FLIGHT MANUAL

SCHLEICHER ASK 21

This Manual must be carried on board at all times.

Registration: ......................

Factory serial number: ..................

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 EU 1.10.83

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.

$6.00
I. GENERAL  
1.1 LOG OF REVISIONS

<table>
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<tr>
<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. Fries</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. Fries</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 Flight Manual (TN no. 13 r)</td>
<td>June 6, 1984 signed by Mr. Fries</td>
<td>June 4, 1984</td>
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<td>04</td>
<td>2 and 21 dated: May 16, 1984</td>
<td>Amendment to the Manuals in English Language (TN no. 14)</td>
<td>May 28, 1984 signed by Mr. Fries</td>
<td>May 16, 1984</td>
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<td>05</td>
<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. Fries</td>
<td>May 25, 1984</td>
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</table>

All Manuals for ASK 21 can be ordered at: Alexander Schleicher, Segelflugzeugbau  
D-6416 Poppenhausen /W. /West Germany

March 9, 1983
## 1.2 PAGES INCLUDED:

<table>
<thead>
<tr>
<th>Cover page</th>
<th>Pages</th>
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<tbody>
<tr>
<td>1 March 9, 1983</td>
<td>31 March 9, 1983</td>
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<td>2 June 4, 1984</td>
<td>32 March 9, 1983</td>
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<td>30 March 9, 1983</td>
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</tbody>
</table>

*June 4, 1984*
I.3 CONTENTS

| I. General | 1 |
| I.1 Log of revisions | 1 |
| I.2 Pages included | 2 |
| I.3 Contents | 3-4 |
| I.4 Three-side-view | 5 |
| I.5 Description | 6 |

(Beginning of JAR-22-required and LBA-approved part)

| II. Operating limitations | 7 |
| II.1 Airworthiness category | 7 |
| II.2 Permitted operations | 7 |
| II.3 Minimum equipment | 8 |
| II.4 Airspeed limitations & load factor limits | 9-12 |
| II.5 Crew | 12 |
| II.6 Weights | 12 |
| II.7 In flight C. G. range | 13 |
| II.8 Weight & balance information | 13 |
| II.9 General survey drawing, 1:50 | 14 |
| II.10 Placards | 15-19 |
| II.11 Description of symbolic placards | 20-21 |
| III. Emergency procedures | 22 |
| III.1 Recovery from spin | 22 |
| III.2 Canopy jettisoning & emergency bailout | 22-23 |
| III.3 Flights through precipitation | 23 |
| III.4 Wing dropping | 24 |
| III.5 Ground looping | 24 |
| IV. Normal operating procedures | 25 |
| IV.1 Cockpit layout & controls | 25-29 |
| IV.2 Daily inspections | 30-31 |
| IV.3 Pre Take Off Check | 31 |
| IV.4 Take off | 32 |
| IV.5 Free flight | 33 |

March 9, 1983
| IV.6. Low speed flight & wing dropping | 33-34 |
| IV.7. High speed flight | 34 |
| IV.8. Approach and landing | 34 |
| IV.9. Aerobatics | 35-41 |
| V. Rigging & derigging | 42 |
| V.1. Rigging | 42 |
| V.2. Derigging | 43 |
| V.3. Parking | 43 |
| V.4. Road transport | 43 |
| V.5. Preventive maintenance | 44 |
| VI. Center of gravity (CG) | 45 |
| VI.1. Weighing procedure of CG at empty weight | 45-47 |
| VI.2. Empty weight CG position | 47 |
| VI.3. Weighing record | 48-49 |
| VI.4. Calculation of CG at flight weight | 50-52 |
| Lubrication scheme | 53 |
| General lay out | 54 |
| Flight polar | 55 |

