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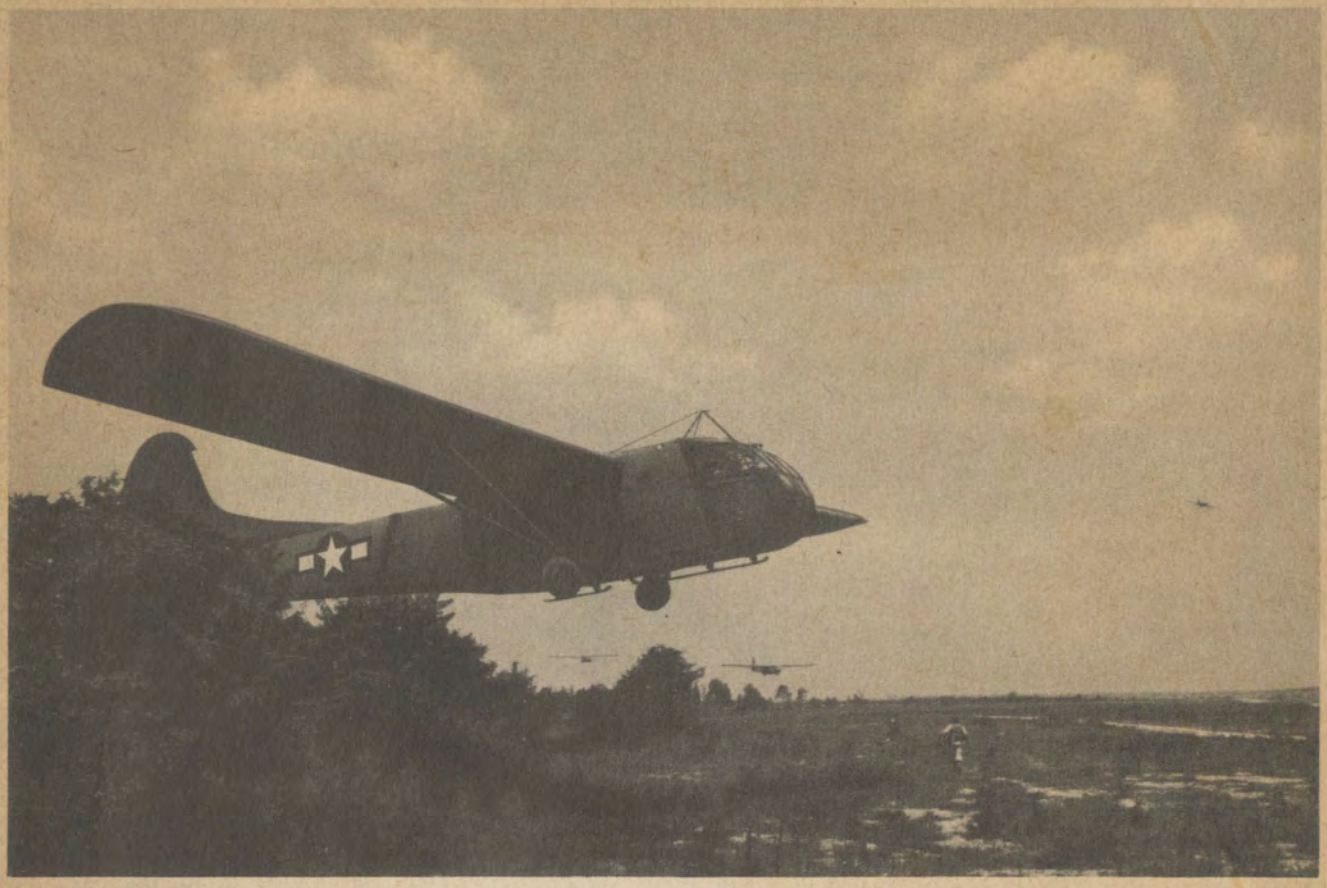

AIR FORCES MANUAL NO. 12

# Glider Flying Training

THIS MANUAL WILL NOT BE CARRIED INTO COMBAT OR INTO, OR OVER, ENEMY TERRITORY.

