

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

for

Sailplane

Model : *Duo Discus*

Serial-No. :

Registr.-No. :

Date of Issue :

FAA-approved for U.S. registered aircraft  
in accordance with FAR 21.29.

Pages as indicated by "LBA-app." are approved  
by

Signature

LUFTFAHRT BUNDESAMT

Authority

Stamp

Original date  
of approval

This sailplane is to be operated in compliance  
with information and limitations contained  
herein.

#### 1.4 Descriptive data

The "Duo Discus" is a two-seat sailplane for advanced training and cross-country flying, constructed from glass and carbon fiber reinforced plastic (GFRP/CFRP), featuring a T-tail (with fixed horiz. stabilizer and elevator).

##### Wing

The wing is four-stage trapezoid in planform, consists of two main panels with tip extension (having a swept-back leading edge) and has double-panel "Schempp-Hirth" type airbrakes on the upper surface. Ailerons are internally driven.

The integral water ballast tanks have a total capacity of approx. 198 Liter (52.3 US Gal., 43.5 IMP Gal.).

The wing shells are a glass fiber/foam-sandwich construction with spar flanges of carbon fiber rovings and shear webs made as a GFRP/foam-sandwich.

##### Fuselage

The cockpit is comfortable and features two seats in tandem. The one-piece canopy hinges sideways and opens to the right. The fuselage is constructed as a pure glass fiber non-sandwich shell and is thus highly energy absorbing. While its aft section is stiffened by GFRP/foam-sandwich bulkheads and webs, the cockpit region is reinforced by a double skin on the sides, with integrated canopy coaming frame and seat pan mounting flanges. The main wheel is retractable and features a hydraulic disc brake; nose wheel and tail wheel (or skid) are fixed.

##### Horizontal tailplane

The horiz. tailplane consists of a fixed stabilizer with elevator. The stabilizer is a GFRP/foam-sandwich construction with CFRP-reinforcements, the elevator halves are a pure CFRP/GFRP shell.

The spring trim is gradually adjustable by a lever resting against a threaded rod.

##### Vertical tail

Fin and rudder are constructed as a GFRP/foam-sandwich. On request a water ballast trim tank with a capacity of 11 Liter (2.9 US Gal., 2.4 IMP Gal.) is provided in the fin.

##### Controls

All controls are automatically hooked up when the sailplane is rigged.

SCHEMPP-HIRTH FLUGZEUGBAU GMBH, KIRCHHEIM/TECK

Duo Discus

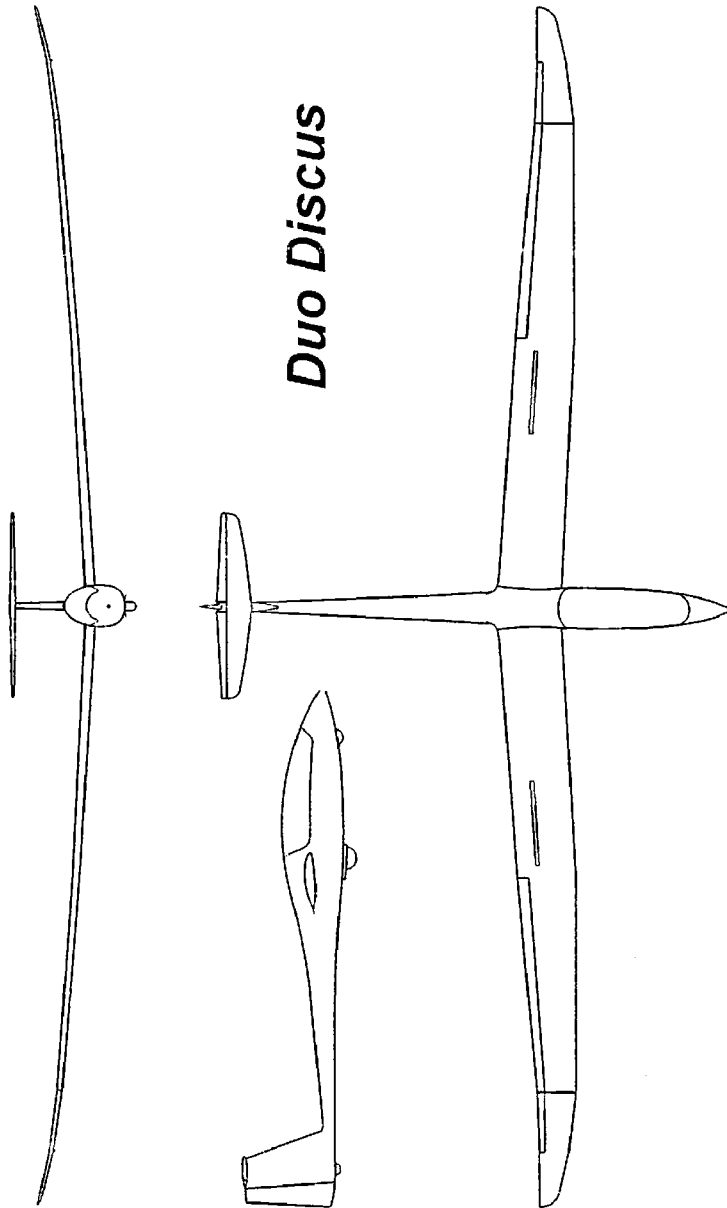
FLIGHT MANUAL

TECHNICAL DATA

|                  |                        |                      |  |
|------------------|------------------------|----------------------|--|
| <u>Wing_</u>     | Span                   | 20.00 m              | 65.62 ft   |
|                  | Area                   | 16.40 m <sup>2</sup> | 176.53 ft <sup>2</sup>                           |
|                  | Aspect ratio           |                      | 24.4   |
|                  | MAC                    | 0.875 m              | 2.87 ft  |
| <u>Fuselage_</u> | Length                 | 8.62 m               | 28.28 ft   |
|                  | Width                  | 0.71 m               | 2.33 ft  |
|                  | Height                 | 1.00 m               | 3.28 ft  |
| <u>Mass_</u>     | Empty mass<br>approx.  | 420 kg               | 926 lb   |
|                  | Maximum<br>all-up mass | 700 kg               | 1543 lb  |
|                  | Wing loading           | 29.9 -<br>6.1 -      | 42.7 kg/m <sup>2</sup><br>8.7 lb/ft <sup>2</sup> |

Duo Discus

1.5 Three-side view



2.2 Airspeed

Airspeed limitations and their operational significance are shown below:

|                 | SPEED                                | (IAS)                         | REMARKS  |
|-----------------|--------------------------------------|-------------------------------|--|
| V <sub>NE</sub> | Never exceed speed in calm air       | 250 km/h<br>135 kt<br>155 mph | Do not exceed this speed in any operation and do not use more than 1/3 of control deflection.                                      |
| V <sub>RA</sub> | Rough air speed                      | 180 km/h<br>97 kt<br>112 mph  | Do not exceed this speed except in smooth air, and then only with caution. Rough air is met in lee-wave rotors, thunderclouds etc. |
| V <sub>A</sub>  | Maneuvering speed                    | 180 km/h<br>97 kt<br>112 mph  | Do not make full or abrupt control movements above this speed as the aircraft structure might get overstressed.                    |
| V <sub>T</sub>  | Maximum speed on aerotow             | 150 km/h<br>81 kt<br>93 mph   | Do not exceed this speed during an aerotow.  |
| V <sub>W</sub>  | Maximum winch launch speed           | 150 km/h<br>81 kt<br>93 mph   | Do not exceed this speed during a winch launch.  |
| V <sub>LG</sub> | Maximum landing gear operating speed | 180 km/h<br>97 kt<br>112 mph  | Do not extend or retract landing gear above this speed.  |
|                 |                                      |                               |  |

2.3 Airspeed indicator markings

Airspeed indicator markings and their colour code significance are shown below:

| MARKING                  | VALUE OR RANGE<br>(IAS)                        | SIGNIFICANCE   |
|--------------------------|--|--|
| Green arc                | 90 - 180 km/h<br>49 - 97 kt<br>56 - 112 mph    | <u>Normal operating range</u><br>(lower limit is the speed 1.1 V <sub>S1</sub> at maximum mass and c/g in most forward position.<br>Upper limit is the max. permissible speed in rough air). |
| Yellow arc               | 180 - 250 km/h<br>97 - 135 kt<br>112 - 155 mph | Maneuvers must be conducted with caution and operating in rough air is not permitted.  |
| Red line<br>at           | 250 km/h<br>135 kt<br>155 mph                  | Maximum speed for all operations.  |
| Yellow<br>triangle<br>at | 100 km/h<br>54 kt<br>62 mph                    | Approach speed at maximum mass without water ballast.  |
|                          |  |  |

2.6 Weights (masses)

|   |                  |
|---|------------------|
| Maximum permitted take-off mass :   | 700 kg (1543 lb) |
| Maximum permitted landing mass :  | 700 kg (1543 lb) |
| Maximum permitted take-off and<br>landing mass w i t h o u t<br>water ballast : | 660 kg (1455 lb) |
| Maximum permitted mass of all<br>non-lifting parts :                            | 440 kg ( 970 lb) |
| Maximum permitted mass in<br>baggage compartment :                              | ---      ---     |

2.7 Center of gravityCenter of gravity in flight

Sailplane attitude: Tail jacked up such that a wedge-shaped block, 100 x 4.5, placed on the rear top fuselage, is horizontal along its upper edge.

Datum : Wing leading edge at root rib

Maximum forward  
c/g position : 45 mm (1.77 in.) aft of datum  
plane

Maximum rearward  
c/g position : 250 mm (9.84 in.) aft of datum  
plane

It is extremely important that the maximum rearward c/g position is not exceeded.

This requirement is met when the minimum front seat load is observed.