March 9, 1983
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

<table>
<thead>
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<th>Parameter</th>
<th>Value 1</th>
<th>Value 2</th>
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<tr>
<td>Span</td>
<td>17,00 m</td>
<td>55,74 ft</td>
</tr>
<tr>
<td>Length</td>
<td>8,35 m</td>
<td>27,4 ft</td>
</tr>
<tr>
<td>Height</td>
<td>1,53 m</td>
<td>5,02 ft</td>
</tr>
<tr>
<td>Aspect ratio</td>
<td>16,1</td>
<td></td>
</tr>
<tr>
<td>Wing area</td>
<td>17,95 m²</td>
<td>192,96 sq ft</td>
</tr>
<tr>
<td>Max. all up weight</td>
<td>600 daN</td>
<td>1320 lbs</td>
</tr>
<tr>
<td>Max. wing loading</td>
<td>33,4 daN/m²</td>
<td>6,84 lbs/sq ft</td>
</tr>
</tbody>
</table>

Airfoil: Wortmann FX S02 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. OPERATING LIMITATIONS

II.1 AIRWORTHINESS CATEGORY

A (Aerobatics) according to LPSM.

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.

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).

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

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

At max. maneuvering speed \( V_M \)
\[ n = +5,3 \]
\[ n = -3,0 \]

At max. permissible speed \( V_{NE} \)
\[ n = +6,5 \]
\[ n = -4,0 \]

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.

\[ V_{NE} = 151 \text{ kts} \quad n = \frac{5.3}{-3} \]

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

<table>
<thead>
<tr>
<th>Altitude (ft)</th>
<th>( V_{NE} ) (knots)</th>
<th>( V_{NE} ) (mph)</th>
</tr>
</thead>
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<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>
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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.

March 9, 1983
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.

March 9, 1983
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).

| Number of lead discs | Min. payload front seat
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td></td>
<td>daN</td>
</tr>
<tr>
<td>0</td>
<td>70,0</td>
</tr>
<tr>
<td>1</td>
<td>68,75</td>
</tr>
<tr>
<td>2</td>
<td>67,5</td>
</tr>
<tr>
<td>3</td>
<td>66,25</td>
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<tr>
<td>4</td>
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<td>11</td>
<td>56,25</td>
</tr>
<tr>
<td>12</td>
<td>55,0</td>
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Max. payload rear seat (pilot incl. parachute):
242 lbs = 110 daN.
1 kg = 2,2046223 lbs

June 4, 1984

TN-No.13 a
Setting of placards

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

<table>
<thead>
<tr>
<th>Model</th>
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<td>DATA PLACARD</td>
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</tbody>
</table>

#### Approved for:
- Max. speed for calm air: 180 km/h
- Max. speed for rough air: 200 km/h
- Max. maneuvering speed: \( V_M \) 180 km/h
- Max. zero low speed: \( V_F \) 180 km/h
- Max. winch launch speed: \( V_W \) 150 km/h

#### WEIGHT AND BALANCE
- Min. payload front seat: kg
- Max. payload front seat: kg
- Max. payload rear seat: kg
- Baggage in wingroots: max. 2 x 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 "OK" and adjusted to proper frequency?
7. Both canopies locked?
5. 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.

2. A. Schleicher
   6415 Poppenhausen
   Model: ASK 21
   Serial no: 21 XXX
   Registration letters: Made in West Germany

3. 1 off
   Aerobatics prohibited!
   Equipment as under airworthiness category "U" (Utility)

3. 1 off
   Aerobatics as per Flight Manual
   Equipment as under airworthiness category "A" (Acrobatic)

For equipment without g-meter and bottom strap.

For equipment with g-meter and bottom strap.

March 9, 1983
Correct

Wrong

Closed

Inspection hole

March 9, 1983
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

Red radial line at -4
Yellow arc from -3 to -4

b) Negative range
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: noseheavy.

Trim: tailheavy.

Tow release: yellow knob LH below canopy frame.

To open canopy: pull back the white levers LH and RH on the canopy frame.

