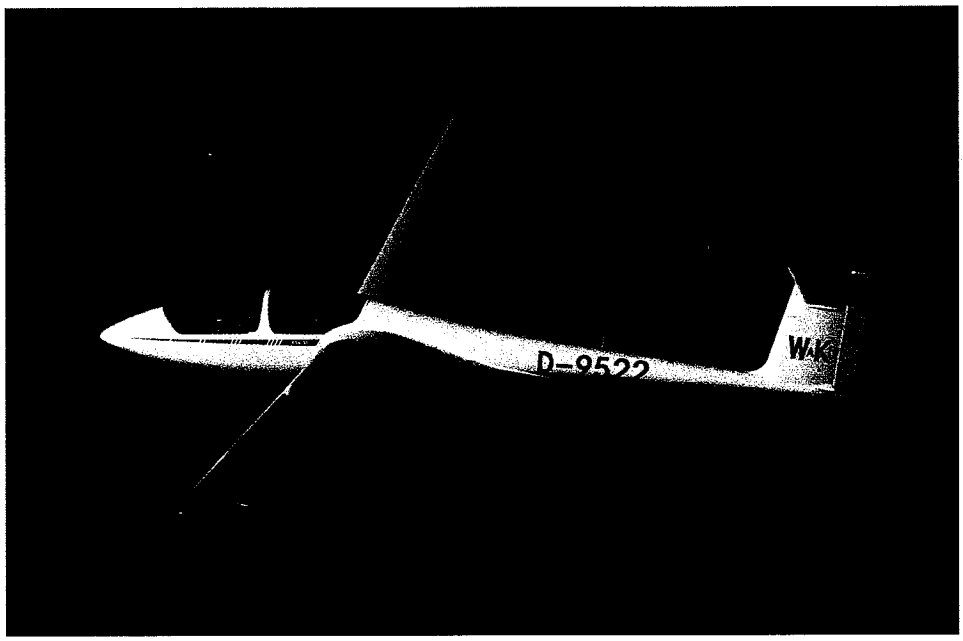
ASK 21



Flight Manual

Maintenance Manual
Repair Manual

ALEXANDER SCHLEICHER SEGELFLUGZEUGBAU
6416 Poppenhausen/ Wasserkuppe, West Germany

F L I G H T M A N U A L

for the sailplane model

A S K 2 1

This manual must always be carried on board !

It belongs to the sailplane ASK 21

Variant ..... Data Sheet no.339

Serial no.: .2.1.9.2.3..

Registration no.: .Y.H.-.G.Y.J

Owner : .....
.....
.....

Manufacturer : Alexander Schleicher
Segelflugzeugbau
6416 Poppenhausen/ Wasserkuppe
West Germany

This manual is the translation of the German original which is approved by the LBA (Federal Office of Civil Aeronautics of the Fed.Rep. of Germany) as operating instructions according to para 12 (1) 2 of the German 'LuftGerPO' (Aviation Equipment Test Regulations).
The translation has been done by best knowledge and judgement. In any case the original text in German language is authoritative.

APRIL 1980 Edition

Check List / 1

Pre Flight Check

1. Main pins safetied ?

2. Rear wing attachment pins: is the safety lock visible above the pin ?

3. Horizontal tail unit pins safetied ? Is the spring retainer engaged ?

4. Elevator pushrod connected ?
   Safetied with a spring clip ?
   This is not applicable for gliders which use the automatic elevator connection !

5. Aileron pushrods connected ?
   Safetied with a spring clip ?
   Do not forget the sight control through the access hole cover !

6. Airbrake pushrods connected ?
   Safetied with a spring clip ?
   Do not forget the sight control through the access hole cover !

7. Check for foreign bodies !

Attention !
With all HOTELLIER quick-release joints one must be able to touch the ball pivot by feeling through the slot in the ball socket. Check the proper engagement of the safety lock by pushing it on to close !

Check List / 2

Pre take-off check:

1. Tail dolly removed – ballast checked?
2. Parachute properly fastened – raise line?
3. Safety harness properly fastened – all operating elements within reach?
4. Put your toes under the toe-straps! Do not flatten the straps! Danger of jamming the pedals!
5. Airbrakes retracted and locked?
6. Placard for spin ballast?
7. Altimeter adjusted?
8. Radio on – frequency and volume checked?
9. Trim adjusted?
10. Control circuit check – Controls easy to operate?
11. Airspace for start and release clear?
12. Check wind
13. Prepared for take-off interruption?
14. Both canopies closed and locked? – Emergency jettisoning procedure in mind?

Check List / 1

Pre Flight Check

1. Main pins safetied ?

2. Rear wing attachment pins: is the safety lock visible above the pin ?

3. Horizontal tail unit pins safetied ? Is the spring retainer engaged ?

4. Elevator pushrod connected ?
   Safetied with a spring clip ?
   This is not applicable for gliders which use the automatic elevator connection !

5. Aileron pushrods connected ?
   Safetied with a spring clip ?
   Do not forget the sight control through the access hole cover !

6. Airbrake pushrods connected ?
   Safetied with a spring clip ?
   Do not forget the sight control through the access hole cover !

7. Check for foreign bodies !

Attention !
With all HOTELLIER quick-release joints one must be able to touch the ball pivot by feeling through the slot in the ball socket. Check the proper engagement of the safety lock by pushing it on to close !

Record of Revisions

Rev No.	Pages Affected	Date of Approval	Date of Insertion	Ref. / Signature
TN 3	10a	27.10.80	05.11.80	Juw
TN 4b A	Check List / 2, 3, 4, 10c, 10d, 11, 23, 26, 26b, 34, annex 1, annex 2	12.12.12	April 13	mg
TN 5b	Check List / 2	26.03.81	24.04.81	Juw
TN 6	12	26.03.82	26.04.82	Juw
TN 7	10a	15.12.82	06.01.83	Juw
TN 8	12	16.05.83	20.06.83	Juw
TN 11	Check List / 1, 36a, 36b	20.12.83	18.03.84	Juw
TN 13	10b	16.02.84	28.02.84	Juw
TN 13a	10c	04.06.84	18.06.84	Juw
TN 15	16a – 19a	25.05.84	12.06.84	Juw
TN 20	Check List 1, 21, 36a, 36b, 37	16.10.87	12.11.87	Juw
TN 21	annex (new tow release coupling)	17.01.90	18.03.90	Juw
TN 22	36b, 37a, 37b	26.11.90	16.12.90	Juw

TN 23	13, 15, 25, 26	29.01.91	21.04.91	Juw
AD 93-001/2/3	annex (L'Hotellier instructions for the maintenance)	27.04.98	15.05.98	Juw
TN 28	annex (nose bolt)	14.03.00	16.04.00	Juw
TN 32	17c	01.06.10	23.08.10	mg

I.2 Contents

I.3 DESCRIPTION

The ASK 21 is a two-seater sailplane with T-tail, fixed nose wheel and dive brakes on upper wing. The main landing gear is sprung.

The sailplane is built in FRP-sandwich-monocoque construction. It may be used for school and high performance flights as well as for aerobatics of the Airworthiness Category 'A'.

