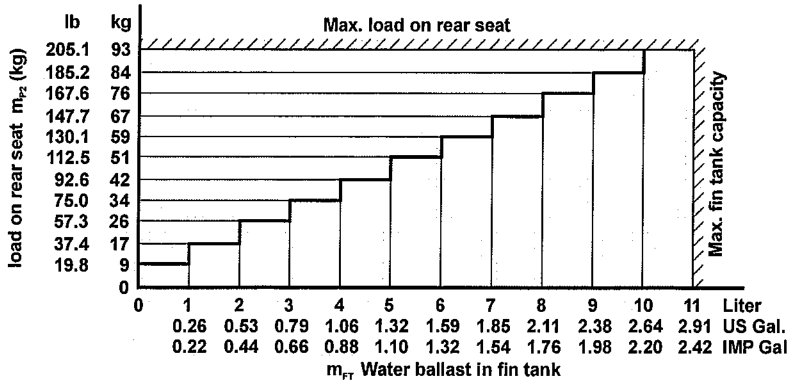
Assumed ballast load in wing tanks:	40 kg/Litres (88 lb/10.6 US Gal)
Assumed load on aft seat:	75 kg (165 lb)

According to the diagrams on page 6.2.8 the following loads in the fin tank are permissible (fill only full Litres):

For ballast in wing tank	:	m_{FT}	=	2 kg/Litre (4.4 lb/0.53 US Gal)
For load on aft seat	:	Δm_{FT}	=	8 kg/Litres (17.6 lb/2.11 US Gal)
Total ballast in fin tank	:	$m_{FT} + \Delta m_{FT}$	=	10 kg/Litres (22.1 lb/2.64 US Gal)



NOTE: Always full Liters are to be filled. Where value jumps, either the higher or the lower amount of ballast may be used.



Section 7

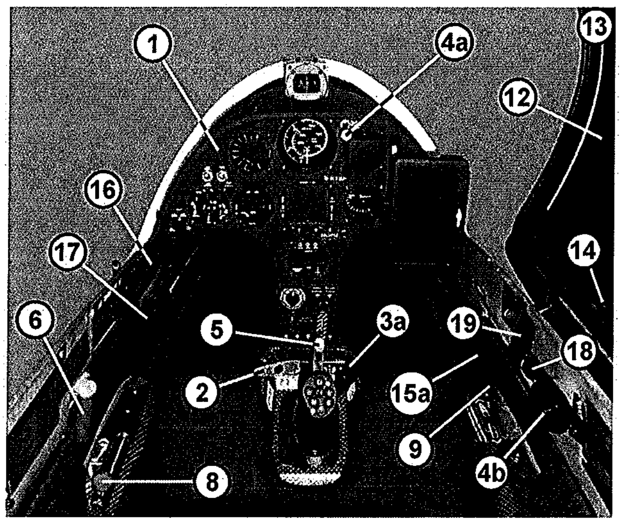
7.1 Introduction

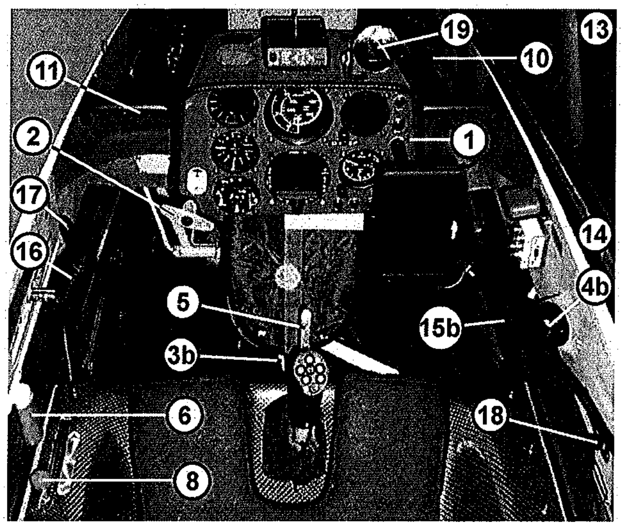
This section provides a description of the powered sailplane including the operation of its systems.

For details concerning optional- systems and equipment refer to section 9 "Supplements".

For further descriptions of components and systems refer to section 1 of the Maintenance Manual.

7.2 Cockpit description





All instruments and control elements are within easy reach of the crew.

(1) Instrument panels

With canopy opened, the instruments for either seat are easily accessible.

The front instrument panel covering is attached to the front instrument panel with two bolts. With opened canopy the front instrument panel can be pivoted upwards.

The rear panel is mounted to the steel tube transverse frame between the seats.

Both instrument panels and their glare shields are easily detached after removing the mounting bolts.

(2) Tow release handles

T-shaped handles, actuating the tow release(s) installed (c/g and/or nose hook)

Front seat: Yellow handle at the base of the control stick on the left

Rear seat: Yellow handle on the lower left hand side of the instrument panel

The winch cable/aerotow rope is released by pulling one of the handles.

(3a) Rudder pedal adjustment (front seat)

Black T-shaped handle on the right hand side near the base of the control stick.

Forward adjustment:	Release locking device by pulling the handle, push pedals to desired position with the heels and let them engage.
Backward adjustment:	Pull handle back until pedals have reached desired position. Forward pressure with heels (not the toes) engages pedals in nearest notch with an audible click.

An adjustment of the rudder pedals is possible on the ground and in the air.

(3b) Rudder pedal adjustment (rear seat)

Locking device on pedal mounting structure on the cockpit floor.

Forward or backward adjustment:
Pull up locking pin by its ring, slide pedal assembly to desired forward or backward position and push locking pin down into nearest recess.

An adjustment of the rudder pedals is possible on the ground and in the air.

(4) Ventilation

a) Small black knob on the front instrument panel on the right:
(Ventilation air quantity)

Pull to open ventilator nozzle
Push to close ventilator nozzle

b) Adjustable bull-eye-type ventilator starboard of the right:

Turned clockwise:	Ventilator closed
Turned anti-clockwise:	Ventilator open

Additionally the clear vision panels or the air scoop in the panels may be opened for ventilation.

(5) Wheel brake

A wheel brake handle is mounted on either control stick.

(6) Airbrake levers

Levers (with blue marking), projecting downwards, below cockpit inner skin on the left.

Forward position:	Airbrakes closed and locked
Pulled back about 40 mm (1.6 in.):	Airbrakes unlocked
Pulled fully back:	Airbrakes fully extended

(7) Head rests

a) Front seat (not illustrated):
Head rest is an integrated component of the seat back and is adjusted with the seat back.

b) Rear seat (not illustrated):
Mounting rail on upper fuselage skin. Head rest is gradually and horizontally adjustable:
Depress locking tap, slide head rest in desired position and let locking tap engage into nearest recess.

(8) Elevator trim

Green knob (for either seat) at the seat pan mounting flange on the left.

The spring-operated elevator trim is gradually adjustable by swinging the knob slightly inwards, sliding it to the desired position and swinging it outwards to lock.

Forward position - nose-heavy
Backward position - tail-heavy

(9) Control- lever for dumping water ballast from wing tanks and (optional) fin tank

Black lever on the front seat rest on the right.

Forward position - dump valves closed
Backward position - dump valves opened

The lever is held in the respective final positions

Fin tank (option)

The fin tank dump valve control is connected to the torque tube actuating the valves in the wing so that all three valves open and close simultaneously.

(10) Seat back (front seat)

Sliding black knob on the cockpit inner skin on the right.

Adjustment: Tilt front end of grip slightly inwards, slide grip to desired position and let engage by tilting it outwards.

In addition, the attachment position can be adjusted in the seat rest.

(11) Rip cord anchorage

Front seat:	Red steel ring on tubular frame between the seats on the left
Rear seat:	Red steel ring at the front of the steel tube centre frame (not illustrated) on the left

(12) Canopy

The one-piece plexiglass canopy hinges sideways on flush fittings.

Take care that the cable restraining the open canopy is properly hooked up.

(13) Canopy locking and jettisoning levers

Lever with red grip for either seat on the canopy frame on the left.

Forward position: canopy locked

To open or jettison the canopy, swing one of the levers back up to the stop (approx. 90°) and raise canopy to the side.

(14) Canopy release

Black lever (for front and rear seat) in the canopy frame on the right.

To open or jettison the canopy, push one of the levers back up to the stop, disconnect the holding rope and raise canopy.

Undercarriage

(15a/b) Front / Rear seat

Retracting :	Disengage black handle below the cockpit inner skin on the right, pull it back and lock in rear recess
Extending:	Disengage handle, push it forward and lock in front recess

(16) Flap lever

Black lever, projecting upwards, on the left cockpit inner skin of each seat. Swing lever slightly inwards, move to desired setting and let engage in appropriate notch.

Forward position:	High speed range
Backward position:	Low speed range

(17) Decompression handle

Black T-shaped handle on the left hand side on the GFRP inner skin, forward of the airbrake lever, provided for either seat.

With handle pulled back, the decompression valves are opened.

