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.: 21659

Registration no.: .....

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

Record of Revisions

Rev. number	Affected Page (s)	Revisions Date	Date Insertion	Ref. / Signature
TN 3	10a	27.10.80	05.11.80	Juw
TN 4a	Check List / 2, 10c, 10d, 11, 23, 26, 26b, 34	25.11.04	16.12.04	mm
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
... 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

Record of Revisions

Rev. number	Affected Page (s)	Revisions Date	Date Insertion	Ref. / Signature
TN 23	13, 15, 25, 26	29.01.91	21.04.91	Juw
TN 25	16a, 21	16.02.93	28.06.93	Juw
AD 93-001/2/3	annex (L'Hotellier instructions for the maintenance)	27.04.98	15.05.98	Juw
TN 30	Check List, 18a, 19b, 19c, 21	22.01.07	16.02.07	mm
TN 46	3, 4, 10c, 10d, 26b, ANNEX 1, ANNEX 2	12.12.12	1.07.13	BSK

I.1 Amendments Record

No.	Title	PAGE	Date, signature
1	Weak link in towrope (TN no.6)	12	15.04.82
2	Weak link in towrope (TN no.8)	12	16.05.83
3	Automatic elevator connection (TN no. 11)	36a,36b Check-list/1	20.12.83
4	Modification of the flight manual (TN no. 13)	10 b	23.02.84
5	Amendment to the Flight Manual (TN no. 13 a)	10 c	June 84
6	New canopy locking system (TN no. 15)	16a 17a 18a 19a	8; 84
7	Change/supplement to the Flight Manual (TN No. 20)	Check-list/1 21, 36a, 36b, 37	03.11.87
8	TM Nr. 21, new production series tow release couplings for aerotow and winch launch	annex	17.08.90
9	Checking and exchange of the parallel rocker at the elevator actuator rod, TN No. 22	36b, 37a, 37b	26.11.90
10	Revision of the Flight Manual TN No. 23	13, 15, 25, 26	15.04.91

I.2 Contents

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?

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 placard 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 aerobatics :**

   Loop, Stall Turn, Split 'S', Immelmann, Slow Roll, Inverted Flights, Spin, Steep ClimbingTurn, 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, Cn-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_m = 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!

Serial No: 21659 | Empty mass: 841 lbs | Max. permissible payload: 482 lbs

Registration: G-DJAD | Empty mass Centre of Gravity: 29.4 inch

Date: 21.09.10 | Weigh and Balance report dated: 08.09.10 | Equipment list dated: 08.09.10

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

pilot mass incl. parachute in front seat (lbs) \ pilot mass incl. parachute in rear seat (lbs)	154	159	163	168	172	176	181	185	190	194	198	203	207	212	216	220	225	229	234	238	243
~~141~~	~~2~~	~~2~~	~~2~~	~~2~~	~~2~~	~~3~~	~~3~~	~~3~~	~~3~~	~~3~~	~~4~~	~~4~~	~~4~~	~~4~~	~~4~~	~~5~~	~~5~~	~~5~~	~~5~~	~~5~~	~~5~~
~~146~~	~~2~~	~~2~~	~~3~~	~~3~~	~~3~~	~~3~~	~~3~~	~~4~~	~~4~~	~~4~~	~~4~~	~~4~~	~~5~~	~~5~~	~~5~~	~~5~~	~~5~~	~~6~~	~~6~~	~~6~~	~~6~~
~~150~~	~~3~~	~~3~~	~~3~~	~~3~~	~~4~~	~~4~~	~~4~~	~~4~~	~~4~~	~~5~~	~~5~~	~~5~~	~~5~~	~~5~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~7~~	~~7~~
154	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7
159	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8
163	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9
168	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9
172	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10
176	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11
181	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11
185	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	11	12	12	12
190	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	12	12
194	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	12	12	12	12	12
198	10	10	11	11	11	11	11	11	12	12	12	12	12	12	12	12	12	12	12	12	12
203	11	11	11	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
207	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
212	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
216	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	
220	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12		
225	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12			
229	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12				
234	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12					
238	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12						
243	12	12	12	12	12	12	12	12	12	12	12	12	12	12							

= invalid loading

Note: This table becomes invalid when the aircraft is modified or with the date of: 08.9.2014

Mod. No TN 4a | Date Nov. 04 | Sig. JN/MG

drawn up by: M Cox

Page 10d | LBA-appr.

Serial No: 21659 | Empty mass: 381 kg | Max. permissible payload: 219 kg

Registration: G-DJAD | Empty mass Centre of Gravity: 748 mm

Date: 21.09.10 | Weigh and Balance report dated: 08.09.10 | Equipment list dated: 08.09.10

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

pilot mass incl. parachute in front seat (kg) \ pilot mass incl. parachute in rear seat (kg)	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
~~64~~	~~2~~	~~2~~	~~2~~	~~2~~	~~2~~	~~3~~	~~3~~	~~3~~	~~3~~	~~3~~	~~4~~	~~4~~	~~4~~	~~4~~	~~4~~	~~5~~	~~5~~	~~5~~	~~5~~	~~5~~	~~5~~
~~66~~	~~2~~	~~2~~	~~3~~	~~3~~	~~3~~	~~3~~	~~3~~	~~4~~	~~4~~	~~4~~	~~4~~	~~4~~	~~5~~	~~5~~	~~5~~	~~5~~	~~5~~	~~6~~	~~6~~	~~6~~	~~6~~
~~68~~	~~3~~	~~3~~	~~3~~	~~3~~	~~4~~	~~4~~	~~4~~	~~4~~	~~4~~	~~5~~	~~5~~	~~5~~	~~5~~	~~5~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~7~~	~~7~~
70	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7
72	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8
74	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9
76	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9
78	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10
80	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11
82	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11
84	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	11	12	12	12
86	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	12	12
88	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	12	12	12	12	12
90	10	10	11	11	11	11	11	11	12	12	12	12	12	12	12	12	12	12	12	12	12
92	11	11	11	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
94	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
96	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	
98	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12		
100	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12			
102	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12				
104	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12					
106	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12						
108	12	12	12	12	12	12	12	12	12	12	12	12	12	12							
110	12	12	12	12	12	12	12	12	12	12	12	12	12								

= invalid loading

Note: This table becomes invalid when the aircraft is modified or with the date of: 08.9.2014

Mod. No	Date	Sig.	drawn up by:	Page 10d
TN 4a	Nov. 04	JN/MG		LBA-appr.

