FLIGHT MANUAL

for Sailplane

Variant: **A R C U S**

Serial-No.

Registr.-No.

Date of issue: **September 2 0 1 3**

Pages as indicated by „appr.“ are EASA approved by

EASA Type Certificate EASA.A.532, issued XX.XX.XX

This 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.

The new or amended text in the revised page will be indicated by a black vertical line in the left hand margin, and the 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 Berichtigung	Abschnitt	Seiten	Datum der Berichtigung	Bezug	Datum und Anerkennung durch	Datum der Einarbeitung	Zeichen /Unterschrift
Revision No.	*Affected section*	*Affected page*	*Date of issue*	*Reference*	*Date and Approval by*	*Date of Insertion*	*Signature*

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.

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0.3 Table of contents

Section 1

1.1 Introduction

The Flight Manual for this sailplane has been prepared to provide pilots and instructors with information for the safe, appropriate and efficient operation of the sailplane

This manual includes the material required to be furnished to the pilot by CS 22. It also contains supplemental data supplied by the manufacturer of the aircraft that out of sight of the manufacturer benefits the pilot

1.2 Certification basis

This sailplane, model designation

A r c u s

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

Month, date, year

Category of Airworthiness: UTILITY

1.3 Warnings, cautions and notes

Statements of the manual regarding the flight safety or important matters for operation are highlighted with the following notions:

"Warning"	means that the non-observation of the corresponding procedure leads to an immediate or important degradation of the flight safety
"Caution"	means that the non-observation of the corresponding procedure leads to a minor or to a more or less long term degradation of the flight safety
"Note"	draws the attention on any special item not directly related to safety, but which is important or unusual.

1.4 Descriptive data

The "Arcus" is a two-seat, high-performance sailplane, constructed from fiber reinforced plastic (FRP), featuring camber-changing flaps and a T-tail (with fixed horizontal stabilizer and elevator).

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

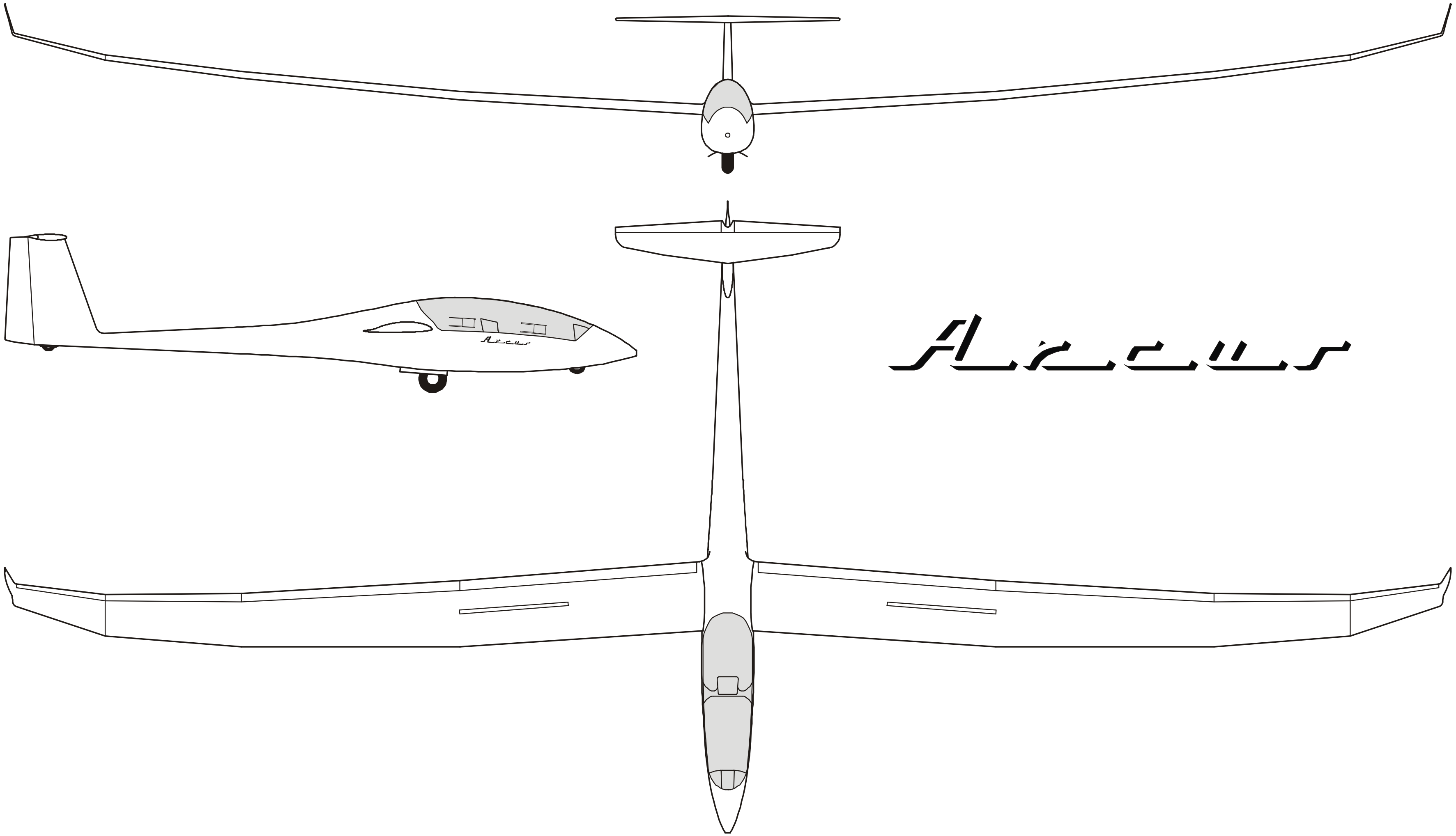
All controls are automatically hooked up when the aircraft is rigged.

R E S E R V E D

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.	440 kg	971 lb
	Maximum all-up mass	750 kg	1654 lb
	Wing loading	32.7 - 48.1 kg/m²	
		6.7 - 9.9 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 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.

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
Yellow triangle at	105 km/h 57 kts 65 mph	Approach speed at maximum mass without water ballast.

2.4 reserved

2.5 reserved

2.6 Weights (masses)

Maximum permitted take-off weight (mass):	750 kg	(1654 lb)
Maximum permitted landing weight (mass):	750 kg	(1654 lb)
Maximum permitted take-off and landing weight (mass) w i t h o u t water ballast:	700 kg	(1544 lb)
Maximum permitted weight (mass) of all non-lifting parts:	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
Maximum rearward c/g position	290 mm (11.42 in.) aft of datum

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 model Arcus is certified in category

U T I L I T Y

Permitted aerobatic manoeuvres:

- without wing water ballast,
- up to a maximum all-up mass of 690 kg (1521 lb)
- with flap position "0"

a) inside loops

b) stalled turns

c) lazy eight

d) spinning

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

2.9 Manoeuvring load factors

The following manoeuvring load factors must not be exceeded:

a) With airbrakes locked

at V_A = 180 km/h, 97 kts, 112 mph

n = + 5.3

n = - 2.65

V_{NE} = 280 km/h, 151 kts, 174 mph

n = + 4.0

n = - 1.5

b) With airbrakes extended

n = + 3.5
n = - 1.5

2.10 Flight crew

The aircraft is two-seated.
When flown solo, the Arcus 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 front as well as the rear seat can be designated as seat for the Pilot in Command. The following requirements have to be met, when the rear seat is designated for the Pilot in Commend:

- All necessary control elements and instruments must be installed for the rear seat.

- 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 effect 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 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])

2 Four-piece safety harnesses (symmetrical)

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).

Additionally to the minimum equipment each occupant must be equipped either with an automatic or manual rescue parachute, or must use a back cushion (thickness approx. 8 cm / 3.15 in when compressed)

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 instruments are 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)
- flap setting "0"

Recommended additional equipment for restricted aerobatics

1 Accelerometer (3 hands, resettable)

2.13 Aerotow and winch launch

Aerotow

Only permissible on 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

Only permissible on 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.

- Life time of the airframe:

  1. Time limits:

     When the Arcus has reached a maximum of 6000 hours of service time, then a special inspection of the airframe must be accomplished in accordance with the inspection program for the extension of the allowed service time.

     If the results of this special inspection, possibly after proper repair of detected defects, are satisfactory, the allowed service time is increased by 3000 hours up to a maximum of 9000 hours in total.

     Thereafter the special inspection in accordance with the above mentioned inspection program must be repeated in intervals not exceeding 1000 hours. If the results are satisfactory and the detected defects properly repaired, then the allowed service time may be increased step by step at each inspection by 1000 hours up to a maximum of 12000 hours in total.

  2. The instructions given in the maintenance manual section 3.3 regarding the inspection procedure for the extension of the allowed service time must be observed.

  3. The inspections must be conducted only in an appropriately licensed maintenance organization.

2.15 Limitations placards

PERMITTED ALL-UP MASS:	750 kg / 1654 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**

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**

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:	**3.0 bar (43 psi)**

A E R O B A T I C S

ONLY WITHOUT WATER BALLAST IN THE WINGS, UP TO AN ALL-UP MASS OF 690 kg (1521 lb) AND WITH FLAP POSITION "0" THE FOLLOWING AEROBATIC MANEUVERS ARE PERMITTED:

(A)	Inside loops	**(C)**	Lazy eight
(B)	Stalled turns	**(D)**	Spins

Operating Conditions: See Flight Manual

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.	Avionic battery (E)**			
2 batt.	in front of rear stick mounting frame (C1, C2)**			
1 batt.	in fin (F)**			
Maximum cockpit seat load			**230*** kg / **507*** 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.				

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

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

Note:
Further placards are shown in the Maintenance Manual.