Technical Data

Span	17.00 m	(55,74 ft)
Length	8,35 m	(27,38 ft)
Height	1,55 m	(5,08 ft)
Wing area	17,95 m^2	(192,95 sq.ft)
Aspect ratio	16,1	
Max all-up weight	600 kg	(1320 lbs)
Max wing loading	33,4kg/M^2	(6,84 lbs/sq.ft)

II. OPERATING LIMITATIONS

II.1 AIRWORTHINESS CATEGORY

Basis of the type-approval are the Airworthiness Requirements for Sailplanes and Powered Sailplanes (LFSM), issue Oct. 23, 1975, with the Airworthiness Category 'A' (Acrobatic).

II.2 OPERATION RANGE CLASSES

The operation range classes approved for the particular sailplane are indicated by a data plate on the instrument panel (see Maintenance Manual page). Depending on the respective equipment the sailplane may be licensed for traffic for the following operation range classes :

1. Airworthiness Category 'U' (UTILITY)
   a. According to VFR (during daylight) - with equipment as per II.3 a.
   b. Cloud flights - with equipment as per II.3 a and II.3 c.

2. Airworthiness Category 'A' (Acrobatic) - with equipment as per II.3 a and II.3 b or II.3 a, II.3 b and II.3 c - for the following acrobatics :

   Loop, Stall Turn, Split 'S', Immelmann, Slow Roll, Inverted Flights, Spin, Steep Climbing Turn, Lazy Eight, Chandelle.

II.3 EQUIPMENT

a. **Min. equipment**

1. Airspeed indicator up to 300 km/h
2. Altimeter
3. Four-piece safety harness for front and rear seat
4. Seat cushions, at least 10cm thick when loaded, or parachutes (automatic or manual)
5. Weight and balance data placard (front and rear seat)
6. Data plate
7. Flight Manual

b. **Equipment for aerobatics**

For aerobatics the above min. equipment must be supplemented as follows :

1. Additional bottom strap for the safety harness
2. G-meter for front seat
3. Foot loops on rudder pedals
4. Parachute (automatic or manual)

c. **Equipment for cloud flying**

For cloud flying the above min. equipment must be supplemented as follows :

1. Variometer
2. Turn and bank indicator
3. Magnetic compass (compensated)
4. VHF transceiver radio

II.4 SPEEDS

Max speed calm air	V_{NE}	=*)280 km/h	(151 kts)
Max speed rough air	V_B	= 200 km/h	(108 kts)
Max maneuvering speed	V_M	= 180 km/h	(97 kts)
Max speed aerotow	V_T	= 180 km/h	(97 kts)
Max speed winch tow	V_W	= 150 km/h	(81 kts)

Rough air means turbulence found in wave-rotors, Cu-clouds, dust devils or when skimming mountain crests.

Maneuvering speed V_M is the highest speed at which full control deflections still may be applied.

With max speed V_{NE} only one third of the max possible deflections may be applied. One must also take into account that with increasing altitude the true airspeed is higher than the reading of the A.S.I. because of the decreasing air density.

True airspeed (TAS) is, however, relevant for safety against flutter.

*) The max indicated V_{NE} is reduced as follows according to altitude :

Altitude (M)	0-2000	3000	4000	5000	6000
V_{NE} indicated (km/h)	280	267	255	239	226

Altitude (ft)	5000	10000	15000	20000
V_{NE} indicated (kts)	151	144	132	121

The airspeed indicator must show the following color codes :

Green arc	80-180 km/h	(43- 97 kts)
Yellow arc	180-280 km/h	(97-151 kts)
Red radial line	at 280 km/h	(at 151 kts)
Yellow triangle	at 90 km/h	(at 48,5 kts)

II.5 LOAD FACTORS

The following load factors must not be exceeded :

at maneuvering speed	V_M	+6,5	-4,0
at max speed	V_{NE}	+5,3	-3,0
with airbrakes extended		+3,5	± 0

G-meter markings :

a. positive range
   yellow arc +5,3 to +6,5
   red radial line at +6,5

b. negative range
   yellow arc -3,0 to -4,0
   red radial line at -4,0

II.6 WEIGHTS

Empty weight approx.	360kg	(792 lbs)
Max all-up weight	600kg	(1320 lbs)
Max weight of non lift producing members	410kg	(904 lbs)

II.7 IN FLIGHT C.G.

The in flight c.g. range is from 234mm to 469mm behind datum (9,21" to 18,46");
correspondingly 20,2 % up to 41,1 % of the mean aerodynamic chord,

t_a = 1,121m (3'68") with a = 8mm (0,32") behind wing leading edge; inner wing = datum point.

II.8 WEIGHT AND BALANCE INFORMATION

Min payload front seat	70kg	(154 lbs)
Max payload front seat	110kg	(242 lbs)
Max payload rear seat	110kg	(242 lbs)
Baggage in wingroots max	2 x 10kg	(2 x 22 lbs)

Neither the all up weight of 600kg (1320 lbs) nor the max weight of non-lift producing members + occupants & baggage of 410kg (904 lbs) must be exceeded.

The weight limitations on the basis of the last weighing are to be found on page 11 !

With this loading the in flight c.g. is in the permissible range.

Low weight in the front seat must be compensated by fixed ballast.

Re II 8. Weight and balance information with spin ballast

Without valid spin ballast-table (Flight Manual page 10d), spin ballast at the tail may not be used. The validity period is specified on each spin ballast-table. A valid spin ballast table can be obtained from the manufacturer (procedure, refer to Maintenance Manual page 32f).

Before every flight with spin ballast the pilots must be weighed with the equipment worn in flight (clothes, parachute ...).

When the load in the front seat is below 70kg (154lbs), compensate missing load by attaching trim ballast in the front fitting, so that the load in the front seat equals 70kg (154lbs). For this purpose, follow the instructions on page 10b. During the further procedure, the front pilot and the front trim ballast count together as a pilot of 70kg (154lbs).

The amount of spin ballast is specified in the current spin ballast-table. The mass of the pilot in the front seat defines the line of the table; the mass of the pilot in the rear seat defines the column of the table. At the intersection, the number of ballast plates (1 kg = 2.2 lbs), which are to be attached, is noted.

Up to a maximum of 12 spin ballast plates are permissible. The plates have to be distributed evenly to the left and right side of the fin and have to be fixed with the provided screw.

CAUTION: *The washer and nut fixed at the cockpit placard (see below)* ***must*** *be used. After removal of the spin ballast the washer and the nut must be fixed again on the placard.*

Attention

Check spin ballast!

Only use spin ballast for flights with two pilots!

Date of weight & balance	Empty weight c.g. (mm/in. behind datum)	Front seat kg/lbs payload incl. chute min / max	Rear seat kg/lbs payload incl. chute min / max	Old spin ballast table removed (check off)	Signature of inspector, inspection stamp

* Flight Manual Page 10d

II.9 TOW RELEASES

For aerotow : nose release E 75

For winch tow : safety release Europa G 73

II.10 WEAK LINK IN TOW ROPE

Aerotow max. 600 ± 60 daN

Winch tow max. 1000 ± 100 daN

II.11 TIRE PRESSURE

Main wheel 5.00-5	:	2,7 bar
Nose wheel 4.00-4	:	2,0 bar
Tail wheel 210×65		2,5 bar

II.12 CROSSWIND

The permissible crosswind component is about 15 km/h. (8 knots).