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
8/9/10	E.W 381 kg E.C.G 767mm	64kg	110kg	N/A	110kg	* Flight Manual Page 10d	O.Taylor 11.9.14 NMS.

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 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.

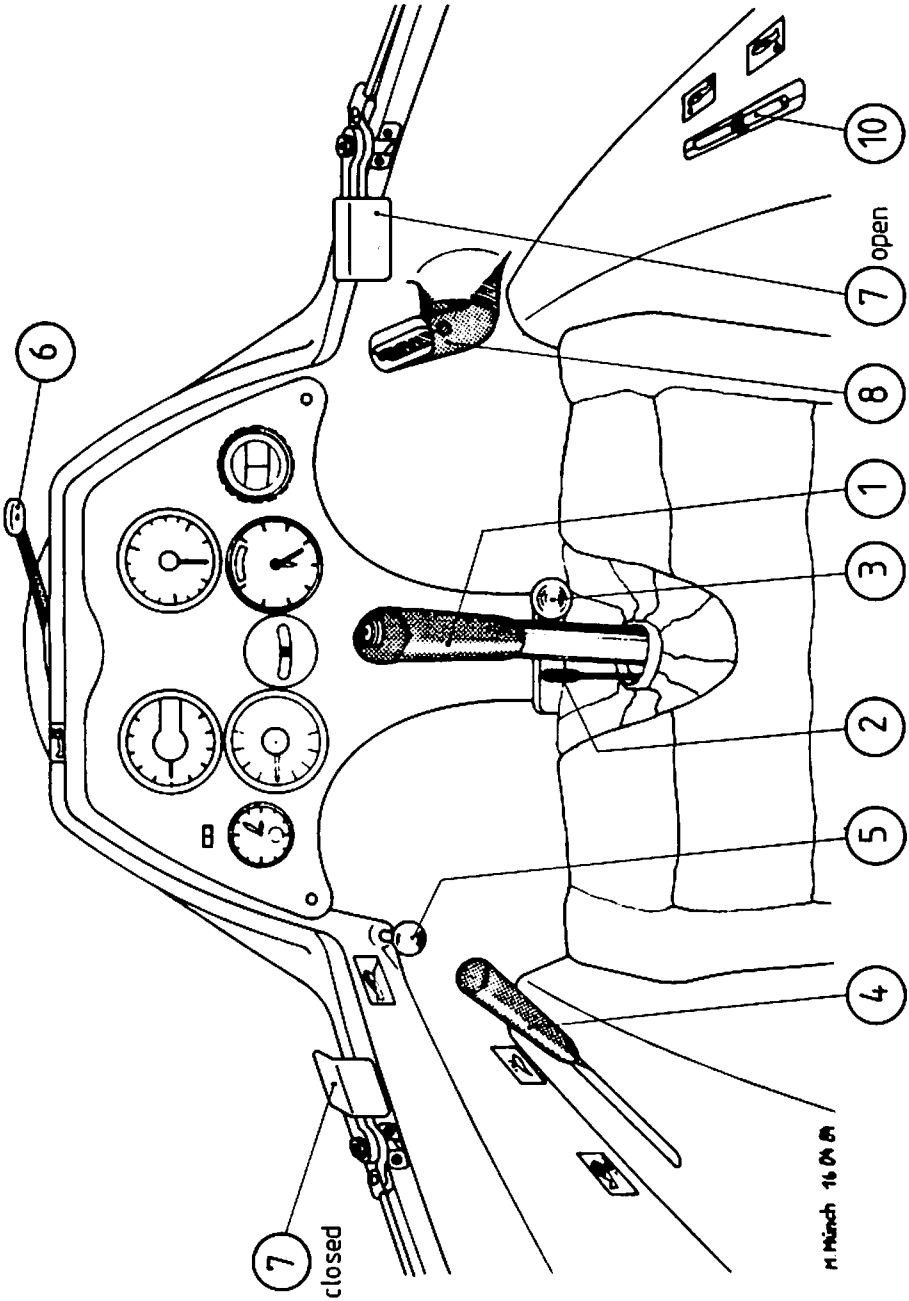
No.6: Canopy emergency jettisoning; horizontal lever with red flat grip above the instrument panel cover; to the left = OPEN.

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.


10
7 open
8
1
3
2
5
4
6
7 closed

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.

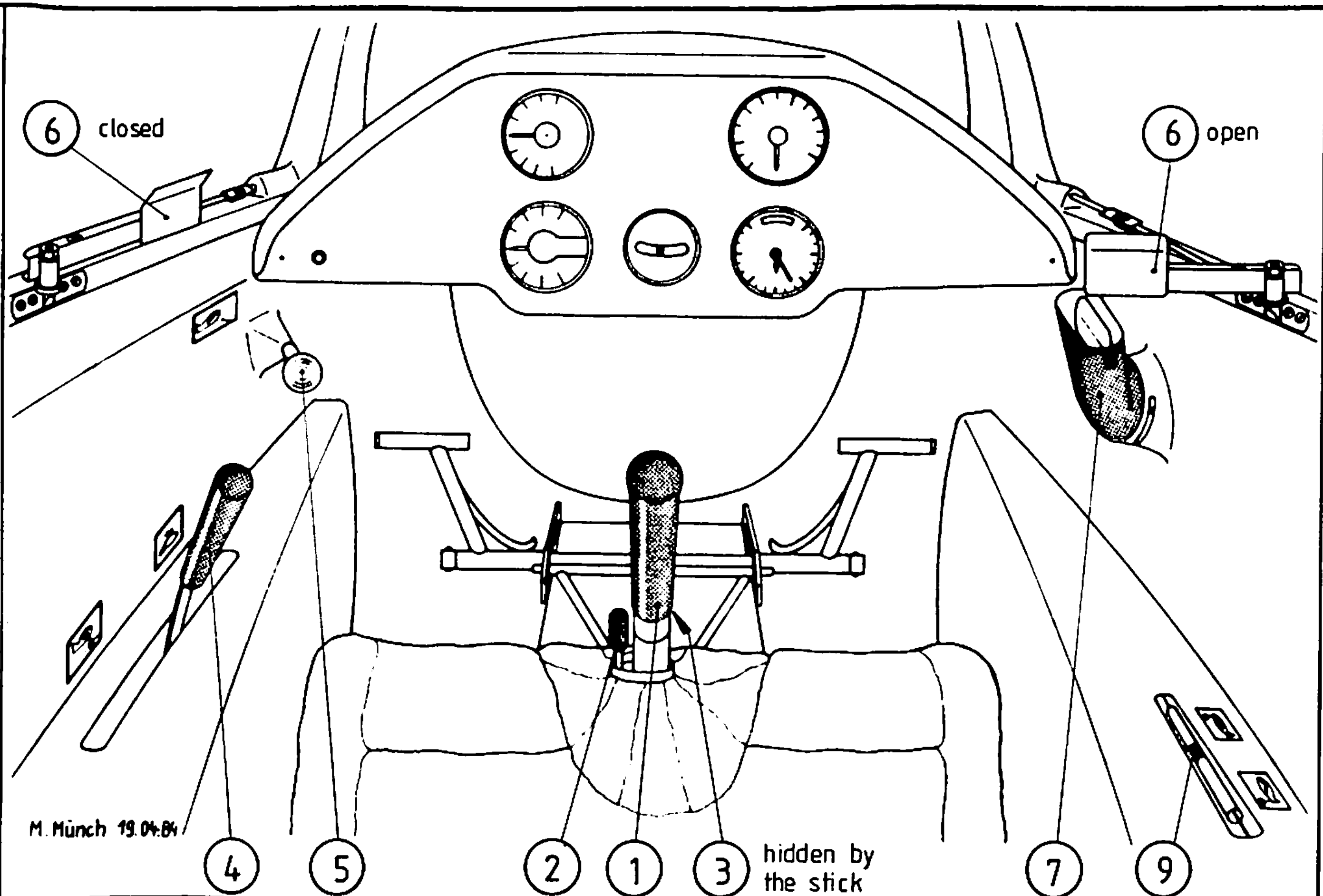
No.5: Release cable; yellow knob on left cockpit wall below the canopy frame.

