Schempp-Hirth, výroba letadel, spol. s r. o.
565 01 Choceň, Czech Republic

FLIGHT MANUAL
for the sailplane
DISCUS CS
Translation of the Czech Manual

Issue June 1990

This manual must be carried on board at all times

It refers to the sailplane

Model Discus CS

Registration No. BGA 4328 HZE

Serial No. 121 CS

Manufacturer Schempp-Hirth, výroba letadel, spol. s r. o.
565 01 Choceň, Czech Republic

Owner

This English edition of the DISCUS CS Flight Manual has been translated with care, and is accurate to the best of our knowledge. However, in all official matters the original Czech text is the authoritative and definite document.

Page No. 14 through page No. 52 are approved by the Civil Aircraft Inspectorate of the Czech Republic (Státní letecká inspekce), Prague.

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Amendment list
(Log of Revisions)

No.	Title	Page	Date
1.	Modification Bulletin No. 1/Discus CS affected: S/N 078 CS and up Cockpit ventilation	5,6	May 1992
2.	Rigging lever omitted	54	April 1993
3.	Technical Note No. 360 - 13 Winglets - optional use on all serial numbers	3, 4 42,54 55,56	June 1994
4.	Change of the manufacturer name on S/N 225 CS and up	Title pg. 10	August 1996
[illegible]	B.G.A. FLIGHT MANUAL SUPPLEMENT INCORPORATED. REF. BGA 2007/01-02/4328 ISSUE 1	REAR COVER	JULY 2008

1. General

1.1 General Description

The Discus CS is a single-seat high performance sailplane in CFRP/GFRP construction featuring a T-tail (with fixed horizontal stabilizer and elevator).

Wings

The two-piece wings each have a tri-trapezoidal plan form, swept-back leading edge and "two- story" airbrakes on the upper surface. Ailerons have internal drive. Water ballast tanks are integral compartments in the wing D nose, total capacity approx. 184 liters. Wing shells are of glass fiber/foam sandwich with spar flanges of carbon fiber rovings and shear webs of glass fiber/foam sandwich. For further improvement of the performance, winglets (option) may be fitted to the wing tips.

Fuselage

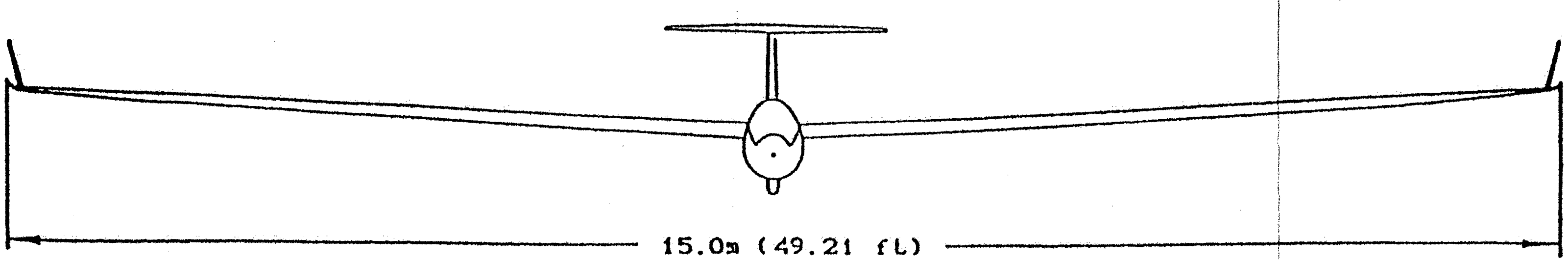
The pilot has a semi-reclining position. The cockpit is comfortable. A one-piece canopy hinges sideways. The fuselage shell is a pure glass fiber lay-up without sandwich and therefore is highly energy absorbing. It is stiffened towards the tail with GFRP/foam sandwich webs and the front fuselage features a double shell on both sides and on the bottom. The sprung undercarriage is retractable and is fitted with a wheel brake.

Horizontal tailplane

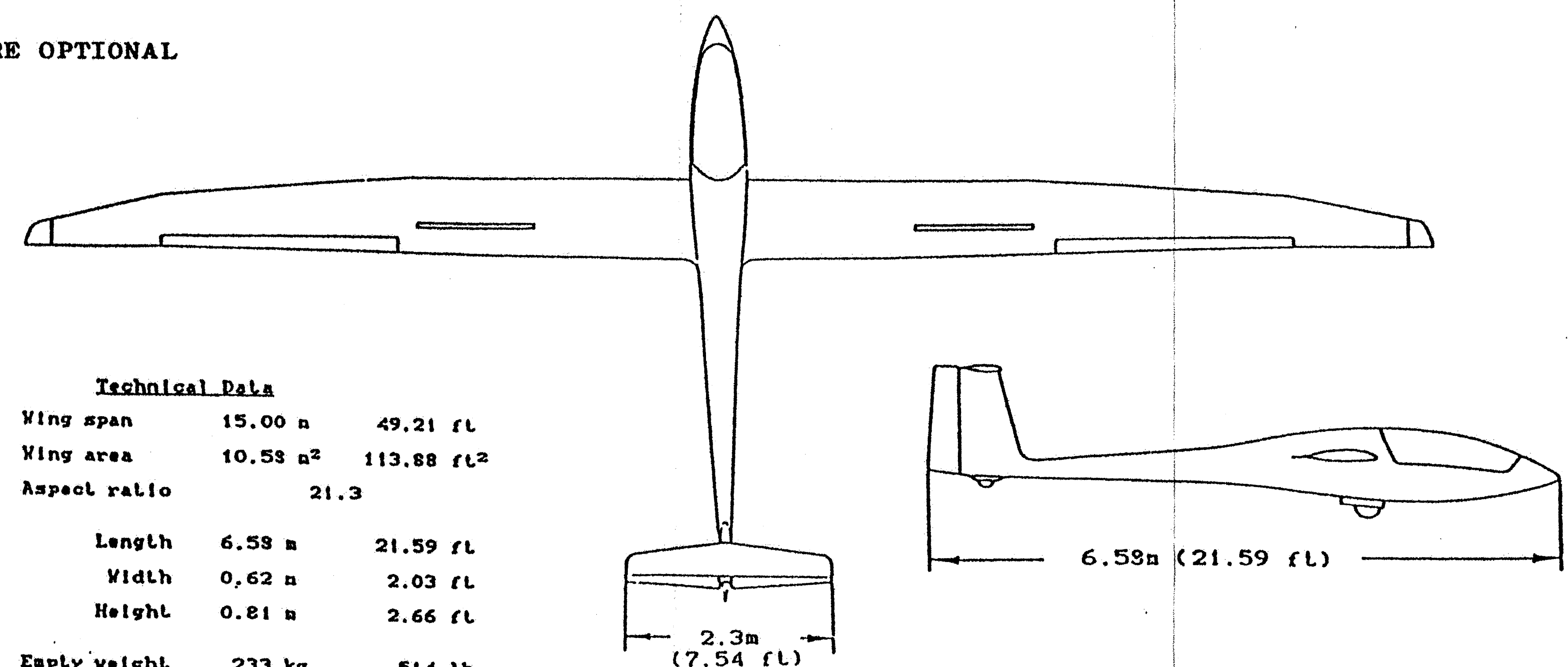
The horizontal stabilizer is built in GFRP/ foam sandwich and the elevator is a pure GFRP lay-up.

Vertical fin

Both fin and rudder are a GFRP/foam sandwich construction. The integral water ballast tank in the fin has a capacity of 6.5 kg (Ltr) (1.72 U.S. Gal./1.43 Imp. Gal.).



WINGLETS ARE OPTIONAL

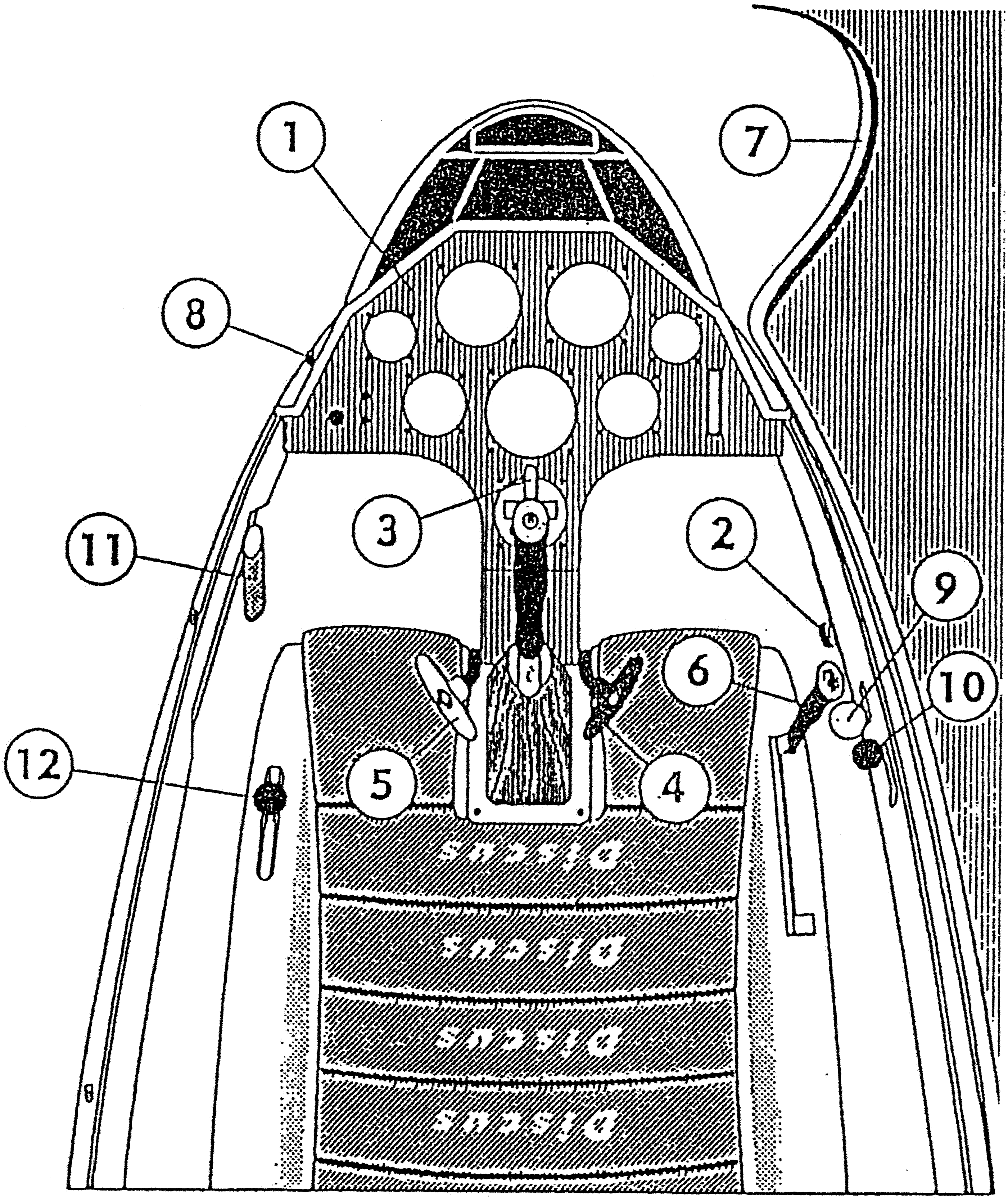


Technical Data

Wing	Wing span	15.00 m	49.21 ft
	Wing area	10.58 m²	113.88 ft²
	Aspect ratio	21.3	
Fuselage	Length	6.58 m	21.59 ft
	Width	0.62 m	2.03 ft
	Height	0.81 m	2.66 ft
Weights	Empty weight	233 kg	514 lb
	Max. A.U.W.	525 kg	1125 lb
Wing loading	minimal	28 kg/m²	5.73 lb/ft²
	maximal	50 kg/m²	10.24 lb/ft²

Discus CS

1.2 Cockpit Design and Controls



(Cockpit Design and Controls,ctd.)