March 9, 1983
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.

c) Release stick; i.e. give in to the pressure of the stick, until the rotation stops and sound airflow is established again.

d) Centralise rudder and allow glider to dive out.

The altitude loss from the beginning of the recovery until normal flight attitude is established, is about 260 ft = 80 m.

III.2 CANOPY JETTISONING AND EMERGENCY BAIL OUT

**Front canopy**

a) Move lever with 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 1-3 seconds.

March 9, 1983
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 is extremely harmless. 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 until normal flight attitude is regained.

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 direction. High grass and rough ground, however, may cause ground looping. In that case release 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.
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.

May 25, 1984

TN no.15
BACK REST ADJUSTMENT

Adjustment

Engaged

March, 9, 1983
DAILY CHECKS [see page 28 FM]
IV.2 DAILY INSPECTIONS

Prior to flight operations the following external checks have to be carried out:

a) Open canopy: check whether the lock catches of the main pins are properly engaged.

b) Check aileron and airbrake connections in the fuselage through the access hole on the LH side above the wing.

c) Check for foreign objects!

d) Check control circuits force and for full deflections; apply full deflections and load the control circuits with fixed controls and airbrakes.

e) Check tire pressure!
   Nose wheel  28 psi = 2,0 bar.
   Main wheel  30 psi = 2,7 bar.

f) Check condition and operation of tow release.
   Operate release: does it snap back freely? Engage and disengage the ring pair. Check the automatic release of the C.G. release with the ring pair which must release automatically backwards.

g) Check wheelbrake: pull airbrake lever; at the end of its travel an elastic resistance must be felt.

h) Check upper and lower wing surface for damages!

i) Aileron: check its condition, full deflection and ease of operation. Check pushrod connection!

j) Airbrake: check its condition, its fit and its locking.

k) Check fuselage for damages, especially the lower side.

l) Check tail unit for correct assembly and locking.
   Check pushrod connection!

March 9, 1983
m) Check condition of tailskid, pitot tube and venturi tube.
n) Check static vents for cleanliness!

IV.3 PRE TAKE OFF CHECK

a) Are controls easy to operate to their full deflections ??
b) Airbrakes locked ?
c) Trim neutral ?
d) Canopy locked ? Pay especially attention to the rear canopy !
e) Safety harness and parachute fastened ?
   (Parachute static line fixed with automatic parachute ?)
f) Altimeter adjusted ?
g) Radio "on" and adjusted to proper frequency ?
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.

March 9, 1983
IV.5  FREE FLIGHT

The glider may be flown up to $V_{NE} = 151$ kts = $174$ mph
= $280$ km/h.

Up to maneuvering 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 $V_{NE}$ only $1/3$ of the max. possible deflections must
be applied.

IV.6  LOW SPEED FLIGHT AND WING DROPPING

With the stick back a distinct tail buffet is felt.
The glider is very harmless in low speed flight. By use
of normal aileron deflections the wings may be kept
level up to min. speed, even with aft C.G. positions.

With normal rudder deflections no wing dropping
is found. Yaw angles of up to $5^\circ$ have no significant
influence on the wing dropping attitude.
Also rapid pulling up into $30^\circ$ pitch does not cause
wing dropping, but only a gentle nose drop. The same
applies for stalling out of a $45^\circ$ turn.
But one has to point out that even the most harmless
glider needs speed in order to be controllable. In
turbulence this is especially important.
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 $35$ kts = $40$ mph = $65$ km/h
  - with airbrakes $37$ kts = $42$ mph = $68$ km/h.

March 9, 1983
Dual
All up weight 1320 lbs = 600 daN,
without airbrakes 40 kts = 46 mph = 74 km/h
with airbrakes 42 kts = 48 mph = 77 km/h.

IV.7 HIGH SPEED FLIGHT
The glider shows no flutter tendency within the permissible speed range.
With extended airbrakes 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 1320 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. It is advisable to unlock the airbrakes at the beginning of 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 full sideslip the airspeed indication goes to zero reading.