(18) Fuel shut-off valve

Black knob on cockpit inner skin on the right (for either seat)

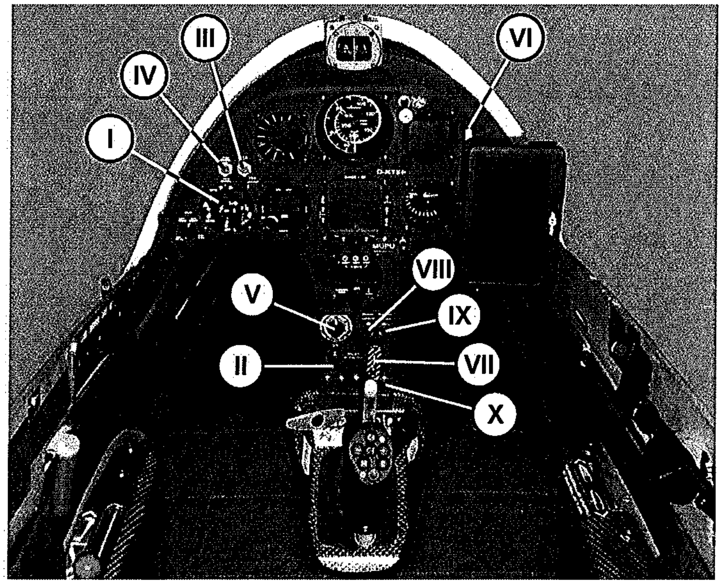
Forward position:	Valve opened
Rearward position:	Valve closed

(19) Rear-view mirror

This is provided in the front cockpit on the right side and in the rear cockpit on the instrument glare shield.

7.3.1 Instrument panels

front panel:

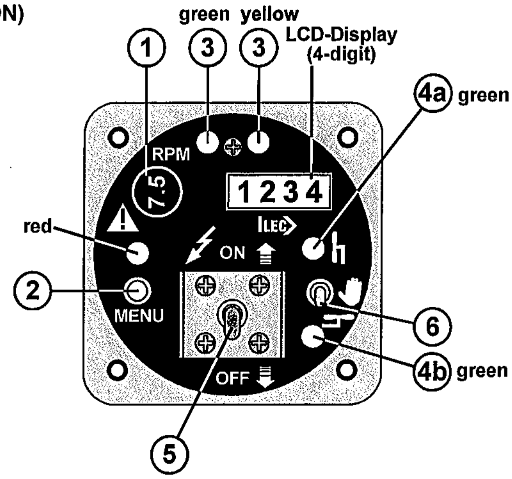


For a description of components No. I through X refer to the following pages: 7.3.2 through 7.3.18.
A description of the instrumentation and an illustration of the rear instrument panel is not deemed necessary.

I Engine control unit

FRONT SEAT

REAR SEAT (OPTION)



The engine control unit TB 06 is designed for a partially automatic extension and retraction procedure of the power plant for engine operation.

The individually necessary steps for the engine extension and retraction process and the engine starting procedure are integrated and controlled by logic operations. The position of the power plant and operating conditions of the engine are detected by two limit switches and an RPM sensor.

In parallel a widely manual engine operation is still possible too.

I Engine control unit TB 06 (contd.)

a) Overview about the readouts and the control elements

(1) Automatic circuit breaker (7,5A)

Protecting the pylon's spindle drive (actuator)

(2) Menu push-button

Features:

- Scroll through the menu of the LCD display
- Affirmation of warnings and error messages
- Reset of the short period elapsed-time counter
- Start calibration of the fuel capacity indication
- Enter data in the set-up menu

(3) RPM indicator

No signal	- RPM below 4500 RPM or engine stopped
GREEN signal	- RPM between 4500 RPM and 6500 RPM (= normal operating range)
YELLOW signal (steady)	- RPM above 6500 RPM
YELLOW signal (flashing)	- RPM between 6500 RPM and 6750 RPM for more than 5 min

(4) Pylon position indicator

a) Upper LED

GREEN signal (flashing)	- Power plant travelling out
GREEN signal (steady)	- Power plant fully extended

b) Lower LED

GREEN signal (flashing)	- Power plant travelling in
GREEN signal (steady)	- Power plant fully retracted

(I) Engine control unit TB 06 (contd.)

a) Overview of the readouts and the control elements (contd.)

(5) Ignition Switch

UP:
- Ignition ON
- Power plant extends completely (automatic mode)
- Electrical fuel pump is switched on

DOWN:
- Ignition OFF
- Power plant retracts completely (automatic mode)
- The electrical fuel pump is switched off in case it is still running

Note:

When the ignition is switched off, the power plant retracts automatically only if the following conditions are met:
The engine speed must have been above 4000 RPM for at least 10s and at the moment the ignition is switched off the engine speed must be at least 2000 RPM.

If either of these conditions are not met the power plant is retracted automatically only to the intermediate position and then stops.

At that point, the engine control unit changes to the manual mode and the engine retraction process must be completed with the manual operation switch.

(I) Engine control unit TB 06 (contd.)

a) Overview about the readouts and control elements (contd.)

(6) Manual operation switch (Pylon drive switch)

The manual operation switch is used to extend or retract the power plant:

- on the ground or
- when the control unit has switched off from automatic mode in the case of missing or incorrect information concerning the position of the power plant or the engine speed. (Manual mode, display shows "HAnd")

The manual operation switch has three positions:

UP	- The power plant extends while the switch is held up (rocker switch). In the fully extended position the pylon spindle drive is cut off by a micro limit switch.
MIDDLE	- Automatic mode
DOWN	- The power plant retracts while the switch is held down (rocker switch). In the fully retracted position the spindle drive is cut off by a micro limit switch.

Note:

When the engine control unit is operating normally in the automatic mode, it is not necessary to use the manual operation switch in flight.

In the manual mode the pilot must execute and control the extension and retraction procedure of the power plant with the manual operation switch!

The power plant can only be retracted with the manual operation switch when the ignition is switched off.

When the power plant is extended by using the ignition switch, the extension process stops when the manual operation switch is held down. Then the automatic mode is switched off.

When the power plant is retracted by using the ignition switch, the retraction process stops when the manual operation switch is held up. Then the automatic mode is switched off.

(I) Engine control unit TB 06 (contd.)

a) Overview about the readouts and control elements (contd.)

(7) LCD-Display

In the four-digit LCD-display the following values are displayed when the engine is extended:

- Engine speed (RPM)	4 9 5 0
- Fuel quantity indicator (Litre)	I 2 _ L
- Battery voltage (Volt)	I 2,3 U
- Resettable short period elapsed-time counter (min in decimal notation)	t 1 2.9
- Short period elapsed-time counter (h:min)	2 2:1 3

In addition with the engine completely retracted:

- Elapsed-time counter (h)	I 2 2 h
- Fuel tank calibration factor	C 1 0 0
- Fuel tank calibration mode	C A L _

Moreover the following information is shown:

- Advice for operation, warnings and error messages
- Set-up menu

With the menu push-button (2) you can scroll through the menu pages.

When the ignition is switched on and the engine is running in the automatic mode the engine speed is displayed.

When the ignition is switched off in the automatic mode the fuel quantity is displayed.

Operation advice, warnings and error messages always come to the front. In this case the LCD-display also starts blinking.

Warnings and error messages must be affirmed with the menu push-button. The warning indication then disappears from the LCD-display.

When the reason for the warning or error message continues, the messages will be repeated.

(I) Engine control unit TB 06 (contd.)

a) Overview about the readouts and control elements (contd.)

(8) Alarm-LED

The red coloured alarm LED flashes when operation advices, warnings and error messages are shown in the LCD-display.

(-) Buzzer

Continuous tone:	Warning notices for high engine speed, fuel quantity reserve, low battery voltage, or (limit) switch error
Intermittent tone:	Operation advice for "fuel shut off valve"
Dual tone:	Operation advice for "manual mode"

(I) Engine control unit TB 06 (contd.)

b) Normal operation advice and warnings

1) **Engine speed indication** `4 9 5 0`

Shows the engine speed in RPM, step size 50 RPM.
A decimal point between first and second digit is displayed when the electrical fuel pump is working. `4.3 0 0`

(In normal operation the electrical fuel pump is running only when the engine is first started)

Warnings:

- Display is flashing with engine speed > 6500 RPM
- RPM indicators (LED) light up, s. a) (3)

Reset of the warnings with the menu button is not possible!

2) **Fuel quantity indicator** `I 2 _ L`

Shows the fuel quantity in the fuel tank (whole litre, max. 12 litre).

Warnings:

- Fuel indicator is blinking when the remaining fuel ≤ 5 litre
- Warning is not repeated when the ignition is OFF
- Warning is repeated every 4min when the engine is extended
- Fuel indication with defective fuel quantity sensor: `- - - L`

Reset of the warnings with the menu button is possible!

3) **Battery voltage** `I 2,3 U`

Shows the voltage of the electrical power supply system that the engine control unit is connected to.

Warnings:

- Display is blinking when the battery voltage ≤ 10,5 Volt

Reset of the warnings with the menu button is possible!

(I) Engine control unit TB 06 (contd.)

b) Normal operation advice and warnings (contd.)

4) **Resettable short period elapsed-time counter** `t 2 7.9`

Resettable elapsed-time counter (0 to 99.9 min)
Reset: With the ignition switched off and the engine retracted scroll down the menu until this value is displayed and then press the menu button for 3s.

5) **Short period elapsed-time counter** `2 2:5 3`

Elapsed-time counter (0 to 99 h:99 min), resettable only by the manufacturer.

6) **Elapsed-time counter** `1 2 2 h`

Elapsed-time counter (whole hours rounded down from 0 to 999 h), resettable only by the manufacturer.