III. EMERGENCY PROCEDURES

III.1 RECOVERY FROM SPIN

According to the standard procedure spinning is terminated as follows:

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

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

Warning: Disregarding the pause will result in slower recovery!

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

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

4. Centralise rudder and allow sailplane 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 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 IN THE RAIN

With wet or slightly iced wings or 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 10 km/h (5,4 knots) for approach speed !!

III.4 WING DROPPING

The sailplane 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 OPERATION PROCEDURES

IV.1. COCKPIT AND OPERATING LEVERS

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 hand grip in the left arm rest.

No.5 Release cable; yellow knob on the front left below the canopy frame.

No.6. Canopy emergency jettisoning; horizontal lever with red flat knob above the instrument panel cover. To the left = "Open".

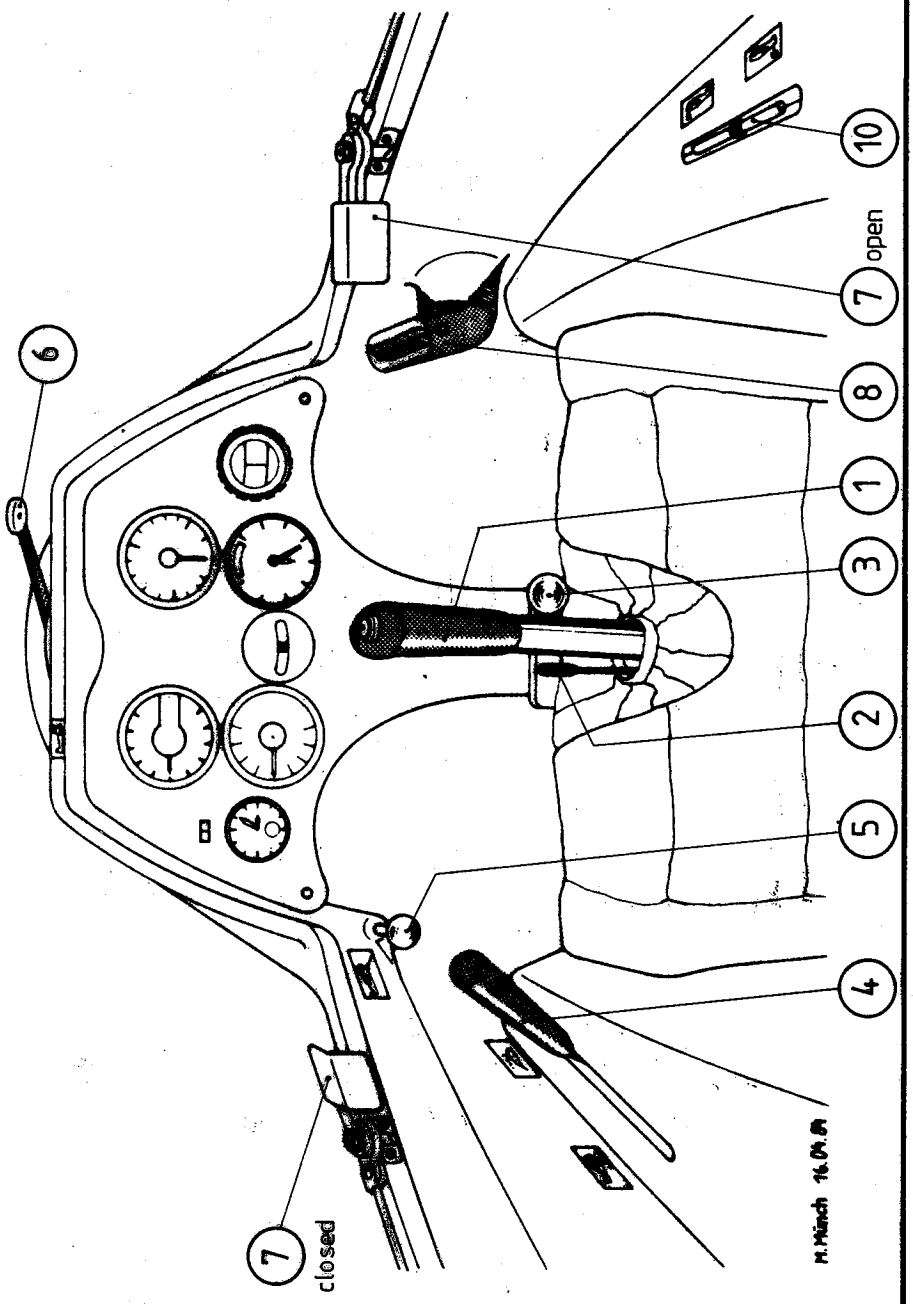
No.7. Front canopy locking; white swivel levers on left & right canopy frame.
To open canopy: pull back both levers.
To lock canopy: push both levers forwards - parallel to the canopy frame.

No.8. Ventilation nozzle; on right cockpit wall below canopy frame; adjustable and closable.

No.9. Back rest; the back rest is adjustable by lifting it at 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.

No.11. Detachable rudder hand lever at the left cockpit wall below the air brake grip (not figured): only applicable for mod TN no.25 dated 16.02.1993.


10
7 open
8
1
3
2
5
4
6
7 closed
H. Münch 16.04.84

Adjustable Headrest:

On the front seat there is an adjustable headrest. When the backrest is used, the headrest is inserted into the base part at the backrest. The headrest is secured in the correct height with the locking pin. Without backrest, the headrest is inserted through the cutout in the instrument cover of the rear instrument panel. A ball catch must lock in noticeable.

The headrest is adjusted correctly, when the head can touch the headrest on eyelevel.

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.