All instruments and controls are within easy reach of the pilot.

(1) Instrument panel

Two screws secure the instrument cover to the panel and to its tubular mounting frame. Panel rises under light pressure after opening the canopy.

(2) Ventilation control

Small knurled knob on the starboard side of the cockpit. Regulation by freeing, moving and tightening up the knob.

Backward position - Closed

Forward position - Open

In addition, the sliding window or the airscoop in the window may be used for ventilation.

(3) Wheel brake control

The wheel brake handle is mounted on the control stick.

(4) Rudder pedal adjustment

Black T-shaped grip on the right side base of the instrument panel console.

Forward adjustment:
Release the locking device by pulling the T-grip. Push pedals with heels into desired position and let them engage the nearest notch.

Backward adjustment:
Pull pedals back with T-grip into desired position. Forward pressure with heels (not toes) will engage pedals into the nearest notch with an audible click.

The rudder pedals may be adjusted on the ground and in the air.

(Cockpit Design and Controls,ctd.)

(5) Launching hook release handle

Yellow T-shaped handle on the left at the base of the instrument panel console.

The winch cable (tow rope) is released by pulling the handle.

(6) Landing gear operating lever

Retract : Unlock the black handle on the right at the seat pan support, pull back and engage in rear recess.

Extend : Unlock black handle, push forward and engage in rear recess.

(7) Canopy

The one-piece plexiglass canopy hinges sideways on flush fittings. Take care that the cable restraining the open canopy is attached.

(8) Canopy locking device

Lever control with red knob on the left on the canopy frame.

Backward position .... canopy locked

To open the canopy swing lever forward and raise canopy.

(9) Canopy emergency jettisoning device

Sliding red knob on the right on the canopy frame.

Backward position .... locked

To jettison the canopy, first swing the locking lever on the left on the canopy frame forward, raise canopy,push the red jettison knob on the right on the inner skin forward and push canopy away.

(Cockpit Design and Controls, ctd.)

(10) <u>Wing and fin tank water ballast dumping device</u>

Black ball-shaped knob on the right in the middle of the GFRP inner skin.

Forward position = Valves closed

Backward position = Valves open

To lock the valves open, push knob downwards into recess.

(11) <u>Airbrake lever</u>

Blue lever on the left hand side of the cockpit.

Lever projects downwards.

Forward position	=	airbrakes closed and locked
Pulled back approx. 40 mm (1.6 in.)	=	unlocked
Pulled fully back	=	airbrakes fully extended

(12) <u>Elevator trim</u>

Green knob on the left at the seat mold support.

The spring operated elevator trim is gradually adjusted by moving the green knob inwards, sliding it into the desired position and releasing it to lock.

Forward position = nose heavy

Backward position = tail heavy

(Cockpit Design and Controls,ctd.)

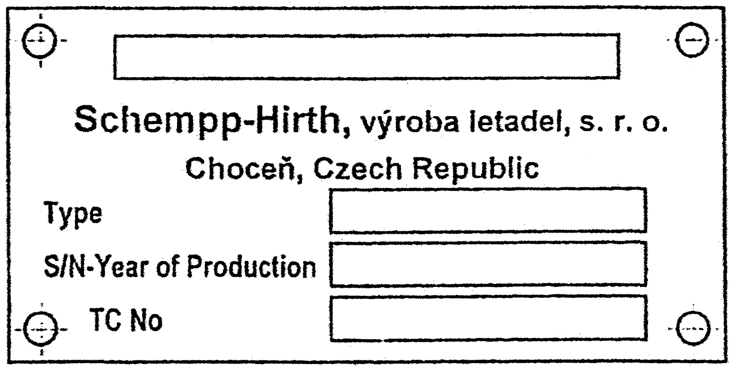
(13) Parachute rip cord attachment (not pictured)

Red ring, situated at the front of the fuselage steel tube framework, left hand side.

(Cockpit Design and Controls,ctd.)

Cocpit placards (operating data and miscellaneous)

Identification plate (fire proof)



Operating limitations

Max permitted all-up weight:	525 kg (1157 lb)		
Max permitted speeds (IAS)	**km/h**	**kt**	**mph**
Max permitted speed	250	135	155
in rough air	200	108	124
Maneuvering speed	200	108	124
on aerotow	180	97	112
Automobile and winch launch	150	81	93

Operating limits when fin tank is used:						
Minimum ground temperature	°C	13.5	17	24	31	38
	°F	56	63	75	88	100
Maximum absolut ceiling	m	1500	2000	3000	4000	5000
	ft	4900	6500	9800	13100	16400

Weak links for towing:
Maximum 680 daN (1499 lb)

Main wheel tire pressure:
up to 360 kg (794 lb) 3.5 bar (50 psi)
above 360 kg (794 lb) 4.5 bar (64 psi)

(Cockpit Design and Controls,ctd.)

Load on pilot's seat (pilot and parachute)
Maximum load 110 kg (242.5 lb)*   Minimum load 70 kg (154.3 lb)*
Pilot's weight of less than 70 kg (154.3 lb) must be raised by using trim ballast

** As the actual minimum or maximum seat load of this sailplane to which this manual refers may differ from the above typical weights, the placard in the cocpit must show the actual weights which are also to be entered in the log sheet (see page 26).*

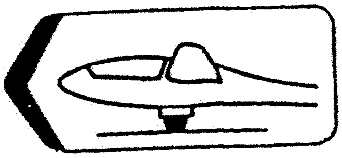
Check list before take-off
o Water in fin tank?   o Loading charts checked?   o Parachute securely fastened?   o Safety harness secured and tight?   o Back rest and pedals in comfortable position?   o All controls and instruments accessible?   o Airbrakes locked after functioning check?   o All control surfaces checked with assistant for full and free movement in correct sense?   o Trimer correctly set?   o Canopy closed and locked?

Aerobatics: without water ballast the following maneuvers are permitted:	
a) Inside loops	c) Spins
b) Stalled Turns	d) Lazy Eight

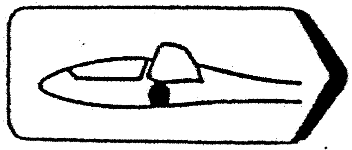
Baggage compartment
Maximal load: 2.0 kg (4.4 lb)

(Cockpit Design and Controls,ctd.)

