0.1 Record of revisions continued

Rev. No.	Affected Pages/ section	Description	Issue Date	EASA Approval Date	Inserted Date Signature
7	0.3, 0.6, 0.7, 9.1-9.12	Electrically operated main landing gear TN1000/14	Nov. 2008	28. January 2009	
8	0.6, 9.1, 9.2, 9.13	Special equipment for very small pilots TN1000/17	May 2010	20. July 2010	
9	0.2 - 06, 1.4, 2.6, 2.11, 2.12, 4.3, 4.5 - 4.7, 4.9, 4.10, 4.13, 4.14, 4.29, 6.3, 6.5, 6.6, 6.10, 6.11, 7.2, 7.9, 7.12, 7.18, 7.21, 7.23, 7.24, 9.7, 9.13	Manual revision TN1000/18	Febr. 2011	13.05.2011	

0.2 List of effective pages

Section		page	issued	replaced	replaced	replaced	replaced
0		0.0	July 2005				
		0.1	see manual amendments				
		0.2	"				
		0.3	"				
		0.4	"				
		0.5	"				
		0.6	"				
		0.7	July 2005				
1		1.1	"				
		1.2	"				
		1.3	"				
		1.4	"	Febr. 2011			
		1.5	"	Jan. 07			
		1.6	"	Jan. 07			
2	App.	2.1	July 2005				
	"	2.2	"				
	"	2.3	"				
	"	2.4	"				
	"	2.5	"	Jan. 07			
	"	2.6	"	Febr. 2011			
	"	2.7	"				
	"	2.8	"				
	"	2.9	"				
	"	2.10	"				
	"	2.11	"	Jan. 07	May 2008	Febr. 2011	
	"	2.12	"	Jan. 07	Oct. 07	Febr. 2011	
		2.13					
		2.14		Jan. 07			
		2.15		Jan. 07			
3	"	3.1	July 2005				
	"	3.2	"				
	"	3.3	"	Jan. 06			
	"	3.4	"				
	"	3.5	"				
	"	3.6	"				
	"	3.7	"				
	"	3.8	"				

0.2 List of effective pages (cont.)

Section		page	issued	replaced	replaced	replaced	replaced
4	App.	4.1	July 2005				
	"	4.2	"				
	"	4.3	"	Febr. 2011			
	"	4.4	"				
	"	4.5	"	Febr. 2011			
	"	4.6	"	Oct. 07	Febr. 2011		
	"	4.7	"	Febr. 2011			
	"	4.8	"				
	"	4.9	"	Febr. 08	Febr. 2011		
	"	4.10	"	Febr. 2011			
	"	4.11	"				
	"	4.12	"	Oct. 0707			
	"	4.13	"	Jan. 07	Oct. 07	Febr. 2011	
	"	4.14	"	Febr. 2011			
	"	4.15	"				
	"	4.16	"	Jan. 07			
	"	4.17	"	Jan. 07	Febr. 08		
	"	4.18	"	Jan. 07			
	"	4.19	"				
	"	4.20	"				
	"	4.21	"	Jan. 07			
	"	4.22	"				
	"	4.23	"				
	"	4.24	"	Jan. 07			
	"	4.25	"	Jan. 07			
	"	4.26	"				
	"	4.27	"				
	"	4.28	"				
	"	4.29	"	Febr. 2011			
5	"	5.1	July 2005				
	"	5.2	"	Febr. 2011			
	"	5.3	"	Jan. 07			
	"	5.4	"				
	App.	5.5	"	Jan. 07			
		5.6	"	Jan. 07			
		5.7	"	Jan. 07			
		5.8	"	Jan. 07			
		5.9	"				

0.2 List of effective pages (cont.)

Section	Page	issued	replaced	replaced	replaced	replaced
6	6.1	July 2005				
	6.2	"				
	6.3	"	Febr. 2011			
	6.4	"				
	6.5	"	Febr. 2011			
	6.6	"	Jan. 07	Febr. 2011		
	6.7	"				
	6.8	"	Jan. 07			
	6.9	"				
	6.10	"	Febr. 2011			
	6.11	"	Febr. 2011			
7	7.1	July 2005				
	7.2	"	Febr. 2011			
	7.3	"				
	7.4	"				
	7.5	"	Febr. 08			
	7.6	"				
	7.7	"				
	7.8	"				
	7.9	"	March 08	Febr. 2011		
	7.10	"				
	7.11	"				
	7.12	"	Febr. 2011			
	7.13	"				
	7.14	"	Oct. .06	Oct. 07		
	7.15	"	Oct. 06	Oct. 07		
	7.16	"	Oct. 07			
	7.17	"	Oct. 07			
	7.18	"	Febr. 2011			
	7.19	"				
	7.20	"				
	7.21	"	Febr. 2011			
	7.22	"				
	7.23	"				
	7.24	"	May 2008	Febr. 2011		

0.2 List of effective pages (cont.)

Section	Page	issued	replaced	replaced	replaced	replaced
8	8.1	July 2005				
	8.2	"				
	8.3	"				
	8.4	"				
	8.5	"				
	8.6	"				
9	9.1	Nov. 2008	May 2010			
	9.2	"	May 2010			
	9.3	"				
	9.4	"				
	9.5	"				
	9.6	"				
	9.7	"	Febr. 2011			
	9.8	"				
	9.9	"				
	9.10	"				
	9.11	"				
	9.12	"				
	9.13	May 2010	Febr. 2011			

1.4 Descriptive data

The DG-1000T is a self-sustainer two-place high performance motorglider with retractable powerplant for training and cross country flying and in addition for aerobatic training.

