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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.

- 9. März 1983

I. GENERAL

I.1 LOG OF REVISIONS

Revisions No.	Pages affected	Description	LBA approval, signature	Date
01	13 dated: Feb 16 1984	Modification of the flight manual (TN no. 13)	Feb. 23. 1984 signed by Mr. Frieß	Feb.16. 1984
02	14,15 2, 42, 43 dated: Dec.20, 1983	Automatic elevator connection (TN no. 11)	March 9. 1984 signed by Mr. Frieß	Dec. 20. 1983
03	2 and 13 dated: June 4, 1984	Amendment to the Flight Manual (TN no. 13 a)	June 6, 1984 signed by Mr. Frieß	June 4, 1984
04	2 and 21 dated: May 16, 1984	Amendment to the Manuals in English Language (TN no. 14)	May 28, 1984 signed by Mr. Frieß	May, 16. 1984
05	2, 25, 26, 26a, 27 dated: May 25, 1984	New canopy locking system (TN no. 15)	June 8, 1984 signed by Mr. Frieß	May 25, 1984

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 :

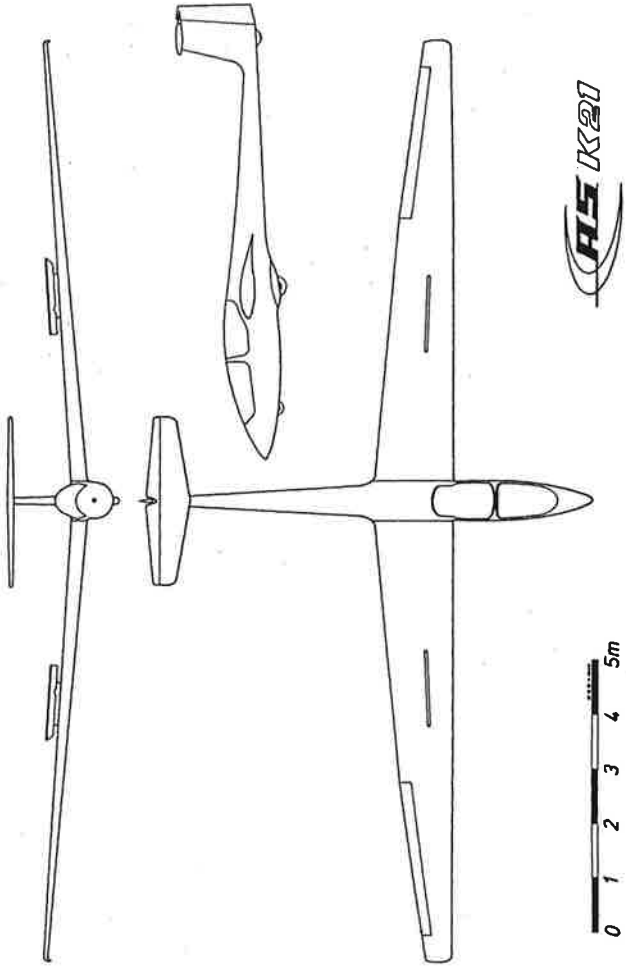
Cover page			
1	March 9, 1983	31	March 9, 1983
2	June 4, 1984	32	March 9, 1983
3	March 9, 1983	33	March 9, 1983
4	March 9, 1983	34	March 9, 1983
5	March 9, 1983	35	March 9, 1983
6	March 9, 1983	36	March 9, 1983
7	March 9, 1983	37	March 9, 1983
8	March 9, 1983	38	March 9, 1983
9	March 9, 1983	39	March 9, 1983
10	March 9, 1983	40	March 9, 1983
11	March 9, 1983	41	March 9, 1983
12	March 9, 1983	42	Dec. 20, 1983
13	June 4, 1984	43	Dec. 20, 1983
14	Dec. 20, 1983	44	March 9, 1983
15	Dec. 20, 1983	45	March 9, 1983
16	March 9, 1983	46	March 9, 1983
17	March 9, 1983	47	March 9, 1983
18	March 9, 1983	48	March 9, 1983
19	March 9, 1983	49	March 9, 1983
20	March 9, 1983	50	March 9, 1983
21	May 16, 1984	51	March 9, 1983
22	March 9, 1983	52	March 9, 1983
23	March 9, 1983	53	March 9, 1983
24	March 9, 1983	54	March 9, 1983
25	May 25, 1984	55	March 9, 1983
26	May 25, 1984		
26 a	May 25, 1984		
27	May 25, 1984		
28	March 9, 1983		
29	March 9, 1983		
30	March 9, 1983		

I.3 CONTENTS

		PAGE
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-reyuired 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 precipifation	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

IV.6.	Low speed flight & wing dropping	33+34
IV.7.	High speed flight	34
IV.8.	Approach and landing	34
IV.9.	Aercobatics	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 emty 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

I.4 THREE-SIDE-VIEW



I.5 DESCRIPTION

The ASK 21 is designed to meet the needs of modern gliding training. It has an all fiberglass 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 m^2	=	192,96	sqft
Max. all up weight	600 daN	=	1320	lbs
Max. wing loading	33,4 daN/m^2	=	6,84	lbs/sqft

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

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.

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;
Flight Manual.

