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T. O. NO. 09-40CA-1

PILOT'S FLIGHT OPERATING
INSTRUCTIONS

FOR

ARMY MODEL
CG-4A GLIDER

BRITISH MODEL
HADRIAN

NOTE: This Technical Order replaces T. O. No. 09-40CA-1 dated 31 December 1942.

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RESTRICTED
T. O. No. 09-40CA-1

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LIST OF REVISED PAGES ISSUED

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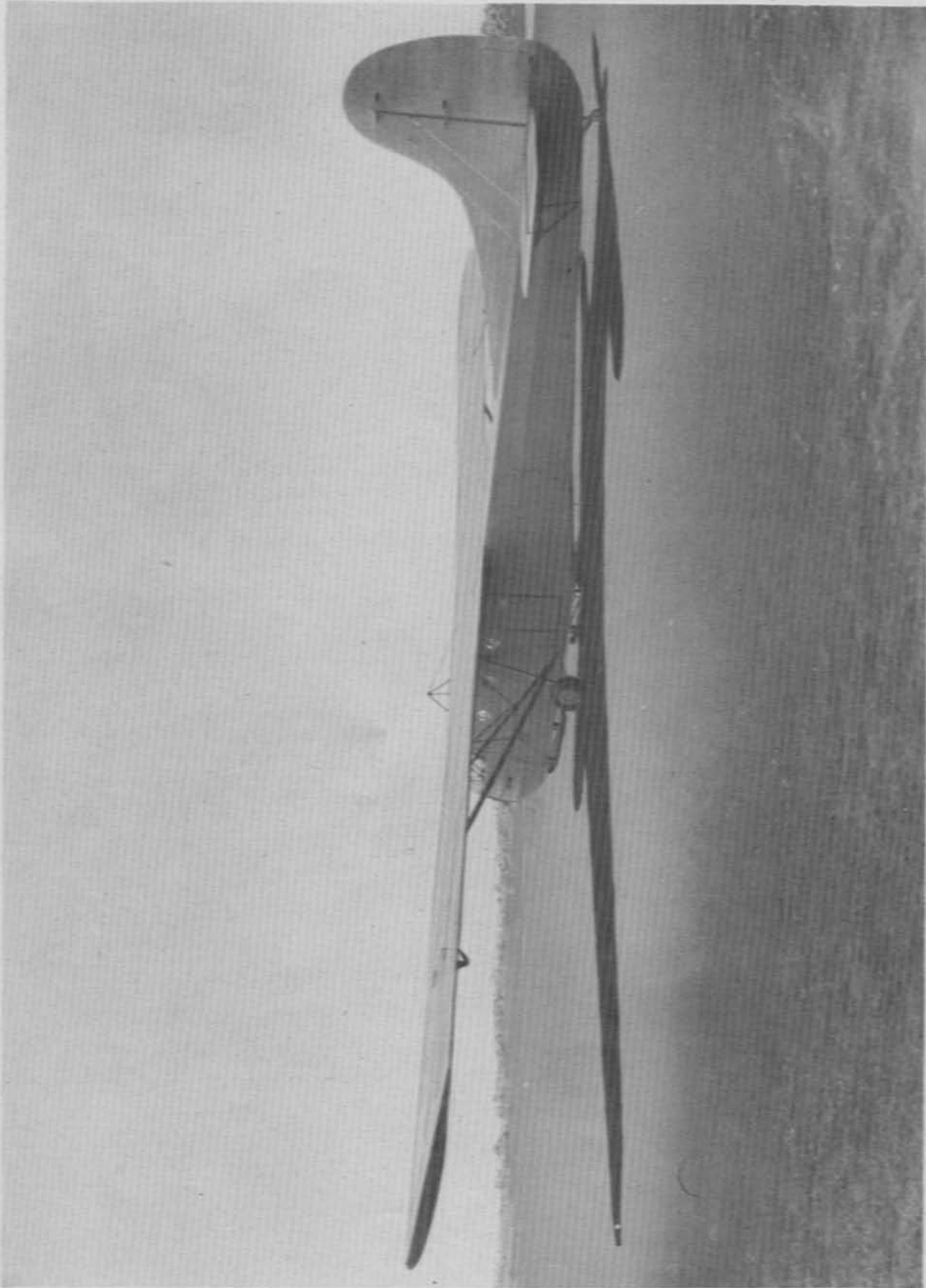


Figure 1—Three Quarter Rear—Left

SECTION I DESCRIPTION AND OPERATION

1. GENERAL.

The model CG-4A glider is a 15-place high wing land monoplane built in accordance with the Army Air Forces Specification No. 1025-2. It has a fabric-covered steel tube fuselage, and a 2-spar, plywood to the rear spar, fabric-covered wing.

2. WING.

a. GENERAL DESCRIPTION.

(1) High wing of 2-spar wooden construction, plywood covering to the rear spar, and fabric-covered throughout. It is externally braced by metal struts with fabric fairing. The wing has a span of 83 feet 8 inches and an area of 851.5 square feet.

