DG
FLUGZEUGBAU GMBH

FLIGHT MANUAL
FOR THE MOTORGLIDER
DG-1001M

TYPE: DG-1000
VARIANT: DG-1000M

TC Data Sheet No.: EASA.A.072

Issued: October 2010

Owner:

Ser. No.:

Registration:

Flight manual approved by.
(Signature)
(Authority)
(Stamp)

Date of approval 25/3/11

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

This Flight Manual is FAA approved for U.S. registered motorgliders in accordance with the provision of 14 CFR Section 21.29, and is required by FAA Type Certificate Data Sheet No. G20CE.

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Warnings and hints

- All motorgliders are very complex technical devices. If you don't use yours as it is intended and within the certified operating limitations or if you fail to carry out proper maintenance work, it may harm your health or place your life in danger.
- Prior to flying the aircraft read all manuals carefully and regard especially all warnings, caution remarks and notes given in the manuals.
- Never take-off without executing a serious pre-flight inspection according to the flight manual!
- Always respect the relevant safety altitudes!
- Respect the stall speeds and always fly with a safety margin above the stall speed according to the flight conditions, especially at low altitudes and in the mountains.
- Use only the battery chargers as specified in the flight manual.
- Don't execute yourself any work on the control system except for greasing.
- Repairs and maintenance work should only be accomplished by the manufacturer or at certified repair stations rated for this type of work. A list of stations which have experience with DG aircraft may be obtained from DG Flugzeugbau.
  In the U.S., a properly certificated individual may also perform repairs and maintenance work.
- Even if no annual inspections are required in your country, have your aircraft checked annually, see maintenance manual section 2.
- Please pay attention to our web-site www.dg-flugzeugbau.de. There you will find the latest technical notes and service information for your glider:
  http://www.dg-flugzeugbau.de/index.php?id=tech-mitteilungen-e
  The „DG Pilot Info" informs you immediately by e-mail about the publication of new technical notes and service information.
  If you don't receive this info service, please send a mail to weber@dg-flugzeugbau.de with subject "DG Newsletter please" to receive this service free of charge.

0 Revisions

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 under lying document for the revision and the date will be shown on the bottom of the page.

Rev. No.	Affected Pages/section	Description	Issue Date	EASA Approval Date	Inserted Date Signature
1	Title, 0.1, 0.2, 0.4÷0.7, 1.5, 2.5, 2.7, 2.10, 2.11, 2.13, 2.14, 3.2, 4.7, 4.9 ÷4.11, 4.14, 4.15, 4.21, 4.24, 4.29, 4.33, 5.1, 5.4 ÷ 5.12, 6.1 ÷ 6.3, 6.5, 6.7, 6.9 ÷ 6.15, 7.2, 7.6, 7.9, 7.12, 7.25 ÷ 7.28, 7.30, 8.3	Manual revision TN1000/22	October 2012	10. Dec. 2012	

0.2 List of effective pages

Section		page	issued	replaced	replaced
0		Title	October 2010	October 2012	
		0.1	see manual amendments		
		0.2	"		
		0.3	"		
		0.4	"		
		0.5	"		
		0.6	"		
		0.7			
		0.8			
1		1.1	October 2010		
		1.2	March 2011		
		1.3	October 2010		
		1.4	October 2010		
		1.5	October 2010	October 2012	
		1.6	October 2010		
2	EASA-app.	2.1	October 2010		
	"	2.2	October 2010		
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Powerplant and powerplant controls:

- Retractable powerplant with liquid- cooled Solo 2 625 02 i two stroke engine with electronic fuel injection and Composite propeller.
  The engine is mounted flexibly to the propeller mast for vibration insulation.
  Reduction gear with 5 high-tech V-belts.
  The engine is equipped with an emergency system which may be activated via a switch in the front (and optionally in the rear) instrument panel in case of a failure of the engine control unit (ECU). This system ensures uninterrupted engine operation during take-off and climb.
  Battery ignition with normal and emergency system.
- Electrical engine extension-retraction, operated automatically with the ignition switch or manually as back-up, electronic safety devices to avoid incorrect operation.
- Engine control instruments with digital LCD indication (Microprocessor technology) DEI-NT including stall warning, outside air thermometer, landing gear warning and canopy warning.

Technical data

Wingspan	m / ft	20 / 65.62
Wing surface	m² / ft²	17.53 / 189
Aspect ratio	/	22.82
Length	m / ft	8.57 / 28.12
Fuselage height	m / ft	1.0 / 3.28
Fuselage width	m / ft	0.73 / 2.4
Horizontal tailplane span	m / ft	3.2 / 10.5
Waterballast (optional)	kg (l) / US.gal	160 / 42.3
Empty mass with basic instruments approx.*	kg / lbs	530 / 1168
Wing loading (with 80kg payload) approx.	kg/m² / lbs/ft²	34.8 / 7.13
Max. mass	kg / lbs	790 / 1742
Max. wing loading	kg/m² / lbs/ft²	45 / 9.22
Max. speed	km/h /kts	270 / 146
Certified for aerobatics	Category U, simple aerobatics approved up to a max. mass of 683 kg /1506 lbs.	

Powerplant

Engine	Solo 2 625 02 i two-cylinder-two-stroke-engine with electronic fuel injection	
Power		50 KW / 68 hp
Reduction gear		approx. 1:2.8
Fuel tank capacity		40 Liter
Propeller	BM-G1-160-R-120-1	Composite
Propeller diameter		1.6 m / 5.25

*Options will increase the empty mass accordingly!

2.4 Power plant

Engine manufacturer:	Solo Kleinmotoren Sindelfingen/Maichingen Germany	
Engine	Solo 2 625 02 i, liquid cooled two cylinder two stroke engine	
Maximum power:	Start:	50 KW / 68 PS (horse power)
	Continuous:	50 KW / 68 PS
Max.	Engine RPM:	6600 1/min
"	Continuous RPM:	6600 1/min
Max. cylinderhead temperature:		95°C
Reduction gear (with 5 V-belts		approx. 1:2,8

Caution: The engine is equipped with an emergency system which may be activated via a switch in the front (and optionally in the rear) instrument panel in case of a failure of the engine control unit (ECU). This system ensures uninterrupted engine operation.

Note: The engine control (ECU) prevents exceeding an engine RPM of 6700 by switching off the ignition. If you reduce the engine speed the ignition will be activated again.

Note: The max. engine RPM given by the engine manufacturer is 6700 RPM. This max. RPM is reduced for operation in the DG-1000M for not exceeding the max. permissible RPM of the propeller.

Propeller:	Diameter 1.6 m (5.25 ft)
Manufacturer:	Binder Flugzeug und Motorenbau GmbH
Type /Variant:	BM-G1-160-R-120-1

2.5 Power plant instrument markings

(on DEI-NT, DEI=digital engine indicator)
Power plant instrument markings and their significance are shown below:

Engine speed indicator:
At the centre of the DEI-NT display, digital indication with 4 digits, limitation data printed above display:

green	0-6600	normal operation range RPM
red	6600	max. RPM

Max. continuous RPM:
No indication as identical with max. RPM.

Max. RPM:
When exceeding this RPM a full screen warning message "Engine Speed" appears, when this warning has been confirmed (by pushing the selector knob at the right hand side of the display) the engine speed display is blinking whilst the engine speed is above max. RPM..

2.7 Mass (weight)

Category „Utility“:
with water ballast:
Maximum take and landing off mass: 790 kg (1742 lbs.)

Caution: It is recommended to dump the water ballast before landing on airfields. Always dump the ballast before an outlanding.

without water ballast: Maximum take-off and landing mass = W_{NLP} + W_{wings}
W_{NLP} = Maximum mass of the non lifting parts (see below)
W_{wings} = actual mass of the wings

Maximum mass of the non lifting parts = 600 kg (1323 lbs.)

Maximum mass in baggage compartment: 15 kg (33 lbs.)

Caution: Heavy pieces of baggage must be secured to the baggage compartment floor (screwing to the floor or with belts). The max. mass secured on one half of the floor (left and right of fuselage centre line) should not exceed 7,5kg (16.5 lbs.).

Ballast

1. Maximum waterballast: 160 kg (353 lbs.)
2. Maximum mass in the trim-ballast box in the fin: 12 kg (26.5 lbs.)
3. Maximum mass in the trim-ballast boxes in the front cockpit (Option): 5 kg (11 lbs.) per box, total 10 kg. (22 lbs.)

With this ballast the max. take-off mass is not to be exceeded.

Caution: Follow the loading procedures see section 6.

Caution: With lower pilot weights lead ballast must be added to the seat. Ballast placed on the seat (lead ballast cushion) must be fastened at the safety belt anchor point.
Option: Provision for removable trim-ballast in the front cockpit see sect 7.17.1.

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. 7.17.1 is mandatory.

2.12 Kinds of operation

1. Flights according to VFR (daylight)
2. Self launching
3. Aerotow
4. Winch- and auto-launching

In addition

1. Cloud flying (daylight): permitted when properly instrumented (see section 2.13b).
2. Simple aerobatics see sect. 4.5.16 “Category „Utility“

Warning: Simple aerobatics and cloud flying are approved up to a max. mass of 683 kg /1506 lbs, which means single seated or with 2 light pilots

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

Note for the US: "Cloud Flying" is considered flying in Instrument Meteorological Conditions (IMC) and requires an Instrument Flight Rules (IFR) clearance in the U.S. This is permissible in the U.S. provided the pilot has the appropriate rating per 14 CFR 61.3, the glider contains the necessary equipment specified under 14 CFR 91.205, and the pilot complies with IFR requirements.

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 attached to 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
(for altimeter in imperial units min. 20000 ft.)
Altimeter with fine range pointer, 1 turn max. 1000 m (3000 ft.)
Magnetic compass (compensated in the aircraft)
Four piece symmetrical safety harnesses
VHF - transceiver (ready for operation)
Engine speed indicator, Fuel quantity indicator, Cylinder head (coolant) temperature indicator, Engine elapsed time indicator (counts as long as the engine is running):
These 4 indicators are incorporated in the DEI-NT. For 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 manual.

b) **Additional equipment for cloud flying**

(Not permitted in Canada and Australia, for the US see note in section 2.12)
Variometer
Turn and bank indicator

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

2.17 Waterballast (Option)

Max. capacity 80 L (21.1 U.S. gal) per wing.
Filling the water ballast is only allowed with a filling system that enables determination of the exact amount of ballast filled, e.g. water gauge or calibrated canisters. Only symmetrical loading is allowed.
After filling, balance the wings by dumping enough water from the heavy wing, see 4.2.3.
Flight with leaking watertanks is prohibited, as this may result in an asymmetrical loading condition.

Warning: Follow the loading chart, see section 6.8.
The max. take-off weight must not be exceeded.

2.18 Trim ballast box in the fin

A box for ballast (trim-weights) is installed in the fin. It can be used to compensate for the mass of the rear pilot and as trim-possibility for heavy pilots.