The minimum front seat load is given in the loading table and is shown by a placard in the cockpit.

A lower front seat load must be compensated by ballast - see section 6.2 "Weight and Balance Record / Permitted Payload Range".

2.8 Approved maneuvers

The sailplane model "Duo Discus" is certified in category

U T I L I T Y

for normal sailplanes.

WARNING:

Aerobatic maneuvers such as

- Spins
- Lazy Eights, Chandelles,  
Stall Turns, Steep Turns
- Positive Loops  
and
- Cloud Flying

are not permitted.

## 2.9 Maneuvering load factors

The following maneuvering load factors must not be exceeded when the sailplane is pulled up:

- a) With airbrakes locked and at  $V_A =$   
180 km/h, 97 kt, 112 mph

$$n = + 5.3$$

$$n = - 2.65$$

With airbrakes locked and at  $V_{NE} =$   
250 km/h, 135 kt, 155 mph

$$n = + 4.0$$

$$n = - 1.5$$

- b) With airbrakes extended, the maximum maneuvering load factor is

$$n = + 3.5 \text{ at } V_{NE}$$

2.15 Limitation placards

|  |     |     |     |
|--|-----|-----|-----|
| <b>MAXIMUM PERMITTED ALL-UP MASS: 700 kg (1543 lb)</b> |     |     |     |
| <b>MAXIMUM PERMITTED SPEEDS (IAS): km/h kt mph</b>     |     |     |     |
| Never exceed speed                                     | 250 | 135 | 155 |
| Rough air speed  | 180 | 97  | 112 |
| Maneuvering speed                                      | 180 | 97  | 112 |
| Aerotowing speed                                       | 150 | 81  | 93  |
| Winch launching speed                                  | 150 | 81  | 93  |
| Landing gear operating speed                           | 180 | 97  | 112 |

fin tank n o t installed

| LOAD ON THE SEATS<br>(crew incl. parachutes) |                   |                    |                   |                    |
|--|-------------------|--------------------|-------------------|--------------------|
| SEAT LOAD                                    | TWO PERSONS       |                    | ONE PERSON        |                    |
|  | min.              | max.               | min.              | max.               |
| front seat load                              | 70* kg<br>154* lb | 110* kg<br>243* lb | 70* kg<br>154* lb | 110* kg<br>243* lb |
| rear seat load                               | at choice         | 110* kg<br>243* lb | _____             | _____              |

Loads of less than the above minimum must be raised by using trim ballast - see instructions given in section 6.2 of the Flight Manual.

fin tank i n s t a l l e d

| LOAD ON THE SEATS<br>(crew incl. parachutes) |  |                    |  |                    |
|--|--|--------------------|--|--------------------|
| SEAT LOAD                                    | TWO PERSONS                                  |                    | ONE PERSON                                   |                    |
|  | min.   | max.               | min.   | max.               |
| front seat load                              | 100* kg<br>220* lb<br>( 70* )kg<br>(154* )lb | 110* kg<br>243* lb | 100* kg<br>220* lb<br>( 70* )kg<br>(154* )lb | 110* kg<br>243* lb |
| rear seat load                               | at choice                                    | 110* kg<br>243* lb | _____  | _____              |

Loads of less than the above minimum must be raised by using trim ballast - see instructions given in section 6.2 of the Flight Manual. The value shown in parenthesis may be used after having thoroughly checked the ballast quantity in the fin tank and the appropriate loading chart.

\* As the actual minimum or maximum load on the seats of this "Duo Discus" (to which this manual refers) may differ from these typical weights, the placards in the cockpit must always show the actual weights, which are also to be entered in the log chart - see page 6.2.3.

|   |                  |
|---|------------------|
| <b>WEAK LINK FOR TOWING</b>                             |                  |
| for Aerotow and Winch launch:<br>max. 910 daN (2005 lb) |                  |
| <b>TIRE PRESSURE</b>                                    |                  |
| Nose wheel :  | 3.0 bar (43 psi) |
| Main wheel :  | 4.0 bar (57 psi) |
| Tail wheel :  |                  |
| (if installed)  | 3.0 bar (43 psi) |

Notes

Further placards are shown in the Maintenance Manual

Section 3

- 3. Emergency procedures
- 3.1 Introduction
- 3.2 Canopy jettisoning
- 3.3 Bailing out
- 3.4 Stall recovery
- 3.5 Spin recovery
- 3.6 Spiral dive recovery
- 3.7 (reserved)
- 3.8 (reserved)
- 3.9 Other emergencies

3. Emergency procedures

3.1 Introduction

Section 3 provides check lists and simplifies procedures for coping with emergencies that may occur.

Emergency situations can be minimized by proper pre-flight inspections and maintenance.

### 3.2 Jettisoning the canopy

The canopy is to be jettisoned as follows:

Swing back one of the red locking levers - provided on the port side of the canopy frame and swing canopy sideways fully open.

The canopy will then be torn out from its hinges by the airstream and gets carried away.

### 3.3 Bailing out

With the canopy gone, the person(s) aboard may bail out.

As the canopy towing frame on the fuselage is made from laminated roving - so that it is strong and without sharp edges - the person on the front seat can grasp it and use it as a support when bailing out.

Additionally the crew member on the rear seat can raise himself by grabbing the cut-outs provided on either side of the instrument panel.

3.4 Stall recovery

On stalling whilst flying straight ahead or in a banked turn, normal flying attitude is regained by firmly easing the control stick forward and, if necessary, applying opposite rudder and aileron.

### 3.5 Spin recovery

A safe recovery from a spin is effected by the following method:

- a) Hold ailerons neutral.
- b) Apply opposite rudder (i.e. against the direction of rotation of the spin).
- c) Ease control stick forward until rotation ceases and the airflow is restored.
- d) Centralize rudder and pull gently out of dive.

With the center of gravity in rearward positions, a steady spinning motion is possible.

After having applied the standard recovery method, the sailplane will stop rotating after about  $1/4$  to  $1/2$  turn.

The loss of height - from the point at which recovery is initiated to the point at which horizontal flight is first regained - can be up to about 100 m (328 ft), and the recovery speeds are between 130 and 170 km/h (70-92 kt, 81-106 mph).

With the center of gravity in the foremost position, a steady spinning motion is not possible. The sailplane stops rotating after a half or a full turn and usually enters a spiral dive.

Recovery is by normal use of opposite controls.

Note: Spinning may be safely avoided by following the actions given in section 3.4 "Stall recovery".

### 3.6 Spiral dive recovery

Depending on the use of the controls, a spin may turn into a spiral dive, if the center of gravity is in a forward position. This is indicated by a rapid increase in speed and acceleration.

Recovery from a spiral dive is achieved by easing the control stick forward and applying opposite rudder and aileron.

**WARNING!**

When pulling out of the dive, the permissible control surface deflections at  $V_A/V_{NE}$  are to be observed!

See also page 2.2.

3.7 - INTENTIONALLY LEFT BLANK -

SCHENPP-KITZ FLUGZEUGBAU GMBH. KIRCHHEIM/TECK

Doc. Discus

FLIGHT MANUAL

3.8 - INTENTIONALLY LEFT BLANK -

3.9 Other emergenciesFlying with uneven water ballast.

If, on dumping water ballast, the wing tanks are emptying unevenly or only on one side - which is recognized at lower speeds by having to apply opposite aileron for normal flying attitude - entering a stall must be avoided.

When landing in this condition, the touch down speed must be increased by about 10 km/h (5 kt, 6 mph) and the pilot must be prepared for the airplane to veer off course as the heavier wing tends to drop somewhat sooner than normal (apply opposite aileron).

Emergency landing with retracted undercarriage

An emergency landing with the main wheel retracted is on principle not recommended, because the potential energy absorption of the landing gear is many times higher as compared to the fuselage shell.

Should the wheel fail to extend, the sailplane should be landed at a flat angle and without pancaking.

Ground loop

If there is the danger of the sailplane overshooting the boundary of the landing field in mind, a decision whether or not to initiate a controlled ground loop should be made at least about 40 m (131 ft) away from the boundary:

- If possible, always turn into the wind and
- as the wing tip is forced down, push the control stick forward simultaneously.

Emergency water landing

From experience gained on the occasion of a composite sailplane landing on water with its undercarriage retracted, the crew must take into consideration that, in the case of the "Doo Discus", the entire cockpit might get forced under water.

Therefore an emergency landing on water should only be chosen as a last resort and the main wheel should always be extended.

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Section 4

- 4. Normal operating procedures
  - 4.1 Introduction
  - 4.2 Rigging and de-rigging
  - 4.3 Daily inspection
  - 4.4 Pre-flight inspection
  - 4.5 Normal procedures and recommended speeds
    - 4.5.1 Methods of launching
    - 4.5.2 (reserved)
    - 4.5.3 Flight
    - 4.5.4 Approach
    - 4.5.5 Landing
    - 4.5.6 Flight with water ballast
    - 4.5.7 High altitude flight
    - 4.5.8 Flight in rain
    - 4.5.9 Aerobatics

4. Normal operating procedures

4.1 Introduction

Normal procedures associated with optional equipment are found in section 9.

This section provides check lists and amplifies procedures for conducting the daily and pre-flight inspection.

Furthermore this section includes normal operating procedures and recommended speeds.

4.2 Rigging and de-riggingRigging

The "Duo Discus" can be rigged by two people if a wing stand or trestle is used under one wing tip.

Prior to rigging, all pins and their corresponding bearings on fuselage, wing panels and tailplane should be cleaned and greased.

Inboard wing panels

Unlock airbrake lever and set water ballast control knob at "closed".

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

Check that the spar stub tip is located correctly in the cut-out 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 on the wing root rib are properly inserted into their corresponding funnels on the fuselage.

