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Flight Manual

for sailplane model

ASW 28-18

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Pages identified by "LBA-App." are approved by the German Federal Civil Aviation Authority (LBA) as shown below:

Signature

Luftfahrt-Bundesamt
Postfach 30 54
3300 Braunschweig

Authority

Stamp

21. OKT. 2004

Original Date of Approval

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

The translation has been done by best knowledge and judgment. In any case the original text in German is authoritative.

Section 0

Published by AS with contributions from Gerhard Waibel, Lutz-Werner Jumtow and Michael Greiner.

IMPORTANT NOTE:

The text given in this Manual (including figures, descriptions and operational or handling information) was produced by the authors with great care. However mistakes or misprint as well as misunderstanding can never be excluded. Therefore the authors must state, that juristical responsibility or guaranty or any other warranty which results from mistakes, misprints or misunderstanding cannot be given. The authors however are very grateful to accept advice for corrections.

This Flight Manual is FAA approved for U.S. registered gliders in accordance with the provisions of 14 CFR Section 21.29, and is required by FAA Type Certificate Data Sheet G13CE.

0.1 Record of Revisions

Any revision of the present manual, except weighing data established from time to time, must be recorded in the following table "Record Of Revisions" (pages 0.2/0.3) and in case of approved Sections endorsed by the LBA.

The new or amended text in the revised page will be indicated by a black vertical line in the margin, and the Rev. No. and the Date will be shown at the bottom of the page.

Record of Revisions

Rev. No.	Section & Pages Affected	Date of Revision	Approval	LBA-Approved on Date	Date of Insertion of Pages	Ref./ Signature

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0.3 Table of Contents

Section

Section 1

1.1 Introduction

This Sailplane Flight Manual has been prepared to provide pilots and instructors with information for the safe and efficient operation of the ASW 28-18 sailplane.

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

1.2 Type Certification Basis

This type of sailplane has been approved by the European Aviation Safety Agency (EASA) after type testing by the German Federal Civil Aviation Authority (LBA). Joint Airworthiness Requirements for Sail-planes and Powered Sailplanes JAR-22 issued 1995 (Change 5 of the original edition) were basis for certification.

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 fiber reinforced plastics", issued 1991.

The Type Certificate has been applied for on 7.12.2000.
The document number is EASA.A.017.
Application is made for Airworthiness Category "U".
U stands for Utility and refers to sailplanes used in normal gliding opera-tion.

1.3 Warnings, Cautions and Notes

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

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

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

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

1.4 Description and Technical Data

The ASW 28-18 is a high performance, single-seat sailplane with exchangeable wingtips for 15m and 18m span. This enables to fly within FAI Standard Class or 18m Class specifications.
The ASW 28 is suitable for record breaking and competition flying. Not least, its pleasant flying characteristics make the ASW 28 suitable for use in performance-orientated clubs.

The ASW 28-18 is a shoulder wing glider with T-tail (fixed stabilizer plus elevator) and sprung suspended, retractable landing gear with hydraulic disc brake. Detachable 0.5m high winglets are installed at the wing tips.

Its aerodynamic design using boundary layer control by blow-turbulators and the use of carbon, aramide (Kevlar) and polyethylene (Dyneema or Spectra) fibers represent the latest state of the art.

Technical Data:

(Metric system)			
Span	18,0	15.0	m
Fuselage length	6.59	6.59	m
Height (Fin and Tail Wheel)	1.3	1.3	m
Max.Take-Off Mass	575.0	525.0	kg
Wing chord (mean aerodynamic)	0.717	0.745	m
Wing area	11.88	10.50	m²
Wing loadings: -			
- minimal	about 29	about 32	kg/m²
- maximal	48.4	50.0	kg/m²

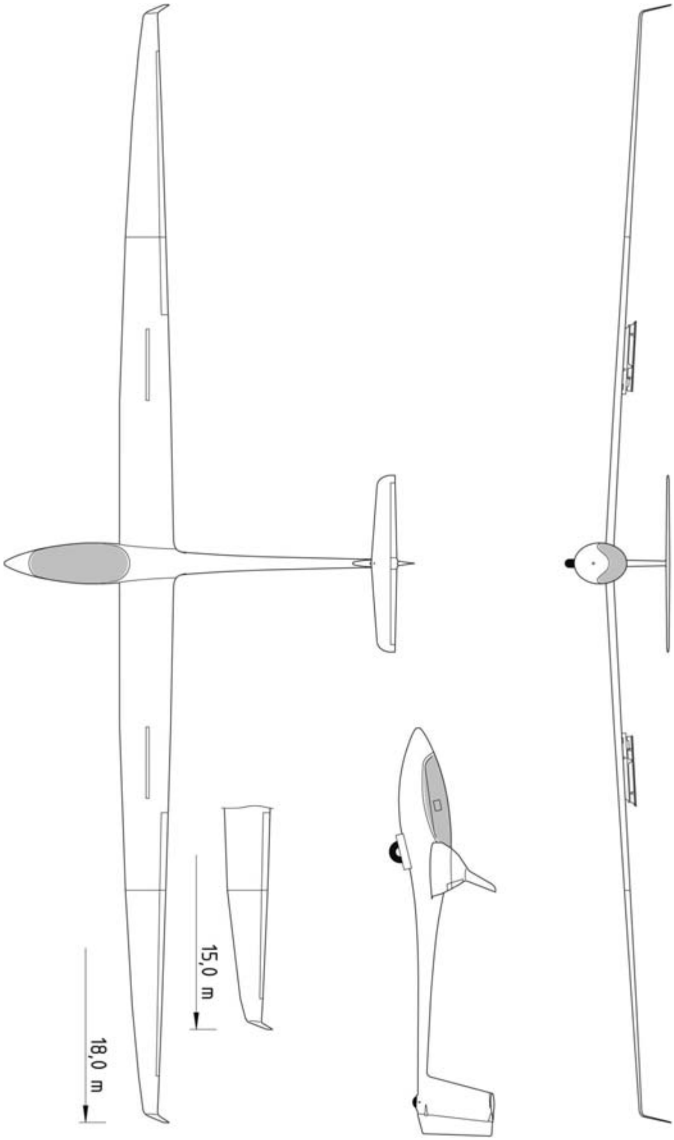
(British and US system)			
Span	59.06	49.21	ft
Fuselage length	21.60	21.60	ft
Height (Fin and Tail Wheel)	4.27	4.27	ft
Maximum Take-Off Weight (Mass)	1267.65	1157.43	lbs
Wing chord (mean aerodynamic)	2.352	2.444	ft
Wing area	127.87	113.02	ft²
Wing loading			
- minimum	about 6.5	about 5.9	lbs/ft²
- maximum	9.91	10.24	lbs/ft²

General View

Foto: M. Münch

1.5 Three View Drawing

Fig. 1.5-1



Section 2

2.1 Introduction

Section 2 includes operating limitations, instrument markings and basic placards necessary for the safe operation of the ASW 28-18, its standard systems and standard equipment.

The limitations included in this Section and in Section 9 have been LBA-approved.

2.2 Air Speed

Air speed limitations and their operational significance are shown below:

	Speed	IAS	Remarks
V_{NE}	Never exceed speed	270 km/h, 145.6 kts, 167.8 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 may be overstressed by full control movement.

	Speed	IAS	Remarks
V_W	Max. **winch-launching speed**	140 km/h, 75.5 kts, 87 mph	Do not exceed this speed during winch- or autotow launching
V_T	Maximum **aero-towing speed**	170 km/h, 92 kts, 106 mph	Do not exceed this speed during aerotowing.
V_{LO}	Maximum **land-ing gear oper-ating 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	Significance
Green arc	92 - 200 km/h, 49.6 - 108 kts, 57.2 - 124 mph	Normal Operating Range
Yellow arc	200 - 270 km/h, 108 - 145.6 kts, 124 - 167.8 mph	Manoeuvres must be conducted with caution and only in smooth air.
Red line	270 km/h, 145.6 kts, 167.8 mph	Maximum speed for all operations.
Yellow triangle	100 km/h, 54 kts, 62 mph	Approach speed at maximum weight **without** water ballast.

2.4 *omitted*

2.5 *omitted*

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2.6 Mass (Weight)

Span:		18m / 59ft	15m / 49ft
Maximum Take-Off Mass	with water ballast	575 kg 1267.6 lbs	525 kg 1157.4 lbs
	for cloud flying and aerobatics	419 kg 923 lbs	405 kg 892 lbs
Maximum Landing Mass:		575 kg 1267.6 lbs	525 kg 1157.4 lbs
Max. mass of all non-lifting parts		285 kg 628.3 lbs	
Max. mass in the baggage compartment		12 kg 26 lbs	

2.7 Centre of Gravity

Centre of gravity range (for flight):

Span:	18m / 59ft	15m / 49ft	
foremost limit	233 mm 9.173 inch	227 mm 8.937 inch	aft of RP
Rearmost limit	406 mm 15.98 inch	406 mm 15.98 inch	aft of RP

See also diagram in Section 5.3.4 .
"RP" means "Reference Datum Point" in this context, which is located at the wing leading edge at the wing root rib.
An example of the C.G. position calculation and a table of c.g. ranges at different empty weights can be found in Section 6 of the ASW 28 Maintenance Manual.

2.8 Approved Manoeuvres

This glider is approved for use in normal gliding operation (Airworthiness Category "Utility").
See also Sections 2.7, 2.9, and 2.10 .
Within this Airworthiness Category U the following aerobatic figures are approved:
Positive Loop, Lazy Eight, Climbing Turns, Stall Turn and Steep Turn.
Further details concerning these maneuvers will be found in Section 4.5.9 .

2.9 Manoeuvring Load Factors

Maximum permissible manoeuvring load factors:

maximum positive load factor	+ 5.3
maximum negative load factor	- 2.65
at an air speed of:	200 km/h (108 kts, 124 mph)

At increasing air speeds, these values will be reduced to:

Airbrake setting:	closed	open
maximum positive load factor	+ 4	+ 3.5
maximum negative load factor	- 1.5	- 0
at an air speed of:	270 km/h (145,6 kts, 167,8 mph)	

2.10 Flight Crew

The crew of the ASW 28-18 is <u>one</u> pilot.
Pilots weighing less than 70 kg = 154,5 lbs (incl. parachute) must use additional trim ballast plates. Decisive is to the Mass and Balance Form in Section 6. also refer to 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).

2.11 Kinds of Operation

Flights may be carried out in daylight, in accordance with VFR.
Cloud flying is permitted:

- if appropriate instrumentation is fitted (see section 2.12)
- regarding the weight limit (see section 2.6)
- and if regulations currently in force are complied with.

In Canada and Australia cloud flying is prohibited !

Aerobatic manoeuvres according to section 4.5.9 of this Flight Manual is permitted:

- regarding the weight limit (see section 2.6)

2.12 Minimum Equipment

Minimum Equipment consists of:

1 ASI indicating up to at least 300 km/h (162 kts)
1 Altimeter
1 4-part safety harness (symmetrical)

Additional minimum equipment for ASW 28 registered in **Belgium** or **France**:

1 Variometer
1 Magnetic Compass
1 Side slip indicator

For cloud flying the following additional equipment must be fitted:

1 Turn-and-Slip indicator
1 Magnetic Compass
1 Variometer

Approved equipment is listed in the Maintenance Manual in Section 12.1. The manufacturer recommends installing a yaw string on top of the canopy as well as a magnetic direction indicator (compass). As the compass is not part of the required minimum equipment, it must not be of an approved kind. Compensation however must be possible and be done.

