FLIGHT MANUAL

SCHLEICHER ASK21

This Manual must be carried on board at all times.

Registration: N221CP

Factory serial number: 21669

Owner: 

This Flight Manual is FAA approved for U.S. registered gliders in accordance with the provisions of 14 CFR Section 21.29 and is required by FAA Type Certificate Data Sheet No. G.47.B.U. 1.10.81

German edition of this Manual is approved under § 12(1)2 LuftGerPO.

Published 

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

I. GENERAL

I.1 LOG OF REVISIONS

<table>
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<th>Revisions No.</th>
<th>Pages affected</th>
<th>Description</th>
<th>LBA approval, signature</th>
<th>Date</th>
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<tr>
<td>01</td>
<td>13 dated: Feb 16, 1984</td>
<td>Modification of the flight manual (TN no. 13)</td>
<td>Feb. 23, 1984 signed by Mr. Frieß</td>
<td>Feb. 16, 1984</td>
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<td>02</td>
<td>14, 15, 2, 42, 43 dated: Dec. 20, 1983</td>
<td>Automatic elevator connection (TN no. 11)</td>
<td>March 9, 1984 signed by Mr. Frieß</td>
<td>Dec. 20, 1983</td>
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<td>03</td>
<td>2 and 13 dated: June 4, 1984</td>
<td>Amendment to the Flight Manual (TN no. 13 a)</td>
<td>June 6, 1984 signed by Mr. Frieß</td>
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<td>Amendment to the Manuals in English Language (TN no. 14)</td>
<td>May 28, 1984 signed by Mr. Frieß</td>
<td>May 16, 1984</td>
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<td>2, 25, 26, 26a, 27 dated: May 25, 1984</td>
<td>New canopy locking system (TN no. 15)</td>
<td>June 8, 1984 signed by Mr. Frieß</td>
<td>May 25, 1984</td>
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<tr>
<td>07</td>
<td>Annex</td>
<td>TN No. 20 New variant of tow release</td>
<td>March 1, 1990 signed by Mr. Schmaljohann</td>
<td>17.08.1990</td>
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<td>08</td>
<td>2, 42a, 43a, 43b</td>
<td>Amendment to the Flight Manual (TN No. 22)</td>
<td>Dec. 4, 1990 Signed by Mr. Skov</td>
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<td>09</td>
<td>2, 22, 24, 33, 34</td>
<td>Revision of the Flight Manual (TN No. 23)</td>
<td>Jan. 29, 1991 Signed by Mr. Kopp</td>
<td>15.04.91</td>
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All Manuals for ASK 21 can be ordered at: Alexander Schleicher, Segelflugzeugbau D-6416 Poppenhausen /W. /West Germany

March 9, 1983
## I.2 PAGES INCLUDED

<table>
<thead>
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<tr>
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<td>March 9, 1983</td>
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<td>7</td>
<td>March 9, 1983</td>
<td>42 Oct. 16, 1987</td>
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**Rev. no./Date Sig.**
- TN23 Jan.91 Waibel

**Author Date**
- Kaiser  Mar.9,1983

**Page no.**
- LBA-App.
I.3 CONTENTS

I. General
I.1 Log of revisions
I.2 Pages included
I.3 Contents
I.4 3-Side-View
I.5 Description

(Beginning of JAR22-required and LBA-approved part.)

II. Operating limitations
II.1 Airworthiness category
II.2 Permitted operations
II.3 Minimum equipment
II.4 Airspeed limitations & load factor limits
II.5 Crew
II.6 Weights
II.7 In flight C.G. range
II.8 Weight and balance information
II.9 General survey drawing 1 : 50
II.10 Placards and instruments color codes
II.11 Description of symbolic placards

III. Emergency procedures
III.1 Recovery from spin
III.2 Canopy jettisoning & emergency bailout
III.3 Flights through precipitation
III.4 Wing dropping
III.5 Ground looping

IV. Normal operating procedures
IV.1 Cockpit layout and controls
IV.2 Daily inspections
IV.3 Checks prior to take off
IV.4 Take off
IV.5 Free flight
IV.6 Low speed flight and wing dropping
IV.7 High speed flight
IV.8 Approach and landing
IV.9 Aerobatics

TN-No.20 dated October 16, 1987
V. 1 Rigging and de-rigging
V. 1.1 Rigging
V. 1.2 De-rigging
V. 3 Parking
V. 4 Road transport
V. 5 Preventive maintenance

VI. Center of gravity
VI. 1 Weighing procedure for empty weight C.G.
VI. 2 Empty weight C.G. range
VI. 3 Weighing record
VI. 4 Calculation of the in flight C.G.

Appendix
Flight polar
Lubrication Scheme
Rigging data (for adjustment of control surfaces, etc.)
I.4 THREE-SIDE-VIEW

March 9, 1983
II.3 MINIMUM EQUIPMENT

a) 2 airspeed indicators;
   2 altimeters;
   2 four-point safety harnesses;
   2 seat cushions, at least 10 cm thick when loaded, or parachutes (automatic or manual);
   Weight & balance data placard for both seats;
   Data plate;

b) Additional equipment for aerobatics
   Bottom straps for safety harnesses in both seats;
   1 G-meter for front seat;
   Foot loops on rudder pedals;
   Parachute (automatic or manual).
II. OPERATING LIMITATIONS

II.1 AIRWORTHINESS CATEGORY

A (Aerobatics) according to LFSM.
Certification basis: Airworthiness Requirements for Sailplanes and Powered Sailplanes dated 1.11.1975.