Push in main wing pin approx. 3 cm (1.2 in.) so that the wing panel is prevented from sliding out by the CFRP-cover of the front wing suspension tube. The panel tip can now be placed on a wing stand.

Next insert the starboard panel - the procedure is the same as for the port wing panel. As soon as the pin on the starboard spar stub has engaged in its corresponding bearing on the opposing wing panel (recognized by a sudden extension of the unlocked airbrakes), the starboard panel can be pushed fully home under some pressure. If it is difficult/impossible to push the panel fully home, remove main wing pin and draw the panels together with the aid of the rigging lever (use flat side only).

Finally push main wing pin fully home and secure its handle.

Wing tip extensions (outbd. panels)

Insert spar of wing tip extension – with locking pin pushed down and aileron deflected upwards – into the spar tunnel of the inboard wing panel.  
When fully home, the spring-loaded pin must have engaged (snapped up) in the corresponding opening on the inboard wing panel. Make sure that the coupling lap on the lower side of the inner aileron has correctly slid under the adjacent outer aileron.

If the locking pin has not snapped up, it has to be pushed up from the lower side with the aid of the tailplane rigging pin.

Horizontal tailplane

Take the round-headed rigging tool (to be stored in the side-pocket) and screw into the front tailplane locating pin on the leading edge of the fin.  
Thereafter slide the tailplane aft onto the two elevator actuating pins, pull rigging tool and its pin forwards, seat stabilizer nose and push locating pin home into the front tailplane attachment fitting.

Remove rigging tool – locating pin must not protrude in front of the leading edge of the fin.

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

After rigging

Check – with the aid of a helper – the controls for full and free movement in the correct sense.

Use tape to seal off the wing / fuselage joint and the joint between main wing panels and their tip extension.

Caution: Do not seal off the gap between the aileron on the tip extension and the aileron on the main wing panel.

Seal off the opening for the front tailplane attachment pin and also the joint between fin and horizontal stabilizer (only necessary if there is no rubber sealing on the upper end of the fin).

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

De-rigging

Remove sealing tape from fuselage-to-wing fillets and from the fin.

Horizontal tailplane

Using the threaded rigging pin, pull out front tailplane attachment pin, lift stabilizer leading edge slightly and pull tailplane forwards and off.

Wing tip extensions (outbd. panels)

Push locking pin down (using the tailplane rigging pin) and carefully pull out tip extension.

Main wing panels

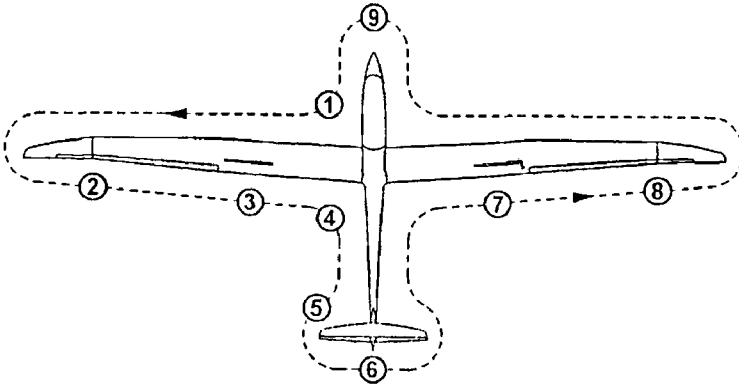
Unlock airbrakes, set water dump valve control knob to the "closed" position and unlock handle of main wing pin.

With a helper on the tip of each wing panel, pull out main wing pin up to the last 20 to 30 mm (0.8 - 1.2 in.) and withdraw the starboard panel by gently rocking it backwards and forwards if necessary.

Thereafter remove main wing pin and withdraw the port wing panel.

### 4.3 Daily inspection

The importance of inspecting the sailplane after rigging and before commencing the day's flying cannot be over-emphasized, as accidents often occur when these daily inspections are neglected or carried out carelessly.



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

- ① a) Open canopy
- b) Check that the main wing pin is properly secured
- c) Make a visual check of all accessible control circuits in the cockpit
- d) Check for full and free movements of the control elements

- e) Check for the presence of foreign objects
- f) (reserved)
- g) (reserved)
- h) Check tire pressure:
  - Nose wheel: 3.0 bar (43 psi)
  - Main wheel: 4.0 bar (57 psi)
- i) Check tow release mechanism(s) for proper condition and function

2

- a) Check upper and lower wing surface for damage
- b) Clean and grease water ballast dump valves (if necessary)
- c) Check wing tip extensions for proper connection (locking pin must be flush with upper wing surface)
- d) Check that the ailerons are in good condition and operate freely. Check for any unusual play by gently shaking the trailing edge. Check hinges for damage

3

- Check airbrakes for proper condition, fit and locking

- ④
- a) Check fuselage for damage, especially on its lower side
  - b) Check that the Static pressure ports for the ASI on the tail boom (1.02 m/3.35 ft forward of the base of the fin) and below the fuselage-to-wing fillet are clear

- ⑤
- a) Check condition of tail skid or wheel.  
If the latter is installed, check tire pressure:

3.0 bar (43 psi)

- b) Should a total energy compensation probe be used, mount it and check the line (when blowing gently into the probe, variometer(s) connected should read "climb")
- c) (reserved)
- d) Check that the Pitot pressure head is clear.  
Gently blowing into the head should produce a reading on the airspeed indicator

Should a water ballast fin tank be installed (option):

- e) Check that the fin tank spill holes are clear
- f) Check water ballast level in fin tank (in case of doubt, discharge ballast)
- g) Check that the dump hole for the fin tank in the tail wheel fairing is clear

- ⑥
  - a) Check horizontal tailplane for proper 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 any unusual play by gently shaking the trailing edge
  
- ⑦ See (3)
- ⑧ See (2)
- ⑨ Reserved

After heavy landings or after the "Duo Discus" has been subjected to excessive loads, the resonant wing vibration frequency should be checked (its value to be extracted from the last inspection report for this serial number).

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

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

4.4 Pre-flight inspection

CHECK LIST BEFORE TAKE-OFF

- Water ballast in fin tank ? (if installed)
- Loading charts checked ?
- Parachute securely fastened ?
- Safety harness secured and tight ?
- Seat back, head rest and pedals in comfortable position ?
- All controls and instruments accessible ?
- Airbrakes checked and locked ?
- All control surfaces checked with assistant for full and free movement in correct sense ?
- Elevator trim correctly set ?
- Canopy closed and locked ?

4.5 Normal operating procedures and recommended speeds4.5.1 Methods of launchingAerotow

ONLY PERMISSIBLE WITH NOSE TOW RELEASE IN PLACE

Maximum permitted towing speed;

$$V_T = 150 \text{ km/h (81 kt, 93 mph)}$$

For aerotow only the nose tow release must be used - hemp and nylon ropes of between 30 and 40 m length (98-131 ft) were tested.

Prior to take-off set elevator trim as follows;

- Rearward c/g positions : Lever forward to first third of its travel
- Other c/g positions : Lever to the middle of its travel

As the tow rope tightens, apply the wheel brake gently (by actuating the stick-mounted lever) to prevent the "Duo Discus" from overrunning the rope.

In crosswind conditions the aileron control should be held towards the downwind wing, i.e. in winds from the left the stick should be displaced to the right. This is to counteract the lift increase on the right wing generated by the tug's prop wake, which the crosswind forces to drift to the right.

For intermediate to forward c/g positions the elevator should be neutral for the ground run; in the case of rearward c/g positions it is recommended that down elevator is applied until the tail lifts.

After lift-off the elevator trim can be set for a minimum in control stick loads.

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When flown solo, the normal towing speed is in the region of 100 to 120 km/h (54-65 kt, 62-75 mph) and 120 to 140 km/h (65-76 kt, 75-87 mph) for two occupants flying with water ballast.

Only small control surface deflections are necessary to keep station behind the tug.

In gusty conditions or when flying into the propeller slip stream of a powerful tug, correspondingly greater control stick movements are required.

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

When releasing the tow rope, pull the yellow T-shaped handle fully several times and turn only when definitely clear of the rope.

4.5.3 Flight

The "Duo Discus" 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 maximum speed range covered by the elevator trim is from about 70 km/h (38 kt, 43 mph) to about 200 km/h (108 kt, 124 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 rudder may be used to the limits of their travel.

|               |                            |                             |
|---------------|----------------------------|-----------------------------|
| All-up mass   | 513 kg<br>1131 lb          | 700 kg<br>1543 lb           |
| Speed         | 99 km/h<br>53 kt<br>62 mph | 113 km/h<br>61 kt<br>70 mph |
| Reversal time | 4.6 sec                    | 4.6 sec                     |

Note:

Flights in conditions conducive to lightning strikes must be avoided.

High speed flying

At high speeds up to  $V_{NE} = 250$  km/h (135 kt, 155 mph) the "Duo Discus" is easily controllable.

Full deflections of control surfaces may only be applied up to  $V_A = 180$  km/h (97 kt, 112 mph).

At  $V_{NE} = 250$  km/h (135 kt, 155 mph) only one third (1/3) of the full deflection range is permissible. Avoid especially sudden elevator control movements.

In strong turbulence, i.e. in wave rotors, thunderclouds, visible whirlwinds or when crossing mountain ridges, the speed in rough air  $V_{RA} = 180$  km/h (97 kt, 112 mph) must not be exceeded.

With the c/g at an aft position, the control stick movement from the point of stall to maximum permissible speed is relatively small, though the change in speed will be noticed through a perceptible change in control stick 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 if the maximum permitted speeds are being exceeded inadvertently.

When extending the airbrakes suddenly, the deceleration forces are noticeable.