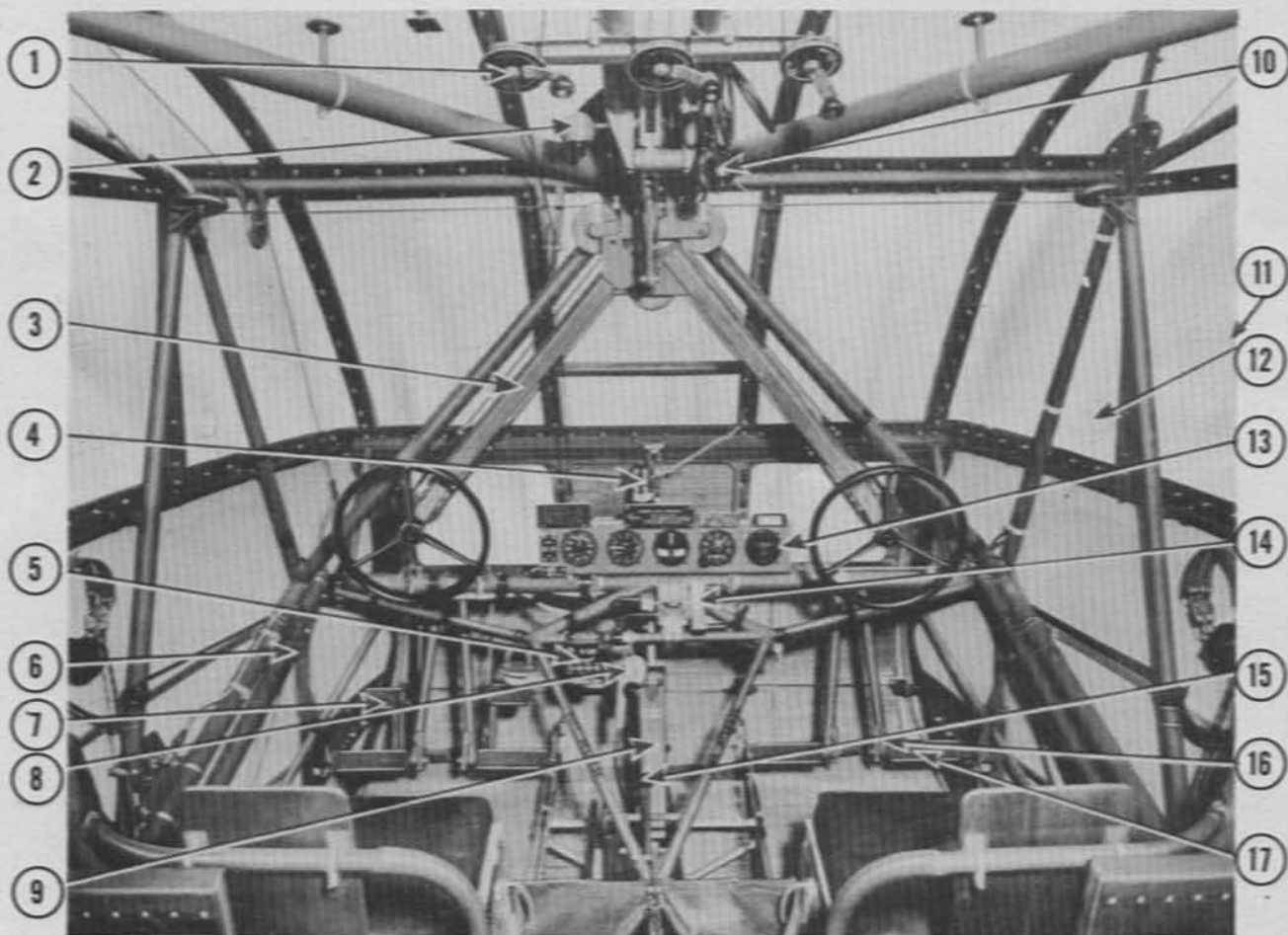


Figure 2—Cockpit and Flying Controls

- | | |
|----------------------------------|----------------------------|
| 1. Tab Controls | 10. Cockpit Light |
| 2. Tow Release | 11. Sliding Windows |
| 3. Dual Control Column | 12. Ventilators |
| 4. Fuse Panel | 13. Instrument Panel |
| 5. Recognition Light Control Box | 14. Interphone Jack Box |
| 6. Spoiler Control Handle | 15. Nose Lock Release |
| 7. Brake Pedals | 16. Pedal Adjustment Lever |
| 8. Interphone Microphone | 17. Rudder Pedals |
| 9. Load Adjuster | |

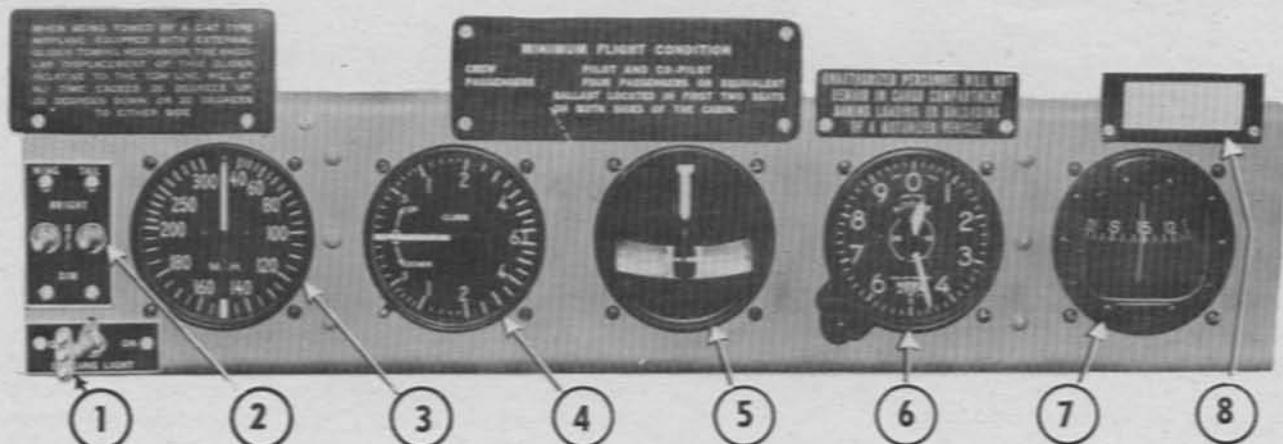


Figure 3—Instrument Panel

- | | |
|----------------------------|------------------------------|
| 1. Landing Light Switch | 5. Bank and Turn Indicator |
| 2. Navigation Light Switch | 6. Altimeter |
| 3. Airspeed Indicator | 7. Compass |
| 4. Rate of Climb Indicator | 8. Compass Compensation Card |

3. EMPENNAGE.

a. GENERAL DESCRIPTION.