II.2 PERMITTED OPERATIONS

The glider is certified for VFR flights during daytime (VFR day).
The approved operation class is indicated by a data placard on the instrument panel. Depending on the respective equipment the glider may be licensed for traffic for the following categories:

1. Airworthiness Category U (Utility), according to VFR with equipment as under II.3 a)

2. Airworthiness Category A (aerobatics), with equipment as under II.3 a) and II.3 b) for the following aerobatics:
   Loop, Stall Turn, Split 'S', Immelmann, Slow Roll, Inverted Flights, Spin, Steep Climbing
   Turn, Lazy Eight, Chandelle.
I.5 DESCRIPTION

The ASK 21 is designed to meet the needs of modern gliding training. It has an all fibreglass sandwich structure.
Midwing with T-tail, tandem seat arrangement, airbrakes on upper wing only.
The glider is stressed for aerobatics (inverted flight included).

Technical Data

Span 17,00 m = 55,74 ft
Length 8,35 m = 27,4 ft
Height 1,53 m = 5,02 ft
Aspect ratio 16,1
Wing area 17,95 m² = 192,96 sqft
Max. all up weight 600 daN = 1320 lbs
Max. wing loading 33,4 daN/m² = 6,84 lbs/sqft

Airfoil: Wortmann FX SO2 196 (inner wing)
Wortmann FX 60 -126 (wing tip)

Winch Tow: Weak Link 1000 daN
Aero Tow : Weak Link 600 daN

March 9, 1983
II.4 AIRSPEED LIMITATIONS AND LOAD FACTOR LIMITS

Max. permissible speed (calm air):

\[ V_{NE} = 151,2 \text{ kts} = 174,00 \text{ mph} = 280 \text{ km/h} \]

Max. permissible speed (rough air):

\[ V_B = 108,0 \text{ kts} = 124,3 \text{ mph} = 200 \text{ km/h} \]

Max. maneuvering speed:

\[ V_M = 97,2 \text{ kts} = 112,0 \text{ mph} = 180 \text{ km/h} \]

Max. speed with airbrakes extended:

\[ V_{LE} = 151,2 \text{ kts} = 174,00 \text{ mph} = 280 \text{ km/h} \]

Stall speed with airbrakes extended:

\[ V_{S1} = 37,0 \text{ kts} = 42,3 \text{ mph} = 68 \text{ km/h} \]

Stall speed with airbrakes retracted:

\[ V_{S0} = 35,0 \text{ kts} = 40,4 \text{ mph} = 65 \text{ km/h} \]

The following safe load factors must not be exceeded (airbrakes retracted, symmetrical maneuvers):

At max. maneuvering speed \( V_M \)

\[ n = +6,5 \]
\[ -4,0 \]

At max. permissible speed \( V_{NE} \)

\[ n = +5,3 \]
\[ -3,0 \]

Rough air is defined as turbulence that can be expected in wave rotors, thunderstorms, whirlwinds, and when crossing mountain ridges.

Maneuvering speed is the highest speed at which full deflections of the control surfaces are still permitted.

With max. permissible speed \( V_{NE} \) only 1/3 of the possible deflections are permitted.

March 9, 1983
True airspeed (TAS) is, however, relevant for safety against flutter. Therefore, one must take into account that with increasing altitude the true airspeed is higher than the reading of the airspeed indicator because of the decreasing air density.

\[ V_{NE} = 151 \text{ kts} \quad n = +5.3 \]

\[ V_{NE} = -3.0 \]

\[ V_{NE} \text{ at various altitudes} \]

<table>
<thead>
<tr>
<th>Altitude (ft)</th>
<th>( V_{NE} ) (knots)</th>
<th>( V_{NE} ) (mph)</th>
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<tbody>
<tr>
<td>5000</td>
<td>151</td>
<td>174</td>
</tr>
<tr>
<td>10000</td>
<td>144</td>
<td>165</td>
</tr>
<tr>
<td>15000</td>
<td>132</td>
<td>152</td>
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<tr>
<td>20000</td>
<td>121</td>
<td>139</td>
</tr>
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</table>

**BEST \( L/D \):** \[ \frac{\text{Horizontal}}{\text{Vertical}} = E = \frac{33.5}{1} \]

**BEST CLIMB SPEED:** \[ @ \frac{95 \text{ km}}{hr} = 51 \text{ kts} \]

**MIN SINK:**
- **Solo:** \[ 2.2 \text{ ft/sec} @ 41 \text{ kts} \]
- **Dual:** \[ 2.5 \text{ ft/sec} @ 44 \text{ kts} \]

March 9, 1983
POSITION ERROR

With normal flights the position error of the airspeed indicator is negligible within the whole range up to 280 km/h (151 kts).

With inverted flights the airspeed indicator reads too low, i.e. up to -40 km/h (-22 kts).

By attaching an extension tube this error may be eliminated. (see also pages 27/28).

The extension tube must project at least 70 mm (2.75 in) past the fuselage nose.
Airspeed indicator markings (IAS)

Red line (max. permissible airspeed):
151,2 kts = 174,0 mph = 280 km/h

Yellow arc (caution range):
97,2 - 151 kts = 112 - 174 mph = 180 - 280 km/h

Green arc (normal range):
43,0 - 97 kts = 50 - 112 mph = 80 - 180 km/h

Yellow triangle (approach speed):
49,0 kts = 56,0 mph = 90 km/h

II.5 CREW : 2 persons

Minimum crew : 1 person (min. weight 70 daN = 154 lbs

Caution: Solo flights may only be conducted from the front seat!

II.6 WEIGHTS

Empty weight approx. 792 lbs = 360 daN
Max. all up weight 1320 lbs = 600 daN
Max. weight of non lift producing members 902 lbs = 410 daN.
II.7 IN FLIGHT CENTER OF GRAVITY RANGE

The approved in flight C.G. range is from 9.21 (234 mm) - 18.46 inches (469 mm) behind the datum line; equivalent to 20 % - 41.1 % of the MAC = 44.13 inches (1121 mm). With a 0.31 inches (8 mm) behind leading edge center part of the wing.