**WARNING:**

Consequently it is wise to check in advance that the harness is tight and that the control stick is not inadvertently thrown forwards when the airbrakes are extended. There should be no loose objects in the cockpit.

It should also be noted that in a dive with the airbrakes extended, the "Duo Discus" should be pulled out less abruptly than with retracted brakes (see section 2.9 "Maneuvering load factors").

A dive with the airbrakes fully extended is limited to an angle to the horizon of  $30^\circ$  at maximum permitted all-up mass at a speed of 250 km/h (135 kt, 155 mph).

Low speed flying and stall behaviour

In order to become familiar with the "Duo Discus" it is recommended to explore its low speed and stall characteristics at a safe height. This should be done whilst flying straight ahead and also whilst in a 45° banked turn.

Wings level stall

A stall warning usually occurs 5 to 7 km/h (3-4 kt, 3-4 mph) above stalling speed (CAS) and begins with vibration in the controls.

If the stick is pulled further back, this effect becomes more pronounced, the ailerons get spongy and the sailplane sometimes tends to slight pitching motions (speed increases again and will then drop to stalling speed).

On reaching a stalled condition - depending on the c/g position - a distinct drop of the ASI reading is observed, which then often oscillates because of turbulent air influencing the fin-mounted Pitot tube. With the c/g in rearward positions, the "Duo Discus" may slowly drop a wing, but usually it can be held level.

A normal flight attitude is regained by easing the control stick firmly forward and - if necessary - applying opposite rudder and aileron.

The loss of height from the beginning of the stall until regaining a normal level flight attitude is up to 30 m (98 ft).

In the case of forward c/g positions and stick fully pulled back, the sailplane just continues to fly in a mushed condition without the nose or a wing dropping.

Normal flying attitude is regained by easing the stick forward.

Turning flight stalls

When stalled during a coordinated  $45^\circ$  banked turn, the "Duo Discus" - with the control stick pulled fully back - just continues to fly in a stalled condition. There is no uncontrollable tendency to enter a spin. The transition into a normal flight attitude is conducted by an appropriate use of the controls.

The loss of height from the beginning of the stall until regaining a normal level flight attitude is approx. 20 to 30 m (66-98 ft).

Influence of water ballast

Apart from higher stall speeds - caused by the higher mass in flight - water ballast in the wing tanks has no aggravating influence on the stall characteristics.

With water ballast in the fin tank, stall characteristics are like those found for aft c/g positions.

#### 4.5.4 Approach

Normal approach speed with airbrakes fully extended and wheel down is 90 km/h (49 kt, 56 mph) without water ballast and flown solo, or 105 km/h (57 kt, 65 mph) at maximum permitted all-up mass.

The yellow triangle on the ASI at the 100 km/h mark (54 kt, 62 mph) is the recommended approach speed for the maximum all-up mass without water ballast (660 kg/1455 lb).

In the above configurations the L/D is approximately 6.7 : 1.

The airbrakes open smoothly and are an effective landing aid.

Side slipping is also a fine aid for landing. It is possible in a straight line with the rudder deflected up to 85 % of its travel and results in a yaw angle of about 40° and a bank angle of about 25 to 30°. The control force reversal perceptible is low.

To return to level flight, normal opposite controls are required.

#### Caution:

With rudder fully deflected, side slips in a straight flight path are not possible - the sailplane will slowly turn in the direction of the displaced rudder.

#### WARNING:

Both the performance and the aerodynamic characteristics of the "Duo Discus" are affected adversely by heavy rain or ice on the wing. Be cautious when landing!

Increase the approach speed by at least 5 to 10 km/h (3-5 kt, 3-6 mph).

#### 4.5.5 Landing

For off-field landings the undercarriage should always be extended, as the protection of the crew is much better, especially from vertical impacts on landing.

Main wheel and tail wheel should touch down simultaneously.

To avoid a long ground run, make sure that the sailplane touches down at minimum speed. A touch-down at a speed of 90 km/h (49 kt, 56 mph) instead of 70 km/h (38 kt, 43 mph) means that the kinetic energy to be dissipated by braking is increased by a factor of 1.65 and therefore the ground run is lengthened considerably.

The hydraulic main wheel disc brake is actuated via the airbrake linkage with airbrakes almost fully extended.

As the effectiveness of the wheel brake is good, the landing run is considerably shortened (the elevator control should be kept fully back).

5.2 LBA-approved data

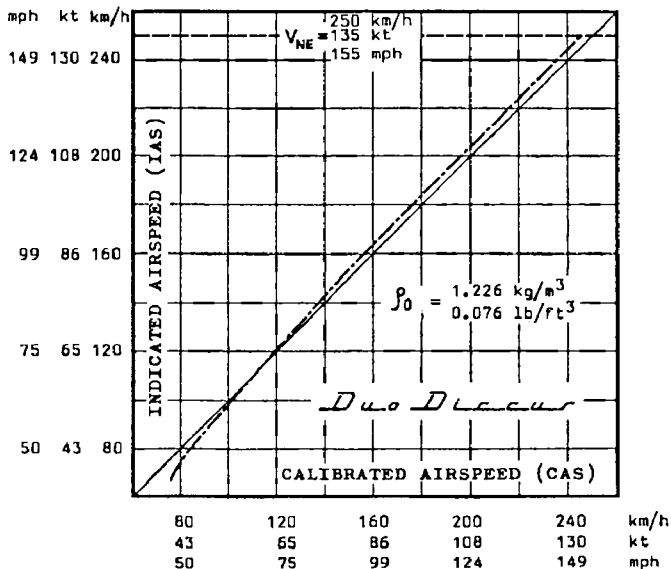
5.2.1 Airspeed indicator system calibration

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

PITOT pressure source: Fin

STATIC pressure ports: Fuselage tail boom, approx. 1.02 m (40.16 in.) forward of the base of the fin and 0.18 m (7.09 in.) below fuselage/wing fillet

All airspeeds shown in this manual are indicated airspeeds (IAS) as registered by the airspeed indicator.



5.2.2 Stall speeds

The following stall speeds (IAS) were determined in straight and level flight:

|                                  |                   |                                  |                                  |
|----------------------------------|-------------------|----------------------------------|----------------------------------|
| All-up mass approx.              | kg<br>lb          | 499<br>1100                      | 700<br>1543                      |
| C/G position aft of datum        | mm<br>in.         | 250<br>9.84                      | 45<br>1.77                       |
| Stall speed,<br>airbrakes closed | km/h<br>kt<br>mph | 35 - 45*<br>19 - 24*<br>22 - 28* | 58 - 60*<br>31 - 32*<br>36 - 37* |
| airbrakes extended               | km/h<br>kt<br>mph | 40 - 45*<br>22 - 24*<br>25 - 28* | 62 - 66*<br>33 - 36*<br>39 - 41* |

\* At minimum speed the ASI reading is heavily oscillating because of turbulent air influencing the pitot tube in the fin

The loss of height from the beginning of the stall until regaining a normal level flight attitude is up to 30 m (98 ft).

5.3.2 Flight polar

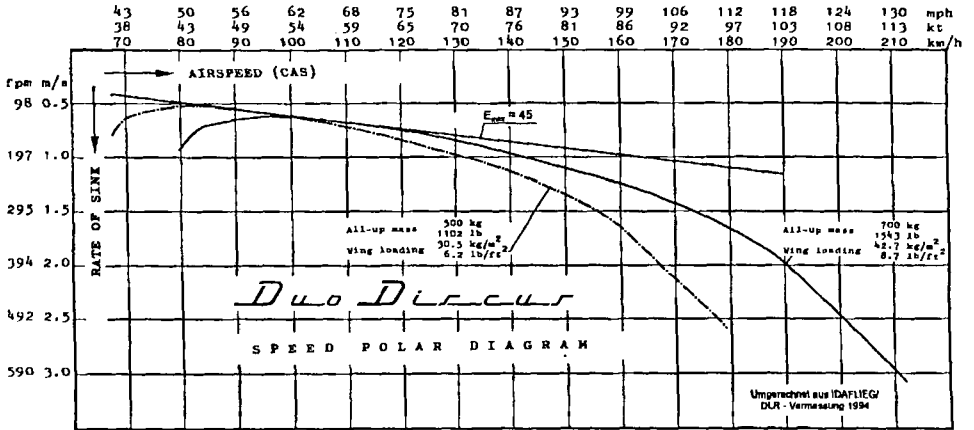
All values shown below refer to MSL

|                      |  |
|----------------------|--|
| All-up mass          | 609 kg<br>1343 lb                                |
| Wing loading         | 37.1 kg/m <sup>2</sup><br>7.6 lb/ft <sup>2</sup> |
| Minimum rate of sink | 0.58 m/s<br>114 fpm                              |
| Best L/D             | 45   |
| at a speed of        | 100 - 103 km/h<br>54 - 56 kt<br>62 - 64 mph      |

Above values are extracted from a DLR/Idaflieg measurement in 1994.

For a speed polar diagram refer to page 5.3.2.2.

Duo Discus



February 1996  
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MB 396-7 / TN 396-3

5.3.2.2

## 6.2 Weight and balance record / Permitted payload range

The following weight and balance log sheet (page 6.2.3) shows the maximum and minimum load on the seats. It is established with the aid of the last valid weighing report - the required data and diagrams are found in the "Duo Discus" Maintenance Manual.

The weight and balance log sheet is only applicable for this particular sailplane, the serial number of which is shown on the title page.

A front seat load of less than the required minimum is to be compensated by ballast - there are two methods;

1. By attaching ballast (lead or sand cushion) firmly to the lap belt mounting brackets.

### Optional trim ballast mounting provision(s)

2. a) By installing ballast (by means of lead plates) at the base of the front instrument panel (for further information refer to page 6.2.2)
- b) By attaching ballast (in addition to method 2 a) by means of lead plates to the front control stick mounting frame on the starboard side near the base of the instrument panel (for further information refer to page 6.2.2).

