Alexander Schleicher GmbH & Co. Segelflugzeugbau
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Flight Manual

for the sailplane

ASW 28 B

Model:	ASW 28 B
Serial Number:	28081
Registration:	F-CPVG
Data Sheet No.:	EASA.A.017
Issue:	01.02.2022

Pages identified by "Appr." are approved by EASA within the scope of type certification.

This sailplane is to operate only in compliance with the operating instructions and limitations contained herein.

Section 0

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0.1 Record of revisions

Any revision of the present manual, except actual weighing data, must be recorded in the following table and, in case of approved sections, must be endorsed by the responsible airworthiness authority. The new or amended text in the revised page will be indicated by a black vertical line in the left-hand margin, and the revision No. and the date will be shown at the bottom of the page.

Record of revisions

rev No.	section & pages affected	date of issue	date of insertion	ref. / signature

Record of revisions

rev No.	section & pages affected	date of issue	date of insertion	ref. / signature

0.2 List of effective pages

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0.3 Table of Contents

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Section 1

1 General

1.1 Introduction

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1.3 Warnings, cautions and notes

1.4 Description and technical data

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1 General

1.1 Introduction

This Flight Manual has been prepared to provide pilots and instructors with information for the safe and efficient operation of the ASW 28 B sailplane.

This Manual includes the material required to be furnished to the pilot by the certification specification JAR-22. It also contains supplemental data useful for the pilot supplied by the sailplane manufacturer.

1.2 Type certification basis

The ASW 28 B has been approved by the European Aviation Safety Agency (EASA) in accordance with JAR-22, Change 5, dated 28 October 1995, including NPA 22D-46 and NPA 22D-64.

Additionally, the following requirement had to be complied with:

"Guidelines for the substantiation of the stress analysis for sailplanes and powered sailplanes made from glass and carbon fibre reinforced plastics", issued 1991.

Category of Airworthiness: Utility

"Utility" refers to sailplanes used in normal gliding operation.

1.3 Warnings, cautions and notes

The following definitions apply to warnings, cautions and notes used in the Flight Manual:

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

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

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

1.4 Description and technical data

The ASW 28 B is a high-performance single-seat sailplane the design of which was orientated to the FAI Standard Class specification.

The ASW 28 B is suitable for record breaking and competition flying. Not least, its pleasant flying characteristics and easy handling make it suitable for versatile club flying use.

The ASW 28 B is a mid-wing glider, built mainly from carbon fibre reinforced epoxy resin. Aramid-, glass- and Dyneema-fibres are used when appropriate. The wing comprises three-part Schempp-Hirth-airbrakes on the upper surface. The wing tips end in 0.5 m high, detachable winglets.

The tail is a damped T-tail. In the vertical tail there is a probe for total pressure, static pressure, and total energy compensation. The pressures for the airspeed indicator and for the altimeter are taken from orifices in the tail boom (static pressure) and in the fuselage nose (total pressure).

The sprung, retractable landing gear has a 5" wheel and a hydraulic disc brake, which is operated when the airbrakes are fully extended.

The gaps at all control surfaces are covered with Mylar-tape. All control surfaces except the rudder are sealed with Teflon-tape.

Technical data:

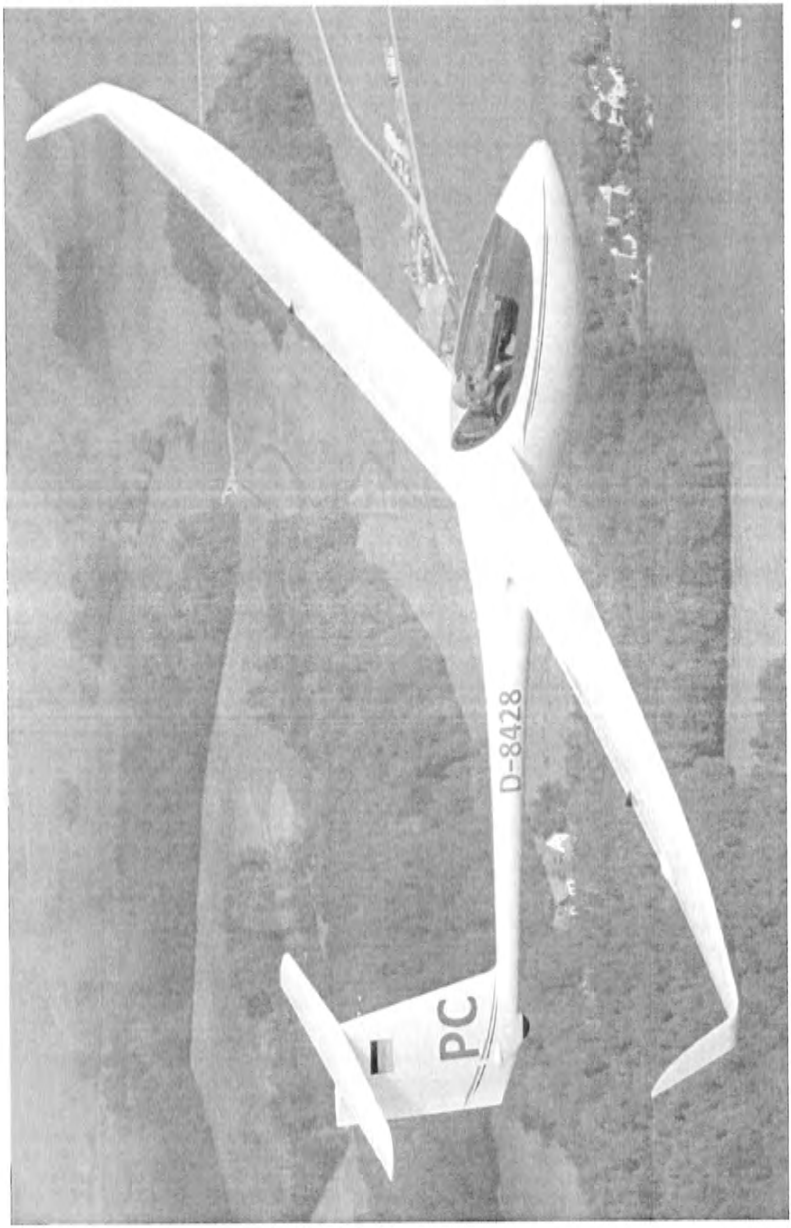
Metric

Span	15.00	m
Fuselage length	6.585	m
Height (Fin and Tail Wheel)	1.3	m
Maximum Take-Off Weight (Mass)	525	kg
Wing chord (mean aerodynamic)	0.745	m
Wing area	10.5	m^2
Wing loading		
minimum	~29	kg/m^2
maximum	50,0	kg/m^2

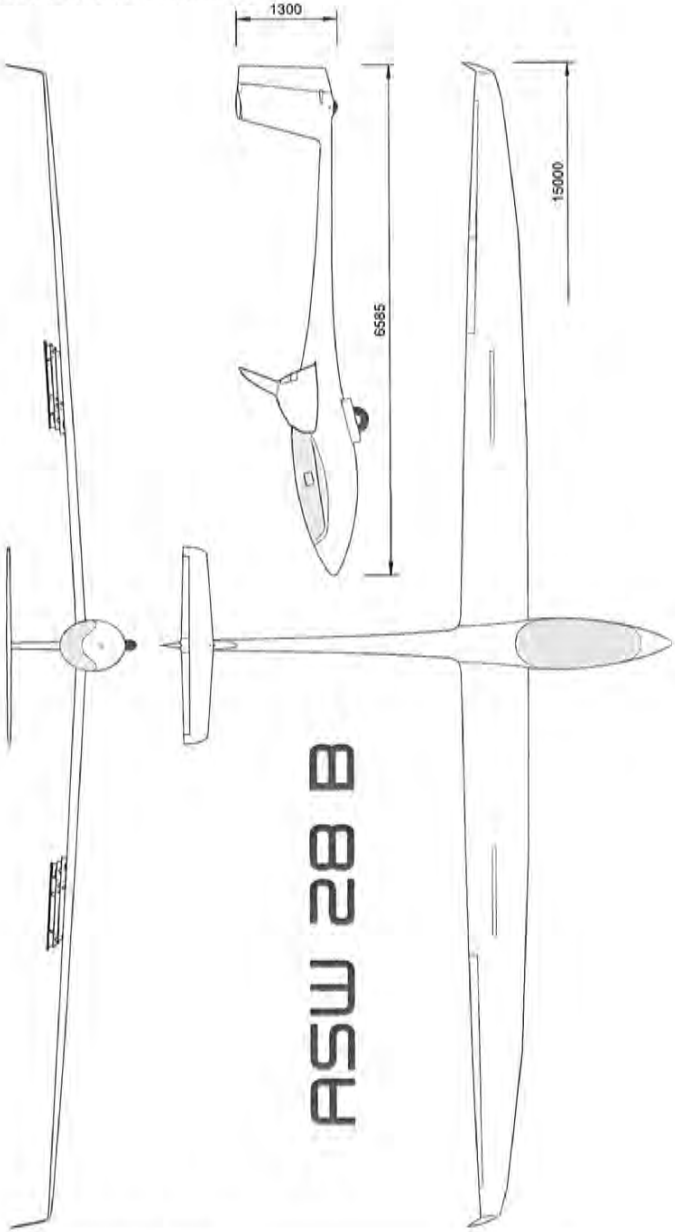
British and US system

Span	49.21	ft
Fuselage length	21.60	ft
Height (Fin and Tail Wheel)	4.27	ft
Maximum Take-Off Weight (Mass)	1157	lbs
Wing chord (mean aerodynamic)	2.444	ft
Wing area	113	ft^2
Wing loading		
minimum	about 5.94	lbs/ft^2
maximum	10.24	lbs/ft^2

General view:



1.5 Three view drawing



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2 Limitations

2.1 Introduction

Section 2 includes operating limitations, instrument markings and basic placards necessary for the safe operation of the AS 34 Me and its standard systems and standard equipment as provided by the manufacturer.

2.2 Airspeed

Airspeed limitations (indicated airspeed IAS) and their operational significance are shown below:

	Speed	IAS	Remarks
V_{NE}	Never exceed speed for **calm air**	270 km/h 146 kts 168 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**	200 km/h 108 kts 124 mph	Do not exceed this speed except in smooth air, and then only with caution. Examples of rough air are lee-wave rotors, thunderclouds, visible whirlwinds or over mountain crests.
V_A	**Manoeuvring speed**	200 km/h 108 kts 124 mph	Do not make full or abrupt control movement above this speed, because under certain conditions the sailplane structure may be overstressed by full control movement.
V_W	**Maximum Winch-launching speed**	140 km/h 75 kts 87 mph	Do not exceed this speed during winch- or autotow launching

	Speed	IAS	Remarks
V_T	**Maximum Aero-towing speed**	170 km/h 92 kts 106 mph	Do not exceed this speed during aerotowing.
V_{LO}	**Maximum Landing Gear Operating speed**	200 km/h 108 kts 124 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	(IAS) value or range	Meaning
Green arc	92 – 200 km/h 49.6 – 108 kts 57 – 124 mph	Normal Operating Range
Yellow arc	200 – 270 km/h 108 – 145.7 kts 124 – 167.8 mph	Manoeuvres must be conducted with caution and only in smooth air.
Red line	270 km/h 145.8 kts 167.8 mph	Maximum speed for all operations.
Yellow triangle	95 km/h 51.2 kts 59 mph	Approach speed at maximum weight **without** water ballast.

2.4 Weight (mass)

Maximum take-off mass	525 kg / 1157 lbs
Maximum landing mass	525 kg / 1157 lbs
Maximum mass non-lifting parts	260 kg / 573 lbs
Max. mass on pilot seat	115 kg / 253.5 lbs
Max. mass in the upper baggage compartment	12 kg / 26 lbs
Max. mass in the lower baggage compartment	5 kg / 11 lbs
Max. trim ballast (battery) in the fin	6 kg / 13.2 lbs
Max. total mass in the fin (ballast and tail tank)	8 kg / 17.6 lbs

2.5 Centre of gravity

Centre of gravity range (for flight):

foremost limit	222 mm	8.74 inch	aft of RP
rearmost limit	345 mm	13.6 inch	aft of RP

"RP" stands for "Reference Point" (Datum), which is located at the leading edge of the wing at the wing root rib. An example of a C.G. position calculation as well as additional remarks are shown in Section 6.

2.6 Approved manoeuvres

This sailplane is certified for use in normal gliding operation according to Airworthiness Category U, "Utility".

Within this Airworthiness Category U the following aerobatic figures are approved:

Positive Loop, Lazy Eight, Chandelle, Stall Turn and Steep Turn. Further details concerning these manoeuvres will be found in Section 4.5.9.

2.7 Manoeuvring load factors

The airworthiness requirements result in the following limits:

Maximum permissible manoeuvring load factors,

at an air speed of 200 km/h (108 kts, 124 mph):

maximum positive load factor: + 5.3

maximum negative load factor: - 2.65

With increasing air speeds, these values will reduce.

At an air speed of 270 km/h (146 kts, 168 mph):

maximum positive load factor: + 4.0

maximum negative load factor: - 1.5

Maximum permissible manoeuvring load factors with airbrakes extended:

At an air speed of 270 km/h (146 kts, 168 mph):

maximum positive load factor: + 3.5

maximum negative load factor: - 0.0

With increasing aileron deflections (up to the maximum permitted) the permissible load factors reduce by $^1/_3$.

2.8 Flight crew

The crew of the ASW 28 B is one pilot.

Pilots weighing less than the minimum load (incl. parachute) must use additional trim ballast plates. Please refer to the "Weight (mass) and balance form" in Section 6 and the description of trim ballast plates in Section 7.11.

In addition, the minimum cockpit load is shown in the Operating Limitations Placard in the cockpit (DATA and LOADING PLACARD).

2.9 Kinds of operation

Flights may be carried out in accordance with day VFR.

Aerobatic manoeuvres according to section 4.5.9 of this Flight Manual are only permitted without water ballast!