Warning: Follow the loading chart see 6.8.7.
Tape the cover of the fin ballast box with tape min. 19mm (3/4 in.) wide prior to each flight.

2.19 Other limitations

2.19.1 Approach and landing

Landing with the engine extended and not running is prohibited, except in an emergency.
If longer sinking flights with the engine idling can't be avoided it is recommended to apply some throttle at least every 60 seconds to ensure enough engine lubrication,
If possible always land in the gliding configuration, engine retracted, to be kind to the engine.

2.20 Limitations placards

DG Flugzeugbau GmbH
Type: DG – 1000M Serial No.: 10- M
Year of construction:

Maximum airspeeds	km/h	kts.
Winch launching	150	81
Aero-tow	185	100
Manoeuvring V_A	185	100
Rough air	185	100
Maximum speed V_{NE}	270	146
Powerplant extended	185	100
Powerplant extension-retraction	100	54

Approved aerobatic manoeuvres, approved up to a max. mass of 683 kg /1506 lbs:
Pos. Loop, Chandelle, Spin, Stall turn

Maximum mass: 790 kg /1742 lbs.

Loading chart

Cockpit load	front seat		rear seat		(Parachute
maximum	110 kg	242 lbs.	90 kg	198 lbs.	included)
or maximum	105 kg	231 lbs.	105 kg	231 lbs.	
minimum	kg	lbs.	/	/	without fin battery
minimum	kg	lbs.	/	/	With fin battery

With lower pilot weight necessary ballast must be added.
Warnung: Um die vordere Schwerpunktlage einzuhalten, dürfen schwere Piloten die DG-1000M doppelsitzig nur betreiben, wenn Sie die Masse von vorderem und hinterem Piloten siehe FHB Abschnitt 6.8.7 austrimmen.

Pre-flight Check
1. Lead ballast (for under weight pilot)?
2. Parachute worn properly?
3. Safety harness buckled?
4. Front seat: pedals adjusted?
   Rear seat: seating height adjusted?
5. All controls and knobs in reach?
6. Altimeter?
7. Dive brakes cycled and locked?
8. Positive control check ? (One person at the control surfaces).
9. Trim ballast box in the fin, correct amount filled in? Locking device completely engaged?
10. Battery in the fin? Loading chart regarded?
11. Trim?

In addition for self launching
12. Fuel level?
13. Fuel cock open?
14. Canopy open, propeller circle clear?
15. After engine start close and lock both canopies.
16. Check max. engine RPM, min. 6000RPM.
17. Check both ignition circuits (4000 RPM)
18. Check emergency system (4000 RPM)
19. Runway free?

Other cockpit placards see section 7

Gepäck max. 15 kg
baggage max. 33 lbs.

Sollbruchstelle 10000 N
rated load 2200 lbs.

Reifendruck 4 bar
Tyre pressure 58 psi
Tail wheel

Reifendruck 3 bar
Tyre pressure 43.5 psi
Main wheel

Ballast box in the fin
Min. load in the front seat
kg box empty  kg box filled

At the control-light in the front instrument panel

Warning:
Rigging of the horizontal tailplane is only permitted with nose down trim-setting!

at the upper left hand side of the fin

LG ext.-retr. up to 185 km/h 100 kts.

Below the controls and control lights for the electrically operated landing gear

Benzin min. 95 Okt. 50:1 Zweitaktöl 40 l
petrol min. 95 ROZ. two stroke oil

On top of main bulkhead left hand side and at fuel filler (Option)

Altitude in [m]	0-3000	4000	5000	6000	7000	8000
V_{NE} IAS km/h	270	256	243	230	217	205
Altitude in [ft]	0-10000	13000	16000	20000	23000	26000
V_{NE} IAS kts.	146	138	131	124	117	111

Note: Engine limitations are printed on the DEI-NT (see section 7.4).

3.1 Introduction

Section 3 provides amplified procedures for coping with emergencies that may occur. Emergency situations can be minimized by proper pre-flight inspections and maintenance.

Caution: Canopy jettison and bailing out should be practised 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 its closed position by operating the red emergency release handle (right) with your left hand, then push the canopy upwards.

The retaining line of the rear canopy will tear off.

The gas struts will disengage automatically

Warning: If bailing out with the engine running it is necessary to switch off the ignition and retract the engine with the manual switch even with the propeller still turning. The propeller will be stopped by the engine doors. Don't try to stop the propeller vertical and to retract the engine using the normal method.

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 section 4.5.7.

4.2.5 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. Do not put any other objects in the battery box.

4.2.6 Refuelling

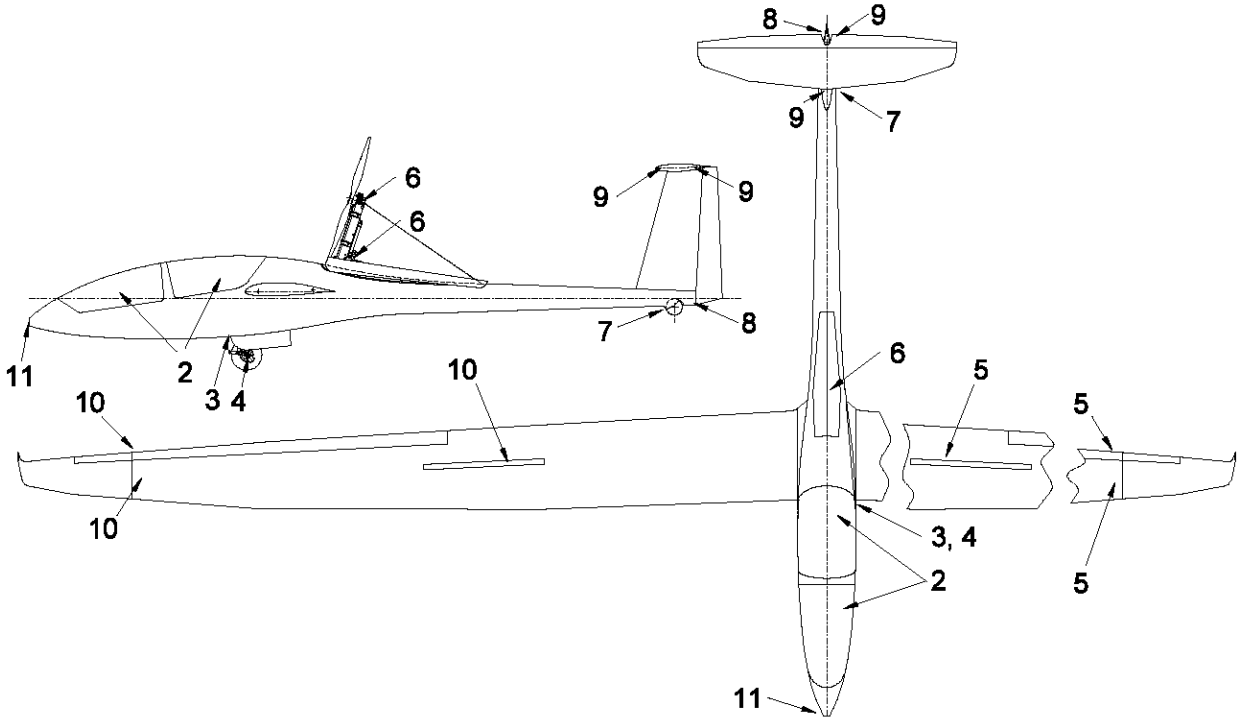
Fuel is transferred via a permanently installed refuelling pump from a can where the correct amount of oil is added and mixed prior to filling.
Oil: Use only super two stroke oil according to section 2.6.
Switch on the main switch of the aircraft.
Couple the fuel filler hose to the fuselage side coupling located in the baggage compartment.
Start the pump by pressing the push button mounted in the main bulkhead (rear cockpit left hand side). 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.
Optional: Refuelling is also possible via the optional tank filler opening on the fuselage exterior surface. If you can't fill premixed fuel (e.g. at the airfield petrol station), half fill the tank with fuel, then add the proper amount of oil and fill up completely.

Caution: If when pressing the push button the re-fuelling pump doesn't start running and the DEI fuel level indication changes immediately to 41 L, the tank full sensor is defective. In such a case refuel via the tank filler opening (if installed) up to the sensor. Otherwise the fuel level gauge will display a higher fuel level than correct. Exchange the sensor as soon as possible.
If no fuel filler opening is installed you have to replace the sensor to be able to re-fuel.
Warning: Make sure to fill in clean fuel without any water.

4.2.7 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.

4.3.2 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 section 7.16 (not every day, but min. every 3 month);
   c) check the main pin securing;
   d) check all controls for wear and function, incl. positive control check, check if the handle of the pedal adjustment cable will be pulled to the front so that it can't hook into the trim release lever at the control stick, even with pedals in a rear position;
   e) Check the tow release system for wear and function incl. cable release check;
   f) Check for foreign objects;
   g) Check the instrumentation for wear and function;
   h) Switch on main switch;
   i) Check the radio and other parts of the electric system (fuses!) for function;
   j) Check the engine controls, especially the interconnection of front and rear throttle handles;
   k) Check all fuses, including the battery main fuse which is located behind the foot of the rear instrument panel under the carpet;

l) Check the extension-retraction mechanism by operating it in both directions. The extension time should not exceed 10 seconds!
Extend the engine halfway;
m) Check the brake fluid level, the reservoir is located left hand side above and behind the main-spar connection;
n) Check the fuel level by the DEI-NT.

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
   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!;
   Check the tyre pressure: 3.0 bar – 43.5 psi;
   b) 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
   a) Check the connection of spindle drive and gas strut to engine and fuselage. To accomplish this extend the engine only so far, that you still can see the connection to the engine mount. Check especially for cracks in the spindle drive fork.
   b) Check both bolts of the front engine mount, these bolts are responsible for the correct drive belt tension;

Note: The rear bolt takes over the loads of the drive belts, the front bolt acts as securing device in case the rear bolt fails.

   c) Check V-belts for wear and correct tension, sudden loss of tension indicates damage of the bolt see item b);
   d) Check ignition system incl. wires and the spark plug connectors for tight fit
   e) Fully extend the powerplant;
   f) Check the propeller mount for cracks, especially at the welding seams.

g) Check all screwed connections and their securing;
h) Check the propeller stopper
i) Check the rear engine suspension (lower side of engine);
j) Check engine retaining cable and its connections in the engine compartment and at the engine;
k) Ccheck function of throttle operation;
l) Check fuel lines, electrical wires, Bowden cables and structural parts for wear and kinks.
m) Check exhaust muffler, propeller mount, radiator, coolant pump and accessories for tight fit and any cracking.
Check especially the rubber mounts of the radiator.
n) Check especially the cable which lifts the muffler during engine extension.
o) To check the water pump and the fuel pump of the normal system, switch on the ignition. You should hear a buzz. After some seconds as soon as fuel pressure is built up, the fuel pump should stop running;
p) Apply strong pressure to the propeller mount in forward, backward and sideways directions to check the rubber engine mounts;
Check the rubber buffer which limits the tilt of the engine against the drive mount due to the engine torque.
q) Visual check of the propeller
r) Turn the propeller 1 revolution by hand and listen for abnormal sounds which may indicate engine damage
s) 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.
t) Check the outlet of the fuel tank ventline for cleanliness, the outlet is located behind the landing gear box;
u) Check the coolant level in the radiator by removing the radiator screw cap. Press down on cap for easier handling. The radiator must be filled up to approx. 25mm (1 in.) below its top.