(1) All tail surfaces are of wood and plywood construction with wooden leading edge and fabric covering.

(2) Trim tabs are provided for both elevator and rudder.

4. FUSELAGE.

GENERAL DESCRIPTION.—The fuselage is of welded steel tube construction with fairings of wooden sections supporting the fabric covering.

5. TAIL WHEEL.

The tail wheel is nonsteerable. In tactical operations, where it is necessary to tow or retrieve the glider over rough terrain, soft dirt, or sand, the tail wheel will be secured in a tow dolly and the glider towed backwards. An adequate tow dolly may be fabricated from a serviceable jettisonable gear. Only under extreme emergency should the glider be towed by attaching a towline to the tow gear release mechanism.

6. UNDERCARRIAGE.

a. The design incorporates two different types of undercarriages, the first of which is an articulated tripod consisting of a vee strut in an approximately horizontal plane and a spring oleo shock absorber in approximately the vertical plane. This type gear equipped with hydraulic brakes and pneumatic tires is referred to as the "training gear."

b. The second type undercarriage is a "tactical" jettisonable gear which can be jettisoned after take-off and consists of a reinforced axle with 27-inch wheel and tire assembly, without brakes. When the jettison gear is used, the landing gear release mechanism will

be checked thoroughly for operation two or three times prior to take-off.

7. CONTROLS (FLIGHT).

a. The central control system consists of dual controls. Control of ailerons and elevators is obtained by two wheels mounted on an inverted "vee" column, hinged at the top of the cockpit. The right-hand column may be removed if desired in which case the left-hand column may be swung over from the pilot to the copilot. Individual rudder pedals are provided which are adjustable fore and aft. The pilot's pedals are equipped with the conventional toe brakes.

b. Trim tabs are actuated by cranks above the pilot's head at the center of the compartment. A round plate behind each trim tab crank handle gives full direction for trimming the glider about the three flight axes. It is inadvisable for the glider pilot to look at the trim tab controls to determine the direction to turn crank for desired trim, during flight. The direction the trim tab is turned should be memorized by the pilot.

c. **JETTISONABLE (TACTICAL) GEAR CONTROLS.**—An overhead lever is provided to release the tactical gear.

d. **SPOILER CONTROLS.**—At the pilot's left and the copilot's right are the spoiler levers which, when pulled, extend the spoilers. These spoilers decrease lift, increase the gliding angle, and raise the sinking speed.

e. **NOSE RELEASE CONTROL.**—Directly between the pilot and copilot is located the nose release lever, which is wired closed during training or while carrying troops. This lever is used to release two latches located in the lower rear corners of the pilot's compartment. It is operated only when necessary to load or unload equipment which cannot pass through the doors located at the rear of the cargo compartment.

8. FUSELAGE EQUIPMENT.

a. GENERAL DESCRIPTION.—Fuselage equipment consists of seats, safety belts, tie-down fittings, nose lifting mechanism, flight report holder, data case, fire extinguisher, first-aid kits and mooring kit.

(1) COCKPIT SEATS.—The cockpit seats are non-adjustable; that is, are mounted directly to the fuselage structure.

(2) When used as a troop transport, removable wooden benches are fastened longitudinally in the fuselage.

(3) D-rings are provided at the lower ends of all vertical tubing members along the sides of the cargo compartment to provide for the lashing down of the cargo load.

(4) The nose lifting mechanism is used to automatically raise the nose (pilots' compartment) of the glider, by means of a $\frac{1}{4}$ -ton reconnaissance car, located in the cargo compartment. The pilot or copilot must pull the nose release lever, and both these men must be out of the pilots' compartment before the nose lifting mechanism can be operated. T. O. No. 09-40CA-5 covers the loading and unloading of a "jeep."

9. EMERGENCY EXIT.

a. Emergency doors are located halfway between cockpit and entrance doors.

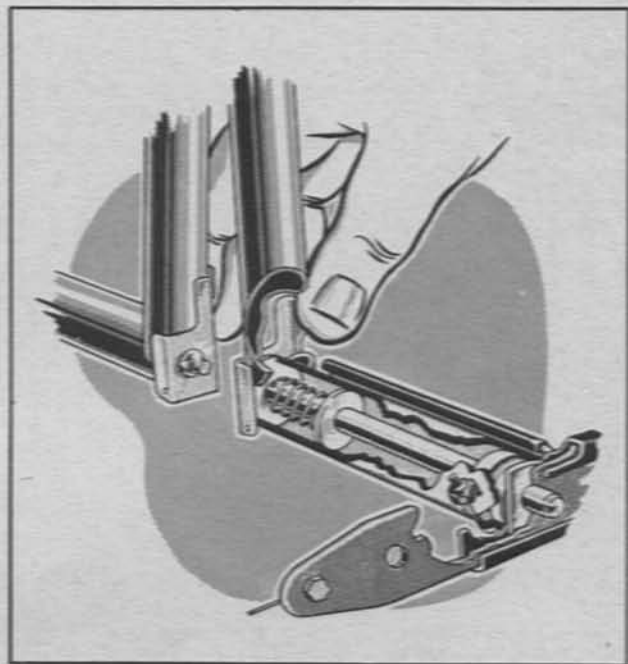


Figure 4—Pedal Adjustment

b. Make absolutely certain that placard, with complete instructions on operation of emergency doors, located in cabin of glider, is carefully read.

SECTION II GENERAL INSTRUCTIONS

1. PREFLIGHT INSPECTION.

a. GENERAL.—The pilot shall satisfy himself that the following inspection has been made and everything is satisfactory before take-off.

(1) All flight instruments will be inspected in accordance with the General Inspection for all airplanes.

