ALEXANDER SCHLEICHER SEGELFLUGZEUGBAU

ASK 21 B

Flight Manual

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Flight Manual

for the sailplane

ASK 21 B

Model:	ASK 21 B
Serial Number:	21953
Registration:	VH-GTY
Data Sheet No.:	EASA.A.221
Issue:	15.06.2018

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

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

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

Section 0

0.1 Record of Revisions

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

Record of Revisions

Rev No.	Section & Pages Affected	Date of Issue	Approval	Date of Approval	Date of Insertion	Ref. / Signature
1	4.17, 7.14 thru 7.17	5/5/22	TN 9	20/6/22	9/6/23	GG 22990

Record of Revisions

Rev No.	Section & Pages Affected	Date of Issue	Approval	Date of Approval	Date of Insertion	Ref. / Signature

0.2 List of Effective Pages

Section		Page	Date
Title Page		---	15.06.2018
0		0.1	15.06.2018
		0.2	15.06.2018
		0.3	15.06.2018
		0.4	15.06.2018
		0.5	15.06.2018
		0.6	15.06.2018
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0.3 Table of Contents

Section

Section 1

1 General

1.1 Introduction

This Flight Manual has been prepared to provide pilots and instructors with information for the safe and efficient operation of the ASK 21 B sailplane.

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

1.2 Type Certification Basis

The ASK 21 B has been approved by the European Aviation Safety Agency (EASA) in accordance with LFSM issued 23rd October 1975.

The Type Certificate has the number EASA.A.221.
Category of Airworthiness: Utility and Aerobatic.
"Utility" refers to sailplanes used in normal gliding operation. "Aerobatic" refers to sailplanes used in aerobatic operation.

1.3 Warnings, Cautions and Notes

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

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

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

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

1.4 Description and Technical Data

The ASK 21 B is a mid-wing two-seater glider with damped T-tail, sprung landing gear with hydraulic disc brake and nose wheel. The wing is equipped with air brakes on the upper surface.

The aircraft is built in FRP-sandwich-monocoque construction.

It may be used for school and performance flights as well as for aerobatics of the airworthiness category "A".

Technical Data:

Span	17 m	55.77 ft
Fuselage length	8.35 m	27.39 ft
Height (Fin and Tail Wheel)	1.55 m	5.09 ft
Wing area	17.95 m^2	193.21 ft^2
Wing chord (mean aerodynamic)	1.121 m	3.68 ft
Aspect ratio	16.1	16.1
Max.Take-Off Mass	600 kg	1323 lbs
Max. Wing loading	33.4 kg/m^2	6.84 lbs/ft^2

General View:

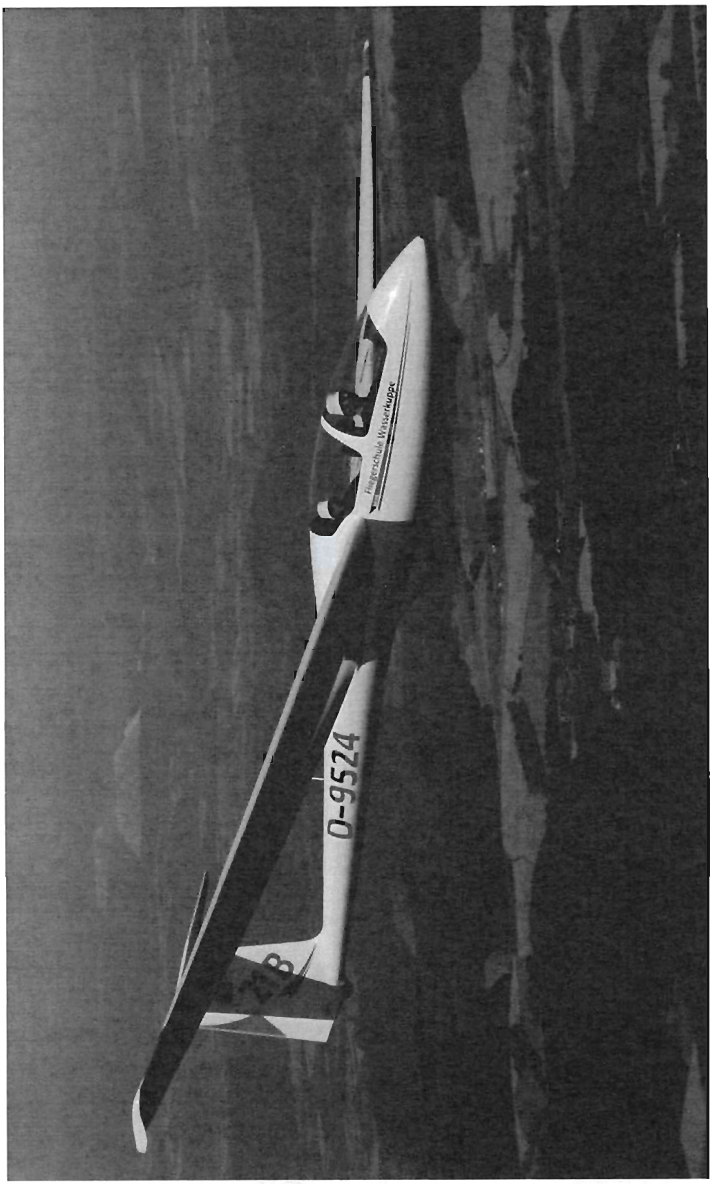
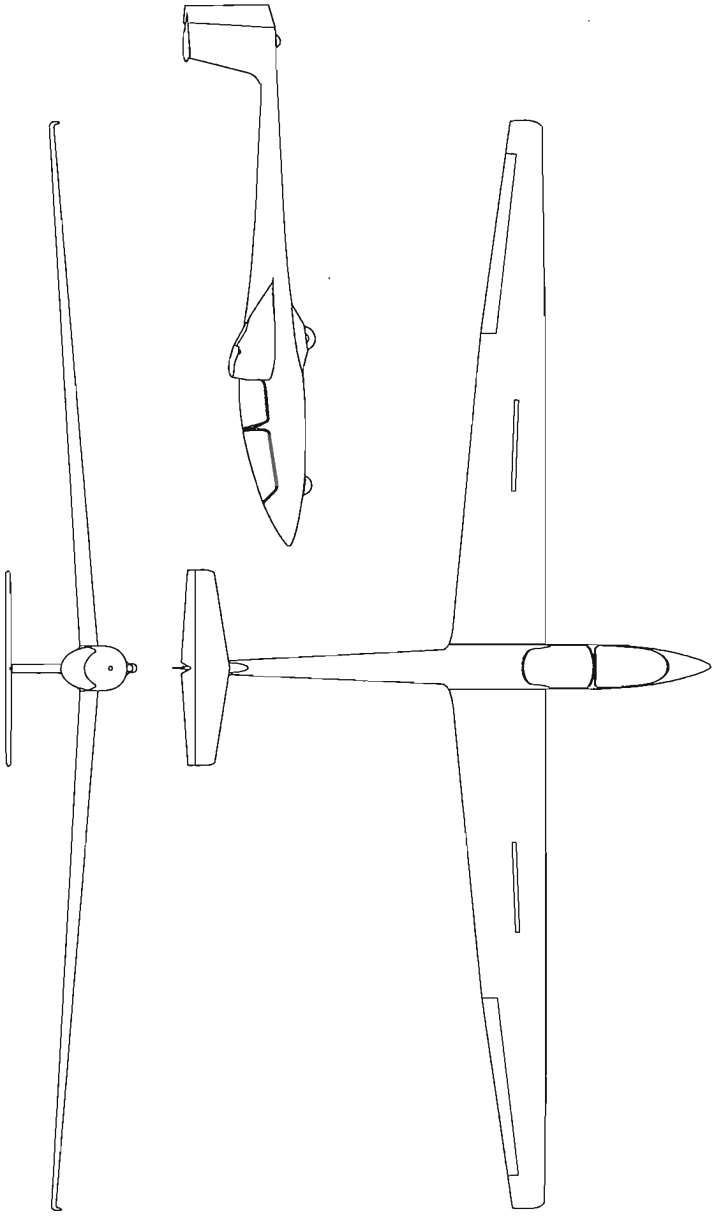


Photo: Manfred Münch

1.5 Three View Drawing



Section 2

2 Limitations

2.1 Introduction

Section 2 includes operating limitations, instrument markings and basic placards necessary for the safe operation of the ASK 21 B and its standard systems and standard equipment as provided by the manufacturer.

2.2 Airspeed

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

	Speed	IAS	Remarks
V_{NE}	Never exceed speed for **calm air**	280 km/h 151 kts 174 mph	Do not exceed this speed in any operation and do not use more than 1/3 of control deflection.
V_{RA}	**Rough air speed**	200 km/h 108 kts 124 mph	Do not exceed this speed except in smooth air, and then only with caution. Examples of rough air are lee-wave rotors, thunderclouds, visible whirlwinds, or over mountain crests.
V_A	**Manoeuvring speed**	180 km/h 97 kts 111 mph	Do not make full or abrupt control movement above this speed, because under certain conditions the sailplane structure may be overstressed by full control movement.
V_W	Maximum **Winch-launching speed**	150 km/h, 81 kts 93 mph	Do not exceed this speed during winch- or autotow launching

	Speed	IAS	Remarks
V_T	Maximum **Aero-towing speed**	180 km/h 97 kts 111 mph	Do not exceed this speed during aerotowing.

2.3 Airspeed Indicator Markings

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

Marking	(IAS) value or range	Meaning
Green arc	80 – 180 km/h 43 – 97 kts 50 – 111 mph	Normal Operating Range
Yellow arc	180 – 280 km/h 97 – 151 kts 111 – 174 mph	Manoeuvres must be conducted with caution and only in smooth air.
Red line	280 km/h 151 kts 174 mph	Maximum speed for all operations.
Yellow tri-angle	90 km/h 49 kts 56 mph	Approach speed at maximum weight.

2.4 G-Meter Markings (only Aerobatic)

G-meter markings are shown below:

Marking	Acceleration value or range [g]
Yellow arc	+5.3 to +6.5 -3.0 to -4.0
Red line	+6.5 -4.0

2.5 Weight (Mass)

Maximum Take-Off Mass	600 kg	1323 lbs
Maximum Landing Mass	600 kg	1323 lbs
Maximum Mass non-lifting Parts	410 kg	904 lbs
Max. Mass in each Baggage Compartment	10 kg	22 lbs
Max. Mass of (optional) Spin Ballast in the Fin	12 kg	26.5 lbs

2.6 Centre of Gravity

Centre of gravity range (for flight):

foremost limit	234 mm	9.21 inch	aft of RP
rearmost limit	469 mm	18.46 inch	aft of RP

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

2.7 Approved Manoeuvres

This sailplane is certified for use in normal gliding operation according to Airworthiness Category U, "Utility". Intentional spinning is approved as described in section 4.5.3.2 "Intentional Spinning".

In compliance with the extended minimum equipment (see section 2.11) this sailplane is certified for aerobatic use according to Airworthiness Category A, "Aerobatic". All manoeuvres except flick manoeuvres are permitted. Not permitted are: negative Loop (Outside Loop), negative up from inverted to vertical, negative from vertical to inverted, inverted Spin and positive or negative Tailslide. Examples for permitted manoeuvres are: Positive Loop, Clover, Stall Turn / Hammerhead, Half Roll and half Loop / Split S, Half Loop and half Roll / Immelmann, Slow Roll, Hesitation Roll / Point Roll (2 and 4 stops), Rolling Turn, Inverted Flight, Inverted Turn, upright Spin, Steep Climbing Turn, Lazy Eight, Chandelle, Cuban Eight (including slow rolls), Humpty upwards (pushed), Humpty 30° upwards from normal flight to inverted (pulled) as well as Lines upwards and downwards.
Refer to chapter 4.5.9 for a more detailed description of the aerobatics.

2.8 Manoeuvring Load Factors

The airworthiness requirements result in the following limits:

Maximum permissible manoeuvring load factors,
at an air speed of 180 km/h (97 kts, 111 mph):
maximum positive load factor: + 6.5
maximum negative load factor: - 4.0

With increasing air speeds, these values will reduce.
At an air speed of 280 km/h (151 kts, 174 mph):
maximum positive load factor: + 5.3
maximum negative load factor: - 3.0

Maximum permissible manoeuvring load factors with airbrakes extended:
maximum positive load factor: + 3.5
maximum negative load factor: - 0.0

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

2.9 Flight Crew

Solo flights have to be conducted only from the front seat.