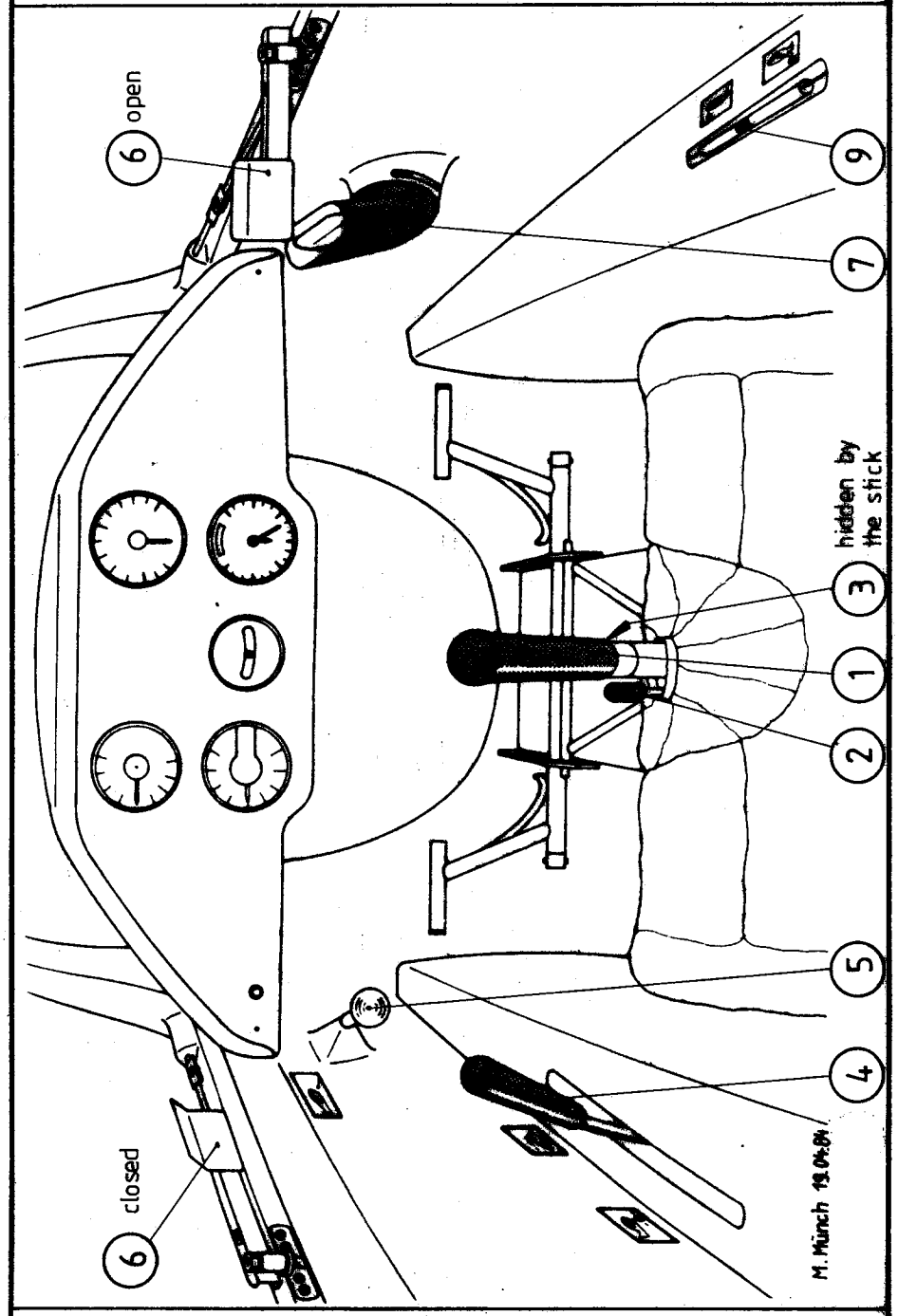
No.5: Release cable; yellow knob on left cockpit wall below the canopy frame.

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.

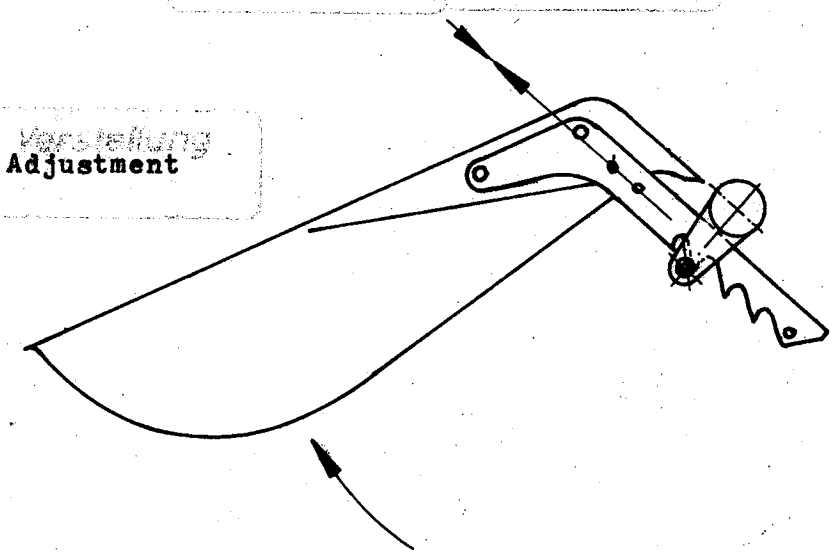
No.8: Back rest; the back rest is adjustable by tilting it from the bottom upwards and forwards (see sketch); in normal flight attitudes the back rest cannot shift by itself.
Very tall pilots may fly without the back rest.

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

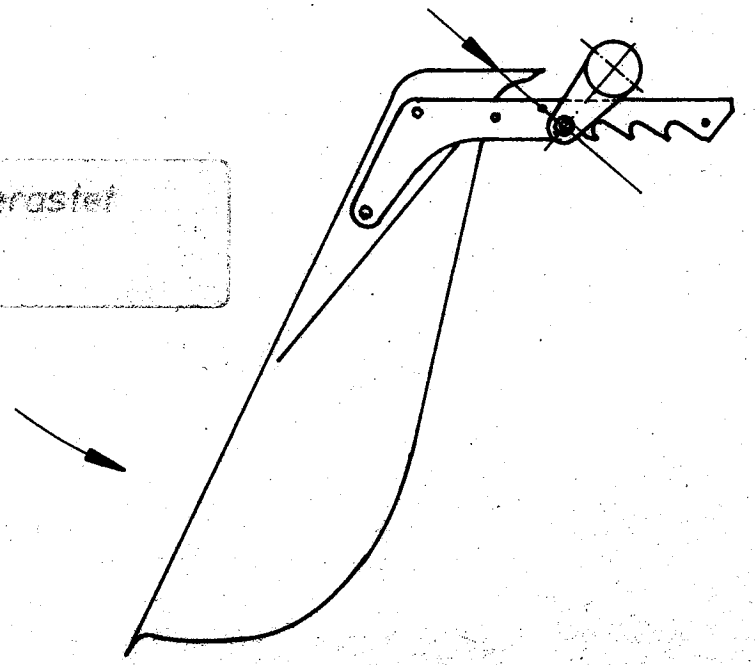

6 open
9
7
hidden by the stick
3
1
2
5
4
6 closed
M. Münch 13.04.84

BACK REST ADJUSTMENT

Adjustment



Engaged



IV.2 DAILY CHECKS

1.a) Open canopy! Check that the main pins are properly secured by the lock catches.

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 tubes of the rudder pedals 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 air brake lever; at the end of its travel an elastic resistance must be felt.

h) Only in flight operation with the rudder hand lever: flanged bolt screwed in at the airbrake handle and secured? Rudder hand lever mounted and secured ?

