Flight Manual

ASW 27

ALEXANDER SCHLEICHER GMBH & CO., SEGELFLUGZEUGBAU
D-36163 POPPENHAUSEN/WASSERKUPPE

FLIGHT MANUAL

FOR SAILPLANE MODEL

ASW 27

MODEL	:	ASW 27
SERIAL No.	:	2 7 1 2 3
REGISTRATION	:	N 9 2 0 K B
DATA SHEET No.	:	389
DATE of ISSUE	:	20.01.97

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

....	(Signature)
Luftfahrt-Bundesamt ...	(Authority)
....	(Stamp)
2 1. Jan. 1997	(Original Date of Approval)

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

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

Published by AS with contributions from Gerhard Waibel (GW) and Lutz-Werner Jumtow (Juw).

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 legal responsibility or guaranty or any other warranty which results from mistake, misprint or translation error 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 provision of 14 CFR Section 21.29, and is required by FAA Type Certificate Data Sheet No. G 05CE.

0.1 Record of revisions

Any revision of the present manual, except actual weighing data, must be recorded in the following table "Record of revisions" (pages 0.2 or 0.3) and in case of approved Sections endorsed by the LBA. The LBA (Luftfahrt-Bundesamt) is the German federal office for civil aeronautics.

The new or amended text in the revised page will be indicated by a black vertical line in the left margin, and the Revision No. and the date will be shown in the box at the bottom left hand of the page.

Record of revision:

Revisions number	TN 2	TN 4	
Affected Section and Pages	0.4; 0.5; 4.4; 4.6; 4.18 - 4.20; 6.5; 7.13; 8.4	0.4; 1.4; 1.5; 4.3; 4.6; 4.23	
Date of Issue	11.01.99	15.04.99	
Approval	LBA-App.	LBA-App.	
Date of Approval	07.09.99	19.05.99	
Date of Insertion	08.09.99	20.05.99	
Ref. / Signature	Juw [signature]	Juw [signature]	

Rev. No. ->	
Affected Section and Pages	
Date of Issue	
Approval	
Date of Approval	
Date of Insertion	
Ref. / Signature	

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0.3 Table of Contents

SECTION 1

1.1 Introduction

This sailplane flight manual has been prepared to provide pilots with information for the safe and efficient operation of the ASW 27 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 Certification basis

This model, sailplane ASW 27 has been approved by the German Federal Civil Aviation Authority (LBA) in accordance with Joint Airworthiness Requirements for Sailplanes and Powered Sailplanes JAR-22 dated 27 June 1989 (Change 4 of the English Original Edition) including amendments dated 22/90/1, 22/91/1 and 22/92/1.

The following additional requirements have been complied with:
"Guidelines for the substantiation of structural strength of components for (powered) sailplanes made from glass fibre and carbon fibre reinforced plastics", edition of May 1986.

For the compliance with JAR 22.807 the results of the research report "Untersuchung über Haubennotabwurfsysteme" (Reseach report about canopy jettison systems) have to be regarded. This report summarises the state of the art in that area. If the canopy design meets the recommendations given then no additional tests are necessary.

A (German) Type Certificate Number 389 was applied for on 15 May 1991 for Airworthiness Category U. U stands for Utility and 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 the non-observation of the corresponding procedure leads to an immediate or important degradation of the flight safety.

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

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

1.4 Descriptive data

The ASW 27 sailplane is a high performance, single-seat sailplane, the design of which was directed toward the FAI 15 m Class specification.
The ASW 27 is suitable for record breaking and competition flying, and is suitable for a pilot experienced in cross-country soaring.

The aerodynamic design including pneumatic and zigzag tape turbulators as laminar to turbulent boundary layer transition control and the construction using advanced carbon, Aramid (Kevlar) and polyethylene (Dyneema or Spectra) fibres, represents the latest technology.

Because of the noticeably improved performance level compared to its forerunner, the ASW 20, the new ASW 27 will open up a wider area of operation.

The ASW 27 is a shoulder-wing glider with fixed horizontal T-tail (stabiliser plus elevator), a spring and a retractable landing gear with hydraulic disk brake.

The wing is equipped with trailing edge flaps extending over the full span to allow the selection of optimum wing camber with respect to drag throughout the speed range. In the "landing" setting the flaps generate high drag with good control which, together with the spoilers on the upper wing surface, permits very steep approaches to landing .

Detachable winglets are mounted to the wing tips.

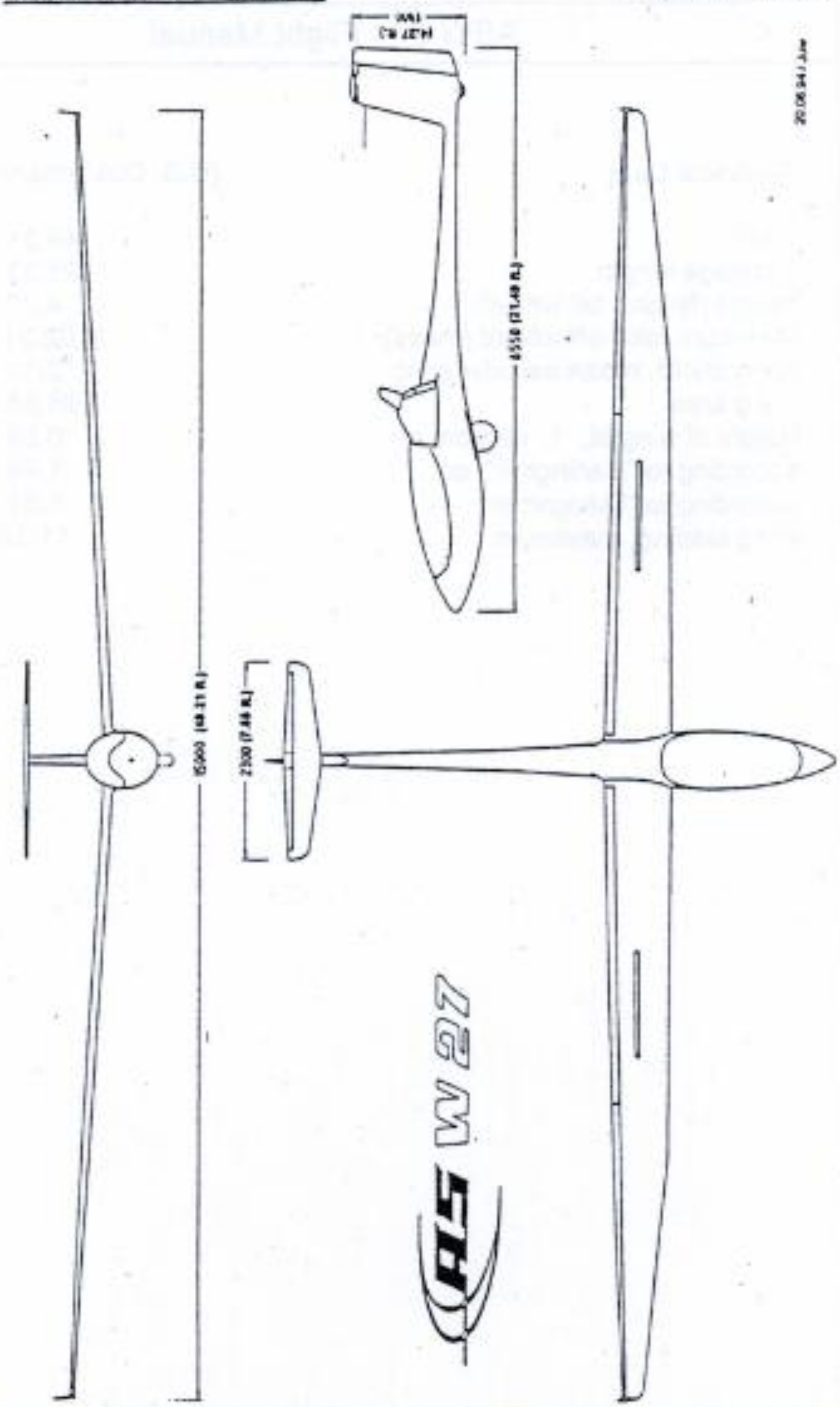
Technical Data:	(SI Units)	
Span	15.00	m
Fuselage length	6.50	m
Height (fin and tail wheel)	1.30	m
Maximum take-off weight (mass)	500.00	kg
Wing chord, mean aerodynamic	0.643	m
Wing area	9.00	m²
Height of winglet, 1. version or	0.27	m
according to "Darlington" or	0,45	m
according to "Maughmer"	0,40	m
Wing loading, maximum	55.56	kg/m²

Technical Data: (U.S. Customary units)

Span	49.21	ft
Fuselage length	21.33	ft
Height (fin and tail wheel)	4.27	ft
Maximum take-off weight (mass)	1102.31	lbs
Wing chord, mean aerodynamic	2.11	ft
Wing area	96.88	ft^2
Height of winglet, 1. version or	0.89	ft
according to "Darlington" or	1.48	ft
according to "Maughmer"	1.31	ft
Wing loading, maximum	11.38	lbs/ft^2

1.5 Three-view drawing

Figure 1.5-1



SECTION 2

2. Limitations

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2.3 Airspeed indicator markings

2.4 Power-plant, fuel and oil
Not applicable for a pure sailplane!

2.5 Power-plant instrument markings
Not applicable for a pure sailplane!

2.6 Weight (mass)

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2.1 Introduction

Section 2 includes operating limitations, instrument markings, and basic placards necessary for the safe operation of the ASW 27 standard systems and standard equipment as provided by the manufacturer.

The limitations included in this Section and some in Section 9 have been approved by the LBA. The LBA (Luftfahrt-Bundesamt) is the German office for civil aeronautics.

2.2 Airspeed

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

	Speed	IAS	Remarks
V_{NE}	Never exceed speed	285 km/h 154 kts 177 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	215 km/h 116 kts 134 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

	Speed	IAS	Remarks
V_A	Manoeuvering speed	215 km/h 116 kts 134 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.
V_{FE}	Max. Flap Extended speed (if applicable give different flap settings) "WK"	WK1: 285 km/h, 154 kts, 177 mph [IAS]. WK2: 285 km/h, 154 kts, 177 mph [IAS]. WKA: 215 km/h, 116 kts, 134 mph [IAS]. WK3: 200 km/h, 108 kts, 124 mph [IAS]. WK4: 180 km/h, 97 kts, 112 mph [IAS]. WK5: 180 km/h, 97 kts, 112 mph [IAS]. WKL: 150 km/h, 81 kts, 93 mph [IAS].	Do not exceed these speeds with the given flap setting "WK"
V_W	Maximum winch-launching speed	130 km/h 70 kts 81 mph	Do not exceed this speed during winch- or autotow launching
V_T	Maximum aerotowing speed	170 km/h 92 kts 106 mph	Do not exceed this speed during aerotowing.

	Speed	IAS	Remarks
V_{LO}	Maximum landing gear operating speed	185 km/h 100 kts 115 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
White arc	92.5 - 200km/h 50 - 108kts, 57.5 - 124mph.	Positive Flap Operating Range
WKL	150 km/h, 81 kts, 93 mph.	Maximum speed in flap setting for landing
WK 4+5	180 km/h, 97 kts, 112 mph.	Maximum speed in flap settings 4 and 5
WK 3	200 km/h, 108 kts, 124 mph.	Maximum speed in flap setting 3
WK A	215 km/h 116 kts 134 mph.	Maximum speed in flap setting A
Green arc	100 - 215 km/h 54 - 116 kts 62 - 134 mph.	Normal Operating Range
Yellow arc	215 - 285 km/h 116 - 154 kts, 134 - 177 mph.	Manoeuvres must be conducted with caution and only in smooth air.
Red line	285 km/h, 154 kts, 177 mph.	Maximum speed for all operations.
Yellow triangle	100 km/h, 54 kts, 62 mph.	Approach speed at maximum weight without water ballast.

2.6 Weight (Mass)

Maximum take-off weight:
- -with water ballast . . . . 500 kg (1102 lbs)
- -without water ballast . . . . . . 395 kg (871 lbs)

Maximum landing weight: . . . . . . 500 kg (1102 lbs)
Maximum weight of all
non-lifting parts: . . . . 280 kg (617 lbs)
Maximum weight in the
baggage compartment: . . . . 15 kg (33 lbs)

NOTE: Water ballast in the fuselage belongs to the non-lifting parts !

2.7 Centre of gravity

Centre of gravity range (for flight):

Foremost limit: 0.210 m (8.27 in) aft of datum (RP)
Aftmost limit: 0.320 m (12.6 in) aft of datum (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 a table of c.g. ranges at different empty weight is shown in Section 6.

2.8 Approved manoeuvres

This sailplane is certified for use in normal gliding operation according to Airworthiness Category U, "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, Chandelle, Stall Turn and Steep Turn. Further details concerning these manoeuvres will be found in Section 4.5.9 .