II.8 WEIGHT & BALANCE INFORMATION

Max. payload front seat (pilot incl. parachute):
242 lbs = 110 daN.

Min. payload front seat (pilot incl. parachute):
154 lbs = 70 daN.

Caution: Short weight in the front seat must be compensated by ballast (installation of lead discs in the nose; 1 lead disc = 2.76 lbs pilot weight).

<table>
<thead>
<tr>
<th>Number of lead discs</th>
<th>Min. payload front seat daN ± kg</th>
<th>Min. payload front seat lbs</th>
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<tr>
<td>0</td>
<td>70.0</td>
<td>154.32</td>
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<tr>
<td>1</td>
<td>68.75</td>
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<td>124.01</td>
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<td>12</td>
<td>55.0</td>
<td>121.25</td>
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Max. payload rear seat (pilot incl. parachute):
242 lbs = 110 daN.

1 kg = 2,2046223 lbs

June 4, 1984
Setting of placards

II. 9
Setting of placards [Only with tail wheel]
### Segelflugzeugbau A. Schleicher Poppenhausen

<table>
<thead>
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<th>Serial no.</th>
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<td>DATA PLACARD</td>
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<td>Max. speed for calm air</td>
<td>280 km/h</td>
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<tr>
<td>Max. speed for rough air</td>
<td>200 km/h</td>
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<tr>
<td>Max. maneuvering speed</td>
<td>$V_M$ 180 km/h</td>
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<td>Max. aero low speed</td>
<td>$V_F$ 180 km/h</td>
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<tr>
<td>Max. winch launch speed</td>
<td>$V_W$ 150 km/h</td>
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</table>

### WEIGHT AND BALANCE

| Min. payload front seat | kg |
| Max. payload front seat | kg |
| Max. payload rear seat  | kg |
| Baggage in wingroots    | max. $2 \times 10$ kg |
| Max. permissible all-up weight | kg |

### Pre Take Off Check:

1. Controls easy to operate?
2. Airbrakes locked?
3. Trim in the center position?
4. Parachute and safety harness fastened?
5. Altimeter adjusted to field height or to zero?
6. Radio "ON" and adjusted to proper frequency?
7. Both canopies locked?
Attention! Emergency bailout!

a) Pull back both canopy side-locks and push canopy upwards.
b) Undo safety harness.
c) Get up and bail out.
d) With manual chute seize release grip and pull out entirely after 1-3 sec.

A. Schleicher
6416 Poppenhausen

Model: ASK 21
Serial no: 21 XXX
Registration letters: Made in West Germany

Aerobatics prohibited!
Equipment as under airworthiness category "U" [Utility]

For equipment without g-meter and bottom strap.

Aerobatics as per Flight Manual
Equipment as under airworthiness category "A" [Acrobatic]

For equipment with g-meter and bottom strap.
Airspeed indicator color codes

43-97 kts / 50-112 mph
Green arc

97-151 kts / 112-174 mph
Yellow arc

Ground: mat-black
Color codes and letter in luminous paint.

G-meter color codes

a) Positive range
Yellow arc from +5.3 to 6.5
Red radial line at +6.5

b) Negative range
Red radial line at -4
Yellow arc from -3 to -4
II.11 DESCRIPTION OF SYMBOLIC PLACARDS

Rudder pedals adjustment: grey knob on RH side of the console.

To adjust pedals backwards:
Take your feet off the pedals and pull pedals backwards; then let go the grey knob and load the pedals in order to lock them.
To adjust pedals forwards:
Pull grey knob and push pedals forwards with your heels; then let go the grey knob and load the pedals in order to lock them.

Airbrakes: blue lever in the LH arm rest; pull to extend airbrakes.

Trim: nose-heavy.

Trim: tail-heavy.

Tow release: yellow knob LH below canopy frame.

To open canopy: pull back the white levers LH and RH on the canopy frame.
Canopy emergency jettisoning:
push to the left the red flat 
knob above the instrument panel.

Ventilation

Prior to take off check the 
proper engagement of the 
canopy locks! forward-locked

This placard must be fitted in 
the front and rear cockpit in 
full view of the pilot.
III. EMERGENCY PROCEDURES

III.1 RECOVERY FROM SPIN

According to the standard procedure spinning is terminated as follows:

a) Apply opposite rudder (i.e. apply rudder against the direction of rotation of the spin).

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

Warning: Disregarding the pause will result in slower recovery!

c) Ease the control column forward (i.e. give in to the pressure of the stick) until the rotation ceases and sound airflow is established again.

Warning: Full forward stick may retard or even prevent the recovery!

d) Centralise rudder and allow glider to dive out.

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

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

III.2 CANOPY JETTISONING AND EMERGENCY BAIL OUT

Front canopy:

a) Move lever with the red knob above the instrument panel to the left and push canopy upwards.

b) Open safety harness.

c) Get up and bail out.

d) With manual chute seize release grip and pull out entirely after 1 to 3 seconds.
Rear canopy
a) Pull back both canopy side locks and push canopy upwards.
b) Open safety harness.
c) Get up and bail out.
d) With manual chute seize release grip and pull out entirely after 1-3 seconds.

If circumstances allow, the front pilot should allow the rear pilot to bail out first.

III.3 FLIGHTS THROUGH PRECIPITATION
With wet or slightly iced wings or with insect accumulation there will be no deterioration in flight characteristics. However, one has to reckon with a rather considerable deterioration in flight performance. This must be taken into account especially on landing final approach.