# Glider Flying Training

## Contents



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APRIL 1944

## Glider Flying Training
## Foreword—To the Glider Pilot

**1. GENERAL. a.** It was recently stated by General Officers of several of the Allied Nations, who witnessed large-scale glider maneuvers in North Carolina, that the American glider pilot is the best trained and most efficient glider pilot in the world.

**b.** On what was this statement based? Its basis was the accomplishment of a seemingly impossible job in a very short time. It was the fact that American glider pilots had proved that the glider can be used tactically in an offensive action. The statement was weighty in that these officers have full knowledge of the capabilities of glider pilots of other nations, friendly and inimical.

**c.** What does it mean to you, the glider pilot? It means that now, incontrovertibly, you have been assigned a top-notch, dramatic job in this war and that those planning the destiny of that job have a well-rooted faith in you. It means that your road as a member of the AAF is well paved ahead and that you know where it leads.

**2. PURPOSE.** This manual is written with the intent of giving glider personnel all the information necessary to the understanding of their duties, as students, in both Advanced Flying Training and Tactical Flying Training.

**NOTE: All glider pilot aviation students or glider pilots will be issued a copy of this manual by the Training Command or the Troop Carrier Command. These copies are to be retained in their permanent possession if a sufficient quantity is available; or turned in upon graduation or elimination from training. A detailed written examination on subjects covered herein will be passed prior to graduation from advanced flying school; and refresher examination will be passed prior to completion of the advanced tactical flying training course.**

**The Trainee or Glider Pilot to whom this manual has been issued in compliance with above should sign below.**

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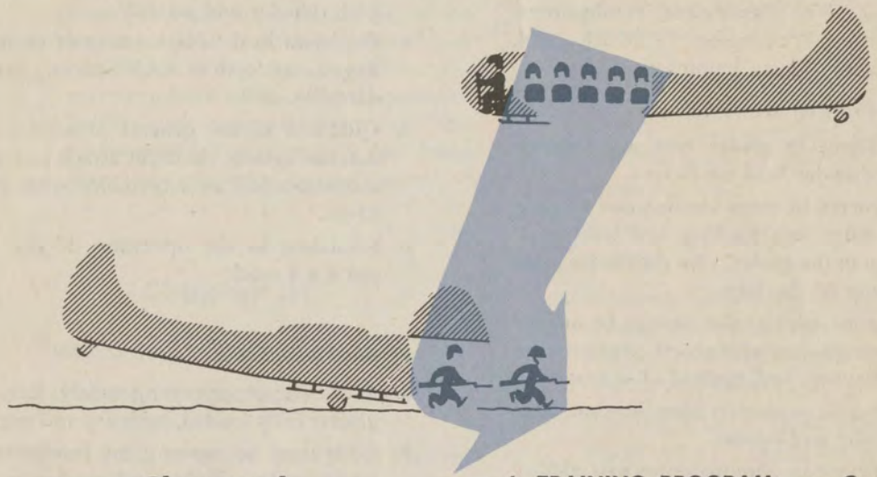
**Trainee or Glider Pilot**

. . . . . .

**Rank and Organization**

# Section I
# Training



## Chapter I
## The Glider Pilot

**3. GENERAL. a.** Glider missions require precision flying under all conditions; this demands faultless technique and a high state of proficiency on the part of the glider pilot. He must be proficient in formation flying and in flying with full loads. He must be able to fly under nearly all conditions of visibility and enemy action, and must be able to land safely in small, unimproved fields.

**b.** This proficiency can be gained only through constant instruction, practice, and supervision. Progress will be determined by the type and amount of flying, the type and number of landings, and the proper supervision exercised over both flights and landings. *Strict air and ground discipline must be enforced.* Both the maintenance and the increase of glider pilot proficiency is *an important direct responsibility of all command, operations, and training personnel.* Lack of training and supervision causes incompetence and carelessness, the results of which are wasted equipment and, often, actual injury to personnel.

**4. TRAINING PROGRAM. a. Command Responsibility.** To accomplish the training necessary. A glider pilot's training is divided into two phases:

(1) The Training Command is responsible for his basic military training, for his flying training, for training in the maintenance and assembly of gliders, and for the selection of potential officer material.

(2) I Troop Carrier Command is responsible for the standardization of tactical glider flying technique, in preparation for joint Airborne Troop Carrier training, and familiarization firing of all airborne weapons.