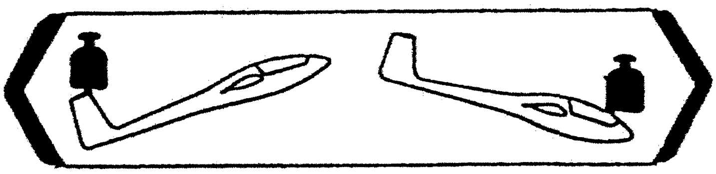
Cockpit controls - markings



gear DOWN

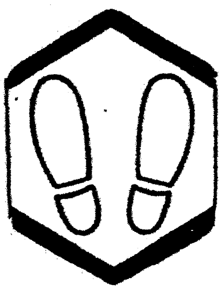


gear UP

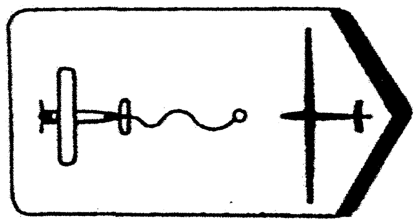


heavy TAIL heavy NOSE

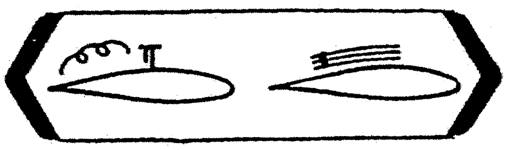
Trimmer - green knob



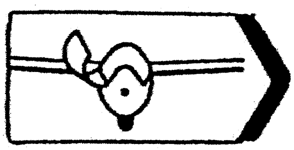
Pedal adjustment

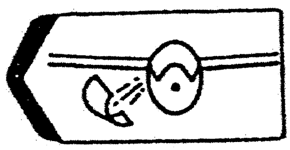


Yellow tow release handle



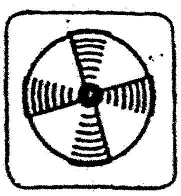
Airbrakes - blue handle



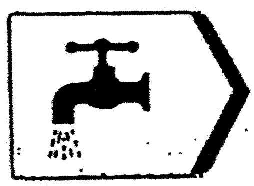


red knobs

left-Canopy opening right-Canopy jettisoning



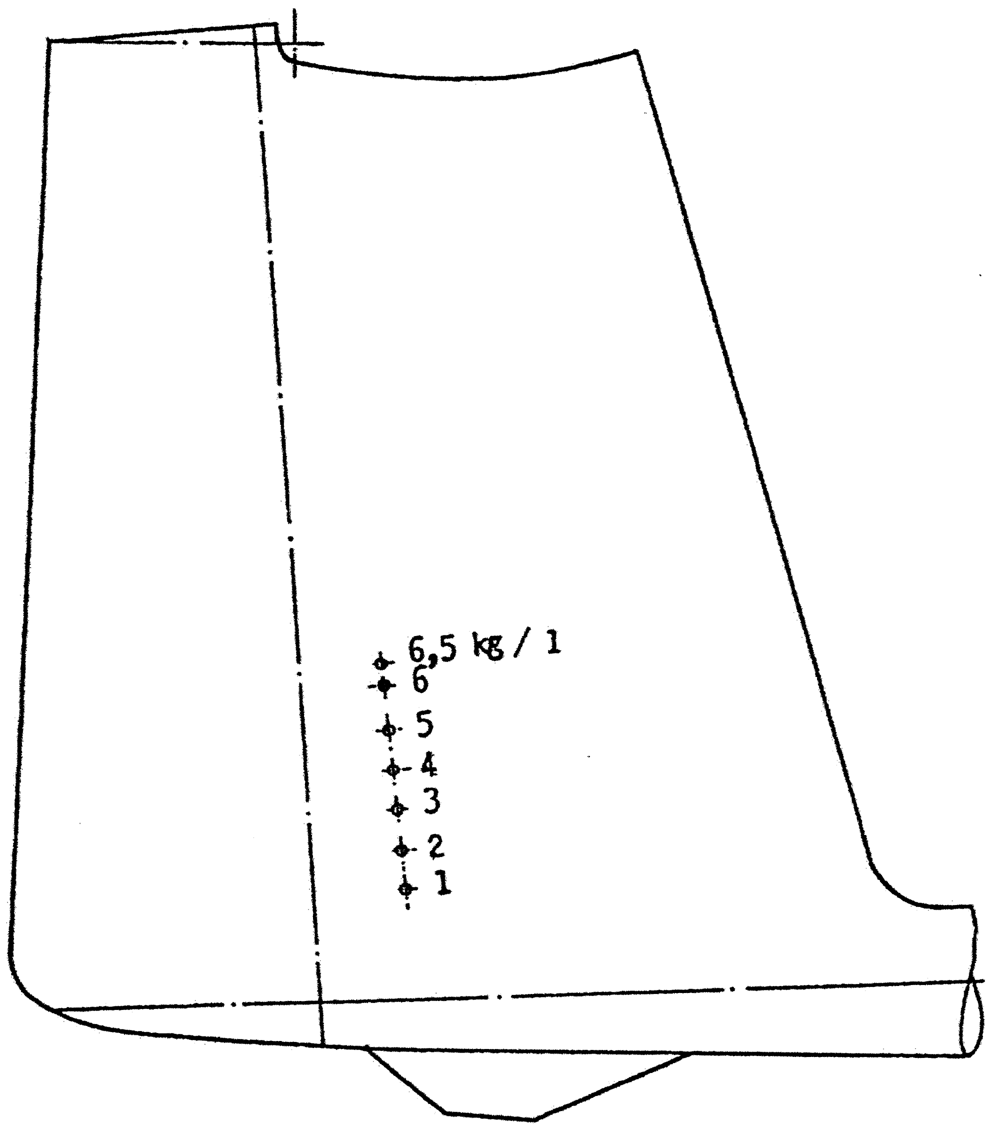
Ventilation



water ballast dumping knob

(Cockpit Design and Controls,ctd.)

Fin tank label: (right side only)



1.3 Airspeed indicator system errors

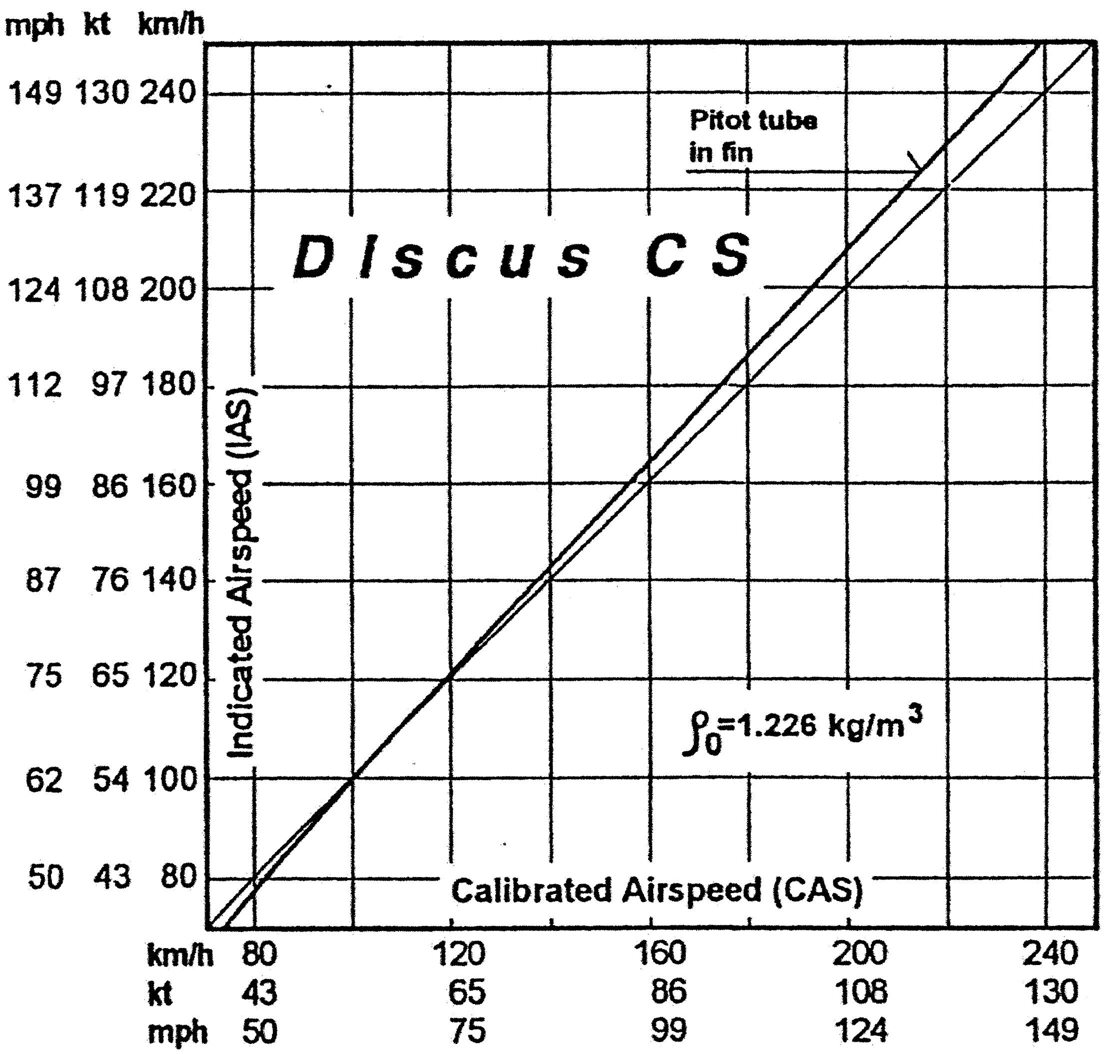
Errors in indicated airspeed caused by Pitot/Static pressure errors may be read off from the calibration chart below.

Position of the pressure ports:

Static pressure: Fuselage, approx. 15cm (5.9in) below main spar cut-out and on fuselage tail boom, approx. 80cm (31.5in) forward of the base of the fin.

Pitot pressure: On the leading edge of the fin.

All airspeeds shown in this manual are indicated airspeeds (IAS) as registered by the airspeed indicator. The calibration curve is also valid for winch launching and aerotow.



2. Operating limitations

2.1 Category of Airworthiness

Category "U" (Utility) according to JAR 22.

According to the requirements of JAR 22, full control surface deflections may be applied up to the maneuvering speed V_A.

At higher speeds, when using full control surface deflections, it would be possible to exceed the stress limits of the sailplane.

For this reason, full deflection of controls must not be used at speeds above 200 km/h (108 kt, 124 mph).

At maximum permitted speed V_{NE} = 250 km/h (135 kt, 155 mph), only a maximum of one third of the full control deflection is permitted.

For the elevator, the deflections at V_{NE} are even considerably smaller and depend on the permitted maneuvering load factors.

In normal weather conditions, this sailplane can be flown at speeds up to V_{NE} = 250 km/h (135 kt, 155 mph) without problems.

In severe turbulence, i.e. wave rotors, thunderstorms, visible whirlwinds and when crossing mountain ridges, V_{RA} = 200 km/h (108 kt, 124 mph) must not be exceeded.

2.2 Permitted operations

1. **VFR Flying in daytime**

   (Minimum equipment according to section 2.3a).

2. **Cloud Flying**

   (Minimum equipment according to section 2.3b).

3. **Restricted Aerobatics:**

   The following aerobatics maneuvers are permitted:

   a) Inside Loop

   b) Spins

   c) Stalled Turn

   d) Lazy Eight

In addition to the equipment listed in section 2.3 it is recommended to equip the sailplane with accelerometer (3 hands, resettable), if it is to be used for aerobatics.

2.3 Minimum Equipment

Instruments and other basic equipment must be of an approved type and should be selected from the list in the Maintenace Manual.

a) Normal operations

1 **Airspeed indicator**

range up to 300 km/h (162 kt, 186 mph), with colour markings shown on page 18.

1 **Altimeter**

1 **Four-piece safety harness**

(symmetrical)

1 **Automatic or manual parachute,**

or a seat-back cushion (thickness approx. 8 cm (3.15 in) when compressed).

1 **Outside air temperature indicator**

with sensor (red line at 2°C (36°F) in minus temperature range).

(Minimum Equipment,ctd.)

b) Cloud Flying

In addition to the equipment listed in section a):

Turn & bank indicator with slip ball

Variometer

VHF - Transceiver

Magnetic compass

Note:

From experience gained to date it appears that the A.S.I. system, as installed, remains fully operational when flying in clouds.

Recommended additional equipment for:

Cloud flying

Artificial horizont

Clock

Restricted aerobatics

Accelerometer (3 hands, resettable)

Note:
For structural reasons the weight of the instrument panel and instruments must not exceed 10 kg (22 lb).

(Minimum Equipment,ctd.)

Operating Instructions

- o Flight and Maintenance Manual
- o Data and Reference Placards

Airspeed Indicator Colour Markings

	km/h	mph	kt
Maximum permitted speed V_{NE}	250	155	135
Maneuvering speed V_A	200	124	108
1.1 x Stalling speed 1.1 x V_{s1}	95	59	51
Green arc (normal range)	95..200	59..124	51..108
Yellow arc (caution range)	200..250	124..155	108..135
Red radial line (never exceed)	250	155	135
Yellow arrow (approach speed)	115	71	62

The stalling speed of which the airspeed indicator markings are based refers to the following configuration:

a) Airbrakes : Closed

b) Maximum weight : W_{max} = 525 kg (1157 lb)

2.4 Airspeed Limits (IAS)

	km/h	kt	mph
Maximum permitted speed V_{NE}	250	135	155
Maximum permitted speed in rough air V_{RA}	200	108	124
Maneuvering speed V_{A}	200	108	124
Maximum permitted speed on aerotow V_{T}	180	97	112
Maximum speed on winch launch* V_{W}	150	81	93

**Maximum permitted speed on automobile & winch launch*

Please note that with increasing altitude true airspeed (TAS) increases versus indicated airspeed (IAS).