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.4 AIRSPEED LIMITATIONS AND LOAD FACTOR LIMITS

Max. permissible speed (calm air):

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

Max. permissible speed (rough air):

V_B = 108,0 kts = 124,3 mph = 200 km/h

Max. maneuvering speed:

V_M = 97,2 kts = 112,0 mph = 180 km/h

Max. speed with airbrakes extended:

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

Stall speed with airbrakes extended:

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

Stall speed with airbrakes retracted:

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

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

At max. maneuvering speed V_M $n = \begin{matrix}+6,5\\-4,0\end{matrix}$

At max.permissible speed V_{NE} $n = \begin{matrix}+5,3\\-3,0\end{matrix}$

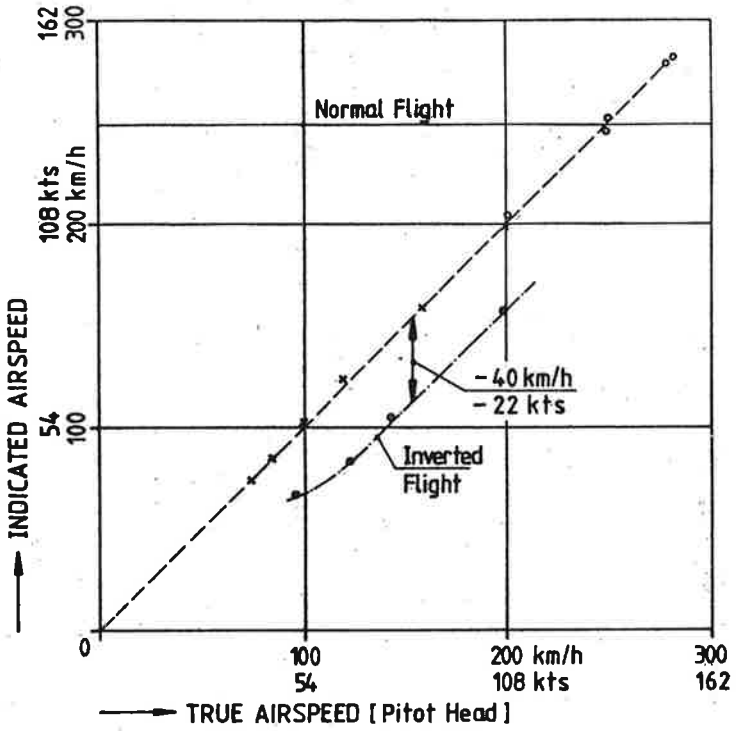
Rough air is defined as turbulence that can be expected in wave rotors, thunderstorms, whirlwinds, and when crossing mountain ridges.
Maneuvering speed is the highest speed at which full deflections of the control surfaces are still permitted.
With max. permissible speed V_{NE} only 1/3 of the possible deflections are permitted.

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 kts n = $\begin{matrix}+5,3\\-3,0\end{matrix}$

V_{NE} at various altitudes

Altitude ft	V_{NE} knots	mph
5000	151	174
10000	144	165
15000	132	152
20000	121	139



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

C.G.
9.21" to 18.46"

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).

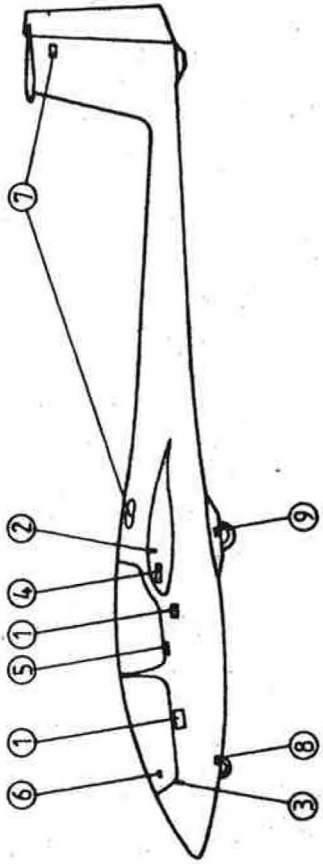
Number of lead discs	Min. payload front seat daN ≙ kg	lbs
0	70,0	154,32
1	68,75	151,57
2	67,5	148,81
3	66,25	146,06
4	65,0	143,30
5	63,75	140,54
6	62,5	137,79
7	61,25	135,03
8	60,0	132,28
9	58,75	129,52
10	57,5	126,77
11	56,25	124,01
12	55,0	121,25