Pilots (incl. parachute) weighing less than the minimum cockpit load, 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. In addition the minimum cockpit load is shown in the Operating Limitations Placard in the cockpit (DATA and LOADING PLACARD).

With a crew of two, the pilot in command sits in the front seat. However, if the occupants agree prior to the flight that the pilot in command sits in the rear seat, than it is necessary that all controls and instruments are available in the rear seat and that the pilot is familiar with the operation of the aircraft from this position.

2.10 Kinds of Operation

Flights may be carried out in accordance with day VFR.

Aerobatics and Cloud Flying are permissible in compliance with the extended minimum equipment (see section 2.11).

2.11 Minimum Equipment

Minimum Equipment consists of:

1 ASI in the front instrument panel, indicating up to at least 300 km/h (162 kts, 187 mph)
1 altimeter in the front instrument panel
2 4-part safety harness (symmetrical)
1 parachute or cushion for the back rest (~ 8 cm thickness) for each occupant

Additionally required for instruction or if the pilot in command sits in the rear seat:

1 ASI in the rear instrument panel, indicating up to at least 300 km/h (162 kts, 187 mph)
1 altimeter in the rear instrument panel

For Aerobatics

2 additional bottom straps for the safety harness
1 G-meter in the front instrument panel
(additionally required for instruction or if the pilot in command sits in the rear seat: 1 G-meter in the rear instrument panel)
Foot loops on rudder pedals
1 parachute for each occupant

For Cloud Flying

1 variometer in the front instrument panel
(additionally required for instruction or if the pilot in command sits in the rear seat: 1 variometer in the rear instrument panel)
1 turn and bank indicator in the front instrument panel
(additionally required for instruction or if the pilot in command sits in the rear seat: 1 turn and bank indicator in the rear instrument panel)
1 compass in the front instrument panel
(additionally required for instruction or if the pilot in command sits in the rear seat: 1 compass in the rear instrument panel)
1 VHF transceiver (ATC/COM)

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

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

2.12 Approved Launch Methods

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

The maximum permissible launch speeds are:

aerotowing	180 km/h (97 kts, 111 mph)
winch launch, car tow	150 km/h (81 kts, 93 mph)

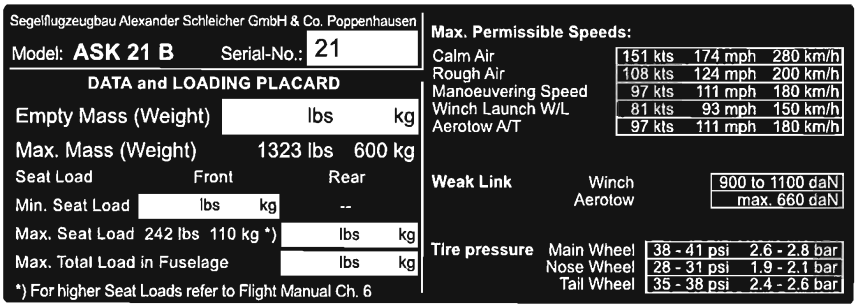
For winch launch, a weak link of 1000 daN ±10% (2248 lbs, black) must be used with the launch cable or tow rope.

For Aero Tow, a weak link according to the tow plane must be used, not stronger than 600 daN ±10% (2248 lbs, black).

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

2.13 Limitations Placards

This placard is located on the right-hand cockpit sidewall and contains the most important mass (weight) and speed limitations (the original placard is to be enlarged by 130%):



If the aircraft has not installed the minimum equipment for aerobatics (see 2.11), this placard is located near the data placard:

Aerobatics are not permitted!

If the aircraft has installed the minimum equipment for aerobatics (see 2.11), this placard is located near the data placard:

Aerobatics permitted as per flight manual

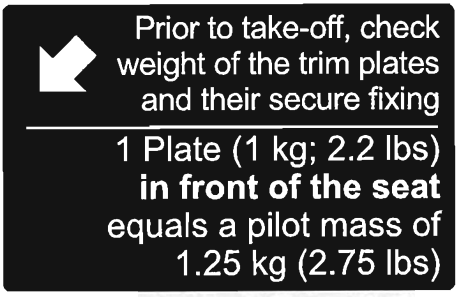
If the aircraft has not installed the minimum equipment for cloud flying (see 2.11), this placard is located near the data placard:

Cloud flying is not permitted!

If the aircraft has installed the minimum equipment for cloud flying (see 2.11), this placard is located near the data placard:

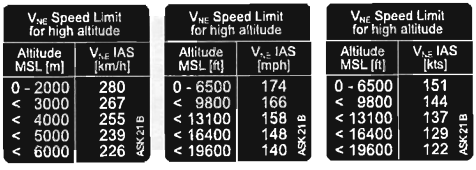
Cloud flying permitted as per flight manual

This placard is located on the right-hand cockpit sidewall of the front seat:



This placard is located below the baggage compartment opening:

The appropriate of these placards is located close to the airspeed indicator:



NOTE
For further placards refer to Maintenance Manual Section 9.

Section 3

3 Emergency Procedures

3.1 Introduction

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

EMERGENCY PROCEDURES

(1) **Canopy Jettison**

front seat	**rear seat**
• Fully pull back the red canopy jettison handle above the instrument panel	• Fully pull back both red canopy jettison handles
• Push canopy upwards	• Push canopy upwards by the handles

(2) **Bailing Out**

front seat	**rear seat**
• Push instrument panel upwards	• Open safety harness
• Open safety harness	• Get up
• Roll over cockpit side	• Climb over cockpit side
• Push off strongly	• Push off strongly
• Caution: Watch wing & tailplane	• Caution: Watch wing & tailplane
• Pull parachute	• Pull parachute

(3) **Spin Recovery**

- Apply full rudder opposite to the direction of the spin
- Short pause (1/2 spin turn)
- Ease the control column forward until rotation ceases
- Centralise rudder and ease out of the ensuing dive

3.2 Jettisoning of Canopy

Front canopy: Fully pull back the red canopy jettison handle above the instrument panel and push the canopy upwards.

Rear canopy: Fully pull back both red canopy jettison handles and use them to push open the canopy. The air stream will break off the canopy rearwards.

CAUTION
Do not push up the front canopy directly above the head with the hands. The rear pins of the locking mechanism will hold the rear end of the canopy down, to make it swivel around its trailing edge.

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

3.3 Bailing Out

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

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

Rear Pilot: Get up - the supporting structure at either side of the instrument panel and the canopy arch serve as handholds - and climb out.

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

CAUTION
Watch out for wing leading edge and tailplane!

3.4 Stall Recovery

In straight or circling flight, relaxing the back pressure on the stick will always lead to recovery. Due to its aerodynamic qualities the ASK 21 B will immediately regain airspeed.

When the glider drops a wing, do not try to counteract rolling motion with the aileron. Relax back pressure on the stick and use the rudder.

3.5 Spin Recovery

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

① Check ailerons neutral.

② Apply full rudder opposite to the direction of the spin.

③ Short pause (hold control inputs for about 1/2 spin turn).

WARNING
Ignoring the pause may delay the recovery!

④ Ease the control column forward (means, give in to the pressure of the stick) until rotation ceases and sound airflow is established again.

WARNING
Full forward stick may delay or even prevent the recovery!

⑤ Centralise rudder and ease out of the ensuing dive.

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

NOTE
During spins the ASK 21 B oscillates in pitch. From a steep nose down spin recovery according to the standard procedure is up to 1 turn, from a flat slow spin less than 1 turn.

The altitude loss from the beginning of the recovery until the normal flight attitude is regained is about 80 m (260 ft).

3.6 Spiral Dive Recovery

Depending on the aileron position in a spin, with forward C.G. positions (i.e. the C.G.-range in which the ASK 21 B cannot sustain a steady spin) it will immediately or after a few turns develop a spiral dive or a slipping turn similar to a spiral dive.

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

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

3.7 Other Emergencies

Groundloops

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

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

Defective Airbrake Control Circuit

If sudden strong change of flight course happens, the pilot should immediately visually check whether the airbrakes have extended on both wings as this asymmetry may have been caused by an airbrake extended on one wing only. This problem could occur due a defect in the airbrake control circuit and cannot be compensated by rudder deflection.

If the airbrake has extended on one wing only, the other airbrake must immediately be extended so far that the aircraft will regain straight and level flight and the airbrake lever must be held in this position.

Depending on the flight altitude initiate an outlanding immediately.

Section 4

4 Normal Procedures

4.1 Introduction

Section 4 provides checklists and procedures for the conduct of normal, daily, operations. Normal procedures associated with optional systems can be found in Section 9.

4.2 Rigging and Derigging

The ASK 21 B can be rigged and derigged without use of rigging aids by four people, or by three people when a fuselage cradle and a wing stand are used.

Rigging

1. Clean and lubricate all pins, bushings and control connections.
2. Support fuselage and keep upright.
3. Push the airbrake lever forward and centre the stick.
4. Begin with the left inner wing and insert its spar fork into the fuselage. If available, support the wing with a wing stand. While rigging, unlock the airbrake over-centre lock in the wing.

   NOTE
   The wing stand must not obstruct the movement of the ailerons!

5. Insert right wing spar root and line up the main pin bushings. Insert and lock main pins. Only now - and not before - may the wing weight be relaxed.

   NOTE
   Never insert the rear wing attachment pins prior to the main pins!

6. Press in the rear wing attachment pins; unscrew the T-tool (special tool, refer to maintenance manual section 12.2) and check whether the safety lock is engaged.

7. After cleaning and lubricating lightly the elevator studs and sockets the tailplane is pushed onto the fin from the front and the elevator must be guided into the elevator connection. Now push the tailplane home until the hexagon socket head bolt (Allen screw) at the leading edge will engage its thread. The bolt must be fully and firmly tightened. The spring loaded lock must engage correctly.

8. Insert the TEC-probe into the fuselage or into the fin (optional equipment) up to the stop.

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

   The elevator-rudder junctions should also be sealed with tape. The canopy rim must never be taped over, so as not to impair bail-out.
   It is recommended that appropriate areas should be thoroughly waxed beforehand, so that the adhesive tape can afterwards be cleanly removed without lifting the paint finish.

10. If necessary charge the battery.

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

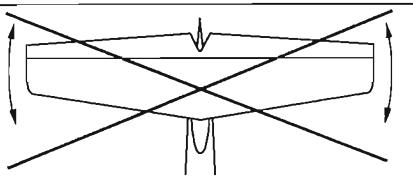
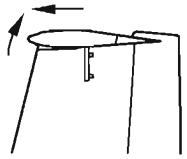
Derigging

Proceed in the reverse order of rigging. It must be paid attention to remove the rear wing attachment pins prior to the main pins.

WARNING

To de-rig the horizontal tail from the fin, only use the method according to Fig. 4.2-1.

Fig. 4.2-1: Correct derigging of the horizontal tail

WRONG: Twist Movement	**RIGHT:** Pitch Movement
	

4.3 Daily Inspection

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

Daily Inspection of the Glider

1) Open canopies. Check main pins inserted up to the handle and secured.
2) Check cockpit and control runs for loose objects or components.
3) Check all batteries for firm and proper attachment.
4) Check full, free and stress-free operation of all controls. Hold controls firmly at full deflection while loads are applied to control surfaces.
5) Check ventilation opening and pitot tube in fuselage nose.
6) Check condition and operation of towing hooks. Check free operation of the release control. Do not forget release checks!
7) Check inflation and condition of tires:
   Main wheel: 2.7 bar ± 0.1 bar (39.5 psi ± 1.5 psi)
   Nose wheel: 2.0 bar ± 0.1 bar (29.5 psi ± 1.5 psi)
   Tail wheel: 2.5 bar ± 0.1 bar (36.5 psi ± 1.5 psi)
8) Check wheel brake for operation and leaks. With airbrake paddles fully extended the resilient brake pressure from the main brake cylinder should be felt through the brake handle.
9) Check both upper and lower wing surfaces for damage.
10) Airbrake paddles: Check condition and control connections. Check both sides for a good over-centre lock. Check both airbrake boxes for loose objects, stones, water etc.
11) Ailerons: Check condition, play and full and free movement, check control connections.