7) **Calibration factor of the fuel quantity indicator** `C 1 0 0`

Calibration procedure: see Flight Manual Section 4.2.2

8) **Calibration mode of the fuel quantity indicator** `C A L _`

Calibration procedure: see Flight Manual Section 4.2.2

9) **Electrical fuel pump**

The electrical fuel pump is switched on automatically when the engine is extended via the ignition switch. The fuel pump is switched off when the engine speed is above 4000 RPM for at least 10s.
As long as the electrical fuel pump is running a decimal point between first and second digit of the engine speed indication is shown.

(I) Engine control unit TB 06 (contd.)

c) Operation advice

1) **Fuel shut-off valve limit switch** `F U E L`

   Monitoring the setting of the fuel shut-off valve
   Display is blinking + Alarm LED + continuous sound alarm when the fuel shut-off valve is not completely open with ignition ON.
   No reset of the operation advice by the menu button with the exception of the sound alarm!

2) **Manual operation** `H A n d`

   Display is blinking + Alarm LED + dual tone sound when the automatic mode is switched off.
   With engine speed >0: Display alternates with the engine speed indication.

   No permanent reset of the operation advice by the menu button!

3) **Operation of the decompression valves** `d E C O`

   Advice to pull the handle for the decompression valves when the ignition is switched ON and the limit switch for the fully extended position of the power plant is reached (Engine ready for starting).
   With engine speed >0: Display alternates with the RPM indication.
   No reset of the operation advice by the menu button!

4) **Automatic mode blocked ("Pause")** `P A U S`

   Protection from unintentional travelling of the power plant
   (When the master switch is switched ON or when the power plant is extended completely with the manual operation switch).
   The system returns to the automatic mode when the ignition switch is changed.

(I) Engine control unit TB 06 (contd.)

d) Operation modes of the engine control unit

Automatic mode: The automatic mode is the standard operation mode for the engine control unit TB 06 in flight. In this case extension and retraction of the power plant are completely controlled by the ignition switch.

Manual operation: In normal case it is reasonable only for pre-flight inspection or maintenance to travel the power plant with the manual operation switch. When the manual operation switch is released before the power plant is completely extended or retracted the LCD display shows "HAnd" to call the pilot's attention to this situation.

Change from automatic to manual operation: If the engine control unit in the automatic mode detects an incorrect situation of the power plant control the system displays an error message on the LCD-display.
An error displayed by the engine control unit first must be affirmed by the pilot (press on the menu button), because if the detected fault continues, not all of the features of the automatic engine control are available to the pilot any more.
If the error affects the power plant travel control and if the power plant is not completely extended or retracted at that moment, the LCD-display shows "HAnd" after the error has been affirmed. Then any further travelling of the power plant must be initiated and controlled by the pilot through the manual operation switch.

Detailed procedures in case of error messages see section e).

Important Note:

During operation in the manual mode the pilot has to check that the propeller has stopped turning before the power plant is retracted by the manual operation switch!

The ignition is not affected by error messages or if the engine control unit changes from automatic mode to manual mode.

Important note:

The following procedures will help the pilot to safely finish the flight in case of an error occurrence in the engine control system. Prior to the next flight with engine operation the cause of the fault must be fixed!

(I) Engine control unit TB 06 (contd.)

e) Error messages and corrective measures

In the following the error messages displayed by the engine control unit are described.

By means of this information the pilot can identify errors or malfunction of limit switches and sensors and can start corrective measures.

i) Minor errors

The following errors have limited effect on the engine operation:

Error message	Description	Restrictions in operation as long as the error exists	Troubleshooting in flight
E_dS	(„Drehzahl-Sensor") Engine speed measuremant defective	- No RPM displayed - No engine over-speed ignition cut-off - No complete automat. retraction of the power plant	None
E_FU	Fuse of the pylon spindle drive popped	Power plant no longer travels	- Push the fuse on the control unit in again - Extend/retract power plant manually if needed
E_FP	Electrical fuel pump defective	Bad starting characteristics of the engine	None

Procedure:

1. Press menu button to affirm the error message in the LCD-display.
2. Take possible corrective measures. If error still exists continue the flight taking into account the restrictions listed above.

(I) Engine control unit TB 06 (contd.)

e) Error messages and corrective measures (contd.)

ii) Limit switch errors

The error messages listed below indicate defective limit switches for the extended or retracted position.
Further extension or retraction of the power plant in this case is only possible according to the procedures listed below.

Error message	Description	Restrictions in operation as long as the error exists	Troubleshooting in flight
E_S0	Limit switch error for the extended position	Extension of the power plant only with the procedure listed below	Procedure see below
E_S1	Limit switch error for the retracted position	Retraction of the power plant only with the procedure listed below	Procedure see below
E_S2	Limit switch error for the both positions	Retraction of the power plant only with the procedure listed below	Procedure see below

Procedure:

1. **Press the menu button to affirm the error message(s) in the LCD-display.**
2. **Check the fuse for the pylon spindle drive in the engine control unit and push the fuse in again if necessary.**

If the error continues and the engine control unit doesn't return to the automatic mode:

3. **Press manual operation switch in the designated direction. Then it will take approx. 3s until the power plant starts to move.**
   Note: The power plant can only be retracted when the ignition is switched off!
4. **If another error message appears in the LCD-display affirm it with the menu button, but don't release the manual operation switch before the final position is reached. Otherwise step three of this procedure must be repeated!**
   Uppon reaching the final position, the fuse of the pylon spindle drive blows.
5. **When the engine is fully extended switch ignition ON to start the engine.**

(I) Engine control unit TB 06 (contd.)

e) Error messages and corrective measures (contd.)

ii) Limit switch errors (ctd.)

Important Note:

When in the manual mode the manual operation switch is pressed although the limit switch for the retracted or extended position has already been reached (green LED shining) the error message „E_S0" respectively „E_S1" will be displayed after approx. 3s.
When the error message is affirmed normal operation of the engine control unit can be continued without any restrictions.

iii) Internal error („program")

The error message listed below is displayed when an internal error has occurred when the engine control unit was switched on

Error message	Description	Restrictions in operation as long as the error exists	Troubleshooting in flight
E_PG	Internal error	Engine control unit inoperative	Switch master switch off and on

Procedure:
In this case the engine control unit is inoperative,
If a reset with the master switch doesn't help contact the manufacturer.

(I) Engine control unit TB 06 (contd.)

f) Set-up menu

In the set-up menu the settings of the engine control unit can be viewed. Some settings are adjustable.

Enter the set-up menu: With the engine fully retracted press the menu button simultaneously when you switch on the master switch.

Then you can scroll through the set-up menu with the menu button. When the button is released for 5s the engine control unit leaves the set-up menu and changes to normal operations mode.

To enter the entry mode for the adjustable settings, press the menu push-button for more than 5s. Then the display of the adjustable setting starts to blink and can be changed by further touching the menu button. Numerical values can be entered only in ascending order.
When there are no further entries the engine control unit returns to the normal operations mode.

(I) Engine control unit TB 06 (contd.)

f) Set-up menu (contd.)

Set-up menu display

1)	Engine control unit serial number	7 0 2 3
2)	Software-version	S 1.0 6
3)	Hardware-version	H 1.0 0
4)	Aircraft model-software	n t u s
5)	Timing for intermediate position (s)	J _ 1.9

Adjustable settings in the set-up menu

5) Timing for intermediate position J _ 1.9

During the automatic retraction the power plant rests in the intermediate position until the engine comes to a stop. The intermediate position is fixed by timing.

The timing from the fully extended position to the intermediate position can be adjusted in the set-up menu.

Settings see Maintenance Manual Section 5.11.

(II) Master switch

ON/OFF-switch on the instrument panel.

UP	-	ON
DOWN	-	OFF

(III) Pneumatic valve

Panel-mounted two-way cock (should a total energy compensation probe be used).

T.E.	=	Variometer(s) fed from T.E. Compensation probe
STATIC	=	Variometer(s) fed from Static Pressure ports
or		
T.E.	=	Variometer(s) fed from T.E. Compensation probe
T.E. slow	=	Variometer(s) fed from T.E. Compensation probe with restrictor

With power on and valve switched to "STATIC" or "T.E. slow", the reading of the variometer(s) is steadier.

(IV) Pneumatic valve

Panel-mounted two-way cock for feeding the ASI from either the Pitot pressure head in the fin or in the fuselage nose.

in glide	=	Pitot head in fin
power on	=	Pitot head in nose

(V) Battery selector switch
Selector switch for the power supply of the Avionic and optional additional equipment: either by the engine battery or by other, optional Avionic batteries, see page 7.12.3

(VI) Outside air temperature indicator

When carrying water ballast, the outside air-temperature (OAT) must not drop below 2° C / 36° F.

(VII) Priority selector switch (only with optional second engine control unit)

Key down: engine control unit in front panel active

Key up: engine control unit in rear panel active

Note:
The inactive engine control unit retains all its indicating functions – the commanding functions, however, are cut off.
To avoid an interruption of the automatic engine control during the switch over the following conditions should be met before activating the Priority selector switch:

- both ignition switches have to be in the same position
- engine has to be fully retracted or fully extended
- both manual operation switches have to be in the middle position

Warning:
With power on, the priority may only be changed if the ignition on both control units is "ON", otherwise the engine may stop running. With power off, the priority may only be changed if the ignition on both control units is "off" to prevent the ignition from being switched on inadvertently.

(VIII) Fuse (6,3 A)

Fuse to protect the complete avionics when fed from the engine battery.