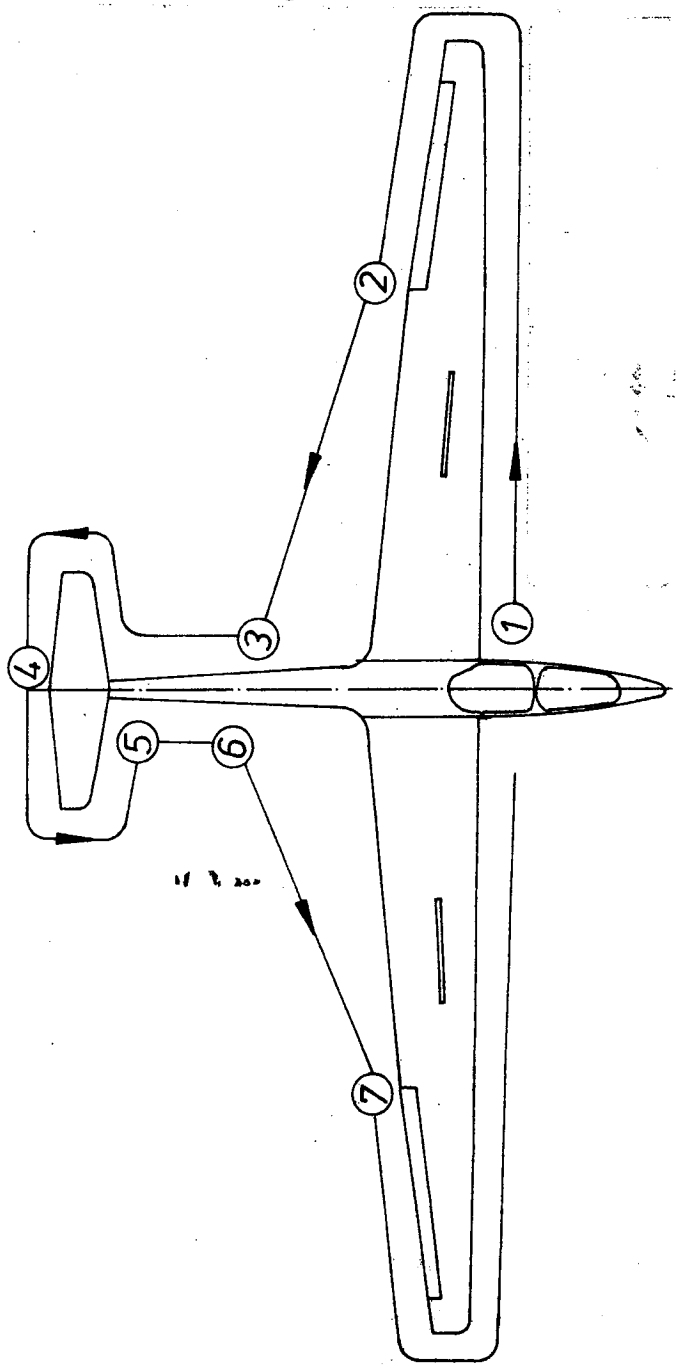
2.a) Check upper & lower wing surface for damages!

b) Aileron: condition, freedom of movement, and play is to be checked ! Check also the push rod connection.

c) Airbrake: check condition, adjustment and good locking.

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

4.) Check that the tailplane is properly assembled and secured. Check also the pushrod connection. Secured by spring clips?



DAILY CHECKS (see IV.2)

5) Check condition of tailskid, pitot tube and venturi tube!

6) Check static vents for cleanness!

7) See 2.)

After rough landings or excessive flight stress the whole sailplane must be checked with the wings and tail unit removed. If any damage is found, a technical inspector must be called in. On no account one must take off again before the damage has been repaired.

See also Maintenance Manual.

IV.3 Pre take-off check

1. Tail dolly removed – ballast checked?
2. Parachute properly fastened – raise line?
3. Safety harness properly fastened – all operating elements within reach?
4. Put your toes under the toe-straps! Do not flatten the straps! Danger of jamming the pedals!
5. Airbrakes retracted and locked?
6. Placard for spin ballast?
7. Altimeter adjusted?
8. Radio on - Frequency and volume checked?
9. Trim adjusted?
10. Control circuit check – Controls easy to operate?
11. Airspace for start and release clear?
12. Check wind
13. Prepared for take-off interruption?
14. Both canopies closed and locked – Emergency jettisoning procedure in mind?

IV.4 TAKE OFF

Winch tow :

Trim neutral.

Max tow speed : 150 km/h (81 kts).

The sailplane features a tow release for winch tow in front of the main wheel.

The most favorable tow speed is 90 - 110 km/h (49 - 60 kts).

There is little pitch up tendency during the initial tow. In the upper third of the tow additional altitude may be gained by slight back pressure.

Tow release : pull the release knob to the stop several times.

Aero tow :

Aero tows only with the nose release in front of the nose wheel.

Recommended tow rope length : 30-60 m (98-197 ft); textile rope.

Trim neutral.

Max tow speed : 180 km/h (97 kts).

The most favorable tow speed during climb is 90 - 140 km/h (49 - 76 kts).

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.

Take off takes place at about 75 km/h (40 kts).

IV.5 FREE FLIGHT

The sailplane may be flown up to V_{NE}= 280 km/h (151 kts), see p.8.
Up to manoeuvring speed of 180 km/h (97 kts) 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, WING DROPPING AND SPINS

With the stick back a distinct tail buffet is felt.
The sailplane 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.ofG.-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 sailplane needs speed in order to be controllable.
In turbulence this is especially important when also a wing dropping may occur.
Spin developement from wing dropping strongly depends on the C.ofG. position and also to some extent from the pilot reaction.
For C.ofG.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.ofG.-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.ofG.-positions are possible in dual flight with a lightweight pilot in the front seat.

For C.ofG.-positions aft of 400 mm behind datum controlable sustained spins are possible. Such a C.ofG.-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:

	without airbrakes	with airbrakes
Single, all up weight 470kg	65 km/h 35 kts	68 km/h 37 kts
Dual, all up weight 600 kg	74 km/h 40 kts	77 km/h 42 kts

Spinning with spin ballast

Mounting of spin ballast see chapter II.8 Mass and Balance Form. Spinning with spin ballast is principally only allowed by dual flights. With spin ballast other aerobatic manoeuvres are not permissible.

Entry procedure:

The best entry speed is 2 km/h (1.1 kts) above the speed, at which the stall warning sets in. This must be checked before in flight.

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

WARNING: *If a spiral dive sets in, it must be stopped immediately, to prevent overstressing the structure.*

Recovery procedure:

Recovery according to the standard procedure, see chapter III.1.

Further information can be found in the appendix to the Flight Manual, titled "Spin training with the ASK 21: Summary of important information and further recommendations".

IV.7 High Speed Flight

The sailplane shows no flutter tendency within the permissible speed range.

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

IV.8 Cloud flying

For min. equipment for cloud flying see II.3 a & II.3 c.

According to past experiences the airspeed indicator system is not exposed to the danger of icing-up. However with strong icing-up the pilot must be always take into account the possible failure of the airspeed indicator. When planning cloud flying, he must take this point into consideration.

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

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

IV.9 AEROBATICS

Attention aerobatic flyers !!