(2) Before all flights, check that lock handles for the nose section at the front of the cargo compartment are definitely engaged.

(3) Check security of tail brace struts and wires. Check wires for tension.

(4) Check tactical landing gear to make sure gear is locked in place, and that release lever will actuate both hooks, locking gear in place.

(5) Check to see that spoilers are in "CLOSED" position.

(6) Try all controls to make sure that external locks have been removed and full movement is unrestricted.

(7) Check tow release controls on both glider

and tow plane as well as tow release attachment and metering pins.

(8) Set altimeter to read the same as towship altimeter at sea level altitude, if on a cross country mission. If operating and landing on the same airport, set altimeter at zero, or ground level.

(9) If radio communication is used, check radio with towplane. If intercommunication is installed, check with towplane and other glider, if on double tow.

(10) Check the loading of the glider for the "CENTER OF GRAVITY" position. In minimum flying condition (pilot and copilot) 600 pounds of ballast should be provided.

2. FLIGHT INSTRUCTIONS.

a. Fasten safety belt.

b. Adjust ventilators for circulation of air in front cockpit.

c. TAKE-OFF.—Set trim tab controls to neutral marks. After towplane has started its run and when glider has attained take-off speed, the glider should be pulled off carefully, and maintained from then on



Figure 5—Showing Use of Deceleration Parachute

approximately 10 feet higher than the towplane. The pilot should attempt to keep the nose skids from touching the ground or runway on take-off. If this happens, hold the control column back to lighten the load on the skids as much as possible. When the glider is equipped with a jettisonable gear with parachute assembly, the gear should not be jettisoned until at least 400 feet of altitude is reached.

d. APPROACH AND LANDING.

(1) Spoilers may be utilized as desired to control gliding angle and sinking speed. Extreme caution should be exercised when using spoilers on the turn toward the landing strip. Spoilers should be applied with caution during the end of the landing approach, since full application results in a high sinking speed.

(2) The procedure for contacting the ground will be similar with all types of landing gear. If the landing gear has been jettisoned and landing is to be made on skids, it is desirable to land in a near level attitude, permitting all skids to touch simultaneously. However, little or no damage will result if landed in a nose-high, three-point attitude. After ground contact is made, pilot will have very little control of the glider but should attempt to keep it straight ahead by use of the rudder. Average stop on sod terrain will be approximately 50 yards.

(3) Most missions will be planned using the hydraulic training type landing gear. Contact will be made in a three-point attitude, whenever possible. With this gear brakes are available for slowing the glider or steering it on ground run. Should a short stop be necessary, pilot will apply full brakes, ease

control column forward until nose skids touch, then hold in a forward position with full brakes applied. On sod terrain a stop can be made in approximately 50 yards.

(4) If landing is made on the tactical jettisonable landing gear, a long roll can be expected. Contact with the ground will be identical to that used for the training type gear, and if a short run is desired, pilot will immediately push forward on control and attempt to stop by using nose skids.

(5) When the glider is used to carry the jeep, the nose latch should not be released until glider has come to a complete stop. When nose latch is released, pilot and copilot will immediately leave their seats and go out of the glider through the emergency exit door. When a jeep is carried with training type landing gear, it will be necessary to prop up the tail of the glider and hold the nose in contact with the ground before the unloading operation. After jeep has been unloaded the tail will be eased back to the ground to prevent damaging the "A" frame or tail cone. Only authorized personnel will remain in cargo section during the loading or unloading of a mechanized vehicle.

(6) TO OPERATE THE PARACHUTE. (For gliders equipped with deceleration parachutes only.)

Note

The parachute will not be operated until the glider has released the towline and is in free flight. The parachute should not be opened when free flight indicated air speed is under 75 or above 140 mph.

(a) Upon approach to the landing area the parachute can be opened to attain an increased rate of descent. This is accomplished by pulling the parachute opening handle which is located in the nose section immediately to the right of the center line of the glider. The parachute control handles are equipped with a safety device to prevent the release handle being pulled before the parachute opening handle.

(b) After the parachute has been opened the copilot should be prepared for a signal from the pilot to release the parachute from the glider should such action be necessary.

(c) When approach to the landing area is made at a low altitude and high rate of speed the parachute may be opened at glider indicated air speeds of 80 to 140 mph to reduce forward speed of the glider.

(d) When approach is made to the landing area at a high altitude the parachute may be opened at a maximum indicated air speed of 140 mph to obtain an increased rate of descent. The rate of deceleration and loss of altitude are dependent upon the velocity and attitude of the glider at the time the parachute is opened.

(e) The rate of descent as shown in table I can be expected while the parachute is opened. (See table I.)

Note

With a moderate pull up to level flying posi-

tion the glider can be decelerated from 150 to 75 mph glider indicated air speed in 30 seconds with a loss in altitude of approximately 500 feet.

(f) Because of the higher rate of descent when the parachute is used, additional care must be taken in flaring out the glider path when making contact with the ground. In training, the parachute should be released from the glider before the tail wheel touches the ground or just before the glider comes to a stop, so that the parachute is not damaged by being dragged over the ground.

TABLE I

Miles per Hour Indicated Air Speed	Feet per Minute With Parachute Open
150	4200
140	3600
130	3000
120	2500
110	2000
100	1500
90	1150
80	800
70	700

The above table is applicable at sea level. An addition in rate of descent of approximately 2 percent will be attained per 1000 feet above sea level.

SECTION III SPECIAL INSTRUCTIONS

1. LIMITATIONS OF FLYING AND FLYING CHARACTERISTICS.

Flying characteristics are dependent upon the towing airplane. The stalling speed of this ship fully loaded is approximately 60 mph indicated air speed.

Spinning is prohibited. If a spin inadvertently develops, attempt a normal recovery.

No acrobatics should be undertaken in this type of craft.