2.9 Manoeuvring Load Factors

Maximum manoeuvring load factors:
- maximum positive load factor + 5.3
- maximum negative load factor - 2.65

at an airspeed of 215 km/h (116 kts, 134 mph)

These values are reduced to:
- maximum positive load factor + 4.0
- maximum negative load factor - 1.5

at an airspeed of 285 km/h (154 kts, 177 mph)
Maximum manoeuvring load factor with:
- airbrakes extended + 3.5
  up to 285 km/h (116 kts, 134 mph)
- flap in landing setting (WK L) + 4.0
  up to 150 km/h (81 kts, 93 mph)

2.10 Flight crew

The crew of the ASW 27 is one pilot.
Pilots weighing less than 70 kg = 154,5 lbs (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 7.13 .
Additionally a "Data and Loading Placard" is affixed to the righthand cockpit wall.

2.11 Kinds of operation

Flights may be carried out in daylight, in accordance with visual flight rules (VFR). Cloud flying is permitted if appropriate instrumentation is fitted but only without water ballast, and if local airspace regulations currently in force are followed.

Cloud flying is prohibited in Canada!
Aerobatics manoevres according to Section 4.5.9 of this Manual are approved, but only **without** water ballast.

2.12 Minimum equipment

Minimum equipment consists of:

- 1 Airspeed indicator (ASI) with a range up to at least 300 km/h (162 kts or 186 mph) with markings given in section 2.3 of this FM.
- 1 Altimeter
- 1 4-part safety harness (symmetrical)

Additionally (in Germany) for flights at airfields with air traffic control and also for cross-country flights:

- 1 VHF-Transceiver (COM)

Additional minimum equipment for ASW 27 registered in Belgium or France:

- 1 Variometer
- 1 Compass (magnetic)
- 1 Slip indicator

For cloud flying, the following additional equipment must be fitted:

- 1 Turn-and-slip indicator
- 1 Variometer
- 1 Compass (magnetic)

Approved equipment is listed in the **Maintenance Manual** under Section 12.1 .

2.13 Aerotow and Winch- and Autotow-Launching

The maximum permissible towing speeds are:

For aerotow:	170 km/h, 92 kts, 106 mph
For winch- and autotow launching:	130 km/h, 70 kts, 81 mph

For both types of launch, a weak link of 560 to 660 daN (1235 lbs to 1455 lbs) must be used in the launch cable or tow rope.

For aerotow, the tow rope must be at least 40 m (130 ft) but not more than 60 m (200 ft) in length.

2.14 Other Limitations

For flights above 3000 m (FL 100) reduced maximum speeds are necessary; see Section 4.5.7 and an appropriate placard next to the altimeter.

2.15 Limitations Placards

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

Segelflugzeugbau A. Schleicher GmbH & Co. Poppenhausen

Model: **ASW 27** Serial No.: **27**

DATA and LOADING PLACARD

Empty Mass:	kg	lb
Max. Flight Mass:	500 kg	1102 lb
Min. Seat Load	kg	
Max. Seat Load	kg	
Max. Permissible Speeds:		
Calm Air	154 kts	285 km/h
Winch Launch W/L	70 kts	130 km/h
Aerotow A/T	92 kts	170 km/h
Extending Landing Gear	100 kts	185 km/h
as Maneuvering Speed	116 kts	215 km/h
Weak Link for Aerotow & Winch Launch:	1235 to 1455 lbs	
	560 bis 660 daN	
Tire Pressure Main Wheel:	2.1 to 2.5 bar	(30 to 36 psi)
Tail Wheel:	2.4 to 2.6 bar	(34 to 38 psi)

This placard is to be glued below the data placard.

REDUCED MINIMUM COCKPIT LOAD
<u>WITHOUT</u> TRIM BALLAST IN THE FIN:
SEE FLIGHT MANUAL - PAGE 6.4 !

This placard is to be glued near the data placard.

Following aerobatic manoeuvers are approved without waterballast and only in flap setting A !

Looping (positive)
Lazy Eight
Chandelle
Stall Turn
Steep Turn, max. bank angle 70°

SECTION 3

3.1 Introduction

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

The following procedures should be included in a ground briefing and/or familiarization for the ASW 27.

Brief headings are followed by a more detailed description.

EMERGENCY PROCEDURES

To Jettison Canopy

- Pull both red levers left and right-hand on the canopy frame back all the way and
- pull canopy backwards and UP!

Bailing Out

- Push instrument panel UP;
- Release safety harness;
- Roll over cockpit side;
- Push off strongly;
- Watch wings and tail surfaces.

- Pull parachute ripcord!

Spinning

- Apply opposite rudder and at the same time
- relax back pressure on stick until rotation stops,
- center rudder and immediately pull gently out of dive !

3.2 Canopy jettison

Pull the canopy-jettison levers (red levers mounted left and right on the canopy frame) and pull canopy backwards and upwards!
In a vertical dive, the air loads on the canopy may be high. With some yaw, however, low pressure builds over the canopy. Therefore, apply some rudder deflection in this case. This may also help the canopy to clear the tail.

3.3 Bailing out

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

Push the instrument panel UP (if this was not done in the course of jettisoning the canopy). Get out or simply roll over cockpit rail.

When jumping, push yourself away from the aircraft as hard as possible. Try to avoid contact with the wing leading edge or tail surfaces.

Pull parachute rip chord when a manually operated chute is used after you cleared the sailplane.

3.4 Stall recovery

In straight or circling flight, relaxing the back pressure on the stick will always lead to recovery.

Due to its aerodynamic qualities, the ASW 27 will immediately regain flying speed.

3.5 Spin recovery

According to the modified JAR-22 Standard Method:

(1) Apply opposite rudder (i.e., in the direction opposite to the rotation of the spin) and at the same time
(2) ease the control stick forward until the rotation stops;
(3) center the rudder and gently pull out of the dive.

CAUTION: Furthermore, spin recovery will be accomplished more quickly if flap deflection is reduced. It is advisable to reduce the circling flap setting to neutral (flap setting 3).

Spinning is not noticeably affected by extending the spoilers but such action will increase the height loss when pulling out of the dive and is, therefore, inadvisable.

WARNING: For structural reasons, spinning in the landing-flap setting is strictly prohibited. If a spin should inadvertently develop while in this flap setting, the flap setting should immediately be reduced to neutral (flap setting 3) and, only then, should recovery action be initiated.

NOTE: Waterballast has no noticeable influence on spinning qualities except that recovery speeds are higher and as a consequence greater losses in altitude are noted.

3.6 Spiral dive recovery

Depending on the aileron position during a spin with forward c.g. positions (i.e. the c.g. range when the ASW 27 will no longer sustain a steady spin) the spin will immediately or after a few turns develop into a spiral dive or a slipping turn similar to a spiral dive.

These conditions can both be terminated by:
(1) applying opposite rudder
(2) applying aileron opposite to direction of turn.

3.9 Other emergencies

(1) Jammed elevator control system

If the flap control system is jammed, the ASW 27 is converted into an aircraft with a fixed wing profile.
On the other hand, it does not always occur to the pilot that, with the elevator control system jammed, the flaps still afford some measure of pitch control for improving the situation for bailing out or even perhaps eliminating the need to do so.

(2) Emergency landing with retracted landing gear

Emergency landings with retracted landing gear are not advised in principle, because 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 27 should be touched down with flaps in landing position L and the spoilers closed as much as possible, at a shallow angle, and without stalling onto the ground.

(3) Groundloops

If the aircraft threatens to roll 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 groundloop.

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

(4) Emergency landing on water (ditching)

A "landing" on water by a composite glider with the wheel retracted has been attempted as an experiment. The experience suggests that the sailplane will not skim across the water, but rather the whole cockpit area will be forced under the surface of the water. 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 the very last resort.

(5) Flying with defective water ballast jettison

The valve operating system ensures that, when water ballast is jettisoned, all tanks (when installed) are drained at the same time. This is necessary for flying quality reasons.
When jettisoning water ballast in flight, it must be ensured that water is draining from both wings. Both wings should be checked by visually observing the flow from the cockpit.
The fuselage tank is transparent and can therefore easily observed from the cockpit.

If a failure of the valves should cause asymmetric loads, the flight should be terminated with extreme care, maintaining an adequate margin above stall speed as incipient or full spins with asymmetric ballast loads are not permitted. Special care should be taken to avoid turning in the direction of the heavier wing.
If a valve is defective, all valves must be closed and a landing at the higher weight must be accepted rather than a landing with asymmetric load.

(6) Incorrect aerobatic manoeuvers

When aerobatic manoeuvres are badly executed and spanwise slipping or even worse tail slipping is expected:
Hold all control surfaces __firmly__ in neutral position.

SECTION 4

4.1 Introduction

Section 4 provides checklists for daily inspection and preflight inspection 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 de-rigging

Rigging: The ASW 27 can be rigged without the use of rigging aids by three people or by two people, if a fuselage cradle and wing stand are used.

1. Clean and lubricate all pins, bushes, and control connections.

2. Support fuselage upright. If the wheel is lowered, ensure that the landing gear is locked down securely.

3. Set the flap lever to flap setting 1 or 2.

WARNING: When the flap lever is in position L for landing the automatic flap control connection may fail to engage properly. Better design of this detail was tried but ended in lack of stiffness and excessive play of this connection. Misrigging is easily detected in preflight checks as the flap lever cannot be actuated at all and is blocked in full negative flap setting where a take-off is impossible.

4. Insert the right wing panel spar fork into the fuselage and support the outer end of the wing with a stand, if available.

NOTE: The wing stand must not obstruct the movement of the flap !

5. Insert the left wing panel spar root and line up main rigging pin bushings. Insert and lock the main pins. Only at this point, and not before, may the wing-panel end be unsupported.
   If the aircraft is still supported in a fuselage cradle, it is recommended that the landing gear be extended at this point and rigging completed with the aircraft resting on the gear.

6. After cleaning and lightly lubricating the elevator studs and sockets, the horizontal tail is pushed on to the fin from the front. Each elevator half must be guided into the elevator actuator. The plastic seal covering the elevator gap must be placed on top of the elevator actuator. Use sheet-alloy tool Schleicher-No. 99.000. 4657 for this procedure by placing it between the seal and the elevator actuator. Push the tail completely aft until the hexagon socket head bolt near the leading edge will engage. The bolt must be fully and firmly tightened; it is secured by a spring ball catch, where the ball engages in the grooves on the side of the bolt head.

7. The winglets must be installed into their pockets in the wing tips, (Darlington or Maughmer winglets must be safetied by a M5-thread screw and additionally) adhesive tape must be used as safety! (Use minimum 15mm wide white tape, for example "Tesaflex" No.4163 or 3M-Scotch 35 white, Vinyl Electrical Tape 10828). For temperatures above 25°C (77°F) or extreme low temperatures use textile reinforced tapes (for example Tesaband 4651 white or an equivalent medical tape).

NOTE: For wings with integrated (wet surface) water tanks the ventilation port at the winglet root is not taped over!

NOTE: Integrated (wet inner surface) water ballast tanks are vented at the wing tip below the winglet to wing intersection. **That port must never be taped over!**

8. The "Multiprobe" must be installed into its socket in the nose of the fin.

WARNING: Without the probe installed the ASI readings are unusable.

9. A considerable performance improvement can be achieved with little effort by taping all the gaps between the wing and tail junctures with plastic, self-adhesive tape (on the non-moving parts only). The canopy must not be taped shut because this would impair bailing out.
   It is recommended that areas to be taped should be thoroughly waxed beforehand, so that the adhesive tape can be removed without lifting the gelcoat.

10. If flexible water ballast tanks are fitted in the wing-panels, connect both vent tubes from the water bags to the vent mounted in the fuselage skin above the baggage compartment.
    This check is obsolete when integrated (wet inner wing surface) water ballast tanks are installed!
    However for integrated tanks the cover of the big ventilation (and filling) hole on the upper wing surface must be checked for proper seat and taped over water tight during flight.

11. Use the check list (See section 4.4) to carry out a pre-flight check.
    Under point 2, Control surface clearances at trailing edge min. 1.5 mm = 1/16 in!, check that the wing control surfaces have the minimum clearance from each other and from the inboard and outboard wing fixed surfaces. This clearance is necessary to ensure that these controls do not foul each other or the wing when deformed under flight loads.

De-rigging

To **de-rig**, proceed in the reverse order for rigging. The following suggestions are added:

1. Drain all water ballast. Ensure that all the water has drained out by lowering alternately each wing tip several times.

2. If the horizontal tail is very firmly seated, it will be more easily dismantled by two people pushing forward alternately at the tips.

3. Before removing the wings from the fuselage, do not forget to disconnect the vent hoses (not applicable for integrated water ballast tanks!) and remove the winglets!

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 a hangar, as experience indicates they are vulnerable to hangar damage and vermin.

1. Open canopy and check canopy jettison system.

2. Are main pins fully inserted and secured?

3. Perform a Positive Control Check. Control connections (ailerons, flaps, and airbrakes) in fuselage to wing intersection as far as visible from the cockpit.

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

5. Check full and free operation of all controls through full deflections. Hold controls firmly while loads are applied to control surfaces. A competent person should assist you when doing this check.

6. Check ventilation opening and optional Pitot tube in fuselage nose.

7. Check inflation and condition of tires:
   Main wheel: 2.3 bar ± 0.2 bar (33 psi ± 3 psi)
   Tail wheel: 2.5 bar ± 0.1 bar (36 psi ± 2 psi)

8. Check condition and operation of tow hook(s). Release operating freely? Release checks done?

9. Check wheel brake for operation and fluid leaks. With airbrakes fully extended, the brake pressure from the main brake cylinder should be felt through spoiler handle.