Add a safety margin of 5 knots = 10 km/h for approach speed!
III.4 WING DROPPING

The glider stalls extremely benign. Nevertheless one always has to face the possibility of wing dropping because of turbulence. In that case push stick forward immediately and apply opposite rudder against a noticeable turn at the same time to regain a normal flight attitude. If the rudder deflection against the turn is forgotten, a spin may occur even if the stick pressure is released.

III.5 GROUND LOOPING

For normal conditions, smooth runway, short grass, one may take off with the wing on the ground without having to fear a change in the direction.

High grass and rough ground, however, may cause ground looping. In that case release the tow rope immediately.
IV. NORMAL OPERATING PROCEDURES

IV.1. COCKPIT LAYOUT AND CONTROLS

Front seat:
No.1: Stick.
No.2: Trim; flat lever with green knob LH of stick.
No.3: Rudder pedal adjustment; grey knob at the console.
No.4: Airbrakes with wheelbrake; blue lever in the left arm rest.
No.5: Release cable; yellow knob on left cockpit wall below the canopy frame.
No.6: Canopy emergency jettisoning; horizontal lever with red flat grip above the instrument panel cover; to the left = OPEN.
No.7: Front canopy locking:
   White swivel levers on left and right canopy frame.
   To open canopy: pull back both levers.
   To lock canopy: push both levers forwards, parallel to the canopy frame.
No.8: Ventilation nozzle; on right cockpit wall below the canopy frame; revolving and lockable.
No.9: Back rest; the back rest is adjustable by tilting it from the bottom upwards and forwards (see sketch); in normal flight attitudes the back rest cannot shift by itself.
   Very tall pilots may fly without the back rest.
No.10: Trim indicator; in the right arm rest behind the ventilation nozzle.
Front seat
Rear seat:
No.1: Stick.

No.2: Trim; flat lever with green knob LH of stick.

No.3: Rudder pedal adjustment with circular grip in front of stick.

No.4: Airbrakes with wheelbrake; blue lever in the left arm rest.

No.5: Release cable; yellow knob on left cockpit wall below the canopy frame.

No.6: Rear canopy locking = Canopy emergency jettisoning; red swivel levers on left and right canopy frame.
To open canopy: pull back both levers.
To lock canopy: push both levers forwards, parallel to the canopy frame.

No.7: Ventilation nozzle; on right cockpit wall below the canopy frame; revolving and lockable.

No.8: Back rest; the back rest is adjustable by tilting it from the bottom upwards and forwards (see sketch); in normal flight attitudes the back rest cannot shift by itself.
Very tall pilots may fly without the back rest.

No.9: Trim indicator; in the right arm rest behind the ventilation nozzle.
Rear seat
BACK REST ADJUSTMENT

Adjustment

Engaged
DAIΛY CHECKS [see page 30 FM]
IV.2 DAILY INSPECTIONS

Prior to flight operations the following checks must be accomplished:

1.a. Open canopy! Check that the main pins are properly secured.

b. Check the proper connection of the ailerons and airbrakes through the access hole on the left side above the wing. Are the quick-release connectors secured with spring clips?

c. Check for foreign bodies!

d. Check the control circuits force and that all controls are free-moving. Apply full deflections and load the control circuits with fixed controls and airbrakes.

Check the plastic tubes inside the S-shaped rudder pedal tubes for proper and tight fit.

e. Check tire pressure:
   Nose wheel 2.0 bar (28 psi)
   Main wheel 2.7 bar (38 psi)
   Tail wheel (If installed) 2.5 bar (35.6 psi).

f. The condition and function of the tow release mechanism is to be checked. Actuate the tow release: does it snap back freely? Engage and disengage the ring pair. Check the automatic release of the C.G. towing hook with the ring pair which must release automatically backwards.

g. Check the wheel brake. Pull the airbrake lever; at the end of its travel an elastic resistance must be felt.

2.a. Check upper and lower wing surface for damages!

b. Aileron: its condition, free-movingness and play is to be checked! Check also the pushrod connection.

c. Airbrake: its condition, fit and locking is to be checked.

3. Check the fuselage for damages, in particular also the bottom side.

4. Check that the tailplane is properly assembled and secured. Check also the pushrod connection! Secured with spring clips?
5. Check condition of tailskid, pitot tube and venturi tube.

6. Check static vents for cleanliness.

7. After rough landings or excessive flight stress the whole sailplane must be checked with the wings and the tail unit being removed (see also point 2.). If any damage is found, a technical aviation inspector must be called in. On no account one must take off again before such damage has been repaired.
See also the Instructions For Continued Airworthiness !!

IV.3. CHECKS PRIOR TO TAKE OFF

See the Check Lists in Section VII., p.43, of the Instructions
For Continued Airworthiness !!
IV.4 TAKE OFF

Winch tow
Trim neutral.
Max. tow speed: 81 kts = 93 mph = 150 km/h.
The glider features a tow release for winch tow in front of the main wheel.
The most favorable tow speed is 50-60 kts = 56-58 mph = 90-110 km/h.
There is little pitch up tendency during initial tow.
In the upper third of the tow additional altitude may be gained by slight back pressure.
Tow release: pull the release knob several times to the stop.

Aero tow
Aero tows only at the nose release in front of the nose wheel. Recommended tow rope length: 100-200 ft.
Trim neutral.
Max. tow speed: 97 kts = 112 mph = 180 km/h.
The most favorable tow speed during climb is 50-75 kts = 56-87 mph = 90-140 km/h.
Take off may be done with the wingtip on the ground.
Getting the wings level is no problem. However, the pilot is advised to be careful with high grass and very rough ground.
Lift off takes place at about 40 kts = 47 mph = 75 km/h.
IV.5 FREE FLIGHT

The glider may be flown up to \( V_{WE} = 151 \text{ kts} = 174 \text{ mph} = 280 \text{ km/h} \). Up to maneouvrng speed of 97 kts = 112 mph = 180 km/h full control deflections can be applied. At higher speeds the controls must be applied more carefully. At \( V_{WE} \) only 1/3 of the max. possible deflections must be applied.