WITH NOSE SKID:
Minimum cockpit load raised by 2 kg / 4.41 lb!

BALLAST IN FIN TANK IS DUMPTED SIMULTANEOUSLY WITH WING TANKS

Section 3

3. Emergency procedures

3.1 Introduction

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

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 getcarried away.

3.3 Bailing out

After jettisoning of the canopy (see section 3.2) the emergency exit is made.

- release harness

Front crew:

- Bend upper body slightly forward, grab the canopy coaming frame of the fuselage with both hands and lift the body up. The instrument panel is pushed up by the legs.
- Leave the cockpit to the left.
- The rip cord of a manual parachute should be pulled at a safe distance and height.

Rear crew:

- Pull yourself up at one of the handles on either side of the instrument panel and support yourself on the canopy frame or on the arm rest of the seat pan.
- 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

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.

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 will stop rotating after about ½ to ¾ turn, depending on the flap position.

The loss of altitude - 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 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 must be recovered immediately.
Recovery is by normal use of controls (see page 3.6).

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 Reserved

3.8 Reserved

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 aircraft 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 aircraft may quickly start yawing and rolling. An ensuing spiral dive, however, may possibly be avoided by resetting the flaps immediately at “0".

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 on principle not recommended, because the potential energy absorption of the landing gear is many times higher as compared to the fuselage shell.

Should the wheel fail to extend, the aircraft should be landed at a flat angle, with flaps set at “L”' and without pancaking.

Ground-loop

If there is the danger of the aircraft 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
- 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. Rigging and derigging

Rigging

The Arcus 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.

Derigging

Remove sealing tape from wing panels and tailplane.

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.

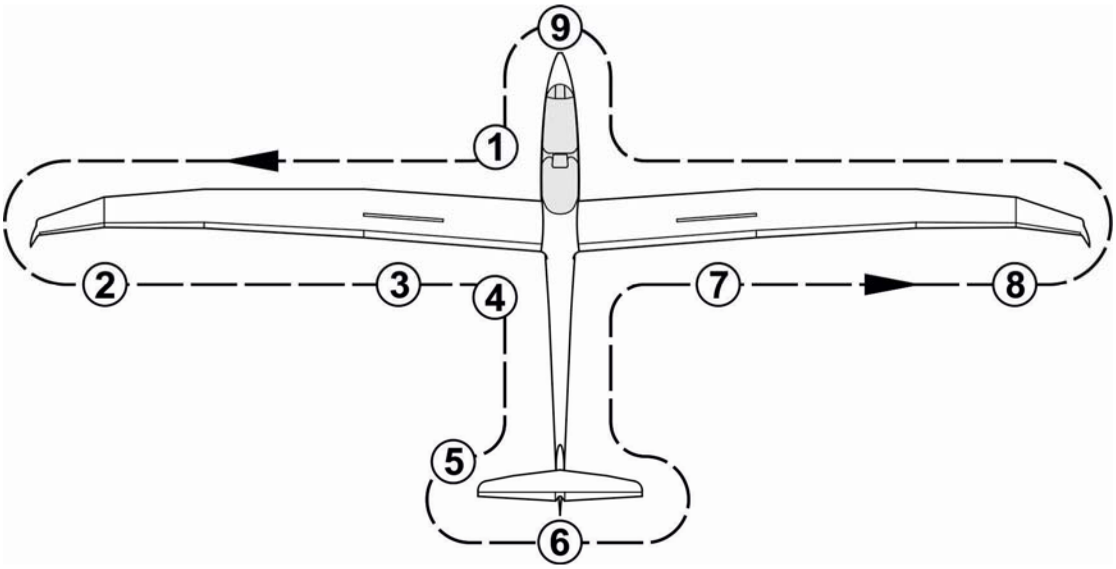
Main wing panels

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.

4.3 Daily Inspection

The importance of inspecting the 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 aircraft, 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) (reserved)

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) Check airbrakes for proper condition, fit and locking

(4) a) Check fuselage for damage, especially on its lower side

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

(5) a) Check condition of tail wheel (air pressure 3.0 bar)

b) If TEK-probe is present, install probe and check TEK-line (connected Variometer have to read climbing when blowing from front of probe)

c) Check that the fin-mounted PITOT tube is clear.
When blowing gently into this probe, the ASI must register

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

d) Check that fin tank spill holes are clear

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

f) Check that the dump hole for the fin tank in the tail wheel fairing 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) OPTION: Check that the Pitot pressure head in the nose cone is clear. When blowing gently into the tube, the airspeed indicators must register

After heavy landings

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

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

After a ground loop, especially the rear part of the fuselage tube and the transition to the vertical tail has to be checked for damage and detached bulkheads.
To do so, support the wings of the rigged glider (without horizontal tail) and apply hand force to the side at the bracket for the horizontal tail. Check the fuselage structure for excessive deformation, buckling and crackling noise.

If damage is discovered (i.e. 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 etc.), then the aircraft must be grounded until the damage has been judged respectively repaired by a qualified person.

4.4 Preflight 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 chart 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 Trim correctly set ?
- O Flaps set for take-off ?
- O Canopy closed and locked ?

4.5 Normal operating procedures and recommended speeds

4.5.1 Methods of launching

a) Aerotow

(Only permissible on nose tow release)

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 glider 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.

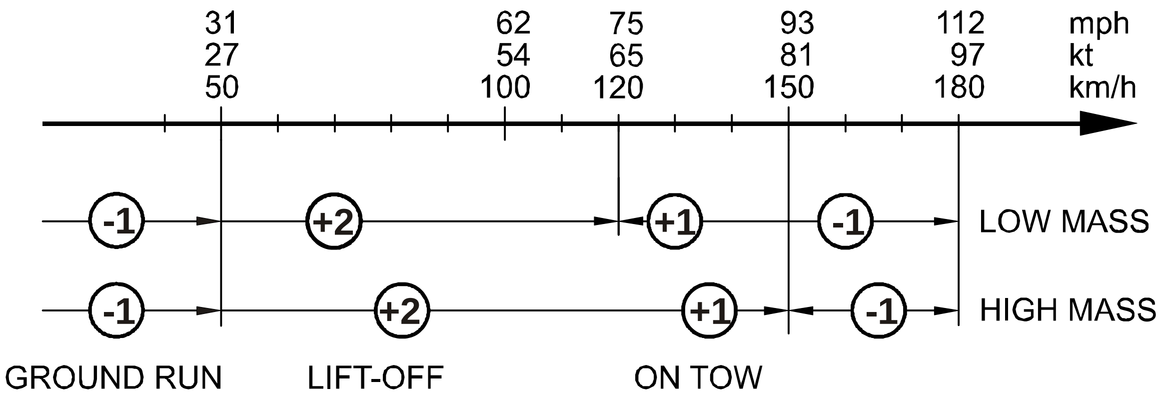
For intermediate to forward c/g positions the elevator control should be slightly back for the ground run; in the case of rearward c/g positions it is recommended that neutral elevator is maintained until the tail lifts.

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 to start the takeoff roll with a flap setting of "-1 or -2" in a crosswind take off or on rugged surface. 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 aircraft 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.

b) Winch launch

(Only permissible on C/G tow release)

Maximum permitted launching speed:

$$V_W = 150 \text{ km/h (81 kts, 93 mph)}$$

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 C/G position, 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 glider 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 M 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.

Warning:

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

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.

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 Reserved

4.5.3 Flight / Cross country flight

The aircraft 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 ranges 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 aicraft 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 moved 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 gradually (allow 2 seconds).

It is strictly noted that in a dive with airbrakes extended the aircraft has to be pulled out less abruptly (maximum 3.5 g) that with retracted airbrakes (maximum 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 approx. 41° at maximum permitted all-up mass of 750 kg (1654 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 = 750 kg 1654 lbs
Low speed flying (straight and level)	L	km/h kts mph	83 45 52	91 49 57
	+2	km/h kts mph	83 – 90 45 – 49 52 - 56	91 – 97 49 – 52 57 - 60
	+1	km/h kts mph	90– 105 49 – 57 56 – 65	97 – 116 52 – 63 60 - 72
Max. L/D	0	km/h kts mph	105 – 130 57 – 70 65 – 81	116 – 145 63 – 78 72 - 90
Flying between thermals and high speed flying	-1	km/h kts mph	130 – 155 70 – 84 81 – 96	145 – 174 78 – 94 90 - 108
	-2	km/h kts mph	155 – 175 84 – 94 96 - 109	174 – 189 94 – 102 108 - 117
	S	km/h kts mph	175 – 280 94 – 151 109 - 174	189 – 280 102 – 151 117 - 174

For a speed polar diagram refer to section 5.3.2.

For smooth thermals and while climbing in slow straight flight flap setting **"+2"** is recommended. In turbulent thermals, which require a quick aileron response, and climbing in straight, slow flight flap setting **"+1"** is advantageous.

Near the lower end of the optimum circle speeds in thermals the pilot may even use flap setting **"L"**, especially at high all-up masses or in updrafts with hardly any variation in flying speed.

Best glide and moderate inter-thermal speeds are covered by flap setting "0" and "-1" – for high cruise the optimum performance is achieved with the more negative settings.

Low speed flight and stall behaviour

In order to become familiar with the 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 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).

When reaching a stalled condition with the c/g in middle and rearward positions, the stick reaches the stop and the 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 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

When stalled during a coordinated 45° banked turn and a forward c/g, the Arcus - 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 (option), stall characteristics are like those found in an aft c/g position.

4.5.4 Approach

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 (700 kg / 1544 lb).

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.
Apart from 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 deflected 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 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).

4.5.5 Landing

For off-field landings the undercarriage should always be extended, as the protection of the crew is much better, especially from vertical impacts on landing.

Main wheel and tail wheel should touchdown simultaneously.