10. If installed, check connections to wing and fuselage water ballast tank ventilation lines (not applicable for integrated water ballast tanks!).

11. Check battery voltage to be > 12 V.

12. Check both upper and lower wing surfaces for damage and water ballast openings for dirt.
    For integrated wing water ballast tanks only: Check ventilation port at the wing tip to be clean as well as the cover on the upper outer wing surface for proper seating watertight taping!
    Are the Winglets undamaged and taped?

13. Ailerons and flaps:
    Check condition and full and free movement (control-surface clearances). Check external linkage fairings for clearance.

14. Airbrakes:
Check condition and control connections. Check both airbrakes have good over-centre locks. Check both airbrake boxes for loose objects, stones, water etc.

15. Check fuselage, especially underside, for damage and water ballast exit for dirt if applicable.
Check ventilation ports of the water ballast system at the top of the fuselage for dirt and/or free flow .

16. Check that static pressure ports in the fuselage tail boom are unobstructed.

17. Check that rudder, horizontal tail, and elevator are correctly fitted and for damage or excessive play. Check that tail bolt is tight and locked.

18. Check probe in fin:
Is probe properly seated and tight ?

19. Check water-ballast system for leaks after it is filled.

4.4 Preflight inspection

The following check list containing the most important points is affixed to the cockpit underneath the instrument panel box within easy view of the pilot:

Pre flight check

1. Control connections checked and assembly pins safetied secure (wing and horiz. tail) ?
2. Check control forces and freedom of control movements incl. pedals and rudder, canopy down! (Control surface gaps minimum 1.5 mm as viewed from trailing edge ?!)
3. Automatic parachute static line connected ?
4. Battery installed + secured ?
5. Check the C.G. ! Trim weights in fuselage nose, battery in fin ?
6. Observe the trim plan !
7. Water ballast outlets and vents clear ?
8. Tail dolly removed ?

Pre take-off check:

1. Fasten parachute !
2. Fasten safety harness !
3. Landing gear locked ?
4. Airbrakes locked ?
5. Trim set in take-off position ?
6. Flaps set in take-off position ?
7. Altimeter set ?
8. Check wind direction !
9. Close and lock canopy !

4.5 Normal Procedures and Recommended Speeds

4.5.1 Launching

4.5.1.1 Winch- and autotow-launching

The sailplane is only certificated for winch- and autotow-launches when the c.g. tow release is used.

For winch-launching the following flap settings are recommended:

- 4 (+19.5°) for gusty conditions and/or crosswind, when no waterballast on is board.
- 5 (+24°) with waterballast, but for nil wind or steady headwind.

The trim should be set to 30% from front stop for rear c.g.positions and to neutral for forward c.g. positions and both flap settings. At those trim setting, the ASW 27 will assume a gentle climb attitude. Above a minimum safe height, the climb should be steepened by applying back pressure on the stick.

An autotow-launch is a shorter and milder version of a winch launch and mostly only safety alitude is gained. Because of the short cable length the steep climb attitude is not possible.

A weak link of 560 to 660 daN (1235 to 1455 lbs) must be used in the launch cable.

The maximum acceptable crosswind component is 30 km/h (16.2 kts or 18.6 mph).

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

CAUTION: Winch launching with water ballast is not recommended with less than a 20 km/h (10.8 kts or 12.4 mph) headwind component. The winch driver must be informed of the actual weight.
Before take-off, check the seating position and ensure that the controls are within reach. The seating position, especially when using cushions, must preclude the possibility of sliding backwards during the initial acceleration or steep a climb.

WARNING: We expressly warn against attempting any launch using an under powered winch or tow car with a tail wind!

4.5.1.2 Aerotow

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

For aerotows, flap setting 4 is recommended.
The trim should be set nose-heavy.
A tow rope of 40 to 60m (130 to 200ft) length, but never less than 40m long should be used.

Experienced pilots should start their take-off run in flap setting 2 (0°). This flap setting affords excellent lateral control. At an indicated airspeed of about 50 km/h (27 kts) the flap setting should be increased to 4 (+19.5°) or, for short take-off runs or when carrying much water ballast, to setting 5 (+24°). For the remainder of the tow, flap setting 4 should be selected for reasons of trim loads.
For pilots not experienced in flapped aircraft, flap setting 4 is recommended for both take-off and throughout the aerotow.

NOTE: Inform tow pilot of the minimum towing speed.

Take-off Mass		Recommended Towing Speed
300 kg*	(660 lb)	115 km/h (62 kts, 71.5 mph)
355 kg	(780 lb)	120 km/h (65 kts, 74.5 mph)
400 kg	(880 lb)	125 km/h (68 kts, 77.5 mph)
500 kg	(1102 lb)	130 km/h (70 kts, 81 mph)

* only possible with lightweight pilots !

The maximum acceptable crosswind component is 35 km/h (19 kts, 22 mph).

4.5.2 Take-off, aerotowing

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

Try to keep the tail wheel in contact with the ground until the aircraft lifts off. This increases not only the directional stability during the ground run but also helps the sailplane lift off at the earliest possible moment.
After lift-off, climb to between 1 and 2 m (3 and 6 ft) to avoid pitch oscillations caused by ground effect and slipstream turbulence from the towplane.

4.5.3 Flight

(1) Use of flaps

Flap control allows improved adaptation of the aircraft to changing flight attitudes.
Flap settings 1, 2 and 3 are straight flight settings. Setting 1 is for high speed flight, setting 2 (0°) is mostly used between thermals.

In flap setting 2 the lower wing surface contour is flush and the low drag laminar boundary layer can pass the well faired hinge line until it is intentionally tripped into a turbulent layer which attaches to the surface of the trailing edge.
Flap setting 3 (+12°) the upper wing surface contour is flush and aerodynamically at an optimum. Therefore low drag is achieved for slow level flight at best L/D.
For slow ridge soaring as well as when surfing a mild wave flap setting 3 is also recommended. Only in turns at the edges of the lift area flap setting 4 is used in turns, seting 5 in steep turns only.

Flap settings 4 and 5 are purely for use while circling. Flap setting 4 is designed for centring into thermals and circling in turbulent lift.
Flap setting 5 should be selected when the conditions warrant tight and steady circling in the core of a thermal.

The best flap settings at various speeds depend very much on the wing loading. The effect of the all-up weight at any one time on the appropriate speeds for the various flap settings is shown in the diagram in Section 5.2.2 .

Because the flap setting directly influences the amount of lift generated over the whole of the wing, a sudden, jerky operation of the flaps will cause a sudden drop or climb; therefore, care should be exercised in this respect, especially when flying close to the ground or circling near other sailplanes.

When circling, remember that the stall speed will increase compared to that in straight flight for the same flap setting.
As a general guideline, you should expect the stall speed to increase 10% at about 30° bank and 20% at about 45° bank.

(2) Lowspeed Flight and Stall Behaviour

The ASW 27 behaves normally in slow and stalled flight. With the c.g. position well aft, flow separation at the fuselage and horizontal-tail buffeting give warning of an impending stall.
The stall behaviour of the ASW 27 depends very strongly upon the rudder deflection and in what manner it is moved. When the rudder is neutral the stall is extremely docile, whereas a sudden deflection of the powerful rudder kicks the ASW 27 into a wingover or a spin.
At the foremost c.g. limit, the stall characteristics become very gentle, because the limited elevator effectiveness no longer allows the maximum angles of attack to be reached.
At this c.g. position, stall warning through buffeting will not be experienced but large aileron deflections can be applied without dropping a wing.

Even at the rearmost c.g. limit, about half the maximum aileron deflection can still be applied, with the rudder centered, to maintain the aircraft in straight, stalled flight. It is however better to control the sailplane gently using only the rudder and keeping the control stick centered.

Violent applications of rudder or aileron near the stall speed result in a wingover followed by spiral dive, spinning, or side slipping, depending on the c.g. position.

More specifically, the following apply:

C.G. Position	Flap Setting	Rudder and Aileron Coordinated	Rudder and Aileron Crossed
aftmost	3,4,5	steady spin	steady spin
central	3,4,5	spin, leading to spiral dive	spin, leading to slipping turn
foremost	3,4,5	≈ half turn of spin, leading to spiral dive	slipping turn

The wing drop in circling flight is not noticeably more violent than in straight flight.
In flap positions 1 and 2, wing dropping is less pronounced because less elevator up travel is available.

CAUTION: Height loss due to an incipient spin from straight or circling flight depends largely on the all-up flight weight.

Height loss from straight flight after prompt recovery action is about 50 m (164 ft) !

Height loss from circling flight is up to 170 m (558 ft) !

NOTE: The ASW 27 is <u>not</u> approved for flights in lightning strike conditions. Therefore flights in such conditions must be avoided.

4.5.4 Landing Approach

Make the decision to land in good time and select flap setting 4 or 5 and lower the wheel at not less than 100 m (300 ft) agl.

For the remainder of the pattern, maintain about 100 km/h (54 kts, 62 mph) (yellow triangle on ASI).

The sailplane should be trimmed between 90 km/h and 100 km/h (49 kts and 54 kts/56 mph and 62 mph). In turbulence, the approach speed should be appropriately increased.

When the airbrakes are about half open during an approach for landing there is no load on the lever in the cockpit and the airbrake panels may start to oscillate up and down about an inch. These oscillations do not impair the flying qualities and low handforces are needed to damp the motion. When the airbrakes are either full out or nearly closed no oscillations have been noted.

CAUTION: Only when you are quite certain of being able to reach the boundary of the landing area on final approach should the landing flap setting L (+47°) be selected.

At airspeeds above 100 km/h (54 kts, 62 mph), the control forces required to engage flap setting L will increase. It is, therefore, inadvisable to engage the landing flap setting L at more than 100 km/h. The control forces are generated by the large deflection of the inboard flaps, which deflect downwards +47°, while the outboard aileron deflects only +6° down.

This marked wash out greatly increases the sink of the aircraft, especially at air speeds between 120 and 130 km/h (65 and 70 kts/ 75 and 81 mph). By changing pitch attitude (forward or back pressure on the stick) the glide angle can be further varied to a large degree.
In addition, glide-path control can, of course, be exercised in the normal way by means of the triple-paneled airbrakes.

NOTES: In a strong headwind, use of the landing-flap setting L is NOT recommended, due to the danger of undershooting the landing area!
If you are not familiar with the use offlaps as a landing aid, you should initially use only flap setting 5 for landing into a headwind.

CAUTION: The danger of a sudden drop makes it inadvisable to reduce the flap setting near the ground. This applies to a reduction from landing flap to flap setting 5 or 4 as well.
Such a reduction when in danger of undershooting must only be employed above a safe height (at least 40 m, 131 ft), a safe speed (at least 95 km/h, 52 kts, 59 mph) and after practicing the maneouvre at greater heights.

4.5.5 Landing

Before landing, the water ballast must be jettisoned.
In an emergency (e.g., abandoned take-off), the structural strength will prove adequate for a landing at maximum all-up weight.

When final approach is flown in flap setting L with some nose-down attitude, 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 the wheel brake too firmly applied.

During the 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 wheel braking.

The flaps may be left in the landing setting L, because the negative aileron deflection will provide adequate lateral control until the aircraft comes to a stop. If flap setting 5 was used for the landing, it is advisable to engage flap setting 1 after touch down. This will inhibit the sailplane from lifting off again and the aileron effectivity is improved, which will help in controlling the crosswind effect.

When parking the aircraft, engage flap setting 3 to save the plastic sealing strips over the control-surface gaps from deformation.

4.5.8 Flying with Water Ballast

WARNING: Cloud flying with water ballast is **not approved**! (See also section 2.11).

For weak weather conditions, the wing loading of the ASW 27 is already optimum with no or little (about 60 l or 15 U.S. gallons) additional water ballast.
If the achieved rate of climb in lift is markedly greater than 2 m/s (400 ft/min), the wing loading can be increased to a maximum of 55.56 kg/m² equivalent to 11.38 lb./ft² by use of water ballast.

NOTE: Remember that ballast will increase the stall speeds and take-off runs.
Ensure that the condition of the airfield and the length of take-off run available for the power of the towplane or winch permit a safe launch.

(1) Filling of Water Ballast:

CAUTION: For integrated wing water ballast tanks the ventilation (and filling) cover on the upper outer wing surface must be checked for proper seating and watertight taping!

It is most important to fill the tanks only by means of the filling nozzles provided because they are fitted with a strainer designed to prevent contamination of the valves.
The fill and dump ports for the water ballast are situated about 30 cm (12 in.) left and right of the fuselage and about 23 cm (9 in.) behind the wing leading edge on the lower wing surface.
The water-ballast operating lever in the right hand cockpit arm rest should be positioned OPEN (forward = valve-open position).
Start by filling the tanks with the wings level. The tank venting is designed such that the tanks will be well vented in this position.

WARNING: For integrated wing water ballast tanks it is necessary to **keep the sailplane level**, as otherwise the low wing will drain slowly through the ventilation port at the wing tip!