Altering the front seat load by trim ballastOptional trim ballast mounting provision(s)

On request the "Duo Discus" is equipped with one or two mounting provisions for trim ballast, thus allowing a reduction of the placarded minimum front seat load (when flown solo) as shown in the table below.

- a) Trim ballast mounting provision below front instrument panel:

This tray holds up to three (3) lead plates with a weight of 3.7 kg/8.2 lb each. Plates are made to fit only into this tray.

Lever arm of trim ballast plates:  
2055 mm (6.74 ft) ahead of datum

- b) Trim ballast mounting provision on front stick mounting frame on the starboard side:

This tray holds up to three (3) lead plates with a weight of 3.9 kg/8.6 lb each. Plates are made to fit only into this tray.

Lever arm of trim ballast plates:  
1855 mm (6.09 ft) ahead of datum

| WHEN FLOWN SOLO: Difference in seat load as compared with placarded front seat minimum; | Number of lead plates required; |
|---|---------------------------------|
| up to 5 kg (11 lb) less   | 1                               |
| up to 10 kg (22 lb) less  | 2                               |
| up to 15 kg (33 lb) less  | 3                               |
| up to 20 kg (44 lb) less  | 4                               |
| up to 25 kg (55 lb) less  | 5                               |
| up to 30 kg (66 lb) less  | 6                               |

**WEIGHT AND BALANCE LOG SHEET** (loading chart)  
for Ser.No.:

|  |     |     |     |     |
|--|-----|-----|-----|-----|
| Date of weighing   |     |     |     |     |
| Empty mass (kg)  |     |     |     |     |
| Equipment list dated   |     |     |     |     |
| Empty mass c/g position aft of datum (mm)                    |     |     |     |     |
| Max. useful load (kg) in fuselage incl. ballast in fin tank  |     |     |     |     |
| Load (kg) on the seats (crew including parachutes):          |     |     |     |     |
| Maximum front seat load when flown solo                      | 110 | 110 | 110 | 110 |
| with two occupants   |     |     |     |     |
| Maximum rear seat load                                       |     |     |     |     |
| Water ballast fin tank installed (YES / NO)                  |     |     |     |     |
| Minimum front seat load regardless of load on rear seat with |     |     |     |     |
| a) Fin tank NOT installed                                    |     |     |     |     |
| b) Fin tank installed *)                                     |     |     |     |     |
| Inspector<br>Signature<br>Stamp                              |     |     |     |     |

**Note:**

- \*) 1. For safety reasons the value determined by weighing with an empty fin tank has been increased by 30 kg (66 lb) so as to allow for an unnoticed filled fin tank.
2. Adding the mass of 30 kg (66 lb) is not required, however, if the pilot either dumps all water ballast (prior to take-off) or does ensure that the ballast quantity in the fin tank is compensated by an appropriate load in the wing tanks and/or on the aft seat.

For the determination of the water ballast quantity permitted in the wing tanks refer to page 6.2.5.

For the determination of the water ballast quantity permitted in the fin tank refer to page 6.2.6 through 6.2.8.

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Duo Discus

Maximum water ballast load

Maximum all-up mass including water ballast : 700 kg (1543 lb)

C/g position of water ballast in wing tanks : 65 mm (2.56 in.) aft of datum plane

Note: When determining the maximum permitted wing water ballast load, allowance must be made for water ballast in the fin tank (see page 6.2.7 and 6.2.8), i.e. this load must be added to the empty mass shown in the table below (if tank is used).

Empty mass \* = Empty mass as per page 6.2.3 + ballast in fin tank

Tank capacity of both wing tanks : 198 kg/liter (52.31 US Gal., 43.56 IMP Gal.)

Table of water ballast loads at various empty masses and seat loads:

| Empty mass *<br>kg lb | Total load on the seats (kg / lb) |               |               |               |               |               |               |              |              |              |            |            |
|-----------------------|-----------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|--------------|--------------|--------------|------------|------------|
|                       | kg lb                             | kg lb         | kg lb         | kg lb         | kg lb         | kg lb         | kg lb         | kg lb        | kg lb        | kg lb        | kg lb      | kg lb      |
| 410 904               | 198 52.3 43.5                     | 198 52.3 43.5 | 190 50.2 41.8 | 170 44.9 37.4 | 150 39.6 33.0 | 130 34.3 28.6 | 110 29.1 24.2 | 90 23.8 19.8 | 70 18.5 15.4 | 50 13.2 11.0 | 30 7.9 6.6 | 10 2.6 2.2 |
| 420 926               | 198 52.3 43.5                     | 198 52.3 43.5 | 180 47.6 39.6 | 160 42.3 35.2 | 140 37.0 30.8 | 120 31.7 26.4 | 100 26.4 22.0 | 80 21.1 17.6 | 60 15.9 13.2 | 40 10.6 8.8  | 20 5.3 4.5 | 0 0 0      |
| 430 948               | 198 52.3 43.5                     | 190 50.2 41.8 | 170 44.9 37.4 | 150 39.6 33.0 | 130 34.3 28.6 | 110 29.1 24.2 | 90 23.8 19.8  | 70 18.5 15.4 | 50 13.2 11.0 | 30 7.9 6.6   | 10 2.6 2.2 | 0 0 0      |
| 440 970               | 190 50.2 41.8                     | 180 47.6 39.6 | 160 42.3 35.2 | 140 37.0 30.8 | 120 31.7 26.4 | 100 26.4 22.0 | 80 21.1 17.6  | 60 15.9 13.2 | 40 10.6 8.8  | 20 5.3 4.5   | 0 0 0      | 0 0 0      |
| 450 992               | 180 47.6 39.6                     | 170 44.9 37.4 | 150 39.6 33.0 | 130 34.3 28.6 | 110 29.1 24.2 | 90 23.8 19.8  | 70 18.5 15.4  | 50 13.2 11.0 | 30 7.9 6.6   | 10 2.6 2.2   | 0 0 0      | 0 0 0      |

Water ballast in wing tanks

Water ballast in (optional) 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 the fin tank ( $m_{FT}$ ) to compensate for the nose-heavy moment of

- water ballast in main wing panels ( $m_{WT}$ )  
and/or
- loads on the aft seat ( $m_{P2}$ )

Compensating water ballast in main wing panels

The determination of the ballast quantity in the fin tank ( $m_{FT}$ ) is done with the aid of the diagram shown on page 6.2.8.

Compensating loads on the aft seat

Pilots wishing to fly with the center of gravity close to the aft limit, may compensate the nose-heavy moment of loads on the aft seat with the aid of the diagram shown on page 6.2.8.

**Note:** When using fin ballast to compensate for the nose-heavy moment of wing ballast and loads on the aft seat, then both values resulting from the diagrams on page 6.2.8 must be taken into account.

The maximum amount of water ballast, available for compensating the above mentioned nose-heavy moments, is 11 liter (2.91 US Gal., 2.42 IMP Gal), which is the maximum capacity of the fin tank.

WARNING:

A compensation of masses exceeding the placarded minimum front seat load is not allowed!

When determining the water ballast quantity for the fin tank, bear in mind that the maximum permitted useful load in the fuselage (see page 6.2.3 "Weight and balance log sheet") must not be exceeded - check as follows:

- $m_{P1}$  = load on front seat
- $m_{P2}$  = load on aft seat
- $m_{FT}$  = ballast in fin tank (to compensate for ballast in wing tanks)
- $m_{FT*}$  = ballast in fin tank (to compensate for loads on the aft seat)

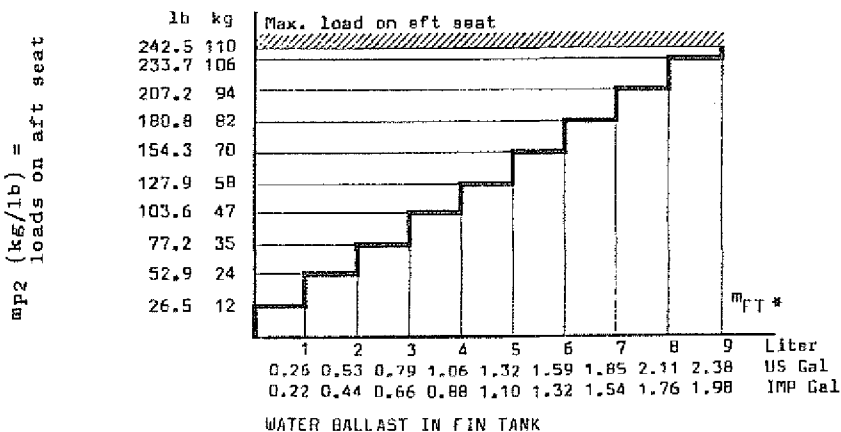
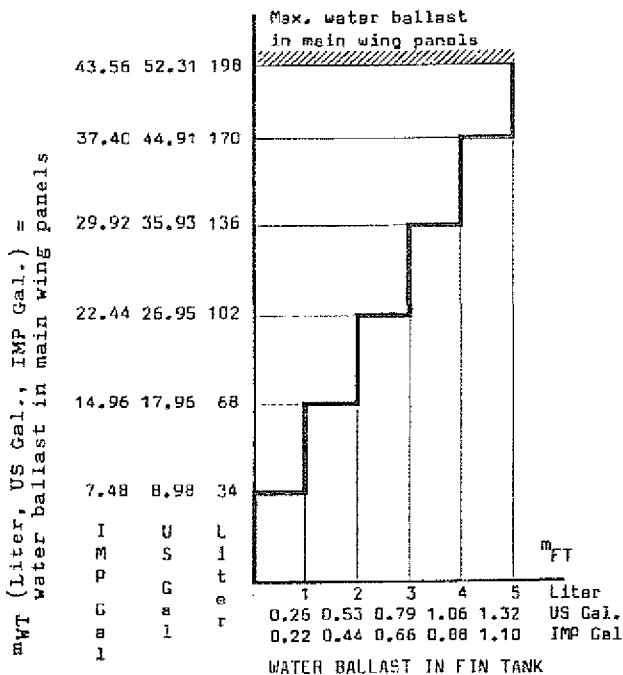
$$m_{P1} + m_{P2} + m_{FT} + m_{FT*} = \text{less or equal to maximum useful load in fuselage (see also page 6.2.3)}$$

In order to avoid that the maximum permitted all-up mass is exceeded, the ballast in the fin tank must also be taken into account when determining the maximum allowable ballast quantity for the wing tanks.