12) Check fuselage, especially underside, for damage.

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

14) Pressure probe on the tail boom or optional in the fin: Check condition and proper seating.

15) Check if spin ballast (optional) is installed inside the fin compartment.

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

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

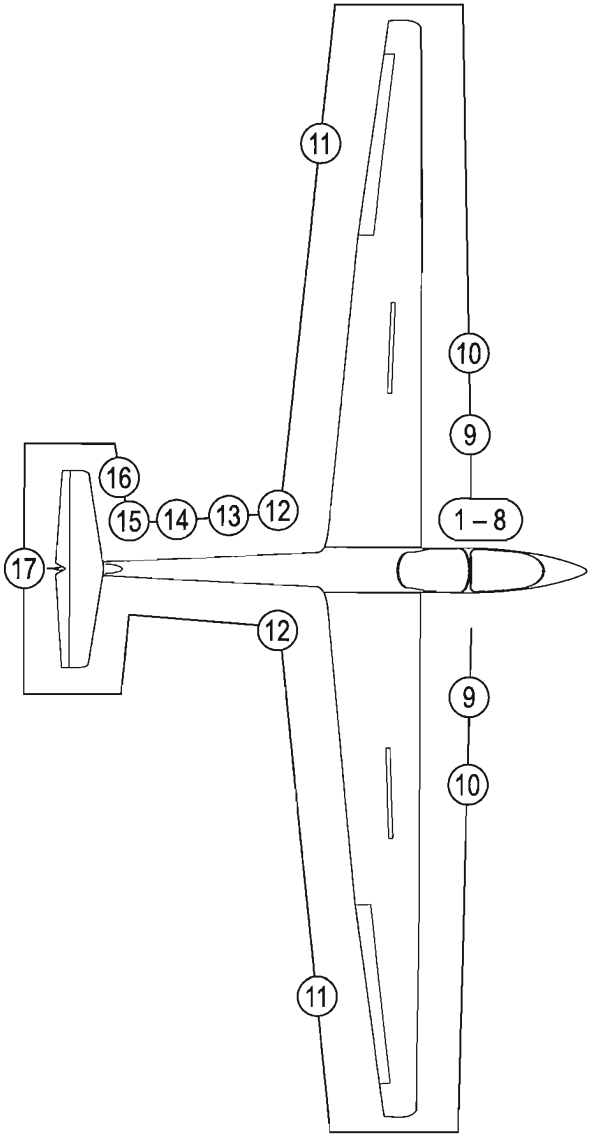
The numbers for the above points correspond with those in the following illustration "Tour of Inspection".

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

Pre Flight Check

- Check main pins (secured)
- Check for foreign matter in the cockpit
- Check comtrols (positive connections, freedom of movement and play)
- Check pitot and static pressure openings (dry and unobstructed)
- Check for visible damage on towing hooks, landing gear and surfce
- Test tow release
- Check tyre pressure and wheel brake
- Check TEC-Probe mounted and inserted until stop
- Check correct mounting and securing of the tailplane
- Check spin ballast in vertical tail (optional)
- Check mass and balance

Tour of Inspection round the Aircraft



4.4 Pre-Flight Inspection

Place the headrest in the front seat correctly before entering the sailplane. If the adjustable backrest is used, the headrest is inserted into the attachment on the backrest - otherwise into the attachment inside the rear instrument cover.

The headrest of the front seat has to be adjusted such that the point of head contact is at eye level.

The following Check List containing the most important points is affixed within easy view of the pilot, upon the left cockpit frame:

Pre Take-off Check

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

4.5 Normal Procedures and Recommended Speeds

4.5.1 Winch Launch

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

CAUTION
Before Take-Off, check seating position and that controls are within reach. The seating position, especially when using cushions, must preclude the possibility of sliding backwards during initial acceleration or steep climb.

For winch launch, a weak link of 1000 daN ± 10% (2248 lbs, black) must be used in the launch cable or tow rope. (Weak link colours refer to the colour scheme of the Tost company)

The trim should be set neutral.

Maximum acceptable crosswind component is listed in section 5.3.1.

	Recommended	Maximum
Winch-launch airspeed:	90 – 110 km/h 49 – 59 kts 56 – 68 mph	150 km/h 81 kts 93 mph

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

Rudder and aileron immediately respond during take-off run, so it is possible to keep the wings level. With the trimmer adjusted as mentioned above, the ASK 21 B will assume a gentle climb attitude after take-off. Nevertheless, every winch launch is different and the pilot must be prepared to correct the flight attitude immediately. After take-off, pitch and flight path is controllable right away.

NOTE

Actions necessary after a cable failure are always also subject to wind and airfield circumstances. Apart from this, after a cable failure in the flat phase of a winch launch the pilot must immediately push sensitively (Do not push the glider into the ground!) to establish a stabilized flight attitude before taking any further action.

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

CAUTION

After a cable failure in the steep part of the winch launch the stick must be immediately and fully pushed forward. Achievement of a safe airspeed can only be learned from the airspeed indicator, not from the pitch attitude.

WARNING

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

4.5.2 Aero Tow

CAUTION
The sailplane is only certificated for aerotow operation when the forward tow release in front of the nose wheel is used.

A textile rope of a length of 30 – 60 m (100 – 200 ft) is recommended.

The trim should be set neutral.

NOTE
Before start, inform the tow pilot of the recommended towing speed.
Recommended towing speed for climbing: *90 – 140 km/h*
49 – 75 kts
56 – 87 mph

Maximum acceptable crosswind component is listed in section 5.3.1.

4.5.3 Flight

CAUTION
Flights in conditions conducive to lightning strikes must be avoided as these are not covered by the airworthiness requirements for type certification.

4.5.3.1 Low Speed Flight, Stalls and Spins

With the stick back a distinct tail buffet is felt. The aircraft is very benign in low speed flight. By use of normal aileron deflections the wing may be kept level down to minimum speed, even with aft C. of G. positions. With normal rudder deflections no wing dropping is found. Yaw angles of up to 5° have no significant influence on the wing dropping attitude.

The speed at which the stall takes place depends on the payload, refer to section 5.2.2.

Also rapid pulling up into 30° pitch does not cause wing dropping, but just a gentle nose drop.

The same applies for stalling out of a 45° turn. But it is necessary to point out that even the most benign aircraft needs speed in order to be controllable. In turbulence this is especially important when also a wing dropping may occur. Spin development from wing dropping strongly depends on the C. of G. position and also to some extent on the pilot reaction.

The speed at which the stall takes place depends on the bank angle, refer to section 5.2.2.

For C. of G. positions of up to 315 mm (12.4 in) aft of datum, the ASK 21 B does not spin at all. This configuration applies to two heavy pilots. For C. of G. positions from 320 mm through 385 mm aft of datum, more incipient spin turns are possible followed by self recovery after up to 4 1/2 turns at most. Such C. of G. positions can be reached in dual flight only with a lightweight pilot in the front seat.

For C. of G. positions of more than 400 mm (15.75 in) aft of datum controllable sustained spins are possible. Such C. of G. positions usually are only possible with one pilot flying solo.

NOTE

During spins the ASK 21 B oscillates in pitch. From a steep nose down spin recovery according to the standard procedure (see Section 3) is up to 1 turn, from a flat slow spin less than 1 turn.

4.5.3.2 Intentional Spinning (Spin Training)

Introduction

This section provides all information, which are important for spin training. Further information can be found in the excerpt of the USAF manual in appendix B. The spin ballast table (optional equipment) can be found in appandix A.

Spin Characteristics

The ASK 21 B spins in upright flight as well as in inverted flight.

> ***WARNING***
> *Intentional spins are only permitted in upright flight.*

The ASK 21 B spins fast, steeply and combined with a pitch oscillation. The oscillation of the spin causes a variance in pitch attitude that can range from extremely steep to nearly flat. Thereby the nose can pitch up almost to the horizon and the cockpit noise can calm down nearly completely. The pilot may not be used to such flat phases from other gliders of plastic design. The oscillation is more pronounced with increased loading. Nevertheless, it is possible in all phases to recover from a spin within one additional turn. But there are some important points to be regarded.

> ***WARNING***
> *The following important points have to be regarded during recovery:*
>
> - *Deliberately apply opposite rudder **up to the stop**, and keep it at the stop until the rotation ends.*
> - *Short pause (approx. 1/2 turn) after applying rudder and before releasing the stick.*
> - *As long as rotation has not stopped, only give in to the pressure of the stick. Do **not** push the stick.*

Disregarding these points can delay or even prevent recovery.

WARNING

During recovery from stalls in the presence of wing drop, or from departures and spins, application of forward stick prior to opposite rudder can delay recovery up to three additional turns.

In order to obtain a reproducible result independently of the setting of the elevator trim, look out to bring the stick into neutral position, i.e. to the middle elevator course. In no case, the stick should be pushed to full nose down position.

Familiarize yourself with the spin characteristics

WARNING

The combination of varying cockpit noise levels, varying pitch attitudes, and varying rotation rates and airspeed indications can cause disorientation to those unfamiliar with spinning this aircraft. If this occurs, positive application of recovery controls should be initiated immediately to minimize any effects of disorientation.

We strongly recommend even experienced gliding instructors to familiarize them with spinning the double seated ASK 21 B. This may happen through a fellow instructor already experienced in spin training on the ASK 21 B. When the spin ballast attachment is new in the gliding club, there might be opportunities through the national gliding associations or in training courses for the continuing education of instructors. Apart from that, there are also flight schools offering spin training with the ASK 21 B. A list of such schools can be requested from Alexander Schleicher, or looked for on their web site.

Condition of the aircraft

The condition of the glider must be identical to the condition during the last valid weighing. This condition is documented in the equipment list, on which the weighing report refers.

When the batteries in the wing root were installed during weighing, they must also be installed during flight.

CAUTION
Control surface gaps have to be treated according to Maintenance Instruction C.

Disregarding this item can delay spin recovery or may even prevent recovery!

The spanwise gaps of ailerons and elevator must be airtight – according to Maintenance Instruction C this is achieved with a teflon sealing/slip tape under the mylar fairing strips. Mylar fairing strips without sealing tape beneath are not sufficient!

The rudder gap either stays open or a zig-zag-tape is placed on the forward edge of the mylar fairing strip (a combined zig-zag-fairing tape is also possible), see also Maintenance Instruction C.

Usage of the Spin Ballast (optional equipment)

Without valid spin ballast table (Flight Manual Appendix A), spin ballast at the tail must not be used. The validity period is specified on each spin ballast table. A valid spin ballast table can be obtained from the manufacturer (procedure, refer to Maintenance Manual section 6.3).

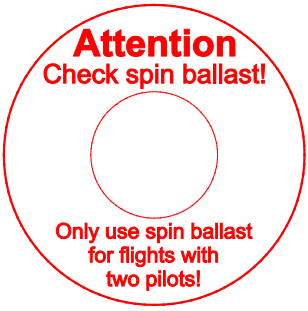
Every other trim ballast and (loose) equipment in the cockpit has to be removed.

Directly before flight the pilots have to weight themselves with the equipment worn in flight (clothes, parachute ...). When the load in the front seat is below 70 kg (154 lbs), compensate missing load by attaching trim ballast in the front fitting, so that the load in the front seat equals 70 kg (154 lbs). For this purpose, follow the instructions in section 7.10. During the further procedure, the front pilot and the front trim ballast count together as a pilot of 70 kg (154 lbs).

According to the spin ballast table in appendix A, spin ballast has to be attached. The mass of the pilot in the front seat defines the line of the table; the mass of the pilot in the rear seat defines the column of the table. At the intersection, the number of ballast plates (1 kg = 2.2 lbs), which are to be attached, is noted. Up to a maximum of 12 spin ballast plates are permissible.

CAUTION

In case of mounted spin ballast, it is only possible to close the fairing of the spin ballast compartment, if the safety mechanism of the fairing is locked by screwing in a special knob. This black knob is located in the front instrument panel. After removing the knob a placard becomes visible, which rises the pilot's awareness of the spin ballast. The knob has to be screwed onto the cockpit placard again after removing the spin ballast.



For more information about handling of spin ballast, see section 7.10 (Spin ballast mounted in the fin) in this manual.

CAUTION

Spinning is approved with as well as without spin ballast in the fin (optional). All other aerobatics is only approved without spin ballast in the fin.