To do so use one (or two) Y-type hose(s) with two (or even three) filling nozzles because both the corresponding left and right (or all three) valves must remain open during filling. This is an important LBA requirement to prevent inadvertent draining of one tank only in one wing.
Integrated (wet inner wing surface) water ballast tanks may also be filled through the ventilation holes at the outer upper wing surface. In that case close the water ballast valves. After filling fasten and tape the covers!
With the wings level, carry out a balance test to ensure that the ballast loads are equal. Should one wing prove heavier, seal the opening in the lighter wing briefly by hand or stopper while opening the valves until equilibrium is achieved. Close the water ballast valves now!

WARNING: It is expressly prohibited to use pressurised water sources (mains, immersion pump, etc.) for filling ballast tanks due to the great possibility of damage to the wing structure.

It is recommended to fill the tanks from slightly elevated containers (on the wing or car roof, and so on). If water under pressure is used, it is essential to interpose an open intermediate vessel (funnel, standpipe, etc.) to ensure that the pressure head cannot rise above 1.5 m (5 ft) during filling.
When the wings are filled to capacity, it can happen that the soft bag tanks or the optional integrated water ballast tanks slowly drain out of the vents while the aircraft is parked. In this case, we recommend that the wing tips be supported level but, on no account, to tape up the vents!

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

Maximum weight	500 kg (1102 lb.)
minus Empty weight	-XXX kg (-YYY lb.)
minus Cockpit Load	-XXX kg (-YYY lb.)
= maximum water ballast	XXX kg (YYY lb.)

You will find a table with precise values in Section 6.2.2 .

(2) Jettisoning the Water Ballast.

We distinguish between two distinct circumstances under which ballast is normally jettisoned:

A) Partial reduction in wing loading:

Every time any water is jettisoned, it is most important to look at the wing trailing edges to ensure that the water is draining at an equal rate from both opened valves!
Open the lever in the cockpit and expect a flow rate of about 1 kg per second (2.2 lb. per second) of water ballast, a bit faster when the tanks are full, slower when the tanks are nearly empty.

B) Rapid ballast jettison:

When the water ballast must be jettisoned beyond the above-mentioned amount, the lever for the water tanks is also set to the OPEN position. Check both wings for proper draining and do not rely only on the lever setting.

The time to drain of the full soft water bags is about 3 ½ Minutes (or 200 Seconds) and about 3 Minutes for the integrated (wet inner wing surface) water ballast tanks.

Should the ballast fail to drain as intended, the valves should be closed immediately; try again to achieve even drainage by operating the valves again or, if icing is suspected, after descending into warmer air.
If this fails after several attempts, the situation should be regarded as an emergency and the instructions in Section 3.9 (5) should be followed.

4.5.7 High-Altitude Flight

Flutter tests were carried out at about 3000 m (9850 ft) msl. Because the ASI under reads with increasing altitude but since flutter limits for sailplanes are determined by true airspeed, the following limitations apply to high-altitude flights:

Altitude msl.	V_{NE} Indicated Airspeed
1000 m (3281 ft)	285 km/h, 154 kts, 177 mph
2000 m (6562 ft)	285 km/h, 154 kts, 177 mph
3000 m (9843 ft)	280 km/h, 151 kts, 174 mph
4000 m (13123 ft)	261 km/h, 141 kts, 162 mph
5000 m (16404 ft)	247 km/h, 133 kts, 154 mph
6000 m (19685 ft)	234 km/h, 126 kts, 145 mph
7000 m (22966 ft)	221 km/h, 119 kts, 137 mph
8000 m (26247 ft)	209 km/h, 113 kts, 130 mph
9000 m (29528 ft)	197 km/h, 106 kts, 122 mph
10000 m (32808 ft)	185 km/h, 100 kts, 115 mph
11000 m (36089 ft)	172 km/h, 93 kts, 107 mph
12000 m (39370 ft)	159 km/h, 86 kts, 99 mph

If the above airspeed limits given as IAS are adhered to the true air speed will remain constant at 320 km/h (173 kts, 199 mph) above 3000 m (9843 ft) altitude.

V_{NE} Speed Limit for high altitude	
Altitude msl.(m)	V_{NE} IAS (km/h)
< 3.000	280
< 5.000	247
< 7.000	221
< 9.500	197
< 11.000	172
< 12.000	159

V_{NE} Speed Limit for high altitude	
Altitude msl. (ft)	V_{NE} IAS (kts)
< 10.000	151
< 16.500	133
< 23.000	119
< 29.500	106
< 36.000	93
< 40.000	85

V_{NE} Speed Limit for high altitude	
Altitude msl.(ft)	V_{NE} IAS (mph)
< 10.000	174
< 16.500	154
< 23.000	137
< 29.500	122
< 36.000	107
< 40.000	99

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 if the aircraft is wet before climbing through the icing level. Experience indicates that water drops on the surface will be blown backward, lodge in the control gaps, and there dry comparatively slowly.

WARNING: This may cause the controls to become very stiff, or, in extreme cases, to jam them. A single climb through the icing level with a dry aircraft, on the other hand, is not likely to impair the use of the controls even if heavy icing of wing- and tail- leading edges occurs.
When carrying water ballast, avoid flying above the icing level due to the danger of frozen outlet valves, or, in extreme cases bursting the wings due to freezing water ballast.

4.5.8 Flight in Rain

Rain drops, frost, and ice impair the aerodynamic qualities and also alter the flying behaviour of a sailplane. Therefore, the quoted minimum speeds for straight and circling flight should, under such conditions, be increased by about 10 km/h (5.5 kts). Airspeeds should not 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** are only allowed <u>**without**</u> water ballast on board !

Aerobatics are not yet tested in flight with **Darlington-** or **Maughmer-Winglets installed. Aerobatics** are therefore <u>**not approved**</u> in that configuration!

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.

With central and forward C.G. positions the ASW 27 cannot be held in a spin. A steady spin is only possible with aft C.G. positions and is therefore not a suitable aerobatic manoeuvre.

For aerobatic flying an additional flap setting WK A (+10°) is installed so that the full speed range up to VA = 215 km/h (116 kts; 134 mph) can be utilized while still maintaining aerodynamic efficiency.

All approved manoeuvres can be safely executed well within the maximum g-load value of 5.3 g without the use of a g-meter. Installation of a g-meter will however improve the manoeuvering from an aerodynamic point of view.

NOTE: As the ASW 27 is a very high performance glider with rapid speed build up it is imperative that aerobatic manoeuvres are only performed by qualified pilots who have received proper training.

> Following aerobatic manoeuvers are approved without waterballast and only in flap setting A !
>
> Looping (positive)
> Lazy Eight
> Chandelle
> Stall Turn
> Steep Turn, max. bank angle 70°

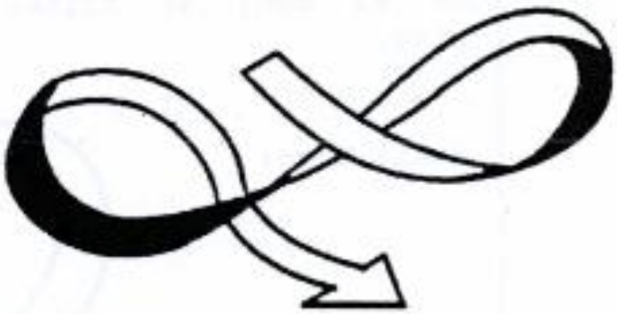
This placard has to be installed near the data placard.

The following manoeuvres have been demonstrated and are approved:

Loop:
(positive)

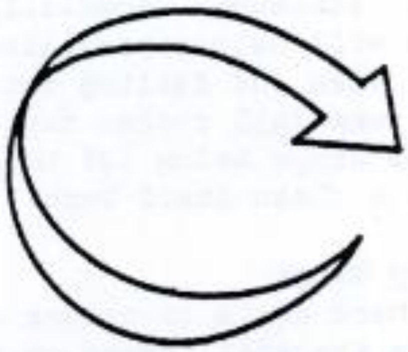
A positive loop may be flown with an entry speed at the lowest point from 190 km/h (103 kts; 118 mph), but an entry speed of 210 km/h (113 kts; 130 mph) is recommended, especially at high weight and forward C.G.. The required g-load is well below the maximum value of 5.3 g, and optimum initial g-load is approximate 3.5 g .

Lazy Eight:



This figure may be flown with an entry speed of 160 km/h (86 kts; 99 mph) or more at the point of intersection. However, increasing the speed to 190 km/h (103 kts; 118 mph) makes the manoeuver easier to fly while at the same time it will also look better. The Lazy Eight is a precision co-ordination manoeuver and a "yaw string" on the canopy is very useful to avoid slipping.

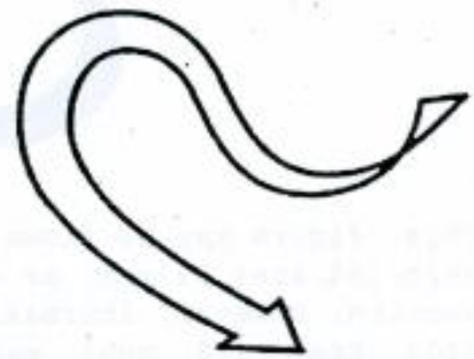
Chandelle:
(climbing)



This manoeuvre is a steep 180° climbing turn (a very good exercise for control coordination).
Recommended entry speed is 215 km/h (116 kts or 134 mph).
After picking up speed the sailplane must be levelled and at the same time aileron must be applied and the stick eased back. After 90° change of direction, 60° bank and 30° pitch-up attitude should be gained [airspeed not below 160 km/h (86 kts or 99 mph)].
Now apply opposite aileron and ease the stick forward or slightly push over.

The manoeuvre is completed when the sailplane flies in opposite direction and level at ≈100km/h (54 kts or 62 mph) at higher altitude and offset to the side.

Stall Turn:



The Stall Turn is a most demanding manoeuver requiring very precise flying. Recommended entry speed is 200 to 215 km/h (108 to 116 kts, 124 to 134 mph). While pulling up it is recommended to roll the sailplane slightly into the turn before reaching vertical attitude, especially at the lower entry speed. This will help controlling the glider and reduces the risk of falling into a slipping tail slide. In any case <u>full</u> rudder must be applied before the airspeed drops below 135 km/h (73 kts; 84 mph) to ensure a clean Stall Turn.

Steep Turn:

At bank angle in excess of 70° the acceleration and hence the stall speed of the glider will increase rapidly with increasing bank angle and already at 75° the acceleration is 4 g and the ASW 27 will stall (High Speed Stall) at approximately 150 km/h (81 kts; 93 mph) in flap position WK A. It is therefore recommended to limit the bank angle during steep turns to 70° or less and keep the speed above 160 km/h (86 kts; 99 mph) to avoid flow detachment on the wing. However, using a g-meter sustained 4-g turns can easily be achieved at an airspeed of 170 km/h (92 kts; 106 mph).

SECTION 5

5.1 Introduction

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

The data in the charts have been computed from actual flight tests with the ASW 27 sailplane in good condition and using average piloting techniques.

5.2 Approved Data

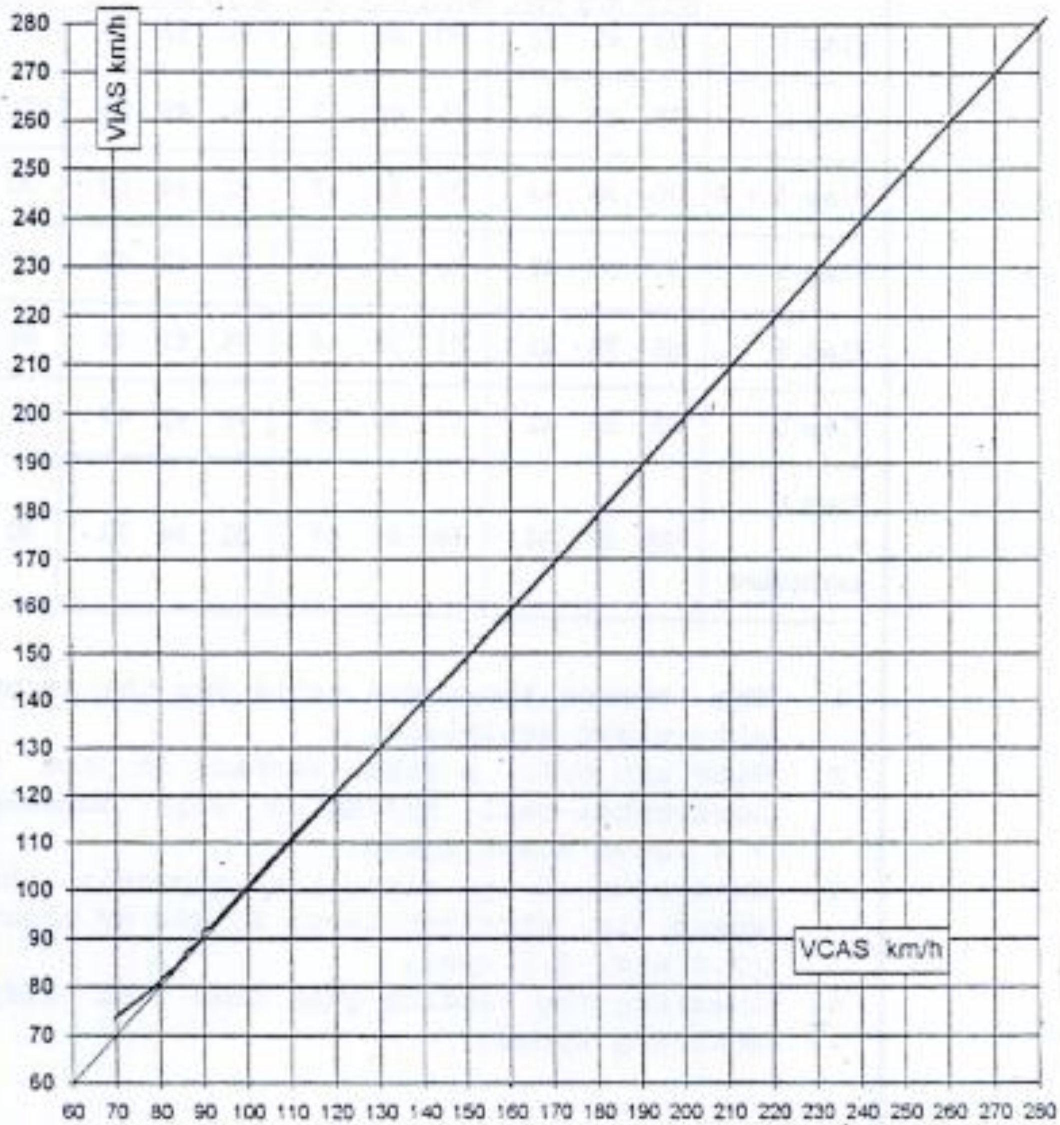
5.2.1 Airspeed Indicator System Calibration