After touch-down the flaps can be set at “0” or “-1” for improved aileron response during the landing run.

To avoid a long ground run, make sure that the aircraft touches down at minimum speed.
A touch-down at 90 km/h (49 kt, 56 mph) instead of 75 km/h (40 kt, 47 mph) means that the kinetic energy to be dissipated by braking is increased by a factor of 1.44 and therefore the ground run is lengthened considerably.

As the effectiveness of the hydraulic wheel brake is good, the landing run is considerably shortened (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 in either wing 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 sailplane (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 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, particularly at low speed), it is necessary to fly faster because of the higher mass and also to avoid stalling the airplane.

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 airplane veering off course.

Water ballast fin tank

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).

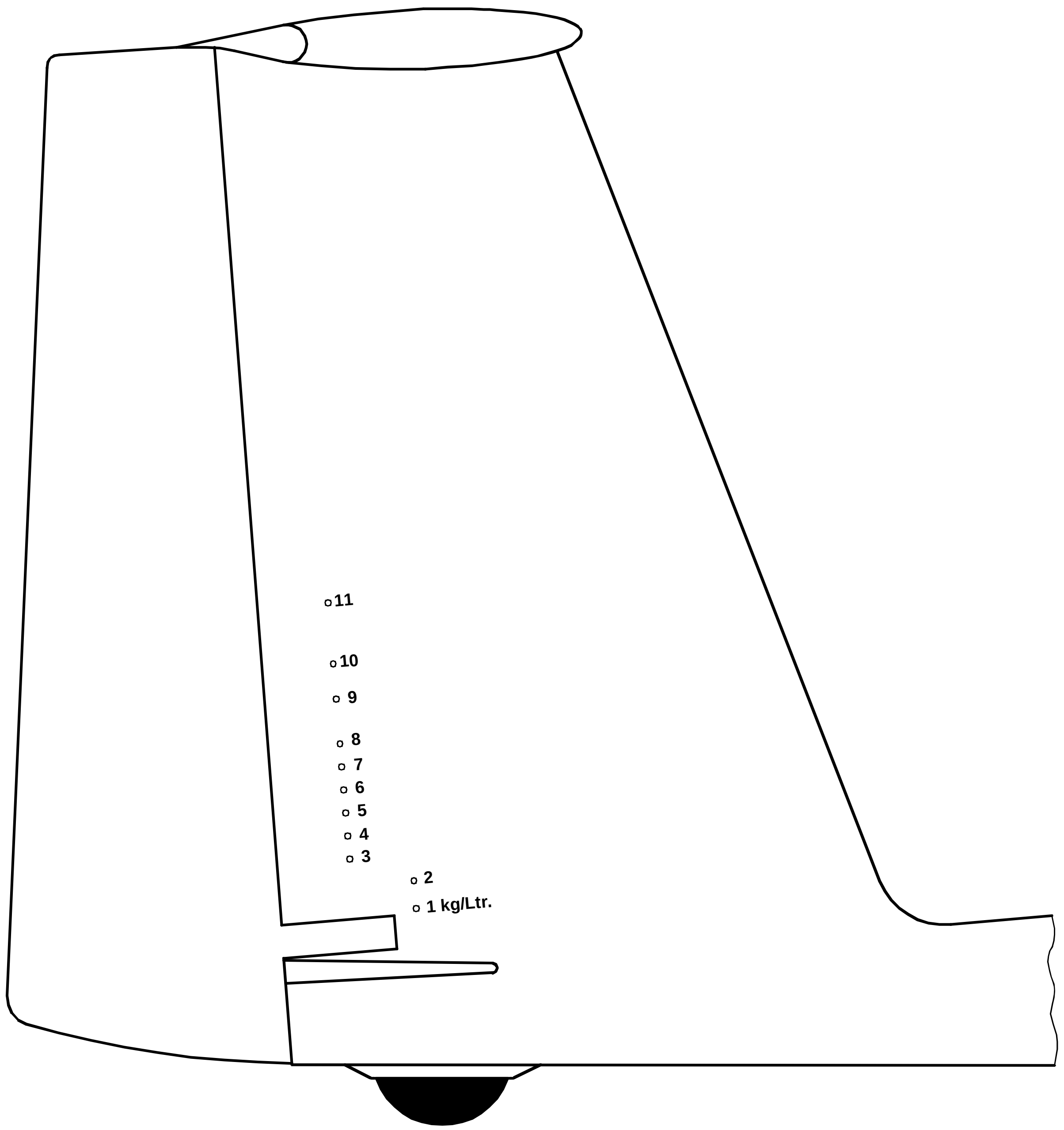
The ballast quantity to be filled depends on the water load in the wing tanks and/or on the load on the aft seat – see loading table on page 6.2.8.

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 fuII fin tank is about two (2) minutes, therefore draining the full tanks of the main wing panels always takes longer.

Continued 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). Thus freezing of the valves with subsequent damages can be prevented.

Caution:

2. Before filling the wing water ballast tanks check with open valves if both sealing caps of the valves open equally wide.
   In addition, the valves seats have to be cleaned and greased slightly. It must be checked that both valves close tight when operated in the cockpit.
   Smaller dripping leaks can easily remedies by pulling down the sealing caps into the valve seat with the mounting screw for the horizontal stabilizer.

3. 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.

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

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 aircraft 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 single days. Optimally, for parking, all water ballast should be completely drained and the filler caps should be 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)		
m	ft	km/h	kts	mph
0	0	280	151	174
1000	3281	280	151	174
2000	6562	280	151	174
3000	9843	270	146	168
4000	13123	263	142	163
5000	16404	245	132	152
6000	19685	232	125	144
7000	22966	220	119	137
8000	26247	207	112	129
9000	29528	195	105	121
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 aircraft 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 aircraft 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.

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"**:

The following aerobatic manoeuvres are allowed:

(a) inside loop

(b) stall turn

(c) lazy eight

(d) spinning

> **WARNING:**
> The Arcus is a high performance sailplane.
> Therefore the Arcus will gain speed very rapidly in dive.
> Aerobatic manoeuvres with the Arcus 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.
> 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 sailplane for aerobatic manoeuvres is allowed.

Inside loop

Enter manoeuvres at a speed between 180 km/h (97 kt, 112 mph) and 210 km/h (114 kt, 131 mph) (200 km/h (108 kt, 124 mph) 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 are the needed load factors.

Lazy eight

Enter manoeuvre at a speed of about 180 km/h h (97 kt, 112 mph). After pulling up in a 45°-climb enter the turn at about 120 km/h (65 kt, 75 mph). The speed during recovery: about 180 km/h h (97 kt, 112 mph).

Stalled turn

Enter manoeuvre at a speed between 180 km/h h (97 kt, 112 mph) and 210 km/h (114 kt, 131 mph). Pull up continuously into the vertical climb.

It is recommended to enter the manoeuvre at a speed of 200 km/h (108 kt, 124 mph) because then you will have more time to establish the vertical climb and you will not have to apply the maximum permitted load factor.
During the vertical climb you can let the outside wing drag, so to speak.
At an indicated airspeed of about 140 km/h (76 kt, 87 mph) to 150 km/h (81 kt, 93 mph) 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 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 only 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 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:

Neutralize aileron, apply full rudder deflection in the opposite direction 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 (97 kt, 112 mph).

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 increasing 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 sailplane in good condition and using average piloting techniques.

5.2 Approved data

5.2.1 Airspeed indicator system calibration

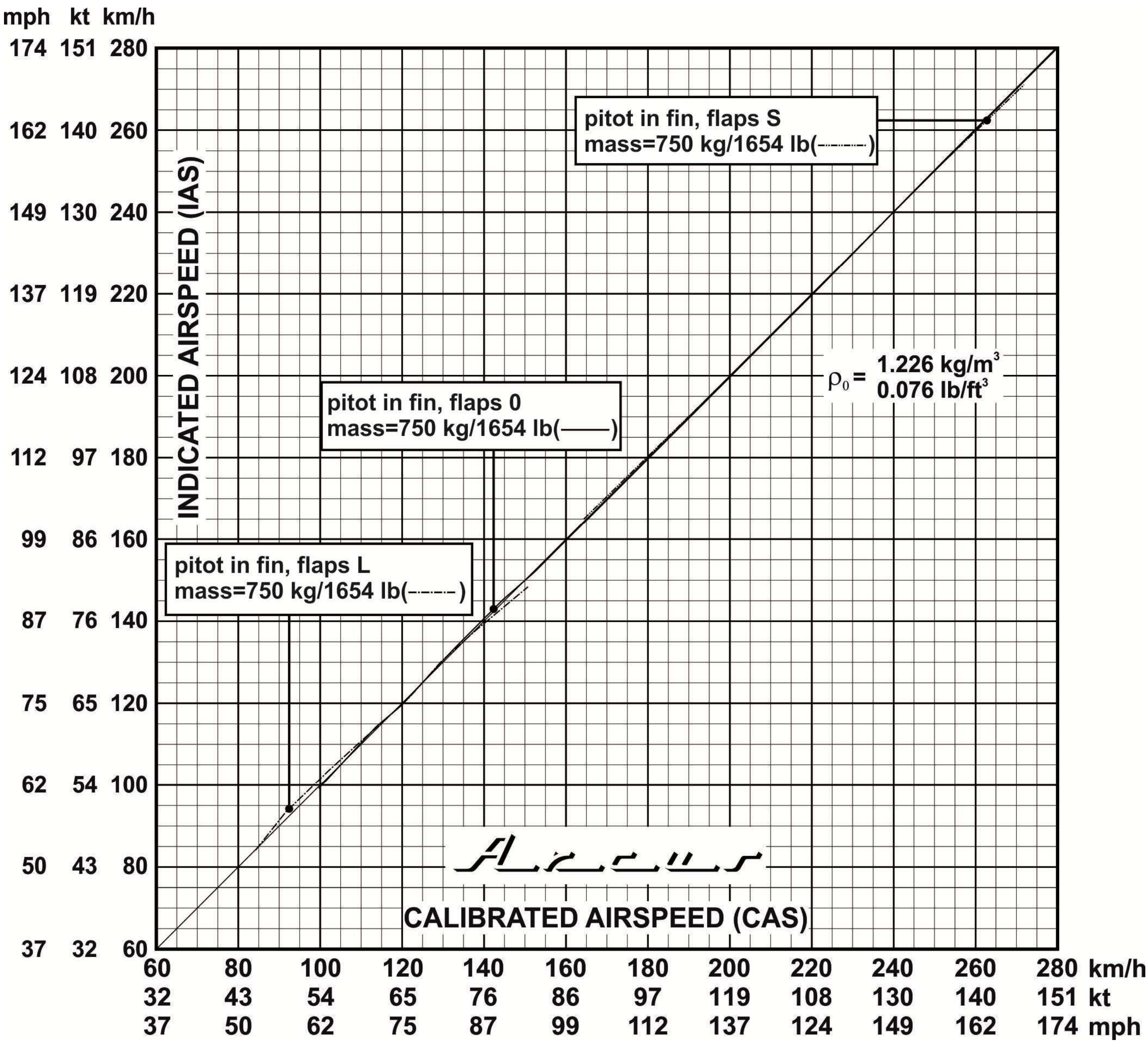
Errors in indicated airspeed (IAS) caused by Pitot/Static pressure errors may be read off from the calibration chart below and on page 5.2.1.2. These charts are applicable to free flight.