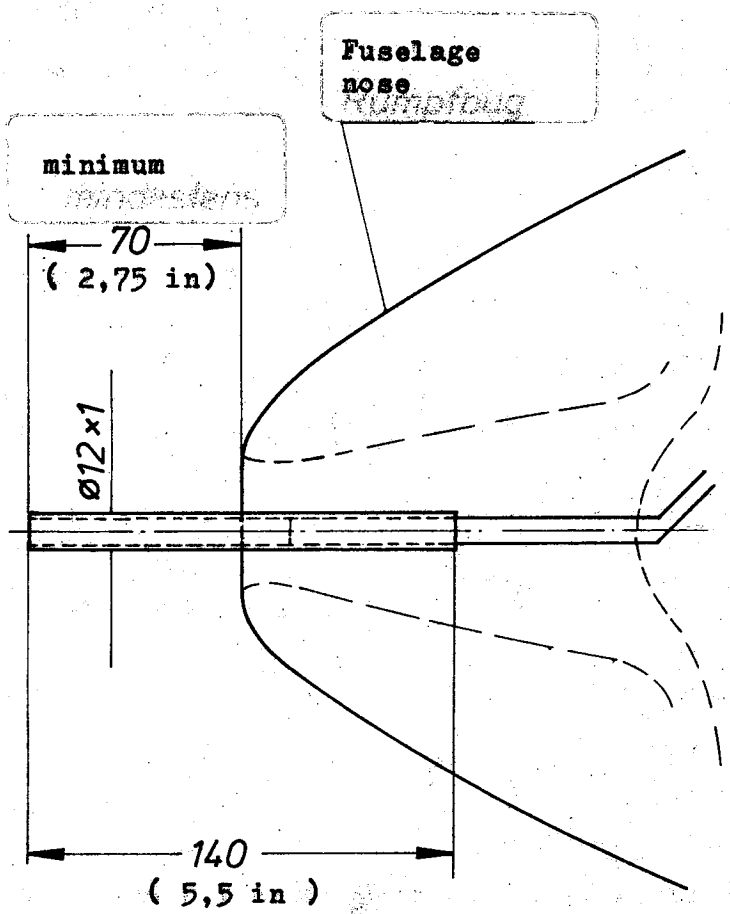
Even a sailplane which is approved for full aerobatics does not have infinite strength capacities. Most hazardous are aerobatics which get out of control or are badly executed, as they result in the high loads.

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 - 12Ø x 1; 140mm (5,5 in) in length - this error disappears. The tube must project in the front at least 70mm (2,75 in). For normal flights this is not necessary. In order to avoid damage when parking the sailplane in the hangar, this tube should not be left on any longer than necessary.



Extension tube for total pressure head with inverted flight. Brass tube 140 mm (5,5 in) in length (12 ø x 1).

One may also use a suitable plastic tube provided that it is sufficiently stiff and straight.

For the aerobatics hereafter mentioned the following entrance speeds are recommended :

	Indicated Entrance speed		Max Acceleration
Loop upward	single : 155km/h (84 kts)		2 - 3 g
	dual : 170km/h (92 kts)		
Stall Turn	single : 165km/h (89 kts)		3 g
	dual : 180km/h (97 kts)		
Split 'S'	single : 170km/h (92 kts)		2 - 3 g
	dual : 180km/h (97 kts)		
Immelmann	single : 165km/h (89 kts)		2,5 - 3,5g
	dual : 180km/h (97 kts)		
Slow Roll	single : 150km/h (81 kts)		
	dual : 165km/h (89 kts)		
Steep Climbing)			
Turns and Lazy)	single : 140km/h (76 kts)		
Eight)	dual : 150km/h (81 kts)		
Chandelle	single : 160km/h (86 kts)		
	dual : 175km/h (95 kts)		

Permissible Indicated Speeds

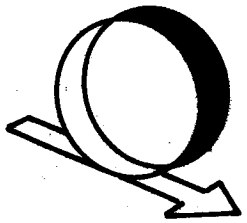
Inverted flight without pitot head extension :

V_{NE}	single	65-240 km/h	(35-130 kts)
	dual	70-240 km/h	(38-130 kts)

Indicated maneuvering speed V_M = 140 km/h (76 kts)
Indicated max speed V_{NE} = 240 km/h (130 kts)

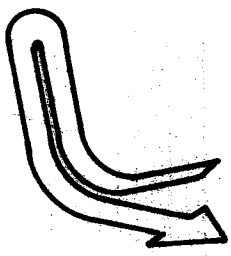
Inverted flight with pitot head extension :

Indicated maneuvering speed V_M = 180 km/h (97 kts)
Indicated max speed V_{NE} = 280 km/h (151 kts)
Indicated stall speed = 87 km/h (47 kts) with two occupants



LOOP

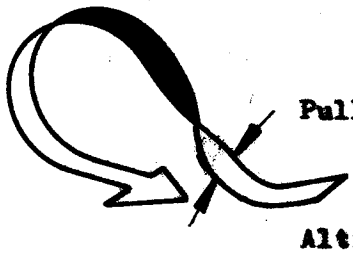
Entrance speed :
single : 155 km/h
dual : 170 km/h
max. g = 2 - 3



STALL TURN

Entrance speed :
single : 165 km/h
dual : 180 km/h
max g = 3

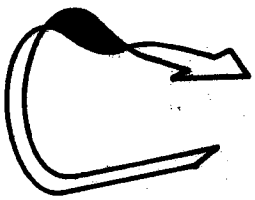
SPLIT 'S'



Pull-up at least 30° !

Altitude loss approx. 100 meter

Entrance speed :
single : 170 km/h
dual : 180 km/h
max. g = 2 - 3



IMMELMANN

Entrance speed :
single : 165 km/h
dual : 180 km/h
max. g = 2,5 - 3,5

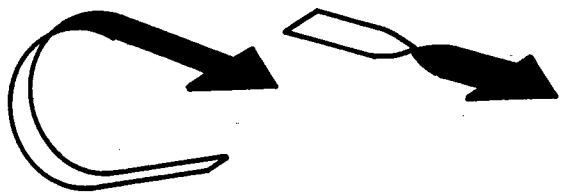
SLOW ROLL

Entrance speed :

single : 150 km/h

dual : 165 km/h

INVERTED FLIGHT

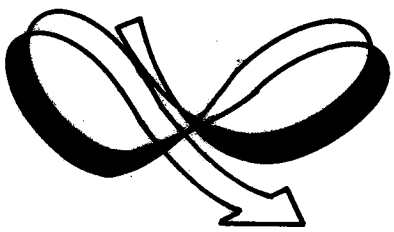


HALF ROLL

HALF LOOP

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

SPIN

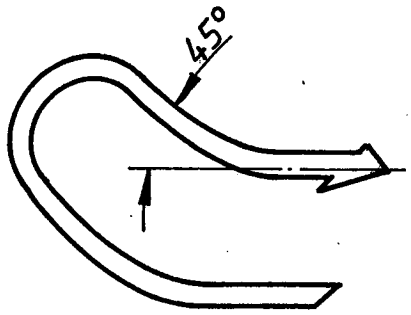


LAZY EIGHT

Entrance speed :

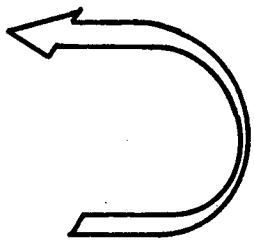
single : 140 km/h

dual : 150 km/h



STEEP CLIMBING TURN

Entrance speed :
single : 140 km/h
dual : 150 km/h



CHANDELLE

Entrance speed :
single : 160 km/h
dual : 175 km/h

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 sailplane or as the speed increases unvoluntarily to rapidly.