IV.6 LOW SPEED FLIGHT, WING DROPPING AND SPINS

With the stick back a distinct tail buffet is felt. The glider is very benign in low speed flight. By use of normal aileron deflections the wings may be kept level down to minimum speed, even with aft C.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. Also rapid pulling up into 30° pitch does not cause wing dropping, but only a gentle nose drop. The same applies for stalling out of a 45° turn. But one has to point out that even the most benign glider 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.G. position and also to some extent from the pilot reaction.

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

For C.G. positions aft of 400 mm behind datum controllable sustained spins are possible. Such a C.G. position is usually only possible with one lightweight pilot in the front seat.
Note: During spins the ASK 21 oscillates in pitch. From a steep nose down spin recovery according to the standard procedure is up to 1 turn, from a flat spin less than 1 turn.

The speed at which the stall takes place depends on the payload. The following standard values are applicable:

**Single:** All up weight 1034 lbs = 470 daN,  
without airbrakes 65 km/h (35 kts) IAS  
with airbrakes 68 km/h (37 kts) IAS.

**Dual:** All up weight 1320 lbs = 600 daN,  
without airbrakes 74 km/h (40 kts) IAS  
with airbrakes 77 km/h (42 kts) IAS.

**IV.7 HIGH SPEED FLIGHT**

The glider shows no flutter tendency within the permissible speed range.  
With airbrakes extended in a 45° dive the speed remains below $V_{NE} = 151$ kts = 174 mph = 280 km/h; it goes up to $125$ kts = 144 mph = 232 km/h at an all up weight of 1230 lbs = 600 daN.

**IV.8 APPROACH AND LANDING**

The most favorable approach speed is 49 kts = 56 mph = 90 km/h.  
With turbulence it may be advisable to increase slightly the approach speed.  
Even steep approaches may be slowed down efficiently with the airbrakes at the beginning of the landing final approach.

Note: The airbrakes increase the stalling speed by about 1.6 kts = 3 km/h.  
Sideslipping is also suitable as an approach control. With full rudder during the sideslipping the rudder pressure decreases to zero; the rudder must be pushed back.  
During sideslipping the airspeed indication goes to zero reading.
IV.9 AEROBATICS

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 being an approved two-seater for full aerobatics offers this possibility.

Such guidance is even prescribed according to § 69 (4) of the German LuftPersPO (Aviation Personnel Test Regulations) dated January 9, 1976. Following § 96 (3) of the said LuftPersPO an adequate experience is required from flight instructors.

Note: the normal airspeed indicator system shows a large pressure error in inverted flight during which the airspeed indicator reads 40 km/h = 22 kts too low. When extending the pitot head by attaching a brass tube - 12 Ø x 1; 5,5 in = 140 mm in length - this error disappears. The tube must project in the front at least 2,75 in = 70 mm. For normal flights this is not necessary. In order to avoid damage when parking the glider in the hangar, this tube should not be left on any longer than necessary.

March 9, 1983
Permissible indicated speeds

Inverted flight without pitot head extension:
\[ V_{NE}: \text{Single } 35-130 \text{ kts} = 65-240 \text{ km/h.} \]
\[ \text{Dual } 38-130 \text{ kts} = 70-240 \text{ km/h.} \]

Indicated maneuvering speed \[ 75 \text{ kts} = 140 \text{ km/h} \]
Indicated max. speed \[ 130 \text{ kts} = 240 \text{ km/h.} \]

Inverted flight with pitot head extension:
Indicated maneuvering speed \[ 97 \text{ kts} = 180 \text{ km/h} \]
Indicated max. speed \[ 151 \text{ kts} = 280 \text{ km/h} \]
Indicated stall speed \[ 47 \text{ kts} = 87 \text{ km/h} \]
with two occupants

ATTENTION: 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.

Airbrakes must be extended as soon as the pilot loses the control of the glider or as the speed increases unvoluntarily too fast.

Exception: "Tail sliding" !!!
The trim remains in the center position for aerobatic maneuvers. Don't ever change the trim when flying aerobatics !!

PROHIBITED AEROBATICS
All abrupt aerobatic maneuvers
Loop forward
Tail sliding.

March 9, 1983
Extension tube for total pressure head with inverted flights

Brass tube 5.5 in = 140 mm in length (12 Ø x 1). One may also use a suitable plastic tube provided that it is sufficiently stiff and straight.

March 9, 1983
<table>
<thead>
<tr>
<th>Aerobatics</th>
<th>Indicated entrance speed</th>
<th>Max. acceleration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loop upward</td>
<td>Single: 84 kts = 155 km/h</td>
<td>2-3 g</td>
</tr>
<tr>
<td></td>
<td>Dual: 92 kts = 170 km/h</td>
<td></td>
</tr>
<tr>
<td>Stall Turn</td>
<td>Single: 89 kts = 165 km/h</td>
<td>3 g</td>
</tr>
<tr>
<td></td>
<td>Dual: 97 kts = 180 km/h</td>
<td></td>
</tr>
<tr>
<td>Split 'S'</td>
<td>Single: 92 kts = 170 km/h</td>
<td>2-3 g</td>
</tr>
<tr>
<td></td>
<td>Dual: 97 kts = 180 km/h</td>
<td></td>
</tr>
<tr>
<td>Immelmann</td>
<td>Single: 89 kts = 165 km/h</td>
<td>2.5-3.5 g</td>
</tr>
<tr>
<td></td>
<td>Dual: 97 kts = 180 km/h</td>
<td></td>
</tr>
<tr>
<td>Slow Roll</td>
<td>Single: 81 kts = 150 km/h</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dual: 89 kts = 165 km/h</td>
<td></td>
</tr>
<tr>
<td>Steep Climbing</td>
<td>Single: 76 kts = 140 km/h</td>
<td></td>
</tr>
<tr>
<td>Turns &amp; Lazy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eight</td>
<td>Dual: 81 kts = 150 km/h</td>
<td></td>
</tr>
<tr>
<td>Chandelle</td>
<td>Single: 86 kts = 160 km/h</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dual: 95 kts = 175 km/h</td>
<td></td>
</tr>
</tbody>
</table>
LOOP
Entrance speed:
Single 84 kts = 155 km/h
Dual 92 kts = 170 km/h
Max. g = 2-3.