Pitot pressure source:
- Fin (lower tube)
- optional: fuselage nose cone

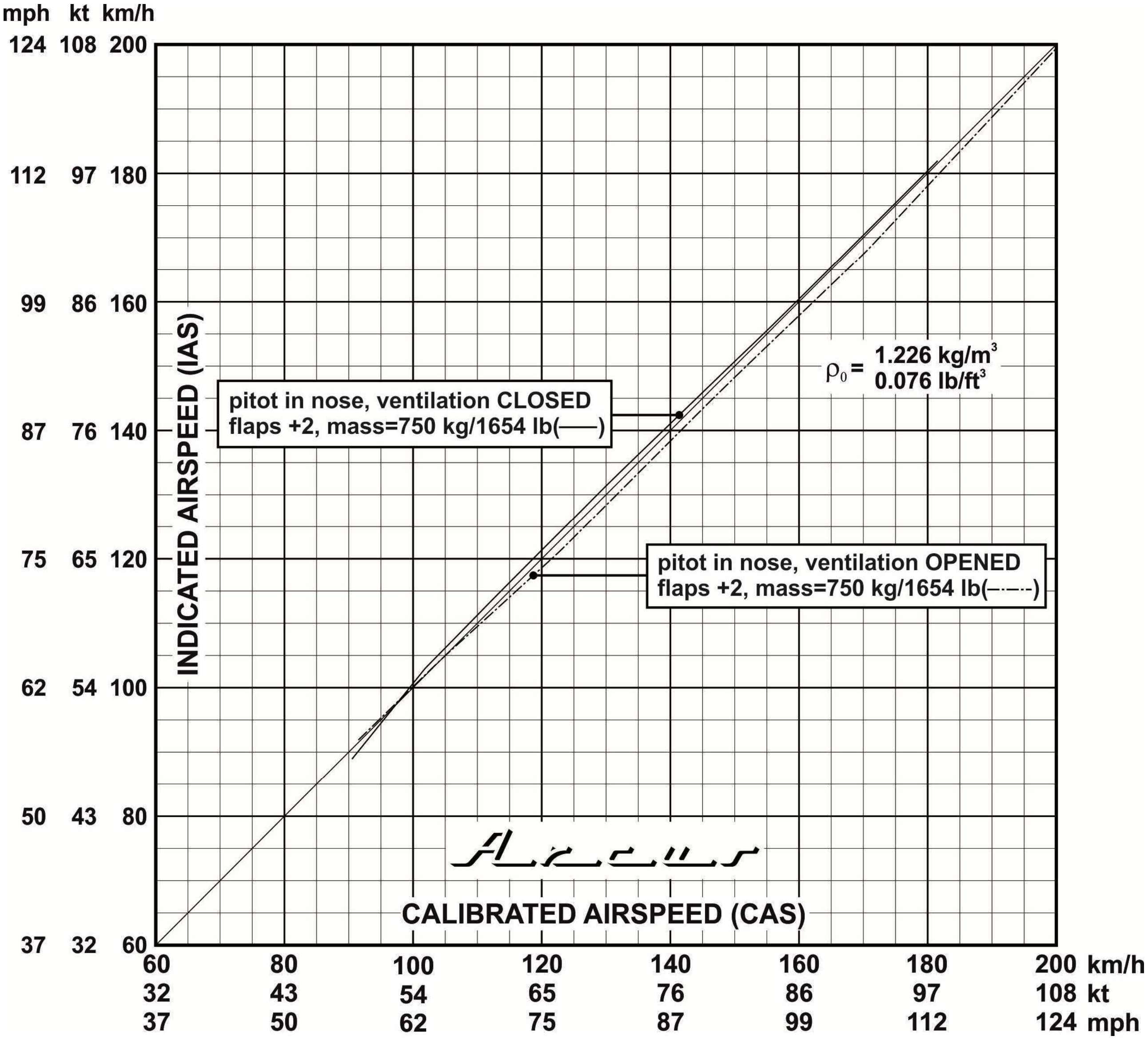
Static pressure ports: Fuselage tail boom, approx. 1.02 m (40.16 in.) forward of the base of the fin

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

Pitot pressure source in fin:



Optional pitot pressure source in fuseelage nose:



5.2.2 Stall speeds

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

All-up mass (approx.)		750 kg 1654 lb	750 kg 1654 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	67* 37* 43*
flaps at "0"	km/h kts mph	86 46 53	67* 36* 42*
flaps at "S"	km/h kts mph	93 50 53	77* 42* 48*
airbrakes extended			
flaps at “L”	km/h kts mph	86 46 53	70 38 43

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

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

5.2.3 reserved

5.2.4 Additional information

N o n e

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).

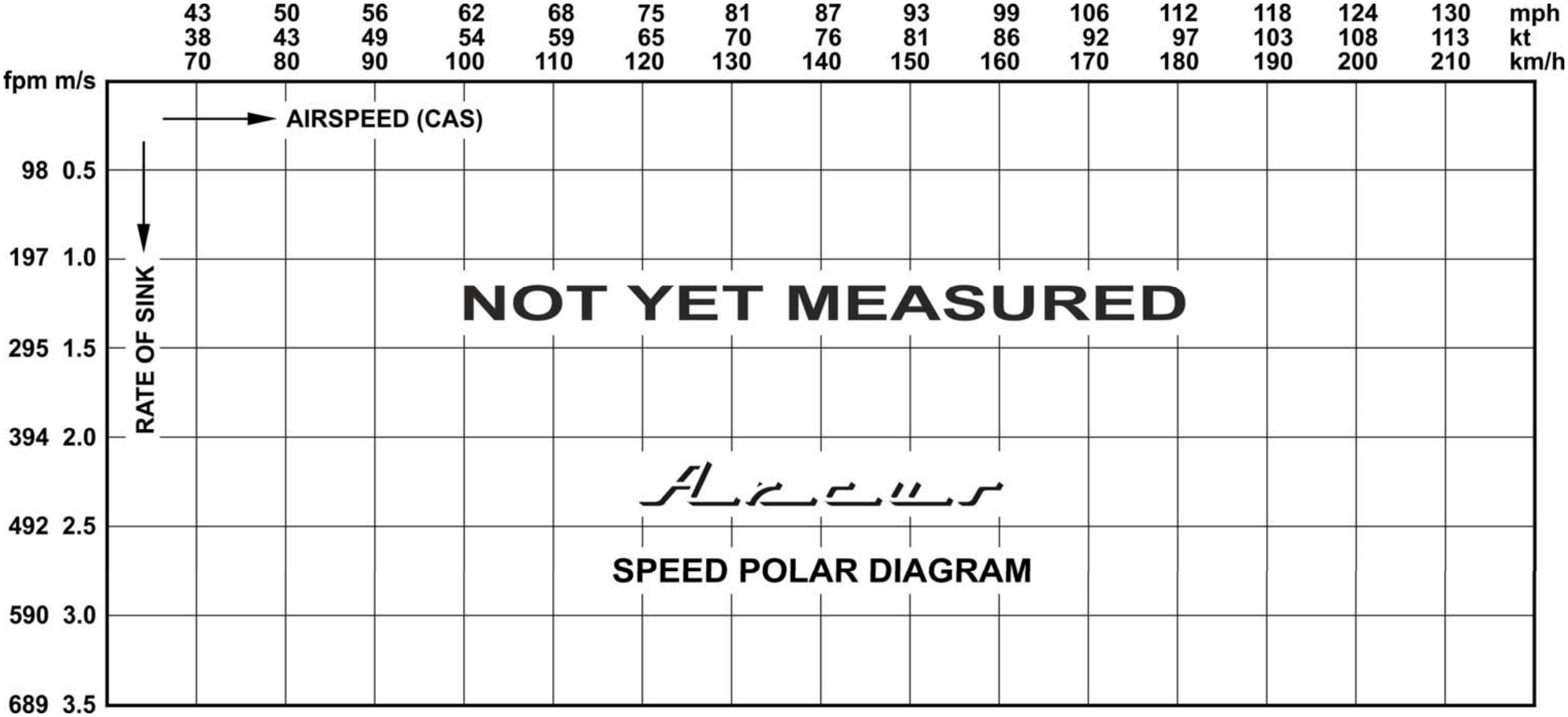
5.3.2 Flight polar

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

All-up weight (mass)	**750*) kg** **1654 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**

*) aircraft performance not yet measured

Flight polar see page 5.3.2.2


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
SPEED POLAR DIAGRAM

Section 6

6. Weight (mass) and balance

6.1 Introduction

6.2 Weight (mass) and balance record and permitted payload range

Determination of:

- Water ballast in wing tanks
- Water ballast in fin tank

6.1 Introduction

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

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

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

6.2 Weight and balance record and permitted payload range

The following loading chart (page 6.2.3) show amongst others the empty mass, the maximum and minimum load on the seats and the maximum payload 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, the serial number of which is shown on the title page. The indicated required minimum load is only applicable for operating with nose wheel. If the aircraft is operated with the optional nose skid the indicated required minimum load increases about 2 kg (4.4 lb), see also page 6.9 of the Maintenance Manual.