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.

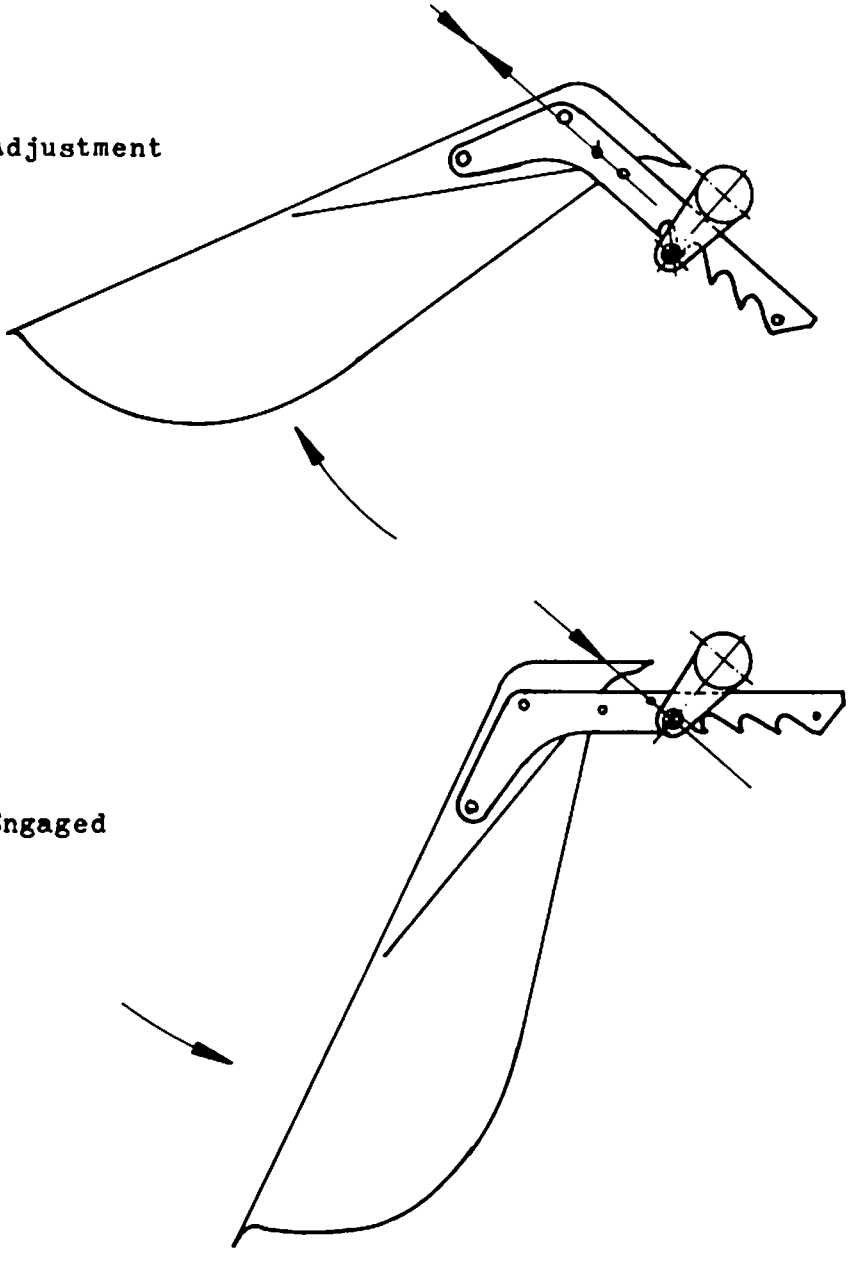
No.7: Ventilation nozzle; on right cockpit wall below the canopy frame; revolving and lockable.

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 closed
6 open
4
5
2
1
3 hidden by the stick
7
9
M. Münch 19.04.84

BACK REST ADJUSTMENT



IV.2 Daily Inspections

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

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

c) Check for foreign bodies !

d) Check the control circuits force and that all controls are free-moving. Apply full deflections and load the control circuits with fixed controls and airbrakes.
Check the plastic tubes inside the S-shaped 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 airbrake lever; at the end of its travel an elastic resistance must be felt.