7. Tail wheel:-
Check for wear, free play and excessive dirt in the wheel box. Remove excessive dirt prior to take off;
Check tyre pressure: 4 bar -58 psi;
8. Rear end of the fuselage:-
Check the lower rudder hinge and the connection of the rudder cables for wear, free play and correct securing;
Check the bulkhead and fin trailing edge shear web for cracks and delamination;

4.5 Normal procedures and recommended speeds

4.5.1 Electrically operated main landing gear

4.5.1.1 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 (only installed up to Ser. No. M4). 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 decrease, 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.

4.5.1.2 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 3.13.

Resetting the system for normal operation should be executed after landing, for procedure see section 4.5.1.3.

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 4.5.1.1. to continue the flight.

4.5.1.3 Resetting the emergency extension system for normal operation

After an emergency extension the system must be reset for normal operation. To accomplish this you must pull one of the 2 emergency extension handles and simultaneously switch the toggle switch down. The centre (red) and the lower green LED will shine.

Switch and handle must be operated until the centre LED stops shining and only the lower green LED continues shining. The spindle drive will then stop operating, then let go handle and switch.

Note: It may occur that the spindle drive stops before the gas strut is completely reset. Allow the system 5 minutes to cool down and start the resetting process again.

Thereafter you may retract the landing gear again according to section 4.5.1.1.

4.5.1.4 Part extension and retraction for inspection and servicing

The retraction may be stopped by switching the toggle switch down,

The extension may be stopped by switching the toggle switch up and pressing simultaneously the press button.

Only the red LED will shine.

For any service work switch off the main switch!

With the procedures described in section 4.5.12.1 you may retract or extend the landing gear again.

4.5.1.5 Precautionary measures against retracting the landing gear while on the ground

If the glider is resting on the main landing gear the landing gear should not be retracted, as retraction will result in damage of the landing gear. To minimise the risk of such operating error the following safety features have been incorporated:

If the toggle switch is switched up, nothing will happen.

If the toggle switch is switched up and the press button is pressed 1 time a warning tone will sound (only installed in Ser. No. M1 up to M4), otherwise, nothing will happen.

Only if the toggle switch is switched up and the press button is pressed 2 times within 2 seconds the landing gear will be retracted.

Caution: If you leave the DG-1000M unattended switch off the main switch to prevent any operating error.

4.5.4.2 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 110 km/h (60kts.) or not more than 150 km/h (81 kts.).

Warning: Winch launch with high take-off weight requires a powerful winch!

4.5.5 Free flight

Stalling characteristics (level and turning flight)

When stalled the DG-1000M will warn by buffeting. If the stick is pulled further the DG-1000M will drop one wing.

Only at forward C.G. positions can the DG-1000M 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-1000M 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.

4.5.7.2 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 1.7 m/sec. (340 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 85-95 km/h (46-51 kts).
   Check 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.

Warning: If after starting the engine the failure message "Starter Run" will be displayed, the starter motor didn't disengage and is producing electric power, stop the engine immediately to prevent damage of the control unit.

4.5.12 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.

4.5.13 Cloud flying

Cloud flying is approved but only up to a max. mass of 683 kg /1506 lbs (single seated or with 2 light pilots). Take care to fly smoothly and coordinated. It is prohibited to use a spin as a method for reducing altitude in cloud. 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.

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

Note for the US: "Cloud Flying" is considered flying in Instrument Meteorological Conditions (IMC) and requires an Instrument Flight Rules (IFR) clearance in the U.S. This is permissible in the U.S. provided the pilot has the appropriate rating per 14 CFR 61.3, the glider contains the necessary equipment specified under 14 CFR 91.205, and the pilot complies with IFR requirements.

4.6 Flight with the engine removed from the aircraft

The DG-1000M 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. 4.10.9 in the maintenance manual).

1. Remove the powerplant. Spindle drive, gas struts and exhaust system remain in the fuselage.

2. In addition to the on-board battery install a battery in the fin see section. 7.17.6.

3. Carry out a C.G. calculation according to section 6.9. The in-flight C.G. will be moved forward by approx. 75 mm (3 in.) depending on the flight mass and empty mass C.G.
   This C.G. shift is acceptable, as the forward limit of the in-flight C.G. for operation with engine removed is 120 mm in front of the C.G. with engine installed.

Item	**mass**		**C.G. behind datum**		**moment**	
	kg	**lbs.**	**m**	**ft.**	**kg×m**	**ft.×lbs.**
engine with propeller	-58	-127.9	1.261	4.14	-73.14	-529.0
fin battery	5.5	12.1	5.34	17.52	29.37	212.4
Difference	-52.5	-115.7	0.834	2.735	-43.77	-316.6

4. Fix the limit switch “engine retracted” with a Ty-rap in the actuated position. Otherwise the DEI-NT will remain in the powered flight mode.
5. Tape the engine doors carefully with fabric tape.

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.

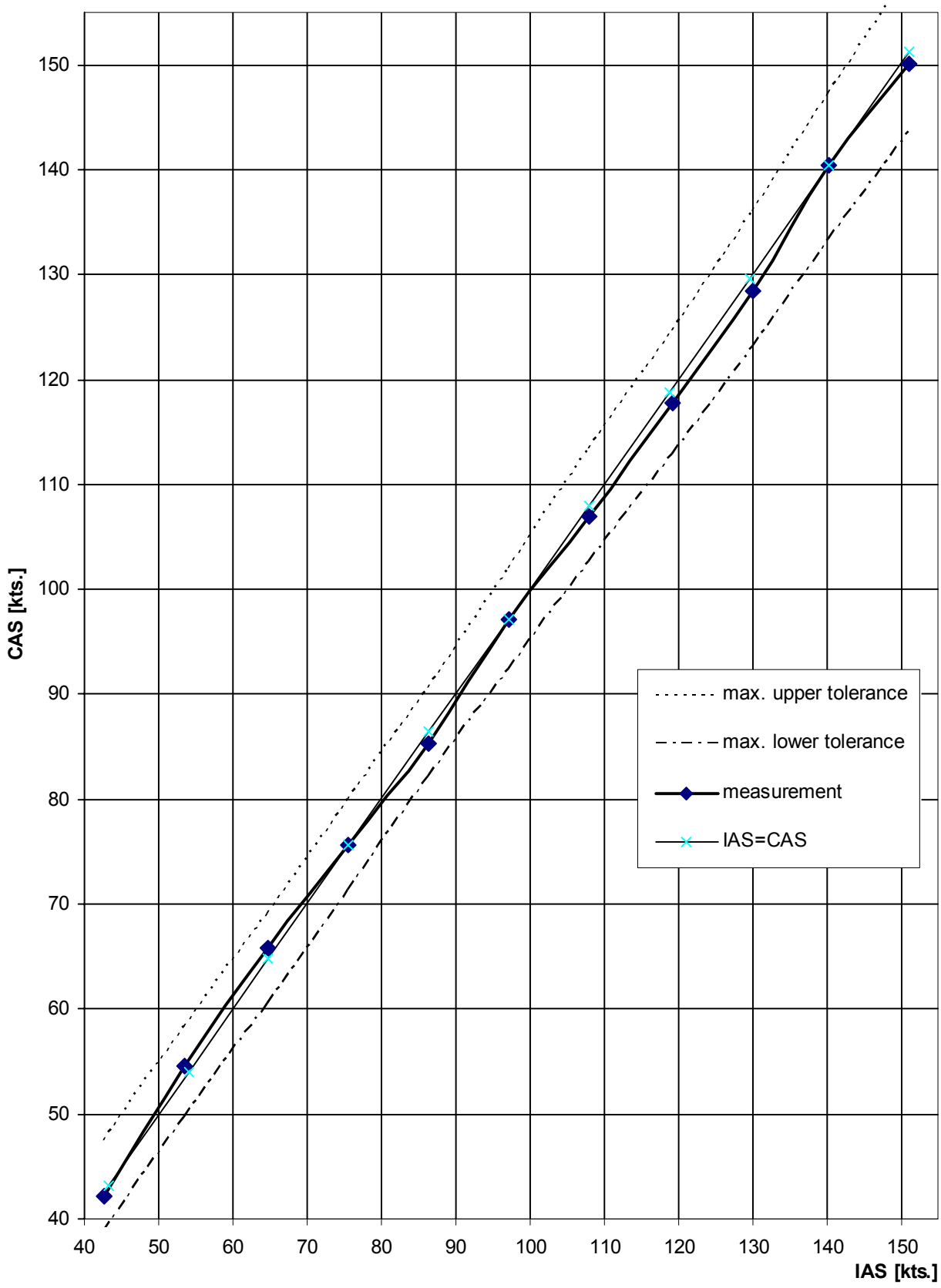
5 Performance

5.1 Introduction

This section provides approved data for airspeed calibration, stall speeds and take-off performance and non-approved additional information.

The data in the charts has been computed from actual flight tests with the motorglider in good and clean condition and using average piloting techniques.

Airspeed indicator system calibration British, US



5.2.2 Stall speeds

The given speeds are the minimum achievable speeds during level flight in km/h and (kts.).

Note: the stall speeds given in the table have been determined by reducing the airspeed very slowly (quasistationary). With faster speed reduction as given in the airworthiness requirements, stall speeds will be lower.

Airbrakes retracted

mass kg	470	500	550	600	650	700	750	790
mass lbs	1036	1102	1213	1323	1433	1543	1653	1742
W/S kg/m^2	26.8	28.5	31.4	34.2	37.1	39.9	42.8	45.1
W/S lbs/ft²	5.49	5.84	6.43	7.01	7.59	8.18	8.76	9.23
V km/h	61.7	63.6	66.8	69.7	72.6	75.3	77.9	80.0
V kts	33.3	34.4	36.0	37.6	39.2	40.7	42.1	43.2

Airbrakes extended

mass kg	470	500	550	600	650	700	750	790
V km/h	64.9	66.9	70.2	73.3	76.3	79.2	81.9	84.1
V kts	35.0	36.1	37.9	39.6	41.2	42.7	44.2	45.4

The loss of height for stall recovery is approximately 50 m (160 ft) if recovered immediately.