This is of no consequence with regard to the stressing of the sailplane. However, for flutter prevention the following speeds (IAS) must not be exceeded:

Altitude		V(IAS)			Altitude		V(IAS)		
m	ft	km/h	kt	mph	m	ft	km/h	kt	mph
0	0	250	135	155	6000	19680	230	124	143
1000	3280	250	135	155	7000	22960	217	117	135
2000	6560	250	135	155	8000	26240	205	111	127
3000	9840	250	135	155	9000	29520	193	104	120
4000	13120	250	135	155	10000	32800	182	98	113
5000	16400	243	131	151	12000	39360	158	85	98

2.5 Load Factors

The following maneuvering load factors must not be exceeded:

at V_A = 200 km/h (108 kt, 124 mph)

$n = + 5.3$

$n = - 2.65$

at V_{NE}= 250 km/h (135 kt, 155 mph)

$n = + 4.0$

$n = - 1.5$

Airbrakes closed.

Airbrakes extended : Maximum $n = + 3.5$.

2.6 Weights

	kg	lb
Empty weight (approx.)	233	514
Maximum permitted all-up weight	525	1157
Maximum weight of non-lifting parts	240	529

For maximum permitted water ballast refer to section 2.7

2.7 Loading Table

Seat load (pilot and parachute):

Minimum	70 kg (154.3 lb)
Maximum	110 kg (242.5 lb)

Note:
As the actual minimum or maximum seat load of this sailplane to which this manual refers may differ from the above typical weights, the seat load placard in the cockpit must show the actual weights from the log chart on page 26.

Pilot's weight of less than this minimum seat load must be raised by using trim ballast.

1. Ballast (lead or sand cushion) must be securely held in place by attaching it to the lap belt brackets.

2. Ballast by means of lead plates can be installed into the fuselage nose cone. 2.2 kg (4.85 lb) correspond to 5.0 kg (11.0 lb) pilot weight. The installation point is 1715 mm (67.52 in) ahead of datum (BE).

Neither the max. permitted all-up weight nor the maximum weight of the non-lifting parts may be exceeded.

Centre of gravity (C.G.) of the pilot:
(with parachute or back cushion)

450 mm (17.72 in) ahead of datum (BE).

(Loading Table,ctd.)

Loading Table With Water Ballast

Max permitted all-up weight
(including water ballast) .... 525 kg (1157 lb)

Lever arm of water ballast
aft of datum (BE) .... 203 mm (7.99 in)

Table of water ballast at various empty weights and seat loads (pilot incl. parachute):

Empty		Seat load pilot and parachute kg (lb)														
kg	lb	70 (154)			80 (176)			90 (198)			100 (220)			110 (243)		
220	485	184	48.6	40.5	184	48.6	40.5	184	48.6	40.5	184	48.6	40.5	184	48.6	40.5
225	496	184	48.6	40.5	184	48.6	40.5	184	48.6	40.5	184	48.6	40.5	184	48.6	40.5
230	507	184	48.6	40.5	184	48.6	40.5	184	48.6	40.5	184	48.6	40.5	184	48.6	40.5
235	518	184	48.6	40.5	184	48.6	40.5	184	48.6	40.5	184	48.6	40.5	180	47.5	39.6
240	529	184	48.6	40.5	184	48.6	40.5	184	48.6	40.5	184	48.6	40.5	175	46.2	38.5
245	540	184	48.6	40.5	184	48.6	40.5	184	48.6	40.5	180	47.5	39.6	170	44.9	37.4
250	551	184	48.6	40.5	184	48.6	40.5	184	48.6	40.5	175	46.2	38.5	165	43.6	36.3
		*	**	***	*	**	***	*	**	***	*	**	***	*	**	***

*) ...liters **) ...U.S.Gallons ***) ...Imp.Gallons

Water ballast in both wing tanks

Baggage Compartment

Max. permitted load in baggage compartment:

2.0 kg (4.4 lb)

This load must be considered when the maximum permitted water ballast load is determined.

Lever arm of baggage aft of datum (BE):

880 mm (34.65 in)

(Loading Table,ctd.)

Loading Table When Using The Fin Tank

In order to shift the center of gravity close to its aft limit (favourable in terms of performance), water ballast may be carried in a fin tank (m_{FT}) to compensate for the nose heavy moment of water ballast in the wing (m_{WT}).

The determination of the ballast quantity is done with the aid of the diagram on page 22 d.

(Loading Table,ctd.)

Example

for the determination of the ballast quantity:

Example

Total water ballast in both wing tanks

m_{WT} = 70 kg (liters)

Resulting water ballast in fin tank as shown in the diagram on page 22 d:

m_{FT} = 2.0 kg (liters)

As the scale on the fin tank is graduated for full kilograms (liters) only, a quantity of

2.0 kg (liters)

is filled in fin tank.

End of the example

(Loading Table,Using Fin Tank,ctd.)

When determining the quantity of water ballast for the fin tank, bear in mind that the maximum permitted payload (see log chart, page 26) must not be exceeded. Check as follows:

$m_{PILOT} + m_{FT} \leq$ (less or equal to the max. permitted payload shown on page 26).

In order to avoid that the maximum permitted gross weight is exceeded, the ballast in the fin tank must also be considered when determining the maximum allowable water ballast for the wing tanks.

Caution:

The fin tank should never be used when there is the danger of the water ballast becoming frozen.

Flying conditions must conform with the following table:

Operating limits for fin tank:

Minimum ground temperature	°C	13.5	17	24	31	38
	°F	56	63	75	88	100
Maximum absolute ceiling	m	1500	2000	3000	4000	5000
	ft	4900	6500	9800	13100	16400

Caution:

Observe the outside air temperature indicator. The temperature must not drop below

2 °C (36 °F).

2.8 C.G. Positions

a) In-flight C .G. position

Sailplane attitude : Tail jacked up such that a wedge-shaped block 100 : 4.4, placed on the fuselage tail boom, is horizontal along its upper edge.

Datum (BE) ...... Wing leading edge at root rib

Max. forward
C.G. position ... 260 mm (10.24 in)
aft of datum (BE)

Max. rearward
C.G. position ... 400 mm (15.75 in)
aft of datum (BE)

Make sure that the maximum permitted rearward C.G. position is not exceeded - this is ensured when the minimum seat load (pilot and parachute) is observed.
A lower seat load must be compensated by ballast. (See section 2.7,"loading table").

b) Empty weight C.G. position

After repair, repainting, installation of additional equipment, modifications etc. the center of gravity must be re-determined by weighing the sailplane; in any case the Discus CS should be re-weighted every four years. Make sure that the empty C.G. is within the permitted range. If necessary, compensating ballast weight must be installed.

When the empty weight C.G. limits and the loading table are observed, the C.G. position in flight will be within the permitted range.

(C.G. Positions, ctd.)

The determination of the C.G. ranges as shown in the diagrams on page 25 A and 25 B is done with the following seat loads:

Forward C.G. Positions: With a maximum seat load of 110 kg (242.5 lb) and with max. permitted water ballast

Rearward C.G. Positions: With various minimum seat loads and with 2.0 kg (4.4 lb) load in the baggage compartment

For easier determination of the "empty" weight C.G.position the table on page 24 A shows, at various empty weights, the maximum permissible loads on the tail skid (or wheel - if installed) with various seat loads (with reference to the rearmost C/G position).

Just determine the actual load on the tail skid (or wheel) with the sailplane being in weighing attitude (main wheel on the ground, tail jacked up as described on page 23).

If the determined load on the tail skid (or wheel - if installed) is below the value shown on page 24 A, the C.G. position is within the permitted range.

(C.G. Positions, ctd.)

Empty weight		Load on tail wheel with a seat load of: 70	154	75	165	80	176	85	187
kg	lb	kg	lb	kg	lb	kg	lb	kg	lb
220	485	28.7	63.2	29.7	65.5	30.8	67.9	31.8	70.2
225	496	29.0	63.9	30.0	66.2	31.1	68.6	32.2	71.0
230	507	29.4	64.9	30.4	67.1	31.5	69.5	32.4	71.5
235	518	29.7	65.5	30.7	67.7	31.8	70.2	32.8	72.4
240	529	30.0	66.2	31.1	68.6	32.0	70.6	33.1	73.0
245	540	30.3	66.9	31.4	69.3	32.4	71.5	33.5	73.9
250	551	30.7	67.7	31.7	69.9	32.7	72.1	33.8	74.6
255	562	31.0	68.4	32.1	70.8	33.0	72.8	34.1	75.2
260	573	31.3	69.1	32.3	71.3	33.4	73.7	34.4	75.9

(C.G. Positions, ctd.)

Empty weight C.G. Range

Permitted forward C.G. position at maximum seat load of 110 kg (242.5 lb) and maximum permitted water ballast.

Empty Weight		C.G. aft of datum	
kg	lb	mm	in
220	484.7	663.3	26.1
221	486.9	661.4	26.0
222	489.2	659.5	26.0
223	491.4	657.6	25.9
224	493.6	655.7	25.8
225	495.8	653.9	25.7
226	498.0	652.0	25.7
227	500.2	650.2	25.6
228	502.4	648.4	25.5
229	504.6	646.6	25.5
230	506.8	644.9	25.4
231	509.0	643.1	25.3
232	511.2	641.3	25.2
233	513.4	639.6	25.2
234	515.6	637.8	25.1
235	517.8	636.0	25.0
236	520.0	634.3	25.0
237	522.2	632.5	24.9
238	524.4	630.8	24.8
239	526.6	629.1	24.8

Empty Weight		C.G. aft of datum	
kg	lb	mm	in
240	528.8	627.3	24.7
241	531.0	625.6	24.6
242	533.2	623.8	24.6
243	535.4	622.1	24.5
244	537.6	620.4	24.4
245	539.8	618.7	24.4
246	542.0	617.0	24.3
247	544.2	615.3	24.2
248	546.4	613.6	24.2
249	548.6	611.9	24.1
250	550.8	610.2	24.0
251	553.1	608.5	24.0
252	555.3	606.9	23.9
253	557.5	605.2	23.8
254	559.7	603.6	23.8
255	561.9	602.0	23.7
256	564.1	600.4	23.6
257	566.3	598.8	23.6
258	568.5	597.2	23.5
259	570.7	595.6	23.4
260	572.9	594.1	23.4

Max. permitted absolute ultimate weight
A.U.W. = 525 kg (1157 lb)

(C.G. Positions, ctd.)