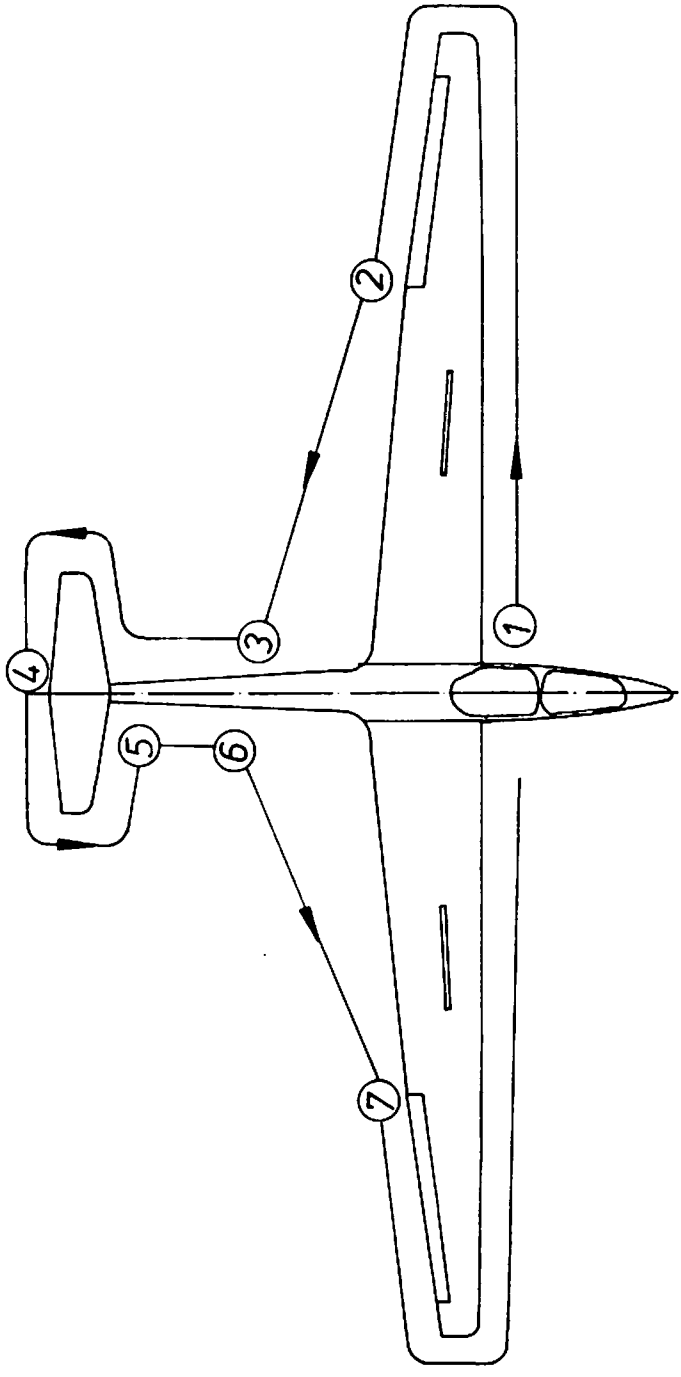
2.a) Check upper and lower wing surface for damages !

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

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

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

4.) Check that the tailplane is properly assembled and secured. Check also the pushrod connection. Secured 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. Controls easy to operate ?? (Control circuits check done ??)

2. Airbrakes locked ??

3. Trim neutral ??

4. Canopy locked ?? Pay especially attention to the rear canopy !

5. Safety harness and parachute fastened ?? (Parachute static line engaged with automatic parachute ??)

6. Altimeter adjusted to field height or to zero ??

7. Radio "on" and adjusted to proper frequency ??

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 two 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.

For C. of G.-positions aft of 400 mm behind datum controllable sustained spins are possible. Such a C. of G.-position is usually only possible with one lightweight pilot in the front seat.

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

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

	without AB	with AB
Single, all up weight 470kg	65 km/h IAS (35 kts)	68 km/h IAS (37 kts)
Dual, all up weight 600 kg	74 km/h IAS (40 kts)	77 km/h IAS (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.

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

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

Single: All up weight 470 kg (1034 lbs):
without airbrakes 65 km/h (35 kts) IAS
with airbrakes 68 km/h (37 kts) IAS

Dual: All up weight 600 kg (1320 lbs):
without airbrakes 74 km/h (40 kts) IAS
with airbrakes 77 km/h (42 kts) IAS

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.

IV.8 CLOUD FLYING

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

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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 !!

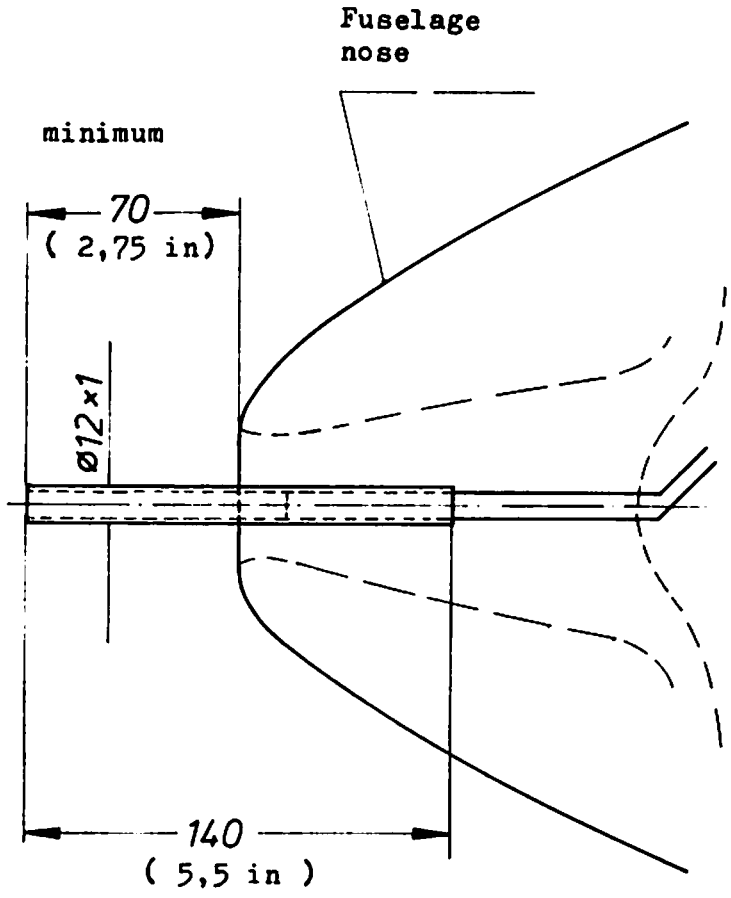
Even a sailplane which is approved for full aerobatics does not have infinite strength capacities. Most hazardous are aerobatics which get out of control or are badly executed, as they result in the high loads.