2.13 Aerotow and Winch Launching

The maximum permissible launch speeds are:

aerotowing	170 km/h (92 kts, 106 mph)
winch launch	140 km/h (75.5 kts, 86 mph)

For winch launch, a weak link of 675 to 825 daN (1517 to 1854 lbs.) must be used in the launch cable or tow rope.

For Aero Tow, a weak link according to the tow plane must be used, not stronger than 825 daN (1854 lbs.). The tow rope must be as specified in optional regulations but additionally not less than 40 m = 130 ft or more than 60 m = 200 ft in length.

2.14 Limitations Placards

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

Segelflugzeugbau A. Schleicher GmbH & Co. Poppenhausen

Model: **ASW 28-18** Serial No.:

DATA and LOADING PLACARD

	15 m	18 m
Empty mass:	kg	kg
Max take-off mass:	525 kg	575 kg
Min. Seat Load	kg	
Max Seat Load:	kg	

Max. Permissible Speeds:

Calm Air:	146 kts	270 km/h
Winch Launch W/L:	75 kts	140 km/h
Aerotow A/T	92 kts	170 km/h
Extending Landing Gear:	108 kts	200 km/h
as Maneuvering Speed:	108 kts	200 km/h

Weak Link for Aerotow & Winch Launch: 675 bis 825 daN

Tire Pressure

Main Wheel:	49 - 52 psi	3,4 - 3,6 bar
Tail Wheel:	34 - 37 psi	2,4 - 2,6 bar

This placard is to be glued near the data placard:

Reduced minimum Cockpit Load
without Trim Ballast in the Fin:
see Flight Manual Page 6.4 !

For Reduction of Minimum Cockpit Load by means of removable trim ballast discs mounted in the front part of the cockpit: - see Section 7.11.

This placard is to be glued near the data placard.

Cloud flying and the following aero-
batic manoeuvres are only
approved up to a flight-mass of
18m: **419kg / 923lbs**
15m: **405kg / 892lbs**

Looping (positiv)
Lazy Eight
Chandelle (climbing)
Stall Turn
Steep Turn, max bank angle 70°

This placard is to be glued near the data placard, if only installed a c.g. tow release.

Only approved for winch-
and autotow-launching!

This placard is to be glued near the data placard, if only installed a forward tow release.

Only approved for
aerotowing!

Section 3

3.1 Introduction

This section 3 provides check list and amplified procedures coping with emergencies that may occur.

Brief head-words are followed by a more detailed description.

EMERGENCY PROCEDURES

Canopy Jettison

① Pull both the left and right-hand red levers
at the canopy frame back all the way
② pull canopy REARWARD and UP!

Bailing Out

① Push instrument panel UP
② release safety harness
③ roll over cockpit side
④ push off strongly
⑤ watch out for wings and tail surfaces!
⑥ pull parachute!

Spin Recovery

① apply opposite rudder and
② relax back pressure on stick until rotation stops
③ center rudder and immediately pull out gently from dive !

Note: *Aileron neutral supports recovery*

3.2 Jettisoning of Canopy

Pull canopy jettison (red levers mounted left and right at canopy frame) and pull canopy rearwards and up!

3.3 Bailing Out

If bailing out becomes inevitable, first jettison canopy and only then release safety harness.

Push instrument panel UP (if this was not 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. Try to avoid contact with wing leading edges or tail surfaces!

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 28-18 will immediately re-gain flying speed.

3.5 Spin Recovery

① Apply opposite rudder (this means: in the direction opposite to the rotation of the spin) and
② relax back pressure on the stick until rotation stops
③ center the rudder and gently pull out of the dive.

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

3.6 Spiral Dive Recovery

Depending on the aileron position during spinning with forward C.G. positions - that is: the C.G.- range when the ASW 28-18 will no more sustain a steady spin - it will immediately or after a few turns develop a spiral dive, or a slipping turn similar to a spiral dive.

In contrast to spinning a spiral dive is characterized by high g-loads. Therefore do not pull further, 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 *omitted*

3.8 *omitted*

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3.9 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 lowered, the ASW 28-18 should be touched down with airbrakes closed as far as possible, at a shallow angle and without stalling on to 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 by a plastic glider with wheel retracted has been experimentally tried out. The experience gained on that occasion suggests that the aircraft will not skim across the water, but that the whole cockpit area will be forced under the surface. If the depth of the water is less than 2 m = 6,5 ft, the pilot is in the greatest danger. Touching down on water is, therefore, recommended **only with wheel lowered,** and **only** as a very last resort.

Flying with Defective Water Ballast Drainage

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

When jettisoning water ballast in flight, it should be positively ensured that the water is draining from both wings. Small pilots may see the water outflow directly from inside the cockpit. Tall pilots may use a back view mirror or use the mirror effect of their sun glasses.

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 does not open, 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.

If a drain valve does not close, dump all water ballast.

Section 4

4.1 Introduction

Section 4 provides checklist and amplified procedures for the conduct of normal operation. Normal procedures associated with optional systems can be found in Section 9.

4.2 Rigging and Derigging

To rig: The ASW 28-18 can be rigged without use of rigging aids by three people, or by two people when a fuselage cradle and a wing trestle are used.

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. Begin with the right inner wing and insert its spar fork into the fuselage. If available, support the wing with a trestle. While rigging, the airbrake over-centre lock in the wing should be released, but the airbrake paddles retracted, and the ailerons slightly raised. The stick should be placed in the centre and the airbrake lever pushed forward.

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, and rigging completed with the aircraft standing on its main wheel.

5. Screw the provided tool into the hole at the outer end of the inner wing leading edge. Pull the safety pin and hold it in this position with the help of the tool. Align the outer wing and slide its spar stub into the inner wing. Both the lift pins and the ailerons must connect. When the safety pin lines up with its corresponding bushing, push it in until the distinct stop. Now the outer wing can be relieved and the tool be screwed off.

NOTE: *Check the safety pins extension vanishing completely under the airfoils contour.*

NOTE: *It goes without saying that only mating wing tips may be rigged*

6. The winglets are installed into their pockets in the wing tips and secured by the self engaging spring loaded bolt. Self adhesive tape seals the gap and secures the winglet additionally.

   Screw the cover of the water ballast filling/ventilation opening on the upper wing surface in place and secure it with self adhesive white tape.

7. Prior to rigging the horizontal tail, check if a trim weight or -battery in the fin compartment is needed, or already 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 control tongue. Use rigging aid AS-P/N 99.000.4657 to do so. This sheet metal part is held between elastic seal and 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 multi probe into the fin up to the stop and secure it with adhesive tape.

9. A considerable performance improvement can be achieved with little effort by taping all gaps at the wing junctions with plastic self-adhesive tape (on the non-moving parts only).

NOTE: *The venilation port of the inner wing water tanks is located on the wing lower side, 30cm (1ft) from the aileron inwards. The ventilation port of the optional tail water tank is located atop the left side of the vertical tail*
These openings must be kept open in any case!

The fin-tailplane junctions should also be taped. 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.

10. *omitted*

11. Now use the Check List (see the following Section 4.3) to carry out the pre-flight check.

To de-rig: proceed in the reverse order of rigging starting with the horizontal tail, winglets, wing tips and inner 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. Despite technical provisions, the wing surfaces might suffer from humidity on the long run.

2. 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

① - Open canopy and check canopy jettison

- Main pins inserted up to the handle and secured?

- Check positive control connections - ailerons, elevator and air-brakes - in fuselage/wing mounting area.

- Check cockpit and control runs for loose objects or components.

- Check all batteries for firm and proper attachment (up too two slots in the baggage compartment and one optional between the pilot’s knees through the seat pan)

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

- Check ventilation opening and - if installed - pitot tube (optional extra) in fuselage nose.

- Check condition and operation of towing hook(s). Release con-trol operating freely ? Don't forget release checks!

- Check wheel brake for operation and leaks. With airbrake pad-dles fully extended the resilient brake pressure from the main brake cylinder should be felt through the brake handle.

② - Check both upper and lower wing surfaces for damage. Check water ballast drain openings on lower surface to be clean.

- Check, whether the wing tips are correctly installed:
  the safety pin extension vanishes under the airfoil contour,
  and the ailerons are properly connected without loose play

③ - Ailerons:
  Check condition and full and free movement (control surface clearances). The gap 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 friction areas of the elastic seals must be cleaned from any dirt!

- Check the cover for the filling and ventilation opening of the water ballast tank on the upper wing surface for proper seating and safety by elastic tape.

- Are the winglets undamaged and secured?

④ - Airbrake paddles:
  Check condition and control connections. Do both sides have good over-centre lock? Check both airbrake boxes for loose objects, stones, water etc.

- The seat areas of the airbrake cover plates must be carefully cleaned!

⑤ - Check inflation and condition of tires:
  Main wheel : 3.5 bar ± 0.1 bar (= 50,8 psi +/- 1,5 psi)
  Tail wheel : 2.5 bar ± 0.1 bar (= 35,6 psi +/- 1,5 psi)

⑥ - Check fuselage, especially underside, for damage.

⑦ - Check static ports in the fuselage tail boom for obstructions (moisture?).

⑧ - Check the pressure port in the fin:
Is the probe properly seated, tight and secured by elastic tape?

- Check tail water ballast tank drain hole to be clean.

⑨ - Check that the tailplane bolt is tight and locked.

- Is a trim weight or Battery installed inside the fin compartment? Elevated minimum cockpit load, see mass and balance form, section 6.2.

⑩ - Check that rudder, tailplane and elevator are correctly fitted, and check for damage or excessive play.

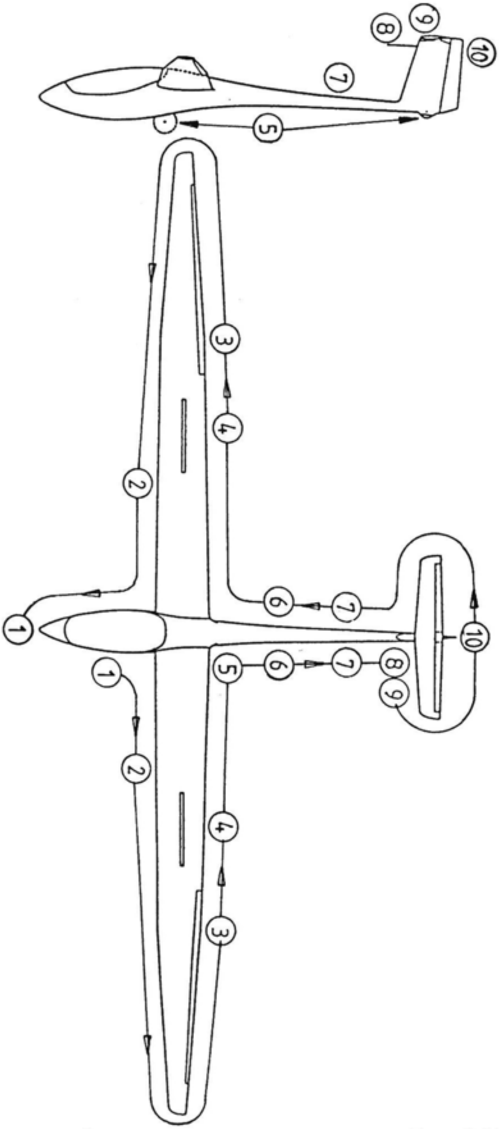
The numbers against the above points correspond with those in the following illustration "Tour of Inspection".