Do not exceed a diving speed of 150 mph indicated.

As elevator and rudder loads become quite heavy at high speeds, use trim tabs whenever possible.

2. EMERGENCY LANDING AT SEA.

a. PREPARATION FOR DITCHING

(1) Pilot warns crew as soon as he determines that ditching is necessary.

(2) Pilot instructs crew to jettison all doors and use bayonets to cut out exits in the roof or sides of the glider. (See figure 6.)

(3) Pilot instructs crew to throw all loose unnecessary equipment overboard.

(4) Pilot instructs crew to keep safety belts fastened until landing is accomplished.

(5) Copilot should knock out side windshield panel, unfasten parachute harness, make sure his safety belt is buckled, and then relieve the pilot of the controls so that he may accomplish the same.

b. DITCHING

(1) A tail-low landing should be made, flying the glider at minimum speed.

(2) In a wind below 25 mph velocity, land along the swell. In a wind about 25 mph velocity, land as near into the wind as possible and angle onto the upslope of the swell, according to conditions involved.

c. AFTER DITCHING

(1) The glider should be abandoned as shown in figure 7.

(2) All personnel should climb onto the wings of the glider as these sections will remain afloat for several hours. Precautions should be taken to prevent puncturing holes in the skin of the wing surfaces, as this will decrease the length of time the wing panels will remain afloat.