2.10 Minimum Equipment

Minimum Equipment consists of:

1 ASI indicating up to at least 300 km/h (162 kts, 187 mph)

1 Altimeter

1 4-part safety harness (symmetrical)

1 Parachute or cushion for the back rest (~ 8 cm thickness)

1 Outside air temperature gauge

For cloud flying the following additional equipment must be fitted:

1 Turn-and-Slip indicator

1 Magnetic compass

1 Variometer

NOTE
The temperature indication can be provided by an on-board computer.

The list of equipment that must be operative for all flights consists of this listed minimum equipment as well as equipment required for the flight by the associated operational rules of the appropriate civil aviation authority. Such implemented rules can cover operational requirements, airspace requirements and any other applicable requirements for the intended operation.

Approved equipment is listed in the Maintenance Manual in Section 12.1. The manufacturer recommends installing a yaw string on top of the canopy.

2.11 Aerotow, winch and autotow launching

Launching by Aerotow is approved using the towing release in the fuselage nose. Winch and car tow launches are approved using the c.g. tow-release below the seat.

The maximum permissible launch speeds are:

Aerotowing	170 km/h (72 kts, 106 mph)
Winch launch, car tow	140 km/h (75 kts, 87 mph)

For winch launch, a weak link of 600 daN ±10% (1350 lbf ±10%) (blue) must be used with the launch cable or tow rope.

For Aerotow, a weak link according to the tow plane must be used, not stronger than 600 daN ±10% (1350 lbf ±10%) (blue). Besides other regulations, which may exist, the tow rope must be a textile rope not less than 40 m (130 ft) or more than 60 m (200 ft) in length.

Weak link colours are not binding; this information refers to the colour scheme of the Tost company.

2.12 Other Limitations

Water Ballast

Section 6 describes what amount of water may be used, to stay within the limitations of mass and c.g.

After water ballast has been loaded, it has to be checked that the ballast is distributed symmetrically. This is the case only if the wings can be held level with ease.

Only pure water may be used, without any additives.

WARNING
Flying with water ballast in air mass temperatures of less than 3°C is not permitted. At outside temperatures of less than 3°C the water ballast has to be jettisoned.

WARNING
Aerobatics and spinning with water ballast is not permitted!

See section 4.5 for more information about water ballast.

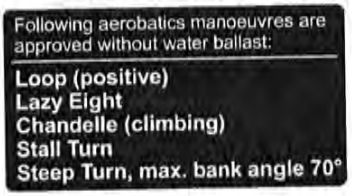
2.13 Limitations placards

This placard is fixed to the left-hand cockpit side wall and contains the most important mass (weight) and speed limitations:

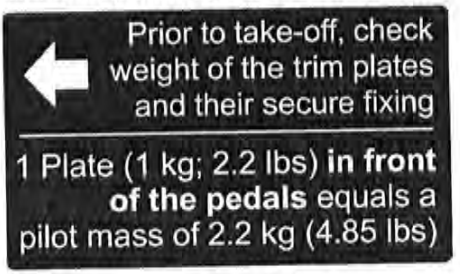
Note:

The configuration during weighting must be noted on the loading placard.

This placard is to be fixed near the previous data placard:



If an attachment for trim weights is installed in front of the front pedals, then this placard is affixed on the right-hand side of the cockpit side wall:



This placard is fixed to the tube between the front lift pins:

This placard is affixed in front of the baggage compartment, which is left of the landing gear box:

Section 3

3 Emergency Procedures

3.1 Introduction

3.2 Jettisoning of canopy

3.3 Bailing out

3.4 Stall recovery

3.5 Spin recovery

3.6 Spiral dive recovery

3.7 Other emergencies

3 Emergency Procedures

3.1 Introduction

This section provides checklists, which describe briefly the recommended procedures to follow in emergencies. Afterwards a more detailed description follows.

EMERGENCY PROCEDURES

(1) **Canopy jettison**

- Fully pull back both red canopy jettison handles at the left and right canopy frame
- Push canopy rear- and upwards

(2) **Bailing out**

- Push instrument panel upwards.
- Open safety harness.
- Roll over cockpit side.
- Push off strongly.
- Caution: Watch wing & tailplane!
- Pull parachute!

(3) **Spin recovery**

- Apply full rudder opposite to the direction of the spin and
- Ease the stick forward until rotation ceases
- Center the rudder and ease out of the ensuing dive

NOTE
Neutral aileron supports recovery.

3.2 Jettisoning of canopy

Fully pull back both red canopy jettison handles at the left and right canopy frame and push the canopy rear- and upwards.

> ***CAUTION***
> *Push the canopy open with the canopy jettison handles. Do not push up the canopy above the head directly with the hands. The "Röger-hook" will hold the rear end of the canopy down, to make it swivel around its trailing edge.*

In a vertical dive, the air loads on the front canopy may be high. With some yaw, however, low pressure builds up over the canopy. Therefore, apply some rudder in this case!

3.3 Bailing out

If bailing out becomes inevitable, first the canopy is jettisoned and only then should the seat harness be released.

Push instrument panel upwards (if this was not yet already done in the course of jettisoning the canopy). Get up or simply roll over cockpit side.

When jumping, push yourself away from the aircraft as strongly as possible. In case of manual parachute release grip the handle and pull out entirely after 1 – 3 seconds.

> ***CAUTION***
> *Watch out for wing leading edge and tailplane!*

3.4 Stall recovery

In straight or circling flight, relaxing of back pressure on the stick will always lead to recovery. Due to its aerodynamic qualities the ASW 28 B will immediately re-gain flying speed.

When opposite aileron is applied during a fully stalled flight attitude, the ASW 28 B will roll outwards a little as back pressure is relaxed.

3.5 Spin recovery

According to the so-called standard procedure, spinning is terminated as follows:

① Check ailerons neutral.
② Apply full rudder opposite to the direction of the spin.
③ Ease the stick forward (means, give in to the pressure of the stick) until rotation ceases and sound airflow is established again.
④ Centre the rudder and ease out of the ensuing dive.

CAUTION
Spinning is not noticeably affected by extending the air brakes, but this increases the altitude loss and reduces the permissible load factor during recovery. It is therefore advisable to keep the air-brakes retracted.

NOTE
Water ballast has no noticeable influence on spinning qualities except that recovery speeds are higher and as a consequence greater loss in altitude is experienced.

The altitude loss from the beginning of the recovery until the normal flight attitude is regained is about 100 m (330 ft).

3.6 Spiral dive recovery

Depending on the aileron position in a spin, with forward C.G. positions (i.e., the C.G.-range in which the ASW 28 B cannot sustain a steady spin) it will immediately or after a few turns develop into a spiral dive or a slipping turn similar to a spiral dive.

In contrast to a spin, a spiral dive is characterized by high g-loads. Therefore, do not pull the stick further back, but:

① release stick
② reduce bank angle with rudder and aileron against direction of turn
③ gently pull out of the dive

3.7 Other emergencies

Emergency landing with retracted landing gear

Emergency landings with retracted landing gear are not advised in principle, as the capacity for energy absorption of the fuselage is many times less than that of the sprung landing gear. If the wheel cannot be extended, the ASW 28 B should be touched down with the airbrakes closed as far as possible, at a shallow angle and without stalling onto the ground.

Groundloops

If the aircraft threatens to roll out beyond the intended landing area, the decision should be made not less than 40 m (130 ft) before reaching the end of the landing area to initiate a controlled ground loop.

- If possible, turn into wind!
- When putting down a wing, at the same time push the stick forward and apply opposite rudder!

Emergency Landing on Water

A landing on water with a composite glider with wheel retracted has been experimentally tried out. The experience gained on that occasion suggests that the aircraft will not skim on the water surface, but that the whole cockpit area will be forced under the surface.

If the depth of the water is less than 2m (6,5ft), the pilot is in the greatest danger. Touching down on water is, therefore, recommended **only with extended landing gear,** and **only** as the very last resort.

Flying with defective water ballast system

The water ballast dump valve operation ensures that, when water ballast is jettisoned, both tanks are drained at the same time. When the optional tail water ballast tank is installed also this tank is drained at the same time. This is necessary for reasons of flight characteristics.

When jettisoning water ballast in flight, it should be positively observed that the water is draining from both wings.

If a failure of the valves should cause asymmetric loads, the flight should be terminated with extreme care, maintaining an adequate margin above stalling speed as incipient or full spins with asymmetric ballast load are not permissible. Special care should be taken to avoid turning and slipping in the direction of the heavier wing.

If a drain valve is defective, the matching valve on the opposite side must be closed, as a landing at a higher landing weight is to be preferred compared to a landing with an uneven load.

Defective airbrake control circuit

If sudden strong change of flight course happens, the pilot should immediately visually check whether the airbrakes have extended on both wings as this asymmetry may have been caused by an airbrake extended on one wing only. This problem could occur due a defect in the airbrake control circuit and cannot be compensated by rudder deflection. If the airbrake has extended on one wing only, the other airbrake must immediately be extended so far that the aircraft will regain straight and level flight and the airbrake lever must be held in this position.

Depending on the flight altitude immediately initiate an out-landing.

Lightning strike or assumed lightning strike

Select an airspeed within the green range of the airspeed indicator. Check whether all control surfaces are operational and work correctly. However, the airbrakes should only be tested near a suitable landing area. Should structural damage be anticipated, immediately look for a suitable landing area.

CAUTION
Electrical systems are likely to be affected after a lightning strike or they might even fail totally.

Section 4

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- 4.2 Rigging and derigging
- 4.3 Daily inspection
- 4.4 Pre-flight inspection
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4 Normal procedures

4.1 Introduction

This Section contains Check Lists for the daily inspection and pre-flight checks. It also describes normal operating procedures. Normal procedures associated with optional systems and equipment are described in Section 9.

4.2 Rigging and derigging

The ASW 28 B can be rigged and derigged without use of rigging aids by three people, or by two people when a fuselage cradle and a wing stand are used.

Rigging

1. Clean and lubricate all pins, bushings and control connections.
2. Support fuselage and keep upright. If the wheel is lowered, check that the landing gear is securely locked down.
3. Insert right wing spar fork into fuselage and support the wing tip with a trestle, if available.

   While rigging, the airbrakes must be unlocked but extended (by using the special tool AS-P/N 99.000.8872, grey metal lever). The ailerons should be slightly raised. Centre the stick and push the airbrake lever almost fully forwards.

   NOTE
   The wing stand must not obstruct the movement of the ailerons!
4. Insert left wing spar root and line up the main pin bushings. Insert and lock main pins. Only now - and not before - may the wing weight be relaxed. If the aircraft is still supported in a fuselage cradle, it is recommended that the landing gear should be extended at this stage and locked. Complete rigging with the aircraft standing on its main wheel.

5. The winglets are installed into their pockets in the wing tips and secured by the self-engaging spring-loaded bolt. Adhesive tape seals the gap and secures the winglet additionally.
6. Screw the cover of the water ballast filling/ventilation opening on the upper wing surface in place and mask it.
7. Prior to rigging the horizontal tail, check if a trim weight or battery in the fin compartment is needed, or is already installed! The trim weight and/or battery have to be secured by tight fit against any vertical movement with the horizontal tail installed. After cleaning and lightly lubricating the elevator studs and sockets, the tailplane is pushed onto the fin from the front. Each half-elevator must be guided into the elevator connections. The elastic lip seal covering the elevator gap must be placed on top of the elevator actuator. Now push the tailplane home until the hexagon socket head bolt at the leading edge will engage its thread. The bolt must be fully and firmly tightened. It is secured by means of a spring ball catch, whose ball must engage in the grooves on the side of the bolt head.
8. Insert the probe(s) into the fin up to the stop and secure with adhesive tape.
9. A considerable performance improvement can be achieved with little effort by taping all gaps at the wing junctions with plastic adhesive tape (only on the non-moving parts).

   The elevator-rudder junctions should also be sealed with tape. The canopy rim must never be taped over, so as not to impair bail-out.

   It is recommended that appropriate areas should be thoroughly waxed beforehand, so that the adhesive tape can afterwards be cleanly removed without lifting the paint finish.

   CAUTION
   The ventilation ports of the water tanks must be kept open in any case!

Derigging

To de-rig: proceed in the reverse order of rigging starting with the horizontal tail, winglets and wings. We would add the following suggestions:

1. Drain all water ballast. To properly do so screw off the cover from the wing water tank on the upper wing surface. Ensure that all the water has emptied out by putting down alternative wing tips several times.
2. If a tail water ballast tank is installed, check if water has gathered in front of the rudder or inside the fuselage tail cone. If water is found, check all hose clamps, hoses and valve for leaks.
3. If the tailplane is very firmly located in its rear seating, it will be more easily dismantled by two people alternately pushing it forwards by the tips.

4.3 Daily inspection

Before commencing flying operations, the aircraft must be thoroughly inspected and its controls checked; this also applies to aircraft kept in the hangar, as experience shows them to be vulnerable to hangar-packing damage and vermin.

Daily inspection of the glider

The following numbers correspond with those in Fig. 4.3-1 "Tour of Inspection".

1) Open canopy and perform visual inspection of the canopy jettison.
2) Check main pins inserted up to the handle and secured.
3) Check cockpit and control runs for loose objects or components.
4) Check all batteries for firm and proper attachment.

5) Check full, free and stress-free operation of all controls. Hold controls firmly at full deflection while loads are applied to control surfaces.

6) Check ventilation opening in fuselage nose.

7) Check condition and operation of towing hooks. Check free operation of the release control. Do not forget release checks!

8) Check inflation and condition of tires:
   Main wheel: 2.5 bar ± 0.1 bar (36.5 psi ± 1.5 psi)
   Tail wheel: 2.5 bar ± 0.1 bar (36.5 psi ± 1.5 psi)

9) Check wheel brake for operation and leaks. With airbrake paddles fully extended the resilient brake pressure from the main brake cylinder should be felt through the brake handle.

10) Check both upper and lower wing surfaces for damage.

11) Airbrake paddles: Check condition and control connections. Check both sides for a good over-centre lock. Check both airbrake boxes for loose objects, stones, water etc.

12) Check the winglets for damages and proper securing. Check the ventilation ports of the wing water ballast tank.