(IX) Fuse (4 A)

Fuse to protect the two electrical fuel pumps (second fuel pump optional) and the rpm - sensor.

(X) Fuses (2 - 4 A)

Fuses to protect each avionic (see Maintenance Manual – Diagram 9).

7.4 Undercarriage

The main wheel of the Arcus T is retractable with shock absorber struts and features a hydraulic disc brake. The nose wheel (if installed) and tail wheel (or skid) are fixed.

The extension/retraction process of the main wheel is described on page 7.2.7 (cockpit description). The operation of the main wheel brake is given on page 7.2.4.

For a technical description of the retractable undercarriage including its wheel brake system see also page 1.2.3 of the Arcus T Maintenance Manual.

7.5 Seats and restraint systems

The seat pans are bolted to mounting flanges provided on both sides of the cockpit.

The front seat features a back rest, which is adjustable in flight - see also page 7.2.5 concerning the procedure for its adjustment.

For each seat the lap straps are anchored to the seat pan.

While the shoulder straps for the front seat are attached to the steel tube transverse frame, those for the rear seat are anchored to the steel tube center frame.

A list of approved restraint systems is provided in section 7.1 of the Arcus T Maintenance Manual.

7.6 Static pressure and Pitot pressure system

Static pressure sources

a) Static pressure ports are on either side of the fuselage tail boom, 1.02 m / 40.16 in. forward of the base of the fin.

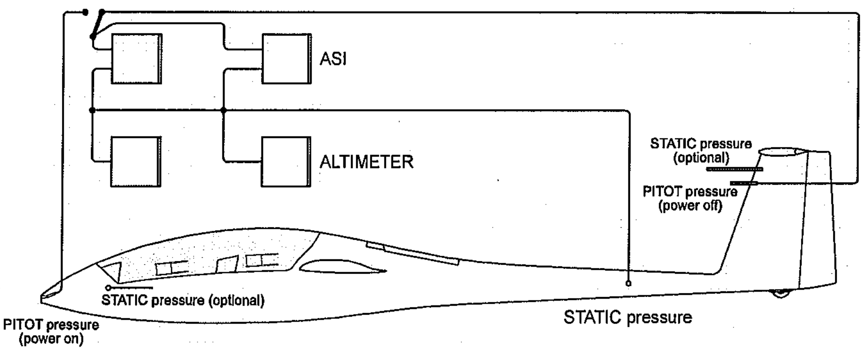
b) On request a special static pressure probe can be installed near the top of the fin (for other instruments besides the ASI).

c) On request additional static pressure ports can be provided on either side of the fuselage skin next to the front instrument panel.

Pitot pressure sources

a) For configuration "power plant retracted", the Pitot pressure head installed near the upper end of the fin is to be used.

b) For configuration "power on", the Pitot pressure head situated in the fuselage nose is to be used.



7.7 Airbrake system

Schempp-Hirth type airbrakes are employed on the upper surface of the main wing panels.

A schematic view of the airbrake system is given in the Maintenance Manual.

7.8 Baggage compartment

An enclosed baggage compartment is not provided.

For soft objects (like jackets etc.), however, there is space above the spar stubs.

Any such items must be taken into account when determining the permissible load on the seats.

7.9 Water ballast system(s)

A steel cable connects the operating lever in the cockpit to the dump valve of the (optional) fin tank and a further steel cable to the torque tube actuating the wing tanks - see page 7.9.3.

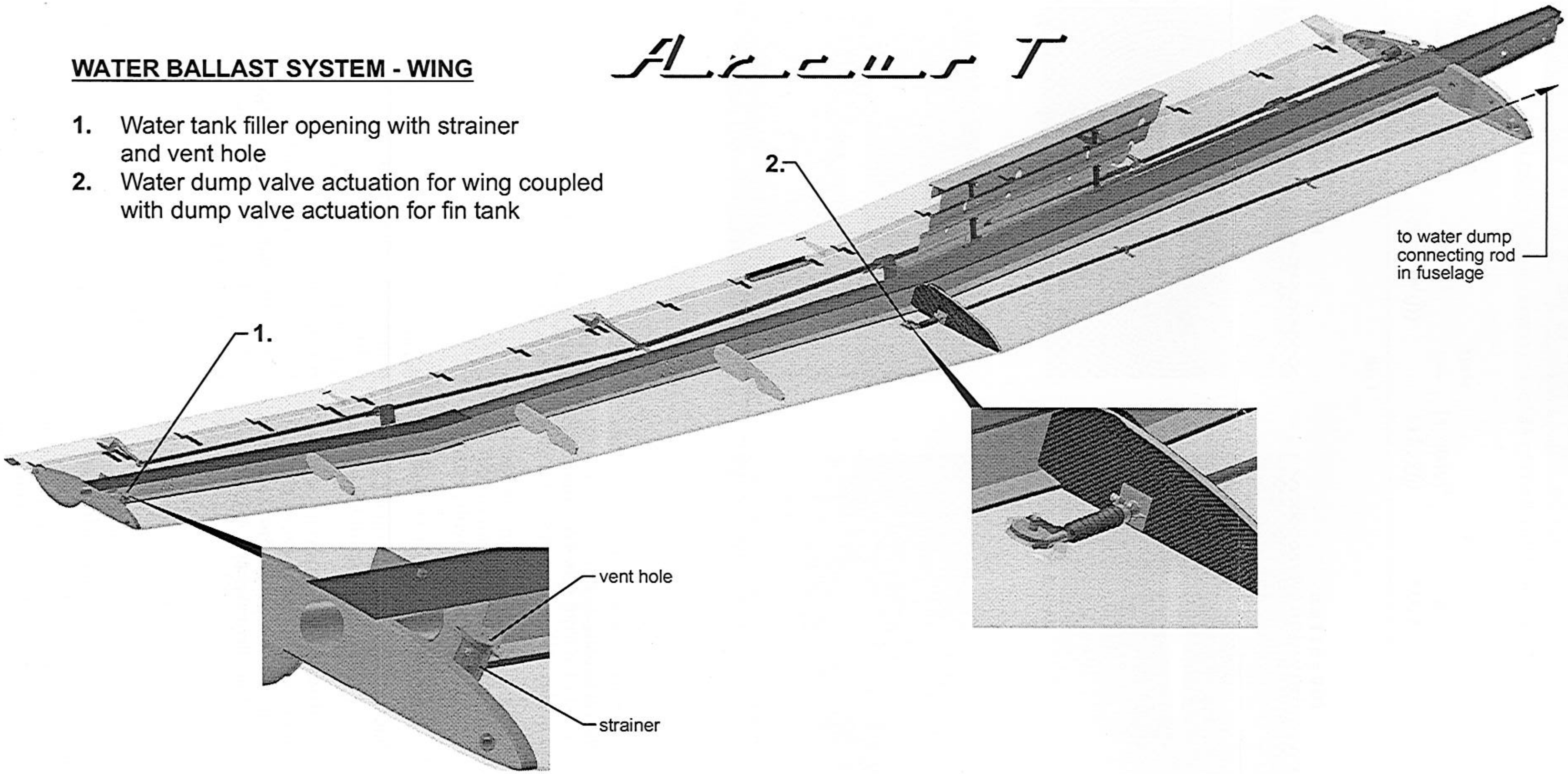
On rigging the main wing panels, the torque tube in the fuselage is automatically hooked up to the torsional drive of the dump valve plugs.

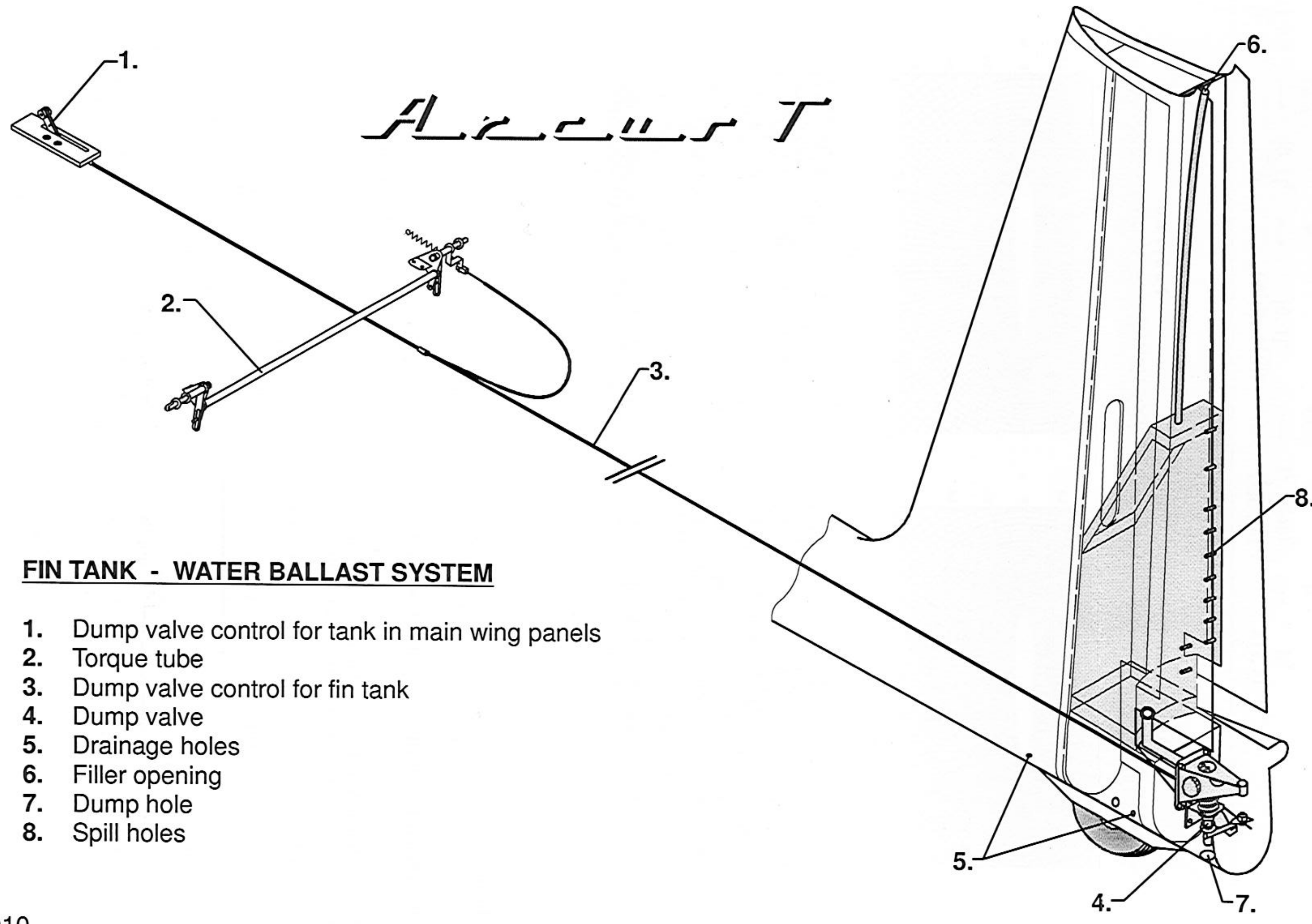
The torque tube is rotated to the "CLOSED" position by spring force - see page 7.9.2.