Empty Weight Center of Gravity Range

Permitted Rearward C.G. position

Empty Weight kg	Empty Weight lb	70 kg (mm)	154 lb (in)	75 kg (mm)	165 lb (in)	80 kg (mm)	176 lb (in)	85 kg (mm)	187 lb (in)
220	484.7	666.0	26.2	684.9	27.0	705.0	27.8	724.0	28.5
221	486.9	664.9	26.2	683.6	26.9	703.7	27.7	722.6	28.4
222	489.2	663.7	26.1	682.4	26.9	702.3	27.6	721.1	28.4
223	491.4	662.5	26.1	681.2	26.8	701.0	27.6	719.7	28.3
224	493.6	661.4	26.0	680.0	26.8	699.6	27.5	718.3	28.3
225	495.8	660.2	26.0	678.8	26.7	698.3	27.5	716.9	28.2
226	498.0	659.1	25.9	677.6	26.7	696.9	27.4	715.6	28.2
227	500.2	657.9	25.9	676.5	26.6	695.6	27.4	714.2	28.1
228	502.4	656.8	25.9	675.3	26.6	694.3	27.3	712.8	28.1
229	504.6	655.7	25.8	674.1	26.5	693.0	27.3	711.5	28.0
230	506.8	654.5	25.8	673.0	26.5	691.7	27.2	710.1	28.0
231	509.0	653.4	25.7	671.9	26.5	690.4	27.2	708.8	27.9
232	511.2	652.3	25.7	670.7	26.4	689.1	27.1	707.5	27.9
233	513.4	651.2	25.6	669.6	26.4	687.9	27.1	706.2	27.8
234	515.6	650.1	25.6	668.5	26.3	686.6	27.0	704.9	27.8
235	517.8	649.0	25.6	667.4	26.3	685.4	27.0	703.6	27.7
236	520.0	648.0	25.5	666.3	26.2	684.1	26.9	702.3	27.6
237	522.2	646.9	25.5	665.2	26.2	682.9	26.9	701.0	27.6
238	524.4	645.8	25.4	664.1	26.1	681.7	26.8	699.8	27.6
239	526.6	644.8	25.4	663.0	26.1	680.5	26.8	698.5	27.5

Permitted Rearward C.G. position

Empty Weight kg	Empty Weight lb	70 kg (mm)	154 lb (in)	75 kg (mm)	165 lb (in)	80 kg (mm)	176 lb (in)	85 kg (mm)	187 lb (in)
240	528.8	643.8	25.3	662.0	26.1	679.3	26.7	697.2	27.4
241	531.0	642.7	25.3	660.9	26.0	678.1	26.7	696.0	27.4
242	533.2	641.7	25.3	659.8	26.0	677.0	26.7	694.8	27.4
243	535.4	640.7	25.2	658.8	25.9	675.8	26.6	693.6	27.3
244	537.6	639.7	25.2	657.7	25.9	674.7	26.6	692.3	27.3
245	539.8	638.7	25.1	656.7	25.9	673.5	26.5	691.1	27.2
246	542.0	637.7	25.1	655.7	25.8	672.4	26.5	689.9	27.2
247	544.2	636.7	25.1	654.6	25.8	671.3	26.4	688.8	27.1
248	546.4	635.8	25.0	653.6	25.7	670.2	26.4	687.6	27.1
249	548.6	634.8	25.0	652.6	25.7	669.1	26.3	686.4	27.0
250	550.8	633.9	25.0	651.6	25.7	668.1	26.3	685.3	27.0
251	553.1	632.9	24.9	650.6	25.6	667.0	26.3	684.1	26.9
252	555.3	632.0	24.9	649.6	25.6	666.0	26.2	683.0	26.9
253	557.5	631.1	24.8	648.6	25.5	664.9	26.2	681.8	26.8
254	559.7	630.2	24.8	647.7	25.5	663.9	26.1	680.7	26.8
255	561.9	629.3	24.8	646.7	25.5	662.9	26.1	679.6	26.8
256	564.1	628.4	24.7	645.7	25.4	661.9	26.1	678.5	26.7
257	566.3	627.5	24.7	644.8	25.4	660.9	26.0	677.4	26.7
258	568.5	626.6	24.7	643.9	25.4	659.9	26.0	676.3	26.6
259	570.7	625.7	24.6	642.9	25.3	658.9	25.9	675.2	26.6
260	572.9	624.9	24.6	642.0	25.3	658.0	25.9	674.1	26.5

Max. permitted absolute ultimate weight
A.U.W. = 525 kg (1157 lb)

WEIGHT AND BALLANCE LOG CHART valid for Serial Number:

Date of weighing							
Inspector Signature Stamp							
Empty weight (kg)							
Equipment list dated							
Empty weight C.G. position aft of datum (BE) (mm)							
Weight of pilot and parachute (kg)	max^{x}						
	min						
Maximum payload (kg)							
Max. permitted water ballast at max payload (kg)							

^{x}) max seat load not to exceed 110 kg

2.9 Towing hook(s)

a) C.G. Release mechanism (if installed)
For winch launching and aerotow the TOST release mechanism

Safety release "Europa G 72" or

"Europa G 73" or "Europa G 88"

is used, which is installed on the bottom of the fuselage in front of the main landing wheel.

b) Nose tow release mechanism (if installed)

For aerotow the TOST release mechanism Nose release

"E 72" or "E 75" or "E 85" is used, which is

installed in the nose of the fuselage.

2.10 Weak links in winch cable and aerotow rope

For both winch launching and aerotow:

Maximum: 680 daN (1499 lb)

The minimum strength of the weak link should not be less than the value for the maximum all-up weight.

2.11 Tire Pressure

Up to 360 kg (794 lb) A.U.W. = 3.5 bar (50 psi)
Above 360 kg (794 lb) A.U.W. = 4.5 bar (64 psi)

2.12 Crosswind

Maximum crosswind component proven for take-off and landing: 20 km/h (5.6 m/s,11 kt)

3. Emergency Procedures

3.1 Spin Recovery

1. Apply full opposite rudder against the direction of rotation of the spin.

2. Ease the control stick forward until the rotation ceases.

3. Centralize rudder and pull out smoothly from dive.

3.2 Emergency Exit

In case of danger, the roomy and uncluttered cockpit ensures a quick and safe emergency exit.

The procedure for jettisoning the canopy is as follows:

1. Swing canopy locking lever (with red knob) on the left side of the canopy frame forward and raise canopy.
2. Push red knob located direcly below the right hand canopy frame forward.
3. Throw off the canopy.

The canopy coaming frame of the fuselage is made of fiberglass laminates, strong and without sharp edges, so the pilot may use it for support when bailing out.

The forward hinged instrument panel rises under light pressure by hand or with the legs, thus allowing for an easier emergency exit.

3.3 Safety Considerations

Take-off by winch-launch or aerotow from uncut grass fields must be strictly avoided.

If a wing tip is caught in high grass, release winch cable/tow rope immediately, otherwise a cart-wheel with resulting ground loop (with risk of damage or injury of the pilot) cannot be prevented.

After an emergency release at low altitude, in straight flight a speed of 70 to 90 km/h (38-49 kt, 43-56 mph), depending on wing loading, should be maintained.

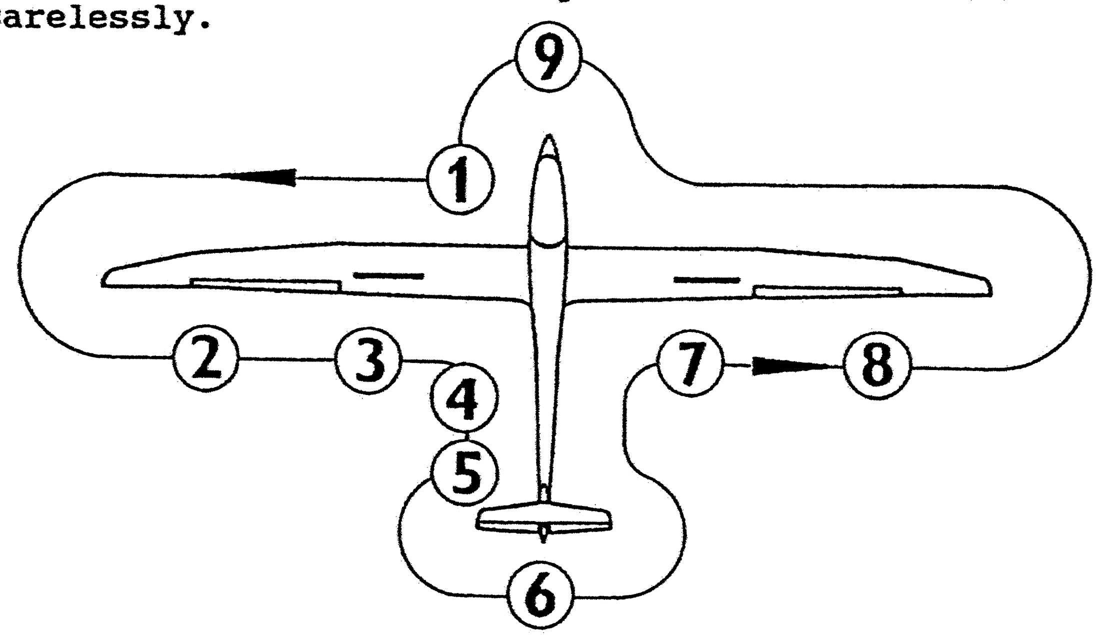
In circling flight the speed should be increased according to the bank angle. This will prevent the sailplane from being inadvertently and unnoticeably flown in a stalled condition.

If light vibration and sloppy controls are felt, the sailplane is flying in a stalled condition. The control stick should then be eased forward immediately.

4. Normal Operations

4.1. Daily Inspection

Before commencing the day's flying or after rigging the sailplane it is very important to inspect it carefully, as accidents often occur when these daily inspections are neglected or carried out carelessly.



When walking around the sailplane, check all surfaces for paint cracks, dents and unevenness. In case of doubt, ask an expert for his advice.

1. a) Open the canopy and check forward hinged instrument panel for proper function.

   b) Check that the main pin is fully home and secured.

   c) Make a visual check of all control circuits in the cockpit.

   d) Check controls for full, correct and free movements.

   e) Check for foreign objects.

(Daily Inspection, continued)

f) Check main wheel tire pressure:

Up to 360 kg (794 lb) AUW : 50 psi (3.5 bar)
GREATER THAN ~~Up to~~ 360 kg (794 lb) AUW : 64 psi (4.5 bar)

g) Check condition and operation of the tow hook(s).

2. a) Check upper and lower wing surfaces for damage.

b) Clean and grease water dump valves.

c) Check ailerons for proper condition and free movement.

Check for unusual play by gently shaking the trailing edge of the aileron.

Check hinges for damage.

3. Check airbrakes for proper condition, fit, and locking.

4. a) Check fuselage for damage, particularly the underside.

(Daily Inspection, continued)

4. b) Check that the static pressure ports below the main spar cut-out and the fuselage tail boom (0.8 m (31.5 in) forward of the leading edge of the fin) are clear.

5. a) Check condition of tail skid (or wheel, if installed,tire pressure 2.0 bar(28 psi)).

   Check that the fin tank dump hole is clear.

   b) If a Total Energy Compensation probe is used, mount it and check the line (when blowing gently into the probe, variometer should read "climb").

   c) Check that the spill holes of the fin tank are clear.

   d) Check ballast quantity in fin tank (in case of doubt dump water).

6. a) Check horizontal tailplane for correct attachment and locking.

   b) Check elevator and rudder for free movement.

   c) Check trailing edge of elevator and rudder for damage.

   d) Check elevator and rudder for unusual play by gently shaking the trailing edge.