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) Eight)	single	140km/h (76 kts)	
	dual	150km/h (81 kts)	
Chandelle	single	160km/h (86 kts)	
	dual	175km/h (95 kts)	

Permissible Indicated Speeds

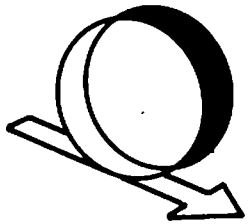
Inverted flight without pitot head extension :

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 occupents



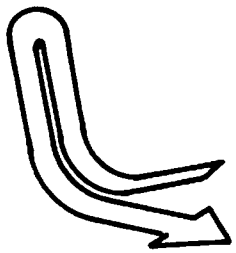
LOOP

Entrance speed :

single : 155 km/h 84 kn

dual : 170 km/h 92 kn

max. g = 2 - 3



STALL TURN

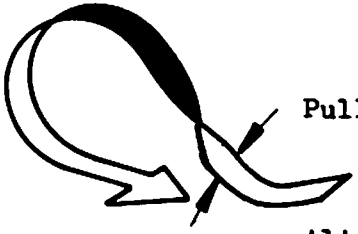
Entrance speed :

single : 165 km/h 90 kn

dual : 180 km/h 97 kn

max g = 3

SPLIT 'S'



Pull-up at least 30° !

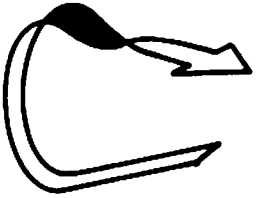
Altitude loss approx. 100 meter

Entrance speed :

single : 170 km/h

dual : 180 km/h

max. g = 2 - 3



IMMELMANN

Entrance speed :

single : 165 km/h 90kt

dual : 180 km/h 97kt

max. g = 2,5 - 3,5

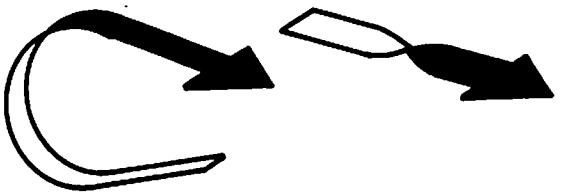
SLOW ROLL

Entrance speed :

single : 150 km/h 81 kn

dual : 165 km/h 90 kn

INVERTED FLIGHT

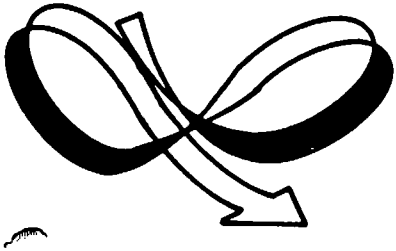


HALF ROLL

HALF LOOP

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

SPIN

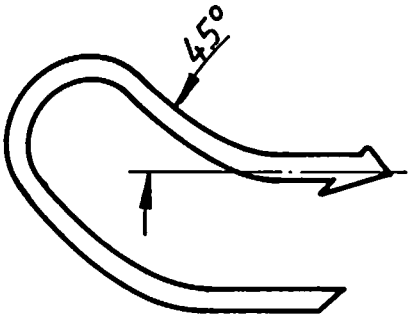


LAZY EIGHT

Entrance speed :

single : 140 km/h 76k

dual : 150 km/h 81k

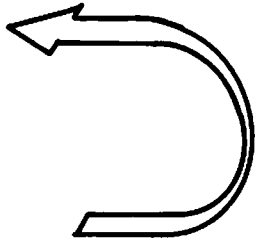


STEEP CLIMBING TURN

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 too rapidly.

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.

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

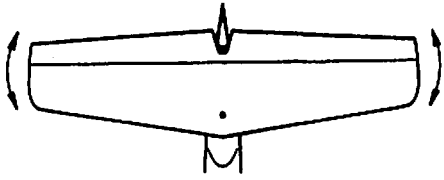


Fig. V.2-2
RIGHT: Pitch movement

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.

V.5 PREVENTIVE MAINTENANCE

The whole surface of the sailplane is painted with a weather resisting, white polyester coat. Impurities may be washed off with a mild cleansing agent. Heavy impurities may be removed with a polish.

For the paint maintenance only silicone-free agents are to be used (e.g. 1 Z-special cleansing agent-D2 from the company W.Sauer & Co., 5060 Bensberg, W. Germany, or the cleansing polish from the company Lesonal). Though the sailplane 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.

SHEET: 1 of 1	Technical Note for	Alexander Schleicher GmbH & Co. Segelflugzeugbau D-6416 Poppenhausen

Glider model:

ASK 18, ASK 18B . . . . . TN-No. 7
ASW 19, ASW 19B . . . . . TN-No. 23
ASW 20/20L, ASW 20B/20BL, ASW 20C/20CL TN-No. 34
ASK 21 . . . . . TN-No. 21
ASW 22 . . . . . TN-No. 6
ASK 23, ASK 23B . . . . . TN-No. 7
ASH 25, ... TN-No. 4

Subject: New production series tow release couplings for aerotow and winch launch.

Serial number applicability:

ASK 18/18B,	Data Sheet No.	L-307,	all serial no.s
ASW 19/19B,	Data Sheet No.	L-308,	all serial no.s
ASW 20/20L,	Data Sheet No.	L-314,	all serial no.s
ASW 20B/20Bl,	Data Sheet No.	L-314,	all serial no.s
ASW 20C/20CL,	Data Sheet No.	L-314,	all serial no.s
ASK 21,	Data Sheet No.	L-339,	all serial no.s
ASW 22,	Data Sheet No.	L-351,	all serial no.s
ASK 23/23B,	Data Sheet No.	L-353,	all serial no.s
ASH 25,	Data Sheet No.	04.364,	all serial no.s

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

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

Action:

1. Where replacement is required or where a corresponding installation location is provided the new tow release coupling production series can be installed instead of the previous ones.