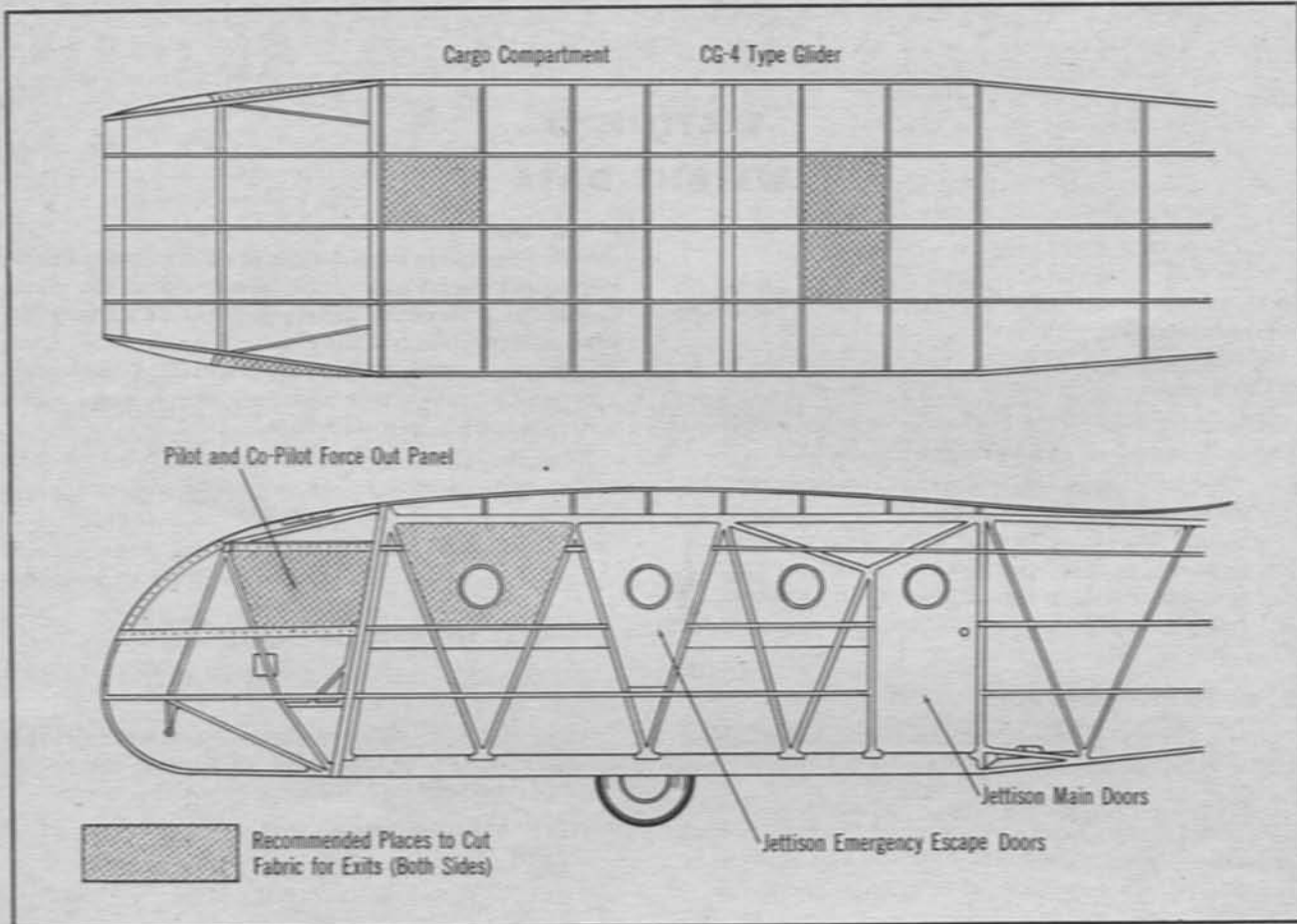


Figure 6—Emergency Exits

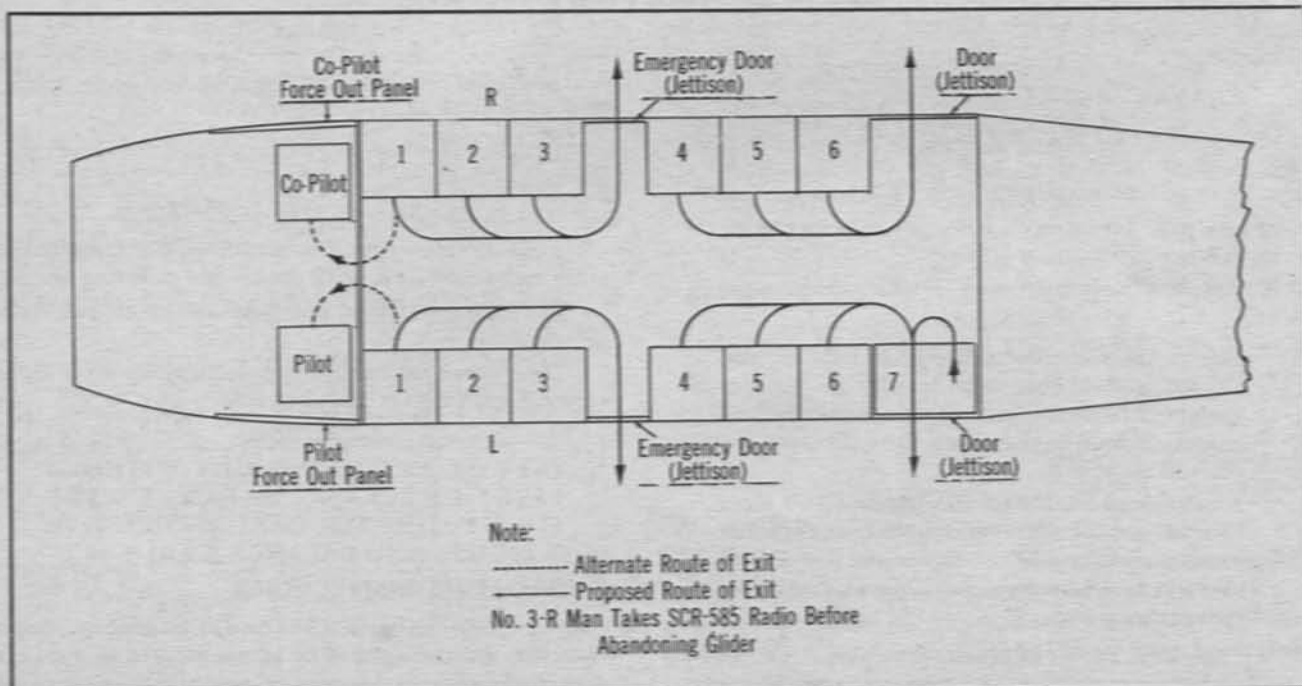


Figure 7—Method of Abandoning CG-4A Glider

SECTION IV WEIGHT DATA

1. WEIGHTS.

	<i>Jettisoned Gear</i>	<i>Training Gear</i>
Gross weight	7500 lb	7500 lb
Weight empty	3790 lb	3900 lb
Useful load	3710 lb	3600 lb
Wing loading	8.81 lb/sq ft	8.81 lb/sq ft

CAUTION

This glider must not be flown at less load than the following: pilot and copilot, four passengers or their equivalent weight located on the first two seats, each side, of the cargo compartment. For actual weight distribution in this glider, refer to the Handbook of Weight and Balance, AN 01-1-40.

2. ALTERNATE LOADING.

a. To reduce the possibility of overloading CG-4A gliders prior to towing, the following restrictions will be observed:

b. Any CG-4A glider gross weight condition which exceeds the design condition of 7,500 pounds is to be considered as an operational emergency measure.

c. The CG-4A glider is never to be flown at a greater gross weight than 9,000 pounds.

d. The maximum permissible indicated air speeds at various gross weights is to be in accordance with table I below.

TABLE I

<i>Glider Gross Weight</i>	<i>Maximum Permissible Calibrated Indicated Air Speed</i>	<i>Maximum Permissible Glider Indicated Air Speed</i>
7,500 lb	150 mph	158 mph
8,000 lb	143 mph	151 mph
8,500 lb	135 mph	143 mph
9,000 lb	128 mph	135 mph

Note

Due to the location of the pitot tube on the CG-4A glider nose section, the glider air-speed instrument indicates air speeds approximately 8 mph higher than the calibrated indicated air speed.

A calibrated indicated air speed of 150 mph should not be exceeded under any glider gross weight condition, due to the possibility that windshield panels may blow in, and other failures may occur.

e. The glider center of gravity is to be maintained between the limits of 25 to 33.5 percent m.a.c. However, with a center of gravity of 30 to 31 percent m.a.c., it

will be possible to keep the glider off the forward skids during the initial part of the take-off. With the glider loaded to emergency gross weights, satisfactory lateral, directional, and longitudinal control and trimming characteristics will be experienced. At the higher emergency gross weights, the glider will react somewhat sluggishly in towed flight.

f. Landing rolls of approximately 2,000 to 3,000 feet are to be expected at the higher emergency gross weights, even with full application of brakes.

g. Take-offs will be normal except for longer ground rolls and higher take-off speeds as the gross weight is increased.

3. SPECIAL LOADING INSTRUCTIONS.

a. TO LOAD THE ¼-TON TRUCK (JEEP). (Refer to T. O. No. 09-40CA-5.)

(1) Unlatch and raise nose section, pulling cable so that the door check slides back along the rod to hold the door fully open.

(2) Let down ramps.

(3) Back in with car.

(4) Engage cable at rear of car.

(5) Lower nose section and lock in position.

(6) Move car forward to place initial tension in rear cable.

(7) Depress the springs of car by placing the weight of four men on the front bumper and tie down to shackle (D-ring) fittings using ½-inch rope.

(8) Install wheel chocks.

(9) Lash the rear end of the jeep in the same manner as in (7) above.

b. TO LOAD THE 75 MM. HOWITZER.

(1) Push Howitzer into cargo compartment, in the same way as the jeep, with the muzzle pointing aft.

(2) Lash securely to prevent fore and aft and vertical motions.

(3) Locate ammunition in accordance with flight adjuster and lash securely in place.