The DG-1000T is available with different wing spans:

A) Wing constructed from carbonfibre reinforced plastics with parting at y= 8,6m and wing tips for 20 m span with Winglets.
   Wing tips for 18 m span are optional.
B) Wing constructed from carbonfibre reinforced plastics with 18 m span without parting.
   Parting at y= 8,6m is optional

- Automatic hook-up s for all controls.
- Comfortable seating and modern cockpit design similar to the DG-single-seaters - safety cockpit.
- Large 2 piece canopy for very good in-flight vision.
- Draught free canopy demist and 1 adjustable swivel air vent for each pilot.
- Sealed airbrake and landing gear boxes.
- Controls in each cockpit.
- All controls are operated with the left hand, which enables the right hand to remain on the control stick.

The DG-1000T is available with 3 different versions of the undercarriage:

A) Very high spring mounted retractable main wheel with disc-brake, tail wheel.
B) High spring mounted retractable main wheel with disc-brake, tail wheel and nose wheel
C) Fixed spring mounted main wheel with disc-brake, tail wheel and nose wheel.
   The main undercarriages versions B and C are interchangeable.

Other characteristics:

Waterballast in the wings and in the fin are optional with 18m span and standard with 20m span.

Standard: A ballast-box is installed in the fin. It can be used to compensate the mass of the rear pilot and as a trim-possibility for heavy pilots.
Max. ballast capacity: 12 kg.

Option: 2 ballast boxes in the front cockpit. The trim-weights used for the trim-ballast box in the fin also fit into these ballast boxes.

Cylinderhead temperature indicator (CHT):
On right hand upper side of the DEI-NT display, indication digital with 3 digits, limitation data printed above display:
red 270°C
When exceeding this temperature a full screen warning "CHT overTemp" appears, when this warning has been confirmed (by pushing the selector knob at the right hand side of the display) the CHT display will keep blinking as long as the CHT is above the max. CHT.

Fuel quantity indicator:
On left hand upper side of the DEI-NT display, indication digital with 2 digits.
Limitation data for the non useable amount of fuel printed above the display:
red 0.5 l
When a fuel quantity of approx. 4 Litres is reached a full screen warning "Low Fuel" appears, when this warning has been confirmed (by pushing the selector knob at the right hand side of the display) "R" is displayed and blinking.

2.6 Fuel

Fuel capacity:
Fuselage tank:

total:	22 l	(5.81 US gal.)
Non useable amount of fuel:	0.5 l	(0.15 US gal.)
Useable amount of fuel:	21,5 l	(5.68 US gal)

Approved fuel grades:

Car super gasoline min. 95 octane (ROZ) (RON) leaded or unleaded
or: AVGAS 100 LL (only if super gasoline is not available)
or: mix 50% AVGAS 100 LL and 50% Car super gasoline unleaded min. 92 octane (ROZ) (RON)

mixed with self mixing Super quality two stroke oil - specification TSC 3 or API TC or JASO FC or higher quality. Mixing ratio 1:50.

Note: The SOLO company recommends the following oil types: CASTROL Actevo 2T or CASTROL Super Two stroke.

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 Range: 0 – min. 10.000 m,
Altimeter with fine range pointer, 1 turn max. 1000 m (3000 ft.)
Magnetic compass (compensated in the aircraft)
Four piece symmetrical safety harness
VHF - transceiver (ready for operation)
Engine speed indicator, Fuel quantity indicator, Cylinder head temperature indicator, Engine elapsed time indicator (counts as long as the engine is running):
These 4 indicators are incorporated in the DEI-NT. Markings and display of the limitations see sect.2.5
Outside air temperature gauge: with probe in the fuselage nose, also incorporated in the DEI-NT.
Rear view mirror
Safety bow 10L35/1 in the fin battery box if no battery is installed. (description see section 4.2.5).
Parachute automatic or manual type or a suitable firm back cushion approximately 8 cm (3 in.) thick for the front seat and 3 – 8 cm (1 – 3 in.) thick for the rear seat
Required placards, check lists
Flight and maintenance manual.

b) **In addition for cloud flying**
(Not permitted in Canada and Australia)
Variometer
Turn and bank indicator

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.

Note: Experience has shown that the installed airspeed indicator system may be used for cloud flying.

2.14 Aerotow, winch and autotow launching

2.14.1 Weak links in towing cables

	Winch launching	aerotow
max.	11000 N (2425 lbs.)	11000 N (2425 lbs.)
recommended	10000 N ± 1000 N (2200 lbs. ± 220 lbs.)	10000 N ± 1000 N (2200 lbs. ± 220 lbs.) for tow behind aeroplanes 6000 N ± 600 N (1323 lbs. ± 132 lbs.) for tow behind slow tow planes eg. Ultralight planes or touring motorgliders

2.14.2 Towing cables (for aerotow only)

Length: 40-70 m (130 - 230 ft)
Material: hemp- or plastic fibres

2.14.3 Max. towing speeds

		maximum	maximum
Aerotow	V_T =	185km/h	100 kts.
Winch- and autotow	V_W =	150 km/h	81 kts.

2.14.4 Tow Release

The C.G. tow release (installed in front of the main wheel) is suitable only for winch- and auto launching..
The nose hook is to be used only for aerotow.

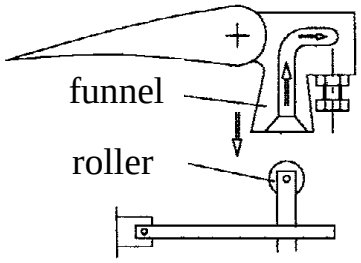
2.15 Crosswinds

The demonstrated crosswind velocity is 15 km/h (8 kts.) according to the airworthiness requirements.

4. Rigging of the stabilizer
   Battery box in the fin: Check if the securing wire 10L35 (made from piano wire) is installed. If a battery is to be installed refer to section 4.2.5, connect the battery.
   Cautiong: Rigging of the horizontal tailplane is only permitted with **nose down** trim-setting. Therefore operate the trim release lever and push the control stick forward, then release the lever to engage the trim (don't operate the trim control knob, the trim should not be pushed to the most nose down position).