STALL TURN
Entrance speed:
Single 89 kts = 165 km/h
Dual 97 kts = 180 km/h
Max. g = 3.

SPLIT 'S'
Pull up at least 30°!
Altitude loss approx. 328 ft = 100 m.
Entrance speed:
Single 92 kts = 170 km/h
Dual 97 kts = 180 km/h
Max. g = 2-3.

IMMELMANN
Entrance speed:
Single 89 kts = 165 km/h
Dual 97 kts = 180 km/h
Max. g = 2,5-3,5.

March 9, 1983
SLOW ROLL
Entrance speed:
Single 81 kts = 150 km/h
Dual 89 kts = 165 km/h.

INVERTED FLIGHT
Note: with the inverted flight
the fuselage nose will be un-
expectedly high above the hori-
zon.

SPIN

LAZY EIGHT
Entrance speed:
Single 76 kts = 140 km/h
Dual 81 kts = 150 km/h.
**STEEP CLIMBING TURN**

Entrance speed:
- Single 75 kts = 140 km/h
- Dual 81 kts = 150 km/h.

---

**CHANDELLE**

Entrance speed:
- Single 86 kts = 160 km/h
- Dual 95 kts = 175 km/h.
V. RIGGING AND DE-RIGGING

V.1 RIGGING

Rigging the ASK 21 can be carried out by four persons without mechanical assistance, and by three persons with the use of a fuselage stand or a wing support.

Prior to rigging, clean and grease all pins, bolts, bushings and control system connections.

1. Set up the fuselage and hold it horizontal.

2. Plug the spar fork of the left wing into the fuselage and - if available - place a wing support under the wing end.

3. Offer up the right wing and align the main pin fittings.

4. Press in the main pins and secure. NEVER insert the rear wing attachment pins prior to the main pins!

5. Press in the rear wing attachment pins; unscrew the T-tool and check whether the safety lock is engaged.

6. Connect and lock the aileron control linkages in the fuselage behind the spar tunnel. You must be able to touch the ball pivot by feeling through the slot in the socket. Also check the proper engagement of the safety lock by pushing it on to close! Secure them with spring clips!

7. Connect and lock the airbrake control linkages in the fuselage behind the spar tunnel. Secure them with spring clips!
8. The tailplane is fitted onto the fin from the front. (see Fig. V.2-1 and V.2-2).
Now the Allan bolt at the leading edge is screwed in; this should be screwed in tightly until the spring-loaded safety pin snaps out over the screw head as far as the socket.

9. Connect the elevator and safety with a spring clip!

Note, if your glider uses an automatic elevator connection: after cleaning and lightly greasing the plug-in elevator connections, the tailplane is fitted onto the fin from the front; both elevator panels must be fitted into their connectors simultaneously. Then the tailplane is pushed back until the Allan bolt at the leading edge can be screwed in; this should be screwed in tightly until the spring-loaded safety pin snaps out over the screw head as far as the socket.

10. Carry out a pre-flight check referring to the Check List (see Section VII, p.43, of the Instructions For Continued Airworthiness!

11. The control circuits must be subjected to an operational test.

12. Check condition and function of the wheel brake; check the tire pressure.
See also Section IV.2 DAILY INSPECTIONS in this Manual.
V.2 DE-RIGGING

De-rigging is carried out in the reverse sequence to that of rigging. It must be taken care that the rear wing attachment pins have to be removed prior to the main pins.

WARNING: For derigging the horizontal tail from the fin it has to be regarded that only the method according to Fig. V.2-2 is used.

Fig. V.2-1
WRONG: Twist movement

Fig. V.2-2
RIGHT: Pitch movement

V.3 PARKING

When parking the glider, the canopies have to be closed!

When an ASK 21 is parked on an airfield in the sunshine (this must also be observed during the waiting time until take-off when the pilots are already on board) the canopies must not be left open for some time.
Depending on the position of the sun and the intensity of the radiation, the burning-glass effect of the canopies can cause a slow fire in the area of the instrument panel or the headrest respectively.

Therefore, if you have to store the glider outside, it is absolutely necessary always to close the canopies and to cover them with a white cloth.

V.4 ROAD TRANSPORT

The design of a glider trailer is another subject and cannot be discussed in all details here. Of course, a closed trailer is preferable. But also an open trailer may serve the purpose, the latter is generally simpler and lighter. It is important that all components are well fixed and have a large support surface.

A structural components survey drawing which can be used for the building of a trailer, can be obtained from ALEXANDER SCHLEICHER.

WARNING: In no case must the elevator actuator fitting be loaded. This fitting trades out of the upper end of the fin. Not even soft foam cushions are allowed. For the construction of the trailer for road transport the full freedone from any load must be carefully regarded.
V.5 PREVENTIVE MAINTENANCE

The whole surface of the glider is painted with a weather resisting, white polyester coat. Impurities may be washed off with a mild cleansing agent. Heavy impurities may be removed with a polish. For the paint maintenance only silicone-free agents must be used (e.g. 1 Z-special cleansing agent-D2 from W.SAUER & CO., 5060 Bensberg, West Germany, - or the cleansing polish from LESONAL). Though the glider is rather insensitive, it should be protected as much as possible against moisture and humidity. If water has soaked into any components, these have to be stored in a dry room and must be turned over frequently.