Exception: „Tail sliding"!

The trim remains in the center position for aerobatic manoeuvres. Don't ever change the trim when flying aerobatics!

With spin ballast is attached, aerobatics are prohibited (except spinning).

10. Prohibited aerobatics

- All abrupt aerobatic manoeuvres.
- Loop forward.
- Tail sliding

IV.10 APPROACH AND LANDING

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

Note : The airbrakes increase the stalling speed by about 3 km/h (1,6 knots).

Sideslipping is also suitable as an approach control.
With full rudder during sideslipping the rudder pressure decreases to zero; the rudder must be pushed back.

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.

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.

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 hat only the method according to Fig. V.2-2 is used.

Fig. V.2-1
WRONG: Twist movement

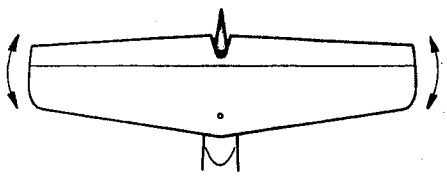
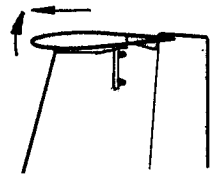


Fig. V.2-2
RIGHT: Pitch movement



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.

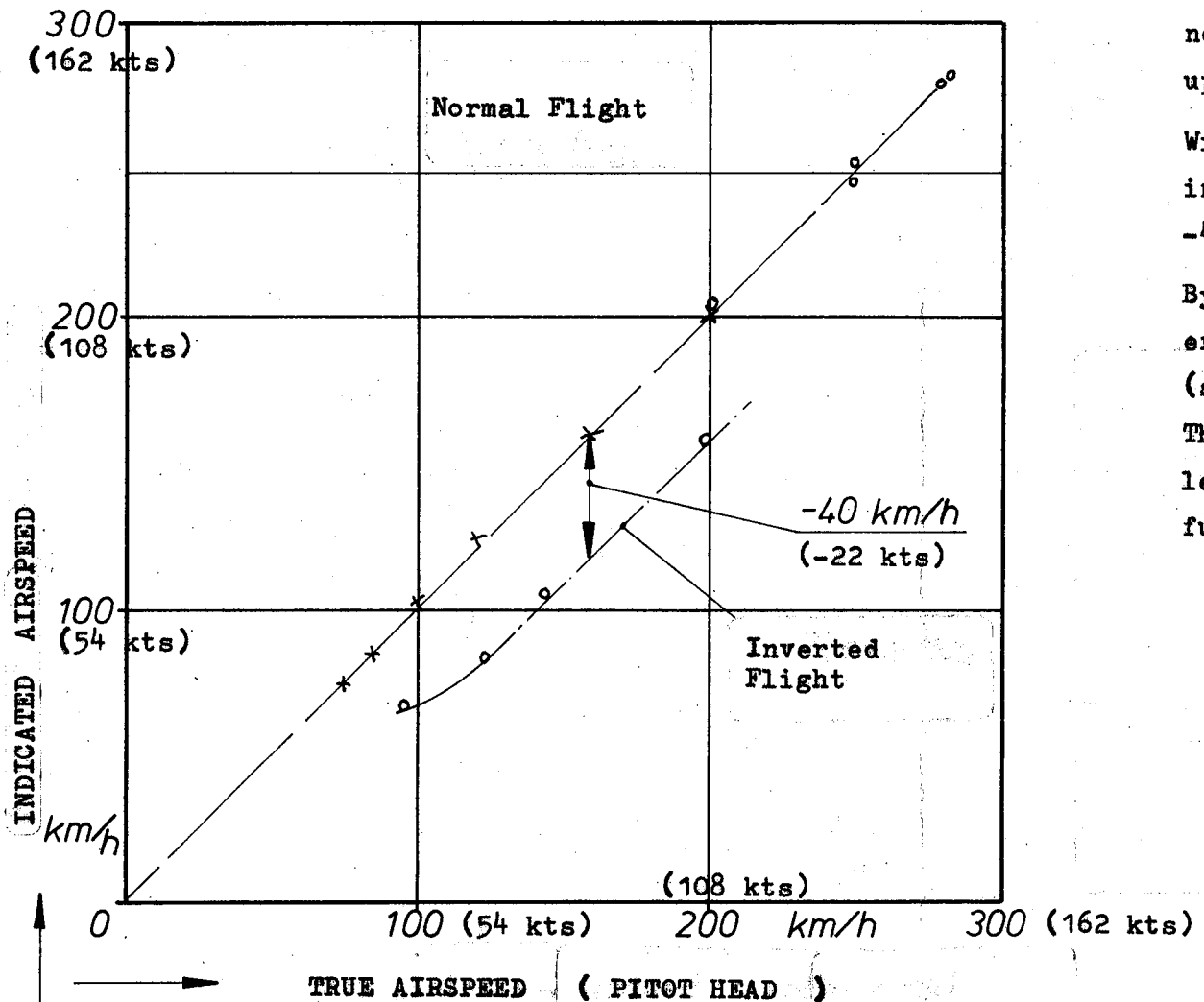
Depending on the position of the sun and the intensity of the radiation, the burning-glass effect of the canopies can cause a slow fire in the area of the instrument panel or the headrest respectively.

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.
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.