The operating lever locks in its respective final positions.

WATER BALLAST SYSTEM - WING

1. Water tank filler opening with strainer and vent hole
2. Water dump valve actuation for wing coupled with dump valve actuation for fin tank





FIN TANK - WATER BALLAST SYSTEM

1. Dump valve control for tank in main wing panels
2. Torque tube
3. Dump valve control for fin tank
4. Dump valve
5. Drainage holes
6. Filler opening
7. Dump hole
8. Spill holes

7.10 Power plant system

For a description and technical data of the power plant refer to the relevant manuals.
The engine with its propeller is suspended in the fork of the steel tube pylon by means of four engine shock mounts. Two engine arresting wires are also attached to the pylon.

An electrical spindle drive actuator, anchored to the fuselage center frame and assisted by a gas strut, swings the pylon up and down.

A cable-actuated linkage opens and closes the doors of the engine bay automatically when the power plant extends/retracts.

A panel-mounted ILEC engine control unit combines a number of functions necessary to operate the power plant system - a description of this unit is found on pages 7.3.2 and on.

The only other controls required for operating the power plant are the fuel shut-off valve and the decompression handle.

For instructions on how to operate the power plant refer to pages 4.5.3.5 and on.

7.11 Fuel System

The central fuel tank is fitted between the struts of the steel tube centre frame and is to be filled as described on Page 4.2.2.1.

The tank vent line extends overboard on the right side at the top of the fin - its outlet must never be taped closed!

A drain valve for this tank is located at the bottom of the engine bay and is directly accessible.

For a view of the fuel system refer to Page 7.11.2.

Fuel gauge

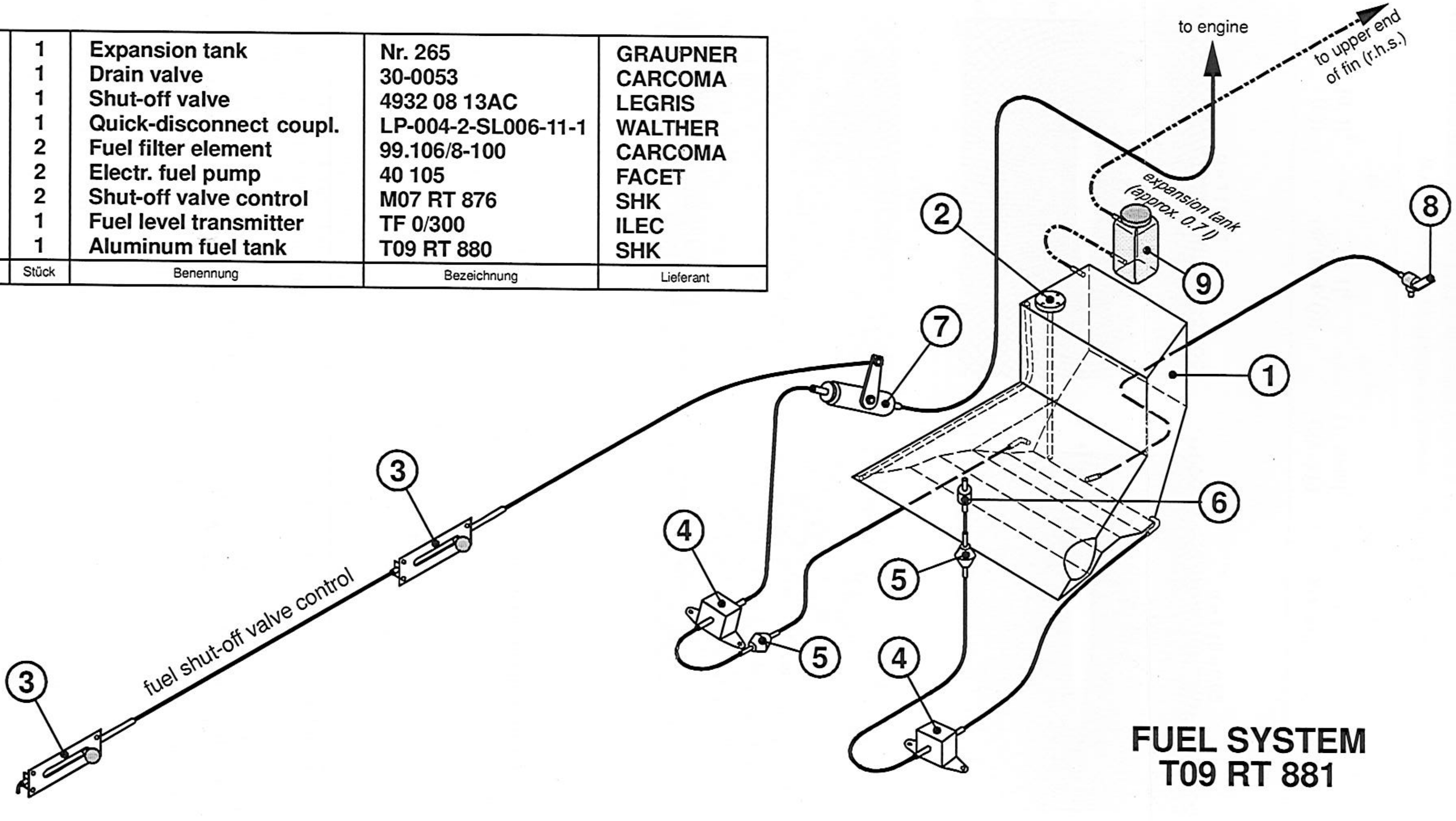
A fuel quantity indicator is provided for the front instrument panel - a description is given on Page 7.3.5.

Cleaning and draining the central tank

The tank may be cleaned and drained through its drain opening.

The fuel system is to be cleaned in compliance with the Arcus T Maintenance Manual.

Teil	Stück	Benennung	Bezeichnung	Lieferant
9	1	Expansion tank	Nr. 265	GRAUPNER
8	1	Drain valve	30-0053	CARCOMA
7	1	Shut-off valve	4932 08 13AC	LEGRIS
6	1	Quick-disconnect coupl.	LP-004-2-SL006-11-1	WALTHER
5	2	Fuel filter element	99.106/8-100	CARCOMA
4	2	Electr. fuel pump	40 105	FACET
3	2	Shut-off valve control	M07 RT 876	SHK
2	1	Fuel level transmitter	TF 0/300	ILEC
1	1	Aluminum fuel tank	T09 RT 880	SHK



FUEL SYSTEM
T09 RT 881

7.12 Electrical system

Gliding avionics

When operated in the plain sailplane configuration, the minimum instrumentation required does not require an electrical power source.

Additional- equipment is to be wired as shown on page 7.12.2 and 7.12.3 "ELECTRICAL SYSTEM – AVIONICS" and must comply with the manufacturer's instructions for the relevant instrument(s).

Power for the avionics is supplied by one or more batteries, see pages 7.12.2 and 7.12.3.

Using a selector switch, power to the glider avionics may also be provided by the power plant battery.