7. See (3)

8. See (2)

(Daily Inspection, continued)

9. Check that the static pressure ports near the instrument panel and the Pitot tube in the fuselage nose are clear. When blowing gently into the Pitot tube the airspeed indicator should register.

10. By removing the connectors behind the instrument panel, water may be drained from Pitot, Static and Total Energy Compensation lines.

After heavy landings or after the sailplane has been subjected to excessive g-loads, the resonant frequency of the wing should be checked (the exact figure of this serial number is shown in the last inspection report).

Check the entire sailplane thoroughly for surface cracks and other damage. For this purpose it should be de-rigged.

If damage is found (i.e. surface cracks in the fuselage tail boom or tailplane, or if delamination is discovered at the wing roots or at the bearings in the root rib) the sailplane must be grounded until the damage has been repaired by a qualified person.

4.2 Pre-flight Inspection

Refer to cockpit placards.(See chapter 1.2, page 5)

4.3 Take-off

4.3.1 Aerotow

Maximum permitted speed on aerotow
V_T = 180 km/h (97 kt, 112 mph)

Use the C.G. hook for aerotow, or, if installed, the nose tow hook. The Discus has been aerotowed using hemp and nylon ropes of between 30 and 60 m (100 and 200 ft) length.

For take-off set trim to about one third travel from its forward position (with the C.G. in aftmost position the trim should be fully noseheavy).

As the tow rope tightens apply the wheel brake gently so that the sailplane does not overrun the tow rope.

For intermediate to forward C.G. positions the elevator should be neutral for the ground run; in the case of rear C.G. positions it is recommended during the ground run that down elevator is applied until the tail lifts.

Due to the control circuit geometry of the aileron control slightly larger control stick movements are required during the take-off run.

After lift-off, at about 75 to 95 km/h (40 - 51 kt, 47 - 59 mph) - depending on the load - the trim can be re-set for minimum elevator control loads.

(Aerotow, continued)

Normal towing speed is in the region of 100 to 120 km/h (54 - 65 kt, 62 - 75 mph) and between 120 and 140 km/h (65 - 76 kt, 75 - 87 mph) when water ballast is carried.

To keep station behind the tug only small control movements are necessary.

Correspondingly greater control movements are required when flying the sailplane into the tug's propeller slip stream; furthermore, tailplane vibration occurs and the airspeed indicator reading varies.

The undercarriage may be retracted during tow; this is not, however, recommended at low altitude, as changing hands on the control stick could easily cause the sailplane to lose station behind the tug.

When releasing the tow rope, pull the yellow grip fully several times and turn only when definitely clear of rope.

With strong crosswind and rear C.G. position apply down elevator during the ground run. For other C.G. positions the elevator during the ground run should be neutral.

For rear C.G. position trim heavy nose. For other positions the elevator trim is in the one third of the range from the forward position..

4.3.2 Winch launching

Maximum permitted winch launch speed
V_W = 150 km/h (81 kt, 93 mph)

Winch launching is permitted only when the C.G. hook is used.

The trim is normally set at a mid-point position, for rearward C.G. positions it should be set to fully nose heavy.

As the cable tightens, apply the wheel brake gently in order to prevent the sailplane overruning the winch cable.

Ground run and lift off are normal and there is no tendency to veer-off or to climb excessively steeply on leaving the ground.

Depending on the seat load the sailplane is lifted off with the control stick almost fully pushed forward in the case of aft C.G. positions and slightly pulled back with the C.G. in a forward position.

After climbing to a safe height the transition to a typical steep winch launch climbing attitude is effected by easing the control column back slightly.

At normal flying weights, without water ballast, the launch speed should not be less than 90 km/h (49 kt, 56 mph), and with water ballast not less than 100 to 110 km/h (54-59 kt, 62-68 mph).
Normal launch speed is about 100 km/h (54 kt, 62 mph), with water ballast about 115 to 125 km/h (62-68 kt, 71-77 mph).

At the top of the launch the cable will normally back release automatically; the cable release should, however, be pulled firmly several times to ensure that the cable has actually gone.

(Winch launching, continued)

Important

Winch launching at maximum permitted all-up weight of 525 kg (1157 lb) should only be performed if an appropriately strong winch and a cable in perfect condition are available.

There is not much point in using a winch launch for a soaring flight if the release height gained is less than 400 m (1300 ft).

The length of the cable should also correspond to this condition.

In case of doubt, reduce all-up weight to e.g. 400 kg (882 lb) or less.

Winch launching with water ballast is not recommended if the head wind is less than 20 km/h (5.6 m/s, 11 kt).

It is explicitly advised against winch launching with a tail wind.

4.4 Free flight

This sailpane has pleasant flight characteristics and can be flown effortlessly at all speeds, loading conditions (with or without water ballast), configurations and C.G. positions.

With a mid-point C.G. position the speed range covered by the trim is from about 70 km/h to about 220 km/h (38 to 119 kt, 43 to 137 mph).

Flying characteristics are pleasant and the controls are well harmonized.

Turn reversal from 45° to 45° is effected without any noticeable skidding.

Ailerons and ruder may be used to the limit of their travel.

Times required are shown below, figures set in parenthesis refer to 525 kg (1157 lb) A.U.W.:

Times of reversal turns

km/h	kt	mph	seconds
95	51	59	4
120	65	75	3

4.5 Low Speed Handling and Stall

In order to become familiar with the Discus we recommend exploring the low speed and stall characteristics at a safe height.

Stalls should be approached from straight flight and from turning flight (with approx. 45° bank).

Stalling from straight and level flight

The following stalling speeds are typical in straight flight:

A.U.W	333 kg		734 lb	525 kg		1157 lb
C.G. aft of datum (BE)	mm		in	mm		in
	400		15.75	260		10.24
Airbrakes	km/h	kt	mph	km/h	kt	mph
Closed (nose hook)	58 (<60)	31 (<32)	36 (<37)	83 (77)	45 (42)	52 (48)
Extended (nose hook)	63 (<60)	34 (<32)	39 (<37)	88 (77)	48 (42)	55 (48)

Figures shown in parenthesis apply for sailplanes having a nose tow hook installed which causes a large airspeed indicator error around the stalling speed.

In the nose of the C.G. being at the fully aft position stall warning occurs 3 to 5 km/h (2-3 kt, 2.3-3.5 mph) above stalling speed and is indicated by vibration in the control system. When pulling the control stick further back, vibration increases up to the point of stall and the ailerons get spongy.

With the C.G. at the fully forward position stall warning occurs just before the stalling speed is reached. The elevator and rudder control of the sailplane is normal up to the point to stall.

(Stalling from straight and level flight,ctd.)

When reaching a stalled condition with the C.G. at an aft position the sailplane may drop a wing but usualy the wings can be held level.

When the C.G. is forward, the sailplane will simply stall straight ahead with full aft stick.

Transition into a normal flight condition is performed by releasing the back pressure on the control stick and, if necessary, applying opposite rudder and aileron.

Turning flight stalls

When approaching a stall from a coordinated 45° banked turn with the control stick fully pulled back the sailplane either continues to fly in a stalled condition or it drops a wing abruptly.

With the C.G. at forward position and the control stick fully pulled back it simply stalls.
Transition into a normal flight condition is performed by appropriate use of controls.

Spins

In the case of aft C.G. position, application of full ruder when the sailplane is stalled will produce a spin.

(Spins,ctd.)

With the C.G. an aftmost position oscillations in pitch occur during a spin.

If aileron is applied in the direction of the spin the pitch attidude steepens and the rate of rotation increases.

Following the standard recovery procedure the loss of height during recovery from a spin is approximately 50 to 80 m (164 to 262 ft) measured from the point at which recovery is initiated to the point at which horizontal flight is regained.

Unfavourable (steep) attitudes on recovery might even cause a loss of height of up to 150 m (492 ft).

Recovery speed is between about 120 and 190 km/h (65 and 103 kt, 75 and 118 mph).

A safe recovery from the spin is effected by following the standart procedure:

a) apply opposite rudder, i.e. against direction of spin

b) short pause

c) ease the control column forward until rotation ceases and the airflow is restored

d) centralize rudder and pull gently out of the resulting dive.

With the C.G. at the fully forward position spins cannot be induced, but, depending on the use of controls a spiral dive may develop. The sailplane will quickly recover from this condition by normal use of opposite controls.

4.6 High Speed Flight

When flying at high speeds up to V_{NE} = 250 km (135 kt, 155 mph) the sailplane is well controlable.

Full deflection of control surfaces may only be used up to V_A = 200 km/h (108 kt, 124 mph).

At V_{NE} = 250 km/h (135 kt, 155 mph) only 1/3 controlled deflections are permitted. Avoid especially sudden elevator control movements.

In strong turbulence, i.e. in wave rotors, thunderstorms, visible whirl winds or when crossing mountain ridges, the speed in rough air V_{RA} = 200 km/h (108 kt, 124 mph) must not be exceeded.

With the C.G. in rearwand positions the control column movement from the point of stall to max. permissible speed is relatively small, though the change in speed will be noticed through a perceptible change in control column loads.

The airbrakes may be extended up to V_{NE} = 250 km/h (135 kt, 155 mph), however, they should only be used at such high speeds in emergency or when the maximum permitted airspeeds are being exceeded inadvertendly.

As the airbrakes are very effective the deceleration forces are considerable if they are extended suddenly.

Therefore it must be ensured that the harness is tight and that the control column is not inadvertently moved when the airbrakes are extended.

Avoid loose object in cockpit.

(High Speed Flight, ctd.)

It should also be noted that with the airbrakes extended the sailplane should be pulled out less abruptly than with retracted airbrakes (see section 2.5, load factors).

A dive with the airbrakes fully extended is limited to an angle to the horizon of about 30° at maximum permitted all-up weight and to about 45° without water ballast at speeds of approximately 250 km/h (135 kt, 155 mph).

4.7 Flying with water ballast

The water ballast tanks are integral compartments in the wing D nose.

The tanks are to be filled with clear water only trough a round opening with a strainer on the upper surface of the wing D nose.

The plugged-in filler caps are withdrawn by inserting the tailplane rigging screw in their 6 mm (0.24 in) female thread. The thread hole in the cap also serves for venting the tank quickly and must therefore be kept clear. In addition both tanks are also vented by a tube running from the highest point of the tank through the wing to the underside of the wing tip. The vent hole in the filler cap may therefore be taped tight when placing the tip of a full wing on the ground. Water then will stop escaping through the venting tube as soon as an air pocket has formed at the highest point of the tank at the root rib. The tape covering the filler cap hole should be removed before take-off so that the ballast tank is drained off in the shortest time.

Capacity of the wing tanks

tank	liters	U.S. Gal.	Imp. Gal.
total	184	48.6	40.5
left	97	25.6	21.3
right	87	23.0	19.2

Dumping the water ballast takes about four to five minutes from full tanks.