Lever arm of water ballast in fin tank ( $m_{FT}$ ):

5320 mm (17.45 ft) aft of datum plane

Fin tank capacity: 11 kg/liter (2.91 US Gal., 2.42 IMP Gal.)



Section 7

- 7. Description of the sailplane and its systems
  - 7.1 Introduction
  - 7.2 Cockpit description
  - 7.3 Instrument panels
  - 7.4 Undercarriage
  - 7.5 Seats and restraint systems
  - 7.6 Static pressure and Pitot pressure system
  - 7.7 Airbrake system
  - 7.8 Baggage compartment
  - 7.9 Water ballast system
  - 7.10 (reserved)
  - 7.11 (reserved)
  - 7.12 Electrical system
  - 7.13 Miscellaneous equipment  
(removable ballast, oxygen, ELT etc.)

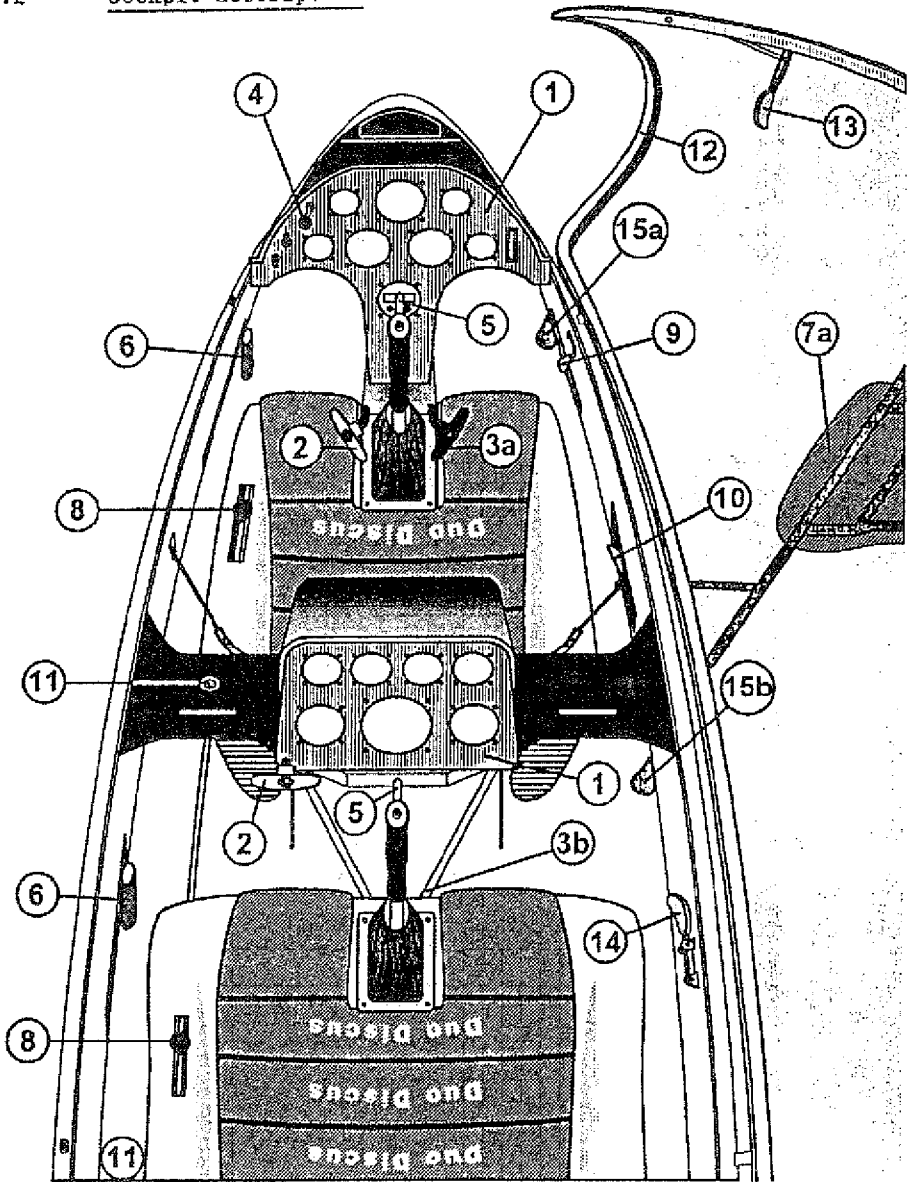
7.1 Introduction

This section provides a description of the "Duo-Discus" including the operation of its systems.

For details concerning optional systems and equipment refer to section 9 "Supplements".

For further descriptions of components and systems refer to section 1 of the "Duo Discus" Maintenance Manual.

7.2 Cockpit description



All instruments and control elements are within easy reach of the crew.

①

### Instrument panels

With canopy opened, the instruments for either seat are easily accessible.

The front instrument panel is attached to the canopy coaming frame on the fuselage and to the control stick mounting frame.

The rear panel is mounted to the steel transverse frame between the seats.

Both instrument panels and their covers are easily detached after removing the mounting bolts.

②

### Tow release handles

T-shaped handles, actuating the tow release(s) installed (c/g and/or nose hook)

Front seat : Yellow handle at the base of the control stick on the left

Rear seat : Yellow handle on the lower left hand side of the instrument panel

The winch cable/aerotow rope is released by pulling one of the handles.

3a

Rudder pedal adjustment (front seat)

Black T-shaped handle on the right near the base of the control stick.

Forward adjustment : Release locking device by pulling the handle, push pedals to desired position with the heels and let them engage.

Backward adjustment: Pull handle back until pedals have reached desired position. Forward pressure with heels (not the toes) engages pedals in nearest notch with an audible click.

An adjustment of the rudder pedals is possible on the ground and in the air.

3b

Rudder pedal adjustment (rear seat)

Locking device on pedal mounting structure on cockpit floor.

Forward or backward adjustment : Pull up locking pin by its ring, slide pedal assembly to desired forward or backward position and push locking pin down into nearest recess.

An adjustment of the rudder pedals is possible on the ground and in the air.

4

Ventilation

Small black knob on the front instrument panel on the left.

Pull to close ventilator

Push to open ventilator

Additionally the clear vision panels or the airscoop in the panels may be opened for ventilation.

5

Wheel brake

A wheel brake handle is mounted on either control stick.

Additionally the wheel brake can be actuated by extending the airbrakes fully.

6

Airbrake lever

Levers (with blue marking), projecting downwards, below the GFRP inner skin on the left.

Forward position : Airbrakes closed and locked

Pulled back about  
40 mm (1.6 in.) : Airbrakes unlocked

Pulled fully back : Airbrakes fully extended and  
wheel brake actuated

Head rests

7a

Front seat : Head rest (vertically adjustable)  
on canopy transverse frame

7b

Rear seat (not  
illustrated) : Mounting rail below upper fuselage  
skin. Head rest is gradually and horizontally adjustable;  
Depress locking tap, slide head rest in  
desired position and let locking tap engage into  
nearest recess

8

Elevator trim

Green knob (for either seat) at the seat pan mounting flange on the left.

The spring-operated elevator trim is gradually adjustable by swinging the green knob slightly inwards, sliding it to the desired position and swinging it outwards to lock.

|                   |   |            |
|-------------------|---|------------|
| Forward position  | - | nose-heavy |
| Backward position | - | tail-heavy |

9

Control knob for dumping water ballast from wing tanks and (optional) fin tank

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

|                   |   |                    |
|-------------------|---|--------------------|
| Backward position | - | dump valves closed |
| Forward position  | - | dump valves open   |

The operating knob is locked in the extreme positions by swinging it downwards into a recess.

Fin tank (optional)

The fin tank dump valve control is connected to the torque tube actuating the valves on the wing so that all three valves open and close simultaneously.

10

Seat back (front seat)

Sliding black grip on the GFRP inner skin on the right.

Adjustment : Tilt front end of grip slightly inwards, slide grip to desired position and let engage by tilting it outwards.

11

Rip cord anchorage

- Front seat : Red steel ring on tubular frame  
between the seats on the left
- Rear seat : Red steel ring at the front of  
the steel tube center frame on  
the left

12

Canopy

The one-piece plexiglass canopy hinges sideways on  
flush fittings.

Take care that the cable restraining the open canopy  
is properly hooked up.

13

Canopy locking and jettisoning levers

Lever with red grip for either seat on the canopy  
frame on the left.

Forward position : Canopy locked

To open or jettison the canopy, swing one of the  
levers back (beyond 90°) and raise canopy.

14

Canopy release

Black lever (for rear seat) on the GFRP inner skin on the right.

Note: Up to S/N 10 this lever is also provided for the front seat.

To remove the canopy, proceed as follows:

Remove pin securing the canopy release lever, swing back the latter and the locking lever, disconnect restraining cable and lift off the canopy.