   Screw the tool W 38/2 into the securing plate (near the top of the left surface of the fin). Pull out the securing plate with the tool, move it downwards to engage in the rigging position. Set the stabilizer on, so that the roller at the fuselage side push rod is inserted into the funnel at the elevator.

   Watch carefully the procedure!

   When the stabilizer is set down and laying on the fin, push it aft. The roller will engage and slide forward in the funnel if you hold the elevator in the pertinent position.

   Release the securing device by pulling out with the tool and engage the securing device by lifting the tool. The securing plate must be flush with the surface of the fin. Screw out the tool.

   Check for correct elevator connection by looking from the rear into the gap at the right hand side of the rudder.

5. Rigging of the outboard wing panels (20m wing extensions or 18 m wing tips): Insert the wing tip extensions into the wing. Press in the locking pin with your finger.
   Insert the wing tip until the aileron connector starts to slide onto the aileron. Strike firmly with the palm of your hand on to the wing tip to lock in the wing tip extension.

6. Tape the gaps of the wing-fuselage junctions and the wing joints.

7. Execute a positive control check, one helper to hold firmly the control surfaces is needed.

4.2.3 Filling the fin ballast tank

This tank must be filled after filling the wingtanks. Determine the amount (see section 6.8.6). Connect the transparent funnel equipped filling hose (supplied with the aircraft) via the hose connector GRS 10-12 to the hose which comes out of the left rear end of the fuselage.
The funnel can be suspended from the top of the rudder.
Fill with clean water using a graduated measuring vessel.
In addition you may check the content level by holding the filling hose against the scale on the fin.
After filling, push the fin tank dump lever in a forward direction (the dump valve will be closed by a spring).
Then remove the filling hose with the hose connector.

4.2.4 Ballast box in the fin

To fill the ballast box remove the Plexiglas cover plate by inserting a 6mm pin into the hole of the upper locking device and move the locking pin downwards. Determine the amount of trim-weights according to section 6.8.7. Slide the weights into the rails of the box. The heavy weights with 2,4 kg (5.3 lbs.) each must be installed in the lower 4 sections and the lighter weights with 1,2 kg (2.65 lbs.) each in the upper 2 sections. It doesn't matter in which sections the weights are installed (in case that not all sections will be filled up), but it is not allowed to insert the light weights into the sections for the heavy weights. Close the compartment.
Caution: When changing trim ballast, check condition and correct gluing of the foam rubber rings 10L45/2 in the ballast box in the fin. Without these rings a correct indication is not possible.
Replace damaged rings according to Service Info 67-07, attached to the MM.

Warning: Check that the locking device has engaged completely.
Tape the cover of the fin ballast box with tape min. 19mm (3/4 in.) wide prior to each flight.
A control light in the front instrument panel starts blinking after each transaction with the weights. By counting the amount of blinks, the amount of ballast can be determined. For a heavy weight 2 blinks appear and 1 blink for a light weight, this means 10 blinks if the box is filled up completely. After a pause of 2-3 seconds the blinking will be repeated etc. The blinking can be stopped by pressing on the control light. Pressing again on the control light reactivates the blinking feature.
After filling the ballast box you should check the correct indication of the control light.
A switch will be operated by the locking pin of the ballast box cover when the pin locks correctly. As long as the switch is not closed, the control light for the ballast box will blink with doubled speed without interruption. The blinking can't be switched off by pressing on the control light contrary to the blinking which indicates the amount of ballast.

Installation of a battery in the fin
A battery in the fin may be installed optionally.
To accomplish the installation the locking bow (part 10L35 made from piano wire) must be removed. The locking bow prevents the installation of a battery and serves as indicator if a battery is installed, as its ends are visible from the outside.
After removing the battery reinstall the locking bow.
Warning: The fin battery raises the min. cockpit load see section 6.8.4.
Only the use of the factory supplied battery Z110 (mass 5.5 kg, 12.1 lbs.) is permitted. Don't put any other objects in the battery box.

Refuelling
Fuel is transferred via a permanently installed refuelling pump from a can where the correct amount of oil is added and mixed prior to filling.
Oil: Use only super two stroke oil according to section 2.6
Switch on the main switch of the aircraft and extend the engine.
Couple the fuel filler hose to the fuselage side coupling (in left hand front side of the engine compartment).
Start the pump by pressing the push button located next to the coupling. As soon as the fuselage tank is full a built in device automatically switches off the pump.
If you want to interrupt or to stop the filling procedure before the tank is full press again the push button.
Starting the pumping again is possible by pressing the push button again.
Warning: Make sure to fill in clean fuel without any water.

4.2.5 Derigging

Derigging follows the reverse of rigging.
Waterballast must be dumped first.
Lock the airbrakes.
For disassembling the securing pins of the wings the tool W 38/2 must be screwed into the thread completely.
The brass part of the tool will then disengage the securing of this bolt.
It is recommended to leave the securing pin in the right wing while you derig the left wing.

Derigging of the outboard wing panels (20m wing extensions or 18 m wing tips):
Use a 6 mm diameter pin for pressing in the locking pin on the wing's upper surface. Pull out the wing tip or the wing tip extension.

4.3 Daily Inspection

Please bear in mind the importance of the inspection after rigging the glider and respectively each day prior to the first take off. It is for your safety.

Caution: After a heavy landing or if other high loads have been imposed on your motorglider, you must execute a complete inspection referring to maintenance manual sect. 2.3 prior to the next take off. If you detect any damage, don't operate your aircraft before the damage is repaired. If the maintenance and repair manuals don't give adequate information, please contact the manufacturer.