5.2.3 Take-off performance

The data is valid for take-off from dry level hard surface, no wind and proper condition of engine, propeller and aircraft.
The take-off procedure is to be executed according to 4.5.2.
SR = take-off roll
S= take-off distance to 15 m (50 ft.) altitude
T = temperature on ground
H = pressure altitude, can be computed as follows:
H (m) = (1013 mb - QNH) • 100 / 11.7 + airfield elevation (m)

mass [kg]		790		735		680	
H [m]	T [°C]	SR [m]	S [m]	SR [m]	S [m]	SR [m]	S [m]
0	0	264	419	216	342	174	275
	15	302	479	247	391	198	315
	30	343	544	280	444	225	357
500	0	298	472	243	386	196	310
	15	340	540	278	441	224	355
	30	386	613	316	501	254	403
1000	0	336	533	274	435	221	350
	15	384	609	314	497	252	400
	30	436	691	356	565	286	454
1500	0	379	602	310	492	249	395
	15	434	688	354	562	285	452
	30	492	781	402	638	324	513
2000	0	429	681	351	556	282	447
	15	491	778	401	636	322	511
	30	557	883	455	722	366	581
2500	0	486	771	397	630	320	507
	15	556	882	454	720	365	579
	30	631	1001	516	818	415	658
3000	0	552	875	451	715	363	575
	15	631	1001	515	817	415	657
	30	716	1136	585	928	471	746

Dry level grass surface increase the take-off distance by 10% to 15%.
Warning: Wet soft grass surface and / or cross wind may increase the take-off distance much more

Take-off performance, British, US

	mass [lbs.]	1742		1620		1499	
H [ft]	T [°F]	SR [ft]	S [ft]	SR [ft]	S [ft]	SR [ft]	S [ft]
0	32	867	1375	708	1123	570	904
	59	991	1572	810	1284	651	1033
	86	1125	1784	919	1458	739	1172
1000	32	932	1478	762	1208	613	972
	59	1065	1690	870	1381	700	1110
	86	1209	1918	988	1567	795	1261
2000	32	1003	1590	819	1299	659	1045
	59	1146	1818	936	1485	753	1195
	86	1301	2064	1063	1686	855	1356
3000	32	1079	1712	882	1399	709	1125
	59	1234	1956	1008	1599	811	1286
	86	1400	2221	1144	1815	920	1460
4000	32	1162	1843	950	1506	764	1211
	59	1328	2107	1085	1721	873	1385
	86	1508	2392	1232	1954	991	1572
5000	32	1252	1986	1023	1623	823	1305
	59	1824	2893	1490	2364	1199	1901
	86	2071	3284	1692	2683	1361	2158
6000	32	1350	2141	1103	1749	887	1407
	59	1543	2447	1261	1999	1014	1608
	86	1752	2778	1431	2270	1151	1826
7000	32	1456	2309	1190	1887	957	1518
	59	1664	2639	1360	2157	1094	1735
	86	1889	2996	1544	2448	1242	1969
8000	32	1571	2492	1284	2036	1033	1638
	59	1796	2848	1467	2327	1180	1872
	86	2039	3234	1666	2642	1340	2125
9000	32	1697	2691	1386	2199	1115	1768
	59	1939	3076	1584	2513	1274	2021
	86	2201	3492	1799	2853	1447	2295
10000	32	1833	2907	1498	2375	1205	1911
	59	2095	3323	1712	2715	1377	2184
	86	2378	3772	1943	3082	1563	2479

5.3 Additional Information

5.3.1 Demonstrated crosswind performance

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

5.3.2 Gliding performance

Performance data with 20 m span (S = 17,53 m²)

wing loading	kg/m²	28	35	42	45
mass	kg	491	614	736	790
minimum sink		0.51	0.56	0.62	0.64
at	V [km/h]	79	88	98	102
best glide ratio		45.9	46.3	46.6	46.8
at	V [km/h]	93	104	120	125

wing loading	lbs/ft²	5.73	7.17	8.60	9.22
mass	lbs.	1611	2015	2415	2592
minimum sink	ft/min.	100	110	122	126
at	V [kts.]	43	48	53	55
best glide ratio		45.9	46.3	46.6	46.8
at	V [kts.]	50	56	65	67

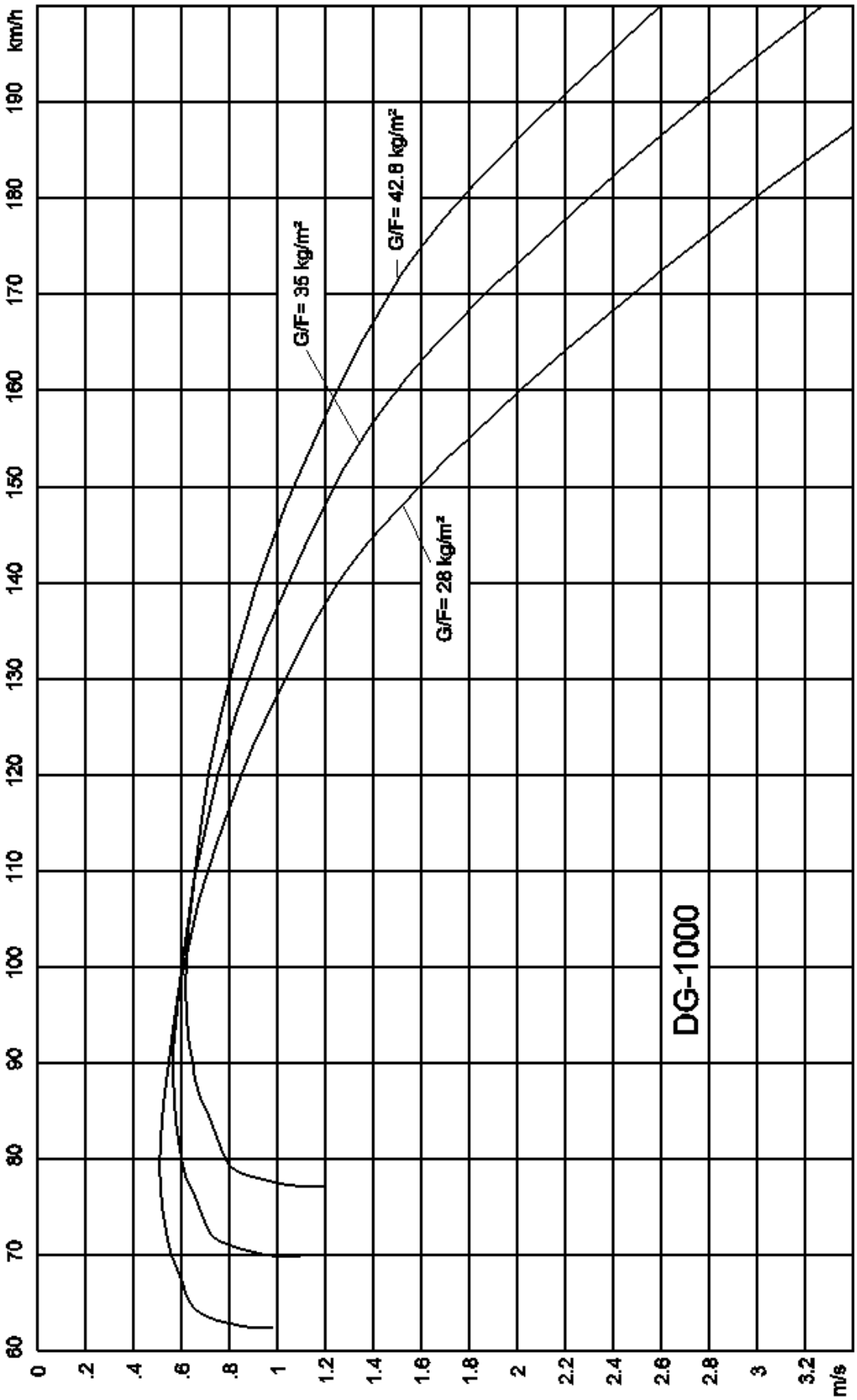
A variation in speed by ± 10 km/h (5 kts.) from the above will decrease the best glide angle by 0.5 glide points and increase the min. sink rate by 1 cm/sec. (2 ft/min).
The polar curves can be seen on the next page.

For optimum performance, the aircraft should be flown with a C.G. towards the rear of the allowable range. This especially improves thermalling performance. However the aircraft will be more pitch sensitive.

The wing fuselage joint, wing parting and the tailplane fin joint should be taped up and the aircraft thoroughly cleaned to obtain maximum performance.

The polars apply to a "clean" aircraft.
With dirty wings or flight in rain, the performance drops accordingly.

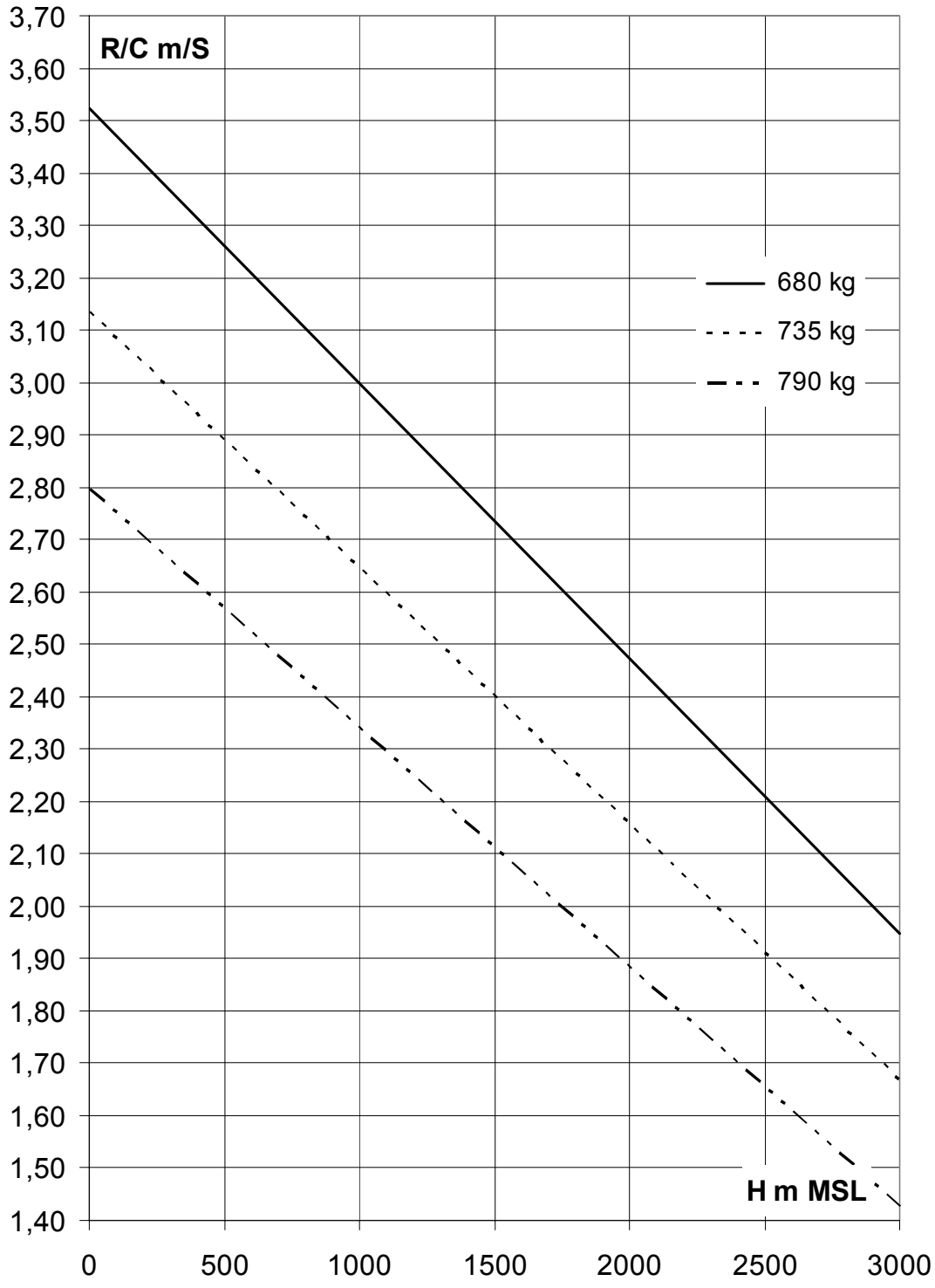
Flight polar with 20 m wing span
1 kts= 1 km/h / 1.852, 1 m/s= 197 ft/min.= 1.94 kts, 1 kg/m²= 0.2048 lbs/ft²