CAUTION

DO NOT ATTEMPT FLIGHT WITHOUT FIRST CHECKING BALANCE WITH FLIGHT ADJUSTER. (SEE HANDBOOK OF WEIGHTS AND BALANCE AN 01-1-40.)

4. UNLOADING INSTRUCTIONS.

a. UNLOADING JEEP.—The design of the glider is such that unloading may be accomplished in a matter of seconds with proper cooperation and training of the crew. The sequence of unloading is as follows:

CAUTION

Do not release the nose until the glider is completely stopped.

(1) The pilot shall trip the down lock holding the nose section closed and the copilot shall slash the tie-down rope on the front of the jeep.

(2) At the same time two of the crew members shall slash the rear tie-down ropes and free the jeep.

(3) When the nose section is released, the copilot goes back to the driver's seat of the jeep and the pilot rides out on the jeep hood.

(4) The jeep driver shall then drive forward, thereby opening the nose section by means of the $\frac{1}{4}$ -inch cable attached to the tow hook of the jeep. (Ramps will fall into position automatically.)

(5) When nose section has been pulled to a horizontal position, a lanyard fixed to the structure shall trip the release mechanism and the structure will be held in this position by means of the automatic check attached to the cable.

b. UNLOADING 75 MM. GUN.

- (1) Release nose down locks.
- (2) Remove or cut lashings.
- (3) Raise nose section by hand and lower ramps.
- (4) Roll Howitzer out.

5. USEFUL LOAD WEIGHT DATA.**a. TROOP CARRIER.**

Crew.....	2 @ 240 lb	480
Passengers.....	13 @ 240 lb	3120
Seats, Packs and Safety Belts.....		109
Fixed Landing Gear.....		277
Miscellaneous.....		211
	Useful Load	4197

b. CARGO CARRIER—JEEP.

Crew.....	2 @ 240 lb	480
Passengers.....	4 @ 240 lb	960
Jeep Car.....		2320
Tie-down Ropes.....		30
Fixed Landing Gear.....		277
Miscellaneous.....		130
	Useful Load	4197

c. CARGO CARRIER—75 MM. HOWITZER.

Crew.....	2 @ 240 lb	480
Passengers.....	3 @ 240 lb	720
75 MM. Howitzer.....		2090
Ammunition (75 MM.) 18 Rounds.....		384
Tie-down Ropes.....		30
Fixed Landing Gear.....		277
Miscellaneous.....		216
	Useful Load	4197

Note

If jettisonable gear is dropped, increase miscellaneous load 277 lb; if carried, increase miscellaneous load 109 lb.

WARNING

Minimum flight condition is noted on instrument panel as follows:

Crew: Pilot and copilot.

Passengers: Four passengers or equivalent ballast located in first two seats on both sides of the cabin.

For the detailed weight of this ship, see AN 01-1-40.

When ballast is used, care must be taken to lash it securely to prevent shifting.

SECTION V**OPERATION OF COMMUNICATIONS EQUIPMENT****1. OPERATION OF COMMUNICATIONS EQUIPMENT.**

a. The glider is equipped with a Type AIA-1 Interphone system employing a tow rope having tied to it a 3 conductor insulated wire which is connected at the tow plane and glider.

b. Three headsets are provided, one each for pilot, copilot and crew chief.

c. One microphone is provided for the pilot.

d. Operation of interphone for contact between glider and towplane is elemental. To talk to the towplane, the large thumb button on the hand-held microphone is pressed. As long as connected, the interphone is in operation. As soon as the glider is released from the towplane, communication is severed.