A front seat load of less than the required minimum load

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 aircraft 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) Optional:
Trim ballast mounting provision on front stick mounting frame on the right 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	optional 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 ....

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. useable 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 regard-less of load on rear seat	min.1)				
Inspector Signature / Stamp					

1) **Warning:**
If fin tank installed, the pilot must either dump all water ballast prior of take-off, or perform an accurate check of the fin tank loading. He must also take the responding compensation loadings (wing water ballast and/or load on rear seat) into account.

2) Installed batteries (see page 7.12.2):
(E) engine battery (optional)
(C1/C2) batteries in front of rear stick mounting frame
(F1/F2) batteries in fin (optional)

For the determination of the water ballast quantity permitted in the wing tanks refer to page 6.2.4.
For the determination of the water ballast quantity permitted in the fin tank refer to page 6.2.6 through 6.2.8.

reserved

Maximum water ballast load

Maximum all-up mass including water ballast: 750 kg / 1654 lb

C/G position of water ballast in wing tanks (forward of datum): 17 mm / 0.70 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		L O A D O N T H E S E A T (kg / lb)																													
		kg		lb	kg		lb	kg		lb	kg		lb	kg		lb	kg		lb	kg		lb	kg		lb	kg		lb	kg		lb
kg	lb	70		154	80		176	100		220	120		264	140		308	160		353	180		396	200		441	220		485	230		507
400	882	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
410	904	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
420	926	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
430	948	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
440	970	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
450	992	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
460	1014	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
470	1036	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
480	1058	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
490	1080	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
500	1103	180	47.6	39.6	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	30	7.9	6.6	20	5.3	4.4
510	1125	170	44.9	37.4	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	20	5.3	4.4	10	2.6	2.2
520	1147	160	42.3	35.2	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	30	7.9	6.6	10	2.6	2.2	0	0	0
		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.
		W A T E R B A L L A S T I N W I N G T A N K S																													

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.

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.

Caution:

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.

Note:

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.

Water ballast in fin tank (optional)

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.

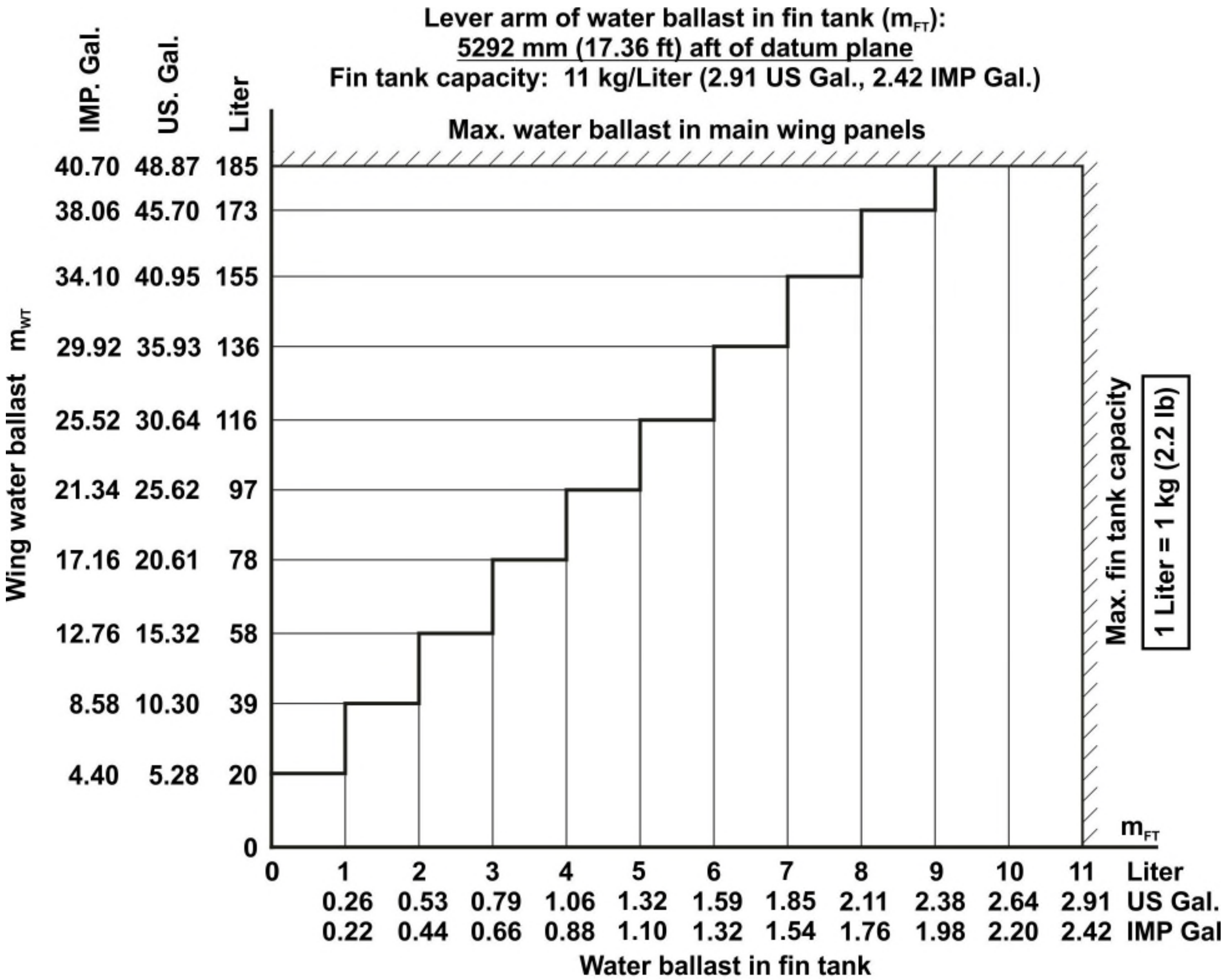
In order to avoid exceeding the maximum permitted all-up weight (mass), the ballast in the fin tank must be taken into account when determining the maximum allowable ballast quantity for the wing tanks.

Example:

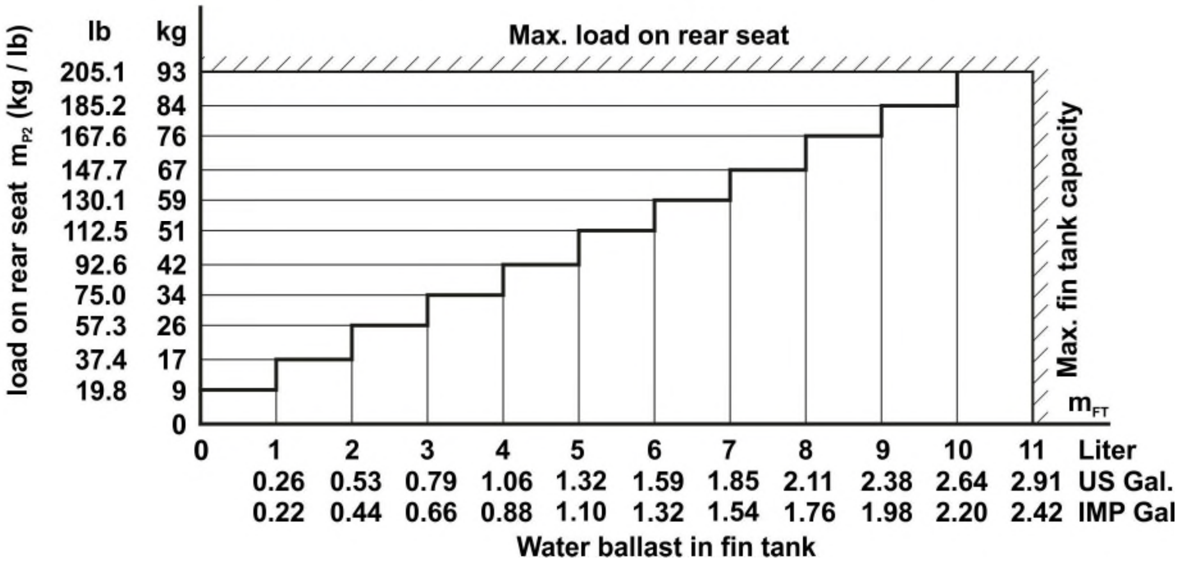
Assumed ballast load in wing tanks:	40 kg/litres (88 lb/10.6 US Gal)
Assumed load on aft seat:	75 kg (165 lb)

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/litres (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