13) Ailerons: Check condition, play and full and free movement. The gaps between the inboard/outboard edge of the aileron and the fixed wing must have a clearance of min. 1.5 mm (1/16 in). This clearance is necessary to ensure that these surfaces do not foul the wing cut-out edges when deformed under load in flight. Check linkage fairing for clearance. The contact areas of the elastic seals must be free of any dirt!

14) Check fuselage, especially underside, for damage.

15) Check static ports in the fuselage tail boom for obstructions or moisture.

16) Multi-Probe in the fin: Check condition and proper seating.

17) Check (if installed) tail water ballast tank drain hole and the ventilation hole for cleanliness.

18) Check if ballast or battery is installed inside the fin compartment (optional). Elevated minimum cockpit load, see mass and balance form, section 6.3.

19) Check that the tailplane bolt is tight and locked.

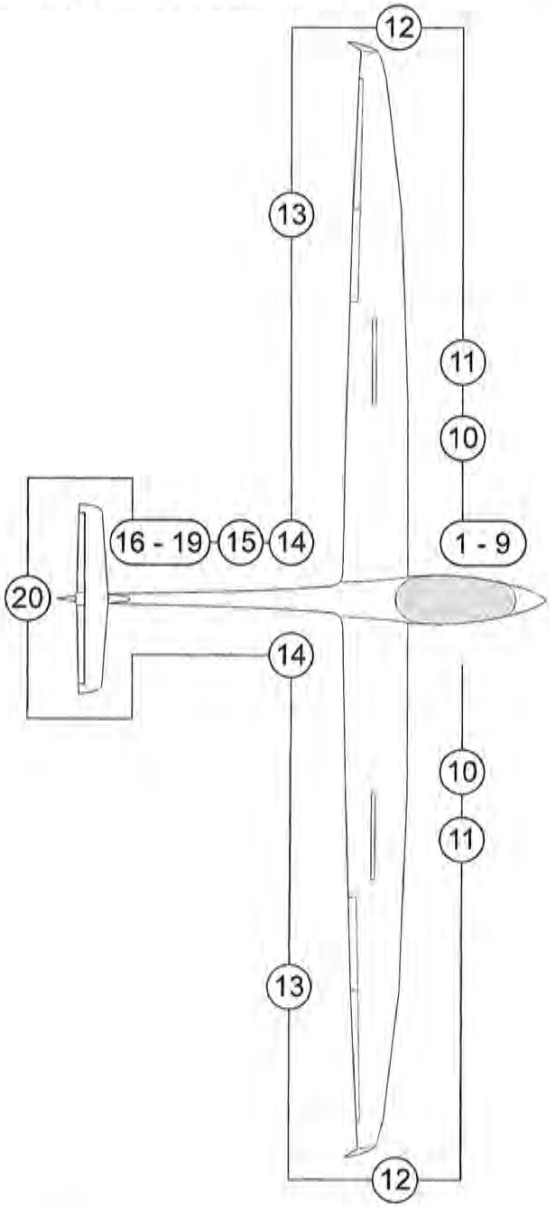
20) Check that rudder, tailplane and elevator are correctly fitted and check for damage or excessive play.

NOTE
Finally, check the water ballast system for leaks, after it has been filled.

These points are briefly repeated on a checklist on the cockpit sidewall:

Pre Flight Check
- Check main pins (secured)
- Check for foreign matter in the cockpit
- Check horizontal tail (secured)
- Check controls (positive connections, freedom of movement, play)
- Check for visible damage on towing hooks, landing gear, surface
- Check Multi-Probe mounted and inserted until stop
- Check whether trim ballast or a battery is installed in the fin
- Check static pressure openings (dry and unobstructed)
- Check tire pressure and wheel brake
- Test tow release
- Check water tank outlets and ventilation openings
- Check mass and balance

Fig. 4.3-1 Tour of inspection round the aircraft



4.4 Pre-flight inspection

Prior to getting on board, check the aircraft loading regarding the total weight and the centre of gravity position. Pay special attention to trim weights installed in the aircraft!

The backrest has to be adjusted properly so that all control elements are easily accessible for the pilot. The headrest has to be adjusted such that the head contact point is at eye level

The following Check List containing the most important points is affixed within easy view of the pilot, below the instrument pod:

Pre Take-off Check

- Remove tail dolly
- Fasten parachute
- If applicable connect rip-chord for automatic parachute
- Take a correct seat position
- Fasten seat harness (especially tighten lap straps)
- Check free movement of the controls
- Close airbrakes and lock them
- Set trim in take-off position
- Set altimeter
- Check radio transmission
- Check locking position of the landing gear
- Check wind direction
- Recap the take-off interruption procedure
- Close and lock canopy

4.5 Normal procedures and recommended speeds

4.5.1 Winch launch

CAUTION
Winch- and car launches must be conducted using the C.G. tow release in front of the main landing gear.

CAUTION
Always start the launch prepared to release. If you cannot keep the wings level, release immediately.

For winch launch, it is recommended that the trimmer should be set at the centre of the indicator for forward c.g.-positions or slightly nose-heavy (in the forward 33% of the indicator gate) for rear c.g.-positions. When these trim settings are adjusted the ASW 28 B will assume a gentle climb attitude.

Above a minimum safe height, the climb angle should be increased by applying back pressure on the stick

For winch launch, a weak link of 600 daN ±10% (1350 lbf, ±10%) (blue) must be used in the launch cable or tow rope (weak link colours refer to the colour scheme of the Tost company).

Maximum acceptable crosswind component is listed in Section 5.3.1.

NOTE
Rear c.g.-positions are given when the cockpit load is close to the actual minimum cockpit load, see page 6.4. Forward c.g.-positions are given when the actual minimum cockpit load is exceeded by more than 30 kg (66.15 lbs.).

NOTE
*The wheel should **not** be retracted during the launch.*

CAUTION
Winch launching with water ballast is not recommended at less than 20 km/h = 10.5 kts headwind component. The winch driver must be informed of the total Take-Off Mass.

CAUTION
Before Take-Off, check seating position and that controls are within reach. The seating position, especially when using cushions, must preclude the possibility of sliding backwards during initial acceleration or steep climb. To do so bring the back rest in the most upright position which is comfortable in order to provide the shoulder straps holding the pilot down in the seat.

WARNING
We expressly warn against attempting any launch by an underpowered winch in a tail wind!

4.5.2 Aerotow

CAUTION
The sailplane is only certificated for aerotow operation when the forward tow release is used.

The trim should be set nose-heavy. A tow rope of between 40 m and 60 m (130 ft and 200 ft) long, but never less than 40 m in length and as specified regulations should be used.

At the start of the take-off run it has proved useful to open the airbrakes fully at first. This prevents over-running the tow rope as slack is taken up, and the tendency for the glider to swing due to one-sided prop wash is considerably reduced. As the ailerons become effective during the ground run, the airbrakes should be promptly closed and locked.

For the actual lift-off, the following practise has proved satisfactory:

Try to keep the tail wheel in contact with the ground until the aircraft lifts off; this increases directional stability during the ground run, and helps the glider to lift off at the earliest possible moment.

After lift-off, climb to between 1 m and 2 m = 3,5 ft and 6,5 ft in order to avoid pitch oscillations caused by ground effect and slipstream turbulence from the tug.

NOTE
Inform tug pilot of minimum towing speed.

T/Off Mass	Recommended Towing Speed
300 kg [661.5 lbs]	115 km/h [62.0 kts]
400 kg [882.0 lbs]	120 km/h [64.8 kts]
525 kg [1157.4 lbs]	125 km/h [67.4 kts]

Maximum acceptable crosswind component is listed in Section 5.3.1.

4.5.3 Flight

In straight flight with clean wings and at a flight mass of about 340 kg [749.7 lbs] the ASW 28 B flies with laminar flow within a speed range of 75 km/h to 160 km/h [40.5 kts to 86 kts]. At the maximum flight mass of 525 kg [1157.4 lbs] the favourable aerodynamic range lies between 90 km/h and 190 km/h [48.5 kts and 102.5 kts]. Beyond these speed ranges, flight performance will noticeably deteriorate.

When circling, remember that the stalling speed will increase compared to that in straight flight.

As a general guideline, you should expect the stalling speed to increase by 10% at about 30° bank, and by 20% at about 45° bank - see also Section 5.2.2.

CAUTION
Flights in conditions conducive to lightning strikes must be avoided as the ASW 28 B is not approved for such conditions under JAR 22 requirements.

Low Speed Flight and Stalling Behaviour:

The ASW 28 B behaves normally in slow and stalled flight. In all C.G. positions, reduced aileron effectivity together with flow separations at the fuselage and a gentle oscillation about the vertical axis will give warning of an impending stall. At the foremost C.G. position, the stall characteristics become very gentle, as the limited elevator deflection will no longer allow maximum angles of attack to be reached.

At this C.G. position, only a gentle stall warning will be experienced, but large aileron deflections can be applied without dropping a wing.

Even with rearmost C.G. position, about half of maximum aileron deflection can still be applied, with rudder centralised, to maintain the aircraft in straight stalled flight. It would, of course, be more appropriate to control the aircraft by means of rudder alone, and to leave the ailerons centred.

Violent applications of rudder and/or aileron would result in a spiral dive, spinning or side slipping, depending on C.G. position.

CAUTION

Height loss due to incipient spin from straight or circling flight depends largely on the all-up flight mass!

Height loss from straight flight after prompt recovery action approx. 20 m (65 ft) !

Height loss from circling flight with max. flight mass up to 100 m (330 ft) !

More specifically, the following would apply:

C.G. Position	Rudder & Aileron Co-ordinated	Rudder & Aileron Crossed
rearmost	steady spin	steady spin
middle	spin, leading to spiral dive	spin, leading to side slipping
foremost	~ half turn of spin, leading to spiral dive	side slipping

Wing drop from circling flight is not noticeably more violent than from straight flight.

4.5.4 Approach

Make the decision to land in good time and, notwithstanding the high performance, lower the wheel at not less than 150 m (~ 500 ft) above ground.

For the remainder of the circuit, maintain about 95 km/h [51 kts] (yellow triangle on ASI scale).

The glider should be trimmed to between 90 and 100 km/h [48.5 and 54 kts]. In turbulence, the approach speed should be appropriately increased.

The triple-paddle air brakes are normally effective in controlling the glide angle.

Side slipping with the ASW 28 B is very effective and may therefore also be used for controlling the glide angle.

Side slips can be performed between 90 km/h and 120 km/h IAS [49 to 65 kts] by gently applying rudder and opposite aileron control at the same time. With increasing speed less aileron deflection is necessary to achieve a straight flight path despite the rudder is fully deflected. The yaw angles and consequently the additional drag decrease with increasing speed. In a stationary side slip the ASI reading is not usable as it reads between 50 km/h [27 kts] and zero. The correct flying speed is controlled by pitch altitude. The upper edge of the instrument panel must not rise above a horizon position as known from thermal flight altitude.

Associated negative rudder control force gradients and rudder lock can be easily overcome by moderate pedal forces or by easing the control stick into a more neutral position.

NOTE

Side slipping should be practised from time to time at a safe height!

With a partial but symmetric water ballast load side slipping is possible!

WARNING

When an asymmetric water ballast load is suspected or recognised, emergency procedures according to Section 3 are applicable. Side slipping into the direction of the heavier wing must be avoided!

4.5.5 Landing

In an emergency (e.g. abandoned take-off), structural strength will prove adequate to a landing at maximum all-up mass.

However, in normal operation it is strongly recommended that the water ballast is jettisoned before landing, in order to increase the safety margin.

Remember to round out in time to allow a clean 2-point touch-down.

Immediately before touching down, the airbrake setting may be reduced so as to avoid touching down with wheel brake too firmly applied.

During ground run the stick should be held fully back; this gives better directional stability in crosswinds, and prevents the tail from lifting due to hard application of the wheel brake.

4.5.6 Flight with water ballast

> ***CAUTION***
> *Ballast will increase the stalling speeds and take-off distance. Ensure that the condition of the airfield, the length of take-off run available and the power of the towplane, tow-car or winch permits a safe launch.*

The ASW 28 B is equipped with up to three water ballast tanks. Both wings contain integrated water tanks with each of about 100 litres (26.4 US-gal.) filling capacity. A water tank with 5 litres (1.3 US-gal.) can be optionally integrated in the vertical tail.

The tail water tank is only intended to compensate the nose-heavy moment of the wing water tanks. Therefore, the valve of this tank opens simultaneous with the wing water tanks.

Ballast limits

See section 6.3 to determine the maximum permissible amount of water ballast.

Water ballast limitations are listed in section 2.14.

Control

The valve operation is done mechanically, operated by the lever on the right-hand cockpit in the sliding block of the landing gear lever and opens all valves at once. If the optional tail tank is installed, its valve is operated by the lever simultaneously, too.

Filling of Water Ballast

> ***CAUTION***
> *If an optional tail water ballast is installed and tail water ballast is needed, this has to be filled first!*

The tail tank is filled through its drain port (in front of the tail wheel). A transparent filling hose is supplied, which can be screwed into the port. For filling the tail water tank the valves must be opened!

The amount of water in the tail tank can be read from the water level in the hose and the level marks on the fin skin. After having filled the tank, close the valve and remove the hose.

The integrated wing tanks can be filled through the filling/ventilation openings on the upper wing skin. For filling, the wings must be kept level. The tank valves have to be closed. Carry out a balancing test to check that the ballast loads are even by levelling the wings.

> ***WARNING***
> *It is expressly prohibited to use pressurised water (mains, immersion pumps etc.) for filling ballast tanks due to possible damage to the wing structure!*

It is recommended to fill from slightly elevated, non-pressurised containers (on wing or car roof etc.). If water under pressure is used, it is essential to interpose an open intermediate vessel (funnel etc.), to ensure that the water column cannot rise beyond 1.5 m (4.9 ft).

WARNING

The aircraft must be parked level after the water ballast is filled in. Otherwise, the integrated water tank may dump slowly through the ventilation of the low wing.

CAUTION

Check the opening cover on the upper wing surface to be properly screwed in and securing by tape!

Having filled the tanks, briefly open valves to check their functionality.

Jettisoning of Water Ballast

To jettison water ballast, the operating lever at the right-hand cockpit wall in the sliding block of the landing gear lever is pushed forward (all valves open).