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

Pre Flight Check

1. Main pins fully home and secure?
2. Check for foreign matter in the cockpit!
3. Outer wings pins and tailplane bolt secure?
4. Check controls for positive connections, freedom of movement and allowed slack.
5. Visible damage on towing hooks, landing gear or surface?
6. Multi prope inserted into fin until stop?
7. Static pressure openings dry and unobstructed?
8. Check tyre pressure!
9. Trial of tow hooks!
10. Water tank outlets und ventilation openings clean?
11. Observe mass and balance data!

Tour of Inspection round the Aircraft



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4.4 Pre-Flight Inspection

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:

1. Tail dolly removed?
2. Fasten safety harness?
3. Rip-chord of automatic parachute connected?
4. Seat comfortable?
5. Safety harness fastened (especially, lap straps tight)?
6. Controls free?
7. Airbrakes closed and locked?
8. Trim set in take-off position?
9. Altimeter correctly set?
10. Radio transmission checked?
11. Landing gear locked?
12. Check wind direction!
13. Close and lock canopy!
14. Procedure for take-off interuption in mind?

4.5 Normal Procedures and Recommended Speeds

4.5.1 Winch Launch

CAUTION: *Winch- and autotow-launches must be conducted using the c.g. tow release.*

A weak link of 675 to 825 daN (1488 to 1819 lbs.) must be used in the launch cable (e.g. the appropriate weak link manufactured by Tost is coloured red, according to Tost information 2003).
Maximum acceptable crosswind component is 25 km/h = 13,5 kts.
Recommended trimmer setting:

C.g. position	Trimmer setting
Foremost	Centre of indicator gate
Middle to Rearmost	Forward third of indicator gate

The more rearward the c.g.-position, the more nose heavy the trimmer should be set.

NOTE: *Rear c.g.-positions are given when the cockpit load is close to the actual minimum cockpit load. Forward c.g.-positions are given when the cockpit load is close to the actual maximum cockpit load. See section 6.2.*

Towing off, rudder and aileron immediately respond, such that it is possible to maintain the wings at zero bank. With the trimmer adjusted as mentioned above, the ASW 28-18 will assume a gentle climb attitude after take-off. Nevertheless every winch launch is different and the pilot must be prepared to correct the flight attitude immediately. After take off pitch and flight path is controllable right away.

NOTE: *Actions necessary after a cable failure are always also subject to wind and airfield circumstances. Apart from this, after a cable failure in the flat phase of a winch launch the pilot must immediately push, and take care of a stabilized flight attitude before further actions.*

Above a minimum safe altitude the climb angle should be increased by applying backpressure on the stick

Recommended winch-launch airspeed:	110 – 120 km/h 60 – 65 kts 68 – 75 mph

CAUTION: *After a cable failure in the steep part of the winch launch immediate and full push must be applied ("1st push stick, 2nd release tow hook, 3rd think").*
Not the pitch attitude, but only the airspeed indicator can ascertain, whether a safe airspeed has been reached.

NOTE: *The landing gear may **not** be retracted during the launch*

CAUTION: *Winch launches with water ballast are only recommended with strong winches or with more 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 under-powered winch in a tail wind!*

4.5.2 Aero Tow

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

The trim should be set slightly 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: *Before start, inform the tug pilot of the recommended towing speed.*

Wing loading	Recommended Towing Speed
30 kg/m^2 6.14 lbs/ft^2	115 km/h 62,0 kts 71,5 mph
40 kg/m^2 8.19 lbs/ft^2	120 km/h 64,8 kts 74,6 mph
50 kg/m^2 10.24 lbs/ft^2	135 km/h 72,9 kts 84,9 mph

Maximum acceptable crosswind component: 25 km/h = 13,5 kts.

4.5.3 Flight

15m span

With clean wings and with a take-off mass of about 360 kg (34,2 kg/m^2) = 793 lbs (7.0 lbs/ft^2) the best L/D is obtained at 108 km/h (58 kts). In the range between about 88 km/h and 126 km/h (48 kts to 68 kts) L/D is over 40. The laminar bucket reaches out up to 170 km/h (92 kts). The speed of minimum sinking is approx. at 90 km/h (49 kts).
With maximum take-off weight (525 kg = 1157 lbs) best L/D is obtained at 130 km/h (70 kts) and minimum sinking at 110 km/h (59 kts). The favourable aerodynamic range stretches out between 105 km/h and 200 km/h (approx. end of laminar bucket, 56 kts to 108 kts).
Beyond these speed ranges, flight performance will noticeably deteriorate. The condition of the glider (flap seals, gaps being taped and dirt on the surface) also influences these values remarkably.
The values base on the idaflieg measurement from 2003, which deviates partly from the measurement 2001, but covers a larger speed range. Idaflieg is switching over to new measurement technologies, thus these values might not be comparable with older data.

18m span

The ASW 28-18 with 18m span has not been measured at that time. A recalculation of the 15m data to 18m and for 370 kg (31.1 kg/m^2) = 816 lbs (6.4 lbs/ft^2) gives a best L/D at 100 km/h (54 kts), a minimum sinking at 85 km/h (46 kts) and a range from 82 km/h to 118 km/h (44kts to 64 kts), in which L/D should exceed 45. The laminar bucket should extend up to 170 km/h (92 kts).
With maximum weight (575 kg = 1267 lbs) best L/D should be obtained at 124 km/h (67 kts), and minimum sinking at 105 km/h (57 kts). The favourable aerodynamic range should stretch from 102 km/h to 200 km/h (approx. end of laminar bucket, 55 kts to 108 kts),

CAUTION: *Flights in conditions conducive to lightning strikes must be avoided as the ASW 28-18 is not approved for such conditions under JAR 22 requirements.*

Low Speed Flight and Stalling Behaviour

The ASW 28 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.

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.

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 and how quickly the pilot reacts.*

Loss of altitude from straight flight after prompt recovery action: ~ 20 m (about 65 ft)

Loss of altitude from straight flight with airbrakes extended after prompt recovery action: ~80 m (about 260 ft)

The cockpit nose may pitch 10° to 40° *below the horizon.*

Height loss from circling flight: up to 100 m (about 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	spin, quickly leading to spiral dive	side slipping

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

High Speed Flight (Airspeed Indicator in yellow Range)

The following consequences arise from the airworthiness requirements:

CAUTION: *Exceed the rough-air speed only in calm air (yellow arc of airspeed indicator).*

CAUTION: *Above manoeuvring speed (yellow arc of airspeed indicator), full control deflections must not be applied. At V_{NE} (red radial line) only one third of the full travel is permissible.*

CAUTION: *In the yellow range airbrakes may only be opened under positive g-loads, and only if this g-load is below 3.5g.*

CAUTION: *And generally it applies: Do not utilise the otherwise permissible range of control deflections during strong gust loads. Simultaneous, full gust loads and maneuvering loads can excess the structural strength.*

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4.5.4 Approach

Make the decision to land in good time and, despite the high performance, lower the wheel at not less than 150 m (~ 500 ft) agl.
For the remainder of the circuit, maintain about 90 – 100 km/h (49 – 54 kts). The yellow triangle on the ASI scale is valid for maximum weight without water ballast. In turbulence or strong headwind increase the approach speed.
Trim the glider to 90 – 100 km/h (49 – 54 kts).

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

Side slipping with the ASW 28-18 is very effective and may therefore also be used for controlling the glide angle.
The slip is initiated with airspeed between 90 km/h and 120 km/h IAS (49 to 65 kts) by gently applying aileron control and holding the flight path with the rudder. 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 checked by the pitch attitude. The upper edge of the instrument panel must not rise above a horizon position known from thermal flight attitude.
The amount of sideslip is controllable with the size of the control deflections. 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
With airbrakes already extended, the slip is more effective and can more easily be initiated.
If the slip is initiated at too high airspeed and with too dynamic control deflections, the glider may react with violent motions. Entry speed should therefore be max. 140 km/h / 76kts / 87mph
.

CAUTION: *Side slipping should be practiced from time to time at a safe height*

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

WARNING: *When an asymmetric water ballast load is suspected or recognized,* ***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

For normal European weather conditions, the wing loading of the ASW 28-18 is at its best even without additional water ballast.
If achieved lift is markedly greater than 2 m/s = 394 ft/min, wing loading can be increased up to a maximum of 48 kg/m² = 9.83 lb/ft² (18m) respectively 50 kg/m² = 10.24 lb/ft² (15m) by use of water ballast.

NOTE: *Remember that ballast will increase the stalling speeds and take-off runs.*
Ensure that the condition of the airfield, the length of take-off run available and the power of the tug, tow-car or winch permit a safe launch.

Filling of Water Ballast

CAUTION: *When an optional tail water ballast is installed and tail water ballast is needed this has to be filled first!*

All water ballast valves are operated by only one actuator lever which is situated on the right hand cockpit arm rest in the landing gear gate. To open all water ballast valves at the same time is an important requirement of the LBA in order to avoid unintended opening of only one valve which in turn leads to uneven load. Lever forward is open!

To fill the tail water ballast tank, screw the transparent filling hose into the drain port in front of the tail wheel and fix it with some tape to the fin in front of the water level marks. Fill the required amount of ballast water into the system and close the valve (rear position). Information about the required amount of water and resulting c.g. is given on the following pages.

The integrated wet surface wing water ballast tanks are then filled through the filling/ventilation openings on the upper wing surface. To do so, the water ballast actuation lever remains in the closed position. Then screw the covers in place and safety.
For filling the wings must be kept level.

Carry out a balancing test to check that the ballast loads are even, by levelling the wings. Should one wing prove to be heavier, the lighter one is filled until an even load is achieved.

The drain ports are about 0,3 m left and right of the fuselage and about 0,27 m behind the leading edge on the lower wing surface. The ventilation opening is located at the lower side of the inner wing, about 1,5 m (5 ft) from the wing tip junction.

WARNING: *It is expressly prohibited to use pressurized 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 head-of-pressure cannot rise beyond 1.5 m = 4,9 ft.

WARNING: *Parking the glider with filled ballast tanks, the wings **must be leveled.**. Otherwise the 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 secured by tape.*

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

The maximum permissible water ballast volume can be calculated as follows:-

Span	18m	15m
Maximum Take-off Weight. .	575 [kg]	525 [kg]
less - Empty Weight	-xxx [kg]	-xxx [kg]
less - Fuselage Load	-xxx [kg]	-xxx [kg]
= max. water ballast load (in kg or liters)	xxx [kg]	-xxx [kg]

You will find a table with precise values in Section 6.2. !

Jettisoning of Water Ballast

To jettison water ballast, the operating lever at the right hand cockpit arm rest in the landing gear gate is pushed forward (valve open).
We distinguish between two types of circumstance in which ballast is normally released.

1. Partial reduction of wing loading:
   The mean rate of drainage amounts to 0.4 l/sec, higher if tanks are full, less if they are nearly empty. After an appropriate lapse of time the valves should be closed.

2. Complete ballast jettison:
   The full tanks take about 9 minutes to drain. The first half of the ballast will drain in about 3½ minutes, while the remainder will take about another 5½ minutes.

Every time any water is jettisoned, it is most important to look at the lower surfaces of the wings and check that the water is draining at an equal rate from both valves! Asymmetric control deflections may also indicate unequal loading.

