0.1 **Record of revisions**

Any revision of the present manual, except actual weighing data, must be recorded in the following table and in case of approved sections endorsed by the responsible airworthiness authority.

The new or amended text in the revised page will be indicated by a black vertical line in the right hand margin, and the Revision No. and the date will be shown on the bottom left hand of the page.

Rev. No.	Affected pages / section	Description	Issue Date	LBA Approval Date	Inserted Date Signature
1	0.3, 0.4, 1.4, 2.8, 4.11, 6.4, 6.8	TN 348/8 Ser.no 5E155-159 +5E164 only	Jan. 96	02.04.96	
2	0.3, 4.11	ÄM 500/9/96 not for Ser.no 5E155-159 +5E164	Mar. 96	12.06.96	
3	0.3, 0.4, 4.2, 4.18, 5.6, 6.7, 7.1, 7.9, 7.10	TN 348/9	Oct. 97	26.11.97	
4	0.1, 0.3, 0.4, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 4.7, 4.16, 4.18, 6.6, 7.6	Manual revision TN 348/14	March 2000	09.05.00	
5	0.3,0.4, 4.7, 7.6, 8.2	TN 348/15	Jan. 2001	07.02.01	
6	0.4, 7.5, 7.5a	TN 348/16 Parking brake/ Piggott-hook	February 2004	25.02.04	
Rev. No.	Affected pages / section	Description	Issue Date	EASA Approval Date	Inserted Date Signature
7	0.3, 0.4, 2.6, 2.7, 3.2-3.4, 4.1, 4.7, 4.15, 7.1, 7.8	TN 348/20 manual revision	May 2008	August 1. 2008	

0.2 List of effective pages

Section	page	issued	replaced	replaced	replaced
0	0.0	July 95			
	0.1	/			
	0.2	/			
	0.3	see record of revisions			
	0.4	"			
	0.5	July 95			
1	1.1	"			
	1.2	Nov. 95			
	1.3	July 95			
	1.4	"			
	1.4	Jan. 96 (only ser.no. 5E155-159)			
	1.5	July 95			
2	App.	2.1 "			
	"	2.2 "			
	"	2.3 "	March 00		
	"	2.4 "	March 00		
	"	2.5 "	March 00		
	"	2.6 "	March 00	May 08	
	"	2.7 "	March 00	May 08	
	"	2.8 "	Jan. 96	March 00	
	"	2.9 "			
3	"	3.1 "			
	"	3.2 "	May 08		
	"	3.3 "	May 08		
	"	3.4 "	May 08		
4	"	4.1 "	May 08		
	"	4.2 "	Oct. 97		
	"	4.3 "			
	"	4.4 "			
	"	4.5 "			
	"	4.6 "			
	"	4.7 "	March 00	Jan. 01	May 08
	"	4.8 "			
	"	4.9 "			
	"	4.10 "			
	"	4.11 "			
	"	4.11 Jan. 96 (only ser.no. 5E155-159)			
	"	4.12 July 95			
	"	4.13 "			
	"	4.14 "			
	"	4.15 "	May 08		
	"	4.16 "	March 00		
	"	4.17 "			
	"	4.18 "	Oct. 97	March 00	
	"	4.19 "			
	App.	4.20 July 95			

0.2 List of effective pages (cont.)

Section	page	issued	replaced	replaced	replaced
5	App. 5.1	July 95			
	" 5.2	"			
	" 5.3	"			
	App. 5.4	"			
	5.5	"			
	5.6	"	Oct. 97		
6	6.1	"			
	6.2	"			
	6.3	"			
	6.4	"			
	6.4	Jan. 96 (only ser.no. 5E155-159)			
	6.5	July 95			
	6.6	"	March 00		
	6.7	"	Oct. 97		
	6.8	"			
	6.8	Jan. 96 (only ser.no. 5E155-159)			
	6.9	July 95			
7	7.1	"	Oct. 97	May 08	
	7.2	"			
	7.3	"			
	7.4	"			
	7.5	"	Febr. 04		
	7.5a	"	Febr. 04		
	7.6	"	March 00	Jan. 01	
	7.7	"			
	7.8	"	May 08		
	7.9	"	Oct. 97		
	7.10	"	Oct. 97		
8	8.1	"			
	8.2	"	Jan. 01		
	8.3	"			
	8.4	"			
	8.5	"			
9	9.1	July 95			