**b. Objective.** The training program for glider pilots is so planned and conducted that when the pilot completes his training he will have the necessary background, skill, and judgment acquired through actual practice to enable him to carry out successfully any assigned glider mission.

**c. Pilot's Function.** The primary function of a glider pilot in combat is to fly his troops and equipment into a restricted area with maximum safety for his load.

## Chapter II

## Standard of Proficiency, Advanced Flying School

**5.** The following is quoted from AAF Training Standard 90-9, War Department Headquarters, Army Air Forces, Washington, 13 March 1944, covering Advanced Flying training only:

1. *Non-flying Requirements:*
   - *a.* Proficient in glider care and maintenance under field conditions.
   - *b.* Instructed in cargo loading and stowing to insure safe loading and lashing of cargo in the glider; also the loading and lashing of the jeep.
   - *c.* Familiar with glider cockpit to include thorough knowledge of instruments, mechanism, and method of operation.
   - *d.* Proficient in aircraft identification, both friendly and hostile.
   - *e.* Proficient in administering first aid.
   - *f.* Qualified with the weapons with which personally armed.
   - *g.* Proficient in the use of panels, pyrotechnics, and simple cipher devices.
   - *h.* Able to perform 1st and 2nd echelon maintenance; and in the uncrating, assembling, and rigging of all current types of tactical gliders.
   - *i.* Proficient in map reading and use of map coordinate codes with particular emphasis on ability to select suitable landing areas from maps, mosaics, or map substitutes.
   - *j.* Qualified to receive and send a minimum of 6 words per minute CW (Radio) and 4 words per minute with blinker signal light (visual code).
   - *k.* Qualified in the standard radio procedure to the extent necessary to insure accurate voice communication.
   - *l.* Proficient in meteorology to the extent necessary to plan long flights; and have a general knowledge of fogs, air masses, cold and warm fronts, and thunderstorms, and the ability to read and decode aviation teletype weather codes and sequences.
   - *m.* Able to distinguish between friendly and enemy uniforms and between friendly and enemy armored and motorized vehicles and aircraft.
   - *n.* Proficient in the employment of camouflage as set forth in AAF Training Standard No. 40-1.
   - *o.* Qualified in the general principles of defense against chemical attack and decontamination in accordance with FM 21-40.
   - *p.* Proficient in the operation of the ¼ ton 4 x 4 truck.

2. *Flying Proficiencies:*
   - *a.* Proficient in operating safely tactical gliders fully loaded, both day and night.
   - *b.* Competent to operate on instruments while in free flight, and proficient in descending through an overcast while in free flight and in reaching objective with minimum delay; descent will be accomplished at a standard rate with emphasis upon maintenance of course within plus or minus 5 degrees. Graduates need not be qualified for instrument rating as provided in AAF Regulation 50-3.
   - *c.* Proficient in precision landings, day and night, in restricted areas to the extent required to be able to land consistently on wheels or skids over an obstacle having a minimum height of 15 feet and stop within 600 feet.
   - *d.* Proficient in navigation by pilotage and dead-reckoning, day or night, especially at minimum altitudes.
   - *e.* Competent to take off and land at night using minimum airdrome aids such as dimmed runway lights and improvised flare paths.
   - *f.* Proficient in the operation of the glider in both high and low tow position.
   - *g.* All training will be conducted with emphasis upon the maximum performance glide with landings to be accomplished three point. Transition training will be directed toward the objective of attaining the maximum performance glide from point of release to landing, which landing will be made three point. Upon completion of the transition phase, primary emphasis will be placed upon proficiency in accomplishment of this maximum performance glide and three-point landing, both day and night.