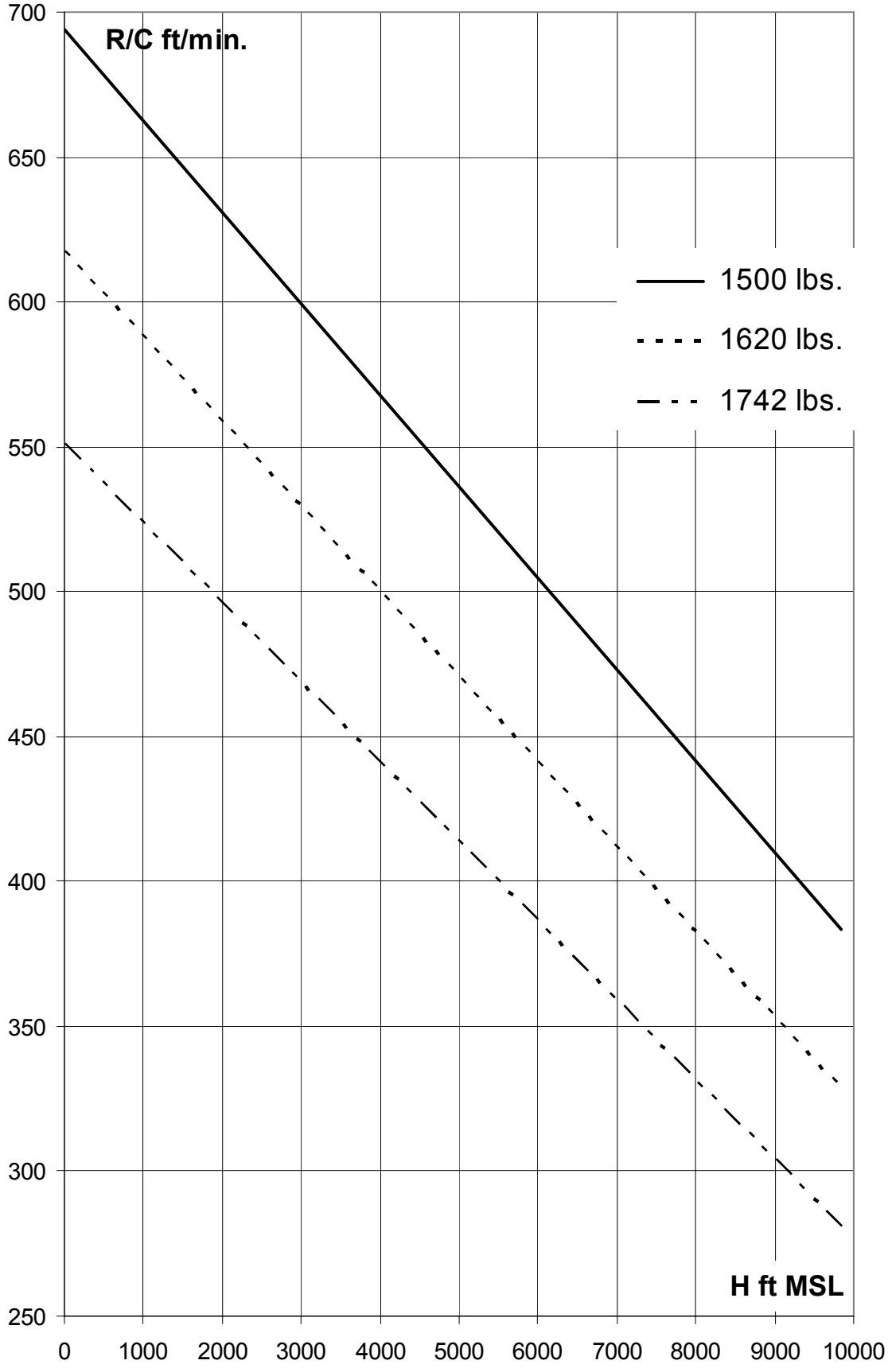
5.3.3 Performance under power

5.3.3.1 Rate of climb

Measured rates of climb for 15°C (59°F) at MSL.
15°C increase in temperature reduces the rate of climb by ca. 0.2 m/s (40 ft/min.).
R/C = climb rate at Vy = 95 km/h (51 kts.) and with flap setting +8°
H = altitude above sea level



Rate of climb British, US



5.3.3.2 Cruising Flight

The cruising speed is approx. 150 km/h (81 kts.) with the recommended engine speed of 6300 RPM.

5.3.3.3 Maximum operational altitude

The maximum operational altitude is more than 4000 m (13100 ft) MSL.
The engine

5.3.3.4 Maximum Range (without reserve)

Take-off mass 730 kg, 1609 lbs.

1. At cruising speed
   with full fuselage tank (40 L, 10.6 US gal)=
   approx. 270 km, 146 nm.
   This is 6.8 km/L; 14 nm/US gal.

2. With saw-tooth flight technique Mc Cready O
   with full fuselage tank (40 L, 10.6 US gal)=
   max. 800 km; 430 nm.
   This is 20 km/L, 40.5 nm/US gal

   These values can only be achieved with still air and exact speed control.

3. With saw-tooth flight technique Mc Cready 1
   with full fuselage tank (40 L, 10.6 US gal)=
   max. 690 km; 370 nm.
   This is 17.3 km/L, 35 nm/US gal.

   The values for saw-tooth technique are for beginning the climb at 500 m (1640 ft) MSL and a climb of 1000 m (3280 ft).

5.3.4 Noise data

Noise requirements: ICAO Annex 16, Volume I, Part II, Chapter X

Measured noise level:	64.3dB(A) at 790 kg (1742 lbs.)
Noise limit:	75.1 dB(A) at 790 kg (1742 lbs.)

6 Mass (weight) and balance

6.1 Introduction

This section contains the payload range within which the motorglider may be safely operated.
A procedure for calculating the in-flight C.G. is also provided.
A comprehensive list of all equipment available for this motorglider is contained in the maintenance manual.

6.2 Weighing procedures

See maintenance manual DG-1000M.
Datum: Wing leading edge at the root rib.
Reference line: aft fuselage centre line horizontal.
The weighing is to be executed with all watertanks and the fuel tank emptied, without ballast in the trim ballast boxes in the fin and in the cockpit (optional) and without fin battery Z110 (Option), powerplant retracted.

6.3 Weighing record

The result of each C.G. weighing is to be entered on page 6.7. If the min. cockpit load has changed this data is to be entered in the cockpit placard as well. When altering the equipment, the new data can be gathered by a C.G. calculation (see section 6.9).
The actual equipment list is enclosed in the maintenance manual or in the aircraft log.

6.4 Basic empty mass and C.G.

Actual data see page 6.7.
With the empty weight C.G. and the cockpit loads in the limits of the diagram in section 6.8.9.1 and if with max. cockpit load (see warning in section 2.8) 12 kg ballast are loaded in the fin ballast box, the in-flight C.G. limits will not be exceeded.

Note: For operation with the powerplant removed other empty mass C.G. limits are valid, see section 16.8.9.2.
For not exceeding the forward C.G. limits heavy pilots when flying the DG-1000M two-seated with powerplant removed must **not** necessarily compensate the mass of the front and the rear pilot according to section 6.8.7.2.

6.5 Mass of all non-lifting parts (WNLP)

The max. mass of all non-lifting parts is 600 kg (1323 lbs.).

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

6.6 Max. mass (weight)

6.6.1 with waterballast:

Maximum take and landing off mass: 790 kg (1742 lbs.)

6.6.2 without waterballast:

Maximum take-off and landing mass = WNLP + Wwings
WNLP = Maximum mass of all non lifting parts (see above)
Wwings = 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.

6.8.3 Baggage

max. 15 kg (33lbs)

Heavy pieces of baggage must be secured to the baggage compartment floor (screwing to the floor or with belts). The max. mass secured on one half of the floor (left and right of fuselage centre line) should not exceed 7,5 kg (16.5 lbs.).

With the load added in the fuselage the max. load without waterballast (W.B.) (see weighing report section 6.8.8) must not be exceeded.

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 Section not effective

6.8.7 Ballast box in the fin

6.8.7.1 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

6.8.8 Weighing report (for section 6.3)

Distances in mm, masses in kg -- 25.4 mm = 1 inch / 1 kg = 2.2046 lbs.

Date of weighing:						
Executed by:						
Date of equipment list:						
Empty mass						
Empty mass C.G.						
Max. mass without W.B.						
Max. load without W.B.						
max. mass with WB						
max. useful load with W.B.						
min. cockpit load ZZ (kg)						
min. cockpit load YY (kg)						
min. cockpit load XX (kg)						
max. load in both seats *	210	210				
Inspector, signature, stamp						

W.B.= waterballast

ZZ= min. load in front seat for solo flying with fin ballast box empty and without fin battery.

YY= ZZ + 16kg= min. load in front seat for solo flying with fin ballast box empty with fin battery.