Draining full wing water tanks takes about 7.5 minutes.

Every time any water is jettisoned, it is most important to check that the water is draining at an equal rate from both corresponding valves (left/right wing)! Asymmetric control deflections may also indicate unequal loading.

Should the wing ballast fail to drain as intended, the valves should be closed immediately (pull the operation lever backwards). Try again to achieve even drainage by operating the valves again or, if icing is suspected, try again after descending into warmer air to achieve a symmetric jettison.

If you do not achieve a symmetric situation after several attempts the situation should be regarded as an emergency, and instructions in section 3.9 (Other emergencies) should be followed.

Valves should remain open after the landing to support the drying of the wing tanks!

4.5.7 High altitude flight

With increasing altitude, the true airspeed (TAS) will be higher than the indicated airspeed (IAS) due to the reduced air density. However, to be free from flutter the true airspeed is decisive. Therefore, the following limitations of the maximum speed V_{NE} depending on the altitude results:

Altitude MSL		V_{NE} Indicated Airspeed		
< 6000 m	19700 ft	270 km/h	146 kts	168 mph
< 8000 m	26250 ft	236 km/h	127 kts	147 mph
< 10000 m	32800 ft	209 km/h	113 kts	130 mph

One of these placards is located near the airspeed indicator:

The units of measurements used to indicate airspeed on placards must be the same as those used on the indicator!

WARNING

Flights in icing conditions are not advised, especially when the aircraft is wet before climbing through the icing level. Experience suggests that drops of moisture on the surface will be blown back, lodge in the control gaps, and dry comparatively slowly there.

This may cause the controls to become stiff to operate, or in extreme cases, jammed. A single climb through icing level with a previously dry aircraft, on the other hand, is not likely to impair the use of the controls, if icing-up of wing and tail leading edges occurs.

WARNING

When carrying water ballast, avoid flying above icing level due to the danger of iced-up outlet valves, or in extreme cases bursting of wings due to ice formation.

Water ballast must therefore be dumped, before entering altitudes with lower temperatures than 3°C (37°F).

4.5.8 Flight in rain

Rain drops, frost and ice impair the aerodynamic qualities and also alter the flying behaviour. Therefore, in such conditions, the quoted minimum speeds for straight and circling flight should be increased by approx. 10 km/h (5.5 kts, 6.2 mph). Air speeds should not be allowed to drop below these values.

CAUTION

Rain drops should be removed from a wet aircraft before take-off.

Do not fly into icing conditions with a wet aircraft. In this context, see also Section 4.5.7 above.

4.5.9 Aerobatics

WARNING
Aerobatics are only permitted without water ballast!

CAUTION
Never release stick and rudder pedals when flying aerobatics.

If the pilot loses control of the aircraft or if the speed increases involuntarily too rapidly, extending the airbrakes may indeed reduce the increase in speed, yet the margin for the pilot becomes more limited: With extended air brakes the permissible load factors are lower (see Section 2.8) and the loss in altitude is larger.

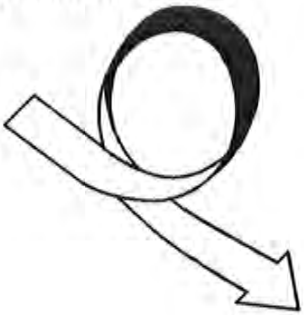
In accordance with JAR-22.3 some simple aerobatic manoeuvres may be permitted for the Utility Category, provided they are demonstrated by appropriate substantiation in the course of type approval tests.

As a steady spin is only possible with aft c.g. positions, the spin is not a suitable aerobatic manoeuvre.

The trim is set to neutral position for all aerobatic manoeuvers.

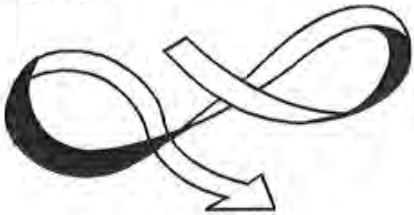
The following manoeuvres have been demonstrated and are approved:

Loop (positive)



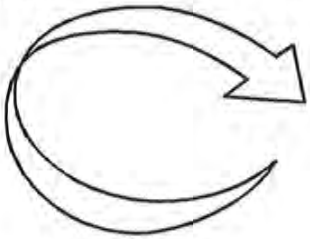
Entrance Speed: 200 km/h
(108 kts, 124 mph)
max. g-loads: 3 g

Lazy Eight



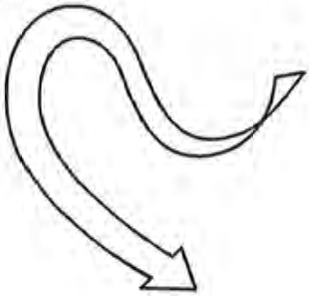
Entrance Speed: 180 km/h
(97 kts, 112 mph)

Chandelle



Entrance Speed: 200 km/h
(108 kts, 124 mph)

Stall Turn



Entrance Speed: 200 km/h
(108 kts, 124 mph)
max. g-loads: 3 g

Steep turns

Steep turns should be carried out with not more than 60 to 70° of bank at about 160 km/h (86 kts, 99 mph).

Section 5

5 Performance
5.1 Introduction
5.2 Approved data
5.2.1 Airspeed indicator system calibration
5.2.2 Stall speeds
5.3 Non-approved further information
5.3.1 Demonstrated crosswind performance
5.3.2 Flight polar – level flight
5.3.3 Flight polar – circling flight
5.3.4 Influence of c.g.-position
5.3.5 Diagram for approved c.g.-limits

5 Performance

5.1 Introduction

This section provides approved data for airspeed calibration and stall speeds as well as non-approved further information.

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

5.2 Approved data

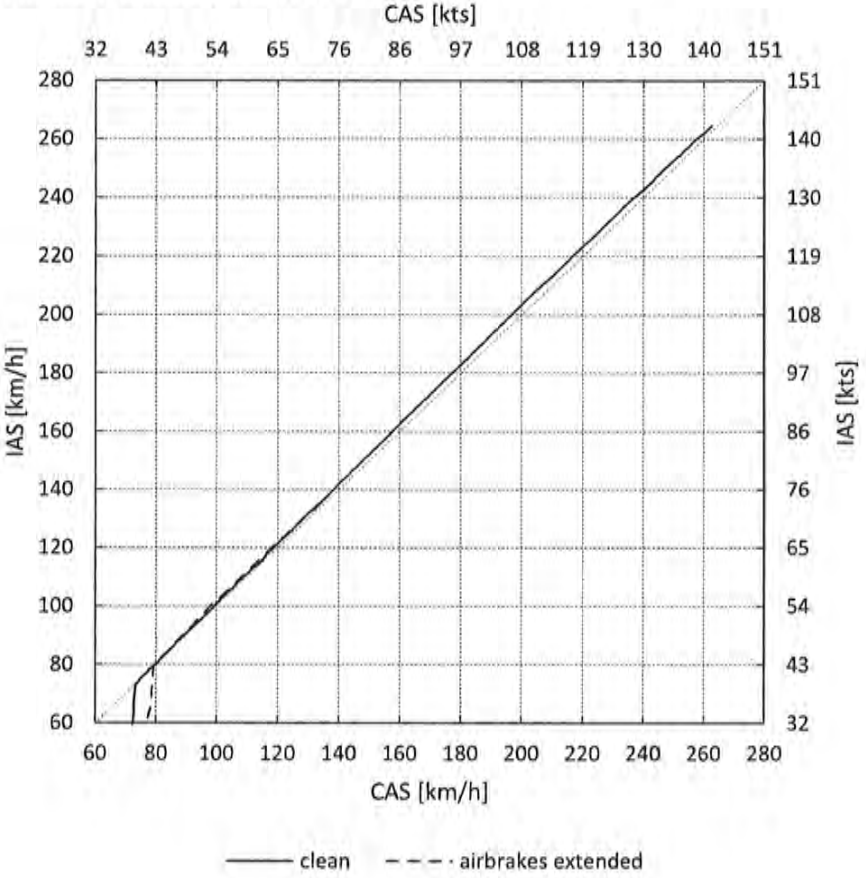
5.2.1 Airspeed indicator system calibration

The following diagram Fig. 5.2-1 shows the indication error of the ASW 28 B pitot-static system (the error of the airspeed indicator instrument adds to the diagrammed error). Upwards of an indication of 80 km/h (43 kts, 50 mph) (without water ballast) or of 90 km/h (49 kts, 56 mph) (at max. all-up mass) the pitot-static system has only a minimal indication error up to 3.5 km/h (2 kts, 2 mph).

In stalled flight the air speed is greatly under-indicated and the pointer will fluctuate between zero and about 70 km/h (38 kts, 43 mph).

NOTE
The ASI must take its pitot pressure from the multi-probe in the fin, and static pressure from the static ports in the fuselage tail boom.

Fig. 5.2-1: Deviation in airspeed indication



IAS = **I**ndicated **A**ir-**S**peed

CAS = **C**alibrated **A**ir-**S**peed

5.2.2 Stall speeds

Stall Speeds in km/h (kts) Indicated Air Speed.

	All-Up Weight		
Air Brake Setting	320 kg 705.5 lbs	410 kg 904 lbs	525 kg 1157.4 lbs
retracted	65 km/h 35 kts	73.5 km/h 39.5 kts	83 km/h 44.7 kts
extended *	71.5 km/h 38.5 kts	81 km/h 43.5 kts	90 km/h 48.5 kts

*) with landing gear extended!

The speeds quoted are valid for the aerodynamically clean glider.

Stall warning in the form of decreasing aileron effectiveness and of tail unit buffeting or gentle oscillation about the vertical axis will commence at about 6 % above the indicated stall speeds.

Extension of air brakes increases the indicated stall speed in straight flight by about 10 % if the landing gear is extended.

Stall Speeds in Circling Flight

In circling flight the stall speeds increase due to the higher load factors.

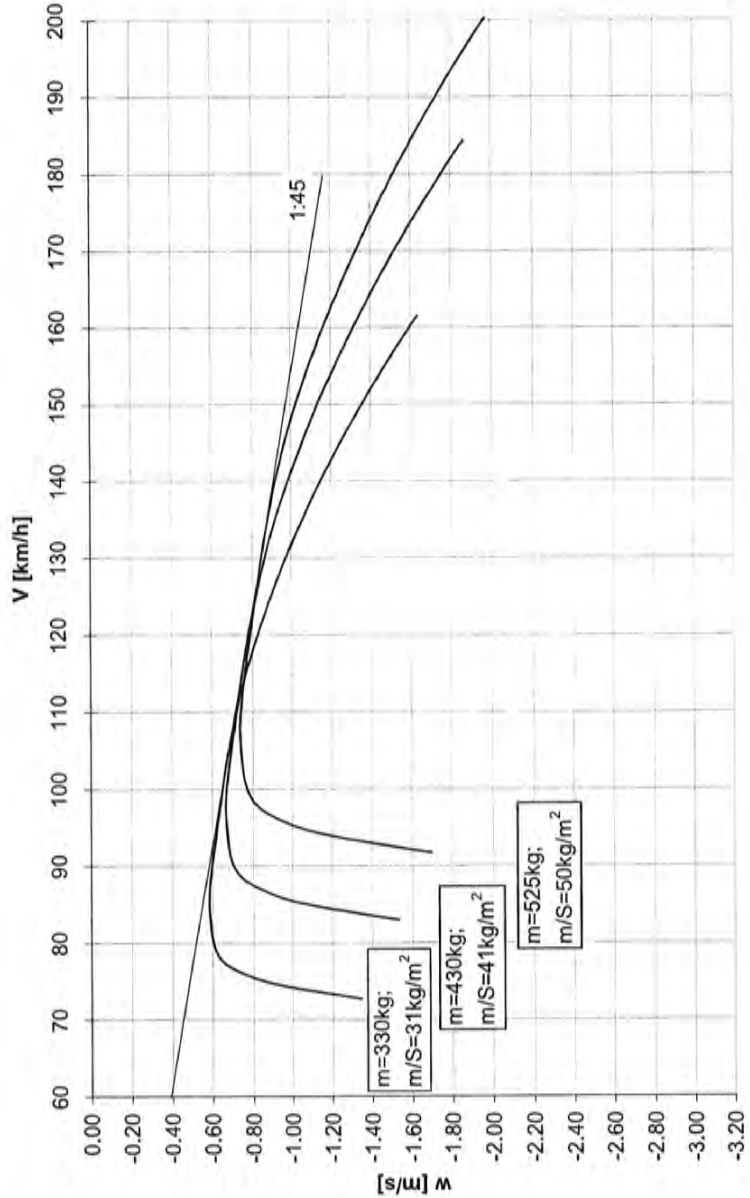
Bank angle	0°	30°	45°	60°	75°
Stall speed in turns compared to straight flight	100%	107%	119%	141%	200%