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

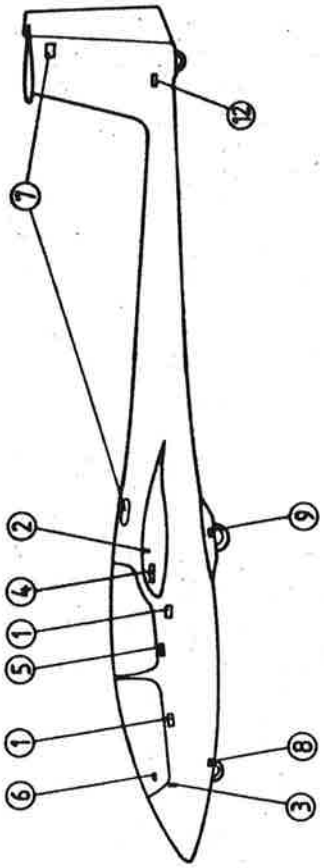
1 kg = 2,2046223 lbs

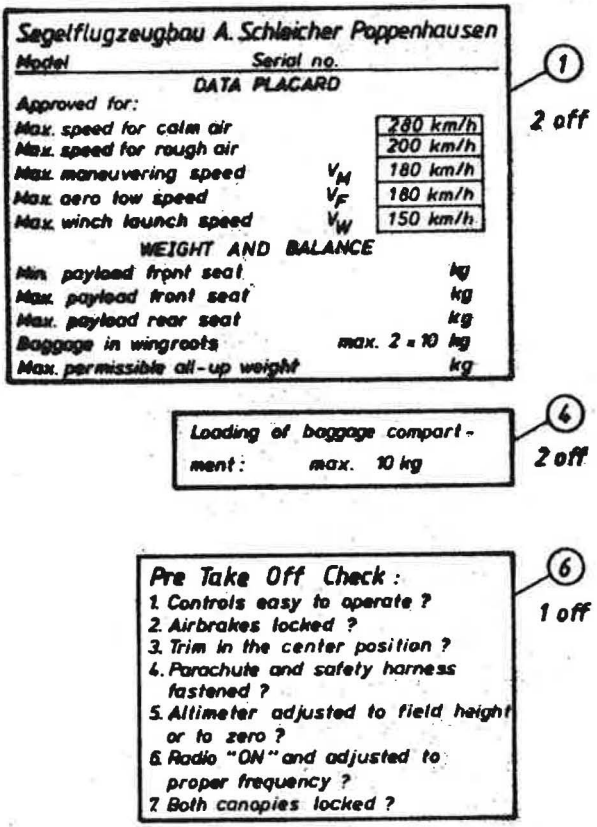
Setting of placards

II. 9



Setting of placards [Only with tail wheel]




Segelflugzeugbau A. Schleicher Poppenhausen
Model
Serial no.
DATA PLACARD
Approved for:
Max. speed for calm air 280 km/h
Max. speed for rough air 200 km/h
Max. maneuvering speed V_M 180 km/h
Max. aero tow 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
1
2 off
Loading of baggage compartment: max. 10 kg
4
2 off
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 ?
6
1 off

(5) 1 off Rear

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
6416 Poppenhausen

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

(3) 1 off

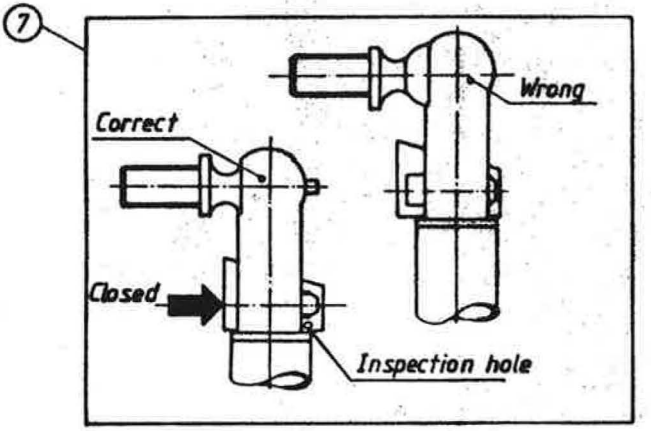
Aerobatics prohibited!
Equipment as under airworthiness category "U" (Utility)

For equipment without g-meter and bottom strap.

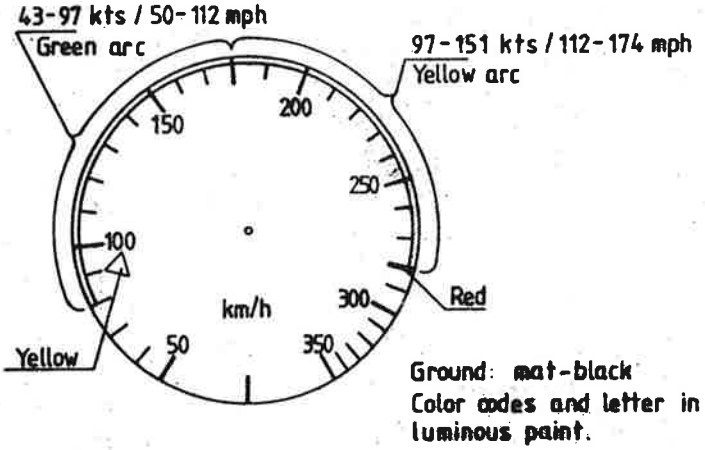
(3) 1 off

Aerobatics as per Flight Manual
Equipment as under airworthiness category "A" (Acrobatic)

For equipment with g-meter and bottom strap.

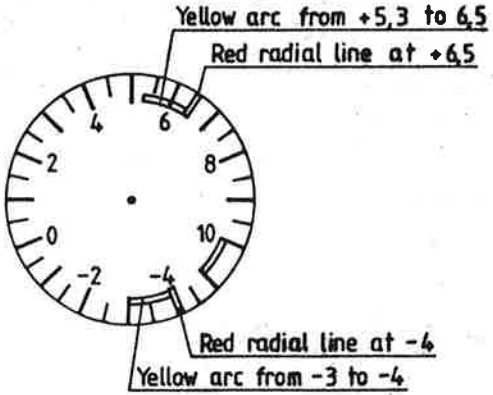

7
Wrong
Correct
Closed
Inspection hole

Airspeed indicator color codes



G-meter color codes

a) Positive range

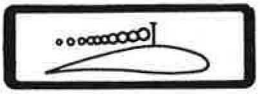


b) Negative range

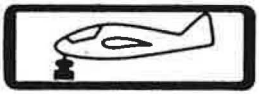
II.11 DESCRIPTION OF SYMBOLIC PLACARDS

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

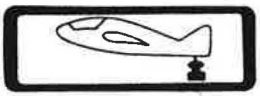
To adjust pedals backwards:
Take your feet off the pedals and pull pedals backwards; then let go the grey knob and load the pedals in order to lock them.
To adjust pedals forwards:
Pull grey knob and push pedals forwards with your heels; then let go the grey knob and load the pedals in order to lock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



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

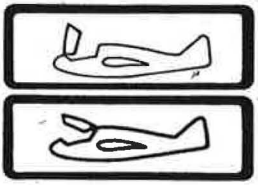


Trim: noseheavy.