Spinning with spin ballast is principally only allowed by dual flights.

By following the spin ballast table a c.g. of approx. 406 mm (16 inch) is set in for the flight. In any case, a maximum of 12 kg at the tail may not be exceeded. This amount of 12 pieces of ballast may not be sufficient with heavy pilots. With such a loading (larger masses on the front and tail of the glider), the glider may even be spinning at more forward c.g.-positions.

Spin Entry Procedure

The best entry speed is 2 km/h (1 kts) above the speed, at which the stall warning sets in. This must be tested in flight before.

Step hard on the rudder in the intended spin direction. Then, fully pull the stick. The aileron stays neutral. The rudder must stay in this position as long as the spin is supposed to continue.

An aileron impulse against spin direction in due time can support spin entry.

> ***CAUTION***
> *We recommend to enter spins in a generously safe altitude.*

For example it may be recommendable to enter the spin not below 1000 m (3280 ft) AGL, when you intend to spin one turn and then recover. If you want to spin three turns and then recover, do not enter the spin below 1300 m (4270 ft) AGL.

When determining your minimum altitude for entering a spin, always bear in mind, that the student may not recover correctly at first go, or other imponderability may happen. For example, recovery may be postponed by three additional turns during a wing drop or spin, when forward stick was applied before opposite rudder.

> ***WARNING***
> *If a spiral dive sets in, opposite rudder, opposite aileron, and relaxed back stick pressure must be used immediately to prevent overstressing the structure.*

If cockpit noise due to outside airflow continues to increase to the point that conversation between crewmembers is difficult, or if the airspeed indicator is increasing through 110 km/h (60 kts), the aircraft is no longer spinning but is likely in a spiral.

NOTE
We recommend not using the airbrakes during recovery to reduce the airspeed, since the tolerable load factor with extended airbrakes is only +3,5g / -0g.

Higher masses in the cockpit and on the tail influence the rotational speed of the spin and the amplitude of the superimposed pitch oscillation. With higher masses, the average pitch attitude is approx. –40° and the pitch amplitude is about ±30°.

In all spins, the altitude loss is approximately 45 m (150 ft) minimum to 80 m (250 ft) maximum per turn.

Spin Recovery

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

① Check ailerons neutral.
② Apply full rudder opposite to the direction of the spin.
③ Short pause (hold control inputs for about 1/2 spin turn).

WARNING
Ignoring the pause may delay the recovery!

④ Ease the control column forward (means, give in to the pressure of the stick) until rotation ceases and sound airflow is established again.

WARNING
Full forward stick may delay or even prevent the recovery!

⑤ Centralise rudder and ease out of the ensuing dive.

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

NOTE
During spins the ASK 21 B oscillates in pitch. From a steep nose down spin recovery according to the standard procedure is up to 1 turn, from a flat slow spin less than 1 turn.

The altitude loss from the beginning of the recovery until the normal flight attitude is regained is about 80 m (260 ft).

Emergency procedures

For your own safety, the decision altitude for a bail out should be determined before start. It should be agreed upon, who makes the decision, and what the instruction to bail out is.

In case, the glider has not yet finished the spin after one turn (for whatever reason), the following questions have to be checked:

- Is full rudder applied against the spin? Is back pressure upon the stick released and aileron neutral?
- Is the glider really in a spin – and not in a spiral dive?

If both questions can be answered with "Yes", the glider should still be given the chance, to recover from the spin (Patience!). The altitude loss in a spin is 45 m to 80 m (150 ft to 250 ft) per turn. After further three turns it propably makes sense to restart the recovery procedure.

4.5.3.3 High Speed Flight (ASI in yellow Range)

The following consequences arise from the airworthiness requirements:

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

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

CAUTION
In the yellow range airbrakes may only be opened under g-loads between 0g and +3.5g.

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

With airbrakes extended in a 45° dive the speed remains below V_{NE} = 280 km/h (151 kts, 174 mph); it increases up to 232 km/h (125 kts, 144 mph) at a mass of 600 kg (1323 lbs).

4.5.4 Approach

Make the decision to land in good time.

For the remaining circuit, maintain about 90 km/h (49 kts, 56 mph). The yellow triangle on the ASI scale is valid for maximum weight. Increase the approach speed in turbulence or strong headwind.

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

Sideslip

Side slipping with the ASK 21 B is very effective.

The rudder pressure decreases to zero in the sideslip with full rudder. The rudder must actively be pushed back to terminate the sideslip.

As the ASI reads no useful values during side slipping, airspeed must be estimated from the pitch attitude.

4.5.5 Landing

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

During the ground run the stick should be held fully back.

Maximum acceptable crosswind component is listed in section 5.3.1.

4.5.6 High Altitude Flight

With increasing altitude the true airspeed (TAS) is higher than the reading of the airspeed indicator (IAS) because of the decreasing air density. The true airspeed (TAS) is, however, relevant for safety against flutter. Therefore the never exceed airspeed V_{NE} changes with height as follows:

V_{NE} Speed Limit for high altitude	
Altitude MSL [m]	V_{NE} IAS [km/h]
0 - 2000	280
< 3000	267
< 4000	255
< 5000	239
< 6000	226

ASK 21 B

V_{NE} Speed Limit for high altitude	
Altitude MSL [ft]	V_{NE} IAS [mph]
0 - 6500	174
< 9800	166
< 13100	158
< 16400	148
< 19600	140

ASK 21 B

V_{NE} Speed Limit for high altitude	
Altitude MSL [ft]	V_{NE} IAS [kts]
0 - 6500	151
< 9800	144
< 13100	137
< 16400	129
< 19600	122

ASK 21 B

The appropriate placard has to be installed near the ASI. The units of measurements used to indicate airspeed on placards must be the same as those used on the indicator.

WARNING

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

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

4.5.7 Flight in Rain

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

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

Do not fly into icing conditions with a wet aircraft. In this context, see also Section 4.5.6 above.

4.5.8 Cloud Flying

Required minimum equipment for cloud flying see Section 2.11.

According to previous experience the airspeed indicator system is not susceptible to icing-up. However with strong icing-up the pilot must always assume the risk of a possible failure of the airspeed indicator. When planning cloud flying, he must take this point into consideration.

Excessive speeds during cloud flying must be avoided in any case. The pilot should try to keep an average speed of about 100 km/h (54 kts, 62 mph). At increasing speeds above 130 km/h (70 kts, 81 mph) he should use the airbrakes to control the speed.

WARNING
Cloud flying must only be done by pilots having the necessary licence. The legal regulations with regard to airspace and the requirements for instruments have to be met.

4.5.9 Aerobatics

The error of the airspeed indicator system in normal and inverted flight is shown in section 5.2.1.

WARNING

Even a glider, which is approved for full aerobatics, does not have infinite strength capacities. Most hazardous are aerobatics which get out of control or are badly executed, as they result in high loads.

Therefore, it is urgently recommended to have oneself guided by an experienced flight instructor. The ASK 21 B being an approved two-seater for aerobatics offers this possibility.

CAUTION

Aircrafts of the airworthiness category Utility (means without extended minimum equipment for aerobatics, see section 2.11) are solely approved for the following manoeuvres:

- *Spin*
- *positive Loop*
- *Stall Turn / Hammerhead*
- *Lazy Eight*
- *Chandelle*

Aircrafts of the airworthiness category Aerobatic (means with extended minimum equipment for aerobatics, see section 2.11) are approved for aerobatics according to section 2.7 "Approved Manoeuvres".

CAUTION

Spinning is approved with as well as without spin ballast in the fin (optional). All other aerobatics is only approved without spin ballast in the fin.

CAUTION

Never release stick and rudder pedals when flying aerobatics.

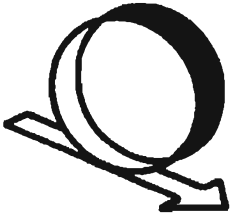
With aerobatics instruction, a reliable agreement must be made between instructor and student flyer with regard to the communication system for the mutual taking over of the controls.

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

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

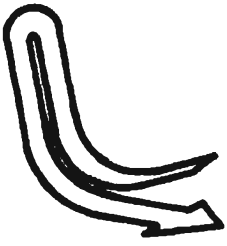
Hereafter, some exemplary chosen aerobatic manoeuvres are described more in detail:

Loop



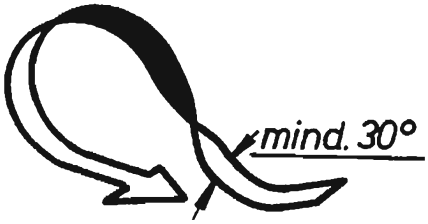
Entrance Speed:
single-seated: 155 km/h
two-seated: 170 km/h
max. g-loads: 2 – 3 g

Stall Turn / Hammerhead



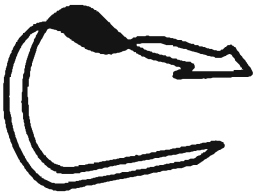
Entrance Speed:
single-seated: 165 km/h
two-seated: 180 km/h
max. g-load: 3 g

Half Roll and half Loop / Split S



Entrance Speed:
single-seated: 170 km/h
two-seated: 180 km/h
max. g-load: 2 – 3 g

Half Loop and half Roll / Immelmann

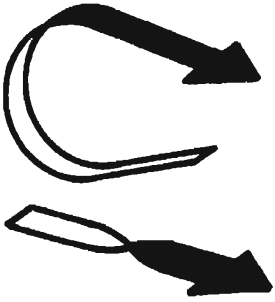


Entrance Speed:
single-seated: 165 km/h
two-seated: 180 km/h
max. g-load: 2,5 – 3,5 g

Slow Roll

Entrance Speed:
single-seated: 165 km/h
two-seated: 180 km/h
max. g-load: 2,5 – 3,5 g

Inverted flight



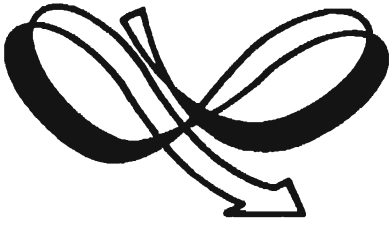
via half Loop or half slow roll (see above)

NOTE
With the inverted flight, the fuselage nose will be unexpectedly high above the horizon.

Spin (upright)

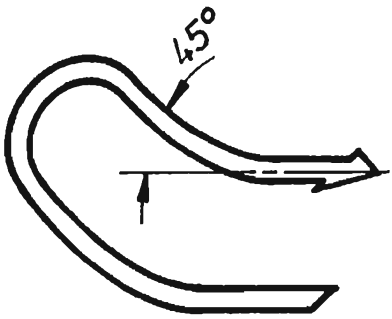
refer to section 4.5.3.2

Lazy Eight



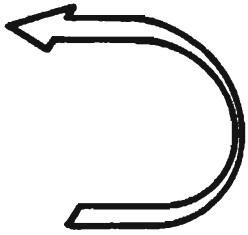
Entrance Speed:
single-seated: 140 km/h
two-seated: 150 km/h

Steep Climbing Turn



Entrance Speed:
single-seated: 140 km/h
two-seated: 150 km/h

Chandelle



Entrance Speed:
single-seated: 160 km/h
two-seated: 175 km/h

Section 5

5 Performance

5.1 Introduction

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

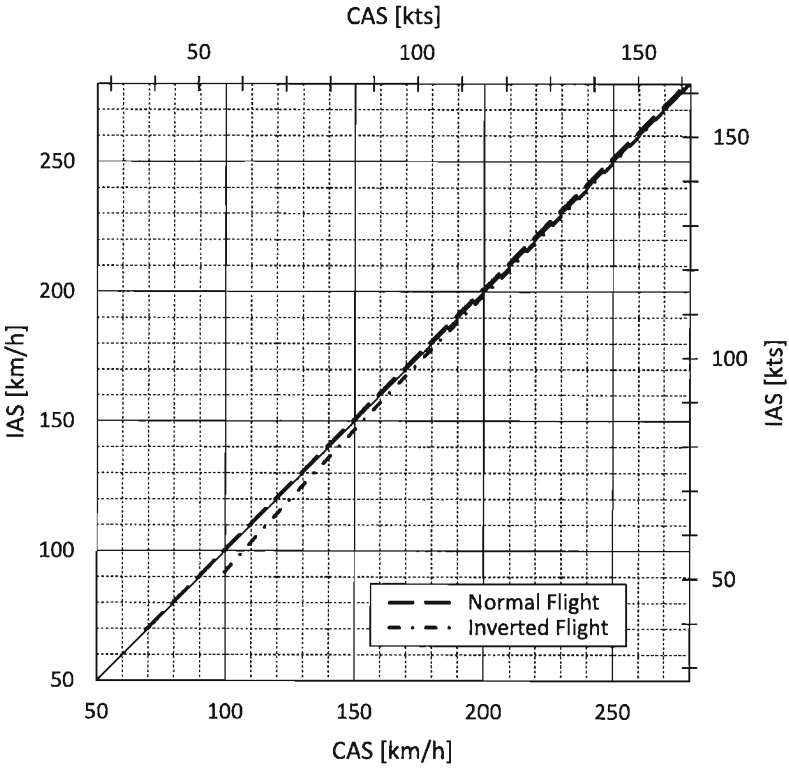
The data in the charts has been computed from actual flight tests with the sailplane in good condition and using average piloting techniques.