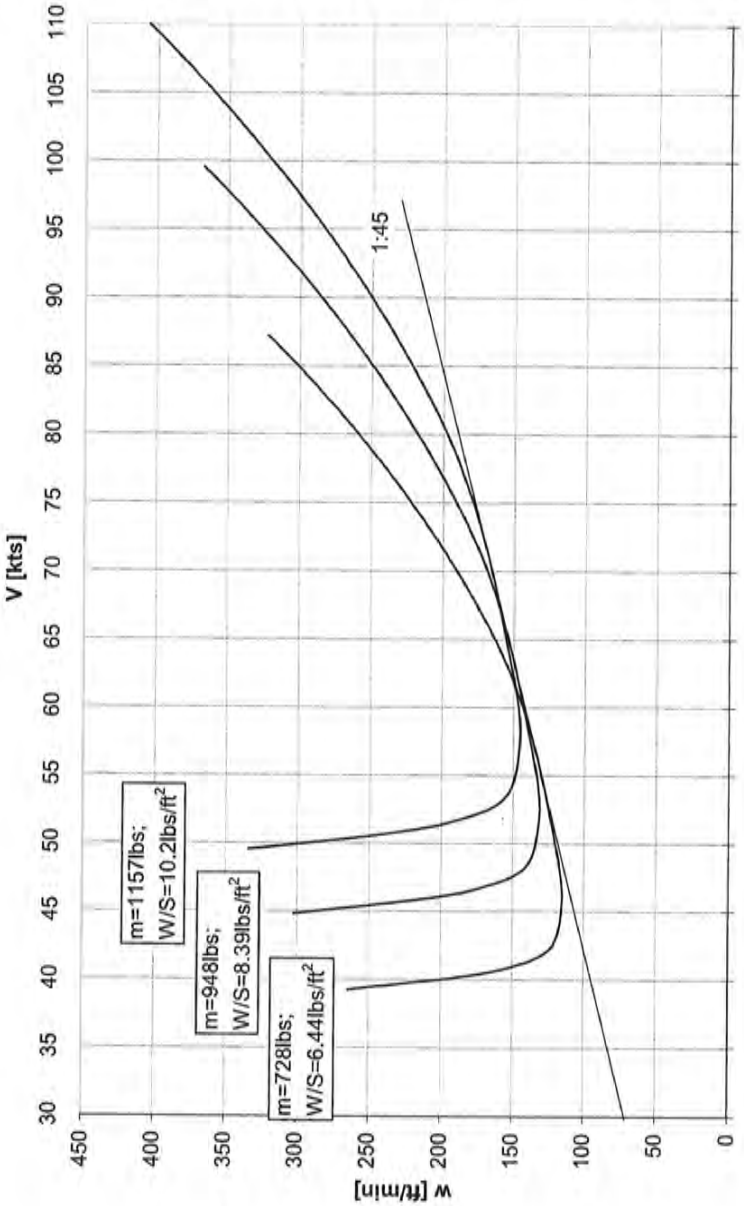
5.3 Non-approved further information

5.3.1 Demonstrated crosswind performance

Winch Launch	25 km/h	13.5 kts	15.5 mph
Aerotow	25 km/h	13.5 kts	15.5 mph
Landing	25 km/h	13.5 kts	15.5 mph

5.3.2 Flight polar – level flight




V [kts]
30
35
40
45
50
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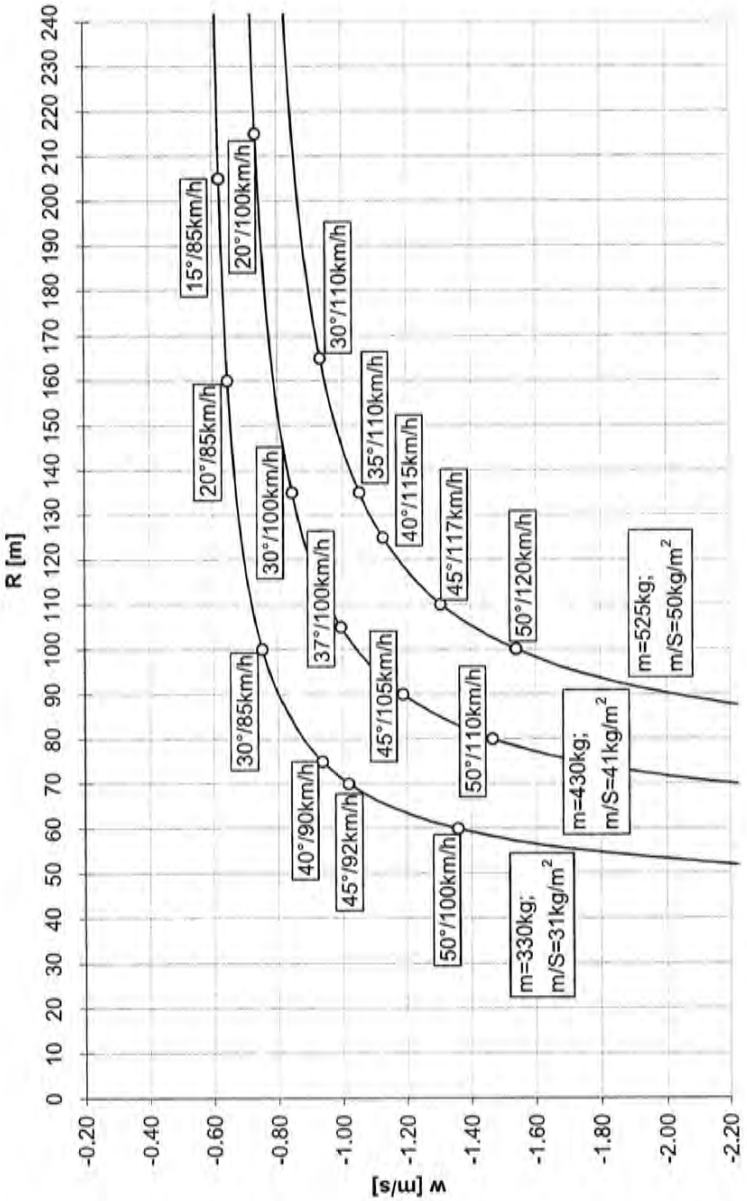
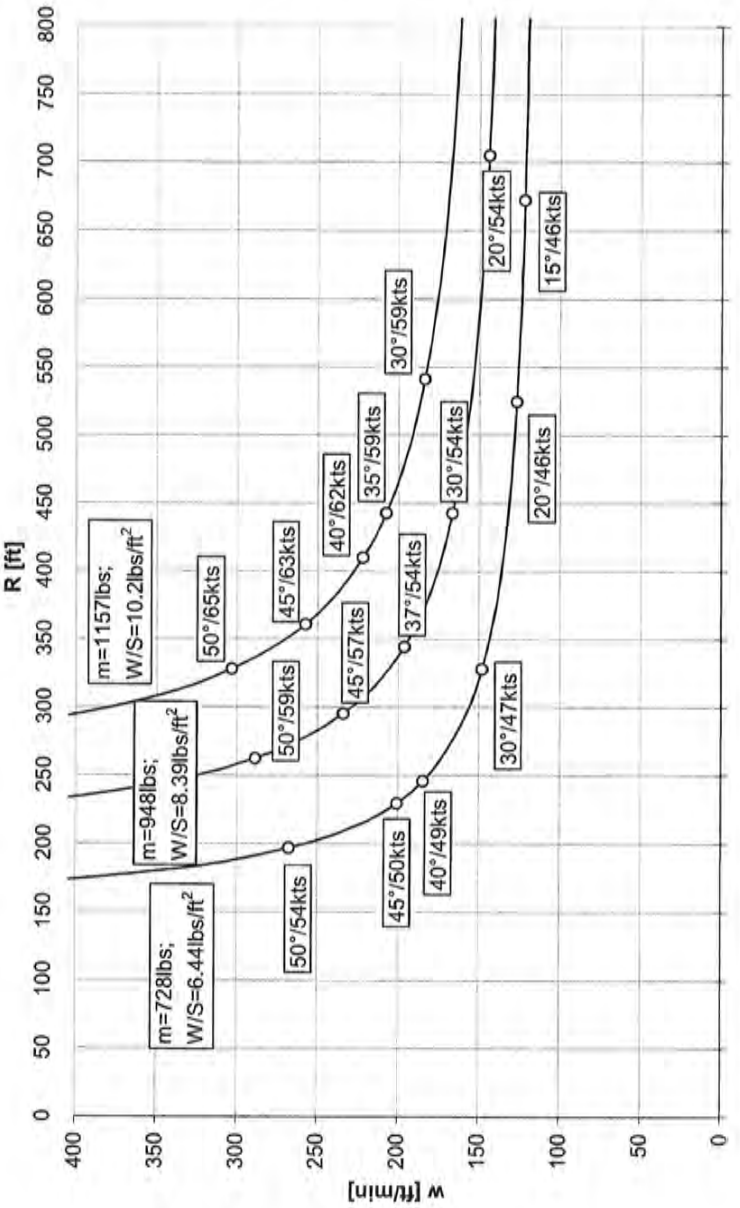
60
65
70
75
80
85
90
95
100
105
110
w [ft/min]
450
400
350
300
250
200
150
100
50
0
1:45
m=1157lbs;
W/S=10.2lbs/ft²
m=948lbs;
W/S=8.39lbs/ft²
m=728lbs;
W/S=6.44lbs/ft²

5.3.3 Flight polar – circling flight




R [ft]
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150
200
250
300
350
400
450
500
550
600
650
700
750
800
w [ft/min]
400
350
300
250
200
150
100
50
0
m=1157lbs;
W/S=10.2lbs/ft²
m=948lbs;
W/S=8.39lbs/ft²
m=728lbs;
W/S=6.44lbs/ft²
50°/65kts
50°/59kts
50°/54kts
45°/63kts
45°/57kts
45°/50kts
40°/62kts
40°/49kts
35°/59kts
37°/54kts
30°/59kts
30°/54kts
30°/47kts
20°/54kts
20°/46kts
15°/46kts

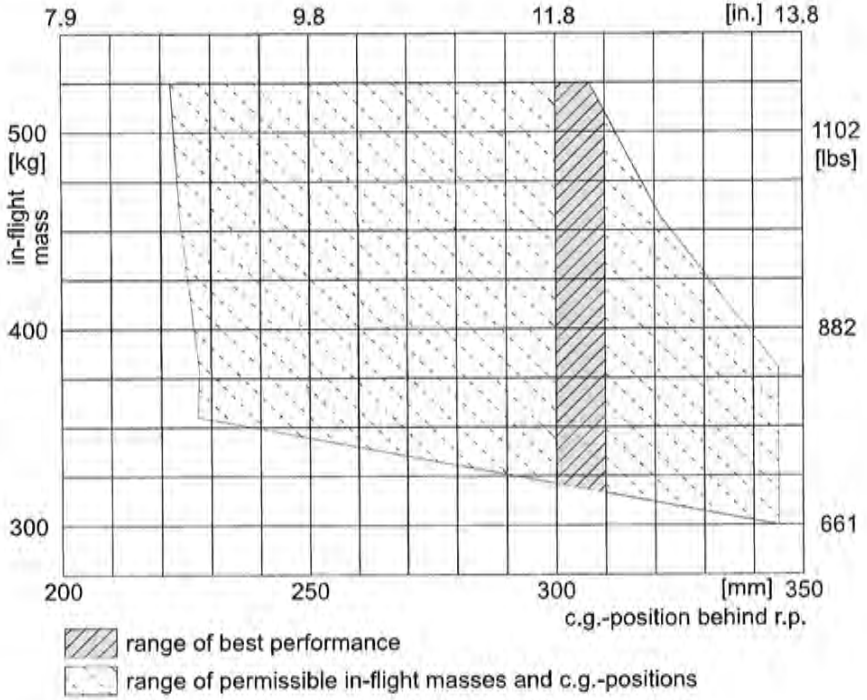
5.3.4 Influence of c.g.-position

To achieve the best gliding performance, the horizontal tail surface must not produce up- or downward lift and the required elevator deflection to trim a certain speed should be as small as possible.

This optimum cannot be realized over the whole range of airspeeds. Therefore, the best choice depends on the proportion of time spent in circling and in gliding. In fast flight rather rearward c.g.-positions are advantageous, in slow flight central-c.g. positions. In general, the optimum c.g. position may vary around 300 – 310 mm (11.81 in – 12.20 in.) behind reference point.

As a matter of principle, the c.g. position has a great influence on longitudinal stability. In forward c.g. positions, control deflections and hand force gradients are larger. Thus, it is advisable for inexperienced, light pilots to add more lead on the (optional) attachment in front of the pedals than necessary to comply with the minimum cockpit load.

5.3.5 Diagram for approved c.g.-limits



The permitted c.g.-range is maintained, when

- the maximum weight of non-lifting parts is observed
- the c.g. of the dry glider is within the permissible range (see Mass and Balance Form, section 6.2), and
- the aircraft is loaded in accordance with section 6.

Section 6

6 Mass (weight) and balance, C.G. position

6.1 Introduction

6.2 Mass (weight) and balance form

6.3 Additional masses (weight) in the fuselage

6.4 Water ballast

6.5 Calculation form

6 Mass (weight) and balance, C.G. position

6.1 Introduction

This section describes the payload range within which the ASW 28 B may be safely operated.

Procedures for weighing the sailplane and the calculation method for establishing the permitted payload range are contained in the applicable ASW 28 B **Maintenance Manual**, Section 6.

A complete list of all equipment installed in the particular sailplane during the last weighing is enclosed in the sailplane records.

During weighing the sailplane the mass and balance is determined for the aircraft in the following defined basic configuration: Aircraft including instruments and equipment according latest equipment list, backrest and seat cushion, logbook and flight manual, batteries according data and loading placard.

It is of vital importance for safe flight not to exceed the limits for the inflight centre of gravity, given in section 2.5.

If the sailplane is operated exactly in accordance with the described configuration the limits are directly observed if the loading limits from section 6.2 were meet. If these limits could not be observed or additional masses were carried on-board during flight than these additional masses have to be considered according section 6.3.

When the flight is conducted using water ballast then the loading conditions have to be checked according section 6.4.

Section 6.5 shows a sample form for a detailed calculation of the inflight centre of gravity. This could be used if the c.g. needs to be exactly known for performance reasons. All required lever arms and masses required for this calculation are shown in section 6.2 and 6.3.

Unit conversions

25.4 mm = 1 in

0.4536 kg = 1 lb

Water (density for cold water at standard pressure):

3.785 L = 3.785 kg = 1 US-gal. = 8.345 lbs

6.2 Mass (weight) and balance form

The following mass and balance form shows the maximum and minimum load in the pilot seat and the total load in the fuselage. In addition, the empty mass of the aircraft and the empty centre of gravity are shown. All values are valid for the basic configuration as described in section 6.1.

The form does **not** regard additional trim masses like the trim mass in the vertical tail, the trim mass in front of the rudder pedals or other optional batteries. To comply with the requirements for the in-flight c.g. and the maximum loading these values have to be calculated and checked! The same applies for flights with water ballast.

These mass and balance data must be calculated in accordance with the currently valid weighing data. The data and diagrams needed for establishing these are to be found in the ASW 28 B Maintenance Manual, Section 6.

This Mass and Balance Form is valid only for the aircraft bearing the Serial No. shown on the title page of this manual!