The canopy is best cleaned with a special plexiglass cleansing agent; in an emergency lukewarm water will do. Rewipe only with pure, soft leather or with glove cloth. Never wipe on dry plexiglass.

The safety harnesses must be regularly checked for damage and tears. The metal parts of the harnesses must be checked for corrosion.

March 9, 1983
VI. CENTER OF GRAVITY (CG)

VI.1 WEIGHING PROCEDURE OF CG AT EMPTY WEIGHT

Prior to determining the CG in flight the CG at empty weight has to be established by weighing the glider. For this procedure the glider must be put on two pair of scales (one at the nose wheel and one at the tail skid).

NOTE: the glider must be set on the two pairs of scales very carefully in order to prevent that the scales get misaligned; (this could lead to erroneous results).

The Datum Line (DL) is situated at the wing leading edge of the straight center part of the wing. Levelling means: wedge on rear top edge of fuselage 1000 : 52 horizontal.

Empty weight CG:
Weight at the nose wheel: lbs
Weight at the tailskid: lbs
Support point nose wheel: in
Support point tailskid: in

NOTE: determination of empty weight and empty weight CG must be done without any additional balance weights (e.g. trim cushion).

Be careful not to exceed the maximum weight of non lift producing parts when using maximum payload. The total weight of non lift producing parts contains the individual weights of fuselage, elevator and maximum payload and must not exceed 410 daN = 920 lbs (the payload must be reduced accordingly).

March 9, 1983
Weight and Balance Sheet

Datum Point Wing Leading Edge [B.P.] y = 0.4 m

\[ r_R = \frac{G_2 \cdot L_1}{G_1 + G_2} \cdot L_2 \]

250 mm Luggage

\( L_1 \)

\( G_1 \)

\( G_2 \)

Wedge 1000:52 horizontal

With pilot C.G. arm = 1185 mm / 46.65 in
before datum point

Aft of datum

750

800 [mm]

\[ \text{min 70 kg Front} \]

\[ \text{max 110 kg Rear} \]

\[ * 110 \text{ kg Front} \]

Hatched area = permissible range

700

350

360

370

380

390

400

\( G_R \) Empty Weight [kg]

With pilot C.G. arm

\[ = 1250 \text{ mm} / 49.21 \text{ in} \]

\[ = 80 \text{ mm} / 3.15 \text{ in} \]

before datum point

\[ \text{max 90 kg Rear} \]

\[ + 110 \text{ kg Front} \]

March 9, 1983
The CG should be recalculated after repair, repainting or installation of additional equipment, but not later than 4 years after the last weighing. The empty weight, empty weight CG position and maximum load should be recorded after each weighing on page of the Flight Manual by a competent person.

VI.2 EMPTY WEIGHT CG POSITION

With the empty weight CG according to the below-mentioned limits and the pilot weights according to the load table, the in flight CG will be within the approved range.

<table>
<thead>
<tr>
<th>Empty Weight</th>
<th>CG forward</th>
<th>CG aft</th>
</tr>
</thead>
<tbody>
<tr>
<td>daN</td>
<td>lbs</td>
<td>mm</td>
</tr>
<tr>
<td>350</td>
<td>770</td>
<td>800</td>
</tr>
<tr>
<td>360</td>
<td>792</td>
<td>784</td>
</tr>
<tr>
<td>370</td>
<td>814</td>
<td>769</td>
</tr>
<tr>
<td>380</td>
<td>836</td>
<td>754</td>
</tr>
<tr>
<td>390</td>
<td>858</td>
<td>732</td>
</tr>
<tr>
<td>400</td>
<td>880</td>
<td>712</td>
</tr>
</tbody>
</table>

March 9, 1983
VI.3 WEIGHING RECORD

<table>
<thead>
<tr>
<th>Equipment used for weighing, carried out by</th>
<th>Date of weighing, (date)</th>
<th>Empty weight (lbs)</th>
<th>Empty CG behind datum (in)</th>
<th>Empty weight momentum (mm)</th>
<th>Max payload (lbs)</th>
<th>Signature</th>
</tr>
</thead>
</table>

The empty weight momentum is necessary to calculate the in flight CG (load table).

March 9, 1982
Schleicher ASK-21, N221CP, s/n 21663

Weight: 12-13-99
Results: \( G_1 = 549\text{#}, \quad G_2 = 291\text{#}, \quad L_1 = 270.5\text{"}, \quad L_2 = 630\text{"} \)

Calculate Empty C.G.
\[
r = \frac{G_2 \times 41}{G_1 + G_2} - \frac{291(270.5)}{549 + 291} = 63.0 - 30.71"\]

Calculate Empty Moment
\[
M_{empty} = 840\text{#} \times 30.71" = 25,796\text{ lb-in} \]

Calculate Useful Load
\[
Max \; All \; up \; Weight = 1320\text{#} \\
Less \; Empty \; Vgt = 840\text{#} \\
Useful \; Vgt = 480\text{#} \]

Example Flight C.G.
\[
\begin{align*}
\text{Empty Vgt} & : 840\text{#} \times 30.71" = 25,796 \\
\text{Pilot} & : 187\text{#} \times -47.24" = -8,834 \\
\text{Baggage} & : 22\text{#} \times -3.15" = -70 \end{align*}
\]

\[
\Sigma W = 1214\text{#} \quad \Sigma M = 16,658 \]

Flight C.G. = \[
\frac{16,658}{1214} = 13.72" \]

Flight C.G. range is 9.2" to 18.4" within Flight C.G. range

as of: 12/13/1999

Copy to P011, P648

Return this page to:

[Signature]

770 848-2861
970 482-2760
CAUTION: Incorrect loading can deteriorate glider handling qualities and can cause hazardous flight conditions. The pilot in command is responsible for correct loading.