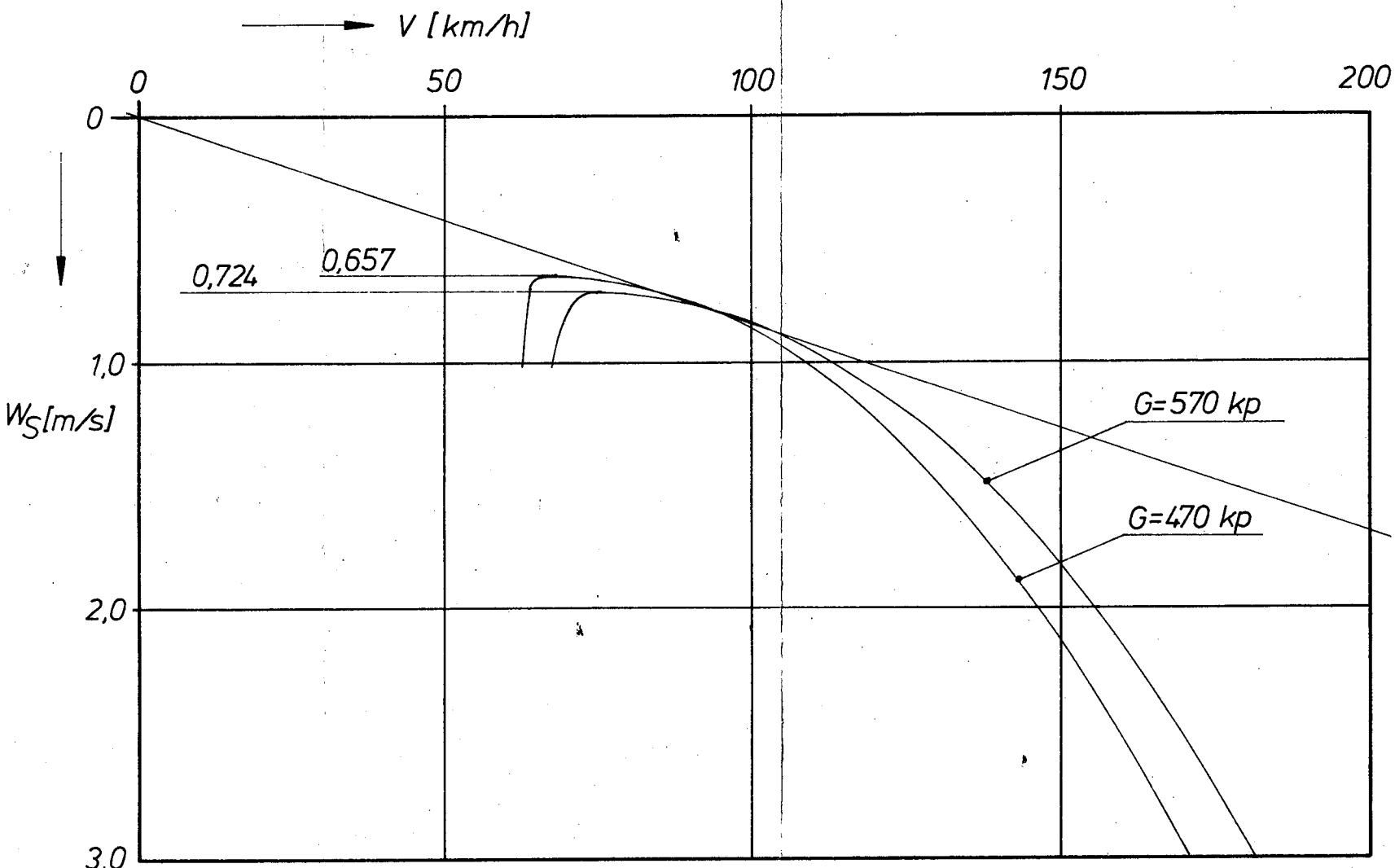


POSITION ERROR

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.


V [km/h]
0
50
100
150
200
0
1,0
2,0
3,0
W_S[m/s]
0,724
0,657
G=570 kp
G=470 kp

LUBRICATION SCHEME

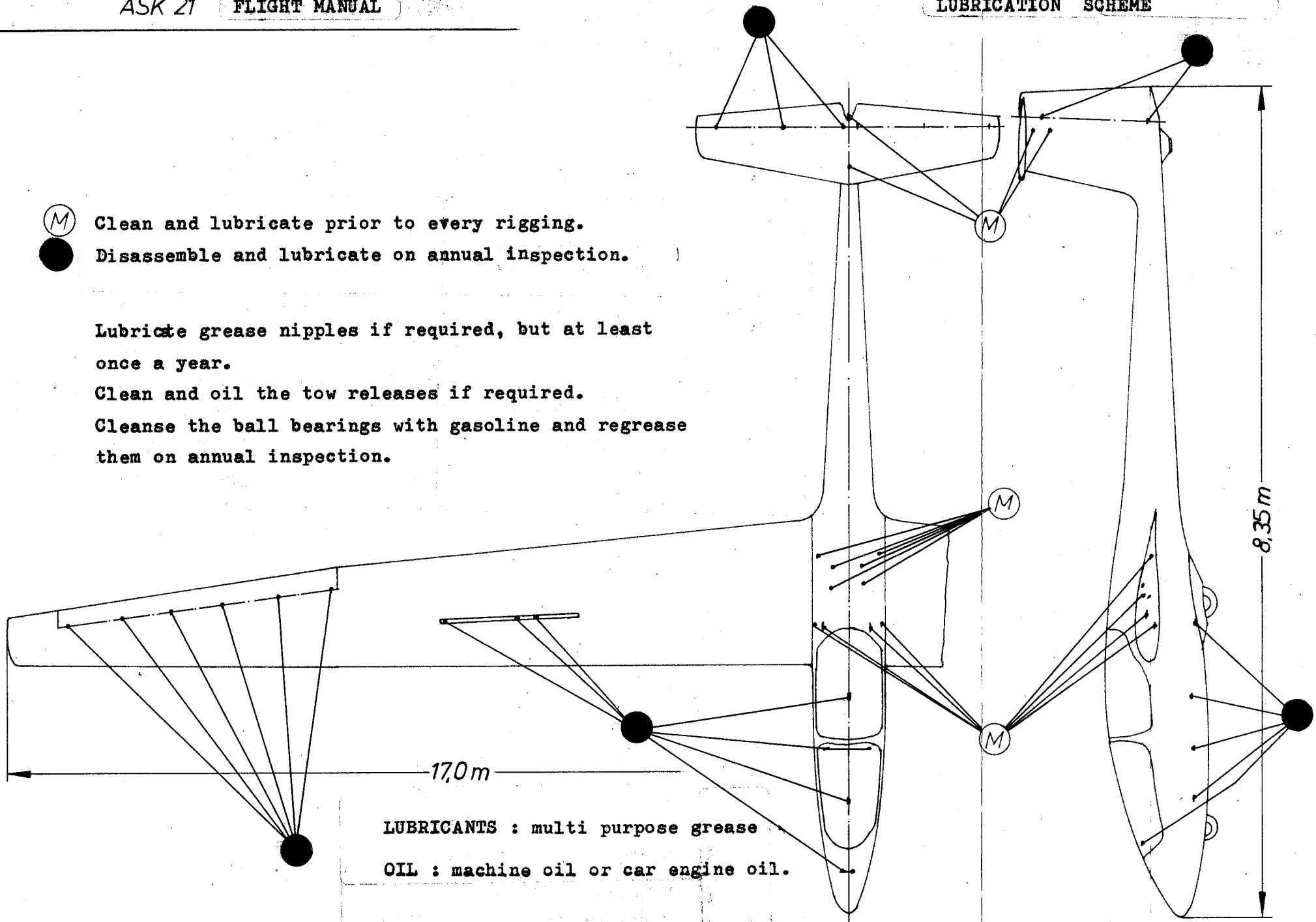
Ⓜ Clean and lubricate prior to every rigging.

● Disassemble and lubricate on annual inspection.

Lubricate grease nipples if required, but at least once a year.

Clean and oil the tow releases if required.

Cleanse the ball bearings with gasoline and regrease them on annual inspection.



LUBRICANTS : multi purpose grease

OIL : machine oil or car engine oil.