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.

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.

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.

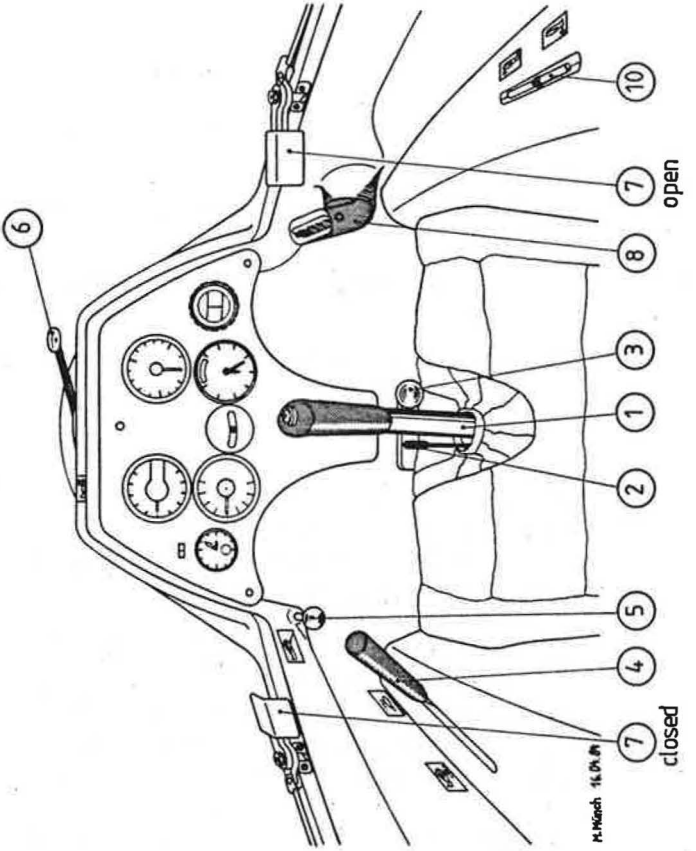
No.7: Front canopy locking:
White swivel levers on left and right canopy frame.
To open canopy: pull back both levers.
To lock canopy: push both levers forwards, parallel to the canopy frame.

No.8: Ventilation nozzle; on right cockpitwall 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.

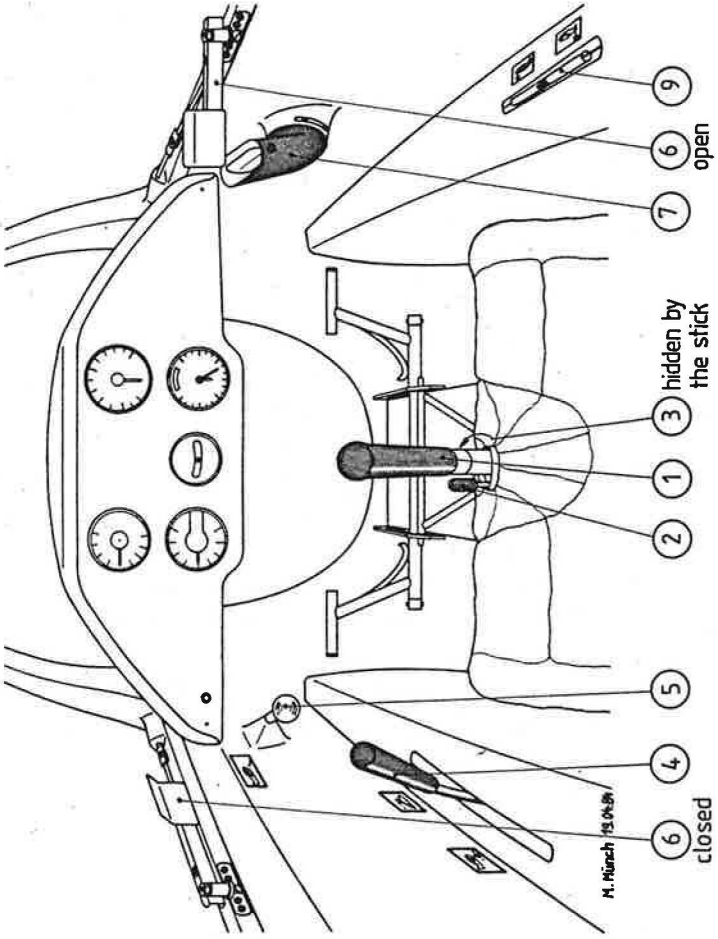
No.6: Rear canopy locking = Canopy emergency jettisoning; red swivel levers on left and right canopy frame.
To open canopy: pull back both levers.
To lock canopy: push both levers forwards, parallel to the canopy frame.