Never fly the glider from the rear seat only!!
<table>
<thead>
<tr>
<th>Weight(lbs)</th>
<th>arm(inch)</th>
<th>Momentum(lbs × inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty weight</td>
<td>× +</td>
<td>=</td>
</tr>
<tr>
<td>Front pilot</td>
<td>× ${46,65}$ * ${49,21}$</td>
<td>=</td>
</tr>
<tr>
<td>Rear pilot</td>
<td>× -</td>
<td>=</td>
</tr>
<tr>
<td>Baggage</td>
<td>× +</td>
<td>=</td>
</tr>
</tbody>
</table>

Sum of weight Sum of momentum

Position of flight CG = \[
\frac{\text{Sum of momentum}}{\text{Sum of weight}} = \]

CG Flight [inches]

* Note: Tall persons shall use the shorter value and set the backrest on the rear position. Small persons shall use the longer value and set the backrest at the forward position.
<table>
<thead>
<tr>
<th></th>
<th>Weight [kg]</th>
<th>×</th>
<th>arm [mm]</th>
<th>=</th>
<th>Momentum [kg × mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty weight</td>
<td>× +</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front pilot</td>
<td>× − {1185} *</td>
<td></td>
<td>{1250}</td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>Rear pilot</td>
<td>× −</td>
<td></td>
<td></td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>Baggage</td>
<td>× +</td>
<td></td>
<td></td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>Sum of weight</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum of momentum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Position of flight CG = \( \frac{\text{Sum of momentum}}{\text{Sum of weight}} \) = CG Flight [mm]

* Note: Tall persons shall use the shorter value and set the backrest on the rear position.
Small persons shall use the longer value and set the backrest at the forward position.
<table>
<thead>
<tr>
<th>Weight [lbs]</th>
<th>arm [inch]</th>
<th>Momentum [lbs x inch]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty weight</td>
<td>814</td>
<td>30.55</td>
</tr>
<tr>
<td>Front pilot</td>
<td>187</td>
<td>{46.65} * {47.24}</td>
</tr>
<tr>
<td>Rear pilot</td>
<td>165</td>
<td>3.15</td>
</tr>
<tr>
<td>Baggage</td>
<td>22</td>
<td>9.84</td>
</tr>
<tr>
<td>Sum of weight</td>
<td>1188</td>
<td></td>
</tr>
<tr>
<td>Sum of momentum</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Position of flight CG = \(\frac{\text{Sum of momentum}}{\text{Sum of weight}}\) = 13.24

*Note: Tall persons shall use the shorter value and set the backrest on the rear position. Small persons shall use the longer value and set the backrest at the forward position.*
<table>
<thead>
<tr>
<th>Glider model:</th>
<th>ASK 18, ASK 18B</th>
<th>TN-No. 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ASW 19, ASW 19B</td>
<td>TN-No. 23</td>
</tr>
<tr>
<td></td>
<td>ASW 20/20L, ASW 20B/20BL, ASW 20C/20CL</td>
<td>TN-No. 14</td>
</tr>
<tr>
<td></td>
<td>ASK 21</td>
<td>TN-No. 21</td>
</tr>
<tr>
<td></td>
<td>ASW 22</td>
<td>TN-No. 6</td>
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<tr>
<td></td>
<td>ASK 23, ASK 23B</td>
<td>TN-No. 7</td>
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<tr>
<td></td>
<td>ASK 35</td>
<td>TN-No. 4</td>
</tr>
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**Subject:**
New production series tow release couplings for aerotow and winch launch.

**Serial number applicability:**
- ASK 18/18B, Data Sheet No. L-307, all serial nos.
- ASW 19/19B, Data Sheet No. L-308, all serial nos.
- ASW 20/20L, Data Sheet No. L-314, all serial nos.
- ASW 20B/20BL, Data Sheet No. L-314, all serial nos.
- ASW 20C/20CL, Data Sheet No. L-314, all serial nos.
- ASK 21, Data Sheet No. L-339, all serial nos.
- ASW 22, Data Sheet No. L-351, all serial nos.
- ASK 22/23B, Data Sheet No. L-351, all serial nos.
- ASH 45, Data Sheet No. 04.344, all serial nos.

**Compliance:**
None: applicable to new built gliders and in case of replacement of tow release couplings.

**Reason:**
According to the company TOST, they have stopped the previous production series of the tow release couplings "Nose tow release coupling E 72/75" and "Safety tow release coupling C 72/73". These have been replaced by the new tow release coupling production series "Nose tow release coupling E 85" and "Safety tow release coupling Europe G 88". In order to guarantee a problem-free exchange of the previous production series against the new one, the new tow release couplings show externally almost no differences.

**Action:**
1. Where replacement is required or where a corresponding installation location is provided, the new tow release coupling production series can be installed instead of the previous ones.
2. When this mod is accomplished, a copy of this Technical Note must be inserted as Annex into the Flight and Maintenance Manual of the glider (Operations Manuals respectively). The accomplishment of this action must be entered into the corresponding table in the manuals (the table headline reads: Additions to... Amendments to... Record or Log of Revisions...).

**Notes:**
The glider owners must regard the "Operating and Maintenance Instructions" for the new production series tow release couplings issued by TOST and giving the service time until the next overhaul.

Poppenhausen, January 17, 1990

Alexander Schleicher
Gmbh & Co.

Lutz W. Jostow

The German original of this Technical Note has been approved by the IBA under the date of March 1, 1990 (signature: SCHMALZER). The translation into English has been done by best knowledge and judgement; in any case of doubt the German original is controlling.