A Inspection prior to rigging:

1. Wing roots and spar ends:-
   a) check for cracks, delamination etc.;
   b) check the bushes and their glued connection in root ribs and the spar ends for wear;
   c) check the control hook-ups at the rootrib for wear and corrosion;
   d) check the strings which hold the waterbags for sufficient tension (see maintenance manual sect. 4.1)
2. Fuselage at wing connection:-
   a) check the lift pins for wear and corrosion;
   b) check the control hook-up s including the water dump system for wear and corrosion.
3. Top of the vertical fin:-
   a) check the mounting points of the horizontal tailplane and the elevator control hook-up for wear and corrosion
4. Check if the securing wire see section 4.2.5 is installed or if a fin battery (Option) is installed and connected
5. Horizontal tailplane:-
   check the mounting points and the elevator control hook-up for wear and corrosion;
6. Rigging points for the outboard wing panels:-
   check the lift pins and bushes for wear and corrosion and check their glued connections. Check the locking device for function and sufficient spring force.

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 (if fitted):-
   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 centre the next time!;
      With TN1000/13 executed, standard from ser. no. 10-133 on:
      Check all parts of the landing gear positive locking device (notch and latch at the landing gear struts) for dirt. Check the Bowden cable for damage.
   b) check the tyre pressure;
      main wheel: 2.5 bar - 36 psi
      nose wheel: 2.5 bar - 36 psi
   c) check wheel brake and hose for wear and function;
5. Left wing:-
   a) check locking of the outboard wing;
   b) check the aileron for excessive free play;
   c) check airbrake- and box and control rod for wear and free play. It must be possible to retract the airbrake, even if it is pressed backwards in direction of flight. If there is any water in the airbrake box this has to be removed;
   d) check the locking of the rear wing attachment pin.
6. Powerplant and brake fluid level:-
   a) all screwed connections and their securing
   b) function of throttle, and propeller brake
   c) ignition system incl. wires and the spark plug connectors for tight fit
   d) Check drive belt for wear and correct tension, sudden loss of tension indicates damage of the engine assembly
   e) engine retaining cable and its connections in the engine compartment and at the engine
   f) fuel lines, electrical wires, bowden cables and structural parts for wear and kinks.
   g) exhaust muffler, propeller mount, cooling air guides, mechanical fuel pump and accessories for tight fit and any cracking.
   h) apply strong pressure to the propellermount in forward, backward and sideward directions to check if the bolted connection between the engine block and the propeller mount or any thing else is loose or damaged. Check the rubber engine mounts also.
   i) visual check of the propeller
   j) turn the propeller 1 revolution by hand and listen for abnormal sounds which may indicate engine damage
   l) drain condensed water from the fuel tank. The drainer is located in the main wheel box on the rear wall on the right hand side.

m) check the outlet of the fuel tank ventline for cleanliness, the outlet is located behind the landing gear box.
n) check if the propeller-stopper will be pressed forward by its gas-strut, the powerplant must be in the position propeller-stopper extended for this check.
o) check the brake fluid level, the reservoir is installed in the front of the engine compartment;

7. Tail wheel:-
   a) check for wear, free play and excessive dirt in the wheel box. Remove excessive dirt prior to take off;
   b) check tyre pressure: 4 bar -58 psi;
8. Rear end of the fuselage:-
   a) check the lower rudder hinge and the connection of the rudder cables for wear, free play and correct securing;
   b) check the bulkhead and fin trailing edge shear web for cracks and delamination;
9. Fin - horizontal tail:-
   a) check the upper rudder hinge for wear and free play;
   b) check the elevator for free play and correct control hook-up , look from the rear into the gap at the right hand side of the rudder;
   c) check the securing of the stabilizer;
   d) check the horizontal tail for free play;
   e) check the TE or Multiprobe for correct insertion and fix it with tape
   f) check the trim-weight box, correct number of weights, locking device completely engaged?

Caution: When changing the trim ballast check condition and correct gluing of the foam rubber rings to the mounting plate of the optical sensors in the trim-weight box. Without rings an indication error of the control lamp in the front instrument panel might occur. Replace missing rings according to Service Info 67-07(attached to the maintenance manual).

   g) check if a fin battery is installed: If the ends of the locking bow are visible on both sides in the fairings at the upper end of the fin this is the indication that no battery is installed.

10. Right wing see item 5.
11. Fuselage nose
    a) check the ports for the static pressure and the pitot pressure and for the PC pressure (at the lower fuselage side) for cleanliness.
    b) if the motorglider was parked in rain, you have to empty the static ports by sucking out the water at the ports.
    c) check the nose hook for cleanliness and corrosion.

3. The DG-1000T pilot should keep his left hand at the throttle handle to enable him to close the throttle immediately in case the tow-plane terminates the tow (This is a standard procedure for powered aircraft pilots).
4. In case of termination of the tow when the DG-1000T is still on the ground close the throttle immediately, then release the towing cable and apply the wheel brake.
5. In case of termination of the tow when the DG-1000T is already in the air take the hand from the throttle, release the towing cable and continue the climb with full throttle. This is still applicable in case the tow plane remains on the ground.
6. If the tow is so fast that the DG-1000T engine may overspeed reduce the throttle as necessary. For a fast cross country tow the powerplant must be retracted.

4.5.1.2 Winch launch

Winch launch is only allowed using the C.G. tow hook!
Set the trim to neutral for winch launch.
Caution: During ground roll and initial take-off (especially when flying solo) push the control stick to a forward position to prevent excessive nose-up pitching rotation during initial take-off.

After reaching safety altitude gradually pull back on the stick, so that the glider will not pick up excessive speed. Don't pull too hard.
After reaching release altitude pull the tow release knob.

Recommended winch launch airspeed 110-130 km/h (60-70 kts.).
Caution: Do not fly at less than 90 km/h (49kts.) or not more than 150 km/h (81 kts.).
Warning: Winch launch with high take-off weight requires a powerful winch!

4.5.2 Free flight

Stalling characteristics (level and turning flight)
When stalled the DG-1000T will warn by buffeting. If the stick is pulled further the DG-1000T will drop one wing.
Only at forward C.G. positions the DG-1000T can be flown in stall without wing dropping, maintain control during stalled flight only with the rudder, holding the ailerons neutral.
With stick forward and opposite rudder if required, the DG-1000T can be recovered without much loss of height. Rain does not influence this behaviour noticeably. The loss of height is approx. 50 m (160 ft).
Stall airspeeds see section 5.2.2.
Caution: Flights in conditions conducive to lightning strikes must be avoided.