## Chapter III

## Standard of Proficiency, Advanced Tactical School

**6.** The following is quoted from AAF Training Standards 30-2-1, 5 August 1943, and 30-2-1a, 31 December 1943, Subject: Troop Carrier Units and Crews. Excerpted are only those which do not duplicate the foregoing. Glider pilots will be:

1. Indoctrinated with the idea of team work within the combat crew, both airplane and glider, to the extent that mutual cooperation and understanding of the other member's work becomes a primary consideration, thereby increasing the possibility of completing the mission in the event of casualties.
2. Instructed in cargo loading and stowing to insure safe loading and lashing of cargo for air transportation, thereby preventing unnecessary damage to the glider and the cargo being carried.
3. Familiar with glider cockpit to include thorough knowledge of instruments, mechanism, and method of operation; also the use of oxygen and its equipment in all types of operations.
4. Instructed in approved methods of abandoning airplane and glider during flight or after crash landing in water.
5. Proficient in care and use of emergency rescue equipment with which aircraft is equipped.
6. Proficient in operating safely tactical gliders fully loaded in formation, both day and night, and proficient in double-tow operation.
7. Proficient in the operation of automatic tow equipment and adequately familiar with its installation and maintenance to supervise same, as soon as equipment becomes available.
8. Proficient in the technique of glider pick-up.
9. Proficient in setting up glider pick-up ground equipment (poles, ropes, etc.), and in selecting terrain favorable for pick-up operations.
10. Familiar with infantry tactics and technique and with operation of all weapons used by airborne troops.
11. Familiar with British Horsa glider.
12. Familiar with telephonic intercommunication system.

**7.** The final assignment of the glider pilot to a tactical squadron in the Troop Carrier Command gives him an opportunity to participate in joint Airborne Troop Carrier maneuvers, before assignment to actual combat theaters.

## Chapter IV
## Flying Technique

**8. GENERAL:** This chapter is intended to embrace the actual technique of glider flying, the standardization of which is essential for successful completion of the foregoing curricula and for the successful employment of mass glider operations.

(*It is urgently recommended that each student write down every important item he learns in a small notebook which should be inspected frequently.*)

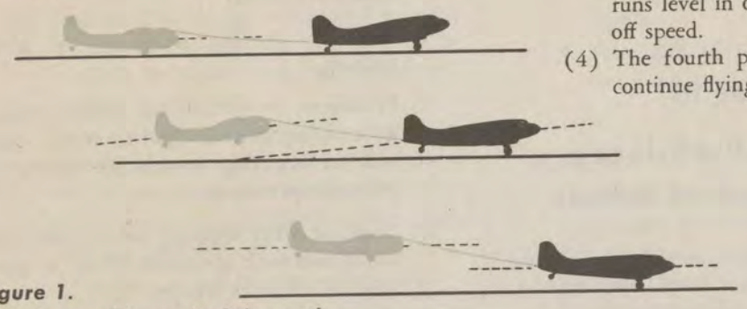


***Figure 1.***
***Relative positions of glider and tow plane during takeoff.***

**9. TAKE-OFF: a.** When moved into take-off position on the runway, the glider pilot will be checked by the signal or hook-up man for readiness for take-off. In some cases, where noise prohibits voice signals, pre-arranged hand or light signals may be substituted. The importance of making sure that brakes are not applied by the glider pilot should not be overlooked. Frequently, set brakes on take-off have broken tow ropes, caused excessive wear to the nose skids, unnecessarily increased take-off time interval, and caused damage to runway marking facilities.

**b.** After the "all clear" signal has been relayed to the tug signal man, he in turn signals the pilot of the towplane to "take up the slack." As soon as the slack has been taken up and the gliders have begun to move down the runway, the tug signal man gives the pilot of the towplane an "OK for take-off" and the combination proceeds down the runway. The sequence of positions of the gliders when taking off is the same in both single and double tow.

**c.** There are five distinct phases in the take-off procedure.

(1) The first phase is to allow the glider to roll level, straight down the runway to gain flying speed.

(2) The second is to take-off as soon as sufficient flying speed is obtained.

(3) The third is to level off just above disturbed air, or approximately 20 feet above the runway, while the towplane runs level in order for it to obtain take-off speed.

(4) The fourth phase is for the glider to continue flying at approximately 20 feet above the runway until the towplane is definitely airborne.

(5) The fifth and final phase is for the glider to find and maintain the normal tow position, which is simply that of staying as low as possible yet avoid all effects of slip stream.

(6) Due to the varying speeds throughout takeoff, the trim tabs cannot be adjusted to advantage. However, after a climb, or when cruising speed is attained, proper trim tab adjustments greatly simplify the pilot's work.