Should the 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 the valves are to be closed again to retain water in the tanks (partial reduction of wing loading), also check that both valves really close. Otherwise jettison all water.

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.

Operation of an optional tail water ballast tank installed inside the fin (tail tank)

Foreword:

Without a tail tank, a desired c.g.-position can be trimmed by trim weights in the front fuselage or in the tail, only for either a "dry" or water loaded configuration. The optional tail water tank allows trimming a specific c.g. position in both configurations.
After reading Section 5.3.4 of this manual, the performance minded pilot can adjust the C.G. for the "dry" sailplane to an optimum position using solid weights. For this he must use trim discs for the front fuselage or an specially prepared trim weight or battery for the upper fin compartment, which is covered and approved by the current weight and balance.
The water ballast tank inside the lower fin can be drained in flight. It is used to compensate the nose heavy moment resulting from the wing water ballast load, which is also disposable in flight. The tail tank may be used to optimise a second c.g.-position when water ballast is carried. However, the dump system does not synchronise the water flow from wing and tail tanks. Therefore it is not possible to maintain the desired c.g., when the water load is only partially disposed.

Balancing a nose heavy moment from the wing ballast tank

When the ASW 28 is equipped with a tail water ballast tank inside the lower fin, it can only be used to compensate the nose heavy moment resulting from a water ballast load inside the wings. Per 10 Ltrs (2.64 US Gall.) in the wing tanks, maximally 0.33 Ltrs (0.087 US Gall.) are allowed in the tail tank.

Total amount of water in the wing tanks	[Ltrs]	0	30	60	90	120	>160
	[US Gall.]	0	8	16	24	32	>42
Maximally allowed amount of water in the tail tank	[Ltrs]	0	1	2	3	4	5
	[US Gall.]	0	0.26	0.53	0.79	1.1	1.3

These values only give the maximum allowed quantity for the tail tank. When this table is regarded, it is ensured, that the c.g. stays within the permissible range (provided the “dry” glider has already been trimmed correctly). The recommended use of the tail tank is described in the following:

Recommended Trimming of the Sailplane

We recommend to trim the sailplane to a c.g. of

Span	As well 15m as 18m
Recommended inflight c.g. behind r.p.	290 – 380 mm 11.41 – 14.96 inch

This way the induced drag and the airfoil drag of the horizontal tail are kept as small as possible. In fast flight periods, the rear c.g. positions of this range are advantageous, whereas in thermalling middle c.g. positions are beneficial.

CAUTION: *In any case, the loading limits of the mass and balance form (section 6.2) have to be regarded.*

<u>Recommended trim of the dry glider</u>

The recommended c.g. range will be reached, when the cockpit load exceeds the minimum cockpit load (see section 6.2) by 13.5 kg (29.7 lbs). Missing mass can be replaced with trim discs of 1,11 kg each on the optional support in the fuselage nose.

Pilot with parachute above minimum cockpit load	[kg]	0	2,5	5	7,5	10	12,5
	[lbs]	0	5.5	11	16.5	22	27.6
Number of trim discs (each 1,11 kg)		6	5	4	3	2	1

Up to 45 kg (99 lbs) above minimum cockpit load, you are within the recommended c.g. range. With higher cockpit loads a trim weight in the tail fin should be installed:

Pilot with parachute above minimum cockpit load	[kg]	45	50	55
	[lbs]	99	110	121
Additional trim-weight in the fin	[kg]	0	1	2
	[lbs]	0	2.2	4.4

CAUTION: *Take care to have the trim-weight attached tight!*

Recommended trim of the glider with water ballast

- If a tail tank **is** installed:

  First trim the glider according to the previous page.

  Only if you are in the forward part of the recommended c.g. range (about 30 kg or 66 lbs above minimum cockpit load), it is advisable to fill the tail tank. In this case with 0,2 Ltrs per 10 Ltrs in the wing tank (with 0.1 US Gall. per 5 US Gall in the wing tanks)

Total amount of water in the wing tanks	[Ltrs]	0	50	100	150	200
Recommended water in the tail tank	[Ltrs]	0	1	2	3	4

Total amount of water in the wing tanks	[US Gall]	0	15	30	45	55
Recommended water in the tail tank	[US Gall]	0	0.3	0.6	0.9	1.1

- If a tail tank **is not** installed:

  If no tail tank is installed, a c.g.-position can be adjusted beneficial in dry and filled condition.

  Between 0 and 30 kg (66 lbs) above minimum cockpit load, trim the glider according to the previous page.

  Only if the cockpit load exceeds the minimum cockpit load by more than 30kg (66lbs), the following mass can be added to the tail trim mass of the preceding page:

Total amount of water in the wing tanks	[Ltrs]	0	50	100	150	200
	[US Gall]	0	13.2	26.4	39.6	52.8
Recommended water in the tail tank	[kg]	0	1	2	3	4
	[lbs]	0	2.2	4.4	6.6	8.8

Since 1kg (2.2lbs) in the fin equalize 4.2kg (9.3lbs) in the cockpit in an unfavourable case, the rearmost c.g.-limit will not be reached after dumping the ballast water. If no appropriate trim weight for the fin is by the hand, there is no danger of exceeding the foremost c.g.-limit. (This is generally valid up to 55kg above minimum cockpit load).

4.5.7 High Altitude Flight

The ASW 28-18 is structurally limited to an EAS of max. 270 km/h (145kt, 167mph). Simultaneously flutter prevention restricts true airspeed TAS to max. 348 km/h (187kts, 216 mph). From both restrictions the never exceed airspeed V_{NE} changes with height as follows:

Altitude msl.		V_{NE} Indicated Airspeed		
0 - 5000 m	0 - 16404 ft	270 km/h	146 kts	168 mph
< 7000 m	< 22965 ft	242 km/h	130 kts	150 mph
< 9000 m	< 29527 ft	215 km/h	116 kts	133 mph
< 10000 m	< 32808 ft	202 km/h	109 kts	125 mph
< 12000 m	< 39370 ft	176 km/h	95 kts	109 mph

The ASI under reads with increasing altitude, thus the true airspeed TAS relative to air mass is sufficient to face even strongest head winds at high altitude.

Placard for airspeed reduction at high altitude:

V_{NE} Speed Limit for high altitude	
Altitude msl [m]	V_{NE} IAS [km/h]
0 - 5000	270
< 7000	242
< 9000	215
< 10000	202
< 12000	176

ASW 28-18

V_{NE} Speed Limit for high altitude	
Altitude msl [ft]	V_{NE} IAS [kts]
0 - 16404	146
< 22965	130
< 29527	116
< 32808	109
< 39370	95

ASW 28-18

V_{NE} Speed Limit for high altitude	
Altitude msl [ft]	V_{NE} IAS [mph]
0 - 16404	168
< 22965	150
< 29527	133
< 32808	125
< 39370	109

ASW 28-18

The appropriate placard has to be installed near the ASI.

JAR 22.1541(c): 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.
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.

4.5.8 Flight in Rain

Rain drops, frost and ice impair the aerodynamic qualities and also alter the flying behaviour. Therefore the quoted minimum speeds for straight and circling flight should, in such conditions, be increased by some 10 km/h = 5,5 kts. Air speeds should not then be allowed to drop below these values.
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.

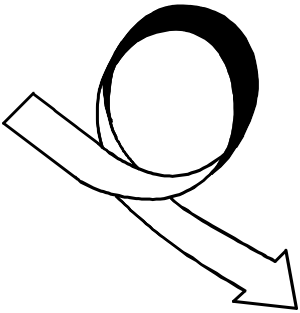
4.5.9 Aerobatics

WARNING: *Aerobatics is only permitted under the* ***mass restrictions from section 2.6***

A steady spin is only possible with aft c.g.-positions, thus a spin is not a suitable aerobatic maneuver. With central and forward c.g.-positions the ASW 28-18 cannot be held in a spin.

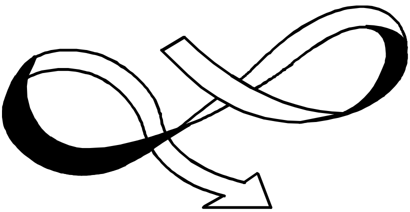
The following maneuvers have been demonstrated and are approved:

Loop (positive)



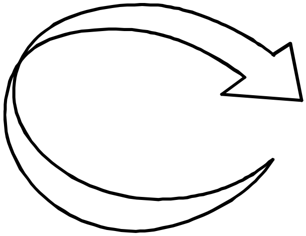
A positive loop may be flown at an entry speed at the lowest point from 180km/h (97kts), but a speed of 200km/h (108kts) is recommended.
The required g-load is about 3 – 3.5 g.

Lazy Eight



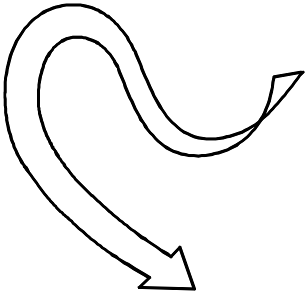
This figure may be flown at speeds of 150km/h (81kts) and more at the entry and at the point of intersection. It is, however, easier to fly this maneuver at an entry speed of about 180km/h (97kts), and it will also look better. A woolen thread on the canopy is very useful in avoiding side slipping.

Climbing Turn



Entry speed for this figure is 160km/h (86,5kts) and above

Stall Turn



For the stall turn the recommended entry speed is also 200km/h (108kts).
While pulling up vertically full rudder must be applied by the time the indicated air speed has reduced to 140km/h (76 kts) with 18m span respectively 130km/h (70kts) with 15m span. This ensures a clean Stall Turn and prevents falling into a slipping tail slide.

Steep turns

In a steep turn with 75° bank the minimum speed is 140km/h (75,5 kts) and an acceleration of 4 g is imposed. It is therefore recommended that steep turns should be carried out with not more than 60 to 70° of bank at about 160km/h (86,5kts) to avoid flow detachment at the wing (High Speed Stall).
However, using a g-meter sustained 4-g turns can easily be achieved at an airspeed of 160km/h (86,5 kts).

Section 5

5.1 Introduction

Section 5 provides approved data for airspeed calibration and stall speeds and non-approved additional information.

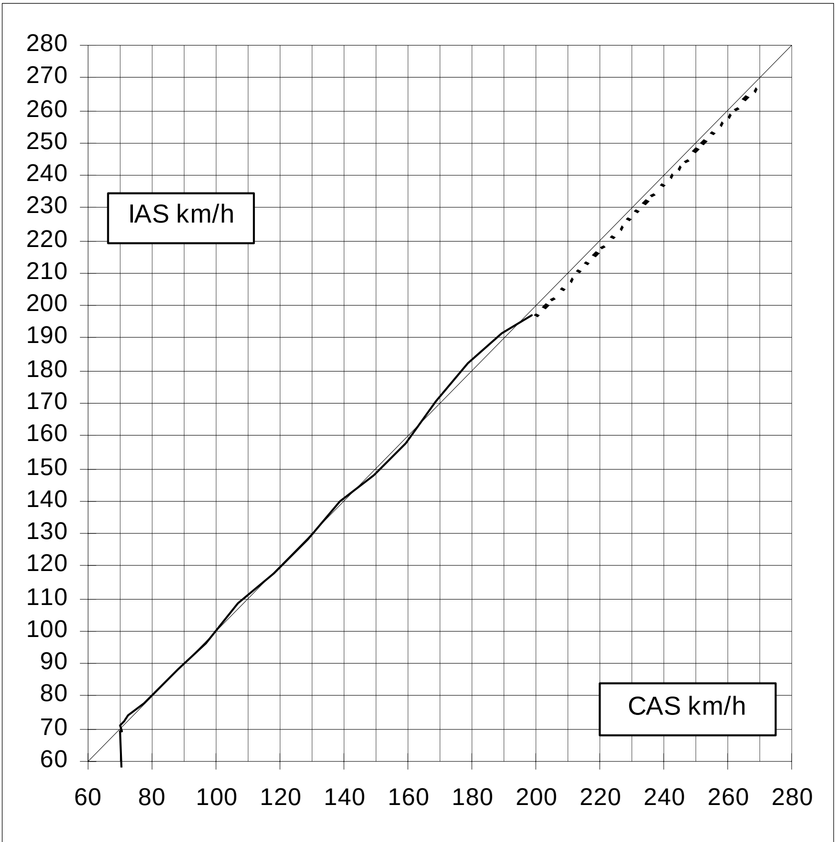
The data in the charts has been computed from actual flight tests with the sailplane in good conditions and using average piloting techniques.