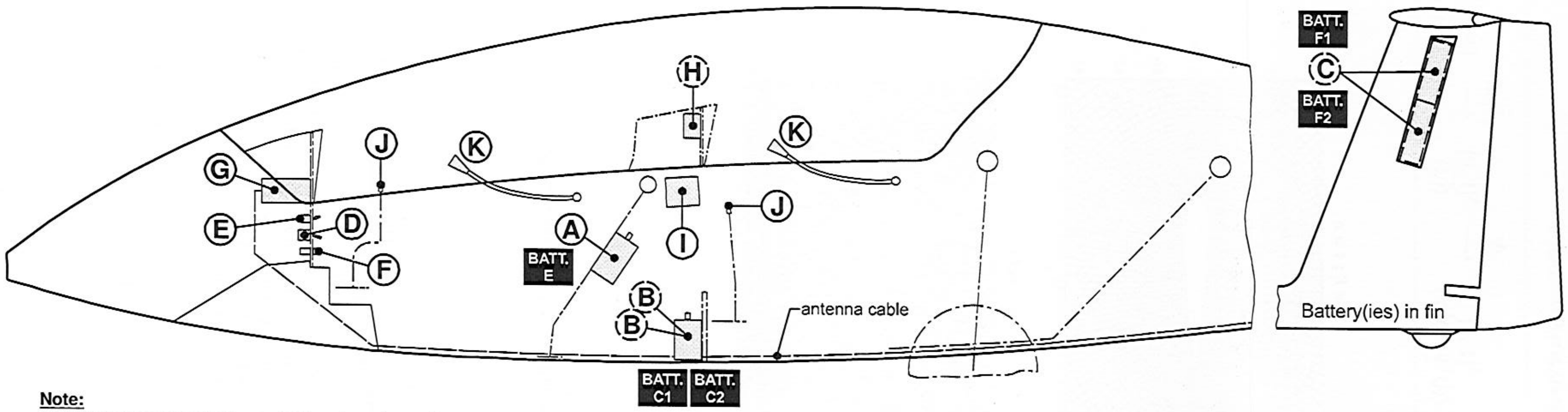
A main switch controls the batteries for the power plant and gliding avionics.

Power plant

The engine features a single-ignition system by means of magnetos (contactless) - a 12 V power source, attached to the steel tube transverse frame as shown on page 7.12.4, 7.12.5 and 7.12.6 "ELECTRICAL SYTEM - POWER PLANT", is only necessary for pylon spindle drive operation and the engine control unit.

This power source is controlled by the main switch and its voltage is displayed by the engine control unit.

By using a selector switch, it may also be used for the gliding avionics.



Note:
VHF-Transceiver and other additional equipment to be wired in compliance with the manufacturer's instructions and be fused individually.

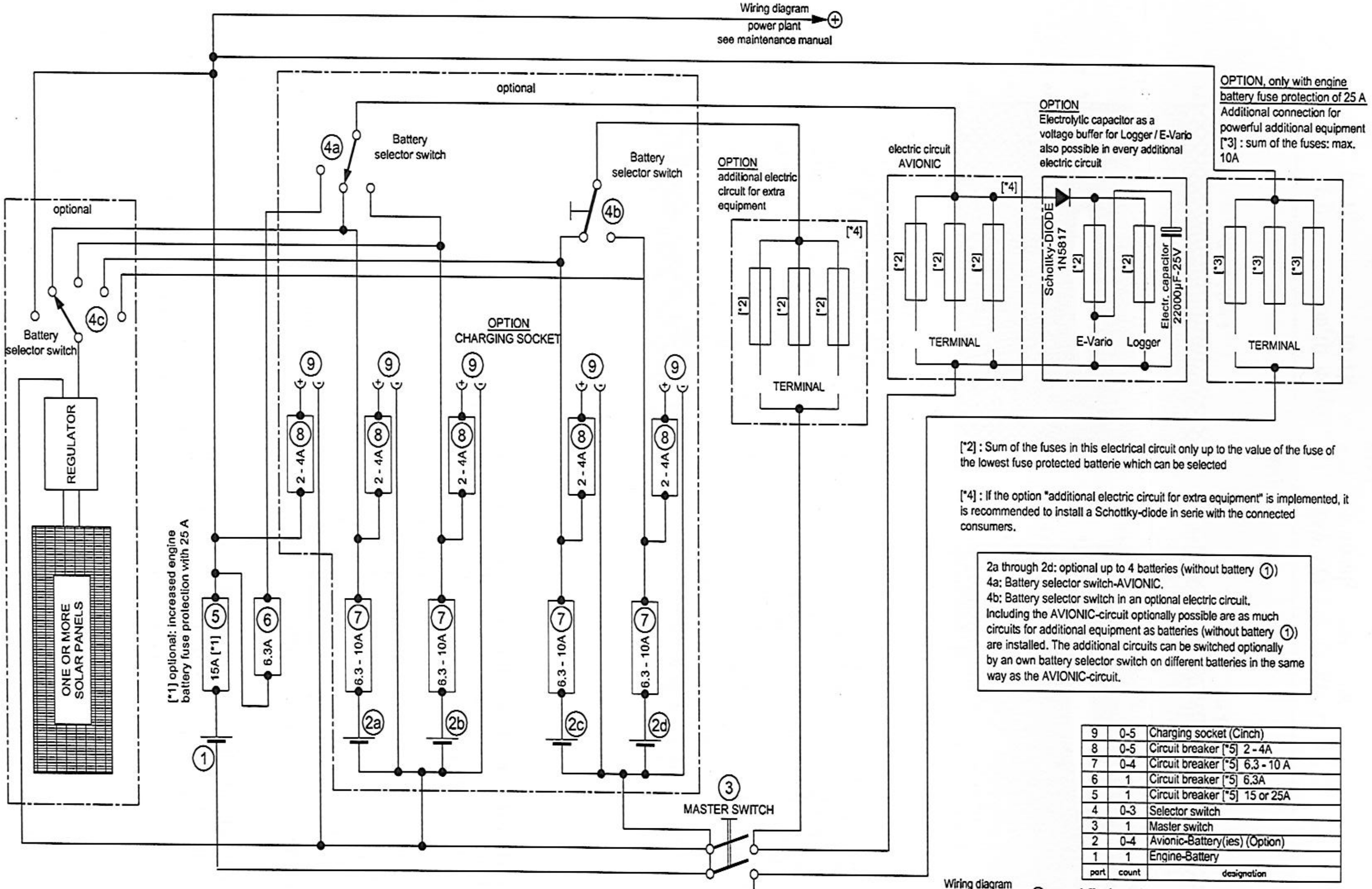
*) Alternative types of storage batteries may be used if they meet the respective demands.

Ⓐ 1 battery 12V / 16 - 18Ah*) BATT. E
Ⓑ Ⓑ (OPTION) 1 - 2 batteries 12V / each 5.7 - 9Ah*) BATT. C1 BATT. C2
Ⓒ (OPTION) 1 - 2 batteries 12V / each 5.7 - 9Ah*) BATT. F1 BATT. F2, optional parallel connected

Ⓓ Master switch
Ⓔ Battery-selector switch (OPTION: additional Battery-selector switch - see 7.12.3)
Ⓕ Fuse board
Ⓖ VHF-Transceiver
Ⓗ (OPTION) VHF-Transceiver - slave control
Ⓘ Speaker
Ⓙ PTT button
Ⓚ Boom-microphone

Arcus T

ELECTRICAL SYSTEM - AVIONIC
T09 RE 880



Solar panels must be wired at the main power supply only by a regulator with maximum voltage of = 14.1 V.
An appropriate battery type must be used.

[*2] : Sum of the fuses in this electrical circuit only up to the value of the fuse of the lowest fuse protected batterie which can be selected

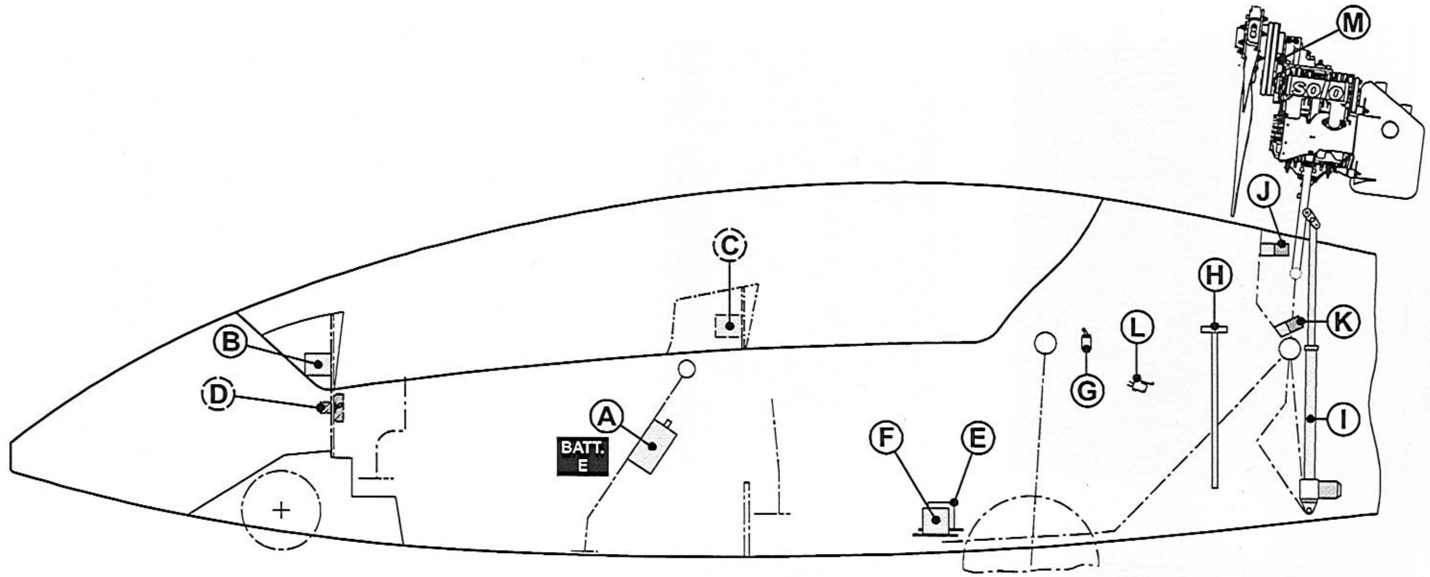
[*4] : If the option "additional electric circuit for extra equipment" is implemented, it is recommended to install a Schottky-diode in serie with the connected consumers.