March 9, 1983
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:

\[ V_{NE} : \]
- Single 35-130 kts = 65-240 km/h.
- Dual 38-130 kts = 70-240 km/h.

Indicated maneuvering speed: 75 kts = 140 km/h
Indicated max. speed: 130 kts = 240 km/h.

Inverted flight with pitot head extension:

Indicated maneuvering speed: 97 kts = 180 km/h
Indicated max. speed: 151 kts = 280 km/h
Indicated stall speed: 47 kts = 87 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 unwillingly 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

Fuselage nose

\[ \text{Ø}12 \times 1 \text{ mm} \]

70 mm
2,75 in. minimum

140 mm
5,5 in.

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 Eight</td>
<td>Single: 81 kts = 150 km/h</td>
<td></td>
</tr>
<tr>
<td></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 '5'
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 unexpectedly high above the horizon.

SPIN

LAZY EIGHT

Entrance speed:
Single 76 kts = 140 km/h
Dual 81 kts = 150 km/h.

March 9, 1983
STEEP CLIMBING TURN

Entrance speed:
Single 76 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.

March 9, 1983
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, all pins, pinholes, and all control system connections must be cleaned and greased.

1. Set up the fuselage and hold it horizontal.
2. Plug the 2-prong spar end of the left wing into the fuselage and - if available - place a wing support under the wingtip.
3. Plug in the right wing.
4. Insert the two main pins and safety them with the safety hook at the spar tunnel. Never insert the rear wingpins prior to the main pins!
5. Insert rear attachment pins; unscrew T-grip and check whether the safety lock is engaged.
6. Connect aileron ball fittings behind the spar tunnel. You must be able to touch the ball pivot by feeling through the slot in the socket. Press the safety lock.
7. Connect airbrake ball fittings behind the spar tunnel.
8. The horizontal tail is fitted onto the fin from the front. Screw in the Allan bolt from above and tighten it with some pressure. The spring-loaded retainer must snap securely into place, i.e. into one of the longitudinal slots of the Allan bolt.
9. Connect elevator!

Note: If your glider features a horizontal tail unit with automatic elevator connection, fit the horizontal tail onto the fin from the front, simultaneously the elevator
must go into its connector. The tailplane is now pushed back until the Allan bolt at the leading edge can be screwed in; this should be screwed in tightly until the spring retainer snaps securely into place.

10. Carry out a pre-flight check, referring to the Check List.

11. Check operation of control circuits.

12. Check operation of wheelbrake and the tire pressure.

V.2. DE-RIGGING

De-rigging is done in reverse order of rigging. One must take care that the rear wing attachment pins have to be removed prior to the main pins.

V.3. PARKING

When parking the glider the canopies have to be locked.

V.4. ROAD TRANSPORT

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

Schleichers will supply general drawings of structural components for the purpose of building a trailer on request.

December 20, 1983
V.5  PREVENTIVE MAINTENANCE

The whole surface of the glider is painted with a weather resisting, white polyester polish paint. 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: 1 lbs
Weight at the tailskid: 1 lbs
Support point nose wheel: 1 in
Support point tailskid: 1 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

Wedge 1000:52 horizontal

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

250mm Luggage

G1

G2

L1

L2

800 [mm]