Above an indication of about 10 km/h (5.4 kts; 6.2 mph) above stall speed (See section 5.2.2), the ASI is subject to only minimal indication errors. The deviations are within an over-indication of about 2 to 3 km/h (1 to 1.5 kts, 1.2 to 1.9 mph) and, therefore, within the range of acceptable instrument error for a good ASI.

NOTE: The ASI must obtain pitot pressure from the Prandtl tube in the fin, optionally also from a pitot tube in the fuselage nose. The static pressure must be obtained from the static ports in the fuselage tailboom.

CAUTION: The following diagram shows the position error of the ASW 27 pressure system and does not include the instrument error of the ASI.

5.2.1.1 Airspeed Calibration Diagram



V_{IAS} = Indicated Airspeed

V_{CAS} = Calibrated Airspeed

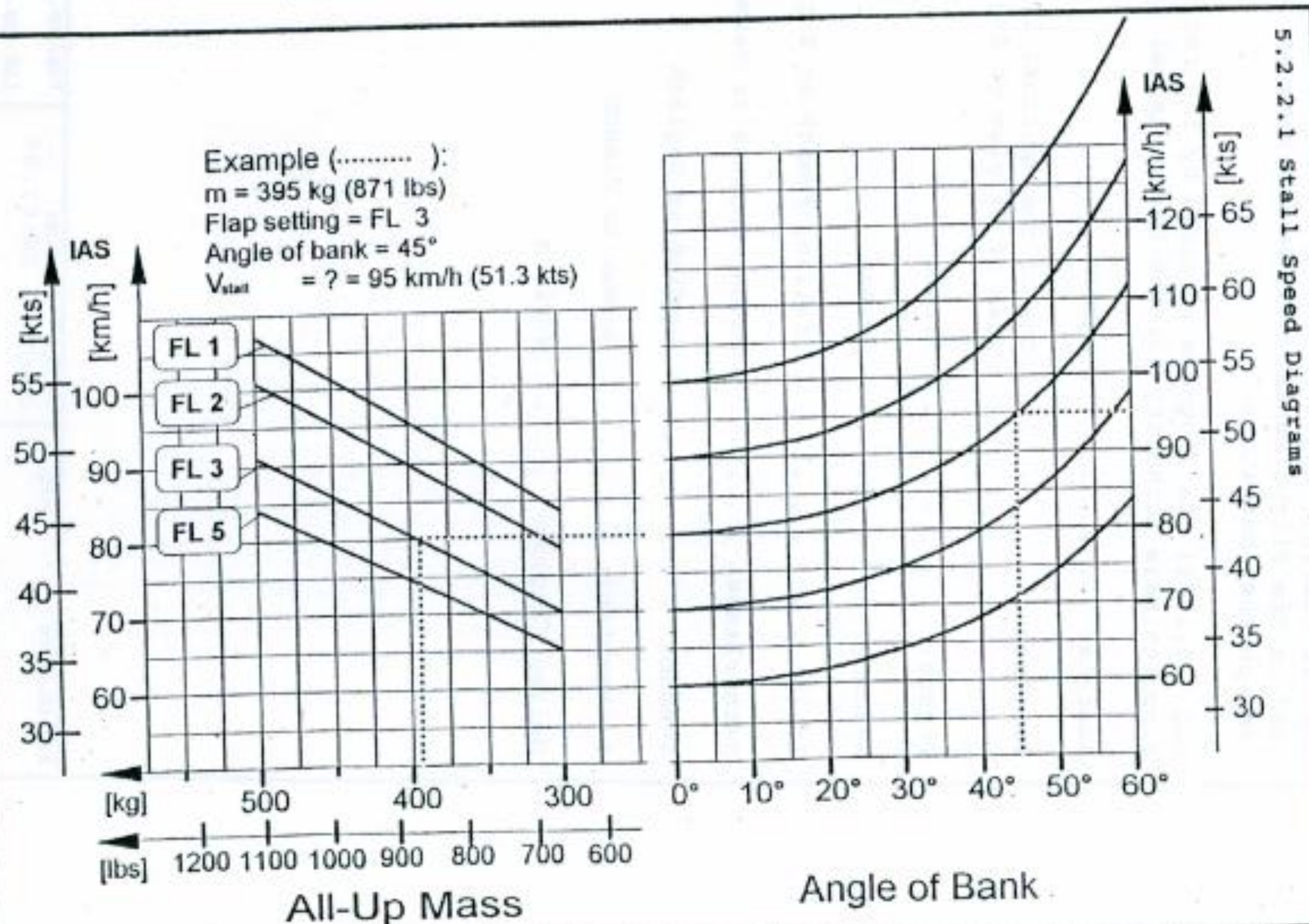
5.2.2 Stall Speeds

Stall speeds in km/h (kts, mph) Indicated Airspeed

Flap Setting	All-Up Weight kg (lb) 300 kg (660 lb)			355 kg (780 lb)			400 kg (880 lb)			500 kg (1102 lb)		
	km/h	kts	mph	km/h	kts	mph	km/h	kts	mph	km/h	kts	mph
Flap 1	83	45	51	90	49	56	96	52	59	107	58	66
Flap 2	78	42	49	85	46	53	90	49	56	101	54	63
Flap 3 + A	70	38	43	76	41	47	81	44	50	90	49	56
Flap 4	67	36	42	73	39	45	77	42	48	87	47	54
Flap 5	65	35	41	71	38	44	75	41	47	84	46	52
Flap L	65	35	41	71	38	44	75	41	47	84	46	52
Flap L + airbrakes	70	38	44	76	41	47	81	44	51	90	49	56

1. The speeds shown are valid for the aerodynamically clean sailplane.
2. With aft C.G., a stall warning in the form of horizontal-tail buffeting will commence about 7 % above stall speed.
3. Extension of the airbrakes increases the stall speed in straight level flight by about 6 km/h (3.2 kts, 3.7 mph).
4. Lowering the landing gear does not affect the stalling speed.

5.2.2.1 Stall Speed Diagrams



5.2.4 Additional Information

JAR 22.1581(c) requires: "The units of measurement used in the Flight Manual must be the same as those used on the indicators."

ACJ 22.1581: The language required by the recipient airworthiness Authority for the Flight Manual is:

Austria: . . . . German

Belgium: . . . . One of the national languages of Belgium or English

France: . . . . French

Germany: . . . . German

Italy: . . . . Italian, French or English

Netherlands: . . . . Dutch, English or German

Sweden: . . . . Swedish or English

Switzerland: . . . . German or French

United Kingdom: . . . . . English

5.3 Non approved further information

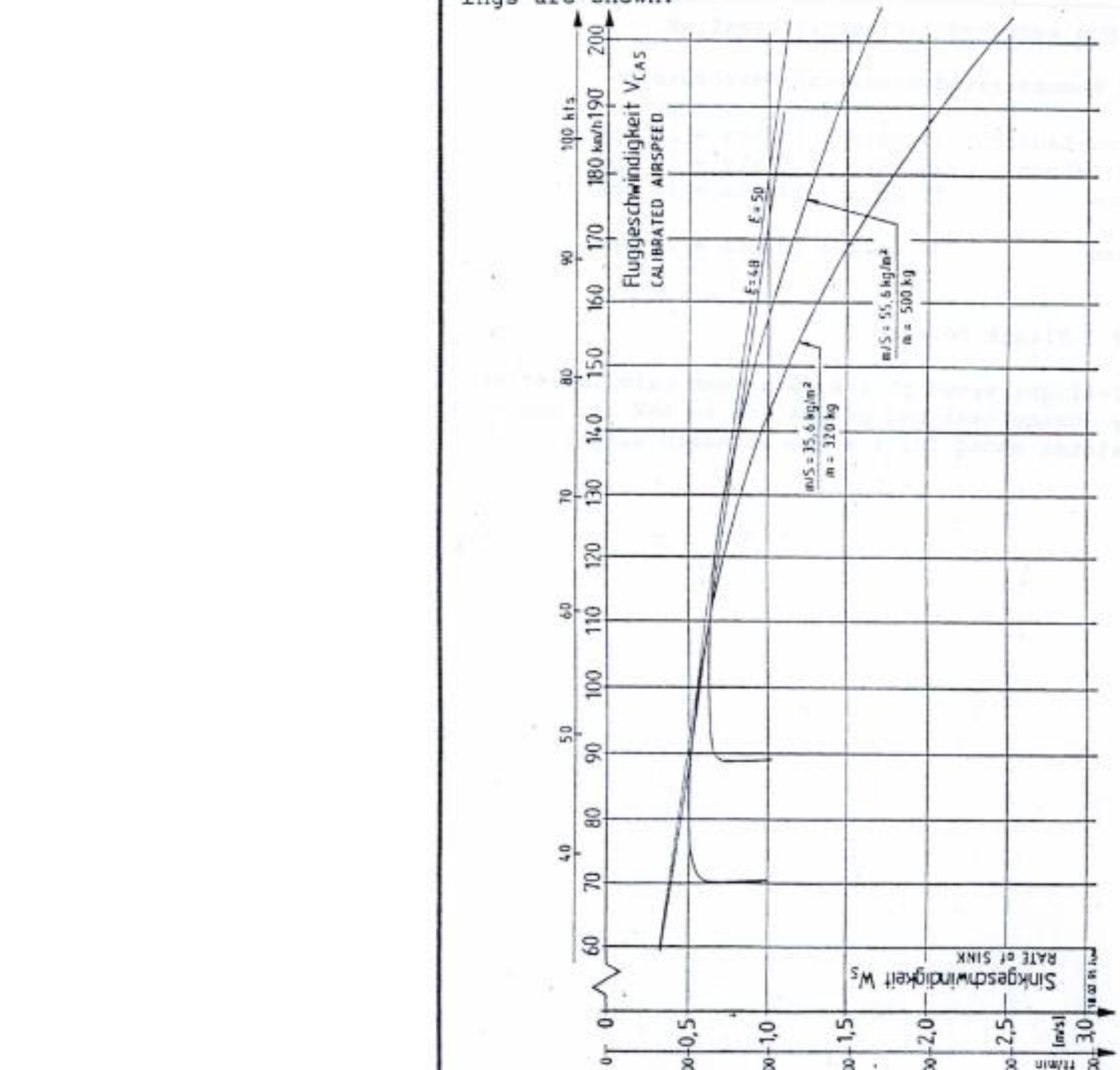
5.3.1 Demonstrated Crosswind Performance

Autotow-Launch	30 km/h = 16 kts = 18 mph
Winch Launch	30 km/h = 16 kts = 18 mph
Aerotow	35 km/h = 19 kts = 22 mph
Landing	37 km/h = 20 kts = 23 mph