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

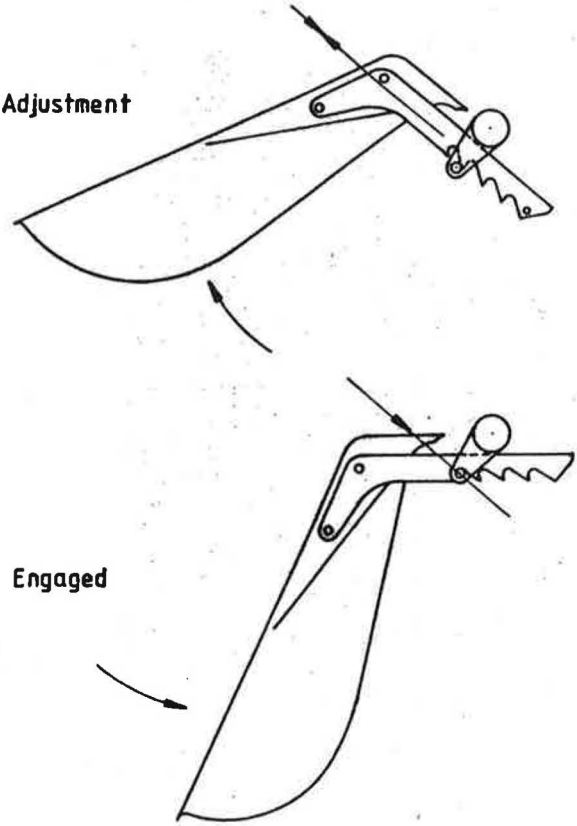
No.8: Back rest; the back rest is adjustable by tilting it from the bottom upwards and forwards (see sketch); in normal flight attitudes the back rest cannot shift by itself.
Very tall pilots may fly without the back rest.

No.9: Trim indicator; in the right arm rest behind the ventilation nozzle.

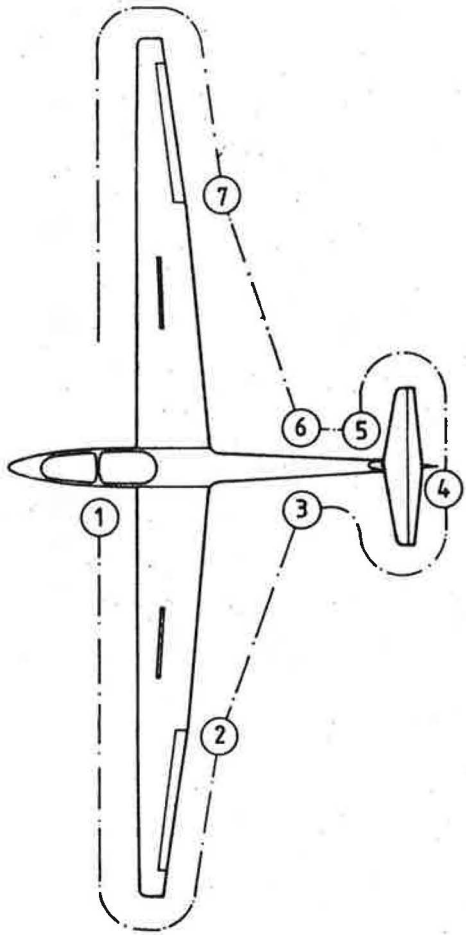
Rear seat



BACK REST ADJUSTMENT



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 38 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 !

m) Check condition of tailskid, pitot tube and venturi tube.

n) Check static vents for cleanness !

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.

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° 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 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.

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.

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.

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.

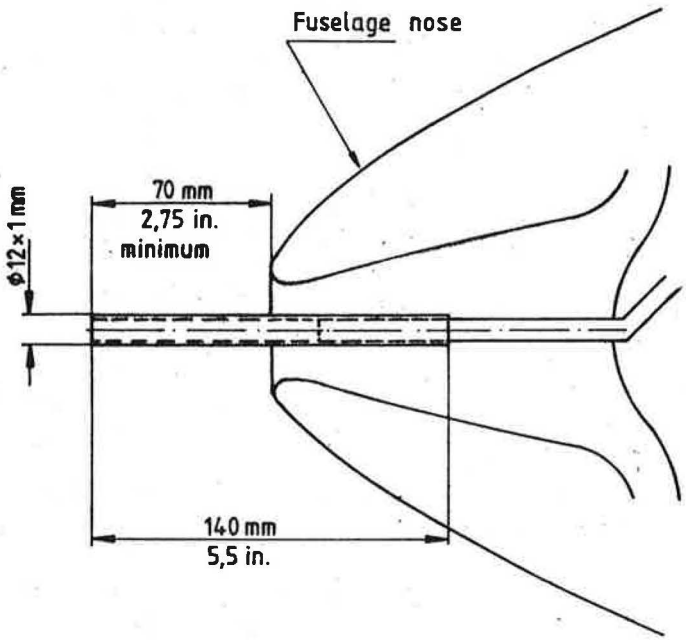
Indicated maneuvering speed 75 kts = 140 km/h
Indicated max. speed 130 kts = 240 km/h.

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 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.

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.