5.2 Approved Data

5.2.1 Airspeed Indicator System Calibration

The following diagram shows the indication error of the ASK 21 B pressure system (The error of the airspeed indicator instrument adds to the diagrammed error). During normal upright flight the pressure system has a deviation of less than 2 km/h (1 kts, 1 mph) over the whole speed range. During inverted flight the deviation of the indicated airspeed is -7.5 km/h (-4 kts, -4.5 mph) at 100 km/h (54 kts, 62 mph); the deviation decreases with rising airspeed during inverted flight and is ±0 km/h (±0 kts, ±0 mph) at 280 km/h (151 kts, 174 kts).

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



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

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

5.2.2 Stall Speeds

The speed at which the stall takes place depends on the payload. The following guide values (IAS) are applicable:

	airbrakes retracted	airbrakes extended
Flight mass 470 kg / 1036 lbs (single-seated)	65 km/h 35 kts 40 mph	68 km/h 37 kts 42 mph
Flight mass 600 kg / 1323 lbs (two-seated)	74 km/h 40 kts 46 mph	77 km/h 42 kts 48 mph

The quoted speeds are valid for an aerodynamically clean glider.

Stall Speeds in Circling Flight

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

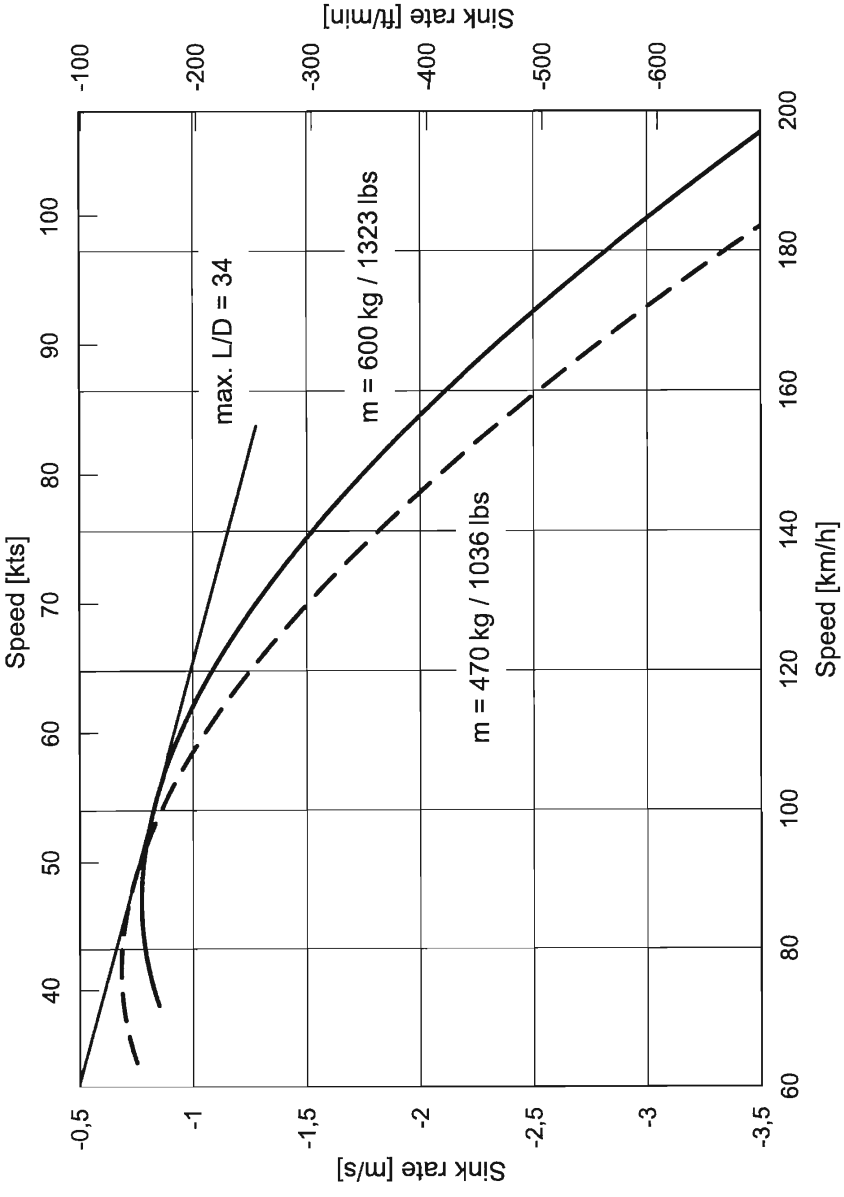
Bank angle	0°	30°	45°	60°	75°
Stall speed in turns compared to straight flight	100%	107%	119%	141%	200%

5.3 Non-Approved Further Information

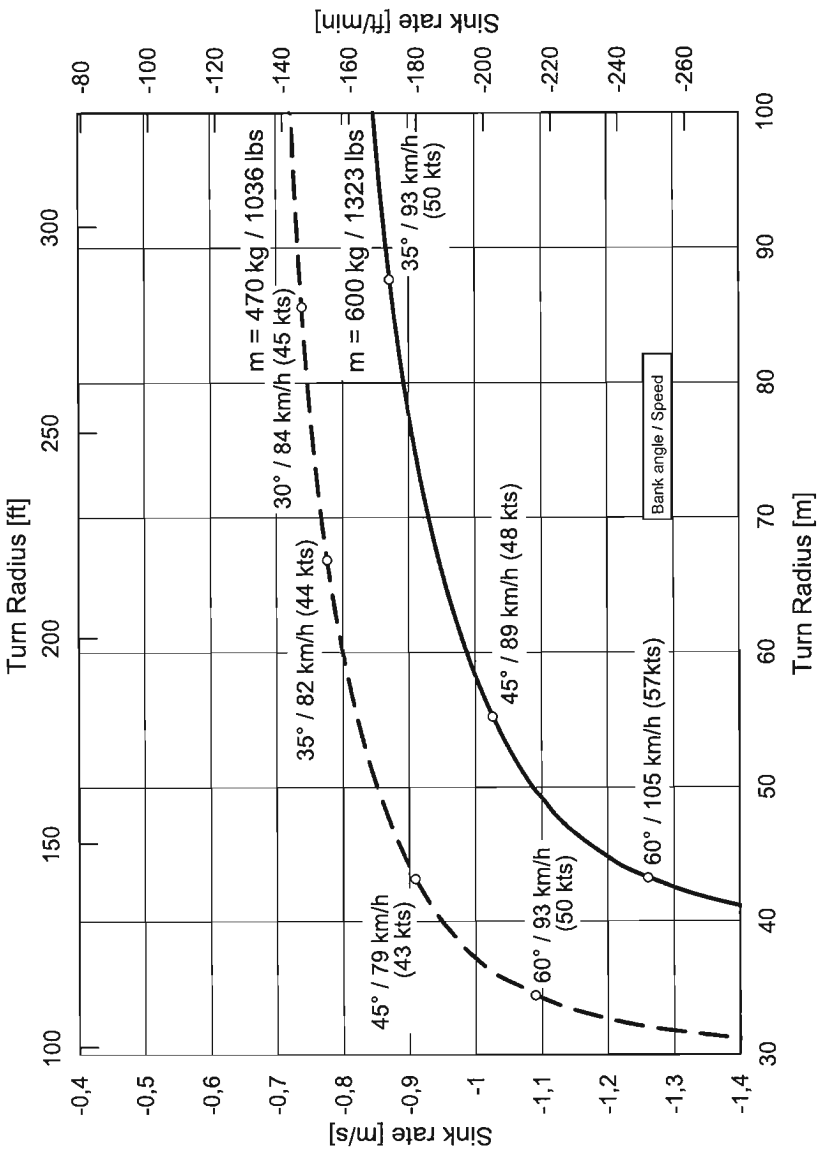
5.3.1 Demonstrated Crosswind Performance

Winch Launch	15 km/h	8 kts	9 mph
Aerotow	15 km/h	8 kts	9 mph
Landing	15 km/h	8 kts	9 mph

5.3.2 Flight Polar - Level Flight



5.3.3 Flight Polar - Circling Flight



CAUTION: These are solely the calculated optima! Additionally observe a safety distance to the stall!

Section 6

6 Mass (Weight) and Balance, C.G. Position

6.1 Introduction

This section describes the payload range within the sailplane may be safely operated.

Procedures for weighing the sailplane and the calculation method for establishing the permitted payload range and a list of all equipment available for this sailplane are contained in the applicable ASK 21 B **Maintenance Manual**, Section 6.

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

It is of high importance for safe flight not to exceed the limits for the in-flight centre of gravity, given in section 2.6.

After repairs, refinishing and fitting additional equipment this weight and balance record has to be updated, either by calculation or if this is not possible by weighing.

Unit Conversions

25.4 mm = 1 in
0.4536 kg = 1 lb

6.2 Mass (Weight) and Balance Form

The Mass and Balance Form overleaf shows the maximum and minimum cockpit loads and the total load permitted in the fuselage.

These mass and balance data must be calculated in accordance with the currently valid weighing data. The data and diagrams needed for establishing these are to be found in the ASK 21 B **Maintenance Manual**, Section 6.

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

Too lightweight pilot

If the **front pilot is lighter** than the minimum mass given in the Mass and Balance Form, then

- weight can be replaced with trim ballast plates fitted in front of the front seat. See also Section 7.10.
- the rear pilot can be regarded with 30% of his mass

Too heavyweight pilot

If there are two pilots and the **front pilot exceeds** the maximum mass given in the Mass and Balance Form (110 kg, 242 lbs), then the maximum mass in the rear seat must be reduced with 5 times of this amount of excess weight.

If there are two pilots and the **rear pilot exceeds** the maximum mass given in the Mass and Balance Form, then the maximum mass of 110 kg (242 lbs) in the front seat must be reduced by this amount of excess weight. The minimum weight in the front seat has to be regarded.

A more precise calculation is possible with the pilot arms given in the maintenance manual section 6.8.

CAUTION
The seat loading may not exceed 130 kg (286 lbs) in either seat.

The maximum load in the fuselage must not exceed the value given in the mass and balance form as well as in the data and loading placard.

Spin ballast in the vertical fin (optional)

For spin trainings optionally spin ballast can be mounted in the fin, refer to section 4.5.3.2.

CAUTION
Use of spin ballast is only allowed with a payload of maximum 110 kg (242 lbs) per seat!

Baggage

Baggage in the baggage compartments has no significant influence on the in-flight c.g.

MASS AND BALANCE FORM

Date of Weighing	Empty mass	Empty mass C.G. aft of RP	Permissible pilot mass incl. parachute			max useful load in the fuselage	old spin ballast table * removed	Inspector´s stamp and signature
			Front seat single seated min.	Front seat single seated max.	Rear seat, with 110 kg (242 lbs) in the front seat max.			
20.08.18	399 kg 880 lbs	747 mm	70 kg 154 lbs	110 kg 242 lbs	91 kg 201 lbs	201 kg 443 lbs	—	LBA-lizenzierter Prüfer von Luftfahrtgerät Ausweis-Nr. 2980 Klasse 3 [signature]

* optional equipment; flight manual appen-

Example of load / C.G. calculation:

A weighing gave the following results:

m_e	= 381 kg	(840.0 lbs)	Empty mass
x_e	= 759 mm	(29.9 inches)	Empty mass C.G.
m_{nl}	= 183 kg	(403.4 lbs)	Weight of non lifting components

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

Date	Empty mass	Empty mass C.G. aft of RP	Permissible pilot mass incl. parachute: Front seat single seated min	Front seat single seated max	Rear seat, with 110kg (242lbs) in the front seat max	max useful load in the fuselage
xx.xx.xx	381 kg 840.0 lbs	759 mm 29.9 inch	70 kg 155 lbs	130 kg 286 lbs	109 kg 240.3 lbs	227 kg 501 lbs

For details see maintenance manual section 6.