2a through 2d: optional up to 4 batteries (without battery ①)
4a: Battery selector switch-AVIONIC.
4b: Battery selector switch in an optional electric circuit.
Including the AVIONIC-circuit optionally possible are as much circuits for additional equipment as batteries (without battery ①) are installed. The additional circuits can be switched optionally by an own battery selector switch on different batteries in the same way as the AVIONIC-circuit.

part	count	designation
9	0-5	Charging socket (Cinch)
8	0-5	Circuit breaker [*5] 2 - 4A
7	0-4	Circuit breaker [*5] 6.3 - 10 A
6	1	Circuit breaker [*5] 6.3A
5	1	Circuit breaker [*5] 15 or 25A
4	0-3	Selector switch
3	1	Master switch
2	0-4	Avionic-Battery(ies) (Option)
1	1	Engine-Battery

[*5] a fuse with corresponding specification in a holder may be used alternatively

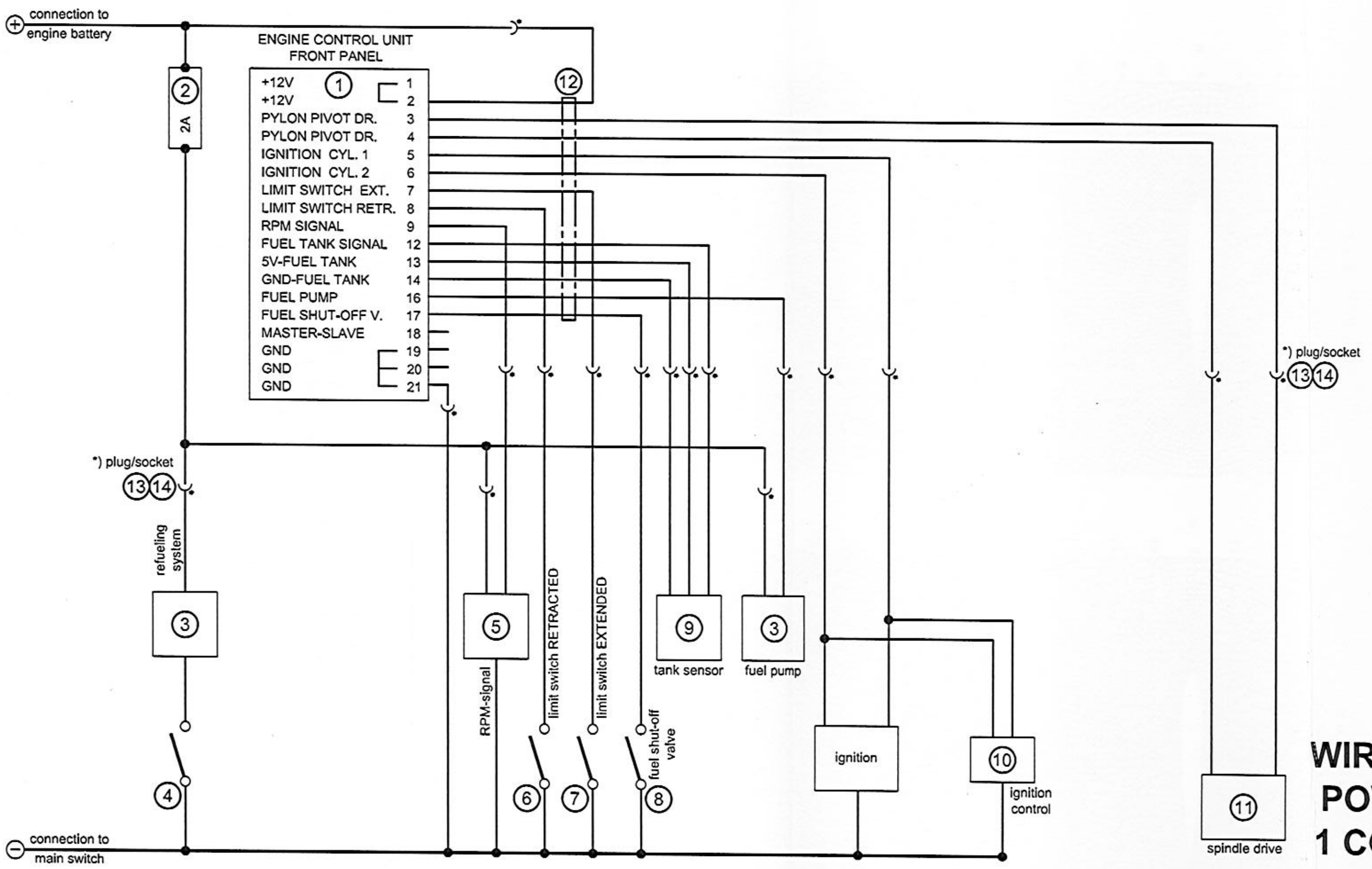
WIRING DIAGRAM - AVIONIC



Arcus T

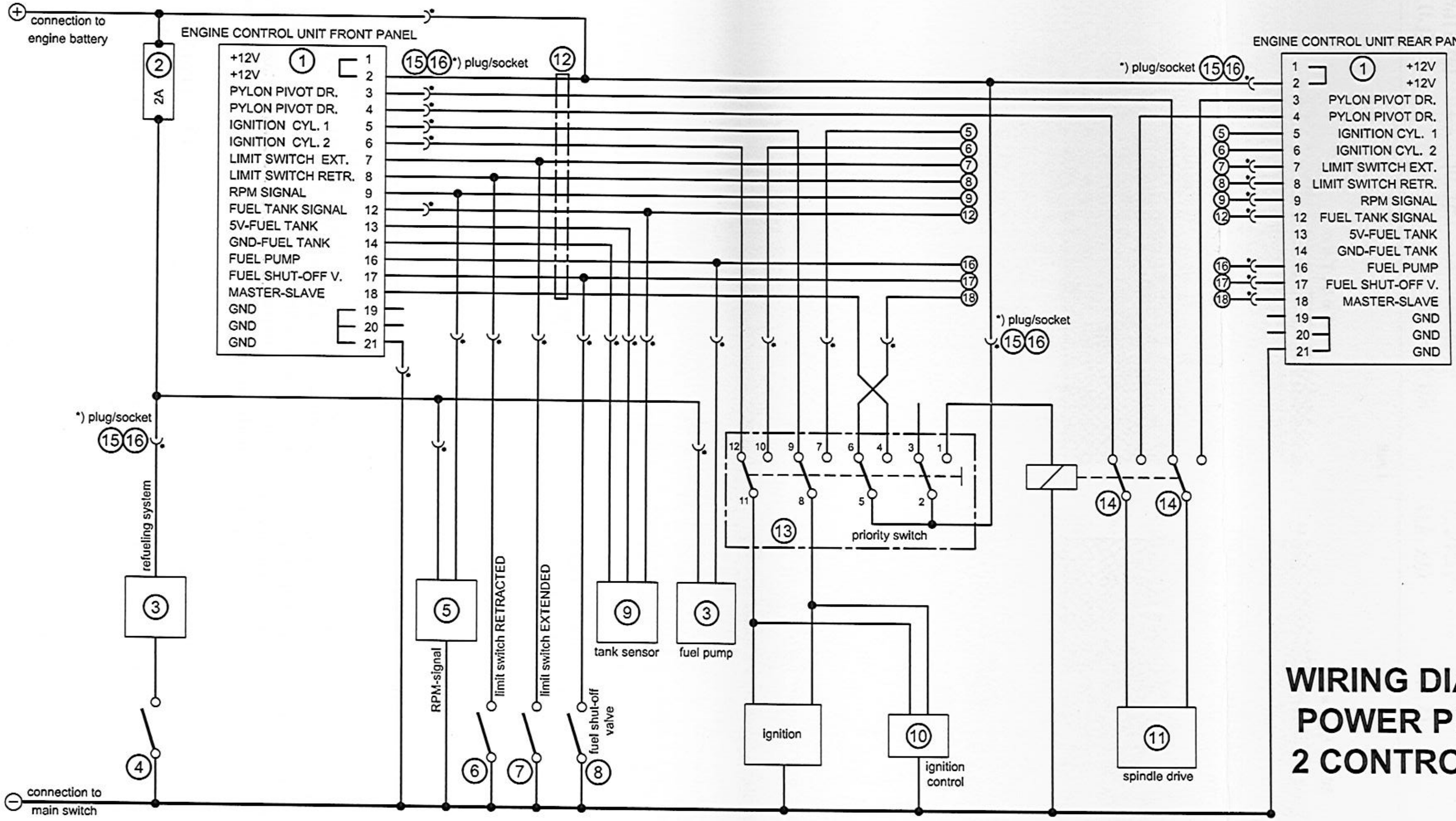
ELECTRICAL SYSTEM - POWER PLANT
T09 RE 881