4.5.3 Cruise engine on

4.5.3.1 General

The engine of the DG-1000T is not designed for continuous cruise with the engine. Due to the drag of the extended powerplant and as the propeller is designed for optimum climb performance, cruise with higher speed is not efficient.
The optimum cruise is with the so called sawtooth technique. After climb with Vy retract the engine and glide with airspeed according to the Mc Cready theory, flying slowly in lift and faster in sinking air.
The medium cruise speed achieved by sawtooth technique is not much less than for level engine on cruise, but the range will be 1.5 times longer.
Performance data see sect. 5.3.5.

4.5.4 Powerplant extension-retraction in flight

4.5.4.1 Extension and starting the engine in flight

1. With the engine extended but not running the rate of sink at 90 km/h (49 kts) increases to 1.5 m/sec. (300 ft/min.).
   Therefore restarting the engine should only be done over landable terrain and not below 400 m (1320 ft) above ground. But it is better to restart the engine at 200 m (660 ft) over a landable field rather than at 400 m (1320 ft) over a forest or unlandable scrub.
   Should a flight be conducted over a wide expanse of unlandable terrain, the engine should then be restarted at 1000 m (3300 ft) above ground level so that if the engine does not start, all the emergency starting procedures can be followed unhurriedly including retraction of the engine if necessary.
2. In a normal restarting situation the loss of altitude from starting the extension procedure until the engine is running is only about 20 m (70 ft).
3. Extension: Fly at 80-90 km/h (43-49 kts). Check if the primer switch is in the “auto” position and if the fuel cock is open.
   Throttle on idle, switch on the ignition. The engine will extend by itself. You may press the starter button before the engine is extended completely. The starter motor will start the engine as soon as the powerplant is extended.
   When the engine fires, release the starter button and move the throttle slowly to full throttle.
   In case of starting problems see sect. 4.5.4.3.

Warning: If after starting the engine the failure message "Starter Run" will be displayed, the starter motor didn’t disengage and produces electric power, stop the engine immediately to prevent damage of the electrical system.

4.6 Flight with the engine removed from the aircraft

The DG-1000T can be flown without the engine when the engine is sent for a major overhaul, or removed to decrease the aircraft empty weight for competition flying or for aerobatics.
The following items must be executed: (see sect. 4.10.6 in the maintenance manual).

1. Remove the powerplant incl. the engine extension-retraction mechanism.
2. In addition to the on-board battery install a battery in the fin see section. 7.17.6.

1 kg = 2.2046 lbs 0.305 m = 1 ft

	mass	C.G. behind datum	moment
mass reduction	kg	m	kgm
engine with propeller	-39,65	1,253	-49,68
			0,00
additional mass			0,00
battery in the fin	5,5	5,340	30,71
total difference	-33,90	(0,560)	-18,97

3. Secure the limit switch for engine retracted (in the rear of the engine compartment) with a Ty-rap in the activated position. Otherwise the DEI-NT will remain in the power flight mode and the goose neck microphones won't be activated.
4. Tape the engine doors carefully with fabric tape.
5. Carry out a C.G. calculation according to section 6.9. The inflight C.G. will be moved forward by approx. 8 mm (0.3 in.) depending on the flightmass and empty mass C.G.

Note: After switching on the main switch some failure messages will be displayed. Confirm each message by pressing the selector switch to eliminate the message.

6.5 Mass of all non-lifting parts (WNLP)

The max. mass of all non-lifting parts is 554 kg (1221 lbs.).

WNLP is to be determined as follows:
WNLP = WNLP empty + cockpit load (pilots, parachute, baggage, trim ballast, fuel, waterballast in the fin, removable items of equipment etc.).
WNLP empty = Total empty weight incl. permanently installed equipment minus weight of the wings.

6.6 Max. mass (weight)

Category A „Aerobatic“

Maximum take-off and landing mass:	630 kg	1389 lbs.

Category „Utility”
with waterballast:

Maximum take and landing off mass:	750 kg	1653 lbs.

without waterballast: Maximum take-off and landing mass = $W_{NLP} + W_{wings}$

W_{NLP} = Maximum mass of all non lifting parts (see above)
W_{wings} = actual mass of the wings

6.7 Useful loads

Max. load **without** waterballast
= max. mass without waterballast - empty masst

Max. load **with** waterballast
= max. mass with waterballast - empty mass

The data is recorded on page 6.7.

6.8.4 Battery in the fin

Only the use of the factory supplied battery Z110 (mass 5.5 kg, 12.1 lbs.) is permitted.
Only heavy pilots should install a battery in the fin.
The battery in the fin raises the min. front cockpit load by 16 kg (35 lbs.).
Note: The fin battery equals (concerning the C.G.) 39 kg pilot mass in the rear cockpit.

6.8.5 Waterballast in the wing tanks (Option)

The tanks have a capacity of 80 l (21,2 US gallons) per wing
The permitted amount of waterballast is dependent on the empty weight and of the load in the fuselage and can be determined from the diagram "**Ballast chart"** section 6.8.10.
It is only allowed to fly with symmetric wing ballast!

6.8.6 Fin ballast tank (Option)

Water ballast in the fin tank should be used to compensate the forward C.G. shift due to the water ballast in the wings.
The amount of ballast in the fin is dependent on the amount of water in the wing tanks and to be determined from the following table.

waterballast in the	
wings	fin
kg	kg
20	0,6
40	1,3
60	2,1
80	2,9
100	3,8
120	4,6
140	5,4
160	6,2
/	/

waterballast in the	
wings	fin
lbs.	lbs.
40	1,2
80	2,7
120	4,2
160	5,9
200	7,5
240	9,2
280	10,8
320	12,4
350	13,5

6.8.7 Ballast box in the fin

a) Compensation of the C.G. shift due to the rear pilot:

The ballast box can accommodate max. 4 weights of 2,4 kg mass (heavy weight) and 2 weights of 1,2 kg mass (light weight), so the max. mass is 12 kg.