With pilot C.G. arm = 1185 mm / 46,65 in
before datum point

750

Alt. of datum

Hatched area = permissible range

With pilot C.G. arm = 1250 mm / 49,21 in
= 80 mm / 3,15 in
before datum point

700

G2 Empty Weight [kg]

max 90 kg Rear
+ 110 kg Front

350 360 370 380 390 400

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 daN</th>
<th>lbs</th>
<th>CG forward mm</th>
<th>in</th>
<th>CG aft mm</th>
<th>in</th>
</tr>
</thead>
<tbody>
<tr>
<td>350</td>
<td>770</td>
<td>800</td>
<td>31,50</td>
<td>800</td>
<td>31,50</td>
</tr>
<tr>
<td>360</td>
<td>792</td>
<td>784</td>
<td>30,87</td>
<td>792</td>
<td>31,18</td>
</tr>
<tr>
<td>370</td>
<td>814</td>
<td>769</td>
<td>30,28</td>
<td>783</td>
<td>30,83</td>
</tr>
<tr>
<td>380</td>
<td>836</td>
<td>754</td>
<td>29,69</td>
<td>774</td>
<td>30,47</td>
</tr>
<tr>
<td>390</td>
<td>858</td>
<td>732</td>
<td>28,82</td>
<td>766</td>
<td>30,16</td>
</tr>
<tr>
<td>400</td>
<td>880</td>
<td>712</td>
<td>28,03</td>
<td>758</td>
<td>29,84</td>
</tr>
</tbody>
</table>

March 9, 1983
**LOAD TABLE**

The empty weight momentum is

<table>
<thead>
<tr>
<th>Date of weighing</th>
<th>Equipment</th>
<th>Empty weight</th>
<th>Empty CG behind da...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(kg)</td>
<td>(mm) (in)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**WEIGHING RECORD**

VI.3

PLUGGIE MANUAL SCHLIECHER ASK 21
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>*</th>
<th>*arm (inch)*</th>
<th>=</th>
<th>Momentum (lbs * inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty weight</td>
<td>*</td>
<td>+</td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>Front pilot</td>
<td>*</td>
<td>-</td>
<td>\text{46.65} *</td>
<td>=</td>
</tr>
<tr>
<td></td>
<td>*</td>
<td>-</td>
<td>\text{49.21}</td>
<td>=</td>
</tr>
<tr>
<td>Rear pilot</td>
<td>*</td>
<td>-</td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>Baggage</td>
<td>*</td>
<td>+</td>
<td>=</td>
<td></td>
</tr>
</tbody>
</table>

\[ \text{Sum of weight} \rightarrow \text{Sum of momentum} \]

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

\* 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>Weight [kg]</th>
<th>( \times )</th>
<th>arm [mm]</th>
<th>( \times )</th>
<th>Momentum [kg ( \times ) mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty weight</td>
<td>( \times )</td>
<td>+</td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>Front pilot</td>
<td>( \times )</td>
<td>( 1185 )</td>
<td>*</td>
<td>( 1250 )</td>
</tr>
<tr>
<td>Rear pilot</td>
<td>( \times )</td>
<td>-</td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>Baggage</td>
<td>( \times )</td>
<td>+</td>
<td>=</td>
<td></td>
</tr>
</tbody>
</table>

\[
\text{Sum of weight} \rightarrow \text{Sum of momentum} \rightarrow \text{CG Flight [mm]}
\]

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

*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 [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>
<td>+ 24,869</td>
</tr>
<tr>
<td>Front pilot</td>
<td>187</td>
<td>- {46,65}</td>
<td>- 88,338</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* 47,24</td>
<td></td>
</tr>
<tr>
<td>Rear pilot</td>
<td>165</td>
<td>- 3,15</td>
<td>- 519,75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 519,75</td>
<td></td>
</tr>
<tr>
<td>Baggage</td>
<td>22</td>
<td>+ 9.84</td>
<td>+ 216,48</td>
</tr>
<tr>
<td>Sum of weight</td>
<td>1188</td>
<td>Sum of momentum</td>
<td>15730,85</td>
</tr>
<tr>
<td>Position of flight CG = [ \frac{\text{Sum of momentum}}{\text{Sum of weight}} ] = 13.24</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* 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.
LUBRICATION SCHEME

1. Clean and lubricate every rigging.
2. Disassemble and lubricate on annual inspection.

LUBRICANTS: multi purpose grease
DIL: machine oil or car engine oil