(Flying with water ballast,ctd.)

When filling the tanks bear in mind the weight of the pilot and ensure that the maximum permitted weight is not exceeded (see loading table, section 2.7, page 22).

Both tanks should be filled with about the same amount of water to prevent lateral imbalance. (With full wing tanks their different capacity is hardly perceptible as the excess weight is situated near the root rib).

When taking off with partly full ballast tanks ensure that the wings are held level in order to allow the water to be equally distributed so both wings are ballanced.

Because of the additional weight in the wings the wingtip runner should continue running as long as possible during the launch.

Thanks to the integral bulkheads in the ballast tanks there is no perceptible movement of the water ballast when flying with partially full tanks.

When flying at maximum permitted A.U.W. the low speed and stall behaviour of the sailplane is slightly different from the flight characteristics without water ballast. The stalling speed increases (see section 4.5), and for corrections of the flying attitude larger movements of the control surfaces are required. Also, for recovery from a stall slightly more height is necessary to regain normal flying attitude.

(Flying with water ballast,ctd.)

Water ballast is dumped through an opening on the lower wing surface near the root rib.

The dump valve mechanism is hooked-up automatically when the wings are rigged.

In the unlikely event of the tanks emptying unevenly or only one of them emptying (recognized by having to apply up to 50% opposite aileron for normal flying attitude), it is necessary to fly somewhat faster to take into account the increased weight and also to avoid stalling the sailplane.

If, despite this, the sailplane should enter a spin with a very flat angle to the horizon, then, for spin recovery according to the standard procedure, full forward stick is required and the airbrakes must be extended.

When landing, be prepared to veer of course, as the heavier wing will touch down somewhat earlier.

<u>Fin Tank</u>

The forward travel of the center of gravity, caused by water ballast in the wings, may be compensated by carrying water ballast in a fin tank, thus regaining optimum performance in circling flight.

For instructions how to use the fin tank refer to the following pages: 22a, 22b, 22c, 47a, 47b.

Water ballast in the fin tank

The water tank is an integral compartment in the fin with a capacity of 6.5 kg (6.5 liters, 1.72 U.S.Gal., 1.43 Imp.Gal.).

The fin tank is filled by connecting one end of a flexible plastic tube (outer diameter 8 mm (0.31 in)) to a water container, its other end is inserted into the filler tube (internal diameter 10 mm (0.39 in)) protruding from the gap of the rudder on top of the fin. The filler tube is accessible with the horizontal tailplane in place or removed.

Six spill holes, one for each kg (Ltr.) ballast, plus a seventh for the maximum capacity 6.5 kg (Ltr.) on top of the tank, all properly marked, are located on the right side of fin (as shown in the acompanying sketch). These holes are important as a water-gauge.

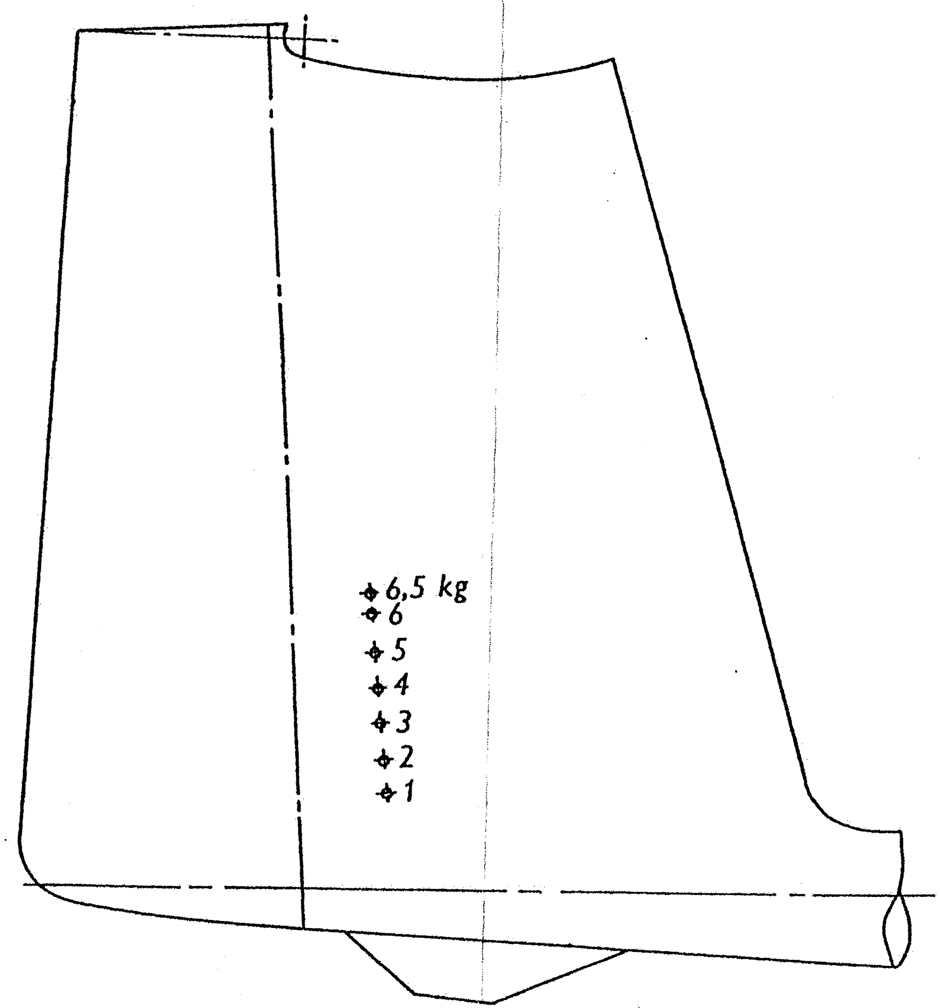
The number of spill holes to be closed with a tape before the tank is filled, depends on the weight of the ballast required to compensate for the water in the wing tanks (see chapter 2.7, page 22).

Always taped closed one hole less than the weight required, measured in kg (Ltr).

Example:

> If a ballast weight of 3 kg (Ltr.) is required, only the lower two holes are taped closed, any excessive water the escapes trough the third hole.

Venting of the fin tank is trough the uppermost 6.5 kg (Ltr.) hole and trough the filler tube.



(Water ballast in the fin tank, ctd.)

Water ballast is dumped from the fin tank through an opening on the underside of the fuselage opposite to the rudder.

The fin tank dump valve is linked to the dumping mechanism of the wing tanks such that all three tanks always open simultanously.

Dumping water ballast from a full fin tank takes about 2 to 2.5 minutes, i.e. half of time required for the wing tanks.

Dumping water ballast from the fin tank therefore is always quicker than from the wing tanks.

(Flying with water ballast, ctd.)

Important

1. On longer flights at temperatures near 0°C (32°F) water ballast must be dumped in any case when reaching a temperature of 2°C (36°F).

2. There is little point in using much water ballast if the average rate of climb expected does not exceed 1.5 m/s (295 ft/min). The same applies to flights in narrow thermals requiring high angles of bank.

3. Before an off-field landing water ballast should always be dumped.

4. On no account whatsoever must the sailplane ever be parked with full ballast tanks, because of the danger of them freezing up. Before the sailplane is parked drain off all water completely, remove the filler caps and allow the tanks to dry out.

5. Before the water tanks are filled, check with the dump valves opened that both drain plugs open, move and close simultaneously. Leaking (dripping) dump valves are avoided by cleaning and greasing the valve seats and drain plugs (with the valves open), then, with the valves closed, the drain plugs are pulled in position with the threaded tool used to attach the tailplane.

6. Never pressurize the tanks, for instance by filling directly from the water hose; water should always be poured in.

7. Before the fin tank is filled, check that those spill holes not being taped closed are clear.

4.8 Cloud Flying

Caution:

Only permitted without water ballast.

This sailplane is sufficiently robust and stable for cloud flying. It is simple to control and is stable in a turn.

Certain basic rules must be observed however.

Under no circumstances may the speed limitations be exceeded.

It is recommended that the airbrakes be extended fully if the speed builds up to 130 km/h (70 kt, 81 mph) or if more than 2g are pulled.

The additional equipment required for cloud flying is to be observed. (See chapter 2.3 b, page 17).

4.9 Flying at temperatures below freezing point

When flying in temperatures below $0^{o}C$ ($32^{o}F$), (as in long wave or during the winter months) it is possible that the usual ease and smoothness of the control circuits is reduced.

Ensure that all control elements are free from moisture so that there is no danger of them freezing solid. This applies especially to the airbrakes.

It has been found beneficial to cover the mating surfaces of the airbrakes with Vaseline along their full length so that they cannot freeze solid. Move the control surfaces occasionally.

When flying with water ballast note the instructions in section 4.7.

(Flying at temperatures below freezing point,ctd.)

Warning

The polyester coating on this sailplane is known from many years experience to become very brittle at low temperatures.

Particularly when flying in long wave at altidudes above about 6000 m (approx. 20000 ft), where temperatures of below -30°C (-22°F) may occur, the gel coat, depending on its thickness and the stressing of the aircraft's components, is prone to cracking.

Initially, cracks will only appear in the polyester coating, however, with time and changing environment, cracks can reach the epoxy/glass matrix. Cracking is obviously enhanced by steep descents from high altitudes at associated very low temperatures.

Therefore, for the preservation of a proper surface finish free from cracking, the manufacturer strongly advises against high altitude flights with associated temperatures of clearly below -20°C (-4°F).

A steep descent with the airbrakes extended should only be conducted in case of emergency.

4.10 Restricted Aerobatics

Caution:

Only permitted without water ballast.

The Discus CS is permitted to carry out the following aerobatics maneuvers:

a) Inside Loops
b) Spins
c) Stalled Turn
d) Lazy Eight

Inside Loop

Enter the maneuver at a speed of 180 km/h (97 kt, 112 mph) IAS. Speed during recovery from the maneuver: Approx. 170 km/h (92 kt, 106 mph).

Spins

Spins are only possible when the C.G. position is aft. Enter the spin from a stall by applying full rudder and with ailerons neutral. Hold the stick hard back while spinning. Recover from the spin by applying opposite rudder and easing the stick forward with the ailerons neutral. Recovery speed is about 140 km/h (76 kt, 87 mph). If spun with the C.G. at the fully aft position, the spin will continue for approximately half a turn after recovery action is initiated.

Stalled Turn

Enter the maneuver at speed of 160 km/h (86 kt, 99 mph). While climbing vertically let the wing which will be on the inside of the turn drag and then at about 140 km/h (76 kt, 87 mph) apply rudder in the direction of the dragging wing in order to prevent a distorted maneuver. Speed during recovery from the maneuver: Approx. 150 km/h (81 kt, 93 mph).

Lazy Eight

Enter the maneuver at a speed of 160 km/h (86 kt, 99 mph). After pulling up in a 45° climb enter a turn at about 120 km/h (65 kt, 75 mph). Recovery speed: Approx. 150 km/h (81 kt, 93 mph).