Recommended entrance speeds for the following aerobatics

	Indicated entrance speed	Max.acceleration
Loop upward	Single: 84 kts = 155 km/h	2-3 g
	Dual: 92 kts = 170 km/h	
Stall Turn	Single: 89 kts = 165 km/h	3 g
	Dual: 97 kts = 180 km/h	
Split 'S'	Single: 92 kts = 170 km/h	2-3 g
	Dual: 97 kts = 180 km/h	
Immelmann	Single: 89 kts = 165 km/h	2,5-3,5 g
	Dual: 97 kts = 180 KM/h	
Slow Roll	Single: 81 kts = 150 km/h	
	Dual: 89 kts = 165 km/h	
Steep Climbing Turns & Lazy Eight	Single: 76 kts = 140 km/h	
	Dual: 81 kts = 150 km/h	
Chandelle	Single: 86 kts = 160 km/h	
	Dual: 95 kts = 175 km/h	

L O O P

Entrance speed:
Single 84 kts = 155 km/h
Dual 92 kts = 170 km/h
Max. g = 2-3.

S T A L L T U R N

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

S P L I T '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.

I M M E L M A N N

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

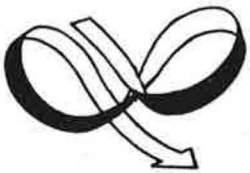
S L O W R O L L

Entrance speed:
Single 81 kts = 150 km/h
Dual 89 kts = 165 km/h.

I N V E R T E D F L I G H T

Note: with the inverted flight the fuselage nose will be unexpectedly high above the horizon.

S P I N



L A Z Y E I G H T

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

S T E E P C L I M B I N G
T U R N

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

C H A N D E L L E

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,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.

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.

VI. CENTER OF GRAVITY (CG)

VI.1 WEIGHING PROCEDURE OF CG AT EMTY 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.

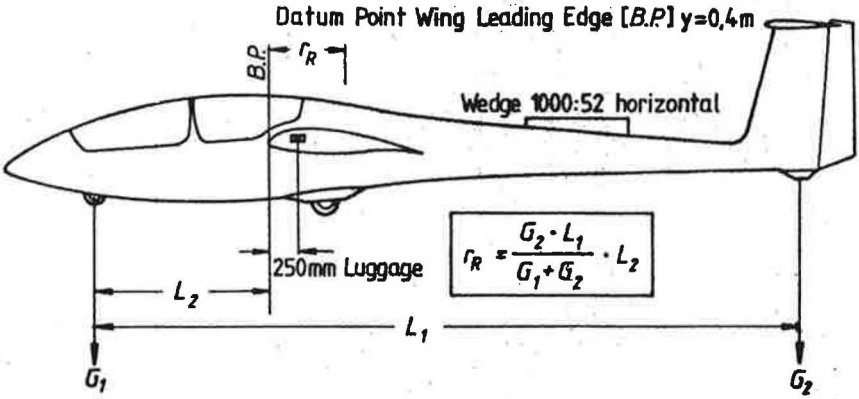
Empty weight CG :

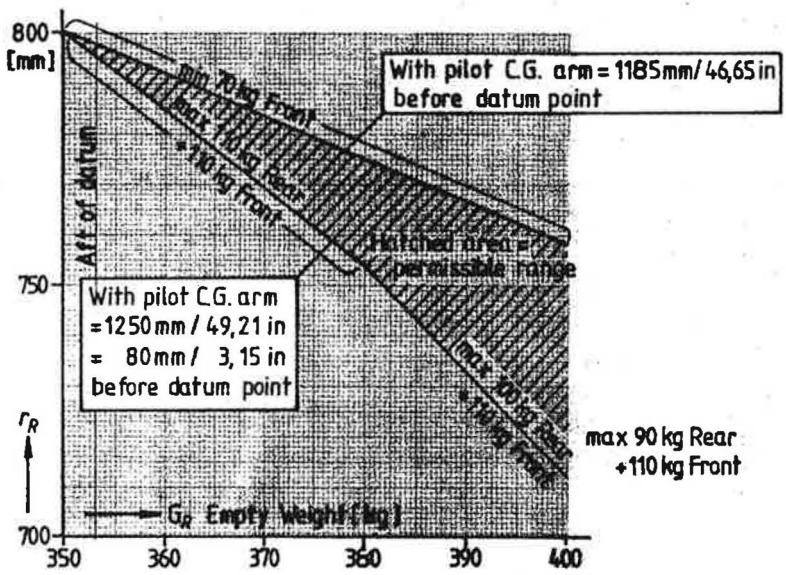
Weight at the nose wheel:	lbs
Weight at the tailskid:	lbs
Support point nose wheel:	in
Support point tailskid:	in

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).

Weight and Balance Sheet





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.

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

VI.3 WEIGHING RECORD

Date of weighing, carried out by	Equipment list used for weighing (date)	Empty weight kg (lbs)	Empty CG behind datum mm (in)	Empty weight momentum	Max. payload kg(lbs)	Signature

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

March 9, 1983

CAUTION : Incorrect loading can deteriorate glider handling qualities and can cause hazardous flight conditions. The pilot in command is responsable for correct loading.

Never fly the glider from the rear seat only !!

VI . 4 Calculation of CG at flight weight

	Weight [lbs]	×	arm [inch]	=	Momentum [lbs × inch]
Empty weight		× +		=	
Front pilot		× −	{46,65 / 49,21} *	=	
Rear pilot		× −		=	
Baggage		× +		=	
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.

VI.4 Calculation of CG at flight weight [metric system]

	Weight [kg]	x	arm [mm]	=	Momentum [kg x mm]
Empty weight		x +		=	
Front pilot		x −	{1185 / 1250}*	=	
Rear pilot		x −		=	
Baggage		x +		=	
Sum of weight →			Sum of momentum →		

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.