Mass and Balance Form

Date of Weighing	Empty mass [1]	Empty mass c.g. aft of BP [2]	Permissible pilot mass incl. parachute [1]		Max. useful load in the fuselage [1]	Inspectors signature and stamp
			min.	max.		
17. MAR. 2025	264,3 kg	632mm	92 kg	115 kg	131,7 kg	

2) For U.S.-registered sailplanes show lbs.
3) For U.S.-registered sailplanes show inches.
Other countries may use metric units.

6.3 Additional masses (weight) in the fuselage

Deviating from the basic configuration the ASW 28 B can be flown with additional masses on board. The following points contains necessary information and data regarding the effect on empty mass and centre of gravity for the different loading items.

CAUTION
When the following paragraphs provides "rules of thumb", these calculations leads to conservative results. Exact results can be achieved using the calculations shown in section 6.5 with the lever arms and masses presented. Especially with regards to the gliding performance a detailed calculation is recommended.

Trim ballast in front of the rudder pedals

If the pilot is lighter than the minimum load in the cockpit seat prescribed by the weight and balance form (section 6.2), then the weight can be replaced with trim ballast plates fitted in front of the rudder pedals (see section 7.11).

One trim ballast plate has a weight of 1.0 kg (2.2 lbs). Up to eight plates can be installed. The lever arm of the trim ballast plates is x = -1680 mm (-66.14 in).

The effect of the trim ballast plates to the in-flight C.G. can be calculated according the calculation sheet from section 6.5. Alternatively, the effect can be estimated by the following ratio:

Per one trim ballast plate installed in front of the rudder pedals, the minimum load in the cockpit seat is reduced by 2.2 kg (4.85 lbs).

The trim ballast plates have to be considered when calculating the total load in the fuselage.

Trim ballast in the vertical fin

A housing is provided in the upper part of the fin where trim ballast, for instance in the form of a battery, may be fitted.

The mass limitations given in section 2.4 have to be met. The lever arm of this trim ballast is x = 4190 mm (164.96 in). For all calculations the actual weight of the trim ballast (battery) has to be considered.

Of course, if any trim ballast is mounted in the fin, the minimum cockpit load will be increased! Compliance with the prescribed in-flight C.G. can be checked with the calculation sheet presented in section 6.5 or can be estimated by the following ratio:

Per 1 kg (2.2 lbs) trim weight in the vertical fin, the minimum load in the cockpit seat is increased by 8.0 kg (17.64 lbs).

The trim ballast in the vertical fin has to be considered when calculating the total load in the fuselage.

Batteries under the footrest

When the power-plant is removed from the ASW 28 B the fuselage can be equipped with an optional second battery below the footrest (see section 7.11). When the power-plant is installed then these two batteries were installed by default and regarded in the weight and balance sheet from section 6.2.

The weight of the installed batteries depends on the type and the manufacturer of the battery. The exact weight of the battery has to be determined before the installation. The lever arm of these batteries is x = -1000 mm (-39.37 in).

Of course, the installation of such batteries decreases the minimum cockpit load. Compliance with the prescribed in-flight C.G. can be checked with the calculation sheet presented in section 6.5 or can be estimated by the following ratio:

Per 1 kg (2.2 lbs) battery weight below the footrest, the minimum load in the cockpit seat is decreased by 1.6 kg (3.5 lbs).

The weight of batteries below the footrest has to be considered when calculating the total load in the fuselage. Check before flight whether batteries are installed by opening the cover at the footrest. See also section 7.10.

Baggage in the cockpit

The pilot can use the baggage compartment behind the head rest. Another baggage compartment left of the main landing gear is available.

The upper compartment is limited to 12 kg (26.4 lbs). The limit for the lower compartment is 5 kg (11 lbs). The baggage has to be considered when calculating the total load in the fuselage. For both compartments the effect from baggage on the in-flight C.G. can be neglected. However, for a detailed calculation according section 6.5 a lever arm of x = 170 mm (6.69 in) can be assumed for the upper compartment. The weight of the baggage in the lower compartment has a lever arm of x = 220 mm (8.66 in).

Oxygen bottle

The ASW 28 B can be optionally equipped with an oxygen bottle fixed at a mounting to the right of the main landing gear box (see section 7.11). The exact bottle weight has to be determined prior to installation. The maximum mass of 5 kg (11 lbs) must not be exceeded! The effect of the oxygen bottle on the in-flight C.G. can be neglected. However, for a detailed calculation according section 6.5 a lever arm of x = 170 mm (6.69 in) can be assumed.

The weight of the oxygen bottle has to be considered when calculating the total load in the fuselage.

6.4 Water ballast

The integrated wing water tanks of the ASW 28 B can hold about 200 liters (53 US-gal.) together. In addition, the vertical tail contains an optional water tank with 5 liters (1.32 US-gal.) quantity. This water tank is only intended to compensate the movement of the C.G. from water ballast in the wings.
When flights were performed with water ballast on-board then several limits have to be observed. Compliance with these limits must to be checked prior to the flight:

1. Maximum take-off weight

Maximum take-off weight may not be exceeded:

	Maximum take-off weight	525 [kg]
–	Empty weight (Weight and balance form, section 6.2)	–..... [kg]
–	Additional weight in fuselage (section 6.3)	–..... [kg]
–	Pilot weight including parachute	–..... [kg]
=	max. water load (incl. tail water tank)	..... [kg]

2. Maximum weight of non-lifting components

Maximum weight of non-lifting components (260 kg / 573 lbs) may not be exceeded:

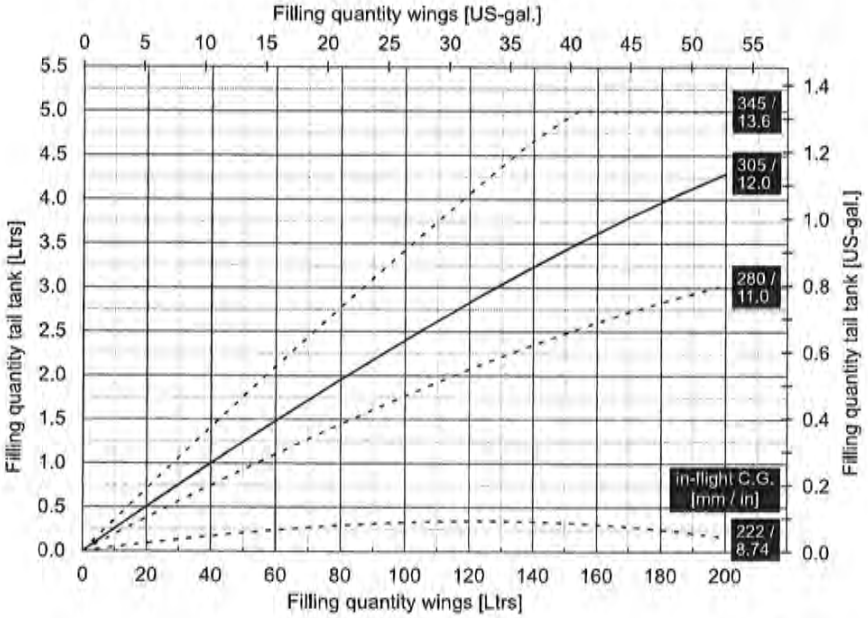
	Total useful load in fuselage Weight and balance form, section 6.2)	..... [kg]
–	Additional weight in fuselage (section 6.3)	–..... [kg]
–	Pilot weight including parachute	–..... [kg]
=	max. water load in tail tank	..... [kg]

3. Movement of the C.G.

The water ballast in the wings moves the centre of gravity forward. To compensate for this movement additional water in the optional tail tank is required.

The following chart can be used to determine the required filling quantity in the tail water tank. The effect of the water loading on the C.G. depends significantly on the in-flight C.G. which would be present without water ballast. Therefore, this value must be considered! The chart contains lines for forward C.G.-positions (222 mm / 8.74 in.), middle C.G.-positions (280 mm / 11 in.) and rear C.G.-positions (345 mm / 13.6 in.). In addition, one line for the optimal C.G.-position (~305 mm / 12 in.) is presented. If the in-flight C.G.-position is not exactly known, then the line for middle C.G.-positions must be used!

Further, the mass limitations given in section 2.4 have to be met.



As an alternative to the estimation by the charts shown above the required compensation of the centre of gravity can be performed by calculation. In that case the calculation is done as shown in section 6.5. The following lever arms can be assumed:

- The lever arm of the water ballast in the wings depends on the filling quantity:

water ballast total	lever arm of water ballast
40 L (10.57 US-gal.)	204 mm (8.03 in.)
80 L (21.13 US-gal.)	207 mm (8.15 in.)
120 L (31.70 US-gal.)	210 mm (8.27 in.)
160 L (42.27 US-gal.)	214 mm (8.43 in.)
200 L (52.83 US-gal.)	219 mm (8.62 in)

  For other filling quantities linear interpolation can be used.

- The lever arm of the water ballast tank in the vertical tail is x = 4330 mm (170.47 in).

6.5 Calculation form

Description	Quantity		Weight		Lever arm		Moment
Empty weight and C.G.-position of empty aircraft (see page 6.4)				kg ×	mm =		kgmm
Pilot weight and lever arm (see page 6.12)				kg ×	mm =		kgmm
Trim weight or battery in vertical tail				kg ×	+ 4190 mm =		kgmm
Trim weight in front of rudder pedals	☐	plates ×	1,0	kg ×	- 1680 mm =		kgmm
Lower baggage compartment				kg ×	+ 220 mm =		kgmm
Upper baggage compartment (behind headrest)				kg ×	+ 170 mm =		kgmm
O_2-bottle next to landing gear compartment)				kg ×	+ 170 mm =		kgmm
Batteries under footrest*	☐	pcs ×		kg ×	- 1050 mm =		kgmm
			sum weight =	kg	sum moment =		kgmm

sum fuselage loading = ☐ kg

The sum of the fuselage loading has to be lower than the usefuel load in the fuselage!

$$\text{in-flight C.G.} = \frac{\text{sum moment}}{\text{sum weight}}$$

The in-flight C.G. has to be betwenn 222 mm and 345 mm aft of reference point (wing leading edge at fuselage)!

*Normally installed during weighting. Fill in only if necessary!

For the calculation of the in-flight centre of gravity the lever arm of the pilot in the cockpit must be known. The following reference values can be assumed:

pilot mass	pilot lever arm	
	lower ref.	upper ref.
70 kg (154.3 lbs)	-565 mm (22.24 in.)	-515 mm (20.28 in.)
90 kg (198.4 lbs)	-540 mm (21.26 in.)	-495 mm (19.49 in.)
115 kg (253.5 lbs)	-500 mm (19.69 in.)	-480 mm (18.90 in.)

For an exact value of the pilot lever arm a weighing must be performed with the pilot including parachute on board.

Section 7

7 Description of the sailplane, its systems and equipment

7.1 Introduction

7.2 Cockpit controls

7.3 Instrument panel

7.4 Landing gear system

7.5 Seats and safety harness

7.6 Pitot and static systems

7.7 Airbrake system

7.8 Baggage compartment

7.9 Water ballast system

7.10 Electrical system of the avionics

7.11 Miscellaneous equipment

7 Description of the sailplane, its systems and equipment

7.1 Introduction

This Section provides description and operation of the sailplane and its systems. Refer to Section 9, Supplements, for details of optional systems and equipment.

A detailed technical description of the glider with layout drawings can be found in the Maintenance Manual.

7.2 Cockpit controls

Aileron and elevator

Both these controls are operated by means of the control column (or stick). The stick is also fitted with the trim release lever for setting the trim, and with the radio transmit button.

Rudder

The rudder pedals are adjustable to suit the length of the pilots' legs.

Pedal Adjustment:
Grey knob right of the stick.

To move pedals forward:

Pull knob and push pedals forward with your heels. Release knob and push again to lock in position.

To move pedals aft:

Relax pressure on pedals, pull knob back. Then release knob and apply pressure to pedals to lock in position.

WARNING
When the pedals are in their extreme positions large shoes may interfere with the fuselage structure. Check free movement of the rudder control circuit!

Trim

There is a trim control for the longitudinal trim. To set the trim, press the trim release lever on the control stick when flying at the desired air speed. A trim indicator is fitted on the left cockpit wall at the seat.

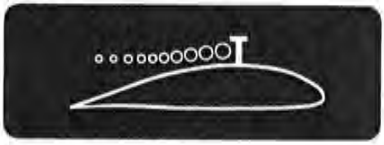
While pressing the stick mounted trim release lever, the trim can also be adjusted by sliding the trim indicator knob to a desired position.

Trim nose heavy

Trim tail heavy

Airbrakes

The airbrakes are operated with the blue handle mounted on the left cockpit wall.

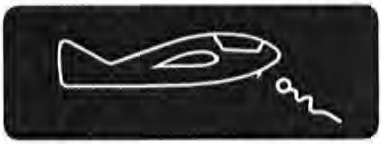


Pull the blue handle to extend the airbrake paddles.

When the airbrake handle is pulled back to its fullest extent, it will also actuate the hydraulic disc brake of the main wheel.

Launch Cable / Tow Hook Release

High on the left cockpit wall you will find the yellow cable release knob.



Yellow T-handle for cable release

Pulling the yellow knob will open one or both of the tow hooks.

To allow the launch cable to be attached, pull the yellow T-handle back to the stop and then let it go, to allow the tow hook to snap shut and lock.

Opening and closing the canopy

The canopy is locked by means of the two white lever handles fitted to the canopy frame at the right and left.

White handle for opening the canopy

To open the canopy, both levers are pivoted to the rear and the canopy is pushed up.

NOTE

If possible, do not leave the aircraft parked or unattended with the canopies open, because…

1. *The canopy could be slammed shut by a gust of wind which might shatter the Perspex.*
2. *At certain elevations of the sun the canopy could act as a lens concentrating the sun's rays, which might harm instruments and equipment severely.*

Emergency canopy jettison

Fully pull back both red canopy jettison handles at the left and right canopy frame and push the canopy rear- and upwards.

Red handles for jettisoning the canopy

Operating the red jettison levers will automatically open the white locking levers, leaving the canopy resting loosely on the cockpit rim. A so-called "Rögerhook" at the rear end of the canopy frame enables a controlled jettison of the canopy, so that the canopy can be raised at the front, while the rear end is still fixed on the fuselage.