The number of weights can be determined by the following table:

Mass of rear pilot		Number of trim weights	Number of blinks of the lamp in the front instrument panel see section 4.2.4
kg	lbs.		
55	121	2 heavy + 1 light	5
65	143	3 heavy	6
75	165	3 heavy + 1 light	7
85	187	4 heavy	8
95	209	4 heavy + 1 light	9
105	231	4 heavy + 2 light	10

Warning: When flying solo the ballast box must be emptied, except see b)! Otherwise you will fly with a dangerous C.G. position.
If the ballast box is filled up, the min. cockpit load in the front seat is raised by 35 kg (77 lbs.).
The resulting value (min. cockpit load in front seat from weighing without ballast + 35 kg) must be entered in the table on page 6.7 as value XX and also on the placard at the indication lights for the fin tank on the front instrument panel.
When using the trim weights make sure not to exceed the max. weight of 750kg (1653 lbs.) Category „U" or 630kg (1389 lbs.) Category „A".

b) Trim-possibility for heavy pilots:

The ballast box may be used for this purpose too.
One trim weight of 1.2 kg raises the min. load in the front seat by 3.5 kg (7.7 lbs.).
One trim weight of 2.4 kg raises the min. load in the front seat by 7 kg (15.4 lbs.).
Example (1 kg= 2.2046 lbs):

Min. cockpit load of the glider:	70 kg	permissible amount of trim weights
Mass of the front pilot:	84 kg	2 x 2.4 kg
Mass of the rear pilot:	65 kg	3 x 2.4 kg or 2 x 2,4 kg and 2 x 1,2 kg
Total amount of trim ballast:		12 kg

This means that the ballast box can be filled completely for this example.
Higher pilot masses can't be compensated.

6.9 C.G. calculation

The actual C.G. can be determined as follows:

For each item, the moment mass x C.G. has to be determined and to be added up and divided by the total mass. See the following example:

1 kg = 2.2046 lbs. = .264 US gal. water 0.305 m = 1 ft

Item	mass [kg]	C.G. behind Datum [m]	Moment [m×kg]
Aircraft empty (with Battery in the fin)	480,0	0,710	340,80
Pilot front	75,0	-1,350	-101,25
Rear	85,0	-0,280	-23,80
Waterballast in the wings	80,0	0,206	16,48
Water in the fin tank	2,9	5,260	15,25
Ballast in box in the fin	9,6	5,400	51,84
Fuel	14,0	0,573	8,02
Total:	**746,5**	**0,412**	307,35
		(X_S = Moment/Mass)	

The limits of the in-flight C.G 0,200m - 0,440m should not be exceeded!

The most important C.G. positions (behind datum):

Pilot: The C.G. position is dependent on the pilots shape, mass and thickness of the parachute. The pilot C.G. position can be determined by executing a weight and balance measurement with glider empty and equipped with the pilot etc. see maintenance manual. Please note, that the distance a has to be measured with both configurations, as it may change due to deflection of the landing gear.
The pilot C.G. can be determined by the following equation:

$$X_P = (X_{SF} * M_F - X_{SE} * M_E)/M_P$$

M_F = flight mass X_{SF} = flight C.G M_P = pilot mass
M_E = empty mass X_{SE} = empty C.G.

If the actual pilot C.G. is not known, you have to take the values from the following table:

flight: v = near the forward C.G.
h = near the aft C.G.

Pilot mass [kg]	Pilot C.G. lever [m] Front cockpit		Rear cockpit	
	v	h	V	h
110	-1,388	-1,335	-0,317	-0,272
105	-1,390	-1,336	-0,318	-0,273
100	-1,391	-1,337	-0,319	-0,274
95	-1,392	-1,338	-0,320	-0,275
90	-1,393	-1,340	-0,321	-0,276
85	-1,395	-1,341	-0,323	-0,277
80	-1,396	-1,342	-0,324	-0,278
75	-1,397	-1,343	-0,325	-0,279
70	-1,399	-1,344	-0,326	-0,280
65	-1,400	-1,345	-0,328	-0,281
60	-1,401	-1,346	-0,329	-0,282
55	-1,402	-1,347	-0,330	-0,283

Further C.G. positions:

Baggage and battery in baggage compartment	0,270 m
Waterballast in the wings	0,206 m
Fin ballast tank (see section 6.8.6)	5,260 m
Ballast box in the fin (see section 6.8.7)	5,400 m
Instruments in front panel	-1,910 m
Instruments in rear panel	-0,740 m
removable ballast (in front cockpit, Option, see section 7.17.1)	-1,960 m
Battery in fin (see section 6.8.4)	5,340 m
Tail wheel /see section 0)	5,305 m
Powerplant (see sect. 4.6)	1,253 m
Fuel tank	0,573 m

C.G. Shift due to extension of the engine

XS2 = XS1 – 5,3/W

W = total mass (kg)
XS2 = C.G. position with engine extended (m)
XS1 = C.G. position with engine retracted (m)

7.1 Introduction

This section provides description and operating of the motorglider and its systems.

M.M. = Maintenance manual

Refer to section 9 "Supplements" for details of optional systems and equipment.

7.2 Airframe

The DG-1000T is a two-place high performance motorglider, either
with 18 m span or
with 20 m span and permanently installed winglets

Construction

Wings	CFRP-foam-sandwich-shell with CFRP-roving spar caps
Ailerons	CFRP-foam-sandwich-shell
Rudder	GFRP-foam sandwich-shell
Horizontal stabilizer	GFRP-foam sandwich-shell with CFRP-roving spar caps
Elevator	GFRP-shell
Fuselage	GFRP-shell, fuselage boom sandwich-shell with Tubus core

Canopy

Two canopies hinged at the right hand fuselage side. Canopy transparencies made from Plexiglas GS 241 or optionally green GS Green 2942.