Undercarriage

15a

Front seat

Retracting: Disengage black handle below the GFRP inner skin on the right, pull it back and lock in rear recess

Extending : Disengage handle, push it forward and lock in front recess

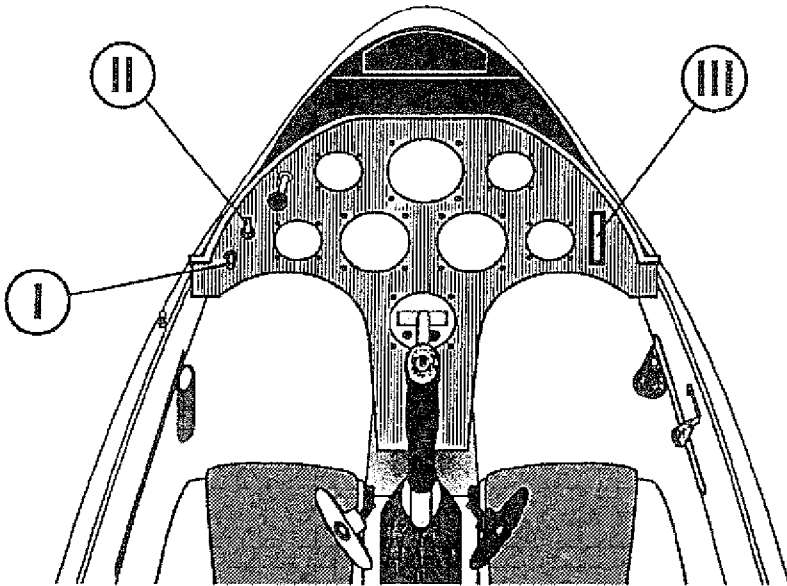
15b

Rear seat

Black handle below the GFRP inner skin on the right.

This handle is provided to assist in operating the undercarriage. It also indicates whether the wheel is up or down.

The handle cannot be used, however, to lock the u/c.

.3 Instrument panelsfront panel

For a description of components No. (I) through (III) refer to page 7.3.2.

A description of the instrumentation and an illustration of the rear instrument panel is not deemed necessary.

I

Master switch

Panel-mounted "ON/OFF" switch (for front seat).

|      |   |     |
|------|---|-----|
| UP   | = | ON  |
| DOWN | = | OFF |

II

Pneumatic valve

Inapplicable

III

Outside air temperature indicator

#### 7.4 Undercarriage

The main wheel of the "Duo Discus" is retractable and features a hydraulic disc brake. A small wheel is provided on the lower side of the forward fuselage section and protects the latter from damage. Instead of the standard rubber tail skid a non-steerable pneumatic wheel is available on request.

The extension/retraction process of the main wheel is described on page 7.2.4 ("cockpit description"), the operation of the main wheel brake is given on page 7.2.2 and 7.2.5.

For a technical description of the retractable undercarriage including its wheel brake system see also page 1.2.5 of the "Duo Discus" Maintenance Manual.

## 7.5 Seats and restraint systems

The seat pans are bolted to mounting flanges provided on either side of the cockpit.

The front seat features a back rest, adjustable in flight - see also page 7.2.5 concerning the procedure for its adjustment.

For either seat the lap straps are anchored to the seat pan.

While the shoulder straps for the front seat are anchored to the steel tube transverse frame, those for the rear seat are attached to the steel tube center frame.

A list of approved restraint systems is provided in chapter 7.1 of the "Duo Discus" Maintenance Manual.

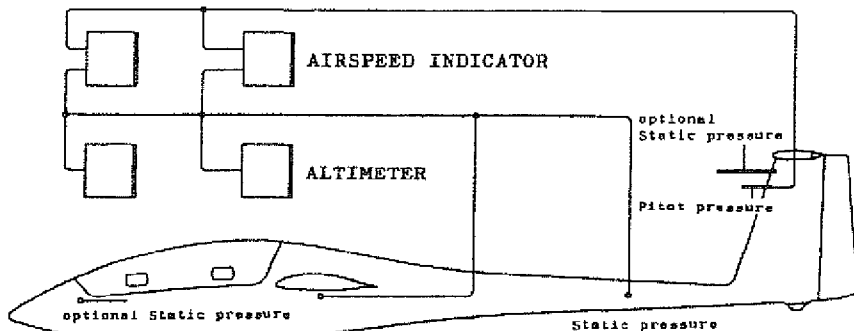
## 7.6 Static pressure and Pitot pressure system

### Static pressure sources

- a) Static pressure ports are on either side of the fuselage tail boom, 1,02 m / 40.16 in. forward of the base of the fin (in the horizontal plane) and 0.18 m / 7.09 in. below the fuselage/wing-fillet, to be used for ASI etc.
- b) On request a special static pressure probe can be installed near the top of the fin (for further instruments, except ASI).
- c) On request additional static pressure sources can be provided on either side of the fuselage skin near the front instrument panel.

### Pitot pressure source

The Pitot pressure head is situated near the upper end of the fin.



7.7 Airbrake system

Schempp-Hirth type airbrakes are employed on the upper surface of the main wing panels.

A schematic view of the airbrake system is given in the Maintenance Manual.

7.8 Baggage compartment

An enclosed baggage compartment is not provided.

Soft objects (like jackets etc.), however, may be deposited on the removable panel (covering the control linkages) behind the main spar stubs.

Such items, however, must be taken into account when determining the permissible load on the seats.

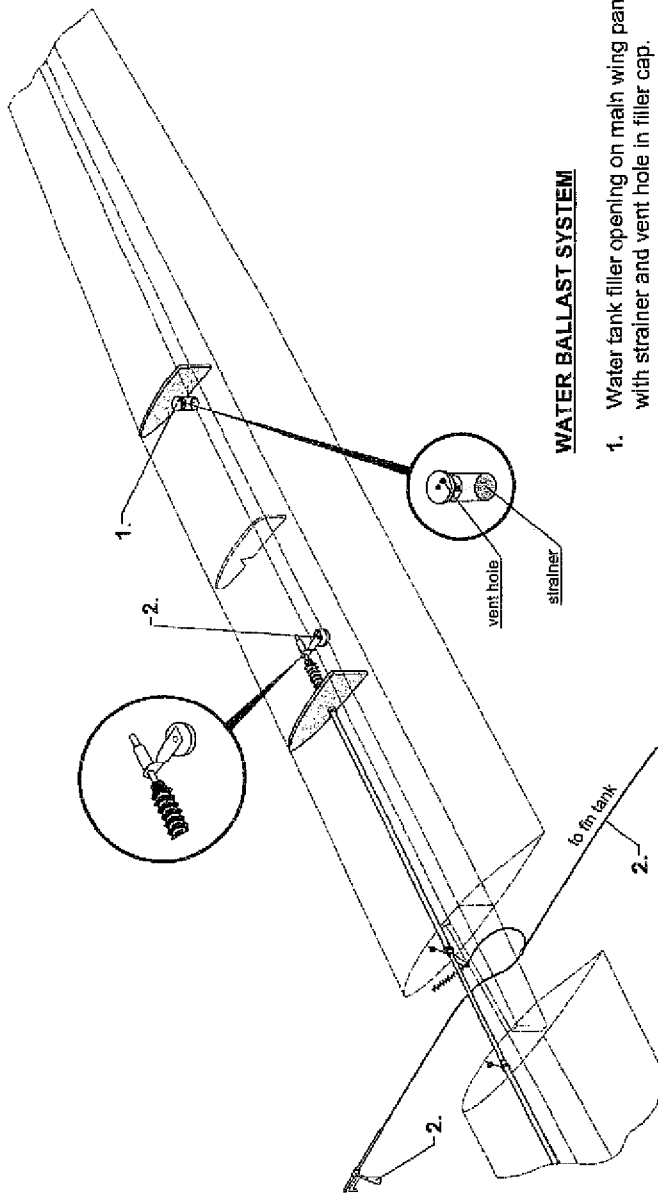
7.9 Water ballast system(s)

A steel cable connects the operating knob in the cockpit to a torque tube actuating the wing tank dump valves and - via a further steel cable - the dump valve of the (optional) fin tank - see page 7.9.3.

On rigging the main wing panels, the torque tube in the fuselage is automatically hooked up to the torsional drive of the dump valve plugs.

The torque tube is rotated to the "closed" position by spring force - see page 7.9.2.

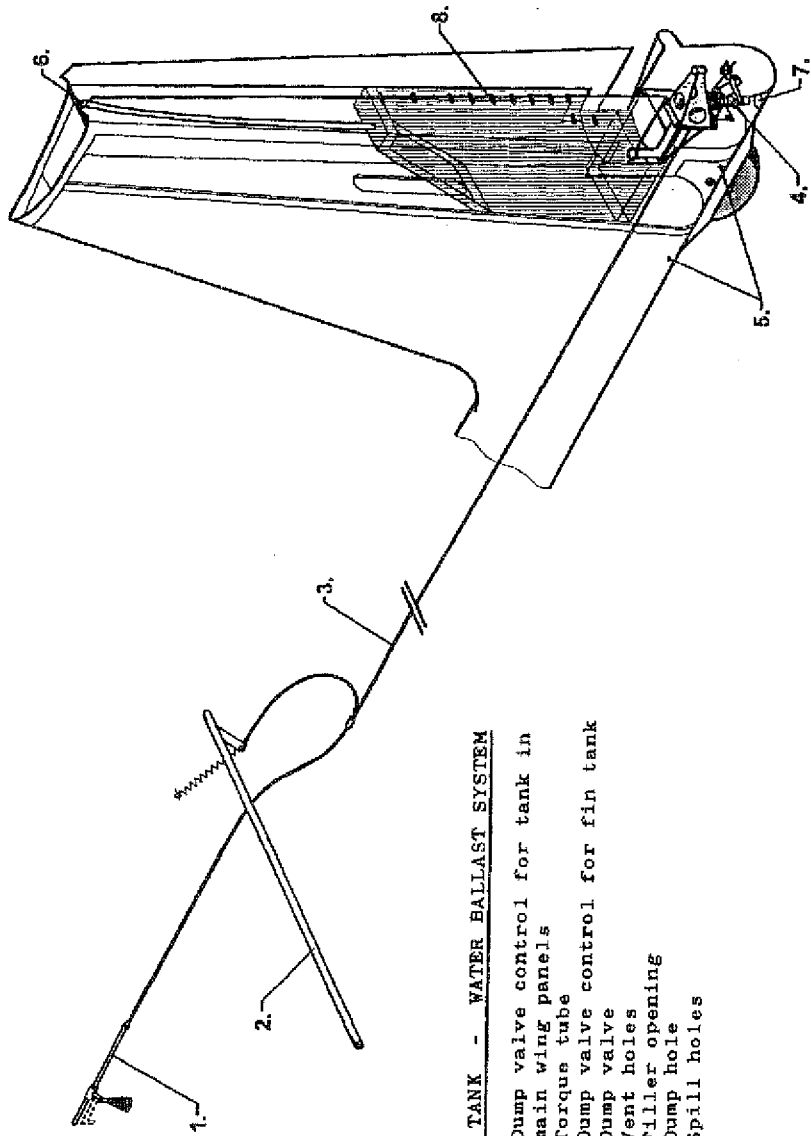
The operating knob in the cockpit is run in a gate and can be locked in its extreme positions.