5.3.2.1 Flight Polars

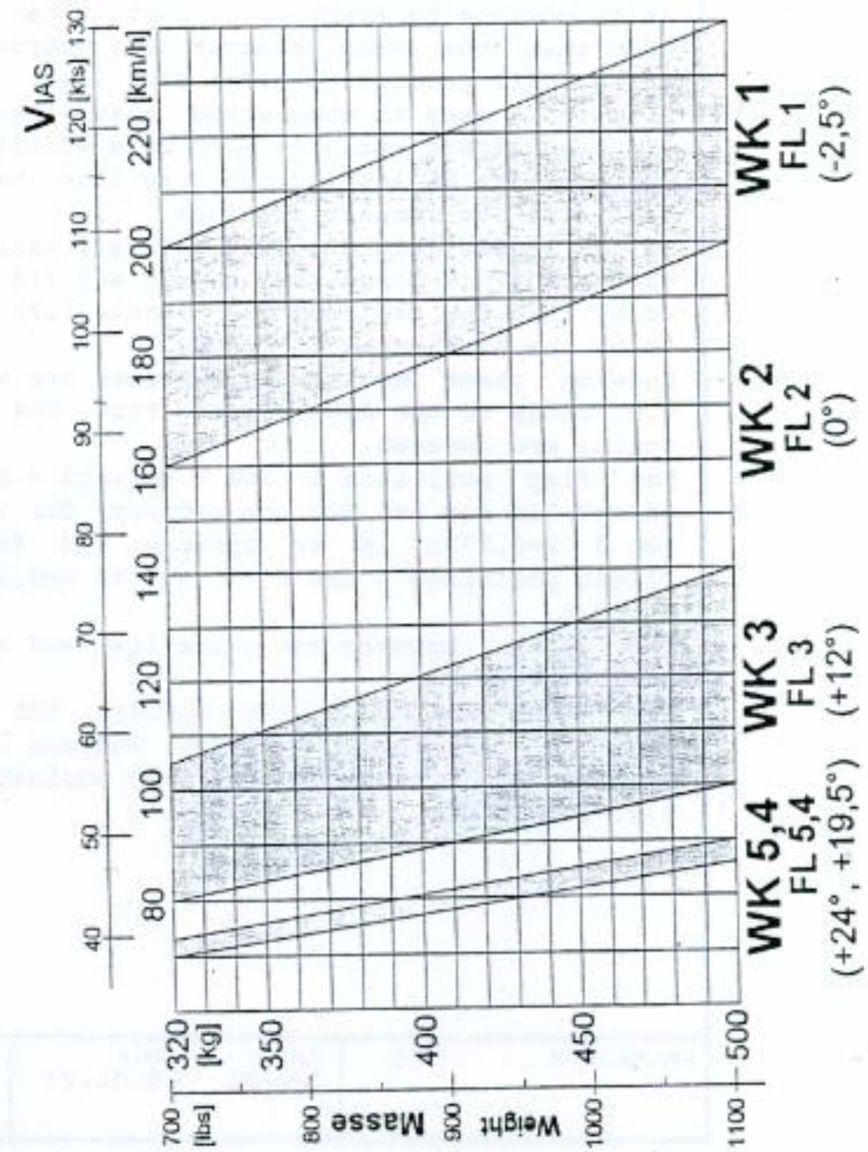
Level-flight speed polars have been calculated carefully using measured polars for an ASW 24, which is the sister model for the 15m Standard Class.

Figure 5.3.2.1-1 Level-Flight Speed Polars
The polars calculated for low and high wing loadings are shown.



5.3.2.2 Optimum-Performance Flap-Setting Ranges

The following diagram was developed using the calculated level-flight polar.



5.3.2.3 Trim drag, influence of c.g.-position on flight performance

In "Technical Soaring" Vol. 16, No. 1 (Jan. 1992) Cedric O. Vernon published an article on "Trim Drag".
He confirmed earlier papers on the subject and explained in detail that the horizontal tailplane must have nearly no lift (neither up nor down) to get the optimum performance of the sailplane.
It is obvious to every pilot that it cannot be optimum that the wing produces lift whereas the horizontal tail produces a great down load.
Also it is easy to understand that the wing with its high aspect ratio is much more efficient at producing lift at low induced drag than the horizontal tail with its compact planform.
So the lowest trim drag for a T-tail sailplane like the ASW 27 is given when nearly all lift is produced by the wing and only very little lift is produced by the horizontal tailplane.
Knowing these details the designer has adjusted the c.g.-range of the ASW 27 such that the calculated optima are covered.
For flap positions 1 and 2 forward c.g.-positions of x=0,21m and x=0,22m are optimum, for flap position 3 x=0,275m is an optimum and for circling flight positions 4 and 5 x=0,29m to x=0,30m are an optimum.
The optima however are quite flat and a compromise has to be found.
For "ridge running" in the eastern USA a forward c.g. is definitely optimum, whereas in very weak weather when circling in thermals dominates a rear c.g. is optimum.

For normal operation a c.g.-position of x=0,25m to 0,29m is regarded as a good compromise for the dry sailplane.
Wing water ballast is located at x=0,24m which brings the c.g. forward. This in turn is more favourable in good weather with long and fast glides and low circling time.

11%

SECTION 6

6.1 Introduction

This section contains 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 the weighing of the sailplane are contained in the applicable ASW 27 **Maintenance Manual**, Section 6.

A comprehensive list of all equipment which is installed in the particular sailplane is enclosed in the last inspection report.

Because the centre of gravity (c.g.) is of vital importance to safe flight, the limits specified (see section 2.7) must never be exceeded.

It is especially important, after repairs, refinishing, and fitting of additional equipment, to ensure that the empty weight c.g. remains within the limits. If this cannot be proved by calculation, the aircraft must be reweighed (see **Maintenance Manual**, Section 6).

6.2 Weight and balance record and permitted payload-range

After weighing the aircraft, the maximum and minimum permissible loads in the seat, baggage compartment, and fuselage water tank are entered in this Weight (Mass) and Balance Form, using table 6.2.1 . Thus, as long as the load limitations are observed, the inflight c.g. will always be within safe and approved limits.

CAUTION: When a tailweight or battery is installed in the special compartment in the fin, the minimum cockpit load is higher!
Therefore, an increased minimum cockpit load must also be indicated in the Weight (Mass) and Balance Form. A placard showing the higher minimum cockpit load must be installed in the cockpit!
The permissible lower cockpit load without trim ballast in the fin is only entered in the Flight Manual page 6.4 .

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 7.13.4 .

6.2.1 Weight and Balance Record/permitted payload range, valid for Serial No: 271.2 3

Date of Weighing	Empty weight*	Empty weight C.G.-arm** aft of RP	Pilot weight including parachute min.*	max.*	Load in baggage compartment and/or fuseage tank*	Inspector's stamp and signature

Permissible load in baggage compartment =
280 kg (617 lbs) minus empty weight of non-lifting parts minus pilot weight minus weight of parachute minus weight of fuselage water ballast. BUT not more than 15 kg (33 lbs) !

* For U.S.-registered sailplanes show lbs.
** For U.S.-registered sailplanes show inches.
Other countries may use metric or SI units.

6.2.2 Water ballast load

The following table gives the possible water ballast load in kg (lb.) depending from the empty weight (mass) of the sailplane plus the useful load.

Empty Weight kg (lb.)	Useful Load, kg (lb.) Pilot + Parachute + Baggage 70 (154)	80 (176)	90 (198)	100 (221)	110 (243)	120 (265)	130 (287)
230 (507)	full	full	full	170* (375)	160* (353)	150* (331)	140 (309)
240 (529)	full	full	170* (375)	160* (353)	150* (331)	140 (309)	+)
250 (551)	full	170* (375)	160* (353)	150* (331)	140 (309)	+)	+)
260 (573)	170* (375)	160* (353)	150* (331)	140 (309)	+)	+)	+)

+) These combinations are precluded because they would cause the maximum permissible weight (mass) of non-lifting parts to be exceeded!

* Fill wing water tanks fully and fill the remaining rest into the fuselage water tank (if installed) !

NOTE: 1 kg of water is equivalent to 2.2 lb. or 0.265 U.S.-gallons

CAUTION: Always fill the wing water tanks first, then fill the remaining water into the fuselage tank.
This is about 140 Litres or 37 US - Gallons for the optional bigger soft water ballast bags then fill the fuselage tank, or about 155 Litres or 51 US - Gallons for integrated wet wing tanks, then fill the fuselage tank .

8,34 PER GAL

Example of load / C.G. calculation:

A weighing gave the following results:
Empty Weight m_L = 240 kg (529.2 lbs)
Empty Weight C.G. x_L = 0.577 m (22.72 inches)

A second weighing with a removeable trim ballast of 4 kg (8.82 lbs) in the fin showed:
Empty Weight m_L = 244 kg (538.02 lbs)
Empty Weight C.G. x_L = 0.635 m (25 inches)

The **WEIGHT (MASS) AND BALANCE FORM** in page 6.4 must be filled in according to the following example :

Date of Weighing	Empty weight*	Empty weight C.G.-arm** aft of RP	Pilot weight including parachute min.*	max.*	Load in baggage compartment and/or fuseage tank*	Inspector's stamp and signature
	240 kg 529 lbs	577 mm 22.72 in. without	70 kg 154 lbs		15 kg 33 lbs	
		trim- ballast in the fin		115 kg 254 lbs	together 45 kg 99 lbs	
xx.xx.97	244 kg 538 lbs	635 mm 25 in. with 4 kg	89 kg 196 lbs		15 kg / full 33 lbs	X X X
		trim- ballast in the fin		115 kg 254 lbs	together 45 kg 99 lbs	

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 sailplane including layout drawings can be found in the **Maintenance Manual.**

The principal purpose of this section is to describe the controls in the cockpit, their operating functions and placards.

7.2 Cockpit controls

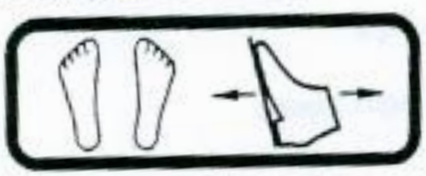
7.2.1 Aileron and elevator

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

7.2.2 Rudder

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

Pedal Adjustment:



Grey knob to the right of the stick.

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

<u>To move the pedals forward,</u> pull the knob and push the pedals forward with your heels. Release the knob and push the pedals to lock in position.

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

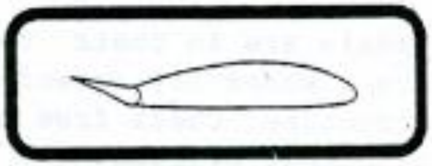
7.2.3 Flap Control

The ASW 27 wing is equipped with trailing-edge controls over the entire span. The **inboard control** is mainly employed as a camber changing flap but also affected by the operation of the ailerons. In flap settings 1 through 5 and A, this **inboard control** deflects almost the same amount as the **outboard control**.
The **outboard control** is usually called an '**aileron**' because it is primarily actuated by the aileron control but it is also deflected in accordance with the flap settings. When the landing flap setting L is selected, the **inboard control** deflects downwards 47° whereas the '**aileron**' deflects downwards 6° only. This helps keep the ASW 27 fully controllable during the landing run.

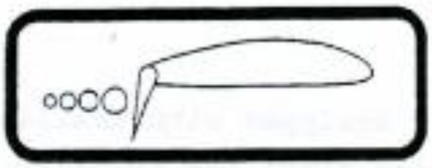
The wing flaps and ailerons are equipped with pneumatic turbulators on the lower surface for the purpose of boundary-layer transition control.
The air emitted through the capillary holes is supplied by the intakes (Pitot or NACA) mounted on the lower surface. This solution is very simple and robust in operation.

Flap settings are selected by means of the black handle on the left cockpit wall.
Pivot the handle down to unlock so that it may be moved forwards or backwards.

The flap settings are marked 1, 2, A, 3, 4, 5 and L above the position pointer.



Flap in high-speed flight setting.



Flap in landing setting.

7.2.4 Trim

The trim is only connected to the elevator-control cicuit.

Normally the ASW 27 is trimmed to about 100 km/h (54kts or 62mph) IAS in flap setting 3. To set the trim, simply press the trim-release button at the control stick when flying at the desired airspeed.

The ASW 27 is now trimmed over a wide speed range when the flaps are set to their optimum position.

For fine adjustment, the stick-mounted trim release button can be pressed at the desired speed.

A trim indicator is fitted along the left cockpit wall near the seat.

When the trim is unlocked by pressing the stick-mounted trim release button, the trim can also be adjusted by sliding the trim-indicator knob to the desired position.

Trim nose heavy

Trim tail heavy

7.2.5 Launch-cable / tow-hook release

High on the left cockpit wall you will find the:

yellow T-handle
for cable-release
(or both releases)

Pulling the yellow T-handle will open one or both the tow hooks.

To allow the launch cable to be attached, pull the yellow knob aft and then merely release it to allow the tow hook to snap shut and lock.

It is possible to install only a forward tow release for aerotowing or only a c.g. tow release for winch- and autotow-launching.

7.2.6.1 Canopy Operation

The canopy is locked after closing by means of the two **white** levers (fitted to the canopy frame on the right and the left) being pivoted forward.

These levers are marked by these labels.

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

7.2.6.2 Emergency canopy jettison

To jettison the canopy, pivot the **red** jettison levers mounted on both sides of the canopy frame backwards and and pull the canopy backwards and upwards!

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

NOTE: If possible, do not leave the aircraft parked or unattended with the canopy open because:

1. The canopy could be slammed shut by a gust of wind which might shatter the canopy.
2. At certain sun elevations, the canopy could act as a reflector, concentrating the sun's rays, which may ignite the cockpit instruments and equipment. At strong sun radiation the canopy should be protected by a white cover to prevent the interior of the cockpit from heating up dangerously. (Electronic equipment and the compass may be affected or damaged).