Approved manoeuvres Category Aerobatic:
(wingspans 17.2 m and 18 m, only without water ballast **in the wing tanks (and fin tank A)**)
All manoeuvres approved for category Utility and:

Inverted flight	recommended speed 140-200 km/h (76-108 kts.)	
	recommended entry speeds	
Slow roll	180-200 km/h	(97-108 kts.)
Half roll and half loop	170-180 km/h	(92-97 kts.)
Half loop and half roll	220 km/h	(119 kts.)

2.10 **Manoeuvring load factors**
The following load factors must not be exceeded:

Airworthiness category:		Utility		Aerobatic	
at manoeuvring speed	VA	+ 5.3	-2.65	+7.0	-5.0
at max. speed	VNE	+ 4.0	-1.5	+7.0	-5.0
airbrakes extended	VNE + 3.5				

2.11 **Flight crew**
a) single seated
max. load in the front seat 110 kg 242 lbs.
min. load in the front seat see placard in cockpit and weighing report page 6.5
b) two seated
max. cockpit load is 210 kg (463 lbs.) with a max. of 105 kg (231 lbs.) in the front seat or 110 kg (242 lbs.) in the front seat and 90 kg (198 lbs.) in the rear seat.
min. cockpit load in the front seat is the min. cockpit load see a) minus 40% of the load in the rear seat. This means that 10 kg (22 lbs.) in the rear seat replaces 4 kg (8.8 lbs.) missing cockpit load in the front seat.
With these loads, the C.G. range given under 2.8 will be kept in the limits if the empty weight C.G. is in its limits. see loading chart in sect. 6.
Either the front seat or the rear seat may designated as seat of the pilot in command.
If the rear seat is to be designated it must be assured that all necessary operating items and instruments are installed and that the pilot in command has sufficient training in flying safely from the rear seat.

Caution: With lower pilot weights lead ballast must be added to the seat. Ballast put on the seat (lead ballast cushion) must be fastened at the safety belt anchorage points. Installation for removable trim ballast see sect. 7.16.1.

Note: For Australia the lower limit for the min. load in the cockpit should not exceed 66 kg (146 lbs.). A provision for removable ballast see sect. 7.16.1 is mandatory.

2.12 Kinds of operation

A) **All configurations**

Flights according to VFR (daylight)
Aerotow
Winch- and auto-launching

B) **In addition when flying without waterballast**

1. Cloud flying (daylight): permitted when properly instrumented (see below).
2. Simple aerobatics see sect4.5.12. (Category Utility)
3. Aerobatics see section 4.5.12. (Category Aerobatic) if the required equipment (see below) is installed, only with 17,2 m and 18 m span.

Note: Cloud flying is not permitted in the USA, Canada and Australia.

2.13 **Minimum equipment**

As minimum equipment only the instruments and equipment specified in the equipment list (see maintenance manual) are admissible.

Note: The actual equipment list is filed in the enclosures of the maintenance manual.

a) **Normal operation**

Airspeed indicator: Range: 0-300 km/h (0-165kts.); Speed range markings see sect. 2.3
Altimeter: Altimeter with fine range pointer, 1 turn max. 1000 m (3000 ft.)
Four piece symmetrical safety harness
VHF - transceiver (ready for operation)
Battery Z07 or a ballast weight of 4,3 kg (9.5 lbs.) installed in the battery box in the fin
Parachute automatic or manual type or a suitable firm back cushion approximately 8 cm (3 in.) thick
Required placards, check lists and this Flight manual.
With optional fin waterballast tanks:
Outside air temperature gauge with probe in the fuselage nose with blue marking for temperatures below 2°C, (36°F).

b) **In addition for cloud flying**

(Not permitted in the USA, Canada and Australia)
Variometer
Turn and bank indicator
Remark: Experience has shown that the installed airspeed indicator system may be used for cloud flying.

c) **In addition for aerobatics** (Category Aerobatic)

Accelerometer capable of retaining max. and min. g-values with markings red radial lines at +7 g and -5 g.