VI 4 Calculation of CG at flight weight

EXAMPLE !

	Weight [lbs]	×	arm [inch]	=	Momentum [lbs × inch]
Empty weight	814	× +	30,55	=	+ 24869
Front pilot	187	× −	{46,65 / 49,21} * 47,24	=	− 8833,88
Rear pilot	165	× −	3,15	=	− 519,75
Baggage	22	× +	9,84	=	+ 216,48
Sum of weight →	1188		Sum of momentum →		15730,85

$$\text{Position of flight CG} = \frac{\text{Sum of momentum}}{\text{Sum of weight}} = \boxed{13{,}24} \leftarrow \text{CG Flight [inches]}$$

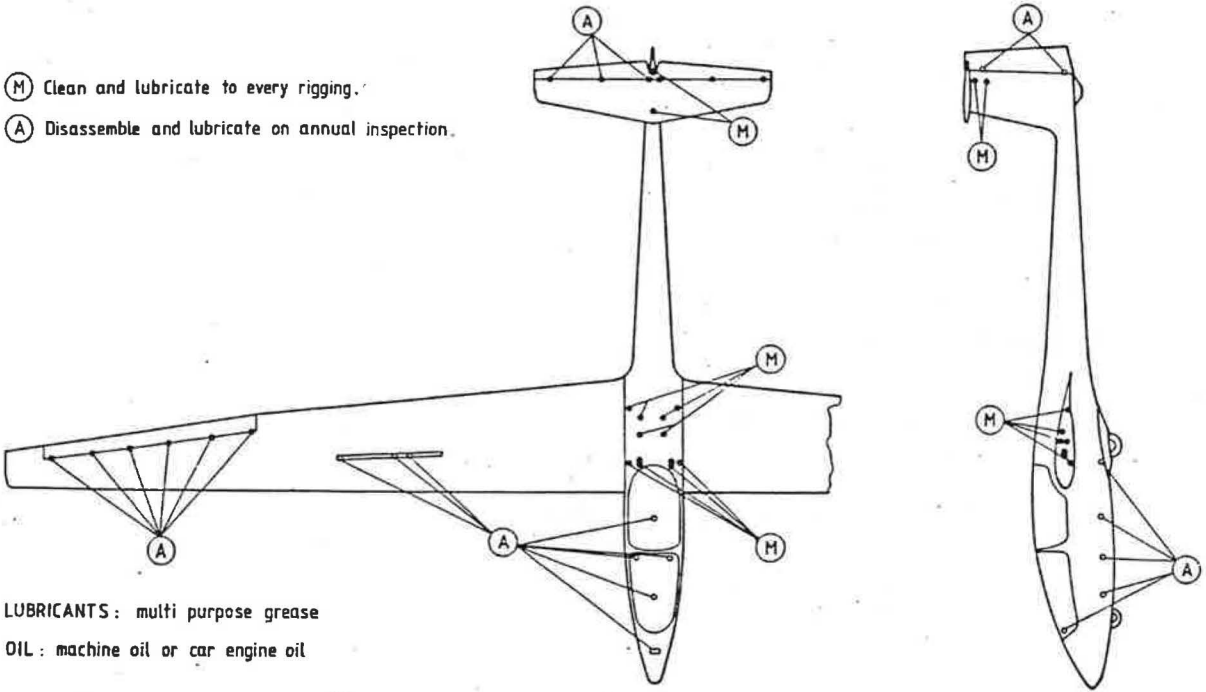
* **Note:** Tall persons shall use the shorter value and set the backrest on the rear position.

Small persons shall use the longer value and set the backrest at the forward position. –

LUBRICATION SCHEME

(M) Clean and lubricate to every rigging.