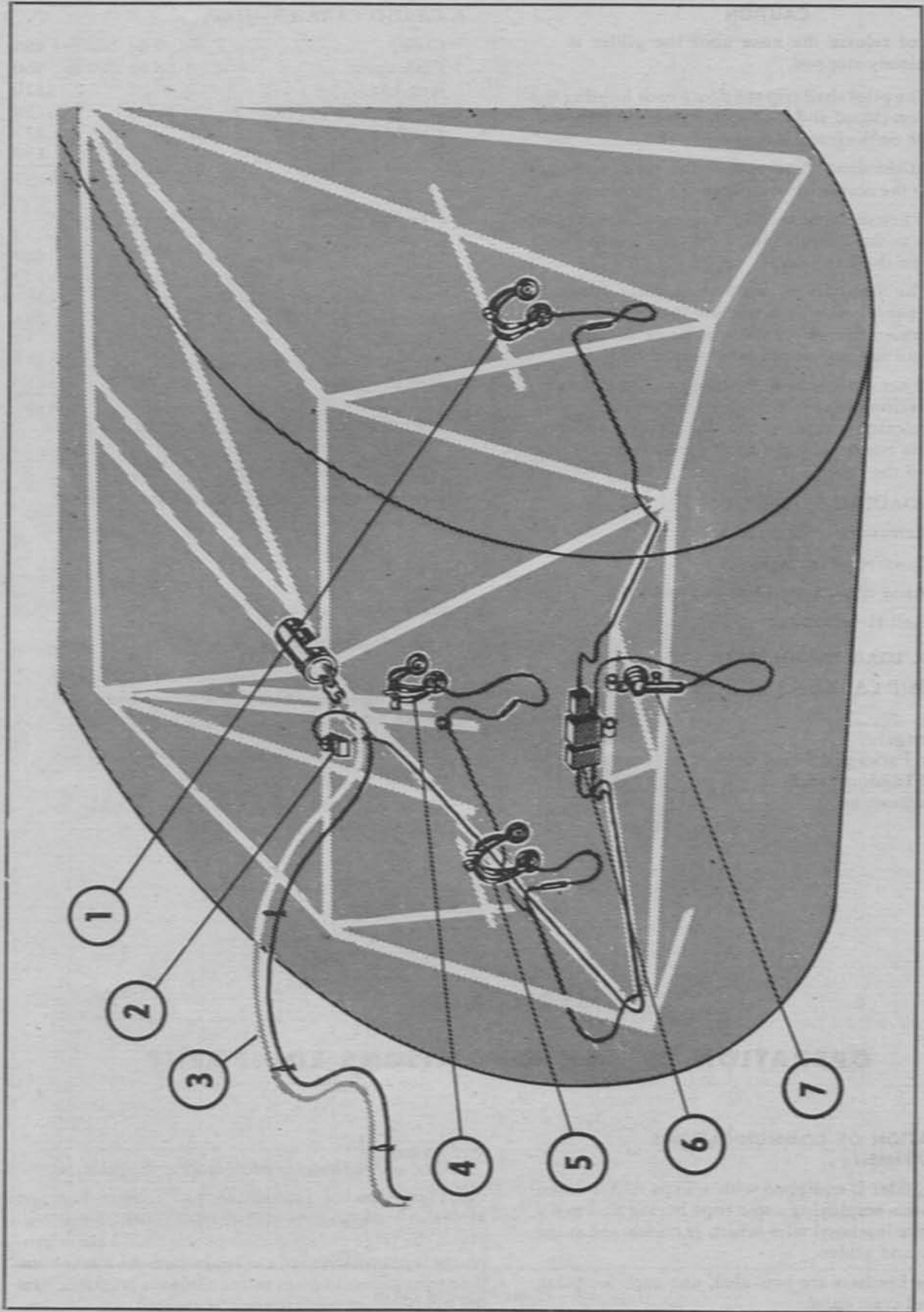


Figure 8—Interphone

- 1. Head Set—Pilot Conductor Table Connector
- 2. Tow Line Conductor Table
- 3. Head Set—Co-Pilot
- 4. Head Set—Crew chief
- 5. Head Set—Co-Pilot
- 6. Head Set Adapter
- 7. Microphone

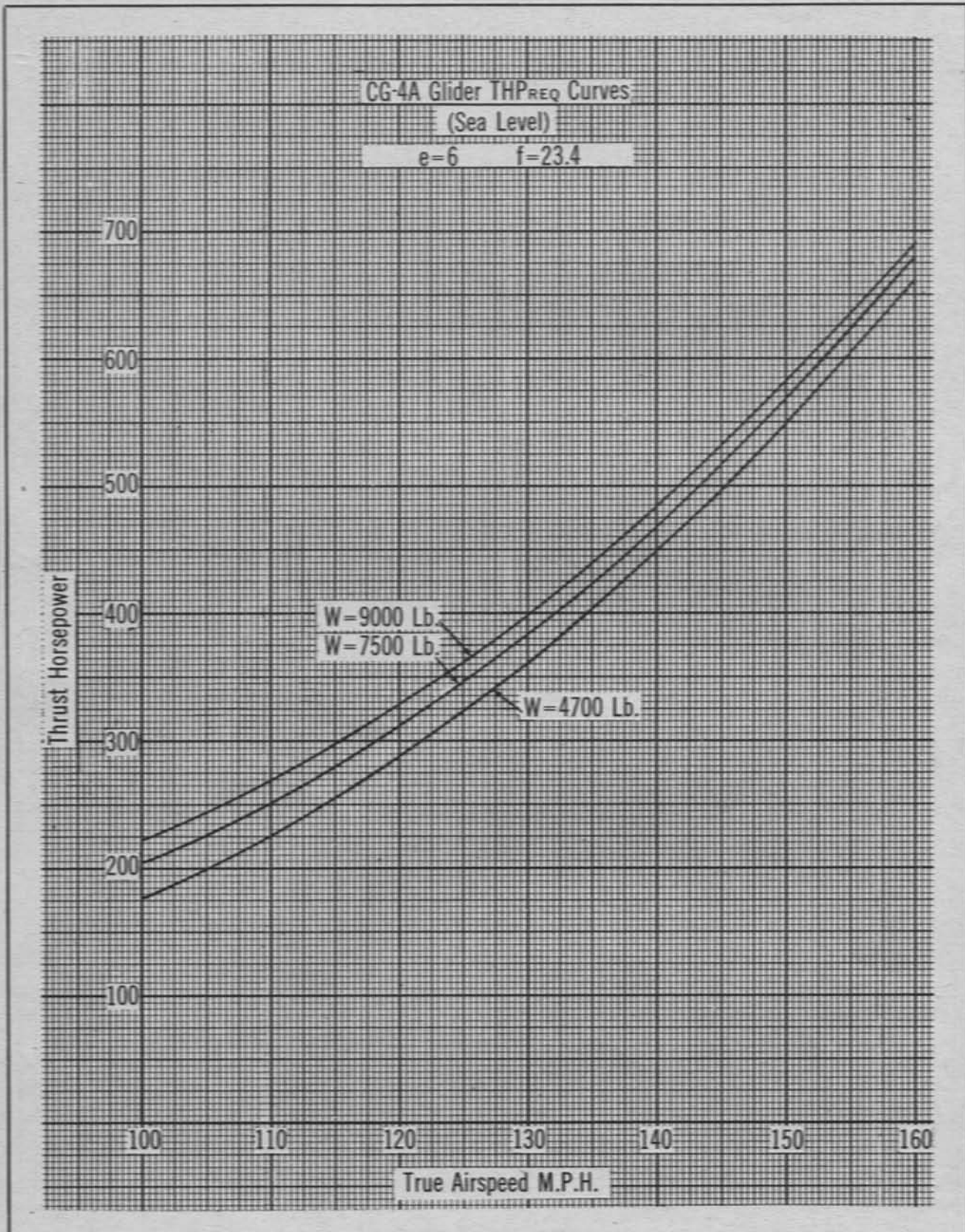


Figure 9—Power Required Curve