Section 7

7 Description of the Sailplane, its Systems and Equipment

7.1 Introduction

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

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

7.2 Cockpit Controls

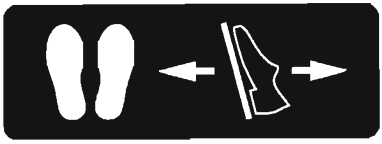
Aileron and Elevator

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

Rudder

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

Front Seat:

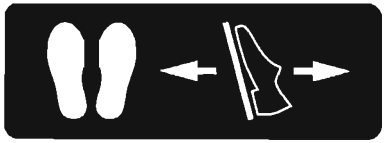


Pedal Adjustment:
Grey knob right of the stick.

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

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

Rear Seat:



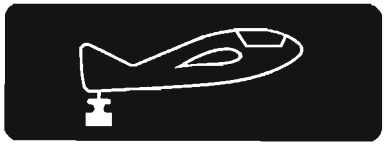
Pedal Adjustment:
Grey ring between front seat and stick

To adjust: Relax pressure on pedals, and pull grey ring up. Move pedals with the ring or with the heels. Left and right of the ring there are holes in the floor, into which the assembly must hook again.

Trim

The trim levers are at the left side of the two control sticks. A trim indicator is fitted at the left cockpit wall at either seat.

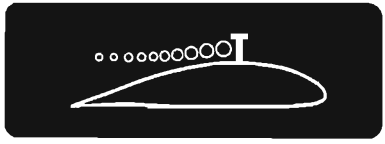
Trim nose heavy



Trim tail heavy

Airbrakes

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

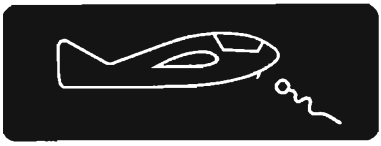


Pull the blue handle to extend the airbrake paddles.

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

Launch Cable / Tow Hook Release

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



Yellow T-handle for cable release

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

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

Opening and Closing the Canopy

Front Seat:

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

White levers for opening the front canopy

NOTE
The front canopy can only be locked, when the rear canopy is closed and locked.

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

Rear Seat:

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

Red levers for opening the rear canopy

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

CAUTION

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

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

Emergency Canopy Jettison

Front Seat:

To jettison the canopy, pull the jettison handle (red handle above the instrument panel) and push the canopy up!

Red handle for jettisoning the canopy

CAUTION

Do not push up the front canopy directly above the head with the hands. The rear pins of the locking mechanism will hold the rear end of the canopy down, to make it swivel around its trailing edge.

NOTE

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

Rear Seat:

Pull back both red canopy jettison handles and use them to push open the canopy. The air stream will break off the canopy rearwards.

Red levers for jettisoning the canopy

Ventilation

Front and rear Seat:

At the right cockpit wall below the canopy frame there are ventilation nozzles which are pivotable and adjustable. If correctly adjusted, they also serve as a demister for the canopies.

Ventilation nozzle
Twist to open respectively close

7.3 Instrument panel

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

Instruments of more than 1 kg (2.2 lbs) need additional support beyond the screws provided. This can be done by means of aluminium straps fixed to the box in front of the instrument panel.

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

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

7.4 Landing Gear System

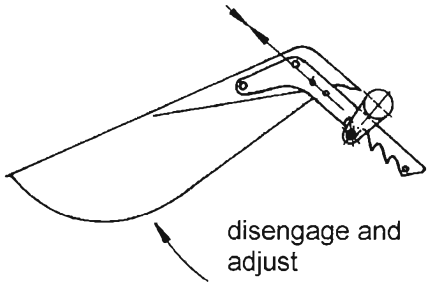
The ASK 21 B uses a fixed, sprung main wheel as well as a fixed nose and tail wheel. Refer to section 4.3 for the tire pressures. The valves of the wheels are on the right hand side.

7.5 Seats and Safety Harness

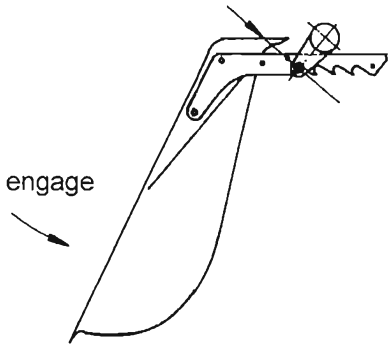
Seat and Seating Positions

Both seat pans use an adjustable backrest (before flight).

Tall pilots may remove the backrest. The choice of a thinner parachute pack of the new type will save further space.



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



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

Front Seat:

The headrest is height-adjustable.

> ***CAUTION***
> *With the backrest installed, the headrest must be inserted into the backrest. Otherwise, the headrest must be inserted into the rear instrument panel.*

The headrest must be adjusted in such a way that the point of head contact is at eye level.

Rear Seat:

The headrest is adjustable in the direction of flight.

Safety Harness

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

① sit down in the seat

② put pelvic belts on and fasten them as tightly as possible

③ make sure that the pelvic belts are lying on the pelvis and the buckle is in the middle of the pelvis

④ plug shoulder belts into the central buckle and fasten them with significantly lower tension than the pelvic belts ***IMPORTANT:*** in doing so, the buckle must not be pulled up towards the soft parts of the body!

⑤ when the belt system get loosen during flight: always refasten the pelvic belts first and then the shoulder belts.

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

Automatic parachute static line

Anchor rings for the static lines (ripcord) of automatic parachutes are attached as standard equipment. These rings are painted red. For the front seat one is located on the right-hand side at the cross tube and for the rear seat one is located on the right-hand side at the spar cover.

7.6 Pitot and Static Systems

A probe is located on the tailboom (or optional in the vertical fin), delivering TE-pressure. Static ports are located laterally in the tail cone. A pitot tube is located in the fuselage nose.

The airspeed indicator is driven by the pitot pressure from the tube in the fuselage nose and by the static pressure from the tail cone.

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

Pneumatic and electric variometers might be fed from the TE-probe on the tailboom (or optional in the vertical fin).

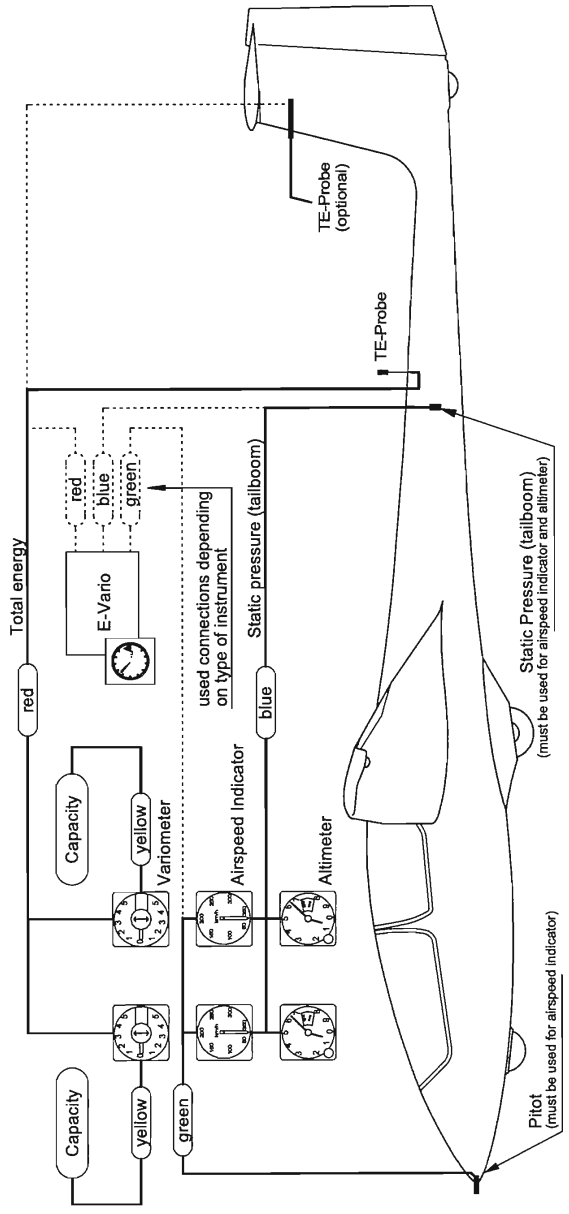
Ensure that the TE-Probe is fully pushed home in its seating in the fin. From time to time, the inner end of the probe should be lightly lubricated with Vaseline or a similar lubricant, in order to save the hose respectively O-ring gaskets from wear.

7.7 Airbrake System

The ASK 21 B is equipped with Schempp-Hirth type airbrakes on the upper side of each wing. They efficiently increase sink rate, but also increase stall speed by 3 - 5 km/h (2 - 3 kts, 2 - 3 mph). They have only a small effect on trim. See section 2.8 for maximum load factors with airbrakes extended.

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

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



7.8 Baggage Compartment

Hard objects may not be carried in the baggage compartments without being securely fastened! If for instance, a barograph is to be carried in this space, a mounting recommended by the manufacturer must be used.

In the left and right wing root

The baggage load in each compartment may not exceed 10 kg (22 lbs).

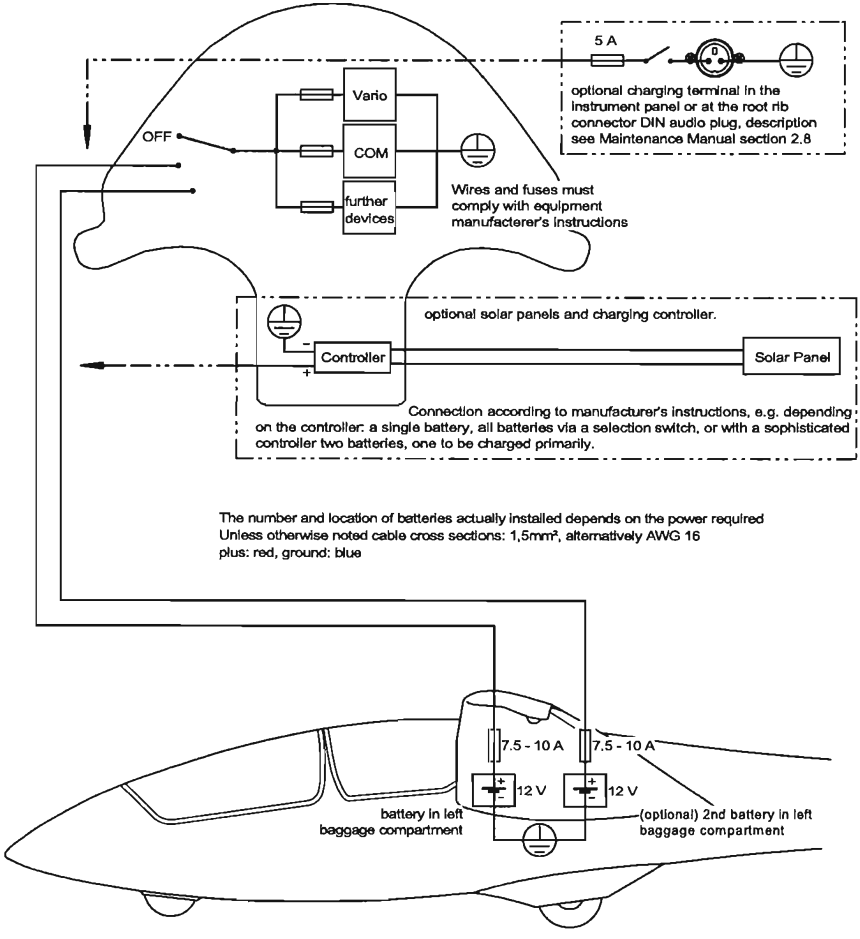
7.9 Electrical System of the Avionics

The electrical system is powered by a 12V battery. The battery compartment is provided in the left baggage compartment. A second battery compartment can be installed in the left baggage compartment optionally. Close to each battery, the circuit is protected with a fuse between 7.5 A and 10 A, depending on the electrical requirements. The battery selector switch in the instrument panel also serves as main switch.