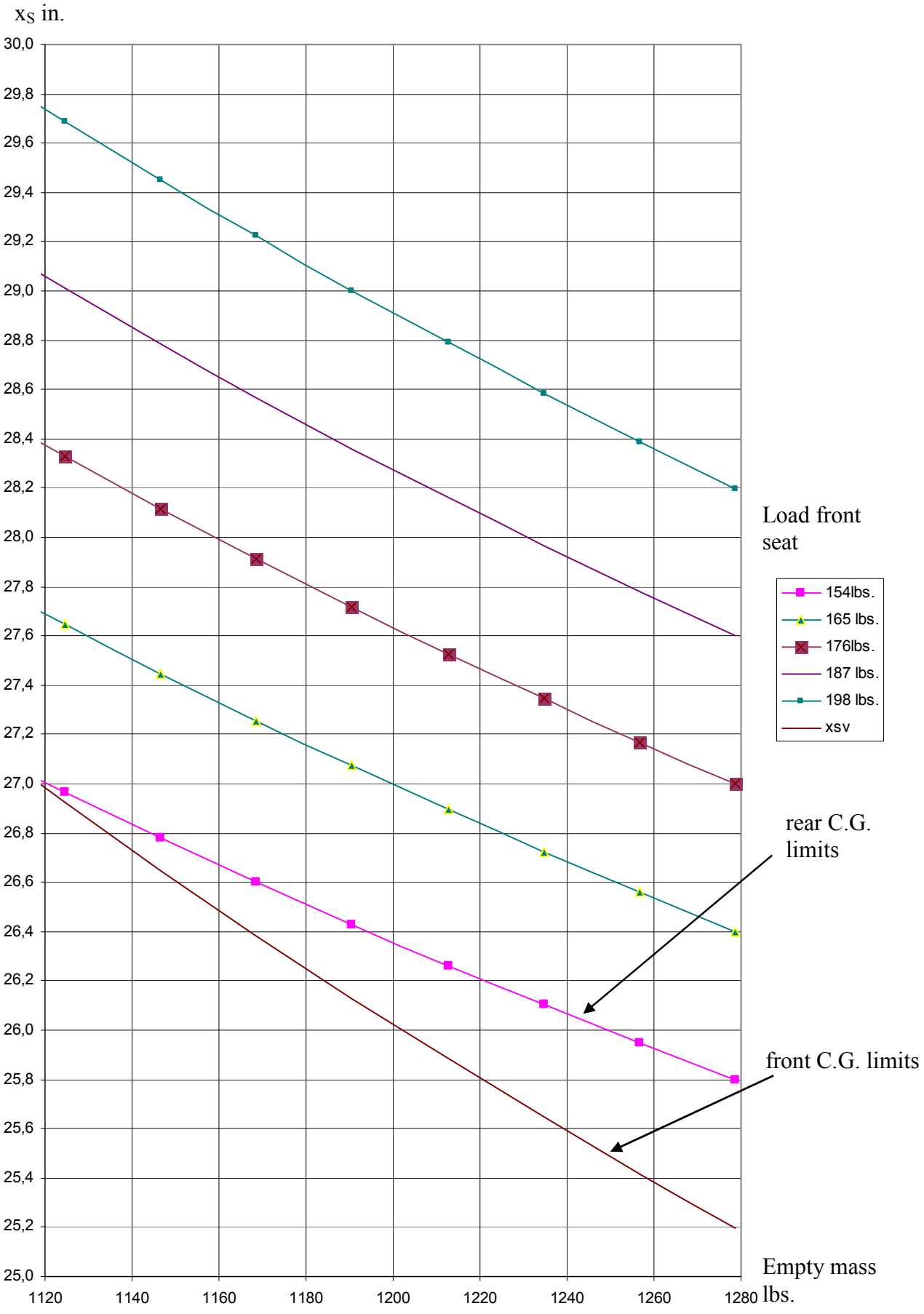
XX= YY+35= min. load in front seat for solo flying with fin ballast box filled with fin battery.

*with max. cockpit load 12 kg ballast must be loaded in the tail ballast box.

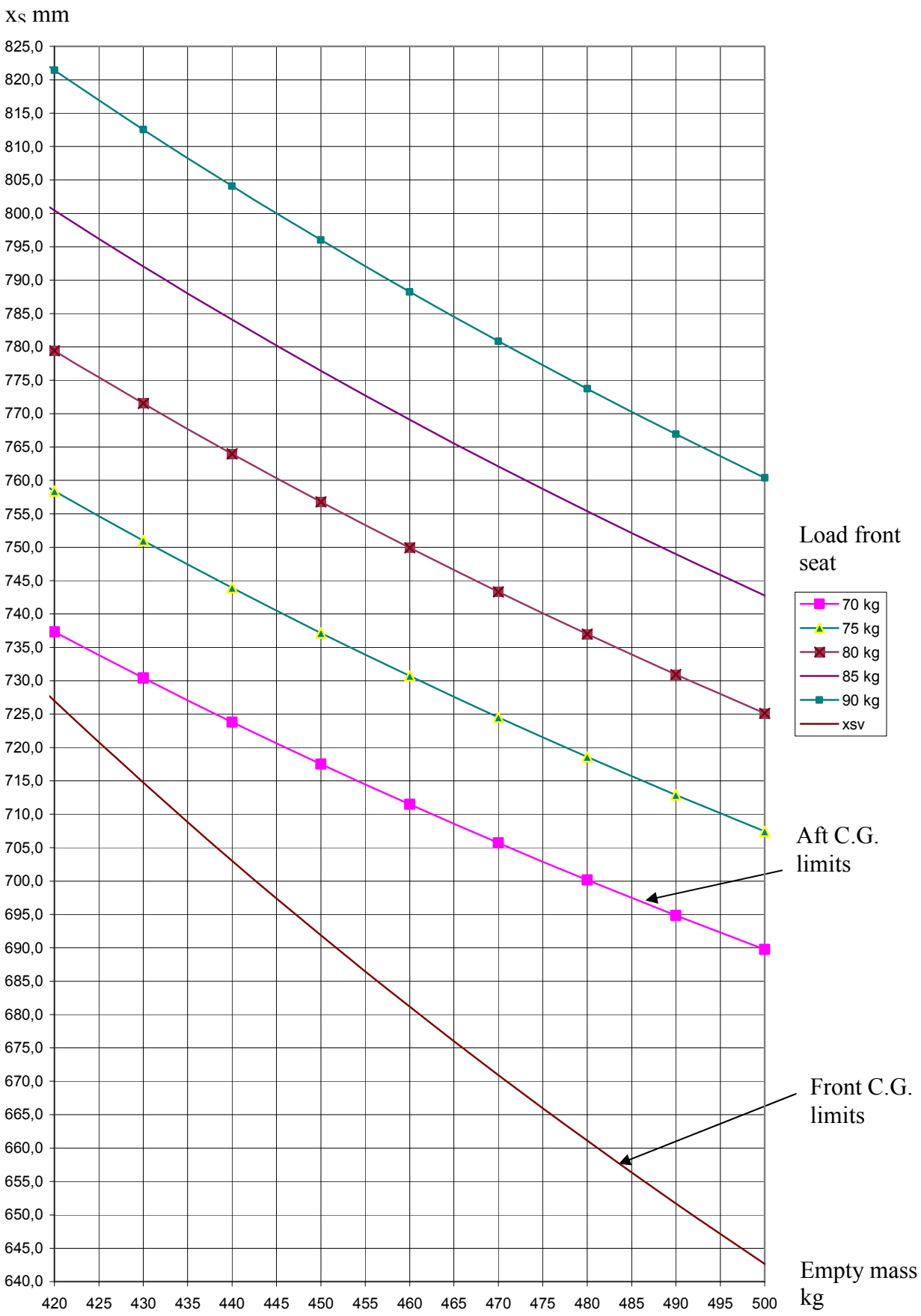
Weighing without battery in the fin, without waterballast and without fuel.

Weighing with powerplant installed and retracted.

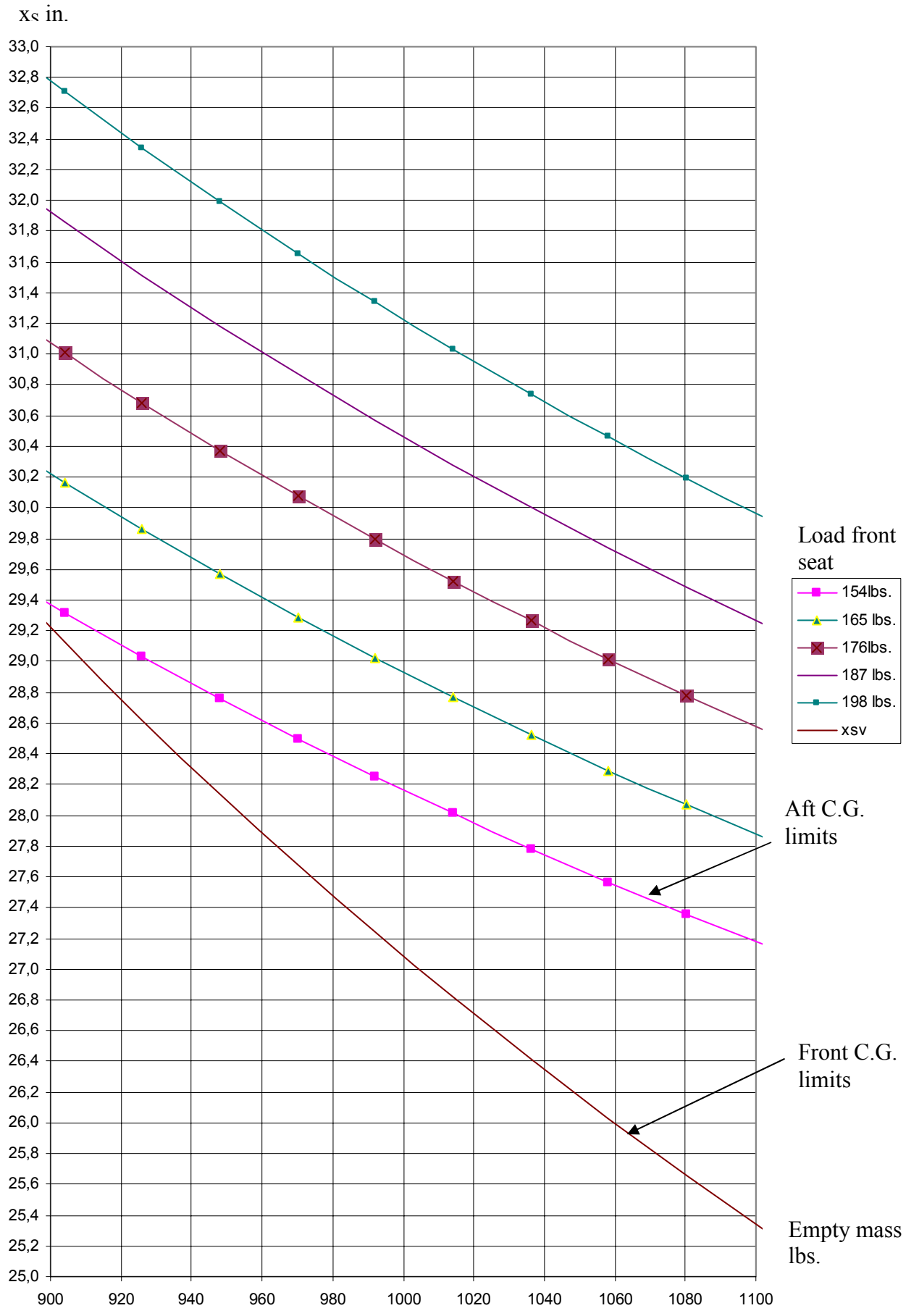
Empty weight C.G. limits with powerplant installed British, US