5.2 Approved Data

5.2.1 Airspeed Indicator System Calibration

Upwards of an indication of 80 km/h = 43 kts (without water ballast) or of 90 km/h = 48,5 kts (at max. all-up mass) the ASI will only show a minimal indication error. The deviations are within 2 to 3 km/h = 1 to 1,5 kts, mostly a little too low, however around 180 km/h about 95 kts also a little too high indication.
In stalled flight the air speed is greatly under-indicated and the pointer will fluctuate between 0 km/h and about 60 km/h = 32 kts.

NOTE: *The ASI takes its pitot pressure from the Prandtl-Tube in the fin, and static pressure from the static ports in the fuselage tail boom. As an option a Prandtl-Tube may be installed in the fuselage nose. If the ASI tekes its pitot pressure from the fuselage nose, the deviations are smaller near stall.*



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.

Span	18m / 59ft		
All up weight	345 kg 760 lbs	460 kg 1014 lbs	575 kg 1267 lbs
Air brake closed	66 km/h 36 kts	76 km/h 41 kts	85 km/h 46 kts
Air brake open*	69 km/h 37 kts	80 km/h 43 kts	89 km/h 48 kts

Span	15m / 49ft		
All up weight	330 kg 727 lbs	430 kg 948 lbs	525 kg 1157 lbs
Air brake closed	65 km/h 35 kts	75 km/h 40 kts	83 km/h 45 kts
Air brake open*	71 km/h 38 kts	81 km/h 44 kts	90 km/h 48 kts

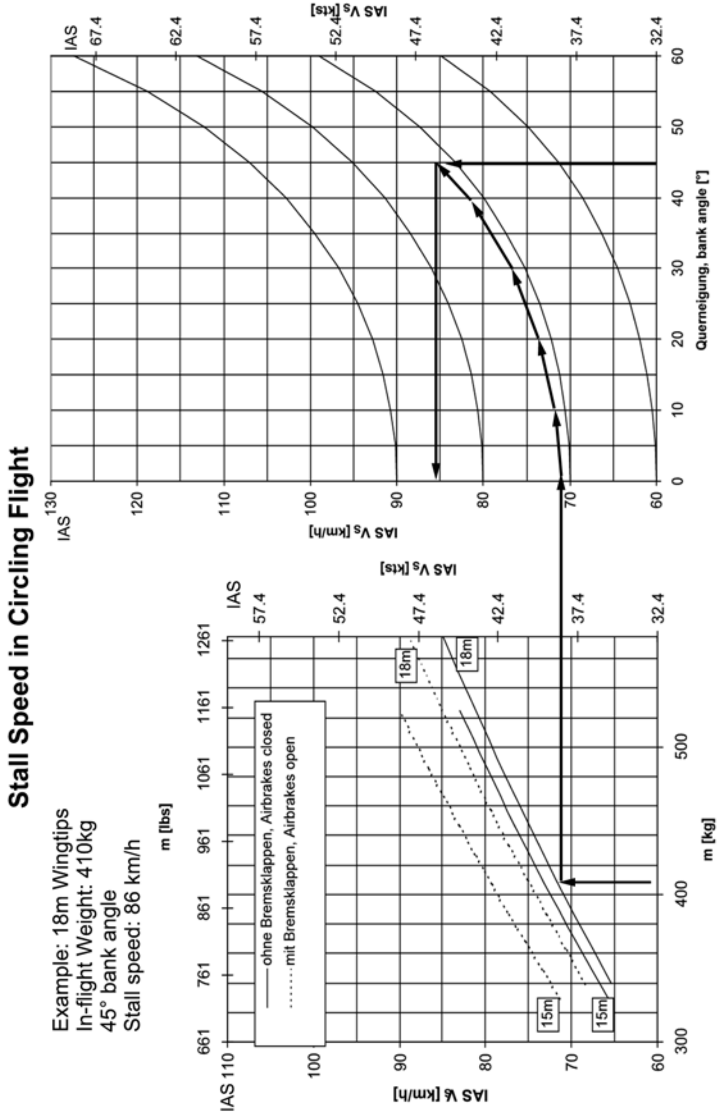
* with landing gear extended !

1. The speeds quoted are valid for the aerodynamically clean glider.

2. 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.

3. Extension of air brakes increases the indicated stall speed in straight flight by about 10 %.

5.2.3 Stalling Speed Diagrams



5.3 Non-Approved Further Information

5.3.1 Demonstrated Crosswind Performance

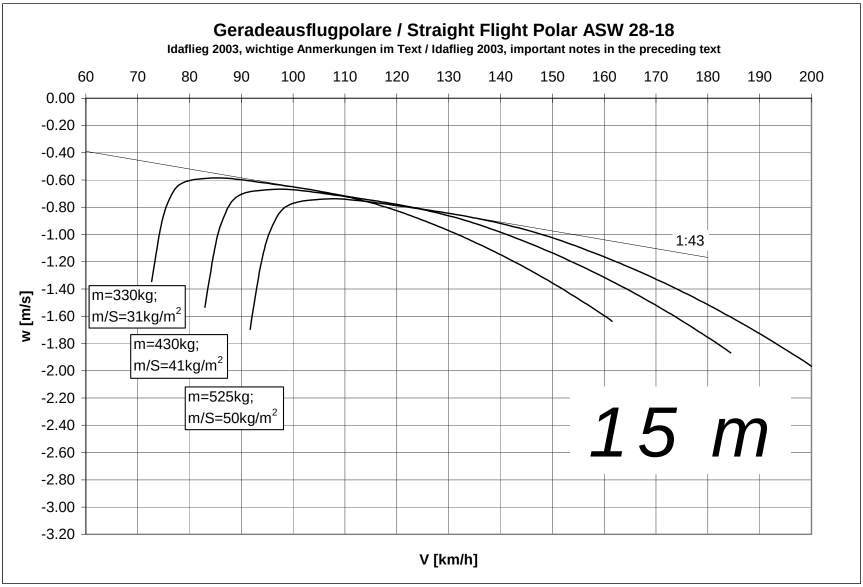
Winch Launch	25 km/h	13.5 kts	15.5 mph
Aerotow	25 km/h	13.5 kts	15.5 mph
Landing	25 km/h	13.5 kts	15.5 mph

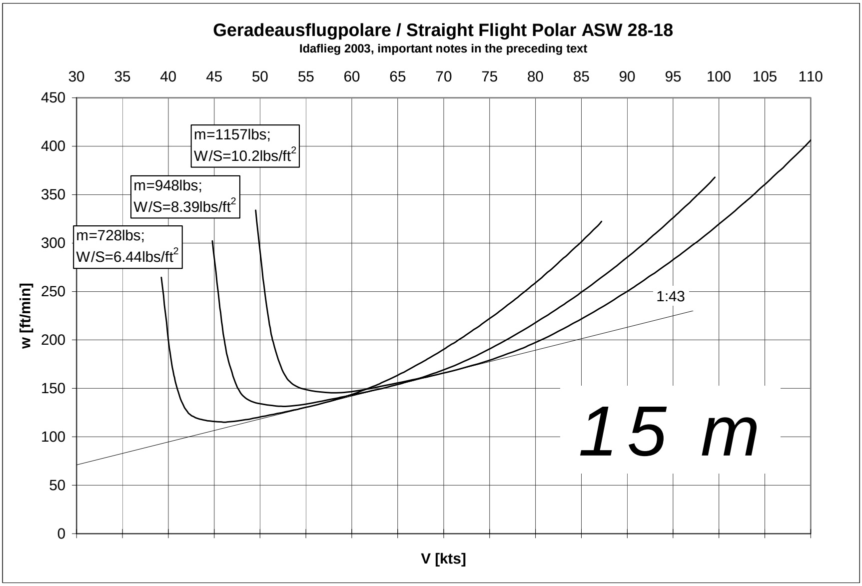
5.3.2 Flight Polar - Level Flight

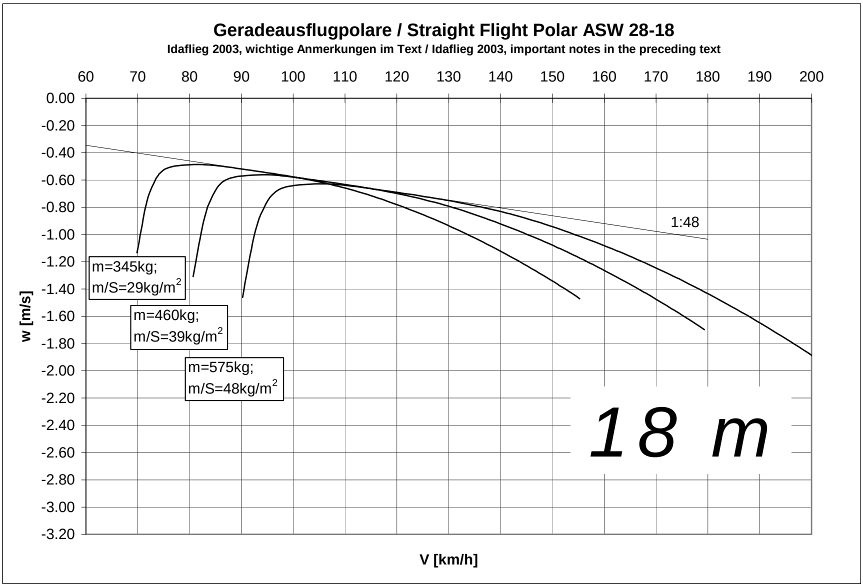
IDAFLIEG measured the gliding performance of the ASW 28 in the years 2001 and 2003. The results of the 2003 campaign are worse by one L/D-point in slow flight and at maximum L/D than the 2001 results. At the same time it must be pointed out, that the 2003 measurements went along with insufficient weather conditions and with a badly calibrated reference glider. The IDAFLIEG report tells, that "with the 15m configuration it was only possible to conduct comparison flights at one day, whereby weather proofed itself as only limited adequate." The reference glider was newly finished, with the zig-zag-tape at a different position. "The dominating factor of the years 2002 and 2003 is the exceedingly unsatisfying state of calibration of the reference glider DG-300" (translated from IDAFLIEG report)

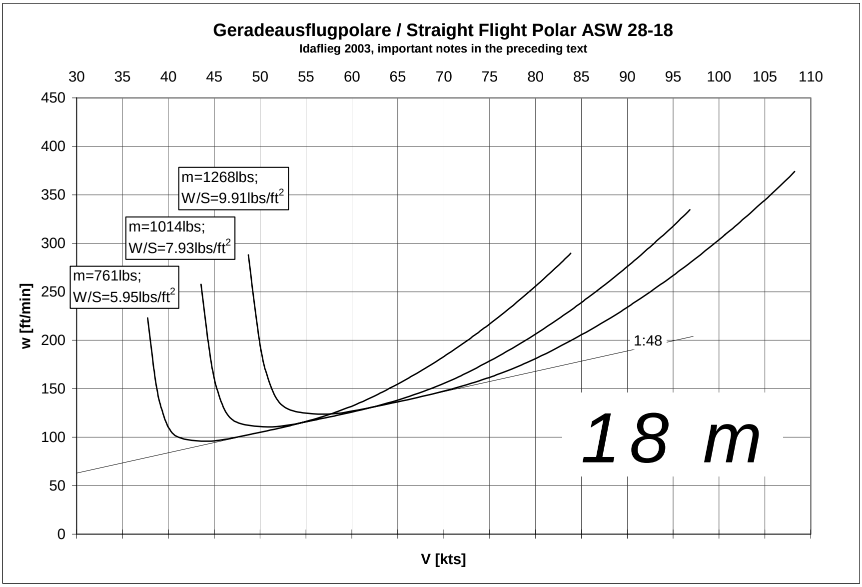
But for two reasons all data in this manual is based on the 2003 measurement. First the 2001 results are incomplete and second comparison with future measurements might still be better possible, since some techniques have newly been introduced 2003.