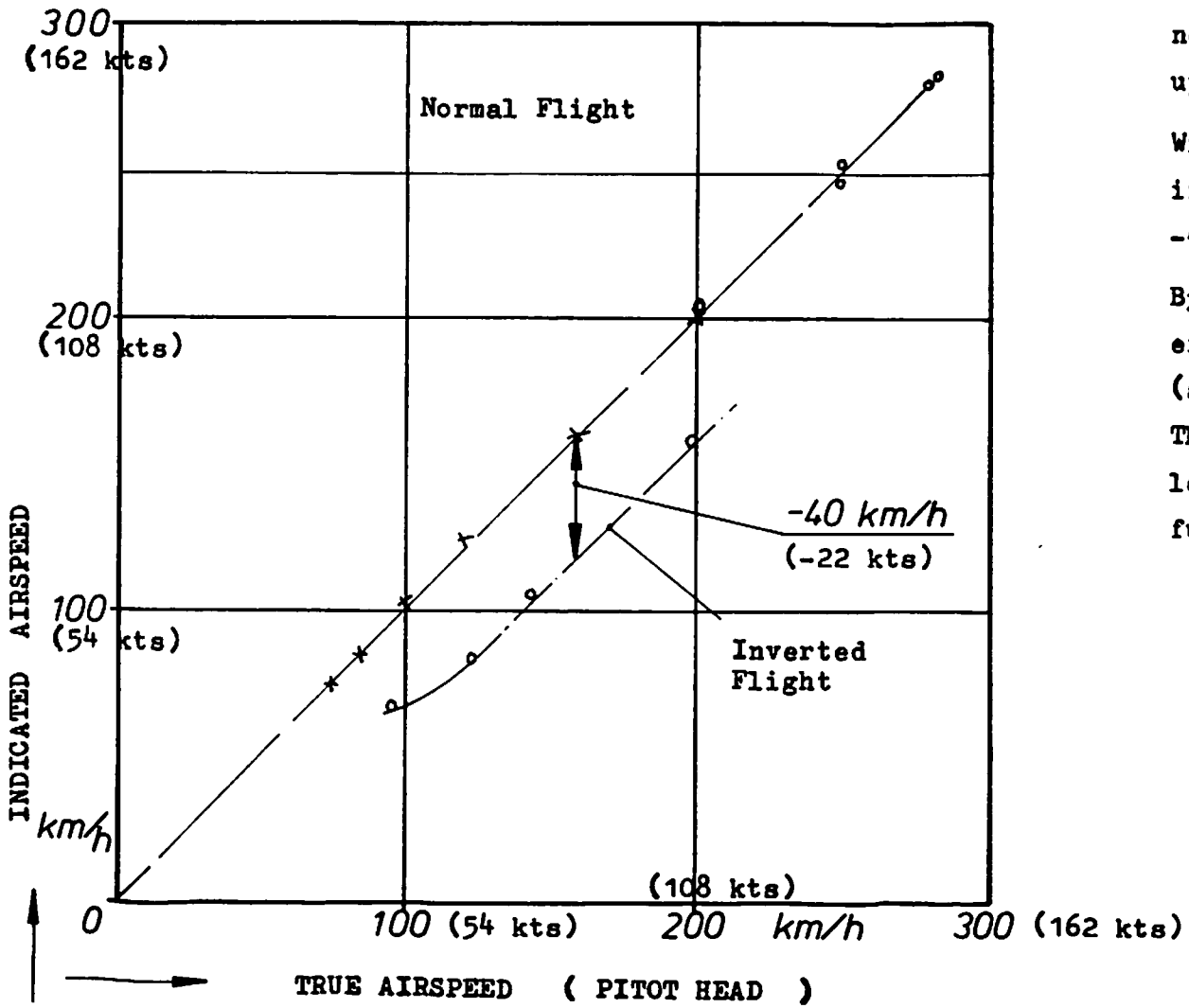
2. When this mod is accomplished, a copy of this Technical Note must be inserted as Annex into the Flight and Maintenance Manual of the glider (Operations Manuals respectively). The accomplishment of this action must be entered into the corresponding table in the manuals (the table headline reads: Additions to.., Amendments to .., Record or Log of Revisions ..).

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

Poppenhausen, January 17, 1990 ALEXANDER SCHLEICHER GmbH & Co.

i.A. Lutz-W. Juntow.