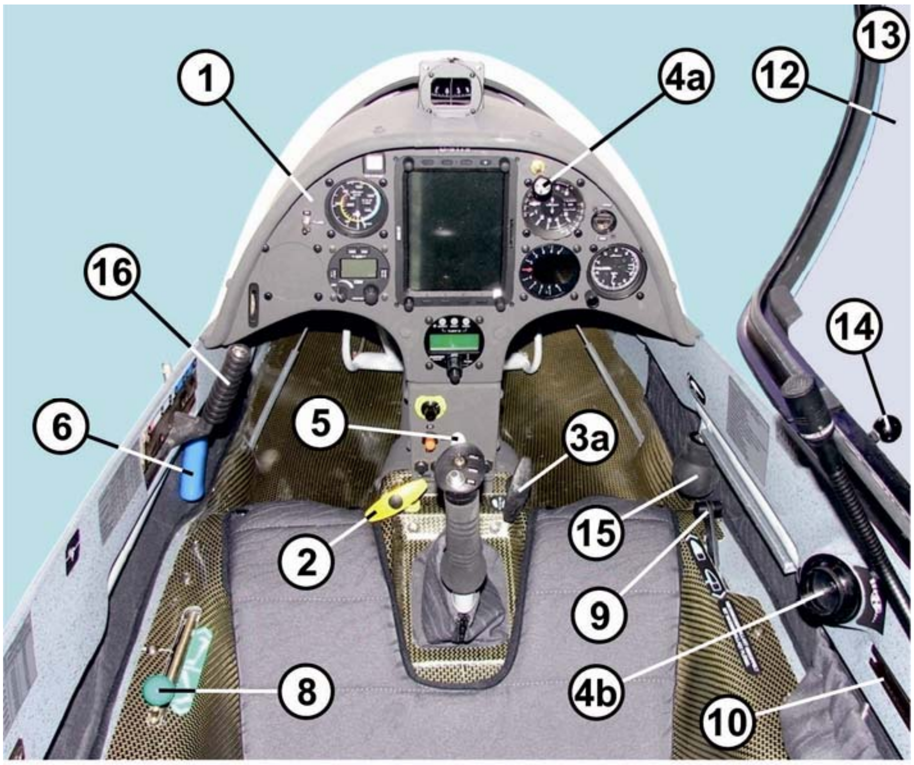
7.1 Introduction

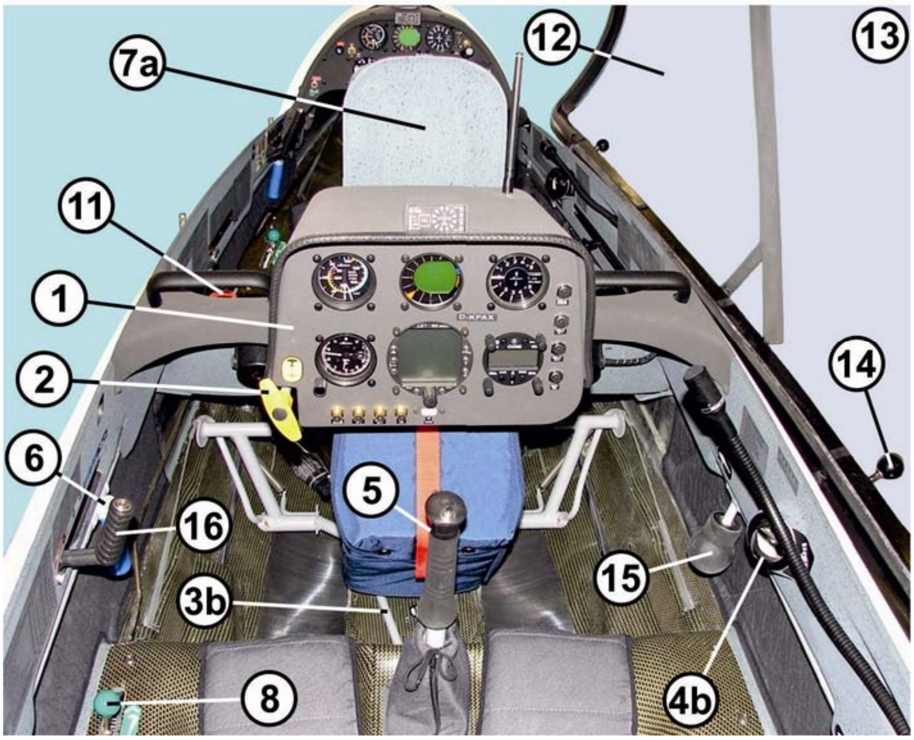
This section provides a description of the sailplane including the operation of its systems.

In Section 9 supplements to the flight manual due to the incorporation of non-standard systems and equipment can be found – if necessary.

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

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 can be pivoted upwards if the canopy is open. The front instrument panel covering is attached to the front instrument panel with two bolts. With removed covering the instrument panel can be detached from the mounting.

The rear panel is mounted to the steel tube transverse frame between the seats. After unscrewing the mounting bolts, the instrument panel and the covering can be removed.

(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:

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 lower attachment position can be varied in the seat rest.

(11) Rip cord anchorage

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

(12) Canopy

The one-piece Plexiglas canopy hinges sideways to the right on flush fittings. Take care that the cable restraining the open canopy is properly hooked up.

(13) Canopy locking and jettisoning levers (not illustrated)

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 right side..

(14) Canopy release

Remove restraining rope from the canopy at the clipper.
To open or remove the canopy, push one of the levers back up to the stop and raise canopy.

Undercarriage

(15) 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 cockpit inner skin on the left.
Swing lever slightly inwards, move to desired setting and let engage in appropriate notch.

Forward position: High speed range

Backward position: Low speed range

7.3 Instrument panels

Instrument panel front:

A description of the designated components I - IV is found on the following page section 7.3.2.

A description of the instruments as well as presentation of the rear Instrument panel is not included.

(I) Master switch

ON/OFF-switch on the instrument panel.

UP - ON

DOWN - OFF

(II) Battery selector switch

(see page 7.12.2)

(III) Outside air temperature indicator

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

(IV) Pneumatic valve (optional)

Panel mounted two-way cock for feeding the ASI in glide

7.4 Undercarriage

The landing gear of the Arcus consist of a retractable main wheel, equipped with shock absorber struts and a hydraulic disc brake, a fixed nose wheel (if installed) and a tail wheel (optionally steerable) respect. a tail skid.

The extension/retraction process of the main wheel is described in sectionr 7.2 “Cockpit description) on page 7.2.4 (Wheel break) and on page 7.2.7 (Undercarriage).

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

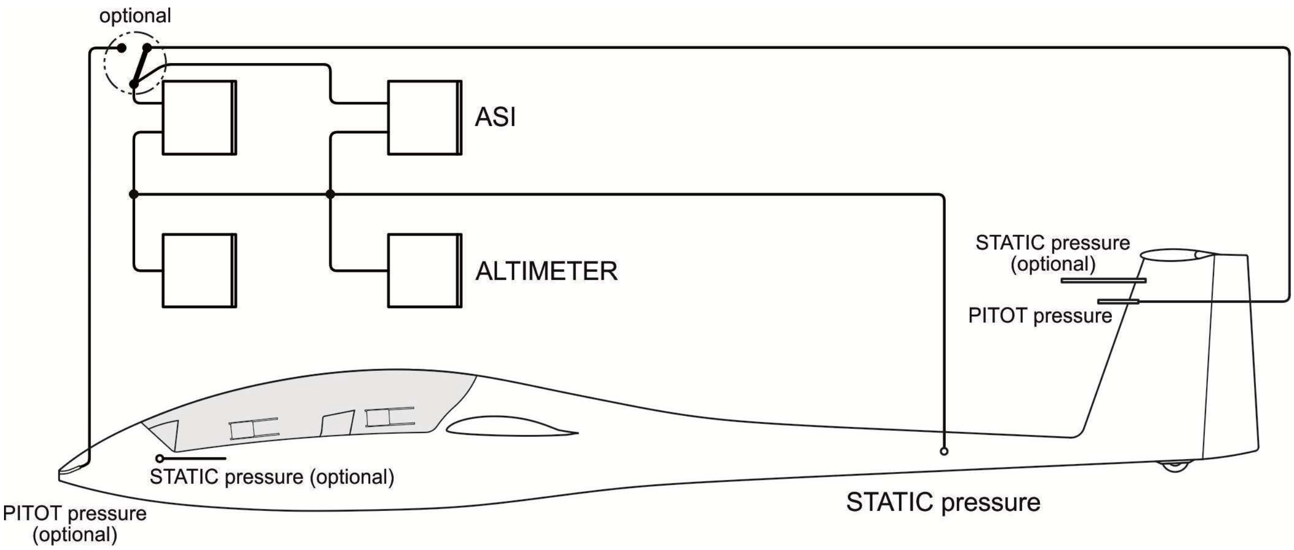
7.6 Static pressure and Pitot pressure system

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.



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.