Each electrical consumer is protected by its own fuse.

If solar cells are installed different variations are possible, depending on the charging controller: e.g. always charging a specific battery; primarily charging one battery and then another, or a switch to select the battery to be charged.

Fig. 7.9-1 Circuit Diagram



7.10 Miscellaneous Equipment

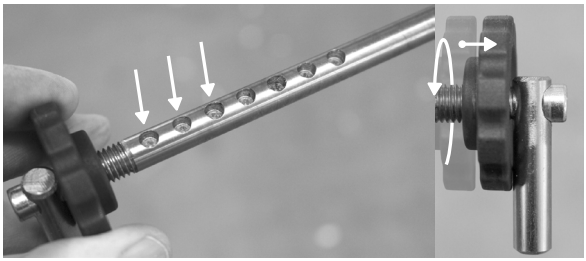
Removable Trim Ballast

The ASK 21 B is equipped with a fitting for lead trim ballast plates in front of the front seat.

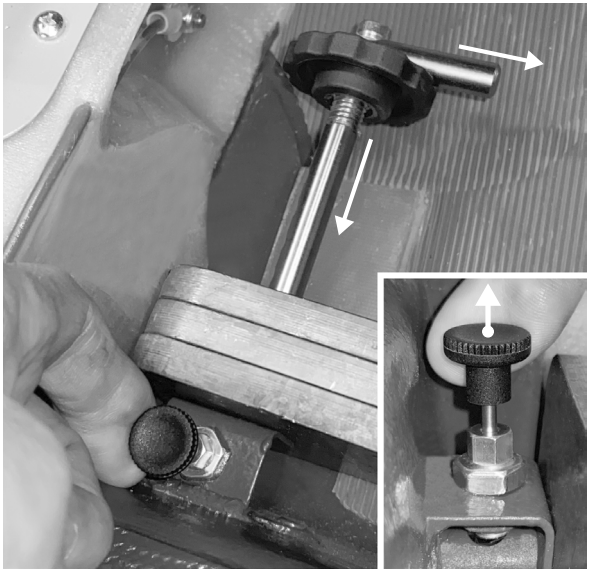
One 1 kg (2.2 lbs) lead trim plate equals a pilot weight of 1.25 kg (2.75 lbs). Thus, a pilot weighing 12.5 kg (27.5 lbs) less than the minimum cockpit load must fit ten trim plates weighing 1 kg (2.2 lbs) each.

A maximum of 12 trim plates (6 on each side) are allowed for installation.

Installation of the trim ballast:

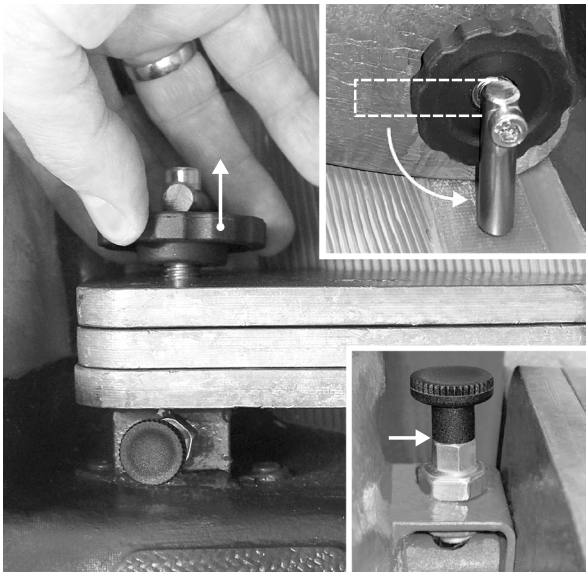


Check snap-in holes at guide rod for soiling.
Turn back the clamping wheel completely.



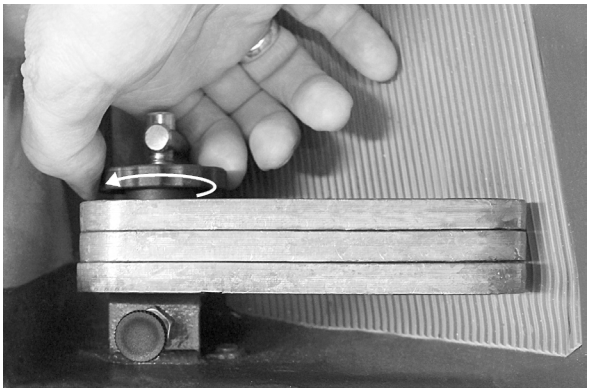
Position the trim plates in front of the mounting support and slide the guide rod through the plates. The handle of the guide rod must be horizontal and pointing outwards.

Pull the locking bolt and push in the guide rod completely.



Now turn the handle of the guide rod vertical downwards and pull back the guide rod to the next locking position.

CAUTION,
check correct engagement of the locking bolt!



Finally fix the trim plates with the clamping wheel.

CAUTION
Check correct installation and firm fit of the trim plates!

Removal of the trim plates is carried out in a reversed order:

First release the clamping wheel. Then pull the locking bolt, turn the guide rod 90° and pull it out.

Spin ballast mounted in the fin (optional)

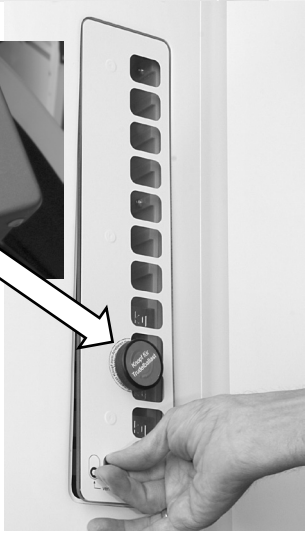
For spin training, optional spin ballast can be mounted in the fin. For all relevant information, important for spin training, refer to section 4.5.3.2.

Inserting the spin ballast weights into the spin ballast box:

Unlock the cover of the spin ballast box and remove it.

The spin ballast weights are placed into the lateral guides of the spin ballast box. Previously, the number of the weights have to be determined – described in section 4.5.3.2.

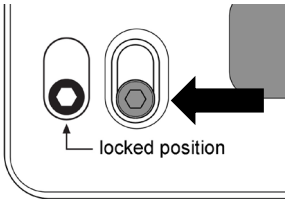
The knob from the front instrument panel is screwed into the cover. For this, the security mechanism on the back of the cover must be pushed upwards against the spring force.



CAUTION
Without the screwed knob, the cover cannot be fitted if spin ballast weights are in the box!

Finally, the cover is to be inserted first in the upper mount and then to be locked at the lower end.

CAUTION
Check correct engaging of the lower locking system and the locked position of the handle.



If the spin ballast weights are taken out, it's recommended to store the weights into the provided transport box to avoid damages. Remove the knob from the cover and put it on its place in the front instrument panel. If there are no weights in the box, the cover can be fitted without the screwed knob.

Oxygen (optional)

Up to two oxygen bottles can be mounted in the area above the spar stubs, if the appropriate attachments are installed. Adapters according to the individual bottles are necessary, which are available from AS as optional accessory. In order to support the bottles in the bulkhead behind the spar, various inserts for the bulkhead required by different oxygen bottles are available.

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

NOTE
Fitting of oxygen equipment causes only a minimal change in the empty-mass c.g. position.

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

Emergency Location Transmitter (optional)

The location least vulnerable to damage in case of accident is the area between the two drag spar pins at either side of the fuselage. Therefore, the emergency location transmitter (ELT) should be fitted to the fuselage wall behind the main spar in an appropriate mounting.

Section 8

8 Sailplane Handling, Care and Maintenance

8.1 Introduction

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

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

8.2 Sailplane Inspection Periods

A Certificate of Airworthiness renewal inspection has to be carried out annually.

Refer to ASK 21 B **Maintenance Manual**, Sections 4 and 7.

8.3 Sailplane Alterations or Repairs

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

For repairs and modifications refer to the applicable Maintenance Manual ASK 21 B **Maintenance Manual**, Sections 10 and 11.

8.4 Ground Handling / Road Transport

Parking

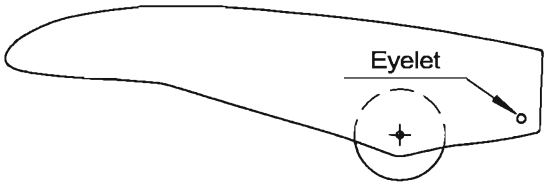
The ASK 21 B is equipped with elastic tape to seal the gaps on the control surfaces. When parking the aircraft, principally all the controls must be set to neutral.

In the open

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

For tying-down the wings, trestles (perhaps from the trailer) should be used to ensure that the ailerons cannot be stressed by the tie-down ropes.

In addition as standard an eyelet is located in the wing tip.



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

In the hangar

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

General

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

Road Transport

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

Above all, it is important to ensure that the wings are supported in properly shaped and fitted wing cradles or at the very least, that the spar ends are securely supported as closely as possible to the root ribs.

Reinforced points of the fuselage are the main wheel (remember the suspension springing!), and tail wheel; also, the drag pins (make up support bushings from plastic material like Nylon!) and the area under the canopy arch.

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

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

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

8.5 Cleaning and Care

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

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

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

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

Neither the best quality of paint protection on the surfaces nor the plastic skins of the water ballast tanks can fundamentally prevent water vapour diffusion; they can only retard the process. If water has entered the airframe and cannot be removed by means of sponge or chamois leather, the aircraft should be de-rigged and dried out in a dry but not too hot room. Also the affected part should be periodically turned.

Sunlight-Effects on the surface finish

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

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

Care of Surface Finish

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

The optional available 2-pack acrylic paint finish may be treated in the same way.

CAUTION

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

In normal use the wax coating need only be renewed annually with a rotary mop.

In moderate European conditions it will suffice if on two occasions a paint preservative is used in addition. In areas subject to long and stronger sun exposure this should be done more often.

For the care of the paint finish, only preparations containing **the lowest available amount of silicone** may be used (e.g.: CARLACK Complete or AEROLACK All In One by Carlack Vertriebsgesellschaft Deutschland mbH, www.carlack.com).

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

NOTE

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

Canopy

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

Safety Harness

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

Section 9

9 Supplements

9.1 Introduction

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

Some commonly used optional installations are covered in Section 7.10 of this manual:

- Oxygen system installation
- Emergency Location Transmitter

9.2 List of Inserted Supplements

Date of Insertion	Doc. No.	Title of inserted supplement
15.06.2018	A	Spin Ballast Table
15.06.2018	B	Excerpt of the USAF Manual referring to Stall and Spin

Serial No: 21953
Registration: VH-GTY
Date: 20.08.18

Empty mass: 399 kg
Empty mass Centre of Gravity: 747 mm
Weigh and Balance report dated: 20.08.18

Max. permissible payload: 201 kg
Equipment list dated: 20.08.18

This table gives the number of weights to be mounted at the tail for spin training (section IV.6)

pilot mass incl. parachute in front seat (kg) \ pilot mass incl. parachute in rear seat (kg)	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
70	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6
72	3	3	3	3	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6	7
74	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7
76	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8
78	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9
80	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9
82	6	6	6	7	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	
84	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10		
86	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11			
88	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11				
90	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11					
92	9	9	10	10	10	10	10	10	11	11	11	11	11	12							
94	10	10	10	10	11	11	11	11	11	12	12	12	12								
96	10	11	11	11	11	11	12	12	12	12	12	12									
98	11	11	11	12	12	12	12	12	12	12	12										
100	12	12	12	12	12	12	12	12	12	12											
102	12	12	12	12	12	12	12	12	12												
104	12	12	12	12	12	12	12	12													
106	12	12	12	12	12	12	12														
108	12	12	12	12	12	12															
110	12	12	12	12	12																

■ = invalid loading

Note: This table becomes invalid when the aircraft is modified or with the date of: 20.08.2022

Appendix B

Excerpt of the USAF Manual referring to Stall and Spin

The US Air Force flight tested the ASK 21 with spin ballast in 1989. Their results also went into the concept of the optionally available spin ballast. In the report of the USAF there is also a recommendation for the Flight Manual. This text is too detailed for the average student pilot. As an offer to the flight instructor, it is attached below. Since it is older there are some deviations from the present flight manual (e.g. concept of spin ballast table).