Tailplane

T-Tail with conventional stabilizer-elevator and spring trim.

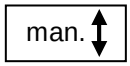
Colour

Airframe:	white		
registration numbers:	grey	RAL 7001	(Pantone 444)
or	red	RAL 3020	(Pantone 485)
or	blue	RAL 5012	(Pantone 307)
or	green	RAL 6001	(Pantone 349)

35. DEI-NT in the rear cockpit (Option) with integrated ignition switch:
The ignition is only on and the powerplant will be extended, if the ignition switches in both cockpits are in the on position. As soon as 1 ignition switch will be switched off, the ignition is off and the powerplant will be retracted.
This means, that for operation from the front seat the ignition switch in the rear cockpit must be always in the "on" position. For operation from the rear seat, the ignition switch in the front cockpit must be "on".

    Caution: For passenger flying etc. it is necessary to secure the ignition switch in the rear cockpit with the securing plate. The securing plate is equipped with a quarter turn lock which must be operated with a screw driver. For storage you may install the securing plate turned 90° in clockwise direction.

36. Manual powerplant extension-retraction switch in the rear cockpit (Option), only together with DEI-NT in the rear cockpit.



37. Starter button in the rear cockpit (Option), only together with DEI-NT in the rear cockpit.

38. **Throttle handle in rear cockpit TN1000/15 (Option):**
The handle is located between item 36) and 37), similar to the front cockpit (not shown in drawing on page 7.3).
Note: No starter button can be installed in the handle.

c) When starting the engine a syringe symbol will be displayed (primer switch on auto position) whilst the primer valve is open.

If the engine will not accelerate when increasing throttle you may press the starter button again to activate the primer again. The syringe symbol will be displayed again.

d) When moving the powerplant via the manual switch, a hand symbol will be displayed showing that the automatic extension-retraction function is deactivated. Operating the ignition switch will reactivate the automatic extension-retraction function . The hand will disappear.

Upper right: CH(T): Cylinder head temperature, above the max. certified CHT the message "CHT OverTemp " will be displayed, after verifying this message the CHT display is blinking.

Further messages (Failure messages and warning messages) see section 7.4.5.

7.4.2 Flight log

The following data will be displayed:
Date, take-off time, landing time, engine time of this flight.
With the selector knob you may choose a flight. by a short push to the selector knob further data for his flight will be displayed: flight duration, max. engine RPM, max. CHT, max. EGT (if sensors are installed).

7.4.3 Operating times

ENGINE TRIP: Trip counter for the engine time, reset in the Setup menu.
ENGINE TOTAL: Engine elapsed time counter, reset only by the manufacturer.
NEXT MAINTENAN.(ce) : The engine time until the next maintenance, reset in the Setup menu after completion of the 25 hour maintenance.
DEI Vx.x E-BOX Vx.x: Software versions of DEI-NT and control unit

7.7 Landing gear

The DG-1000T is available with 3 different versions of the undercarriage:

A) Very high, spring mounted, retractable main wheel with hydraulic disc brake, see diagram 7 M.M, tail wheel.

B) High spring mounted retractable main wheel with hydraulic disc brake, see diagram 8 M.M, tail and nose wheel

C) Spring mounted, fixed main wheel with disc brake, see diagram 9 M.M., tail and nose wheel.

The main undercarriages versions B and C are interchangeable.

a) **Main wheel:**
retractable, assisted by a gas strut (locked in retracted position by an overcentre locking device) or non retractable.
Spring mounted with steel compression springs, fully sealed landing gear box,.

Tyre:	380 x 150 6 PR, diameter 380 mm (15 in.),
Wheel:	Tost 5” wheel with disc brake, width 134 mm, axle 30 mm
Tyre pressare:	2,5 bar (36 psi)

b) **Tail wheel:**

Tyre	200 x 50 6 PR, diameter 200 mm (7,87in.)
Wheel:	Plastic hub with ball bearings, part. No. S23
Tyre pressure	4 bar (58 psi)

c) **Nose wheel** (only version B) and C))**:**

Tyre:	260 x 85, diameter 260 mm (10,2 in)
Wheel:	Tost 4” wheel, width 85 mm, axle 20 mm
Tyre pressure:	2,5 bar (36 psi)

7.8 Tow hooks

See diagram 5 M.M.
Safety release "Europa G 88" for winch launch installed near the C.G.
"nose release E 85" installed in the fuselage nose for aerotow.
Both hooks are operated by the same handles.

7.14 Electrical system

7.14.1 On-board battery

A sealed maintenance free battery 12V/17Ah is installed in the engine compartment (left front).
A fuse (60A) is installed in the positive wire close to the battery.
The engine is not equipped with a Generator to charge the battery.
Recharging the battery with an automatic battery charger is possible via the 12 V sockets in both cockpits. Therefore the master switch must be in the first "charging" position.

7.14.2 Battery in the baggage compartment (Option)

See section 7.17.5

7.14.3 Battery in the fin

see section 7.17.6

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. Z 08.

7.14.4 Wiring

All current - carrying wiring confirms to aeronautical specifications.

7.14.5 Powerplant control and fuses

The DEI-NT (digital engine indicator) and its control unit controls all automatic and safety functions and displays the engine indications on digital displays. The control unit incorporates the master switch, the starter relay, extension-retraction relays and fuses.

7.17 Miscellaneous equipment (Options)

7.17.1 Removable ballast for under weight pilots

The ballast boxes (Option) at the right and left hand side of the instrument console underneath the carpets can accommodate 2 ballast weights of min 2.4 kg (5.3 lbs.) each. Each weight compensates a pilot mass of 3.2 kg (7 lbs.). So a max. of 12.8 kg (28 lbs.) missing pilot mass can be compensated.
The ballast weights are to be fixed in the box with a M8 knurled nut.
Note: The ballast weights used for the ballast box in the fin may be used for these ballast boxes too.