The 18m configuration has not been examined yet (spring 2004), thus values converted from the 15m version are given.

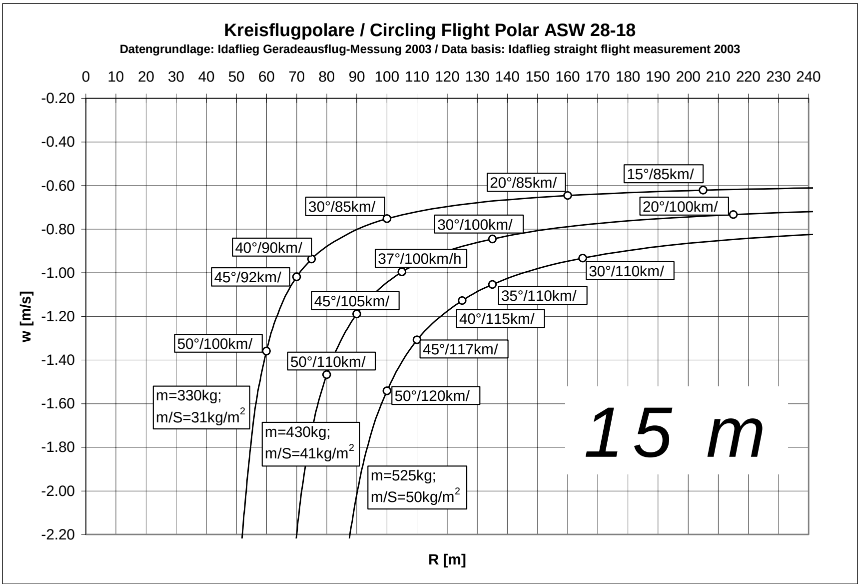

Geradeausflugpolare / Straight Flight Polar ASW 28-18
Idaflieg 2003, wichtige Anmerkungen im Text / Idaflieg 2003, important notes in the preceding text
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
0.00
-0.20
-0.40
-0.60
-0.80
-1.00
-1.20
-1.40
-1.60
-1.80
-2.00
-2.20
-2.40
-2.60
-2.80
-3.00
-3.20
w [m/s]
V [km/h]
1:43
m=330kg; m/S=31kg/m2
m=430kg; m/S=41kg/m2
m=525kg; m/S=50kg/m2
15 m

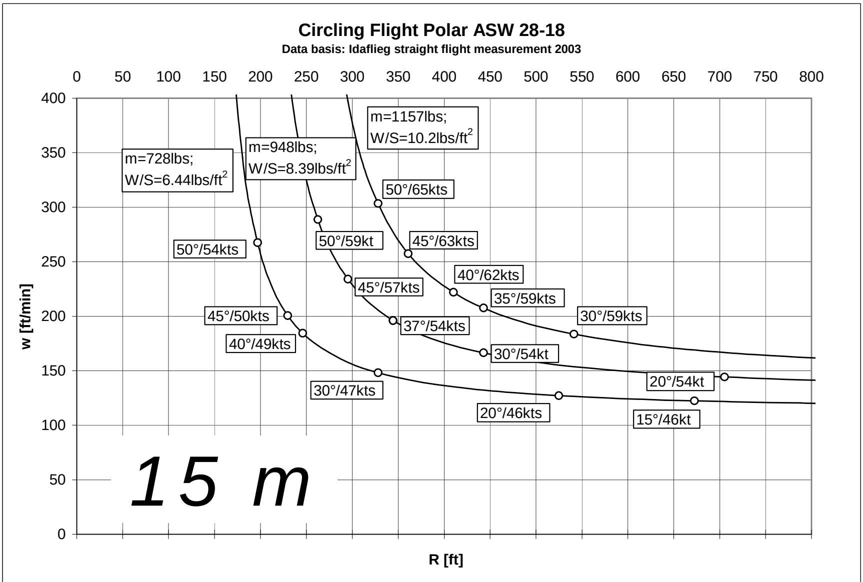

Geradeausflugpolare / Straight Flight Polar ASW 28-18
Idaflieg 2003, important notes in the preceding text
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
450
400
350
300
250
200
150
100
50
0
w [ft/min]
V [kts]
1:43
m=1157lbs; W/S=10.2lbs/ft2
m=948lbs; W/S=8.39lbs/ft2
m=728lbs; W/S=6.44lbs/ft2
15 m


Geradeausflugpolare / Straight Flight Polar ASW 28-18
Idaflieg 2003, wichtige Anmerkungen im Text / Idaflieg 2003, important notes in the preceding text
60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
0.00 -0.20 -0.40 -0.60 -0.80 -1.00 -1.20 -1.40 -1.60 -1.80 -2.00 -2.20 -2.40 -2.60 -2.80 -3.00 -3.20
w [m/s]
1:48
m=345kg; m/S=29kg/m2
m=460kg; m/S=39kg/m2
m=575kg; m/S=48kg/m2
18 m
V [km/h]

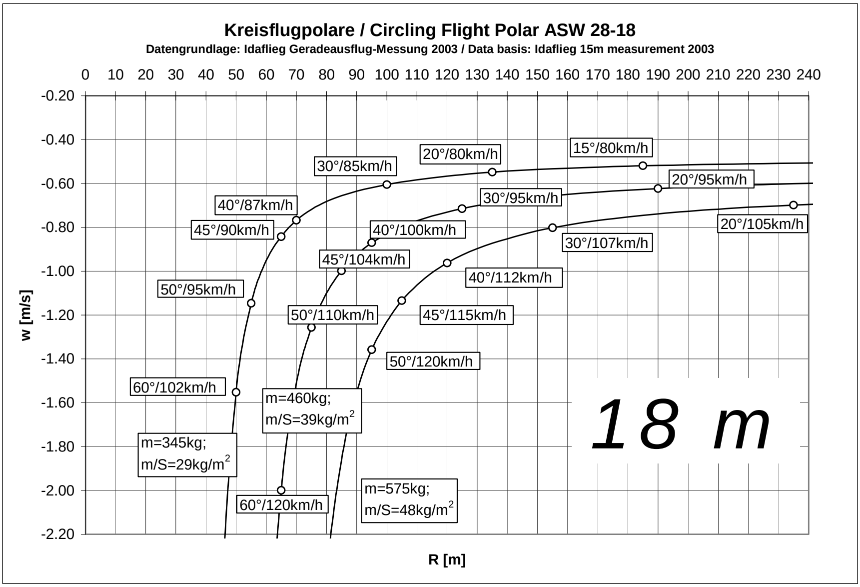

Geradeausflugpolare / Straight Flight Polar ASW 28-18
Idaflieg 2003, important notes in the preceding text
30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110
450 400 350 300 250 200 150 100 50 0
w [ft/min]
m=1268lbs; W/S=9.91lbs/ft2
m=1014lbs; W/S=7.93lbs/ft2
m=761lbs; W/S=5.95lbs/ft2
1:48
18 m
V [kts]

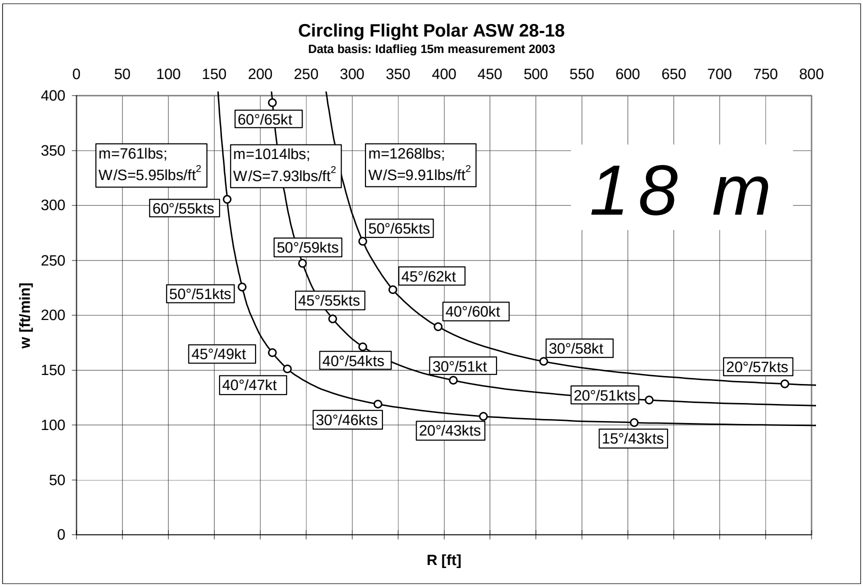
5.3.3 Flight Polar - Circling Flight





All these diagrams have been established by calculations based on the straight flight speed polars given before.





5.3.4 Influence of c.g.-position

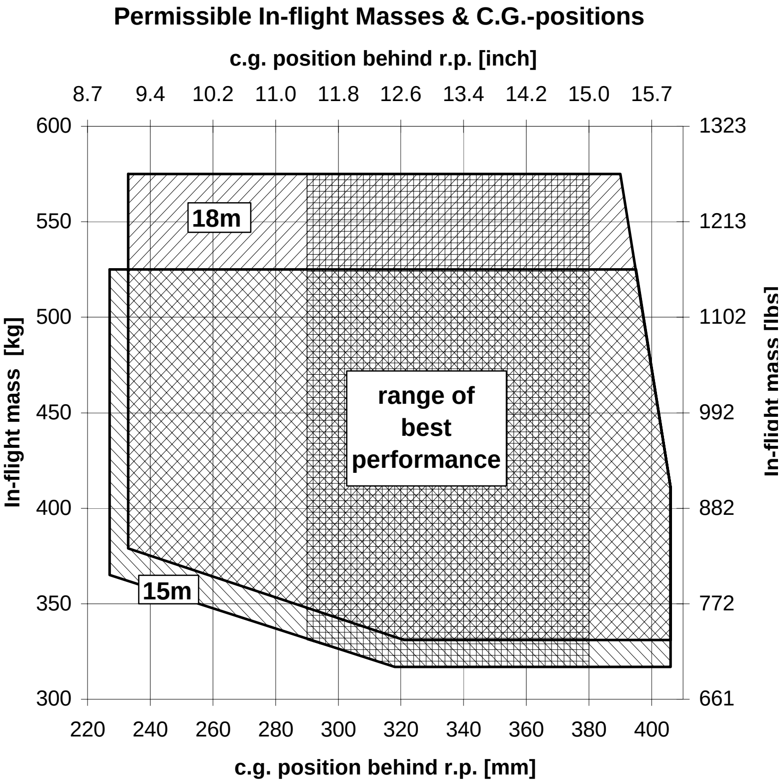
To achieve the best gliding performance the horizontal tail surface must not produce up- or downward lift, for the wing with its high aspect ratio is much more efficient in producing lift at low induced drag than the horizontal tail with its compact plan form.