- (A) 1 Power plant battery 12V / 16 -18Ah BATT. E
- (B) ILEC power plant control unit - front seat
- (C) (OPTION) ILEC power plant control unit - rear seat
- (D) (OPTION) Priority switch
- (E) Electrical fuel pump
- (F) Electrical refueling pump
- (G) Pump ON/OFF switch
- (H) Fuel level transmitter
- (I) Spindle drive (actuator)
- (J) Limit switch - power plant extended
- (K) Limit switch - power plant retracted
- (L) Limit switch - fuel shut-off valve opened
- (M) RPM-sensor



WIRING DIAGRAM POWER PLANT - 1 CONTROL UNIT

Teil	Stück	Benennung	Teil	Stück	Benennung
14	2	Socket	7	1	Limit switch - power plant extended
13	2	Plug	6	1	Limit switch - power plant retracted
12	1	Cable harness - 1 control unit	5	1	RPM sensor
11	1	Spindle drive	4	1	Micro switch (Refueling system)
10	1	Ignition control	3	2	Electr. fuel pump
9	1	Tank sensor	2	1	Circuit breaker
8	1	Limit switch - fuel shut-off valve	1	1	Engine control unit



WIRING DIAGRAM POWER PLANT - 2 CONTROL UNIT

Teil	Stück	Benennung	Teil	Stück	Benennung
16	2	Socket	8	1	Limit switch - fuel shut-off valve
15	2	Plug	7	1	Limit switch - power plant extended
14	2	Relay	6	1	Limit switch - power plant retracted
13	1	Priority switch	5	1	RPM sensor
12	1	Cable harness - 2 control unit	4	1	Micro switch (Refueling system)
11	1	Spindle drive	3	2	Electr. fuel pump
10	1	Ignition control	2	1	Circuit breaker
9	1	Tank sensor	1	2	Engine control unit

7.13 Miscellaneous equipment

Removable ballast (optional)

A mounting provision for removable ballast (trim ballast weights) is provided at the base of the front instrument panel.

A second ballast mounting provision is found on the starboard side of the front stick mounting frame.

The trim ballast weights (lead plates) are to be secured in place by bolts.

For information on how to alter the minimum front seat load refer to section 6.2.

Oxygen systems

Attachment points for the mounting brackets for oxygen bottles are provided on the fuselage skin above spar joint on the left and right sides. To prevent injuries, a hood must be installed covering each valve.

For the installation of oxygen systems, drawings may be obtained from the manufacturer.

Note: After oxygen systems are installed, it is necessary to re-establish the empty mass c/g position of the concerned Arcus T to ensure that the centre of gravity is still within the permitted range.

A List of oxygen regulators, currently approved, is found in the Arcus T Maintenance Manual.

ELT-installation

The installation of an Emergency Locator Transmitter is possible in the following places and must comply with the instructions obtained from Schempp-Hirth:

- In the region of the rear seat on either seat pan mounting flange
- On spar stub cover

Section 8

8.1 Introduction

This section contains manufacturer's recommended procedures for proper ground handling and servicing of the powered sailplane.

It also identifies certain inspection and maintenance requirements which must be followed if the powered sailplane is to retain optimal performance and dependability.

CAUTION:

It is wise to follow a planned schedule of lubrication and preventative maintenance based on climate and flying conditions encountered -see section 3.2 of the Arcus T Maintenance Manual.

8.2 Powered sailplane inspection periods

(for details concerning the maintenance of this powered sailplane refer to its Maintenance Manual)

Airframe maintenance

Under normal operating conditions no airframe maintenance work is required between the annual inspection, except for the routine greasing of the spigots and ball bearings of the wing and tailplane attachment fittings.

Should the control system become heavy to operate, lubricate those places in the fuselage and in the wing panels where plain bearings are used (sliding control rods like u/c- and airbrake linkage).

Cleaning and greasing the wheels and the tow release mechanism(s) depends on the accumulation of dirt.

Rudder cables

After every 200 flying hours and at every annual inspection, the rudder cables are to be inspected at the point where they feed through the S-shaped guides in the pedals, especially at the points of maximum pedal adjustment.

If the rudder cables are damaged, worn or corroded, they must be replaced.

It is permissible for individual strands of the cables to be worn up to 25 %.

Power plant maintenance

Propeller:

Maintenance work on the propeller is required after every 25 hours of engine time or at least once every year and must comply with the instructions given in propeller manual.

Engine:

Maintenance work on the engine is required after every 25 hours of engine time or at least once every year and must comply with the instructions given in the engine manual.

For all other power plant accessories (pylon, pivoting mechanism, fuel system etc.), maintenance work is also required after every 25 hours of engine time or at least once every year.

8.3 Alterations or repairs

Alterations

Alterations on the approved model, which might affect its airworthiness, must be reported to the responsible airworthiness authorities p r i o r to their accomplishment.
The authorities will then determine whether and to what extent a "supplemental type approval" is to be conducted.
In any case, the manufacturer's opinion about the alteration(s) must be obtained. This ensures that the airworthiness does not become adversely affected and enables the aircraft owner/ operator to demonstrate at any time that the powered sailplane concerned complies with an LBA-approved version.

Amendments of the LBA-approved sections of the Flight- and/or Maintenance Manual must in any case be approved by the Luftfahrt Bundesamt (LBA).

Repairs

Abbreviations:

CFRP: carbon-fibre reinforced plastic
GFRP: glass-fibre reinforced plastic

Before every take-off and especially after the powered sailplane has not been used for a while, it should be checked on the ground as shown in section 4.3.

Check for any sign of a change in the condition of the aircraft, such as cracks in the surface, holes, or delamination in the CFRP/GFRP structure etc.

If there is any uncertainty whatsoever regarding the significance of damage discovered, the Arcus T should always be inspected by a CFRP/GFRP expert.

There is no objection to minor damage - which does not affect the airworthiness in any way - being repaired on site.

A definition of such damage is included in the "REPAIR INSTRUCTIONS" which are found in the appendix to the Arcus T Maintenance Manual.

Major repairs may only be conducted by a certified repair station having appropriate authorization.

8.4 Ground handling / road transportation

a) Towing / pushing

When towing the powered sailplane behind a car, a tail dolly should always be used to avoid unnecessary tailplane vibration on the fittings - especially in tight turns.
When pushing the aircraft by hand, it should not be pushed at its wing tips, but as near to the fuselage as possible.

b) Hangaring

The powered sailplane should always be hangared or kept in well ventilated conditions. If it is kept in a closed trailer, there must be adequate ventilation. The water ballast tanks must always be left completely empty.
The powered sailplane must never be subjected to loads when not in use, especially in the case of high ambient temperatures.

c) Tie-down

In the case of a powered sailplane remaining rigged permanently, it is important that the maintenance program includes rust prevention for the fittings on fuselage, wing panels and tailplane.
Tie-down kits common in trade may be used to anchor the aircraft.
Dust covers should be regarded as essential for the powered sailplane.

d) Preparing for road transport

As the wing panels have a thin airfoil section, it is important that they are properly supported, i.e. leading edge down, with support at the spar stubs and at the outer portion in cradles of correct airfoil section.
The fuselage can rest on a broad cradle just forward of the u/c doors and on its tail wheel (or skid).
The horizontal tailplane should be kept leading edge down in two cradles of correct airfoil section or placed horizontally on a padded support.
Under no circumstances should the tailplane be supported by its fittings in the trailer.

8.5 Cleaning and care

Although the surface coating of a composite aircraft is robust and resistant, always take care to maintain a perfect surface.

For cleaning and caring the following is recommended:

- Clean the surface (especially the leading edge of wing panels, horizontal stabilizer and fin) with clear water, a sponge and a chamois leather.
- Do not use rinsing additives common in trade too often.
- Polish and polishing materials may be used.
- Petrol and alcohol may be used momentarily only, thinners of any kind are not recommended.
- Never use chlorine hydrogen (i.e. Tri, Tetra, Per etc.).
- The best polishing method is the buffing of the surface by means of an edge buffing wheel, fitted to a drilling or polishing machine. Thereby hard wax is applied to the rotating disc and distributed crosswise over the surface.

> WARNING:
> To avoid localized overheating, the buffing wheel should be moved constantly!

- For cleaning those fuselage and tailplane areas that are facing the wake of the propeller, the use of a water soluble degreaser (e.g. FLEET - MAGIC EXTRA by Messrs. Chemsearch) is recommended.

Note:
Polishes, wax and additives containing silicone should not be used because this might cause additional work in the case of repairs of the coating.

- The canopy should be cleaned with a plexiglass cleaner (e.g. "Mirror Glaze", "Plexiklar" or similar) or with warm water if necessary.
  The canopy should be wiped down with a soft clean chamois leather or a very soft material such as cotton.
  Never rub the canopy when it is dry!
- The powered sailplane should always be protected from the wet.
  If water is found inside, the components should be stored in a dry environment and turned frequently to eliminate the water.
- The powered sailplane should not be exposed unnecessarily to intense sunlight or heat and should not be subjected to continual mechanical loads.

WARNING:

All external portions of the powered sailplane exposed to sunlight must be painted white with the exception of the areas for the registration and anti-collision markings.

Colours other than white can lead to the CFRP/ GFRP overheating in direct sunlight, resulting in insufficient strength.

Section 9

9.1 Introduction

This section contains the appropriate supplements necessary to safely and efficiently operate the Arcus T when equipped with various optional systems and equipment not provided with the standard aircraft.

9.2 List of inserted supplements

Date	Section	Title of inserted supplements
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