### WATER BALLAST SYSTEM

1. Water tank filler opening on main wing panels with strainer and vent hole in filler cap.
2. Dump valve control for wing tanks and fin tank.

Duo Discus



FIN TANK - WATER BALLAST SYSTEM

1. Dump valve control for tank in main wing panels
2. Torque tube
3. Dump valve control for fin tank
4. Dump valve
5. Vent holes
6. Filler opening
7. Dump hole
8. Spill holes

October 1993  
Revision -

7.10 - INTENTIONALLY LEFT BLANK -

7.11 - INTENTIONALLY LEFT BLANK -

7.12 Electrical system

Gliding avionics - see wiring diagram on page 7.12.2

The wiring of the gliding avionics is shown on the next page and must comply with the manufacturer's instructions for the relevant equipment.

Power to operate the avionics is provided by one or more batteries located forward of the rear control stick mounting frame or next to the fuselage steel tube center frame.

A master switch controls the power source(s).



7.13 Miscellaneous equipmentRemovable ballast (optional)

A mounting provision for removable ballast (trim ballast weights) is provided at the base of the front instrument panel.

A second ballast mounting provision is found on the right hand side of the front stick mounting frame.

The trim ballast weights (lead plates) are to be secured in place by bolts.

For information on how to alter the minimum front seat load refer to section 6.2.

Oxygen systems

Attachment points for the mounting brackets of oxygen bottles are provided on the rear wing suspension tube (for the neck) and further aft on the horizontal GFRP-reinforcement (for the cylinder).

For the installation of oxygen systems, drawings may be obtained from the manufacturer.

Note: After oxygen systems are installed, it is necessary to re-establish the empty mass c/g position of the "Duo Discus" concerned to ensure that the center of gravity is still within the permitted range.

A list of oxygen regulators, currently approved by the Luftfahrt Bundesamt (LBA), is found in the "Duo Discus" Maintenance Manual.

ELT-installation

The installation of an Emergency Locator Transmitter is possible in the following places and must comply with the instructions provided by Schempp-Hirth:

- In the region of the rear seat  
on either seat pan mounting flange
- On top of the main wheel housing
- At the bottom of the O<sub>2</sub>-cylinder mount

Section 8

- 8. Sailplane handling, care and maintenance
  - 8.1 Introduction
  - 8.2 Sailplane inspection periods
  - 8.3 Sailplane alterations or repairs
  - 8.4 Ground handling / road transport
  - 8.5 Cleaning and care

8.1 Introduction

This section contains manufacturer's recommended procedures for proper ground handling and servicing of the sailplane.

It also identifies certain inspection and maintenance requirements which must be followed if the sailplane is to retain that "new plane" performance and dependability.

CAUTION:

It is wise to follow a planned schedule of lubrication and preventative maintenance based on climate and flying conditions encountered - see section 3.2 of the "Duo Discus" Maintenance Manual.

## 8.2 Sailplane inspection periods

For details concerning the maintenance of this sailplane refer to its Maintenance Manual.

### Airframe maintenance

Under normal operating conditions no airframe maintenance work is required between the annual surveys, except for the routine greasing of the spigots and ball bearings of the wing and tailplane attachment fittings.

Should the control system become heavy to operate, lubricate those places in the fuselage and in the wing panels where plain bearings are used (e.g. air-brake linkage).

Cleaning and greasing the wheels and the tow release(s) depends on the accumulation of dirt.

### Rudder cables

After every 200 flying hours and at every annual survey, the rudder cables are to be inspected at the point where they feed through the S-shaped guides in the pedals, especially at the point of maximum pedal adjustment.

If the rudder cables are damaged, worn or corroded, they must be replaced.

It is permissible for individual strands of the cables to be worn up to 25 %.

### 8.3 Sailplane alterations or repairs

#### Alterations

Alterations on the approved model, which might affect its airworthiness, must be reported to the responsible airworthiness authorities *p r i o r* to their accomplishment.

The authorities will then determine whether and to what extent a "supplemental type approval" is to be conducted.

In any case, the manufacturer's opinion about the alteration(s) must be obtained.

This ensures that the airworthiness does not become adversely affected and/or enables the aircraft owner/operator to demonstrate at any time that the sailplane concerned complies with an LBA-approved version.

Amendments of the LBA-approved sections of the Flight and/or Maintenance Manual must in any case be approved by the Luftfahrt Bundesamt (LBA).

#### Repairs

Before every take-off and especially after the aircraft has not been used for a while, it should be checked on the ground as shown in section 4.3.

Check for any sign of a change in the condition of the aircraft, such as cracks in the surface, holes, delamination in the CFRP/GFRP structure etc.

If there is any uncertainty whatsoever regarding the significance of damage discovered, the "Duo Discus" should always be inspected by a CFRP/GFRP expert.

There is no objection to minor damage - which does not affect the airworthiness in any way - being repaired on site.

A definition of such damage is included in the "Repair Instructions" which are found in the appendix to the "Duo Discus" Maintenance Manual.

Major repairs may only be conducted by a certified repair station having an appropriate authorization.

8.4 Ground handling / road transporta) Towing/Pushing

When towing the "Duo Discus" behind a car, a tail dolly should always be used to avoid unnecessary tailplane vibration on the fittings - especially in tight turns.

When pushing the sailplane by hand, it should not be pushed at its wing tips, but as near to the fuselage as possible.

b) Hangaring

The "Duo Discus" should always be hangared or kept in well ventilated conditions. If it is kept in a closed trailer, there must be adequate ventilation.

The water ballast tanks must always be left completely empty.

The sailplane must never be subjected to loads whilst not in use, especially in the case of high ambient temperatures.

c) Tie-down

In the case of a "Duo Discus" remaining rigged permanently, it is important that the maintenance program includes rust prevention for the fittings on fuselage, wings and tailplane.

Tie-down kits common in trade may be used to anchor the sailplane.

Dust covers should be regarded as essential for the "Duo Discus".

d) Preparing for road transport

As the wings have a thin airfoil section, it is important that they are properly supported, i.e. leading edge down, with support at the spar stubs and at the outer portion in cradles of correct airfoil section.

The fuselage can rest on a broad cradle just forward of the u/c doors and on its tail wheel/skid. The horizontal tailplane should be kept leading edge down in two cradles of correct airfoil section or placed horizontally on a padded support.

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

### 8.5 Cleaning and care

Although the surface coating of a composite sailplane is robust and resistant, always take care of a perfect surface.

For cleaning and caring the following is recommended:

- Clean the surface (especially the leading edge of the wings, horizontal stabilizer and fin) with clear water, a sponge and a chamois leather.
- Do not use too often rinsing additives common in trade.
- Polish and polishing materials may be used.
- Petrol and alcohol may be used momentarily only, thinners of all kinds are not recommended.
- Never use chlorine hydrogen (i.e. Tri, Tetra, Per etc.).
- The best polishing method is the buffing of the surface by means of an edge buffing wheel, fitted to a drilling or polishing machine.

Thereby hard wax is applied to the rotating disc and distributed crosswise over the surface.

**WARNING:**

To avoid a local overheating, the buffing wheel should be moved constantly!

- The canopy should be cleaned with a plexiglass cleaner (e.g. "Plexiklar", "Mirror Glaze" or similar) and only if necessary, with warm water.  
The canopy should be wiped down only with a soft clean chamois leather or a very soft material as used for gloves.  
Never rub the canopy when it is dry!
- The "Duo Discus" should always be protected from the wet. If water has found a way in, the components should be stored in a dry environment and turned frequently to eliminate the water.
- The "Duo Discus" should not be exposed unnecessarily to intense sunlight or heat and should not be subjected to continual loads in a mechanical sense.

**WARNING!**

All external portions of the sailplane exposed to sunlight must be painted white - with the exception of the areas for the registration and anti-collision markings.

Colours other than white can lead to the GFRP/CFRP overheating in direct sunlight, resulting in an insufficient strength.

Section 9

- 9.           Supplements
- 9.1          Introduction
- 9.2          List of inserted supplements

9.1 Introduction

This section contains the appropriate supplements necessary to safely and efficiently operate the sailplane when equipped with various optional systems and equipment not provided with the standard aircraft.

9.2 List of inserted supplements

| Date | Section | Title of inserted supplement |
|------|---------|------------------------------|
|      |         |                              |