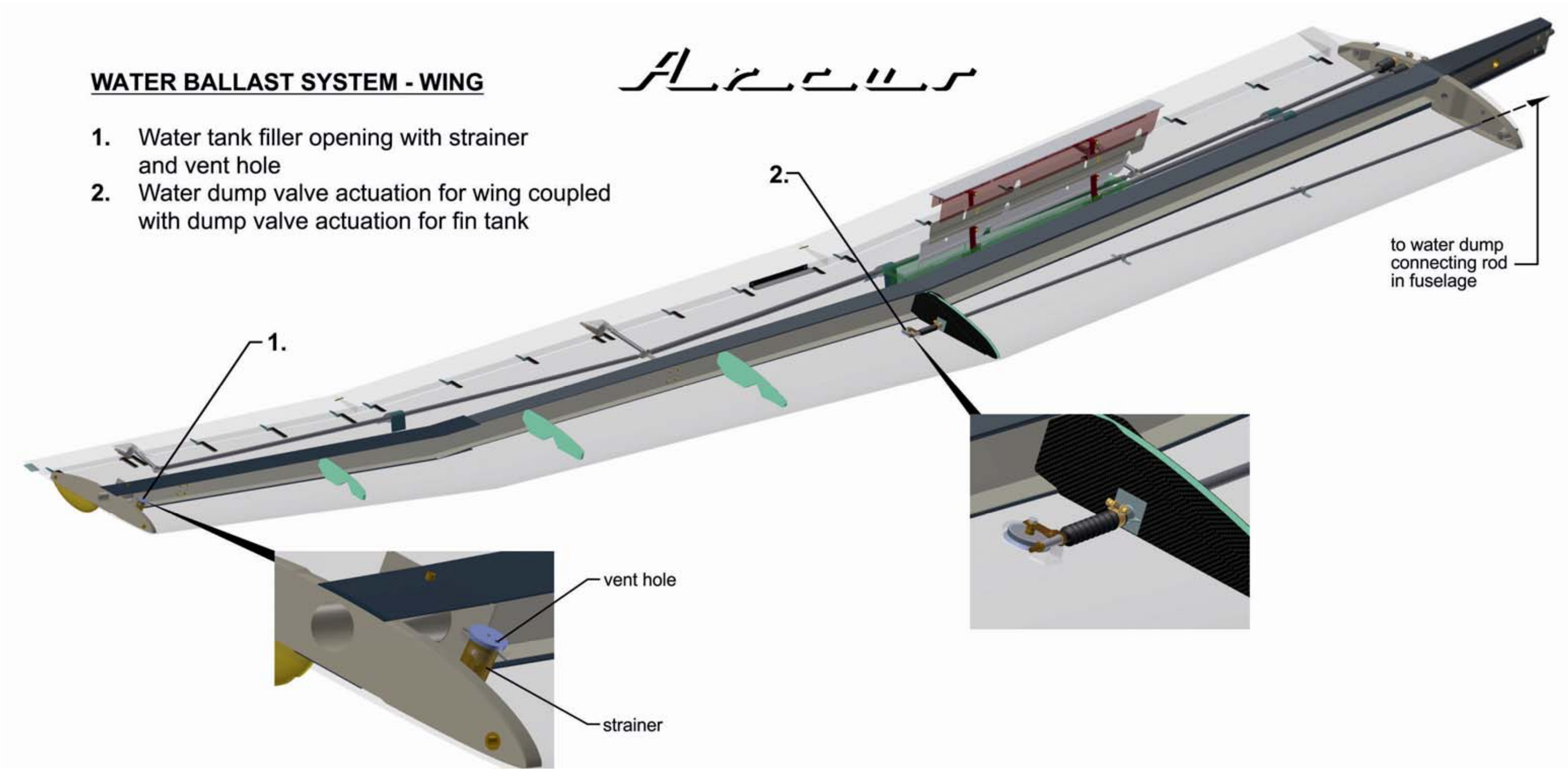
7.9 Water ballast system(s)

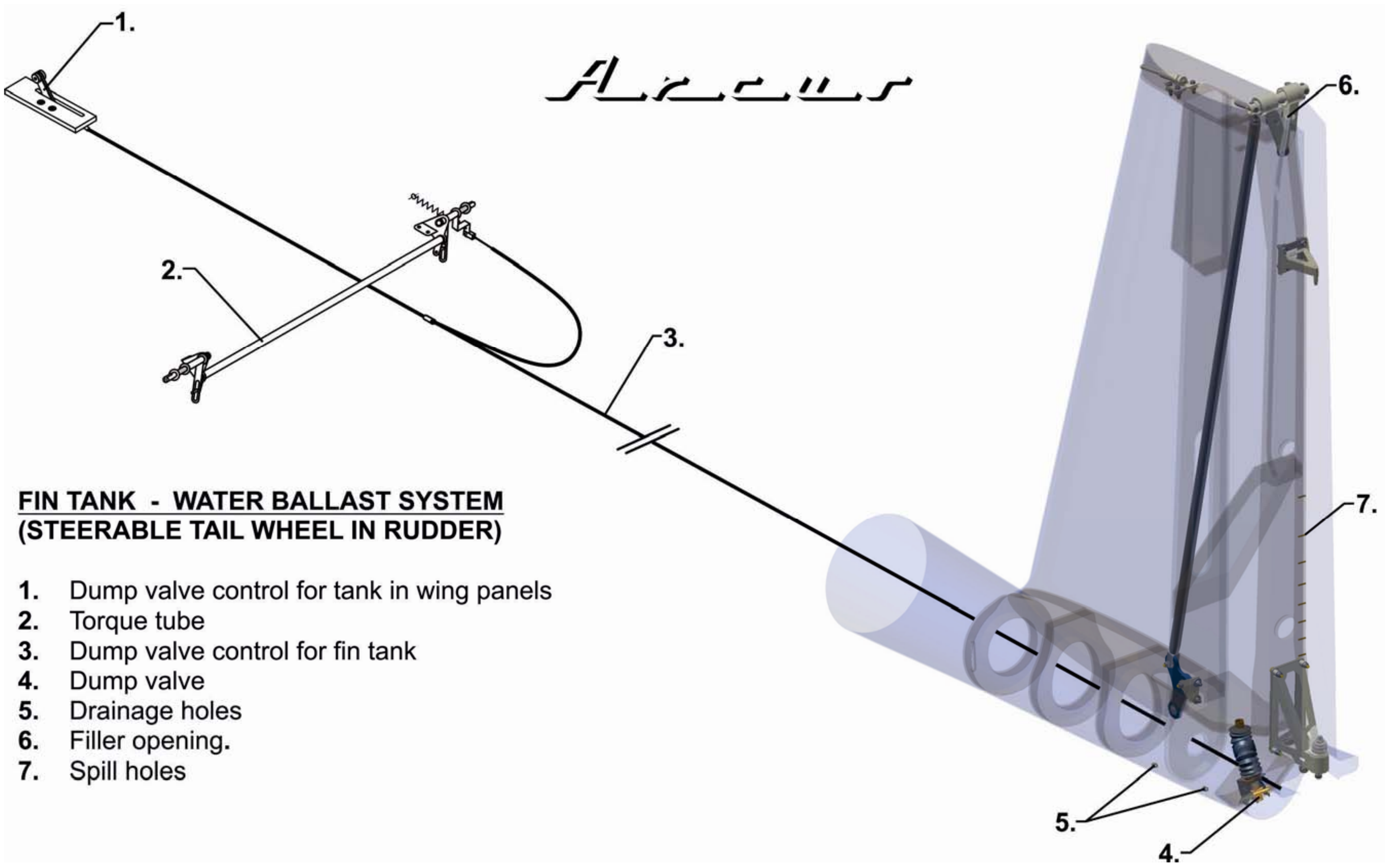
A steel cable connects the operating lever in the cockpit to the dump valve of the (optional) fin tank and a further steel cable to the torque tube actuating the wing tanks - see page 7.9.3.

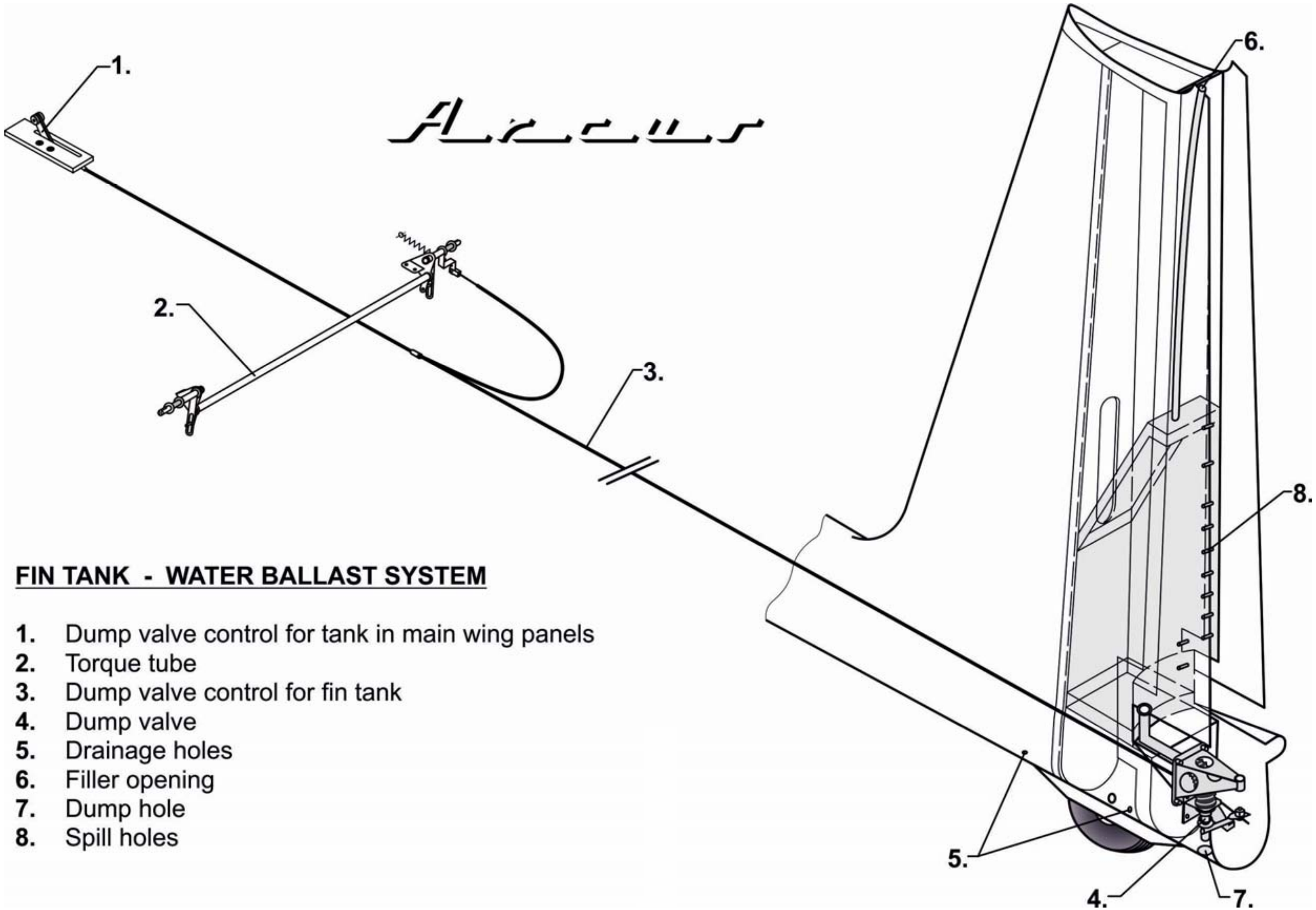
On rigging the main wing panels, the torque tube in the fuselage is automatically hooked up to the torsional drive of the dump valve plugs.