This optimum cannot be realized over the whole range of airspeeds. Therefore the c.g. position must always be a compromise between thermalling and fast flight to the next cloud. Luckily the drag minimum is quite flat.

For a glider without flaps the horizontal tail is not only interesting with respect to its induced drag, but also concerning the necessary elevator deflection and profile drag. Thereby, in the relatively large c.g. range from 290 to 380 mm behind r.p. (11.42 – 14.96 inch) the resulting differences are minor. In fast flight rather rearward c.g.-positions are advantageous, in slow flight central-c.g. positions.

As a matter of principle the c.g. position has a great influence on longitudinal stability. In foreward c.g. positions, control deflections and hand forces gradients are larger. Thus it is advisable for inexperienced, light pilots to mount 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 regarded, 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
- water ballast is only filled in accordance with section 4.5.6.

Section 6

6.1 Introduction

This Section describes the payload range within which the sailplane may be safely operated.
Procedures for weighing the sailplane and the calculation method for establishing the permitted payload range and a comprehensive list of all equipment available for this sailplane and the installed equipment during this weighing of the sailplane are contained in the applicable ASW 28-18 **Maintenance Manual**, Section 6.

6.2 Mass (Weight) and Balance Form

The Mass and Balance Form overleaf shows the maximum and minimum cockpit loads, and any additional load still permissible for the baggage compartment.

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 28-18 **Maintenance Manual**, Section 6.

The values derived for the glider in 18m span configuration are also valid for the 15m wingtips

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

If pilot mass is less than the minimum stated in the Mass and Balance Form, this can be rectified by means of trim ballast plates fitted in front of the rudder pedals. See also Section 7.11.

Heavy pilots often like to ballast their aircraft for optimum performance to suit their individual weight. A housing is provided for this purpose in the upper part of the fin where trim ballast, for instance in the form of a battery, may be fitted.

If any trim ballast is mounted in the fin, the minimum cockpit load will of course be increased! This increased minimum cockpit load must also be shown in the DATA and LOADING PLACARD in the cockpit. The lower permissible cockpit load without trim ballast in the fin will be shown only on page 6.4 of the Flight Manual.

In the cockpit, an additional placard is to be affixed:

Reduced minimum Cockpit Load without Trim Ballast in the Fin: see Flight Manual Page 6.4 !

Sight apertures in the fin make it easy to check whether any trim ballast has been fitted. Clear view through the fin means: No trim ballast fitted! See also Section 7.11 .

MASS AND BALANCE FORM

Date of Weigh-ing	Empty mass [1)] (18m)	Empty mass C.G. aft of RP [2)] (18m)	Pilot mass incl. parachute [1)] (15&18m) max	min	Load in baggage compart-ment [1,3)] (15&18m)	Inspector´s stamp and signature

1) For U.S.-registered sailplanes show lbs.
2) For U.S.-registered sailplanes show inches.
   Other countries may use metric units
3) Permissible baggage load = 285 kg (=628 lbs) less empty mass of non-lifting parts, less pilot mass, less mass of parachute, BUT not more than 12 kg (= 26 lbs) !!

Maximum Permissible Water Ballast Load:

Flight with 15m wingtips		Cockpit load (Pilot + Parachute + Baggage) 75 kg 165 lbs	85 kg 187 lbs	95 kg 209 lbs	105 kg 231 lbs	115 kg 253 lbs	125 kg 275 lbs
Empty mass with 18m span	250 kg 551 lbs	Full	200kg 441 lbs	190 kg 419 lbs	180 kg 397 lbs	170 kg 375 lbs	160 kg 353 lbs
	260 kg 573 lbs	200kg 441 lbs	190 kg 419 lbs	180 kg 397 lbs	170 kg 375 lbs	160 kg 353 lbs	150 kg 330 lbs
	270 kg 595 lbs	190 kg 419 lbs	180 kg 397 lbs	170 kg 375 lbs	160 kg 353 lbs	150 kg 330 lbs	140 kg 308 lbs
	280 kg 617 lbs	180 kg 397 lbs	170 kg 375 lbs	160 kg 353 lbs	150 kg 330 lbs	140 kg 308 lbs	130 kg 286 lbs
	290 kg 639 lbs	170 kg 375 lbs	160 kg 353 lbs	150 kg 330 lbs	140 kg 308 lbs	130 kg 286 lbs	120 kg 264 lbs
	300 kg 661 lbs	160 kg 353 lbs	150 kg 330 lbs	140 kg 308 lbs	130 kg 286 lbs	120 kg 264 lbs	110 kg 242 lbs

Flight with 18m wingtips		Cockpit load (Pilot + Parachute + Baggage)					
		75 kg 165 lbs	85 kg 187 lbs	95 kg 209 lbs	105 kg 231 lbs	115 kg 253 lbs	125 kg 275 lbs
Empty mass with 18m span	250 kg 551 lbs	Full	Full	Full	Full	Full	200kg 441 lbs
	260 kg 573 lbs	Full	Full	Full	Full	200kg 441 lbs	190 kg 419 lbs
	270 kg 595 lbs	Full	Full	Full	200kg 441 lbs	190 kg 419 lbs	180 kg 397 lbs
	280 kg 617 lbs	Full	Full	200kg 441 lbs	190 kg 419 lbs	180 kg 397 lbs	170 kg 375 lbs
	290 kg 639 lbs	Full	200kg 441 lbs	190 kg 419 lbs	180 kg 397 lbs	170 kg 375 lbs	160 kg 353 lbs
	300 kg 661 lbs	200kg 441 lbs	190 kg 419 lbs	180 kg 397 lbs	170 kg 375 lbs	160 kg 353 lbs	150 kg 330 lbs

The integrated wing water ballast tanks in the ASW 28-18 can hold about 210 liters together.

NOTE: *One liter water is equivalent to 0,265 US-Gallons and weights 1 kg or 2.2 lbs.*

CAUTION: *Fill in the tail water ballast first, when an optional tail tank is installed, then fill the wing tanks!*

Example of load / C.G. calculation:

A weighing gave the following results:

m_L	=	283 kg	(624 lbs)	Empty mass
x_L	=	0.609 m	(24.0 inches)	Empty mass C.G.

A second weighing with a (removable) trim ballast of 6 kg (13,23 lbs) in the fin showed:

m_L	=	289 kg	(637lbs)	Empty mass
x_L	=	0.683 m	(26.7 inches)	Empty mass C.G.

The **Mass and Balance Form** in page 6.4 must be filled in according to the following example :

Date of Weigh-ing	Empty mass [1)] (18m)	Empty mass C.G. aft of RP [2)] (18m)	Pilot mass incl. parachute [1)] (15&18m) max	 Min	Load in baggage compart-ment [1,3)] (15&18m)	Inspector´s stamp and signature
xx.xx.xx	283 kg 624 lbs	0.609 m 24.0 in. without trim-ballast in the fin	70 kg 154 lbs		12 kg 26 lbs	
				115 kg 253 lbs	12 kg 26 lbs	
	289 kg 637 lbs	0.683 m 26.7 in. with 6 kg trim-ballast in the fin	90 kg 198 lbs		12 kg 26 lbs	
				115 kg 253 lbs	12 kg 26 lbs	+ + +

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

For details see maintenance manual section 6.

Section 7

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.

The principal purpose of this Section is to describe the controls in the cockpit, their layout and placards.

7.2 Airframe

The wing profile is equipped with boundary layer control by "blow turbulators" on the lower surface.

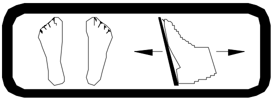
7.3 Flight Controls including Trim

Aileron and Elevator

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

Rudder

The rudder pedal is adjustable to suit the length of the pilot's legs.



Pedal Adjustment:
grey knob at Right of stick.

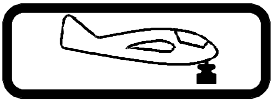
To move pedals forward: pull knob and push pedals forward with your heels. Release knob and push again to lock in position.

To move pedals aft: relax pressure on pedals, pull knob back. Then release knob and apply pressure to pedals to lock in position.

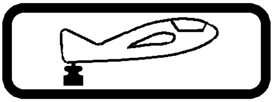
Trim

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

When trim is unlocked by pressing the stick mounted trim release lever, the trim can also be adjusted by sliding at the same time the trim indicator knob to a desired position.



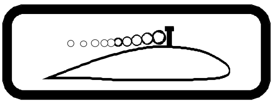
Trim nose heavy



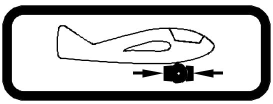
Trim tail heavy

7.4 Airbrake System

The airbrakes are operated by a blue handle mounted at the left cockpit wall.



Pull the blue handle to extend the airbrake paddles.

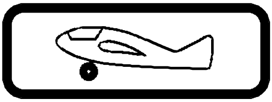


When the airbrake handle is pulled back to its fullest extent, it will also actuate the hydraulic disc brake of the main wheel.

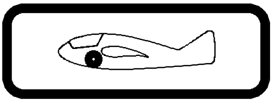
The double-paddle airbrakes extend on the upper wing surface only.

7.5 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)

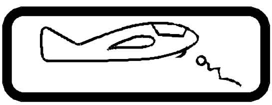
NOTE: *Remember the crib > <u>Retract</u>able landing gear*
*to **<u>retract</u>** landing gear = **<u>retract</u>** lever.*

<u>Tire pressures:</u> Main wheel: 3.5 bar +/- 0.1 bar (50,8 psi +/- 1,5 psi)
Tail wheel: 2.5 bar +/- 0.1 bar (35,6 psi +/- 1,5 psi)

The Valves of main wheel and tail wheel are on the left hand side.
The vent of the tail wheel 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 2.3.4).

7.6 Cockpit, Canopy, Safety Harness and Instrument Panel

Launch Cable / Towing Hook Release



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

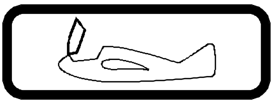
Pulling the yellow knob will open one or both of the towing hooks.
For the launch cable to be attached, pull the yellow knob back and then merely release it to allow the towing hook to snap shut and lock.

Seat and Seating Positions

The seat is designed to allow tall and medium sized pilots to sit comfortably, and improve their position by means of cushions and an appropriate choice of parachute. For tall pilots we would recommend the use of thin parachute packs of the new type. Very short pilots will have to adjust their seating position by means of a hard-foam cushion so that all controls are within comfortable reach, that their view to the outside is improved, and that they are prevented from sliding back during initial take-off (winch launch) acceleration.
Very tall pilots may fly without the seat back, but must then fit a spinal support by means of a hard foam (e.g. Styrofoam, Conticell or Rohacell)!
A head rest made from energy absorbing foam must be stripped on to the shoulder straps as a head rest!