4.11 Approach and Landing

Normal approach speed with airbrakes fully extended and with the undercarriage lowered is 95 km/h (51 kt 59 mph) and at maximum all-up weight 115 km/h (62 kt, 71 mph). In this configuration the glide angle is approximately 1 : 5.5.

The airbrakes open smoothly - they are very effective. There is no perceptible change of trim.

Slide slipping is well controllable and can be used as an effective landing aid, with the airbrakes extended as well.

At minimum speed touch down is tail first.

The wheel brake works well.

To avoid a long landing run make sure that the sailplane touches down at minimum speed (about 70 km/h, 38 kt, 43 mph).

At a touch down speed of 90 km/h (49 kt, 56 mph) intead of 70 km/h (38 kt, 43 mph), the kinetic energy to be dissipated by braking is increased by a factor of 1.65 and therefore increases the length of the ground run considerably.

Note:
For off-field landings always extend the undercarriage.

5. Rigging and De-rigging

5.1 Rigging

The sailplane can be rigged by two persons if a wing stand is used under the wing tip.

All wing and tailplane rigging fittings should be cleaned and greased.

Wings

Unlock the airbrakes and set the water ballast jettisoning knob in the forward (closed) position. Insert the left wing.

It is important that the helper on the wing tip should concentrate on lifting the trailing edge of the wing more than leading edge, so that the rear wing attachment pin does not force the swivel bearing on the fuselage down and out of alignment.

Check that the spar stub is located correctly on the far side of the fuselage (if necessary tilt the fuselage or move the wing gently up and down to help it home).

Check that the angular levers at the root rib are properly inserted in the funnels on the fuselage.

Push in the main bolt approx. 30 mm (1.2 in) so that the wing is is prevented from sliding out by the GRFP cover over the forward wing mounting tube. The wing can now be placed on the stand.

Insert the right wing.

The procedure is the same as for the left wing.

If the wing cannot be pushed fully home:

Check whether the airbrake operating lever is slightly pulled back as otherwise the over-centering forces of the airbrake locking system will drive the wings apart by some millimeters.

Finally push the main wing pin fully home and secure it by its handle with the cowling safety pin on the fuselage side.

Operations with winglets (optional)

Insert tubular spar stub (into the end rib at the tip of the wing) with its locking pin pushed down. Push winglet fully home and check that the locking pin has snapped up.

In case that this pin is not flush with the upper wing surface, it has to be pushed up from the lower side with the aid of a pin with a diameter of 3 mm (0.12 in.).

(Rigging, ctd.)

Horizontal tailplane

Take the round-headed rigging tool (from the cockpit pocket) and screw it into the front tailplane locating pin in the leading edge of the fin.

Slide the tailplane aft onto the two elevator actuating pins. Then pull the roundheaded rigging tool and its pin forward, seat the front of the tailplane and push the pin fully home into the tailplane fitting. Remove rigging tool.

> **Note:**
> The pin must not protrude in front of the leading edge of the fin.

Check whether elevator operating pins are really located by moving the elevator.

After rigging

With the aid of a helper check controls for full and free movement in the correct sense.

Use tape to seal off the wing/fuselage joint, the wing/winglet joint (if existing), the opening for the front tailplane attachment pin and the joint between fin and horizontal stabilizer.

Sealing with tape is beneficial in terms of performance and it also serves to reduce the noise level.

5.2 De-rigging

Before the sailplane is de-rigged, remove sealing tape.

Operations with winglets (optional)

Push locking pin down using the tailplane rigging tool and pull off winglet.

Horizontal tailplane

Withdraw front attachment pin with rigging tool, lift the leading edge of the stabilizer slightly, slide tailplane forwards and off.

Wings

Unlock the airbrakes, set water ballast valve control to "closed" and remove safety pin from the main bolt handle.

With a helper on each wing tip pull out the main bolt and withdraw the right wing, gently rocking it backwards and forwards if necessary.

Then remove the left wing.

5.3 Storage, Hangaring and Transport

The sailplane should always be hangared or kept in well ventilated conditions.

If it is kept in closed trailers there must be adequate ventilation.

The sailplane must not be subjected to loads when not in use, especially in the case of high ambient temperatures.

As the wings have a thin airfoil section it is important that they are well supported:

Leading edge down, with support at the spar roots and approx. 3.3 m (10.8 ft) from the wing tip in wing cradles of correct airfoil section.

The fuselage can rest on broad cradle just forward of the C.G. hook and on its tail skid (or wheel).

The tailplane should be kept leading edge down in two cradles of correct airfoil section, about 1.0 m (3.3 ft) apart.

> On no account should the tailplane be supported by its fittings in the trailer.

In the case of sailplanes which remain rigged permanently it is important to ensure that the maintenance program includes rust prevention for the fittings of the fuselage, wings and tailplane.

Dust covers should be regarded as essential for a high-performance sailplane.

> If the sailplane is being pushed it should not be pushed at the wing tips but as near to the fuselage as possible.

5.4 Caring for the sailplane surface

For cleaning and care we recommend:

- o Water with or without washing agents with usual additives, polish and polish materials.

- o Petrol and alcohol may be used for a short time only.

  Not recommended are thinners of all kinds.

- o Never use chloride hydrogen (i.e. Tri, Tetra, Per, etc.).

- o The canopy should be cleaned with "Plexiklar", "Mirror Glaze", or with a similar plexiglass cleaner and only if necessary, with warm water. The canopy should be wiped down only with a clean soft chamois leather or a very soft material.

Never rub the canopy when it is dry.

- o This sailplane, like any other, should be protected from the wet.

  If water has found a way in, the sailplane should be stored in a dry environment and the componets turned frequently to eliminate the water.

- o The sailplane should not be exposed unnecessarily to intense sunlight or heat and should not be subjected to continual loads in a mechanical sense.

(Caring for the sailplane surface, ctd.)

All external portions of the sailplane exposed to sunlight must be painted white, except the areas for the registrations numbers and (optional) anti-collisions markings.

Colours other than white can lead to the GRFP or CRFP overheating in direct sunlight, resulting in weakening of the structure.

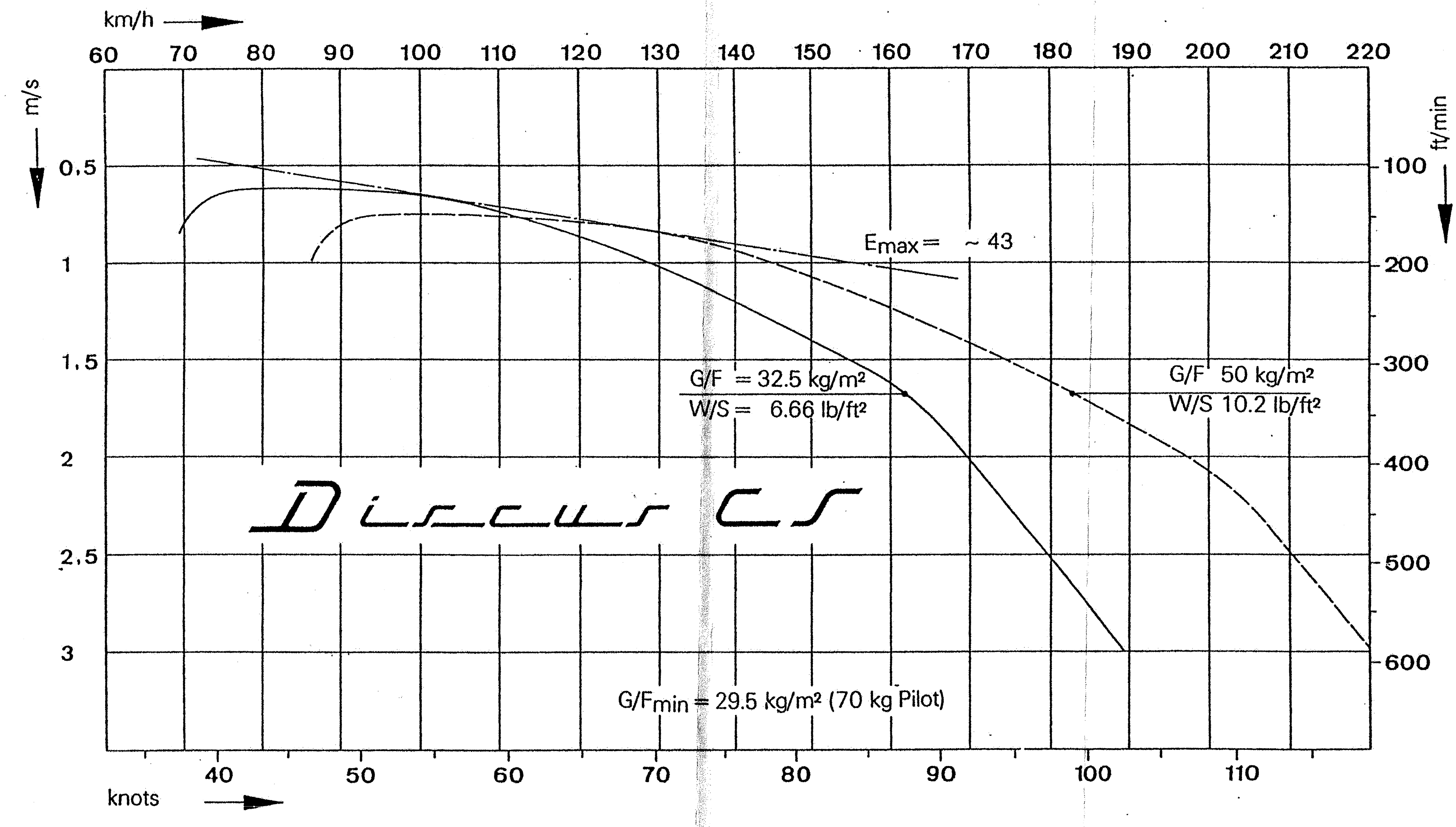
Appendix

6. Performance data

Basic Performance Data Table of Discus CS	
Wing loading	33 kg/m^2 6.76 lb/ft^2
Stalling speed	69 km/h 37 kt 43 mph
Minimum sink rate at velocity	0.61 m/s 120 ft/min 78 km/h 42 kt 48 mph
Maximum glide ratio at velocity	42.2 100 km/h 54 kt 62 mph

Flight performance data shown refer to an all-up weight of 350 kg (772 lb).

A speed polar diagram of Discus CS is shown on the next page.


km/h
60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220
m/s
0,5 1 1,5 2 2,5 3
ft/min
100 200 300 400 500 600
Emax = ~ 43
G/F = 32.5 kg/m²
W/S = 6.66 lb/ft²
G/F 50 kg/m²
W/S 10.2 lb/ft²
Discus CS
G/Fmin = 29.5 kg/m² (70 kg Pilot)
knots
40 50 60 70 80 90 100 110