NOTE

Operating the red jettison levers will automatically open the white locking levers.

Operating the jettison levers on the ground allows the canopy to be removed for easy access when inspecting instruments.

Ventilation

There are two means of ventilation in the cockpit:

A ventilation flap is located at the front of the canopy. This is operated with the small black knob on the instrument panel. This ventilation also serves as a demister for the canopy.

Knob for ventilation
Pull to open

A second ventilation nozzle, adjustable in flow rate and direction, is fitted on the right cockpit wall. Closing this nozzle increases the demist effect of the front vent.

7.3 Instrument panel

For safety reasons, only a FRP panel made in accordance with the lamination scheme specified by the manufacturer may be used.

Instruments of more than 1 kg (2.2 lbs) need additional support beyond the screws provided. This can be done by means of aluminium straps fixed to the stainless-steel canopy support beam.

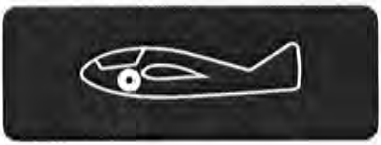
Equipment with operating controls must be fitted conveniently within reach, when the pilot is safely secured in the seat.

Flight monitoring instruments, like ASI and altimeter, must be mounted within the pilot's field of view from which the ASI should be mounted high in the panel in a preferred position.

7.4 Landing gear system

The landing gear is extended and retracted, and locked at either position, by means of the black handled lever mounted at the right-hand cockpit wall.

Landing gear extended
(lever forward)



Landing gear retracted
(lever aft)

NOTE
Remember the crib
*to **pull** up the landing gear > **pull** aft the handle*

Tire pressures: see section 4.3

The valves of main wheel and tail wheel are on the left hand side. The tail wheel valve is only accessible when the tail wheel is removed from the fuselage. Optionally the fuselage can be modified in such a way, that a gap in the seam of the tail wheel fender allows direct filling (see **Maintenance Manual** Section 2.5.4).

7.5 Seats and safety harness

Seat and seating positions

Tall and medium sized pilots can sit comfortably and may adjust the back rest on its lower end (three positions with screws) and on the upper end by actuating the handle in the right cockpit wall. The latter is also possible in flight. The backrest requires the use of an appropriate parachute or a rigid foam cushion.

Adjustment crank of the backrest

Adjust backrest aft:

Release backrest, unlock ratchet lever und guide foreward up to the intended position. Ensure correct engagement of the ratchet lever!

Adjust backrest forward:

Release backrest, unlock ratchet lever und guide aft up to the intended position. Ensure correct engagement of the ratchet lever!

Optimum seating position is achieved when the upper thighs contact the wedge of the seatpan and the backside fits into the corner of the cockpit floor. The anchor points of the lap straps are fixed in such a way relative to the seatpan that submarining (sliding forward from underneath) is extremely remote.

The geometry of the seat is designed such that tall pilots are comfortably seated. We recommend the use of thin parachute packs of the latest type.

Very short pilots must adjust their seating position by means of a firm cushion (energy absorbing, semi-rigid foams are optimum) so that all controls are within comfortable reach and that their view to the outside is improved. A small pilot is positioned high enough when the instrument panel does not restrict the forward view and the headrest contacts your head at eye level. The instrument cover is so designed that the panel edge is in line with the front contour of the canopy glass.

For all sizes of pilots it is very important to adjust and lock the backrest, to prevent being moved backwards during initial take-off acceleration (winch-launch). For the same reason, cushions used must be sufficiently rigid and stiff.

Headrest

The ASW 28 B is equipped with an adjustable headrest. To get access to the upper baggage compartment, the headrest can fold down forward at a hinge which connects the headrest to the backrest.

Prior to the flight, the headrest should be adjusted so that a comfortable head position is reached in every case. The headrest should touch the head at eye level to ensure optimal support. The adjustment is done by a rotary handle on the back of the headrest. On the lower end of the handle a base element with rotary free movement is installed which is held by a magnet at the backrest. The pilot must pay attention that the base element is properly aligned with the contact area.

The slope of the headrest can be adjusted with the black rotary handle on the back.

Safety harness

Correct fastening of seatbelts (recommendation by "TÜV Rheinland"):

① Sit down in the seat.
② Put pelvic belts on and fasten them as tightly as possible.
③ Make sure that the pelvic belts are lying on the pelvis and the buckle is in the middle of the pelvis.
④ Plug shoulder belts into the central buckle and fasten them with significantly lower tension than the pelvic belts.

IMPORTANT
The buckle must not be pulled up towards the stomach area!

⑤ When the belt system loosens during the flight: always refasten the pelvic belts first and then the shoulder belts.

Check every time that each individual strap is properly secured in the harness lock. Check from time to time if the lock opens easily under simulated load.

Automatic parachute static line

An anchor ring is provided for the static line (ripcord) of an automatic parachute. It is located on the left hand (in flight direction) of the main bulkhead underneath the lift pin tube.

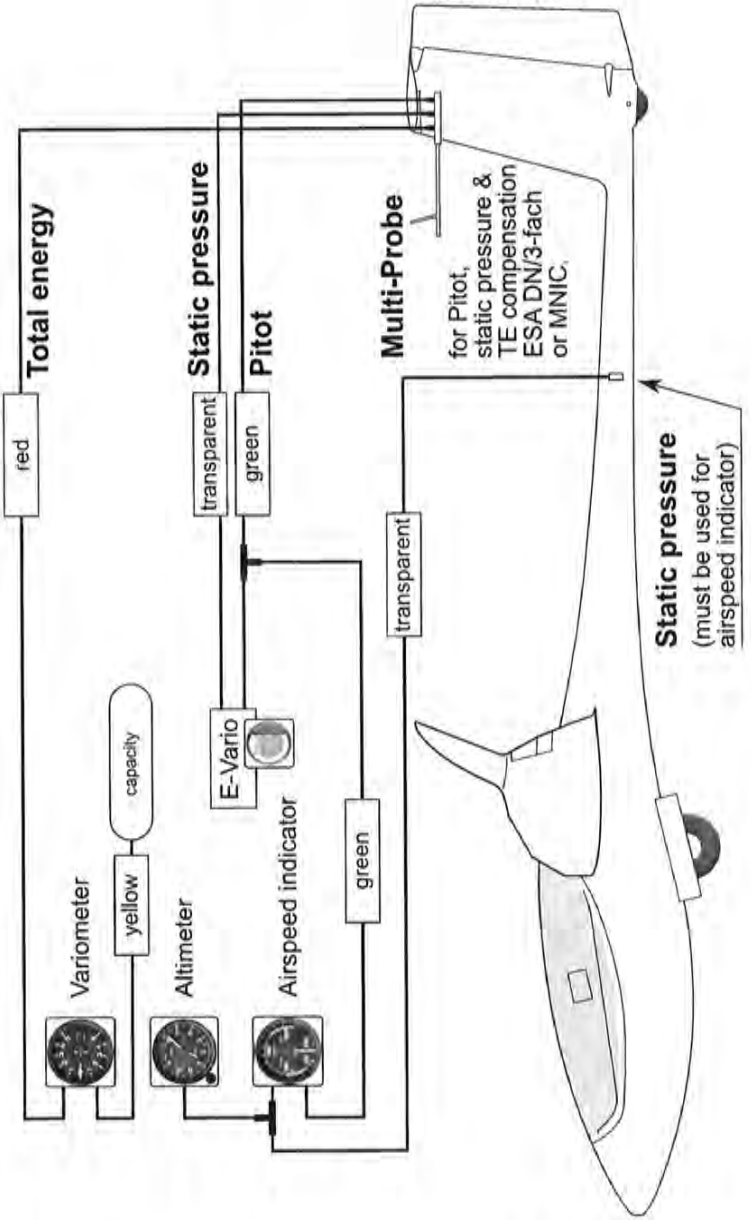
7.6 Pitot and static systems

A Multi-Probe is located in the vertical fin, delivering pitot-, static- and TE-pressure. Static ports are located laterally in the tail cone.

The airspeed indicator is driven by the pitot pressure from the Multi-Probe and by the static pressure from the tail cone. The altimeter is connected to the static ports in the tail cone.

Pneumatic and electric variometers are fed from the Multi-Probe in the vertical fin. Ensure that the probe is fully pushed home in its seating in the fin. From time to time, the inner end of the probe should be lightly lubricated with Vaseline or a similar lubricant, in order to save the O-ring gaskets from wear.

Fig. 7.6-1 Pitot and static lines and instrument connections



7.7 Airbrake system

The ASW 28 B is equipped with Schempp-Hirth type airbrakes on the upper side of each wing. They efficiently increase sink rate, but also increase stall speed by 5-10 km/h (3-5 kts, 3-6 mph). They have only a small effect on trim. Hand forces above 200 km/h (108 kts, 124 mph) can become larger than 20 daN (45 lbf). If hand forces are too high, reduce airspeed. See section 2.9 for max load factors with airbrakes extended.

The airbrake handle also actuates the hydraulic disk brake of the landing gear, when it is fully pulled back.

7.8 Baggage compartment

The fuselage of the ASW 28 B has two options for carrying baggage. Hard objects may not be carried in the two baggage compartments without being securely fastened!

Left of landing gear box

The maximum load in this baggage compartment may not exceed 5 kg (11 lbs).

Identification of lower baggage compartment

In front or on top of the spar

The baggage load in this compartment may not exceed 12 kg (26 lbs).

Identification of upper baggage compartment

7.9 Water ballast system

The wings have integrated tanks of about 200 L (53 US-gal.) capacity in total. As an option, a tail tank with 5 L (1.3 US-gal.) can be installed to counteract the nose heavy moment of the wing water ballast.

On the upper wing surfaces are openings for ventilation and drying of the water tanks, which may also be used for filling ballast water. A screwed in cover closing the openings must be secured with tape in flight.

On the cover of the wing root rib an automatic opener for the drain valve which provides adequate ventilation of the wing when the wing is de-rigged and the other ventilation opening is uncovered.

The valves for the wing water tanks are located each between the inner end of the water ballast tank and the outlet on the lower wing shell. The valve for the optional tail tank is installed in the fin in front of the tailwheel right above its outlet. The tail tank is filled through its draining port. Therefore, a filling hose is necessary, see section 4.5.7.

The valve operation is done mechanically, operated by the lever on the right-hand cockpit in the sliding block of the landing gear lever and opens all valves at once. If the optional tail tank is installed, its valve is operated by the lever simultaneously, too.

Pushing the lever forward opens all valves at the same time.

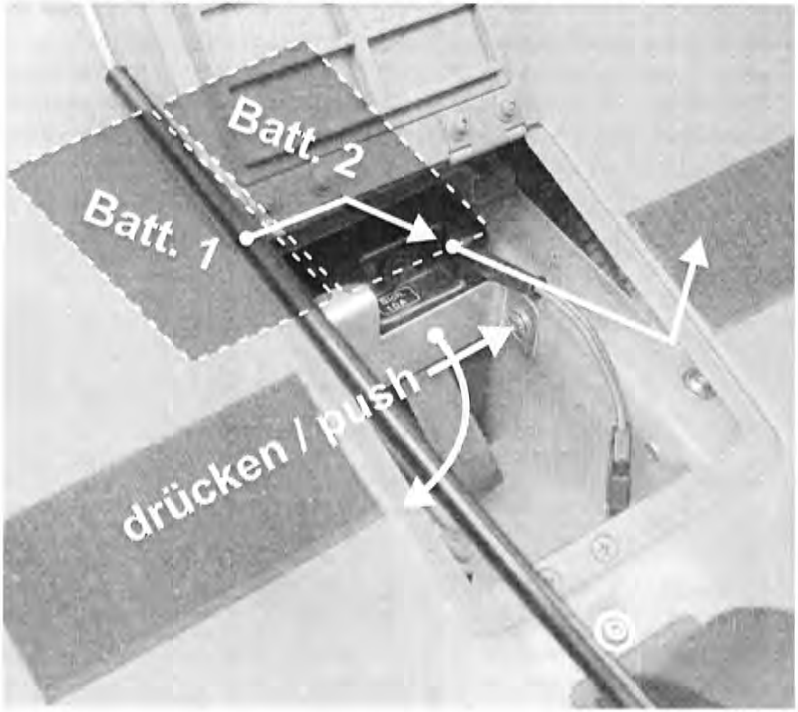
The air vents of the wing water tank end in ports on the winglet roots. The ventilation of the tail tank is done by a hole in the upper region of the vertical tail on the left side. All ventilation holes are marked with a red circle. They have to be checked for free airflow through the holes before a flight with water ballast is performed.

7.10 Electrical system of the avionics

The electrical system for the ASW 28 B avionics is a 12 volt system using two batteries as standard:

- Battery 1 and 2

  These batteries are installed in a special compartment below the footrest and supply the electronic instruments. For electrical protection a 10A fuse is installed directly at every battery.



The batteries are accessible through a cover at the footrest. The batteries are slid in into a specially made mounting. The securing of the batteries is done by an aluminium bracket which locks into a resiliently push knob.

Additionally, there is one more batterie available as an option:

- Battery 3

  This battery can be installed in a special compartment at the upper end of the vertical tail. It can also supply the electrical instruments. For electrical protection a 10A fuse has to be installed directly at the battery.

  The battery must perfectly fit to the compartment. If necessary, additional foam must be used to prevent the battery from shifting.

During the flight the battery selector switch installed in the instrument panel can be used to decide which battery is used to supply the electrical instruments. The markings on the switch complies with the nomenclature used above. If not all the batteries are installed the respective switch positions does not work!

The battery selector switch also works as a main switch for the electrical avionic system. Position "OFF" means that the avionic system is out of service.