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

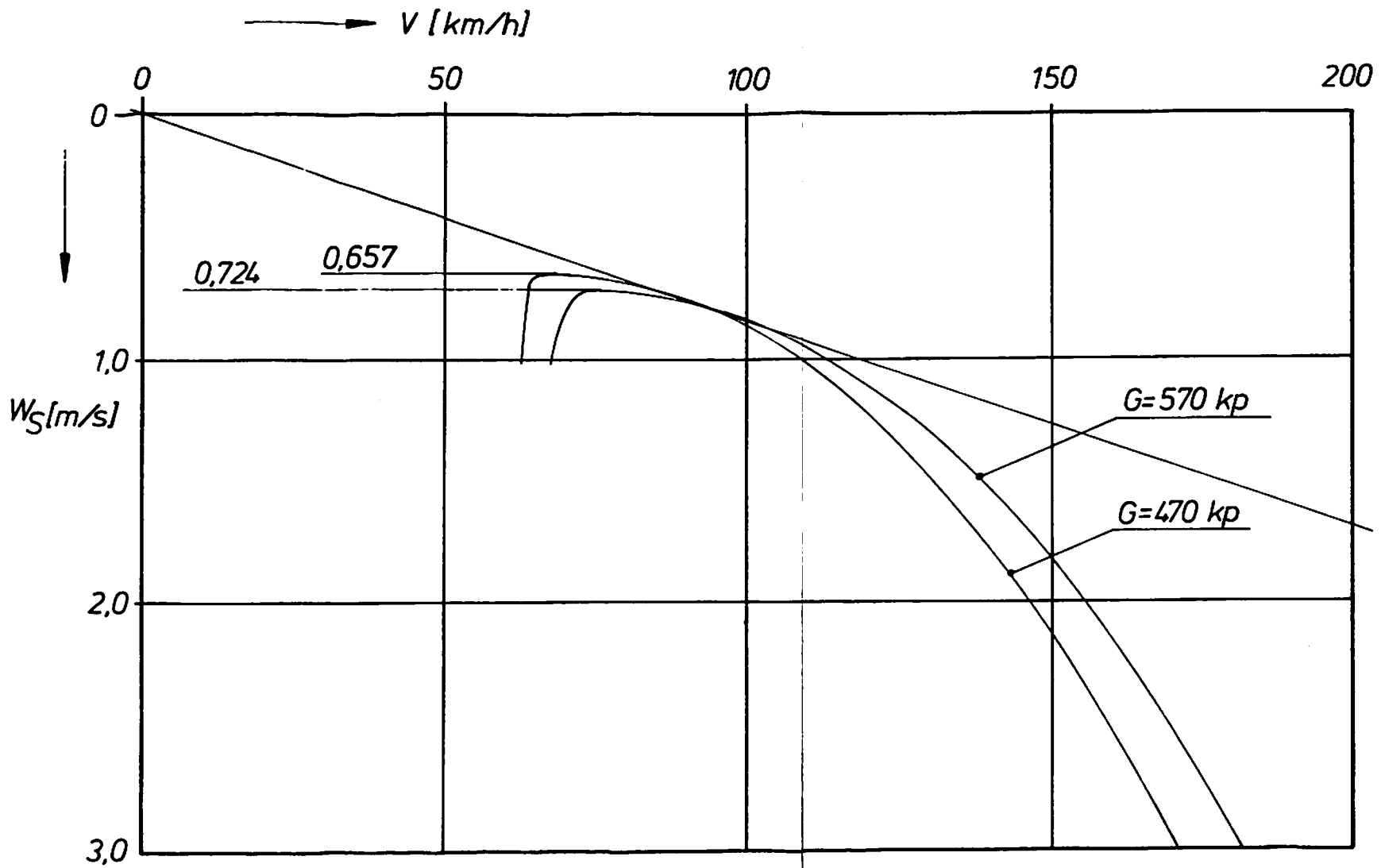


POSITION ERROR

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

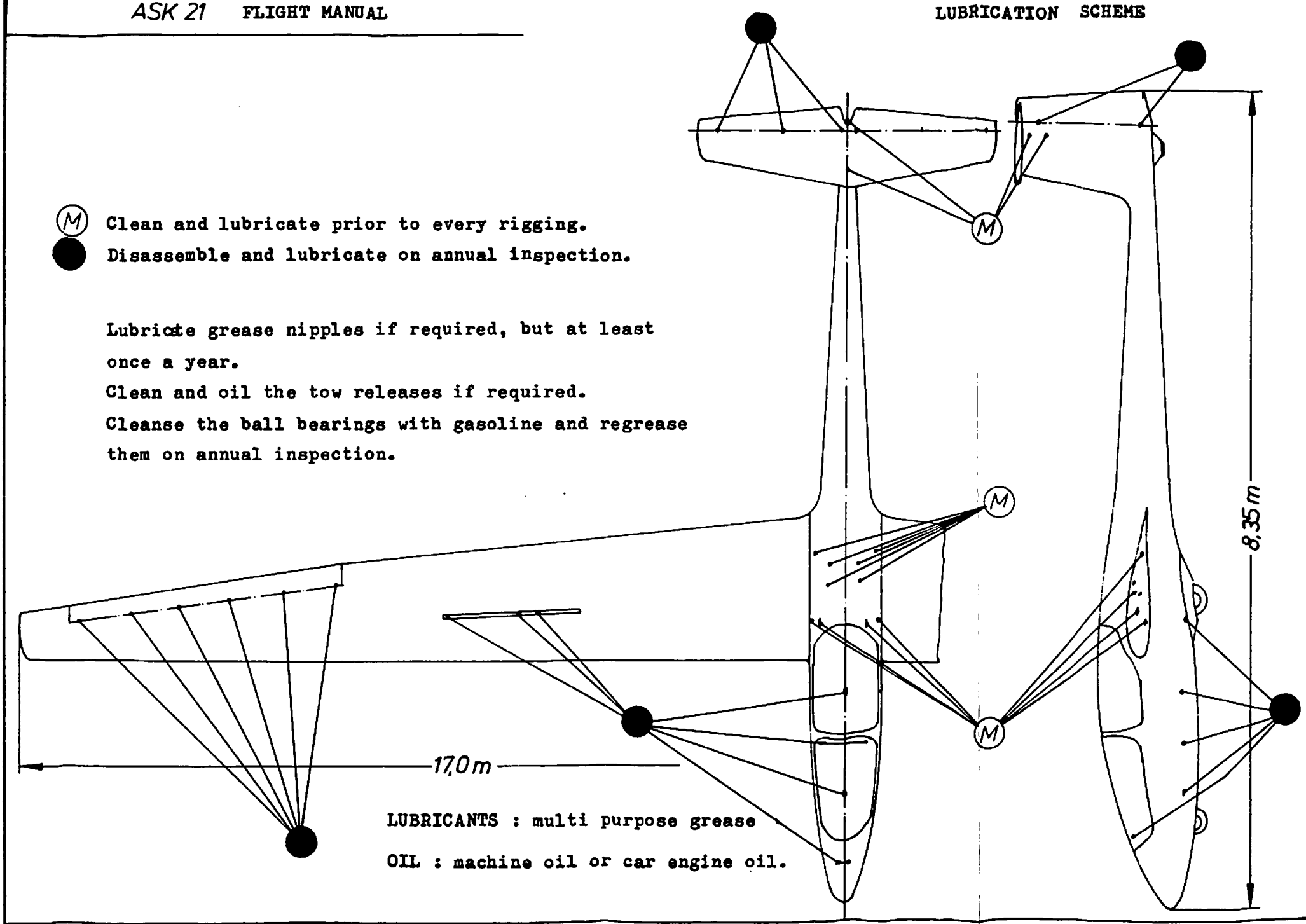
Ⓜ Clean and lubricate prior to every rigging.

● 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.

Attachment 1 of TN 4b

Spin training with the ASK 21: Summary of important information and further recommendations

Introduction

This appendix puts together pieces of information, which are important for spin training, but are found on different places in the Flight Manual. Furthermore, some general recommendations were added. About 170 ASK 21 were fitted with an attachment for spin ballast according to TN 4a (winter 2013). Now, it seems advisable to supply more information and more compact.

Spin Characteristics

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

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

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

WARNING: *The following important points have to be regarded during recovery (see Flight Manual page 13):*

- *Deliberately apply opposite rudder **up to the stop**, and keep it at the stop until the rotation ends.*
- *Short pause (approx. ½ turn) after applying rudder and before releasing the stick.*
- *As long as rotation has not stopped, only give in to the pressure of the stick. Do **not** push the stick.*

Disregarding these points can delay or even prevent recovery.

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

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

Familiarize yourself with the spin characteristics

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

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

Condition of the aircraft

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

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

CAUTION: *Control surface gaps have to be treated either according to the Maintenance Manual, Section VIII, or according to Maintenance Instruction C.*

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

The spanwise gaps of ailerons and elevator must be *air-tight.* According to Maintenance Manual Section VIII this is achieved with a certain adhesive tape. According to Maintenance Instruction C this is achieved with a teflon sealing/slip tape under the mylar fairing strips. Mylar fairing strips without sealing tape beneath are not sufficient!

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

Usage of the Spin Ballast Table

Directly before flight the pilots have to weight themselves with the equipment worn in flight (clothes, parachute ...) (see Flight Manual, page 10c). 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).