6.8.9.2 Empty weight C.G. limits with powerplant removed

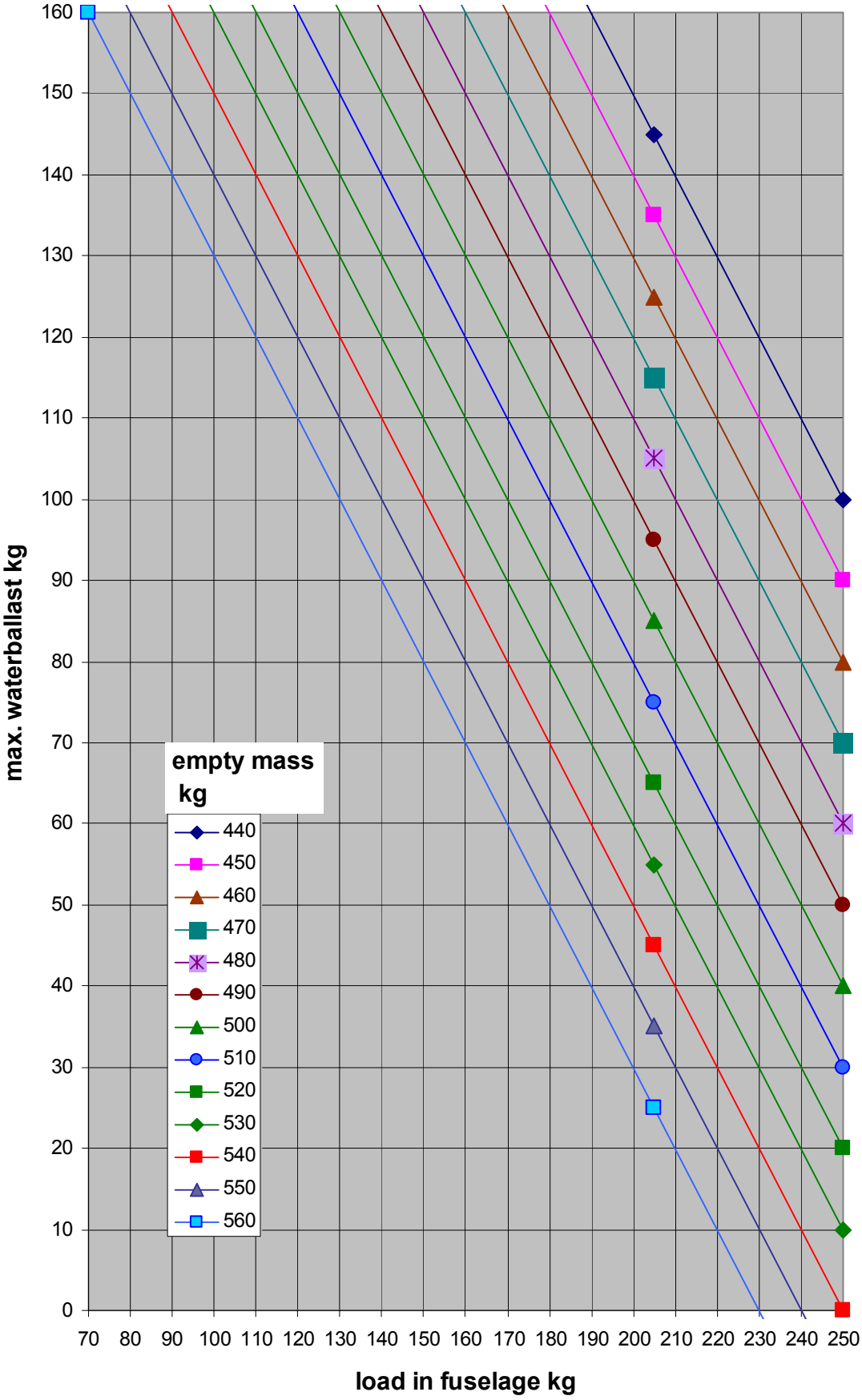


Empty weight C.G. limits with powerplant removed British, US



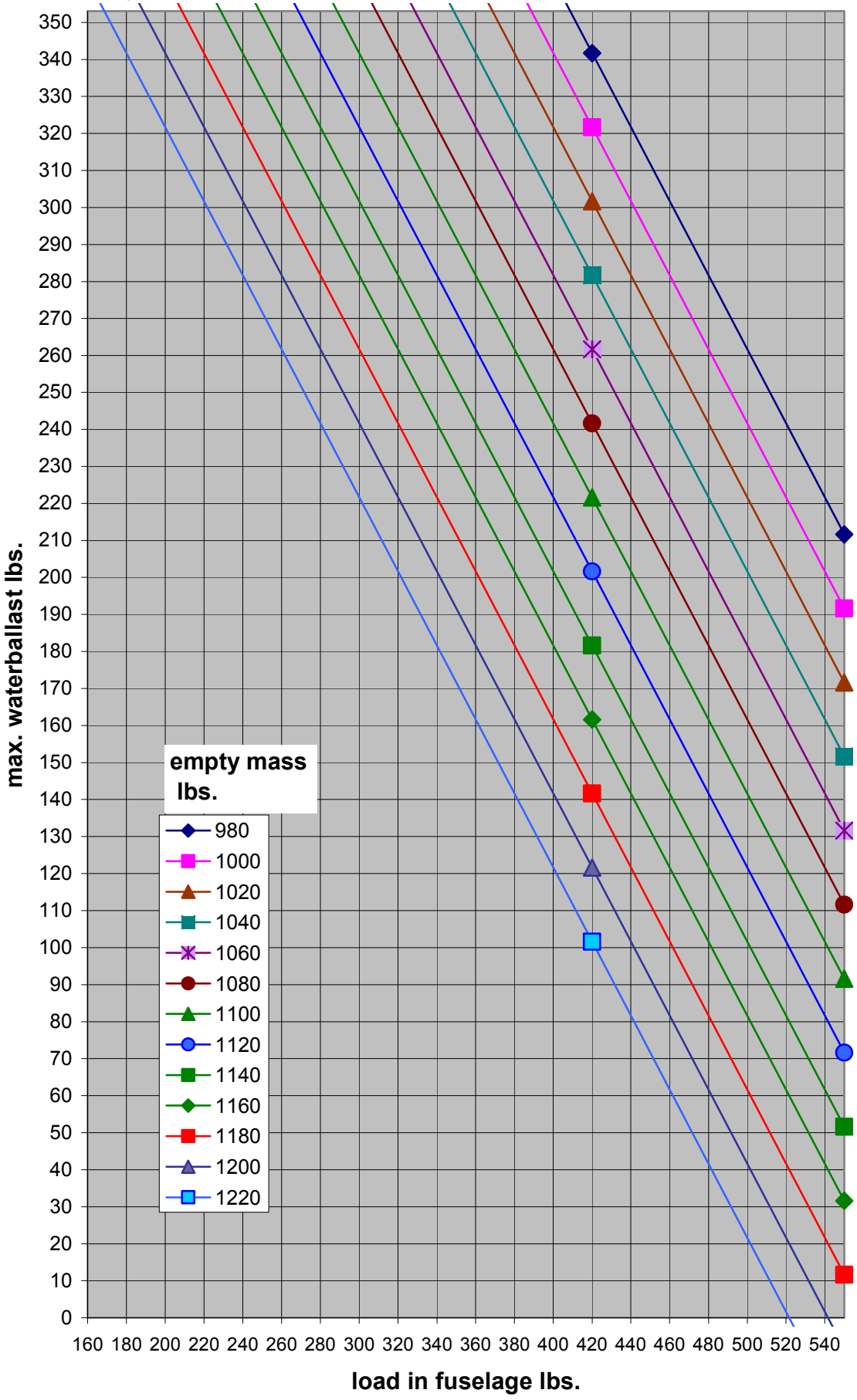
6.8.10 DG-1000 ballast chart (for 6.8.5)

To determine the max. allowable waterballast in the wing tanks for max. take-off weight 790 kg



DG-1000 ballast chart (for 6.8.5) British, US

To determine the max. allowable waterballast in the wing tanks for max. take-off weight 1742 lbs.



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:

Item	mass		C.G. behind datum		moment	
	kg	lbs.	m	ft.	kg×m	ft.×lbs.
aircraft empty	530	1168.4	0.742	2.43	393.26	2844.5
front Pilot	105	231.5	-1.336	-4.38	-140.28	-1014.7
rear pilot	105	231.5	-0.273	-0.90	-28.67	-207.3
fuel	20	44.1	0.369	1.21	7.38	53.4
fin ballast	12	26.5	5.400	17.72	64.80	468.7
fin battery	5.5	12.1	5.340	17.52	29.37	212.4
Total	**777.5**	**1714.1**	**0.419**	**1.38**	325.87	2357.0

The limits of the in-flight C.G should not be exceeded:
Engine installed: 0.320m (12.6 in.) – 0.440m (17.32 in.)
Engine removed: 0.200 m (7.87 in.) – 0.440m (17.32 in.)

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

Pilot: The C.G. position is dependent on the pilot's 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_E = empty mass X_{SE} = empty C.G.
M_P = pilot mass

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		Pilot C.G. lever arm							
		Front cockpit				Rear cockpit			
		v		h		v		h	
[kg]	(lbs.)	[m]	[in.]	[m]	[in.]	[m]	[in.]	[m]	[in.]
110	243	-1.388	-54.65	-1.335	-52.56	-0.317	-12.48	-0.272	-10.71
105	231	-1.390	-54.72	-1.336	-52.60	-0.318	-12.52	-0.273	-10.75
100	220	-1.391	-54.76	-1.337	-52.64	-0.319	-12.56	-0.274	-10.79
95	209	-1.392	-54.80	-1.338	-52.68	-0.320	-12.60	-0.275	-10.83
90	198	-1.393	-54.84	-1.340	-52.76	-0.321	-12.64	-0.276	-10.87
85	187	-1.395	-54.92	-1.341	-52.80	-0.323	-12.72	-0.277	-10.91
80	176	-1.396	-54.96	-1.342	-52.83	-0.324	-12.76	-0.278	-10.94
75	165	-1.397	-55.00	-1.343	-52.87	-0.325	-12.80	-0.279	-10.98
70	154	-1.399	-55.08	-1.344	-52.91	-0.326	-12.83	-0.280	-11.02
65	143	-1.400	-55.12	-1.345	-52.95	-0.328	-12.91	-0.281	-11.06
60	132	-1.401	-55.16	-1.346	-52.99	-0.329	-12.95	-0.282	-11.10
55	121	-1.402	-55.20	-1.347	-53.03	-0.330	-12.99	-0.283	-11.14

Further C.G. positions:

Item	**C.G. positions**	
	m	**in.**
Baggage and battery in baggage compartment	0.270	10.63
Water ballst in the wings	0.206	8.11
Ballast box in the fin (see section 6.8.7)	5.400	212.60
Instruments in front panel	-1.910	-75.20
Instruments in rear panel	-0.740	-29.13
Removable ballast (in front cockpit, Option, see section 7.17.1)	-1.960	-77.17
Battery in fin (Option see section 6.8.4)	5.340	210.24
Powerplant (see section 4.6)	1.261	49.65
Fuel tank	0.425	16.73

C.G. Shift due to extension of the engine

XS2 = XS1 – 3.8/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-1000M is a two-place high performance motorglider 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, Carbonfibre reinforcement in engine bay area

Canopy

Two canopies hinged at the right hand fuselage side.
Canopy transparencies made from Plexiglas clear 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
or	red	RAL 3020
or	blue	RAL 5012
or	green	RAL 6001

18) Water ballast dump handles - silver
Rotate backward to dump.

upper handle	= right wingtank
lower handle	= left wingtank
forward	= valve closed
into the cockpit	= valve open

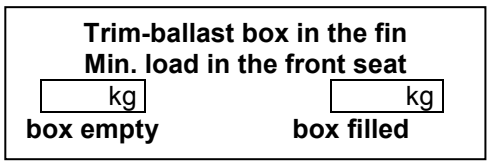
19) Push to talk button (Option) (placard only if installed in the instrument panel)

20) 12 V socket for charging the batteries and socket for headset (Option), front and rear cockpit.