7.17.2 Oxygen system

a) Installation of the oxygen cylinders
   Max. size of oxygen bottle is 7 l capacity with diameter 140 mm (5.5 in.)- If a bottle with smaller diameter is used, this bottle must be wrapped with plastic to come to the same diameter of 140 mm. The bottle must be fixed at its neck with a bracket Z 14 (available at DG-Flugzeugbau GmbH).

b) Installation of the oxygen equipment
   To ensure a safe installation ask DG Flugzeugbau for an installation instruction. For the installation of the Dräger Höhenatmer E 20088 you will find an installation plan 5EP34 in the maintenance Manual.

7.17.3 ELT Emergency Locator Transmitter and Transponder

Installation see maintenance manual DG-1000S section 6.

Caution: Concerning 7.17.2 and 7.17.3.
The installation has to be accomplished by DG-Flugzeugbau or by an approved service station and to be inspected and entered in the aircraft log book by a licensed inspector.

7.17.4 Heavy tailwheel

Instead of the standard tailwheel with plastic hub S23 a tailwheel with brass hub S27/1 may be installed. The installation kit S27/4 is available at DG Flugzeugbau.
The difference in mass between both hubs is 3.1 kg (6.84 lbs.). With the brass hub the min. front cockpit load is increased by 8.5 kg (18.74 lbs.). This higher value must be entered in the cockpit data placards and on page 6.7. Even if the heavy tailwheel is installed only sometimes, the higher min. cockpit load must be entered.

7.17.5 Battery in the baggage compartment with battery selector switch

An additional battery Z01 may be installed in the baggage compartment. In this case a battery selector switch must be installed in the front instrument panel.
Selector positions:
up = internal battery centre position = off down = additional batteries

Preferably the gliding computers and loggers shall be connected to this switch.

The battery fuse is installed at the battery, type: G fuse 250 V 5 x 25 medium slow / 4 A.

7.17.6 Battery in the fin

A battery may be installed in the fin.
Section 0 and the loading chart see section 6.8.4 must be regarded.
Only the use of the factory supplied battery Z110 (12 V, min. 12 Ah, mass 5.5 kg, 12.1 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.
The wiring for this battery is in parallel to the battery in the baggage compartment

7.17.7 Radio installation with automatic commutation

If the factory approved radio installation set is installed, the radio will be switched automatically from "normal" mode to "engine on" mode with the engine extended. With "normal mode" only the goose neck microphones are working.
With "engine on" mode the intercom system is working. Only the microphones of the headsets are working.
The loudspeaker and the speakers of the headsets are working together in both modes.

4.5 Normal procedures

new subsection

4.5.12 Electrically operated main landing gear

4.5.12.1 Extension and retraction in flight

Retraction: For retraction switch and hold the toggle switch up and press the press button twice within 2 seconds. With each press on the button a signal will sound. The landing gear will retract automatically. You may let go of the switches. During retraction the centre (red) LED will shine and the upper green LED will blink. As soon as the landing gear is retracted and locked only the upper green LED will shine.

Warning: If the upper green LED doesn't start to shine and the red LED instead starts blinking refer to section 3.20 emergency procedures.

Extension: For extension switch the toggle switch down and let go.. The landing gear will be extended and locked.

During extension the centre (red) LED will shine and the lower green LED will blink. As soon as the landing gear is extended and locked only the lower green LED will shine.

Note: In case of high acceleration during extension or retraction an over current cut off system will switch off the spindle drive to protect the system. As soon as the g-loads decreasa, the landing gear will continue to travel.

Note: To save electrical power during flight the upper green LED will stop shining after approx. 5 minutes, landing gear retracted and locked.

4.5.11.2 Extending the landing gear via the emergency extension system.

The emergency extension system is also designed to be operated for in flight training purposes. Operation see section 3.19.

Resetting the system for normal operation should be executed after landing, for procedure see section 4.5.12.3.

Caution: It is strongly recommended to train the emergency extension in flight.

Note: Resetting the system for normal operation is also possible in flight. However, this is only permissible if there are 2 pilots on board, one pilot flying the glider and the other resetting the system.

Then you may retract the landing gear again according to section 4.5.12.1. to continue the flight.

9.4 Special equipment for very small pilots (TN1000/17)

To facilitate the operation of the glider by very small pilots 3 different items have been developed, which may be used separately or together.

9.4.1 Removable seat back for the front seat

a) Installation of the seat back: Install the seat back with 2 screws M6x16 DIN965 4.8 BIC with cup washers 15 x M6 MS NI NR4157 to the threads which have been installed according to working instruction No. 1 for TN1000/17.
b) The seat back may be adjusted further to the front by part Z198. Fix the part to the Velcro straps installed at the rear of the seat back.
c) DG-1000 from ser. no. 10-19 on: Remove the headcushion 8R80/2 from the holder on the rear instrument panel cover (fixed with Velcro). When removing the seat back reinstall the head cushion at the holder.
Install the head cushion see above to the Velcro straps installed at the front of the seat back. Instead of the approx. 70 mm (2.8 in.) thick head cushion a thinner head cushion approx. 40 mm (1.6 in.) thick may be used.
d) DG-1000 up to ser. no. 10-18: Remove the head rest from the seat (screwed connection. When removing the seat back reinstall the headrest.
Install a head cushion 8R80/4 to the Velcro straps installed at the front of the seat back.

9.4.2 Airbrake-pushrod with additional handle in front cockpit

For pilots with arms too short to lock the airbrakes an airbrake-pushrod with additional handle part 5St69/2 may be instead in the front cockpit according to working instruction No. 2 for TN1000/17 instead of part 5St69.
This part may remain in the glider for normal operation.

9.4.3 Rudder pedal plates for rear cockpit Z197

Pilots with very short legs may clip rudder pedal plates part no. Z197 on to the rudder pedals. Plates may be installed and removed as often as desired.