According to the spin ballast table page 10d, spin ballast has to be attached. Every other trim ballast and (loose) equipment in the cockpit has to be removed.

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

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

In all spins, the altitude loss is approximately 60 m (200 ft) per turn with a variance of 45 m (150 ft) minimum to 80 m (250 ft) maximum.

Spin Entry Procedure

The spin entry procedure is described on page 26 of the flight manual.

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

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

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

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

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

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

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

Spin Recovery

see Flight Manual page 13, and above "Spin Characteristics"

Emergency procedures

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

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

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

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

Attachment 2 of TN 4b

Excerpt of the USAF Manual

The US Air Force flight tested the ASK 21 with spin ballast in 1989. Their results also went into the concept of Technical Note 4a (TN4a). In the report of the USAF there is also a recommendation for the Flight Manual. This text is too detailed for the average student pilot. As an offer to the flight instructor, it is attached below. Since it is older than TN4a there are some deviations from TN4a (e.g. concept of spin ballast table).

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

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

Doyle B. Janzen, Charles J. Precourt

July 1989,
Air Force Flight Test Center Edwards Air Force Base

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

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

[..]

DEPARTURE AND SPIN SUSCEPTIBILITY

Entry Techniques

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

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

Mass Properties Effects

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

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

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

No Rudder Spin Entry

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

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

SPIN CHARACTERISTICS

Spin Modes

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

Spin-Parameters

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

The oscillation occurs more frequently as the cg is moved aft, while increases in inertia loading result in a larger amplitude of the oscillation. For example, at a forward cg, the oscillation is seen every third turn. At the aft cg limit, the oscillation occurs every ¾ to 1 turn. At low inertia values, the pitch attitude oscillates typically ±15 degrees about 50 degrees nose low, while at high inertia the oscillation is ±30 degrees about 40 degrees nose low.

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

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

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

Since airspeed indications can be unreliable during spins, particular attention is necessary to recognize the transition to a spiral. If cockpit noise due to outside airflow continues to increase to the point that conversation between crewmembers is difficult, or if the airspeed indicator is increasing through 60 KIAS [110 km/h], the aircraft is no longer spinning but is likely in a spiral. Opposite rudder [, opposite aileron,] and relaxed back stick pressure should be used immediately to avoid potential overspeed or overstress situations associated with high-speed spirals. Spoilers should be used as necessary to control airspeeds during all spin or spiral dive recoveries. [Remark: AS does not recommend the use of airbrakes during recoveries. Extracting the airbrakes has an unfavourable influence on the lift distribution, and the tolerable load factor reduces to +3,5g / -0g, see Flight Manual Section II.5].

[..]

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

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

Control forces during spins are light. There is a tendency for the ailerons to float into the direction of the spin, accompanied by 5 to 10 pounds [2,3 to 4,5 daN] of lateral force on the control stick. At the higher spin rates, the elevator and rudder forces at full prospin deflection drop to zero.

CONTROL EFFECTS

Flight Manual Recovery

When opposite rudder is initiated at a slow point or flat phase of the spin, the rotation stops in ¼ to ½ turn and the aircraft recovers. In the majority of cases, even at higher rotation rates, opposite rudder recovers the aircraft in ½ to ¾ of a turn from the point of input. However, with cg's of 14 to 16 inches [355 to 406 mm] and at higher inertias, recovery can take up to 1½ additional turns to recover once opposite rudder is applied. It is imperative that a slight pause occur between application of opposite rudder and forward stick or even greater delay in recovery can occur.

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

A recovery of 1½ turns may take up to 5 seconds, which may seem excessively long to an inexperienced pilot. The flight manual procedure has a 100 percent success rate if given sufficient time to work.

Aileron Effect

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

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

Elevator Effects

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

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

Hands Off

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

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

INVERTED SPINS

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

WARNING: *Intentional inverted spins are prohibited.*

Susceptibility

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

Characteristics

The inverted departure and spin entry are essentially a mirror image of the upright case. The nose falls to approximately 60 degrees nose low and then hesitates. Cockpit g forces build up to –2g and the nose then oscillates back up to 40 degrees nose low. The spin develops in approximately 180 degrees of rotation and is oscillatory just as the upright spin. Altitude loss is 200 to 300 feet per turn [61 to 91 m] and rotation rate is one turn every 3 to 2½ seconds. At the cg's tested, the inverted spin oscillations occur every ¾ to 1 turn. Once the spin is developed, gforces oscillate between –1 and –1.5g. Airspeed oscillates near 40 KIAS [75 km/h] and remains stalled throughout. Cockpit g forces are uncomfortable but other spin characteristics are very comparable to the upright case.

Inverted spin recovery is immediate (¼ to ½ turn) when controls are neutralized. Altitude loss from initiating recovery to level flight is 400 to 500 feet [122 to 152 m]. Since the spin includes a component of roll rate as well as yaw rate, the aircraft rolls to an upright attitude during recovery on its own, without further pilot input. Airspeeds are typically 90 to 100 KIAS maximum [167 to 185 km/h] during inverted spin dive recoveries.

Definitions

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

British Gliding Association

Flight Manual Supplement

Ref BGA 2007/01-02/4351 issue 1

Registration	BGA Number	Manufacturer and type	Serial Number
G-DJAD	**BGA 4351**	**SCHLEICHER ASK21**	**21659**

Title: BGA Operations

Subjects: Extended Weight Operations
Revised Weak Links
Revised Launch speeds
Revised Operational Limitations

Reference: BGA 2007/01 issue 1 (as applicable)
BGA 2007/02 issue 1 (as applicable)
BGA Data Sheets

Applicability: Sailplanes and Self Sustaining Sailplanes issued with a BGA Certificate of Airworthiness prior to 28 September 2008 and transitioned to EASA C of A.

Conditions: The above aircraft, subject to applicability, is approved for operation in accordance with the applicable BGA Data Sheet, as amended.

Any limitation revised or amended by an EASA approved Airworthiness Directive shall have precedence over this flight manual supplement.

Any aircraft operating within the BGA Extended Weight category shall be re-classified as "Utility" - Non Aerobatic, whilst within the extended weight range.

Refer to the BGA Data Sheet for revised limitations.

Approved by the EU commission as a 14(6) derogation dated 4 July 2008, to EC regulation 1592/2002 and 1702/2003 as being compliant with the requirements of Part 21 for continued use on UK registered gliders. Subject to the above applicability and conditions.

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