3.1 **Introduction**

Section 3 provides a checklist and amplification for coping with emergencies that may occur. Emergency situations can be minimized by proper preflight inspections and maintenance.

Caution: Canopy jettison and bailing out should be trained several times on the ground before flying the aircraft.

3.2 **Canopy jettison**

To bail out the white-red canopy opening handle (left) has to be operated with your right hand. Open the canopy as far as possible.
If the canopy doesn't stay open (or is not blown away by the oncoming air), but is closed by the air pressure, you have to release the canopy in it's closed position by operating the red emergency release handle (right) with your left hand, then push the canopy upwards.

The retaining lines will tear off.

The gas struts (if installed) will disengage automatically

3.3 **Bailing out**

First jettison both canopies, then open the safety harness and bail out.
The low walls of the front cockpit allow for a quick push-off exit.

3.4 **Stall recovery**

Easing the stick forward and picking up a dropping wing with sufficient opposite rudder the glider can be recovered from the stall.
To recognize and prevent the stall, please refer to sect. 4.5.4.

3.5 **Spin Recovery**

Apply full opposite rudder against direction of the spin, pause.
Then ease stick forward until the rotation ceases, centralize the controls and carefully pull out of the dive.
The ailerons should be kept neutral during recovery.
Caution: To prevent unintentional spinning do not stall the sailplane. Fly with enough speed reserve especially in gusty conditions and in the landing pattern.
Intended spins with waterballast are not permitted.

Height loss during recovery	up to.	50 - 100 m	(160-330 ft)
max. speed during recovery		200 km/h	(108 kts.)

3.6 **Spiral dive recovery**

Apply rudder and aileron in opposite direction and carefully pull out of the dive.
Spiral dive occurs only when spinning more than 3 turns with medium C.G. positions, see sect. 4.5.12.

To prevent spiral dives intentional spinning should only be executed at aft C.G. positions.
Recovery from unintentional spinning should be done immediately.

3.7 **Recovery from unintentional cloud flying**

Spins are not to be used to loose altitude. In an emergency, pull out the dive brakes fully before exceeding a speed of 200 km/h and fly with max. 200 km/h (108 kts.) until leaving the cloud.
At higher speeds up to VNE, pull out the dive brakes very carefully because of high aerodynamic and g-loads.

3.8 **Flight with asymmetric waterballast**

If you suspect that the waterballast does not dump symmetrically you have to close the dump valves of the wingtanks immediately, to avoid greater asymmetry.

Asymmetry can be verified by the necessary aileron deflection in straight flight at low airspeeds.

When flying with asymmetric waterballast you have to increase the airspeed, especially in turns, so that you can avoid a stall at all costs.

If the aircraft does enter a spin, you have to push the stick forward clearly during recovery.

Fly the landing pattern and touch down aprox. 10 km/h (6 kts.) faster than usually and after touch down control carefully the bank angle to avoid the wing touching the ground too early.

3.9 **Emergency wheel up landing**

It is not recommended to execute a wheel up emergency landing, as the energy absorption capability of the fuselage is much smaller than that of the landing gear.
If the landing gear can't be extended touch down with small angle of attack.

3.10 **Emergency ground loop**

If there is the risk of overshooting the landing strip you have to decide at least 40 m (130 ft) before the end of the field to execute a controlled ground loop.
If possible turn into the wind, lift the tail by pushing the stick forward.