Some definitions are given at the end of the text. Remarks and omissions made by AS are indicated by square brackets [].

Schleicher ASK-21 (TG-9) Stall and Spin Evaluation

Doyle B. Janzen, Charles J. Precourt

July 1989

Air Force Flight Test Center Edwards Air Force Base

This text may supply useful information for the pilot.
It is not part of the approved flight manual.

[..] The following discussion is the recommended writeup for Section VI (Flight Characteristics) of the flight manual. The information is also appropriate for the manufacturer's flight manual. [..]

DEPARTURE AND SPIN SUSCEPTIBILITY

Entry Techniques

The simplest spin entry is accomplished from wings level with the pitch attitude held constant at 10 degrees nose high until stall, while smoothly applying full rudder and full aft stick. Proper timing of aileron inputs prior to stall can generate additional yaw (adverse yaw due to aileron) to assist spin entry. This is particularly true at more forward cg when rudder and elevator alone fail to produce spin entry.

Spin entry is sensitive to entry conditions. If the entry attitude is too nose high, it results in a spiral dive. If the entry attitude is too shallow, it results in a steep-banked sideslip. The spiral or sideslip occur more frequently as the cg is moved forward. Spin entry is unlikely with the in-flight cg forward of 12.4 inches [315 mm]. In this case, entry attempts result in spirals or sideslips regardless of control input techniques.

Mass Properties Effects

Spin entry success is also sensitive to inertia loading. The ASK 21 aircraft has the unique feature of tail ballasting, meaning that it can be loaded at both ends of the fuselage. Although the tail weights were designed to control cg, they greatly effect the inertia terms that govern aircraft response to flight maneuvers. Since the tail weights significantly increase the inertia of the longitudinal axis of the aircraft, any initial yaw rotation results in more angular momentum than without tail weights. This greater momentum results in, achievable spins at cg's further forward than the low inertia case.

Flight testing has produced spins at cg's as far forward as 12.9 inches [328 mm]. With minimum inertia loadings (solo, lightweight pilot without tail ballast), incipient spins can be achieved at cg's aft of 13.0 inches [330 mm] and sustained spins aft of 15.0 inches [381 mm]. With higher inertia loadings (two pilots and tail ballast), incipient spins can occur aft of 12.5 inches [318 mm] and sustained spins aft of only 13.5 inches [343 mm]. Therefore, the tail weights cause the target cg where spins can be expected to move progressively more forward as pilot weights increase.

[..] In reference to test results [..], the best cg for spin training is 16.0 inches [406 mm]. [..] The maximum number of tail weights permitted is [12]. If pilot weights call for more than [12] tail weights [..], use [12] tail weights which will result in a cg slightly ahead of 16.0 inches [406 mm]. Due to the higher inertia of this case, the aircraft will still spin easily for training.

No Rudder Spin Entry

Spin entry without using rudder input can occur under certain conditions. A wing drop at stall can generate sufficient yaw to cause the rudder to float to the prospin position. Wing drop can occur due to adverse yaw from uncoordinated aileron inputs near stall or turbulence. In this case, if recovery is not initiated by applying rudder opposite the wing drop and then breaking the stall with forward stick, a spin can develop.

[..] If proper coordination is not exercised near stall, a departure or spin may occur with only stick inputs.

SPIN CHARACTERISTICS

Spin Modes

The ASK 21 has two spin modes, one upright and one inverted. Both are classified as fast, steep, and oscillatory, However, the oscillation of the spin causes a variance in pitch attitude that can range from extremely steep to nearly flat. The average attitude value is classified as steep. The spin modes may also appear smooth instead of oscillatory if they are only examined for three turns or less. This is because the period and frequency of the pitch oscillation vary as a function of cg and inertia loading. Variations from one oscillation per turn to one oscillation every three turns can be seen, depending on loading.

Spin-Parameters

The pitch attitude during ASK 21 upright spins averages 40 to 50 degrees nose low. The steep phase of the oscillation is as much as 70 degrees nose low and the flat phase as high as the horizon. In no case does the flat phase tend toward an unrecoverable situation. On some occasions, the spin attitude is steep enough that the AOA is momentarily less than stall, resulting in recovery as the aircraft pitches down out of the spin.

The oscillation occurs more frequently as the cg is moved aft, while increases in inertia loading result in a larger amplitude of the oscillation. For example, at a forward cg, the oscillation is seen every third turn. At the aft cg limit, the oscillation occurs every 3/4 to 1 turn. At low inertia values, the pitch attitude oscillates typically ±15 degrees about 50 degrees nose low, while at high inertia the oscillation is ±30 degrees about 40 degrees nose low.

The rotation rate of the spin is as fast as 140 degrees per second, or one turn every 2.5 seconds. This rate occurs at the steep phase of a spin oscillation. During the flat phase, the rotation rate is as slow as 90 degrees per second or one turn every 4.5 seconds. The average rotation rate is fastest at forward cg 's and high inertias, where oscillations occur least frequently. Toward the aft cg limit, where oscillations to flat attitudes are more frequent, the average rotation rate is slowest.

In all spins, the altitude loss is approximately 200 feet [60 m] per turn with a variance of 150 feet [46 m] minimum to 250 feet [79 m] maximum. This indicates that in spite of the oscillatory nature of the spin mode, the descent rate remains relatively constant.

Airspeed indications during the spin oscillate along with pitch attitude. In most cases, airspeed oscillates between 30 and 40 KIAS [56 and 74 km/h]. During larger oscillations in pitch attitude, higher sideslip angles are present and airspeed erroneously reads zero or less (pointer unwinds [backwards]).

Since airspeed indications can be unreliable during spins, particular attention is necessary to recognize the transition to a spiral. If cockpit noise due to outside airflow continues to increase to the point that conversation between crewmembers is difficult, or if the airspeed indicator is increasing through 60 KIAS [110 km/h], the aircraft is no longer spinning but is likely in a spiral. Opposite rudder [, opposite aileron,] and relaxed back stick pressure should be used immediately to avoid potential overspeed or overstress situations associated with high-speed spirals. Spoilers should be used as necessary to control airspeeds during all spin or spiral dive recoveries. [Remark: AS does not recommend the use of airbrakes during recoveries. Extracting the airbrakes has an unfavourable influence on the lift distribution, and the tolerable load factor reduces to +3.5g / -0g, see Flight Manual Section II.5].

[..]

Cockpit noise also varies during sustained spin oscillations. During steep phases of the spin, cockpit noise from outside airflow is loudest, while during flat phases, the cockpit is very quiet.

> ***WARNING***
> *The combination of varying cockpit noise levels, varying pitch attitudes, and varying rotation rates and airspeed indications can cause disorientation to those unfamiliar with spinning this aircraft. If this occurs, positive application of recovery controls should be initiated immediately to minimize any effects of disorientation.*

Control forces during spins are light. There is a tendency for the ailerons to float into the direction of the spin, accompanied by 5 to 10 pounds [2.3 to 4.5 daN] of lateral force on the control stick. At the higher spin rates, the elevator and rudder forces at full prospin deflection drop to zero.

CONTROL EFFECTS

Flight Manual Recovery

When opposite rudder is initiated at a slow point or flat phase of the spin, the rotation stops in 1/4 to 1/2 turn and the aircraft recovers. In the majority of cases, even at higher rotation rates, opposite rudder recovers the aircraft in 1/2 to 3/4 of a turn from the point of input. However, with cg's of 14 to 16 inches [355 to 406 mm] and at higher inertias, recovery can take up to 1 1/2 additional turns to recover once opposite rudder is applied. It is imperative that a slight pause occur between application of opposite rudder and forward stick or even greater delay in recovery can occur.

[Due to this statement the flight manual had been changed, adding the rule to obey a short pause between applying full rudder and relieving stick back pressure.]

A recovery of 1 1/2 turns may take up to 5 seconds, which may seem excessively long to an inexperienced pilot. The flight manual procedure has a 100 percent success rate if given sufficient time to work.

Aileron Effect

For the ASK 21, ailerons against the spin produce a noticeable bank angle away from the spin turn direction as well as a nose down pitch rate. This sometimes results in recovery as the yaw rate decreases through inertial coupling and the nose pitches down leaving the aircraft in a steep sideslip to terminate the spin. In other cases, the aircraft remains in the spin with a bank angle away from the spin direction. Therefore, ailerons against the spin are not a reliable contributor to spin recovery.

Ailerons with the spin increase rotation rate but this effect is masked by the oscillatory characteristics of the spin. In the majority of cases, ailerons into the spin achieve a slightly higher rotation rate and a more sustainable spin. The results of testing isolated aileron inputs indicate neutral aileron is the best position for recovery.

Elevator Effects

In some case, application of forward stick with no rudder input will result in a continued spin. During either the incipient phase of the spin or at the start of a nose up oscillation, full forward stick can produce up to three more turns before recovery.

> ***WARNING***
> *During recovery from stalls in the presence of wing drop, or from departures and spins, application of forward stick prior to opposite rudder can delay recovery up to three additional turn.*

Hands Off

In the majority of cases, when the controls are released during a spin, the stick moves laterally in the direction of the spin. The stick usually reaches full aileron deflection and then starts forward toward neutral. The aircraft pitch attitude steepens and then the rudders return to neutral. At this point, the aircraft self-recovers in a steep attitude.

If the controls are released just after the pitch attitude has cycled nose low and the rotation rate is high, the stick moves abruptly into the direction of the spin and remains at full aft/full aileron deflection. Rudders also remain at full deflection, or nearly so, and the spin continues indefinitely until the pilot forces the controls to the recovery position. This is most prevalent in the 14- to 16-inch cg range [355 to 406 mm] with higher inertia loadings. Since airloads on the controls can occasionally cause them to "lock out" in a prospin position, releasing the controls is not a viable option for departure or spin recovery. The spin recovery procedure must be used to ensure successful recovery.

INVERTED SPINS

Flight testing has verified that the ASK 21 has an inverted spin mode. Testing has been conducted between 15.8 inches cg [401 mm] and the aft cg limit.

WARNING
*Intentional inverted spins are **prohibited**.*

Susceptibility

[..] Inverted spins become less likely to occur at cg's forward of 15.8 [401 mm] inches since control positions become more critical. Overall, the ASK 21 is extremely resistant to inverted spins since only sustained inverted stalls result in spins, regardless of cg. Although testing indicates increased resistance forward of 15.8 inches cg [401 mm], this does not imply inverted spins at more forward cg's are impossible.

Characteristics

The inverted departure and spin entry are essentially a mirror image of the upright case. The nose falls to approximately 60 degrees nose low and then hesitates. Cockpit g forces build up to –2g and the nose then oscillates back up to 40 degrees nose low. The spin develops in approximately 180 degrees of rotation and is oscillatory just as the upright spin. Altitude loss is 200 to 300 feet per turn [61 to 91 m] and rotation rate is one turn every 3 to 2 1/2 seconds. At the cg's tested, the inverted spin oscillations occur every 3/4 to 1 turn. Once the spin is developed, g forces oscillate between –1 and –1.5g. Airspeed oscillates near 40 KIAS [75 km/h] and remains stalled throughout. Cockpit g forces are uncomfortable but other spin characteristics are very comparable to the upright case.

Inverted spin recovery is immediate (1/4 to 1/2 turn) when controls are neutralized. Altitude loss from initiating recovery to level flight is 400 to 500 feet [122 to 152 m]. Since the spin includes a component of roll rate as well as yaw rate, the aircraft rolls to an upright attitude during recovery on its own, without further pilot input. Airspeeds are typically 90 to 100 KIAS maximum [167 to 185 km/h] during inverted spin dive recoveries.

DEFINITIONS

Term	Definition (see page 5 of USAF-report)
Departure	Event in poststall flight, that precipitated entry into a poststall gyration or spin. Momentary event, indicated by uncommanded, divergent aircraft motions, and synonymous with complete loss of control.
Incipient spin	For the purpose of this report, an incipient spin means achieving a minimum of one turn, and the aircraft self-recovered in spite of maintaining prospin inputs.
Sustained spin	For the purpose of this report, a sustained spin was a spin that continued at least five turns, or indefinitely, as long as prospin inputs were maintained.