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

7.2.7 Ventilation

There are two means of ventilating the cockpit:

A vent is located at the front of the canopy.

The vent is operated by means of a small black knob on the instrument panel; pull to open.

This vent also serves as a demister.

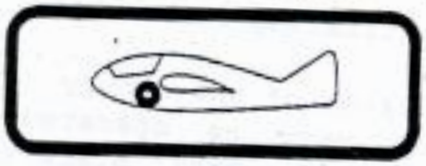
A second air outlet nozzle adjustable in flow rate and direction is fitted on the right cockpit wall. Closing this nozzle increases the demist effect of the front vent.

7.3 <u>Instrument panel</u>

For safety reasons, only a fiberglass instrument panel using a layup plan from the manufacturer may be used.
Instruments weighing more than 1 daN (2.2 lbs) need additional support, beyond the screws provided. This can be accomplished by means of aluminum straps fixed to the box in front of the instrument panel.
Equipment with operating controls must be located within the pilot's reach, when the pilot is secured in the seat safely.
Flight instruments, like the ASI and altimeter, must be mounted within the pilot's field of view.

7.4 Landing gear system

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



Landing gear extended (lever forward)

Landing gear retracted (lever aft)

Tire pressures:
Main wheel: 2.3 bar ± 0.2 bar (33 psi ± 3 psi)
Tail wheel: 2.5 bar ± 0.1 bar (36 psi ± 1.5 psi)
The wheelbrake is operated with the airbrake control lever, see section 7.7 .

7.5 Seats and safety harness

7.5.1 Seat and seating positions

The seat including back and head rests is designed according to latest studies of TÜV Rheinland.
Tall and medium sized pilots can sit comfortably and may adjust their position by adjusting the back rest on its low end (three positions with screws) and on the upper end by actuating the eccentric winch in high right hand cockpit wall position (2,5 to 3 cm [1 to 1.2 in.] per turn of the winch) which is possible in flight. The backrest requires the use of (rigid foam!) cushions or an appropriate parachute.
Optimum seating position is achieved when the upper thighs contact the wedge of the seatpan and the backside fits into the corner to the cockpit floor.

The anchor points of the lap straps are fixed in such a relation to the seatpan that the seating position described above is maintained and submarining (sliding forward from underneath) is extremely remote.
The geometry of the seat is designed such that tall pilots are comfortably seated. For tall pilots, 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, 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. The instrument cover is so designed that the panel edge is in line with the front contour of the glas.

For all sizes of pilots it is very important to adjust and lock the backrest such that they are prevented from sliding aft during the initial take-off (winch-launch) acceleration.
For the same reason the cushions used must be sufficiently rigid and stiff.

Carefully regard that the lever of the eccentricwinch of the backrest is locked!

7.5.2 Safety harness

The safety harness is anchored in such a way that it cannot jam the control runs underneath the seat pan.

The safety harness (seat straps as well as shoulder straps) must be worn at all times, and should be fully tightened. Ensure every time that each individual strap is properly secured in a harness lock. The lock should also be tested from time to time to ensure that it can be satisfactorily released under load.

7.6 Pitot and static systems

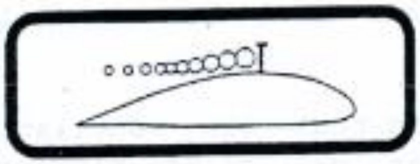
See figure 7.6-1 at the end of this section!

Static pressure for the ASI is obtained from the static ports on either side of the fuselage tail boom.
Pitot (total) pressure for the ASI is obtained from a "Multiprobe" tube or Prandtl tube mounted in the fin.
Optionally a pitot tube mounted in the fuselage nose (ventilation intake) is available.
The pressures for the variometers are obtained from a Prandtl tube or an optional "Multiprobe" mounted in the fin. Ensure that this tube is fully seated in the fin. The O ring in the aft end of the probe should occasionally be lightly lubricated with Vaseline or a similar lubricant to prevent wear.
All ASW 27 are equipped with an adapter for both, a Multiprobe or a Prandtl tube.

The Prandtl tube provides quite accurate pitot and static pressure sources for electronically compensated variometer systems. A Multi-probe provides pitot, static, and total energy (TE) pressures.

7.7 Airbrake system

The airbrakes are operated by the blue handle mounted on the left cockpit wall below the flap handle.



Pull the blue handle to extend the airbrakes.

The ASW 27 is equipped with an airbrake to wheel brake interconnection.
When the airbrake handle is pulled back fully aft, the hydraulic disk brake on the main wheel will also be actuated.

To show this, a placard is installed aft of the airbrake placard.

The triple-panel airbrakes extend from the upper wing surfaces only.
After extending the airbrakes at low speeds, slightly higher trim speeds will result than with the airbrakes closed. At high speeds trim speed will change remarkably when the airbrakes are extended. So the control stick must be handled with care when the airbrakes are operated at high speeds. When the airbrakes are suddenly popped out near V_{NE} expect a rapid deceleration of about 1 "g" (as intended) together with a reduced vertical load factor of about 1/2 "g".
The airbrakes are hard to retract at speeds above V_T = 170 km/h (92 kts, 106 mph). Therefore reduce airspeed below V_T before retracting the airbrakes.

7.8 Baggage compartment

The baggage compartment area behind the spar must only be loaded with objects weighing maximum 2 kg (4.4 lbs) in order not to exceed the in flight c.g. limit! These loads must be carefully secured in place.

NOTE: Please regard that the ventilation openings in the rear wall of the baggage compartment are not obstructed.

Hard objects may not be carried in the baggage compartment in front or on top of the spar without suitably designed lashing or anchorage !
If, for instance, a barograph, a GNSS flight data logger, or an ELT is to be carried in this compartment, a mounting recommended by the manufacturer must be used.

BAGGAGE COMPARTMENT LOAD maximum 15 kg, (33 lbs.)

This placard is attached to the lift-pin tube of the main bulkhead in front of the baggage compartment

Optionally a second battery box may be installed in the baggage compartment lefthand side in front of the spar.
Instead of the baggage compartment above and rear of the spar a fuselage water ballast tank may be optionally installed, see section 7.9 .

WARNING: When the fuselage water ballast tank is removed the baggage compartment floor must be installed to prevent loose objects from falling into the controls, behind and below the spar.

Water ballast system

Normally the wings are equipped with water ballast bags of about 100 litres (26 US-Gal.) capacity.

Bigger water ballast tanks holding about 140 litres (about (37 US-Gal.) together with a fuselage water ballast tank holding 35 litres (9.25 US-Gal.) may be installed instead of the baggage compartment floor as an option. This allows also light weight pilots to fly with maximum wing loading, see section 6.2.2 .
Integrated (wet inner surface) wing water ballast tanks hold about 155 Litres (51 US - Gallons). On the upper outboard wing surface there is a ventilation hole in order to dry the tanks, when not used. A cover is safetied by elastic tape (for example: Fascaltape or Tesaflex 4163, white, Ø 60 mm). At the cover of the hole at the front wing root rib an automatic valve opener is installed which keep the valve open when the wins are de-rigged from the fuselage.

All water ballast valves are actuated mechanically. The control lever is fitted on the arm rest of the right cockpit wall behind the landing gear lever.

The **FORWARD** position of the control lever is all valves **OPEN**.

When the fuselage water tank is installed the appropriate valve is also operated by this lever.
By controlling all the valves with a single lever, an inadvertent opening of only one valve, which would result in an asymmetric and/or tail heavy ballast load, becomes impossible.

7.12 Electrical system

The electric circuit is activated by a switch on the instrument panel.
Each electrical device is protected by its own fuse.
A rather strong fuse next to every battery protects the electric circuits in case of a crash. See also Fig. 7.12-1 at the end of this section.

7.13 Miscellaneous equipment

7.13.1 Oxygen

As optional equipment, a German 3 ltr bottle of about 100-mm diameter or an US-bottle of about 111-mm diameter and 430mm length or 108-mm diameter and 420mm length may be installed.

Appropriate ring type fittings and FRP bottle end fittings are needed and available as an option.

Only use O_2-equipment where the O_2-flow can be monitored and which also comply with JAR 22.1449.

NOTE: Fitting oxygen equipment causes only a minimal change in the empty weight c.g., which is within the approved range !

WARNING: When the sailplane is operated without the oxygen bottle, the hole in the rear cockpit bulkhead must be closed with the cover delivered with the sailplane. Otherwise there is the danger loose objects in the cockpit fouling the controls aft of this bulkhead.

As an option a 4 litre Oxygen bottle of 100 mm in diametre may be installed instead of the fuselage water tank. To do so the baggage compartment floor above and behind the wing spar must be equipped with appropriate fittings for the O_2-bottle used.

7.13.2 Emergency location transmitter (ELT)

The location least vulnerable to damage in case of accident is between the two drag-spar pins on 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 on the cockpit sidewall. Since the whole airframe except for the fin and a small area above the baggage compartment contains carbon fibre which screens electromagnetic radiation, the ELT's antenna must be fitted in the top of the baggage compartment and extend into the canopy area.
Instructions for the installation given by the ELT manufacturer must be followed. The installation of an ELT must be approved by a licensed person.

7.13.3 Removable Trim Ballast

Optionally the ASW 27 can be equipped with a fitting for lead trim ballast plates which can be bolted into place in front of the rudder pedals.
In 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.
A maximum of 6 trim discs weighing 6.66 kg(15.7 lb) together must not be exceeded.

Prior to take-off check the weight of the trim plates and their secure fixing!

One trim plate equals a pilot mass of 2.5 kg (5.5 lbs)

7.13.4 Trim weight (Battery) mounted in the fin

When a trim weight (battery) is fitted in the fin, the minimum cockpit seat load will be higher than 70 kg = 154,5 lbs (incl. parachute).

This increased minimum cockpit load must then be shown in the **DATA and LOADING PLACARD** in the cockpit.
Any **reduced** minimum cockpit load when no tail ballast is fitted will be quoted in Section 6.2.1 .
For further details of minimum cockpit load see in Section 2.10 of this manual.
The foam buffer fitted over the battery secures it above. 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 in the fin compartment must not exceed 6 kg (13.23 lb).

7.13.5 Attachment Point for parachute static line

A red ring is bolted to the rear cockpit wall behind the pilots left shoulder.

7.13.6 Turnpoint Cameras

The canopy frame - in the shoulder area - is designed such that a camera mounted to it is inclined downward a bit, so that the wing tip shows in the upper part of the picture. The inclination saves some bank angle while the turnpoint photo is taken.
To fix the camera make a hole through the canopy frame and use a camera mounting screw (as used to connect it to a tripod).
In order to avoid rotation of the camera the use of VELCRO self adhesive tapes is recommended. Stick the hook side tape to the canopy frame and the loop side tape to the camera.

WARNING: When platforms are used to mount camera(s) they must be removed when no cameras are installed, as they may very likely injure the pilot in a crash !

7.13.7 GPS Flight Data Recorder (Logger)

Small GPS flight data recorders (like the small CAI models) may also be installed to the canopy frame like a camera, see 7.13.6, by use of self adhesive VELCRO tapes and a camera mounting screw.

NOTE: GPS-antenna and the display must be installed to the canopy too or the cables as well as the power supply must be equipped with suitable connectors, so that jettisoning of the canopy is not impaired!

NOTE: Use white tape to cover the data logger so that it may not heated by the sun.