3.11 **Emergency landing on water**

From the experience with emergency water landing we know, that it is likely that the sailplane will dive into the water, cockpit first.

Therefore an emergency landing on water should be the last choice.
In the case of a water landing, however, extend the landing gear.

Recommended procedures:

On downwind leg of the landing pattern: Extend the landing gear, unlock the parachute harness (not the seat harness)

Touch down: With landing gear extended and airspeed as low as possible.

At point of touch-down: Use your left arm to protect your face against possible canopy fracture.

After touch down: Unfasten seat belt harnesses and undo parachute.

Leaving the cockpit under water: If the canopy has not fractured, opening the canopy may be possible only after the forward fuselage is almost completely filled with water.

Section 4

4. Normal procedures

4.1 Introduction

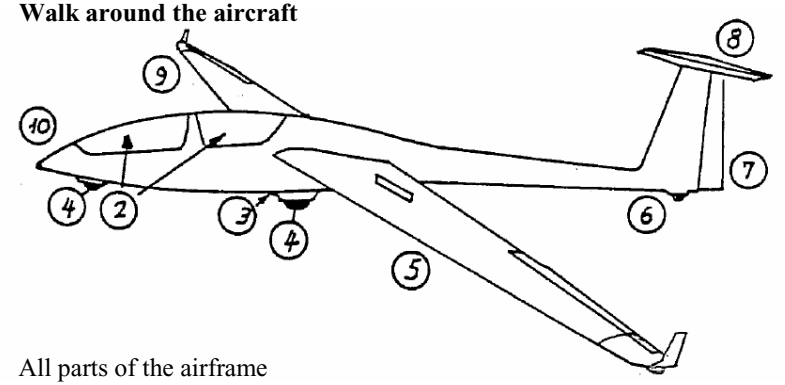
4.2 Rigging and derigging, filling the watertanks
4.2.1 Rigging
4.2.2 Filling the wing watertanks
4.2.3 Filling the fin tank A (Option)
4.2.4 Filling the fin tank B
4.2.5 Derigging

4.3 Daily Inspection

4.4 Pre-flight Inspection

4.5 Normal procedures and recommended speeds
4.5.1 Section not effective
4.5.2 Section not effective
4.5.3 Launch
4.5.4 Free flight
4.5.5 Section not effective
4.5.6 Section not effective
4.5.7 Approach and landing
4.5.8 Flight with waterballast
4.5.9 Flight at high altitude and at low temperatures
4.5.10 Flight in rain and thunderstorms
4.5.11 Cloud flying
4.5.12 Aerobatics

B Inspection after rigging
Walk around the aircraft



1. All parts of the airframe
   a) check for flaws such as bubbles, holes, bumps and cracks in the surface
   b) check leading and trailing edges of the wings and control surfaces for cracks
2. Cockpit area
   a) check the canopy locking mechanism
   b) check the canopy emergency release see sect. 7.15 (not each day, but min. every 3 month)
   c) check the main pin securing
      check the securing ropes of the headrest in the rear cockpit for wear, function and length: is it possible that the headrest interferes with the control stick?
   d) check all controls for wear and function, incl. positive control check
   e) check the tow release system for wear and function incl. cable release check
   f) check for foreign objects
   g) check the instrumentation and radio for wear and function
   h) check the radio and other electrical equipment for function. If there is no electric power it must be assumed, that the battery is not installed in the fin. **Flying is only allowed with the battery in the fin as otherwise the forward C.G. limit** may be exceeded.
   i) check the brake fluid level
3. C.G. Tow hook
   a) check the ring muzzle of the C.G. hook for wear and function
   b) check for cleanliness and corrosion
4. Main landing gear and nose wheel
   a) check the struts, the gear box, the gear doors and the tyre for wear; dirt in the struts can hinder the landing gear from locking over center the next time!