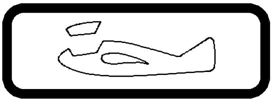
Canopy Operation

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



These levers are marked by these adhesive labels.

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



To jettison the canopy, pull jettison levers (red levers mounted at either side of the canopy frame) and pull canopy away **rearward** and **up**!

Operating the red jettison levers will automatically open the white locking levers, leaving the canopy resting loose on the cockpit rim.

NOTE: *If possible, do not leave the aircraft parked or unattended with canopy 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 cockpit instruments and equipment severly.*

NOTE: *Operating the jettison levers allows the canopy to be removed for easy access when inspecting instruments.*

Safety Harness

Correct Fastening in Gliders (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: in doing so, the buckle must not be pulled up towards the soft parts of the body!

⑤ when the belt system loosens during the flight: always refasten the pelvic belts first ant than the shoulder belts.

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

Ventilation

The ventilation flap is located at the front of the canopy frame and is operated by means of the small black knob on the instrument panel.
Pull to open.

This flap also serves as a de-mister.

A further air outlet nozzle is fitted at the right cockpit wall to the right of the instrument panel, which is opened and closed by twisting the rim and the direction of which can also be adjusted. This air outlet should be closed if the de-misting function of the front canopy ventilation flap needs to be made more effective.

Instrument Panel

For safety reasons, only a GRP panel made in accordance with the lamination plan specified by the manufacturer may be used.
Instruments weighing more than 1 daN need further support, in addition to the fixing screws provided. This can be done by means of aluminum straps fixed to the instrument pod.
Equipment with operating controls must be fitted conveniently to hand and within reach, even when the safety harness is worn. Flight monitoring instruments, like ASI and altimeter, must be mounted within the pilots field of view from which the ASI should be mounted high in the panel in a preferred position.

Automatic parachute static line

An anchor ring is provided for the static line (ripcord) of an automatic parachute left hand on the main bulkhead beneath the lift pin tube.

7.7 Baggage Compartment

Hard objects may not be carried in the baggage compartment in front or on top of the spar without a suitably designed lashing or anchorage!
If, for instance, a barograph is to be carried in this space, a mounting recommended by the manufacturer must be used. Molded containers for 12 V and 5.6 Ah batteries are supplied with the glider as standard equipment.

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

Baggage Compartment:	**max.**	**12 kg**
		26 lbs

7.8 Water ballast system

The wings are equipped with integrated wet surface water ballast tanks of 210 litres (52.8 US-Gallons).
On the upper wing surface is an opening for ventilation and drying the water tanks, which may also be used for filling ballast water. A screwed in cover must be safetied by tape in flight. Use elastic white tape like Fascalfolie or Tesaflex 4163, Ø 60 mm). 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 operation of the mechanical valves are operated by the lever on the right hand cockpit arm rest in the landing gear lever gate.

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

All water ballast valves are operated by only one lever, even the optional tail water tank. Controlling all valves with a single lever prevents an inadvertent opening of only one valve, which would result in an asymmetric and/or tail heavy ballast load.

7.9 Electrical System

The electrical system is supplied by 12 V batteries. Each electrical consumer is protected by its own fuse.
Near the connectors of each battery a 8 A fuse is placed.

7.10 Pitot and Static Systems

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

The airspeed indicator is driven by the pitot-pressure from the vertical fin and by the static pressure from the tail cone.

The altimeter is connected to the static ports in the tail cone.

Pneumatic and electrical variometers are supplied from the probe in the vertical fin..

Alternatively pitot pressure can by taken from an own pitot tube in the fuselage nose or vertical fin..

Ensure that the multi-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.

7.11 Miscellaneous Equipment

Removable Trim Ballast

If required, the ASW 28-18 can be equipped with a fitting for lead trim ballast plates which can be bolted into place in front of the rudder pedals.

For this location, a 1.11 kg (= 2.45 lbs) lead trim plate equals an additional pilot weight of 2.5 kg (= 5.5 lbs).

Thus, a pilot weighing 10 kg (22 lbs) less than the minimum cockpit load must fit four trim plates weighing 1.11 kg (=2.45 lbs) each.

Maximum 6 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. Only use trim masses that were prepared for the individual glider and were considered in the latest entry of the mass-and balance form. Then the minimum cockpit seat load with or without trim mass in the tail can be looked up in section 6.2 (Mass & Balance Form). Only the highest value for the minimum cockpit seat load may be registered on the cockpit placards.

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 which is allowed to be installed into the fin compartment is 6 kg = 13.2 lbs.

Oxygen

A seating for an oxygen bottle is optional, but can be retrofitted any time with few expenses (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 dia. or one US bottle of 4.25" dia, 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 !*

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.

Emergency Location Transmitter

The location least vulnerable to damage in case of accident is the area between the two drag spar pins at either side of the fuselage.
Therefore, the emergency location transmitter (ELT) should be fitted to the fuselage wall in the baggage compartment area, in an appropriate mounting.
Since the whole of the air frame except for the fin and a small area above the baggage space contains CRP layers, and carbon fiber laminations screen the transmission radiation, the ELT aerial must be fitted in the area between wing spar and canopy.

Section 8

8.1 Introduction

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

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

8.2 Sailplane Inspection Periods

A complete inspection should be carried out annually for sailplanes registered in Germany. For other countries the appropriate procedures apply.

Further details are given in the ASW 28-18 **Maintenance Manual**, Sections 4 and 7.

8.3 Sailplane Alterations or Repairs

Regarding repairs and modifications, please see ASW 28-18 **Maintenance Manual**, Sections 10 and 11.

It is important to notify the Aviation Authority concerned **before** carrying out any modification of the glider which is not yet officially approved. This would ensure that the airworthiness of the aircraft is not invalidated.

8.4 Ground Handling / Road Transport

Parking

Parking the ASW 28-18, the controls should be set neutral, since the glider is equipped with elastic tape to seal the gaps at the control surfaces,

Parking of the aircraft in the open can be recommended only if foreseeable weather conditions remain suitable. It should be seriously considered whether the secure picketing, covering, and cleaning of the aircraft before the next flight may not demand more effort than de-rigging and re-rigging would have done.

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.

NOTE: *Parking in the open without protection against weather or light will reduce the life of the surface finish. Even after only a few weeks without intensive care the polyester paint finish can become brittle and develop cracks.*

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, protracted periods of parking with water ballast on board are also inadmissible! The filling and ventilation openings on the upper wing surface and the drain valves must both be opened!

For longer parking periods, also inside hangars as well as during road transport of the sailplane, the winglets must be de-rigged. Because of flutter safety reasons they have to be built extremely lightweight and therefore may be easily damaged during rough ground operation.

When parking, carefully remove any remnants of food (chocolate, sweets, etc.) because experience shows 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. Regulation for trailer dimensions vary from country to country so be sure to provide us with correct data.

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.
Re-inforced points of the fuselage are the main wheel (but remember the suspension springing !), and tail wheel; also possibly the drag spar pins (make up support seatings from plastic material like Nylon!), and the area under the canopy arch.

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, or with heavy tarpaulin cover, may be considered suitable, which in any case should have light coloured surfaces and be well ventilated also while stationary so as to avoid high internal temperatures or humidity.

CAUTION: *Road transport with water ballast on board is* ***not*** *admissible !*

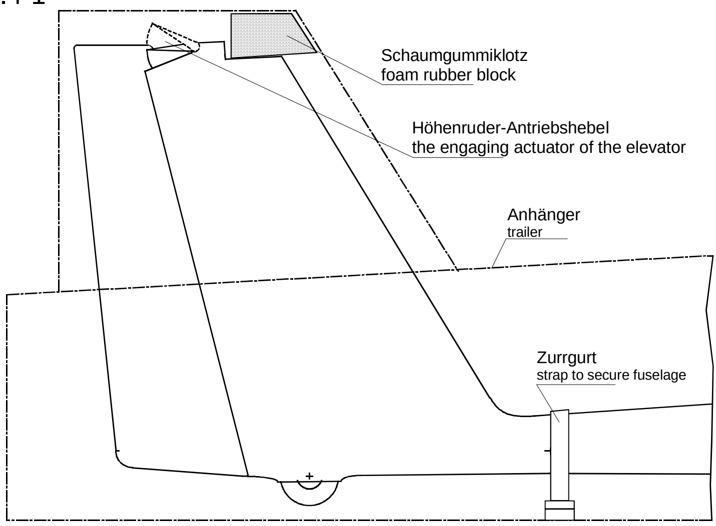
CAUTION: *In order to protect the air brake cover plates from damage the airbrakes must be closed and locked!*

WARNING: *Under **no** circumstances should the elevator actuator on top of the vertical fin 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.

If for example a foam block applied some load to the elevator actuator, and restricted its free movement, fatigue cracks were found after long road transports. **Remedy is urgently needed!**

The following sketch shows, how a foam-rubber block must be trimmed and glued in position. It is also important to have a strap over the fuselage tail boom near the fin, which is connected to the trailer floor. 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.

Fig. 8.4-1



8.5 Cleaning and Care

Contrary to the false assumption that plastic materials are impervious to moisture and ultra-violet light we would state emphatically that even modern gliders need care and maintenance!

Moisture - Effects on the structure of the fiber-reinforced plastics and on the surface finish.

In the long run, moisture will also damage fiber re-inforced composites, as it will penetrate into the expoxy 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 high 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 nor the plastic or rubber skins of older 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, while periodically turning the affected part, in a room which should be as dry as possible, but not too hot.

Sunlight - Effects on the surface finish

Sunlight - especially its UV component - embrittles the white polyester gel coat and the perspex canopy. The wax layer on the gel coat will also oxidize and discolour more quickly if the aircraft is unnecessarily exposed to strong sunlight. Yet there is no paint finish on the market, which is unrestrictedly suitable for plastic gliders, and would approximately reach the life span of the plastic structure of the airframe without maintenance.

Care of Surface Finish

As the white polyester gel coat is protected by a fairly durable wax layer, it will tolerate being washed down from time to time with cold water, with a little cleaning medium added. In normal use, the wax coating need only be renewed annually with a rotary mop. In moderate European conditions it will suffice if on two occasions a paint preservative is used in addition. In areas subject to long and stronger sun exposure this should be done more often.

For the care of the paint finish, only silicone-free preparations may be used (e.g.: 1 Z-Special Cleaner-D 2 by Messrs. Werner Sauer GmbH & Co., D-51429 Bergisch Gladbach, or Car Lack 68, Car-Lack GFT + H mbH, D-78464 Konstanz).

<u>Traces of Adhesive from Self Adhesive Tapes</u> are best removed by means of benzene (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 benzene 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.: Plexiklar) or with lots of clean water. On no account should a dry cloth be used for dusting or cleaning.

Safety Harness

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

9.1 Introduction

This Section contains additional information designed to facilitate safe and effective operation of the glider, if equipped with various ancillary systems and equipment not included as standard equipment.

9.2 List of Inserted Supplements

Oxygen system installation

Emergency Location Transmitter

9.3 Supplements inserted

Oxygen system installation

See Section 7.11 of this Manual.

Emergency Location Transmitter

See Section 7.11 of this Manual.