Fig. 7.6 - 1 Pitot and Static Lines and Instrument Connections

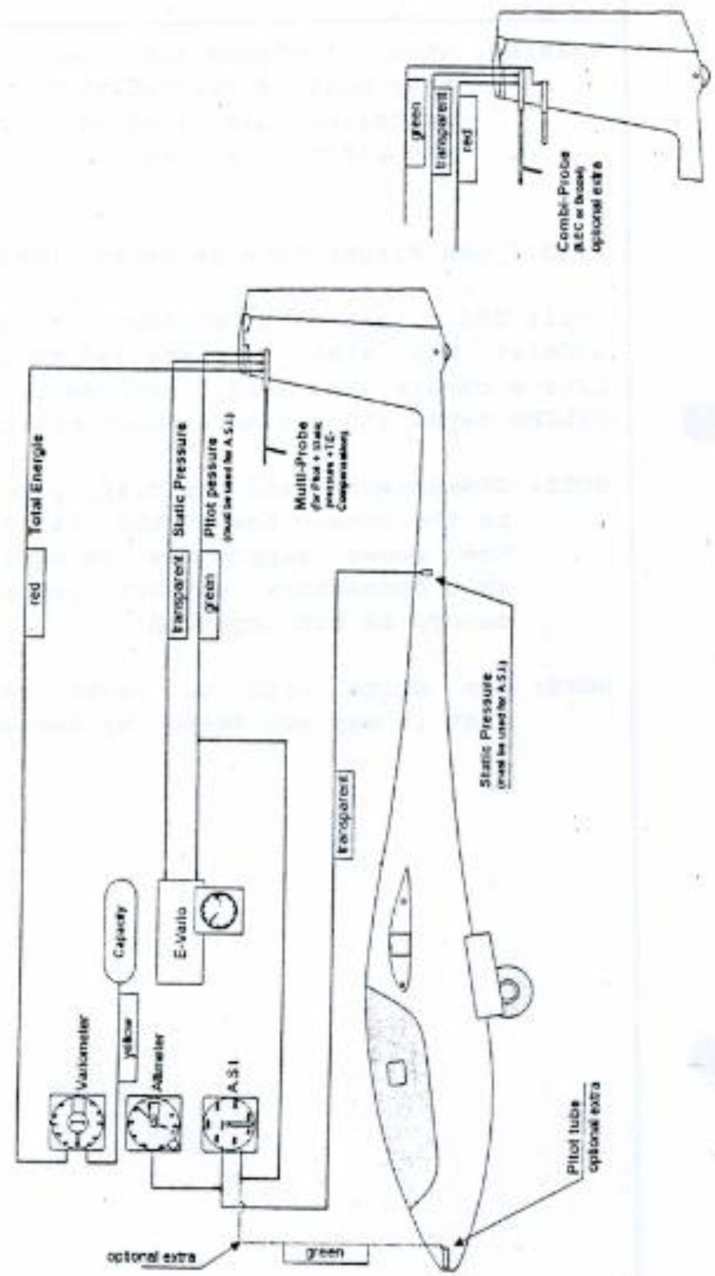
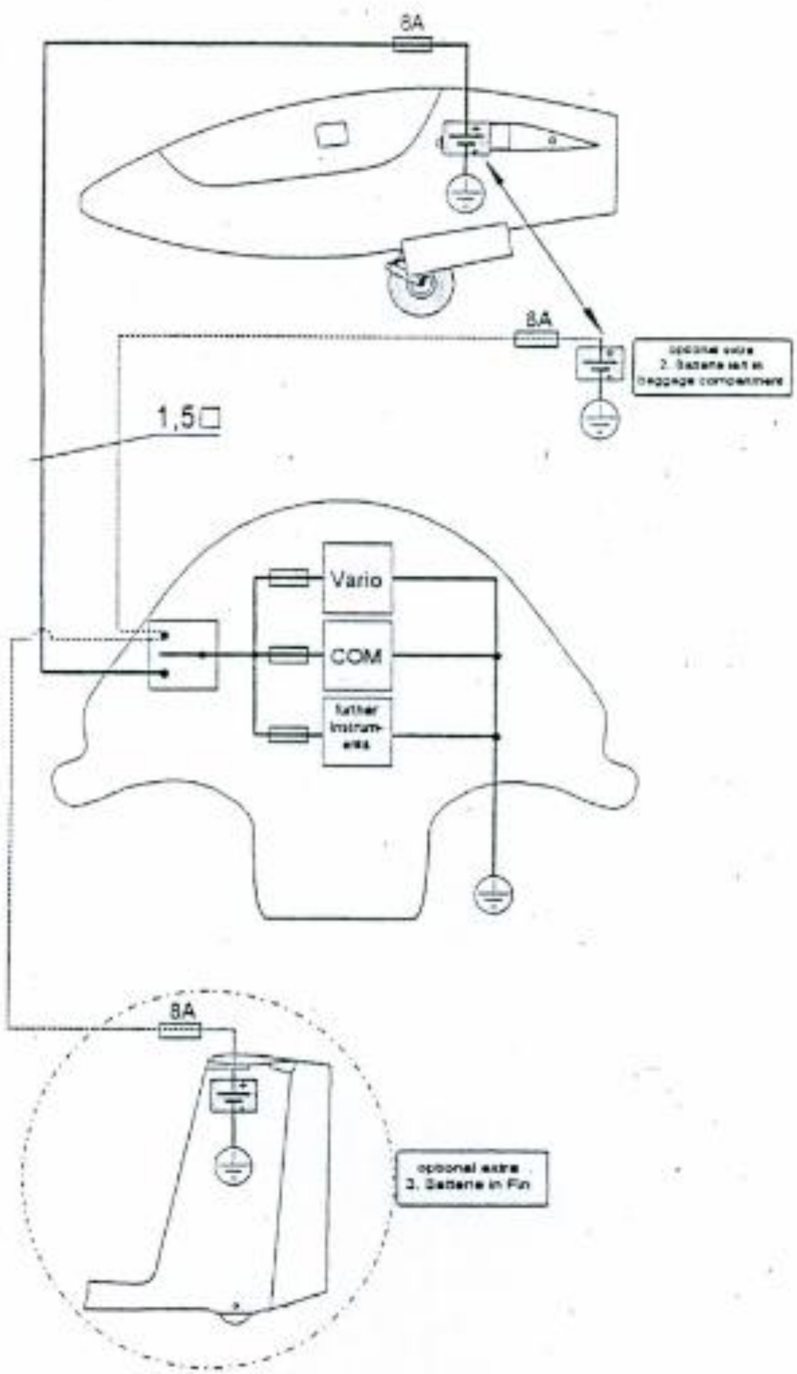


Fig. 7.12 - 1 Circuit Diagram



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

8.1 Introduction

This Section contains manufacturer's recommended procedures for proper ground handling and servicing of the sailplane. It also identifies certain inspection and maintenance requirements which must be followed if the sailplane is to retain 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 period

A complete inspection must be carried out annually.

Further details are given in the ASW 27 **Maintenance Manual**, Sections 4 and 7.

The Operating Manual for Safety Tow Releases from TOST GmbH are approved operational instructions of these components.

8.3 Sailplane alterations or repairs

With respect to repairs and modifications, please see ASW 27 **Maintenance Manual**, Sections 5, 10, 11, and 12.

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

8.4 Ground handling/road transport

(a) Towing on the airfield

For towing the ASW 27 on the airfield a tail dolly is available where an optional towing bar can be attached. A wingwalker is available to lift the wingtip from the ground. This equipment allows safe transport of the sailplane on the airfield behind a car.

(b) Parking

CAUTION: The ASW 27 is equipped with plastic seals over all control gaps. When parking the sailplane, all controls should be set to neutral!

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

Parking the aircraft outside 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.

NOTE: Parking outside without protection against weather or sunlight will reduce the life of the surface finish. After only a few weeks, the polyester finish can become brittle and develop cracks.

If the aircraft is parked in a hangar for protracted periods, it is also recommended that only the canopy be covered. Complete dust covers retain moisture in wet weather for long periods, which can adversely affect the dimensional stability and even the strength of fibre-reinforced composites.

NOTE: For this reason, protracted periods of parking with water ballast on board are also not recommended!
The water ballast valves must be opened in such a case! On integrated (wet inner surface) wing water ballast tanks also the ventilation opening on the outboard upper wing surface must be opened!

(c) Tie-down

To tie down the wings, stands should be used which ensure that the ailerons cannot be stressed by the tie-down ropes.

(d) 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.
Names and addresses of reputable trailer manufacturers can also be supplied.

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 on the fuselage are the main wheel (remember the suspension springing !), and the tail wheel; also, the drag-spar pins (make support bushes from plastic material like Nylon!) and the area under the canopy arch between the c.g.-hook and the lap-strap area.

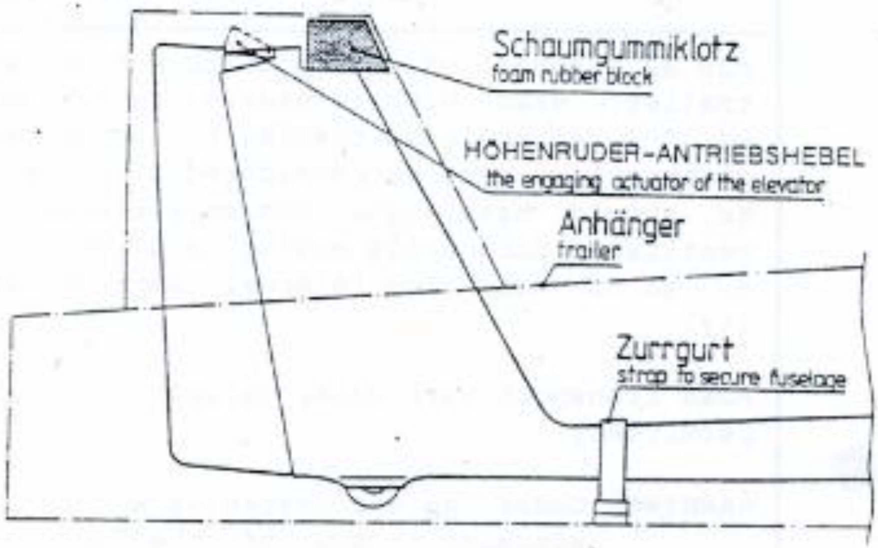
For an aircraft of this quality and value, an open trailer, even with tarpaulin, cannot be recommended. Only an enclosed trailer of composite or metal construction, may be considered suitable. The trailer should have light-colored surfaces and be well-ventilated both while moving and while stationary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

Road transport with water ballast on board is <u>not</u> permitted!

WARNING: Under <u>no</u> 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.

When, for example, a foam block applied some load to the elevator actuator, which, in turn, 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.



8.5 Cleaning and care

Contrary to the popular belief that composite materials are impervious to moisture and ultraviolet light, it can be emphatically stated that even modern sailplanes like the ASW 27 need care and maintenance !

(1) Moisture-effects on the structure of fiber-reinforced plastics and on the surface finish.

In the long run, moisture will damage fiber-reinforced composites because it penetrates the epoxy-resin matrix and causes it to swell, which partially bursts the tight cohesion between the plastic molecules.
In particular, a combination of high temperature and high humidity must be avoided !
For example, a poorly ventilated trailer which is damp inside and is then heated by the sun.

Neither the highest quality paint on the surfaces nor the plastic or rubber of the water ballast-tanks can prevent water-vapor diffusion; they can only retard the process.
If water has entered the airframe and cannot be removed by means of a sponge or a chamois, the aircraft should be derigged and dried out, while periodically turning the affected part, in a room which should be as dry as possible but not too hot.

(2) Sunlight-effects on the surface finish

Sunlight, especially its ultraviolet (UV) component, makes the white polyester gelcoat and the canopy plastic brittle. The wax layer on the gelcoat also oxydizes and discolors more quickly if the aircraft is unnecessarily exposed to strong sunlight. There is no paint finish on the market which is suitable for plastic gliders, and would approximate the life span of the composite structure of the airframe without maintenance.

(3) Care of surface finish

Because the white polyester gelcoat is protected by a fairly durable wax layer, it will tolerate washing occasionally with cold water, with a little cleaning solution added.

CAUTION: The use of alcaline cleaning agents (e.g. "Meister Proper") may affect the paint surface and even penetrate as far as into the foam of the sandwich structure and damage it. In single 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.

Under normal use, the wax coating need only be renewed annually, using a rotary buffer.
Under moderate European conditions, it will suffice if twice a year a good paint preservative (see next chapter) is used in addition. In areas subjected to long and hard sun exposure, this procedure should be followed more often.

To care for the finish, only **silicone-free** preparations may be used (for example 1 Z-Special Cleaner-D 2 from W. Sauer GmbH & Co., D-51429 Bergisch Gladbach).

Traces of adhesive from self-adhesive tape are best removed by means of benzene. (Gasoline is toxic!) After cleaning, renew the wax coating.

NOTE: The identification and decorative markings contain nitric or acrylic paint and, therefore, thinners must not be used and even benzene should not be allowed to remain in contact with them for prolonged periods.

(4) Canopy

The **acrylic** canopy (Plexiglas or Perspex) should only be cleaned using special solutions intended for such material (for example Plexiklar) or with lots of clear water. A dry cloth should never be used for dusting or cleaning. "Pronto" or "Pledge" which are often used are **NOT** allowed as they make the canopy brittle and may cause early crazing.

(5) **Safety harness**

The safety-harness straps should be regularly inspected for tears, compressed folds or wear, and corrosion of the metal parts and buckles. The reliable operation of the release mechanism should be tested, under simulated load, occasionally.

SECTION 9

9. Supplements

9.1 Introduction

9.2 List of inserted supplements

9.3 Supplements inserted

9.1 Introduction

This Section contains the appropriate supplements necessary to safely 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

The following supplements are already covered by this Flight Manual:

(1) Oxygen-system installation	Section 7.13.1
(2) Emergency Location Transmitter	Section 7.13.2
(3) Removable trim ballast	Section 7.13.3
(4) Trim weight (battery) mounted in the fin	Section 7.13.4
(5) Turnpoint camerase	Section 7.13.6
(6) GPS flight data recorder (Logger)	Section 7.13.7

9.3 Supplements inserted

(1) Oxygen-system installation:

When flying at greater heights while using the oxygen system, it should be borne in mind that a particular system may only be suitable for a limited altitude range. The manufacturer's instructions should be followed.
See section 7.13.1 !

(2) Emergency location transmitter

See section 7.13.2 of this manual !

(3) Removable trim ballast

See Section 7.13.3 of this manual !

(4) Trim weight (battery) mounted in the fin

See section 7.13.4 of this manual !

(5) Turnpoint cameras

See section 7.13.6 of this manual !

(6) GPS flight data recorder (Logger)

See section 7.13.7 of this manual !

NOTE: Further entries to this section must be provided in accordance with JAR-22 App H-27 .