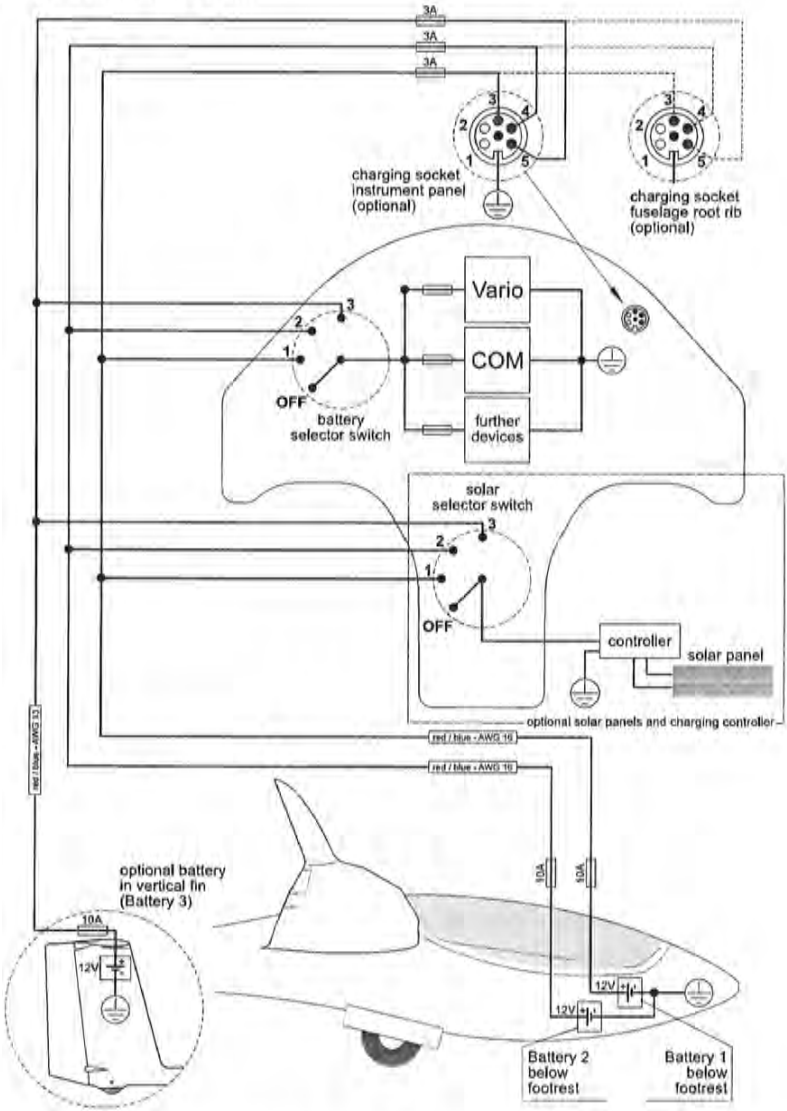
Marking of the main and battery selector switch

Optionally the ASW 28 B is equipped with solar cells on the top of the fuselage behind the cockpit. In this case an additional selector switch is installed in the instrument panel. This switch can be used to select which battery is charged by the solar system.

Marking of the selector switch for the solar system

Every electrical instrument has to be protected by a suitable fuse. The fuse depends on the device – the instructions of the respective manufacturer need to be observed!

Fig. 7.10-1 Circuit diagram



7.11 Miscellaneous equipment

Removable trim ballast (optional)

If required, the ASW 28 B can be equipped with a fitting for lead trim ballast plates which can be bolted into place in front of the rudder pedals. Pilots not meeting the minimum loading can compensate the missing load. Details on that can be found in section 6.3.

A maximum of 8 trim plates are allowed for installation.

Trim mass (battery) mounted in the fin

Fitting a trim mass (or battery) in the fin increases the minimum cockpit seat load. A detailed calculation of in-flight c.g. is required in this case (see section 6.3)! Only use trim masses that were prepared for the individual glider.

The foam buffer fitted over the mass or battery secures it upwards. This plastic foam pad must not be forgotten when changing or replacing batteries. You should also ensure that there is adequate plastic foam seating under the battery to protect it from hard knocks!

The maximum weight allowed to be installed in the fin compartment is 6.0 kg (13.2 lbs).

> ***WARNING***
> *Unless otherwise indicated, the loading placard in the cockpit shows the lower minimum loading without any trim mass at the vertical tail. The increased minimum loading or respectively the in-flight c.g. have to be evaluated!*

Oxygen

A seating for an oxygen bottle is optional, but can be retrofitted any time with little cost (see maintenance manual, section 2.7). The position of the bottle is behind the pilot's right elbow, beside the wheel-box. The bottle must be immovably attached between a rear FRP support and a clamping ring.

Depending on support and clamping ring, one German 3-litre oxygen bottle, 100 mm diameter or one US bottle of 4.25" diameter, 16.5" long or a US-bottle 4.3/16" dia., 17" long can be accommodated.

Fitting the oxygen bottle, ensure that it is properly installed and securely anchored.

WARNING

When the oxygen bottle is removed the cover for the hole in the bulkhead must be installed as otherwise loose objects may get from the cockpit rearward into the control circuits.

NOTE

Fitting of oxygen equipment only causes a minimal change in the empty-mass c.g. position! See section 6 for more information.

When flying at greater heights while using the oxygen installation, it should be borne in mind that any particular system may only be suitable for a limited altitude range. The makers' instructions should be complied with.

Section 8

8 Sailplane handling, care and maintenance

8.1 Introduction

8.2 Sailplane inspection periods

8.3 Sailplane alterations or repairs

8.4 Ground handling / road transport

8.5 Cleaning and care

8 Sailplane handling, care and maintenance

8.1 Introduction

This Section contains manufacturers' recommended procedures for proper ground handling and servicing of the sailplane. It also identifies certain inspection and maintenance requirements to be followed if the sailplane is to retain that new-plane performance and dependability.

It is advisable to follow a planned schedule of lubrication and preventive maintenance based on climatic and encountered flying conditions.

8.2 Sailplane inspection periods

The national requirements regarding continuous airworthiness of the country where the sailplane is registered must be followed.

Refer to ASW 28 B Maintenance Manual, Section 4 and 7.

8.3 Sailplane alterations or repairs

It is essential that the responsible airworthiness Authority is contacted prior to any alterations to the sailplane to ensure that the airworthiness of the sailplane is not compromised.

For repairs and modifications refer to ASW 28 B Maintenance Manual, Sections 10 and 11.

8.4 Ground handling / road transport

Parking

The ASW 28 B is equipped with elastic tape to seal the gaps on the control surfaces. When parking the aircraft, principally all the controls must be set to neutral.

Parking the aircraft in the open can only be recommended when the predicted weather conditions are suitable. It should be seriously considered whether securing, covering, and cleaning the aircraft before the next flight may demand more effort than derigging and rigging.

For tying-down the wings, trestles (perhaps from the trailer) should be used to ensure that the ailerons cannot be stressed by the picketing ropes. It is recommended to use the optional lashing eyes.

> ***NOTE***
> *Parking in the open without protection against weather or light will reduce the life of the surface finish.*

If the aircraft is parked in the hangar for protracted periods, it is recommended to cover only the perspex® canopy with a dust cover, as dust covers retain moisture in wet weather for long periods. Moisture can impair the dimensional stability and even the strength of all fibre reinforced composites.

For this reason, parking with water ballast on board for protracted periods is also not permissible! The filling and ventilation openings on the upper wing surface and the water ballast valves must be opened!

When parking carefully remove any remnants of food (chocolate, sweets, etc.) because experience shows that these attract vermin, which can cause damage to the aircraft.

Road transport

Alexander Schleicher GmbH & Co. can supply dimensioned drawings of the glider which will provide all the measurements needed for building a closed trailer. We can also supply the names and addresses of reputable trailer manufacturers.

Above all, it is important to ensure that the wings are supported in properly shaped and fitted wing cradles, or at the very least, that the spar ends are securely supported as closely as possible to the root ribs. Reinforced points of the fuselage are the main wheel (remember the suspension springing!), and tail wheel; also, the drag pins (make up support bushings from plastic material like Nylon!), and the area under the canopy arch between the c.g.hook and the lap-strap area.

For an aircraft of this quality and value, an open trailer, even with tarpaulin, cannot be recommended. Only a closed trailer of plastic or metal construction may be considered as suitable. The trailer should have light-coloured surfaces and be well ventilated both while moving and while stationary so as to avoid high internal temperatures or humidity.

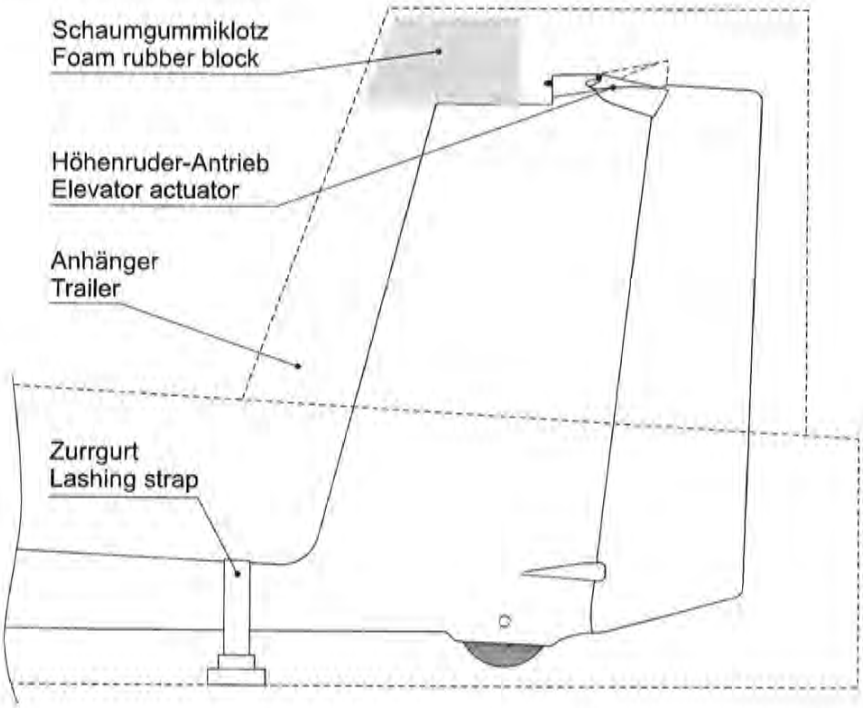
CAUTION
Road transport with water ballast in the wing tanks is not permissible!

CAUTION
In order to protect the air brake cover plates from damage the airbrakes must be closed and locked!

WARNING
The elevator actuator on top of the vertical fin may under no circumstances be loaded or fixed in any way, even by soft foam cushions! When designing or adapting the trailer, free movement and side clearance for the elevator actuator must be provided.

For example, if a foam block applied some load to the elevator actuator, and restricted its free movement, fatigue cracks can develop after long road transports. A workaround is urgently needed!

The following sketch shows, how a foam-rubber block must be trimmed and is to be positioned. It is also important to have a strap, which is connected to the trailer floor, over the fuselage boom near the fin. In any case, it is necessary to guarantee the free movement of the elevator actuator. This must be so even if the stick is pulled fully back and the elevator is fully deflected upward.



8.5 Cleaning and care

Contrary to the popular belief that composite materials are impervious to moisture and ultra-violet light, even modern gliders need care and maintenance!

Moisture-effects on the structure of the fibre-reinforced plastics and on the surface finish.

In the long run, moisture will also damage fibre-reinforced composites, as it will penetrate into the epoxy resin base and cause it to swell, which will partially burst the tight cohesion of the plastic molecules.

In particular, a combination of high temperature and humidity must be avoided! (e.g., poorly ventilated trailer becoming damp inside, which is then heated by the sun).

Neither the best quality of paint protection on the surfaces or the additional frp-liner on the inside of the wet surface water ballast tanks can fundamentally prevent water vapour diffusion; they can only retard the process. If water has entered the airframe and cannot be removed by means of sponge or chamois leather, the aircraft should be de-rigged and dried out in a dry but not too hot room. Also, the affected part should be periodically turned.

Sunlight-effects on the surface finish

Sunlight, especially its ultraviolet (UV) component, makes the paint and the canopy plastic brittle. Do not unnecessarily expose the aircraft to strong sunlight.

The optional 2-pack acrylic paint finish, available for serval years, provides a significantly improved weathering resistance. Regular care is still required to maintain the good appearance and the value of the aircraft.

Care of surface finish

Because the white coating is protected by a fairly durable wax layer, it will tolerate washing occasionally with cold water, with a little cleaning solution added. In normal use the wax coating need only be renewed annually with a rotary polisher. In moderate European conditions it will suffice if a paint preservative is applied twice a year. In areas subject to long and stronger sun exposure this should be done more often. The optional available 2-pack acrylic paint finish may be treated in the same way.

> ***CAUTION***
> *The use of alcaline cleaning agents (e.g. "Meister Proper") may affect the paint surface and even penetrate into the foam of the sandwich structure and damage it. In a few cases the acrylic foam in the control surface sandwich structure was destroyed by the use of unsuitable cleaning agents. Heavy dirt should therefore be removed using a cleaning polish.*

For the care of the paint finish, only preparations containing the lowest available amount of silicone may be used.

Traces of Adhesive from Self Adhesive Tapes are best removed by means of cleaning benzine (car petrol is toxic!) or paint thinners. After cleaning, renew the wax coating.

> ***NOTE***
> *The signal and decorative markings are built up from nitric or acrylic paint; therefore, no thinners must be used and even benzine should not be allowed to act on them for prolonged periods.*

Canopy

The Acrylic Canopy (Plexiglas or Perspex) should only be cleaned by means of a special cleaner (e.g.: Plexus Kunststoffreiniger or Acryshield) or with lots of clean water. On no account should a dry cloth be used for dusting or cleaning.

Safety harness

Regular cleaning of the safety harness according to the applicable manufacturer documentation must be performed. In addition, the safety harness straps should be regularly inspected for tears, compressed folds or wear, and corrosion of metal parts and buckles. The reliable operation of the release mechanism - even under simulated load - should be tested occasionally.

Section 9

9 Supplements

9.1 Introduction

9.2 List of inserted supplements

9 Supplements

9.1 Introduction

This Section contains the appropriate supplements necessary to safety and efficiently operate the sailplane when equipped with various optional systems and equipment not provided with the standard sailplane.

9.2 List of inserted supplements

Date of insertion	Doc. No.	Title of inserted supplement