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
Arcus
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
2.
1.
to water dump connecting rod in fuselage
vent hole
strainer


1.
Arcus
6.
2.
3.
7.
5.
4.
FIN TANK - WATER BALLAST SYSTEM
(STEERABLE TAIL WHEEL IN RUDDER)
1. Dump valve control for tank in wing panels
2. Torque tube
3. Dump valve control for fin tank
4. Dump valve
5. Drainage holes
6. Filler opening.
7. Spill holes


Arcus
1.
2.
3.
4.
5.
6.
7.
8.
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

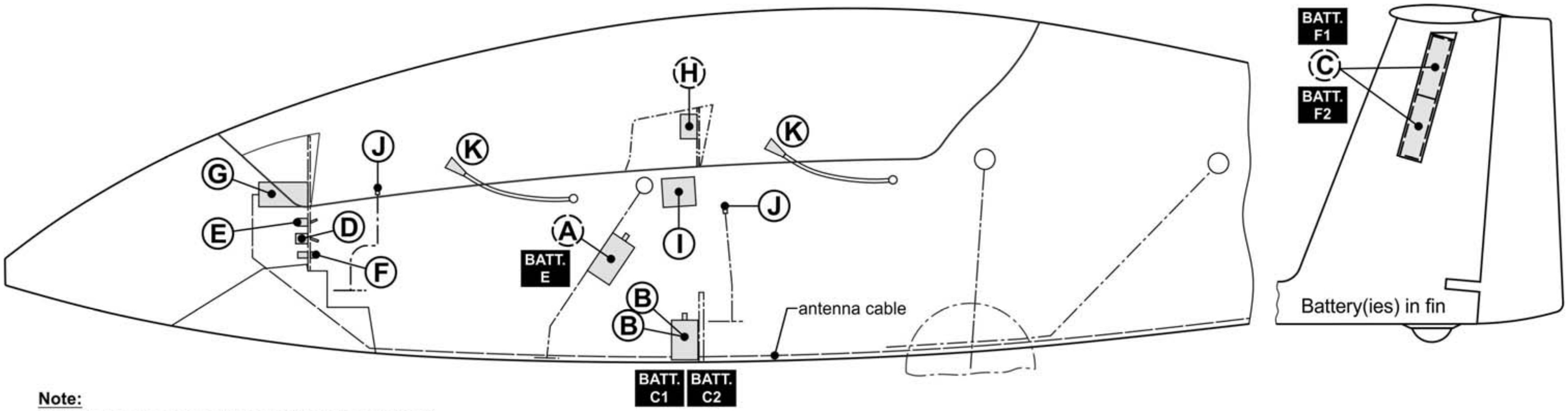
7.10 reserved

7.11 reserved

7.12 Electrical system

Gliding avionics

Additional equipment is connected to the power supply “ELECTRICAL SYSTEM – AVIONIC”, see pages 7.12.2 and must comply with the manufacturer’s instructions for the relevant equipment.



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

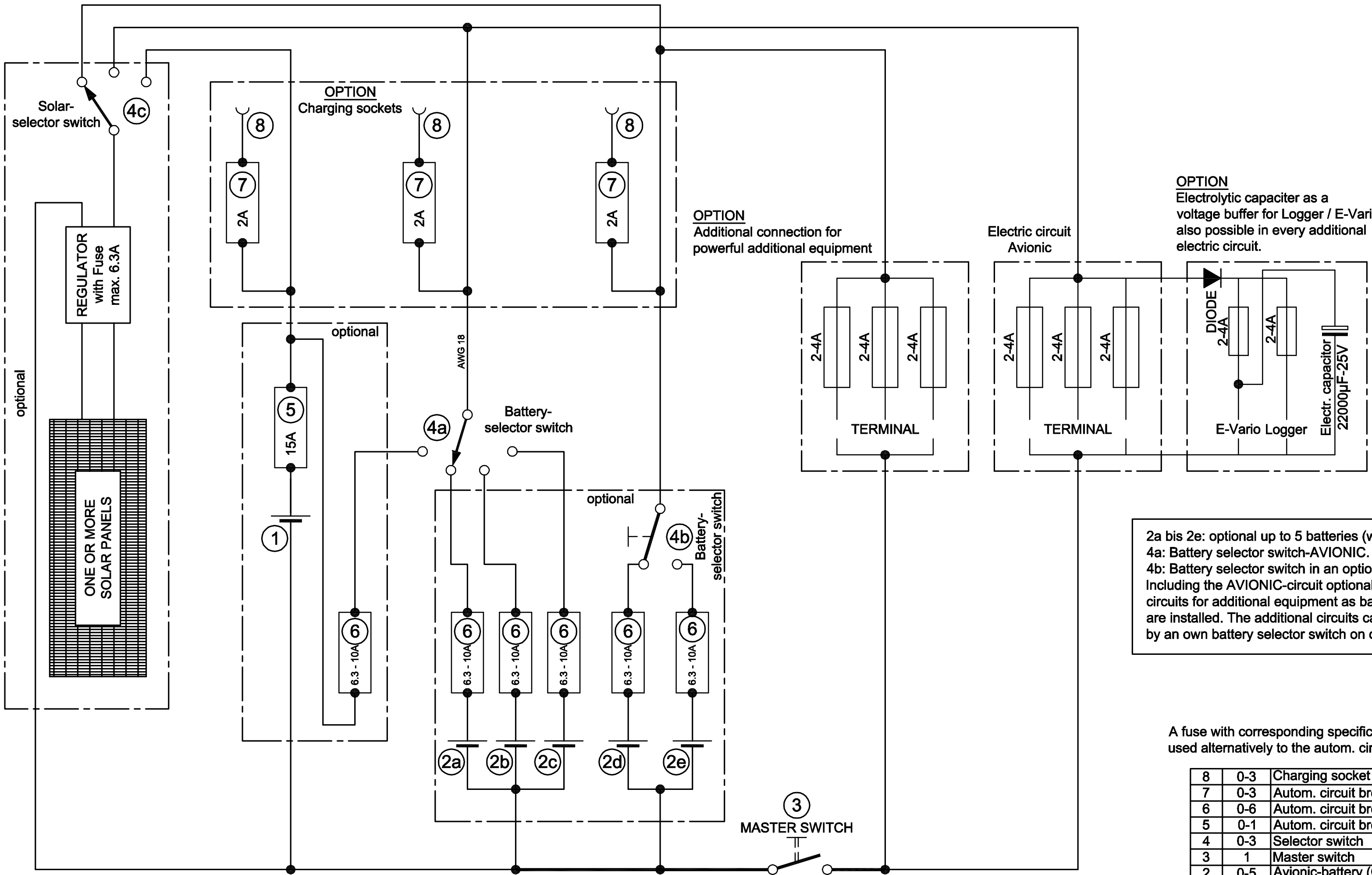
***)** Alternative types of storage batteries may be used if they meet the respective demands.

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

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

Arcus

ELECTRICAL SYSTEM - AVIONIC
S15 RE 880



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 bis 2e: optional up to 5 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.

A fuse with corresponding specification in a holder may be used alternatively to the autom. circuit breakers (Part 5, 6, 7).

Teil	Stück	Benennung
8	0-3	Charging socket
7	0-3	Autom. circuit breaker - 2-4A
6	0-6	Autom. circuit breaker - 6.3-10A
5	0-1	Autom. circuit breaker - 15A
4	0-3	Selector switch
3	1	Master switch
2	0-5	Avionic-battery (Option)
1	0-1	Engine-battery (Option)

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

WIRING DIAGRAM - AVIONIC

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 right 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.

> Caution:
>
> After oxygen systems are installed, it is necessary to re-establish the empty mass c/g position of the concerned Arcus M 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 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
- beside the top of the main wheel housing
- on the reinforced baggage compartment floor above the wing spar stubs

Section 8

8.1 Introduction

This section contains manufacturer’s recommended procedures for proper ground handling and servicing of the sailplane.
It also identifies certain inspection and maintenance requirements which must be followed if the 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 Maintenance Manual.

8.2 Sailplane inspection periods

For details concerning the maintenance of this 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 %.

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 sailplane concerned complies with an approved version.

Amendments of the approved sections of the Flight- and/or Maintenance Manual must in any case be approved by the responsible airworthiness authority.

Repairs

Abbreviations:

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

Before every take-off and especially after the 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 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 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 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 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 and the wing fuel tanks must always be left completely empty.
The 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 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 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:

- o Clean the surface (especially the leading edge of wing panels, horizontal stabilizer and fin) with clear water, a sponge and a chamois leather.
- o Do not use rinsing additives common in trade too often.
- o Polish and polishing materials may be used.
- o Petrol and alcohol may be used momentarily only, thinners of any kind are not recommended.
- o Never use chlorine hydrogen (i.e. Tri, Tetra, Per etc.).
- o 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!

- o 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 Plexiglas 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.
  N e v e r rub the canopy when it is dry!

- The 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 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 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 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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