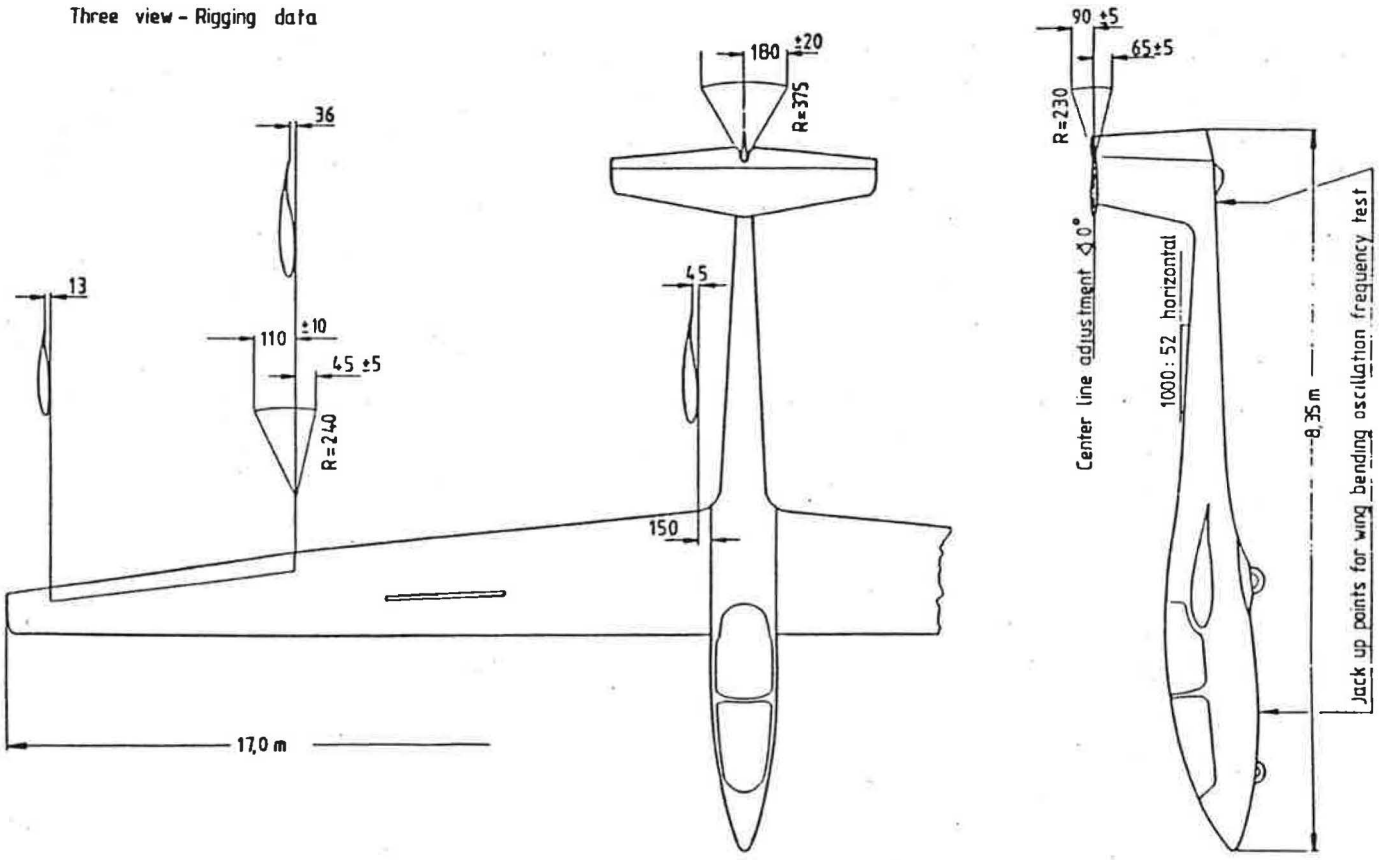
(A) Disassemble and lubricate on annual inspection.

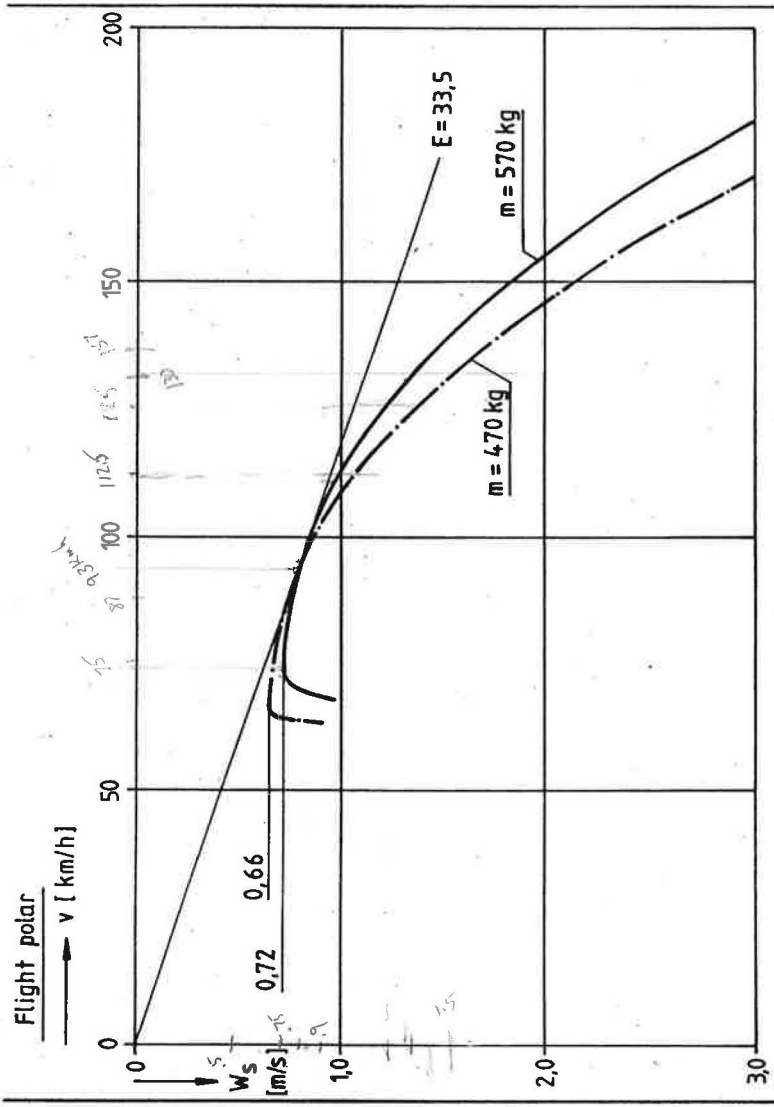


LUBRICANTS: multi purpose grease

OIL: machine oil or car engine oil

Three view - Rigging data




Flight polar
v [km/h]
200
150
100
50
0
0
1,0
2,0
3,0
w_s [m/s]
0,72
0,66
E = 33,5
m = 570 kg
m = 470 kg

March 9, 1983