21) Adjustment strap for the rear seat shell (to be operated on the ground)

22) Selector switch for additional batteries (Option),
up = internal battery
centre position = off
down = additional batteries

23) Control light for the trim ballast box in the fin:
The 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.



A switch will be operated by the locking pin of the ballast box cover.
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.

34) DEI-NT in the rear cockpit 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 automatically.
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 flying with passenger 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 clockwise 90 °.

35) Emergency switch to switch over the engine control from the normal to the emergency system - red in the front instrument panel

up	**normal**	normal engine control via ECU
down	**emergency**	engine control via the emergency system

Note: In the emergency mode not all engine data will be displayed on the DEI-NT.

36) Option: Emergency switch to switch over the engine control from the normal to the emergency system - red in the rear instrument panel

up	**normal**	normal engine control via ECU
down	**emergency**	engine control via the emergency system

If one of the emergency switches is switched to **emergency** the engine control will be switched over to the emergency system.
For normal operation both switches must be in the **normal** position.

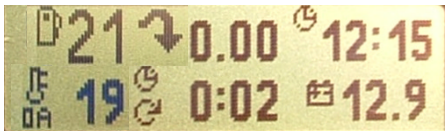
Caution: For flying with passengers etc. it is necessary to secure the emergency switch in the rear cockpit with the securing plate. The securing plate is equipped with a quarter turn lock which must be operated with a screw driver.
For storage you may install the securing plate turned anti-clockwise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

37) Fuse for the main battery 80 A in a recess below the carpets.

38) Not effective

7.4.1.1 Gliding screen

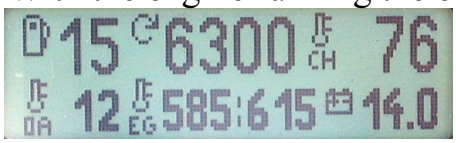
- Upper centre: Stall factor, see set up menu.
- Upper right: Time
- Lower centre: engine time for this flight



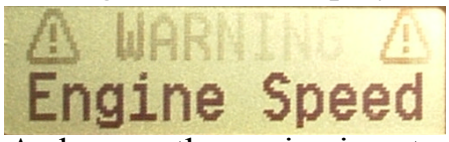
7.4.1.2 Powered flight screen

- Upper centre:

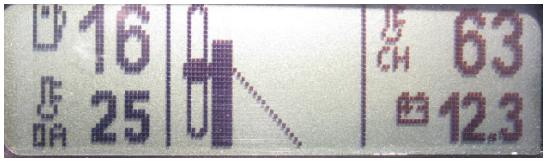
a) With the engine running the engine RPM will be displayed.



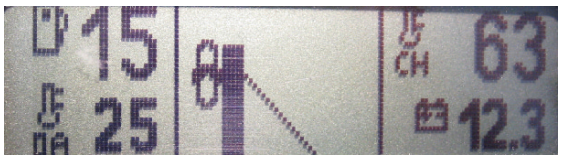
When exceeding the max. engine RPM the message "Engine Speed"will be displayed and the “Warning“ symbol will blink, after verifying this message the RPM display is blinking.



b) As long as the engine is not running symbols showing the position of the powerplant will be displayed. In addition if the powerplant is moving, an arrow will be displayed showing if the powerplant is being retracted or extended (not when moving the powerplant via the manual switch). As soon as the powerplant is completely retracted (limit switch must be activated) the screen changes to the gliding screen. .
In case the propeller is not in the position for retraction a short propeller (side view) will be displayed. In position for retraction a long propeller will be displayed.



powerplant extended,
propeller in position for retraction



propeller not in position for retraction

powerplant in position propeller stopper extended
propeller not in position for retraction

propeller in position for retraction

7.13 Powerplant/fuel system

Powerplant see diagram 13 MM.

7.13.1 Engine

1. Type: See section 2.4.
2. The engine is mounted flexible to the propeller mast for vibration insulation.
3. Battery ignition with both normal and emergency systems.
4. Normal system: The engine is equipped with an electronic fuel injection system.
   The engine control unit (ECU) controls the amount of fuel to be injected (1 injection valve per cylinder) in relation to the engine operational conditions and the flight altitude. The ECU controls the ignition coils of the dual ignition system.
5. Emergency system: In case the normal system fails an emergency system may be activated via a switch in the front instrument panel.
   The emergency system is a simplified ECU which controls the amount of fuel to be injected (1 injection valve per cylinder) only in relation to the engine speed. The emergency system controls the ignition coils of the dual ignition system (same coils as for the normal system). The emergency system has its own injection valves and its own RPM sensor which gets its impulses from notches at the starter ring gear.

Note: The emergency system is designed for engine operation with max. power output as correlated to the throttle setting.
It won't work at conditions with throttle nearly closed e.g. cruise configuration or starting the engine, see section 3.15.

7.13.2 Propeller

Type: See section 2.4.

7.13.3 Reduction gear

Reduction gear with 5 high-tech V-belts. Reduction ratio approx. 1:2.8

7.13.4 Extension - retraction mechanism

System see diagrams 25 and 26 MM.
Electric spindle drive assisted by a gas-strut.
The opening and closing of the engine bay doors is automatic (see diagram 17).

7.13.5 Coolant system

System see diagram 14 MM.
Coolant pump: Electric pump, controlled via the ignition switch, installed at the engine.

7.13.6 Fuel system

System see diagram 16 MM.

7.13.6.1 Fuselage tank

40 l (106 US gal.) useable amount of fuel.
Two electric float gauges are installed in the tank to allow an indication which is almost independent from the pitch angle.
A switch located on top of the tank cuts off the electric power for the electric refuelling pump as soon as the tank is full.

7.13.6.2 Fuel pumps

1. Normal system: Electric pump, controlled via an automatic system in the control unit, installed in the fuselage centre section.
2. Emergency system: Electric pump, controlled via the ignition switch, installed in the fuselage centre section, in parallel to the pump of the normal system.
3. A refuelling pump is installed in the fuselage centre section. The refuelling hose with connector is located in the baggage compartment. The operating switch is mounted in the main bulkhead (rear cockpit left hand side).

7.14 Electrical system

See wiring plan 10E202.

7.14.1 On-board battery

A sealed maintenance free battery 12V/17Ah is installed in the foot of the rear instrument panel in the rear cockpit.
A fuse (80A) is installed in the positive wire behind the foot of the instrument panel in a recess in the cockpit floor under the carpet..
The engine is 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 (Option)

see section 7.17.6

7.14.4 All batteries

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 part no. Z 08.

7.14.5 Wiring

All current - carrying wiring confirms to aeronautical specifications.

7.14.6 Powerplant control and fuses

7.14.6.1 DEI-NT and control unit

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

7.14.6.2 ECU and emergency system

The engine control unit (ECU) and the emergency system see section 7.13.1 are separate units which communicate with the control unit.

The control unit, the ECU and the emergency system are mounted in the compartment behind the wing spar connection.

Note: The powerplant control see section 7.14.5.1, the ECU, the emergency system, the ignition system, the fuel pumps of normal and emergency system, the coolant pump and both DEI's receive their electrical power in addition to the battery directly from the generator at the engine. So in case of a failure of the battery or when switching off the main switch the engine is able to continue running.

7.14.7 Electrically operated landing gear

Wiring see wiring plan 10E4 enclosed to the maintenance manual.

Fuses:
The electrically operated landing gear is protected by resettable fuse in the landing gear control unit.

Landing gear warning:
A landing gear warning device is integrated into the system. Warning is via the DEI-NT see section 7.4.5.

7.15 Pitot and static system

see diagram 11 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.

Probe (PC) for the stall warning device below the fuselage nose.

Additional holder for a TE-probe or a Multiprobe in the fin is to operate variometer and flight computer systems. To preserve the seals inside the holder, the end of the probe should be greased with e.g. Vaseline from time to time.

7.16 Canopies

To jettison the canopies in flight see section 3.2.

Removing a canopy:

Open the canopy, detach the retaining cable of the rear canopy and 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.

Checking the canopy emergency release system:

a) Check with open front canopy if the gas-strut can be disengaged from their ball fittings (from canopy and from fuselage). Grease the ball fittings, also of the gas strut of the rear canopy.

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.

7.17.5 Battery in the baggage compartment with battery selector switch

An additional battery Z73 12V/7Ah with holder Z72 or Z01 12V/10Ah with holder Z200 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 with indicator 5 x 25 medium slow / 4 A.

7.17.6 Battery in the fin

A battery may be installed in the fin.
Section 4.2.5 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.

8.3 Alterations or repairs

It is essential that the responsible airworthiness authority be contacted prior to any alterations, to ensure that the airworthiness of the motorglider is not impaired.
It is prohibited to perform the alterations without approval of the airworthiness authority. The manufacturer will not be liable for the alteration or for damages resulting from changes in the characteristics of the aircraft due to alteration. So it is strongly recommended to execute no alterations which are not approved by the aircraft manufacturer.
External loads such as external camera installations are to be regarded as alterations! Repair instructions can be found in the DG-1000 repair manual. No repairs should be carried out without referring to the manual.

8.4 Tie Down, Parking

Run textile ropes or straps over the wing tips inboard of the winglets for tie down.
Alternatively you may use the holes in the wing tip wheel housings to install the ropes.
The fuselage should be tied down just ahead of the fin.

Water ballast can be left in the wings for a few days only, but not when there is the possibility of freezing! On sunny days the cockpit should be closed and covered.

Caution: Longer parking with exposure to sun and humidity will cause premature ageing of the external surfaces of your motorglider.