4.5.9 **Flight at high altitude and at low temperatures**

With temperatures below 0°C (32°F) for instance when wave flying or flying in winter, it is possible that the control circuits could become stiffer. Special care should be taken to ensure that there is no moisture on any section of the control circuits to minimize the possibility of freeze up. It could be advantageous to apply Vaseline along all the edges of the airbrake cover plates to minimize the possibility of freezing closed.

Apply the controls in short periods.
It is not allowed to carry waterballast.

Caution:

1. At temperatures below -20°C (-4°F) there is the risk of cracking the gelcoat.
2. Attention must be paid to the fact that at higher altitudes the true airspeed is grater than the indicated airspeed.
   The max. speed VNE is reduced. See the following table:

Altitude in Metres	0-2000	3000	4000	5000	6000
VNE IAS km/h	270	256	243	230	218

Altitude in ft.	0-6600	10000	13000	16000	20000
VNE IAS kts.	146	138	131	124	117

3. Dump the water ballast before you reach freezing altitude or descend to lower altitudes.
4. Do not fly below 0°C (32°F) when your glider is wet (e.g. after rain).

4.5.10 **Flight in rain and thunderstorms**

With light rain the stall speed and the sink rate increases slightly and the approach speed has to be increased.
Warning: Flights and especially winch launches in the vicinity of thunder storms should be avoided. Due to lightning discharge, carbon fibre structures may be destroyed.

4.5.11 **Cloud flying**

(only without waterballast and)
Take care to fly smoothly and coordinated. It is prohibited to use a spin as a method for loosing altitude in the clouds. In case of emergency, pull out the dive brakes fully before exceeding a speed of 200 km/h and dive with max. 200 km/h (108 kts) to leave the cloud.

Warning: Flying in or near thunderstorm-clouds is prohibited.

Flight manual DG-500 ELAN ORION

Section 7

7.13 Electrical system

Battery in the fin.
For C.G. reasons the battery is installed in the fin. Only the use of the factory supplied battery Z07 (12 V, min. 10 Ah, mass 4.3 kg, 9.5 lbs.) is permitted.
The battery fuse is installed at the battery, type: G fuse 250 V with indicator 5 x 25 medium slow / 4 A.
After inserting the connector plug in the fin the battery is connected to the electrical system of the glider. If you want to charge the battery inside the glider this can be done via the socket see section 7.3 item 22).
Warning: Use only automatic chargers designed to charge sealed lead acid batteries. To charge the battery to its full capacity a charger with 14.4 V max. charging voltage is necessary (normal automatic chargers charge only up to 13.8V). Such a charger is available from DG Flugzeugbau code no. Z08.
All current - carrying wiring confirms to aeronautical specifications.

7.14 Pitot and static system

see diagram 8 M.M.
Pitot probe in fuselage nose, static ports a short distance behind fuselage nose. The airspeed indicator and the altimeter are to be connected to these ports and probe. Additional holder for a TE-probe or a Multiprobe in the fin is to operate variometer and flight computer systems. To preserve the sealings inside the holder, the end of the probe should be greased with e.g. Vaseline from time to time.

7.15 Canopies

To **jettison** the canopies in flight see section 3.2.
Removing a canopy:
Open the canopy, detach the restraining cable and if installed detach the gas strut from the front canopy. Then close the canopy and operate the red canopy emergency release handle (right) and the white-red canopy opening handle (left). Lift the canopy upwards.
Reinstalling a canopy:
Open emergency release and canopy locking levers. Place the canopy in vertical direction onto the fuselage. Close the emergency release. Open the canopy and snap in the retaining cable and the gas-strut (if installed).
Checking the canopy emergency release system:

a) check with open front canopy if the gas-struts (if installed) can be disengaged from their ball fittings (from canopy and from fuselage). Grease the ball fittings.
b) check with closed canopy if the emergency release handle can be operated and if the canopy can be removed easily, resp. if the canopy will be lifted by the gas-strut. Grease the locking pins.