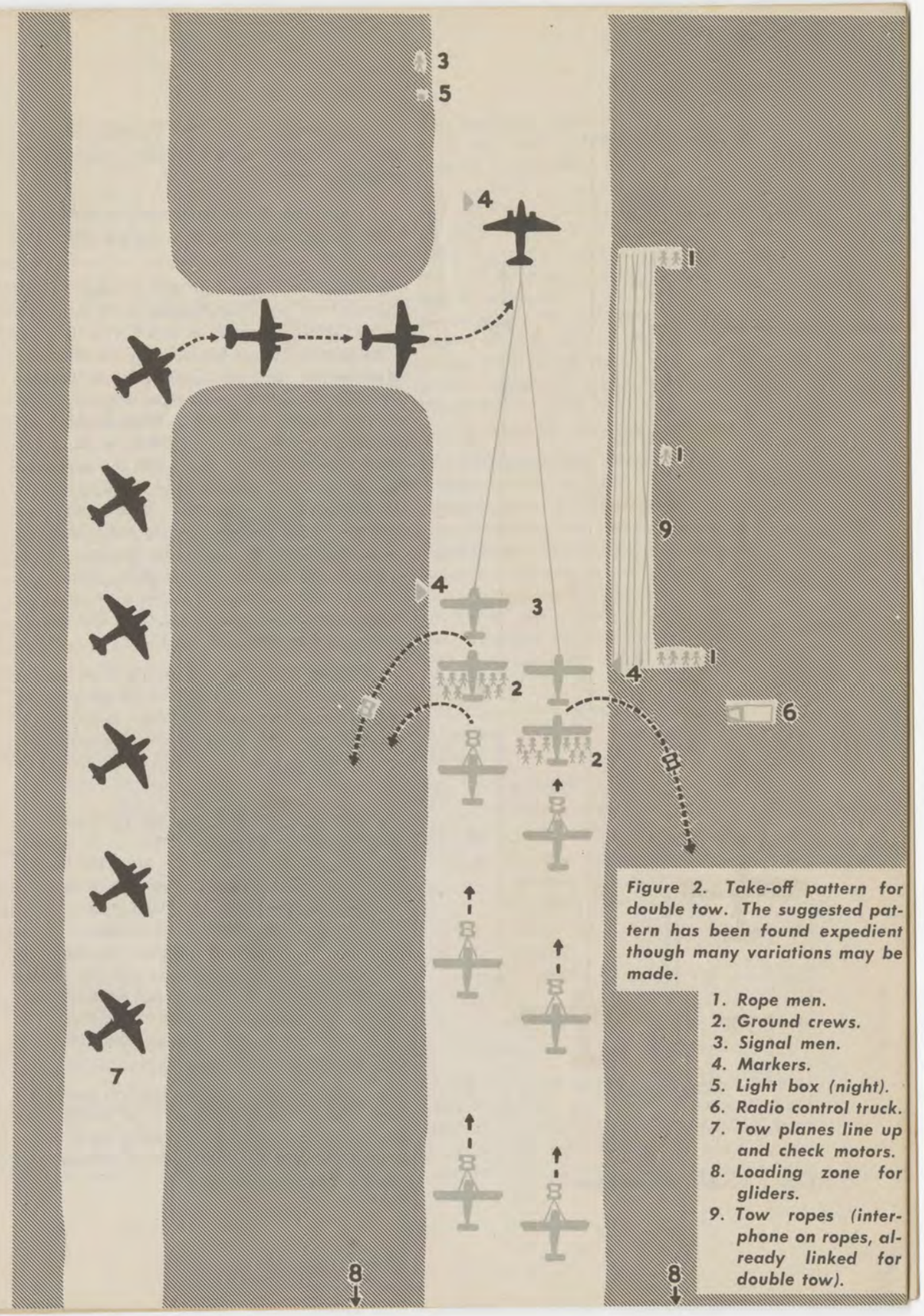



***Figure 2. Take-off pattern for double tow. The suggested pattern has been found expedient though many variations may be made.***

1. *Rope men.*
2. *Ground crews.*
3. *Signal men.*
4. *Markers.*
5. *Light box (night).*
6. *Radio control truck.*
7. *Tow planes line up and check motors.*
8. *Loading zone for gliders.*
9. *Tow ropes (interphone on ropes, already linked for double tow).*

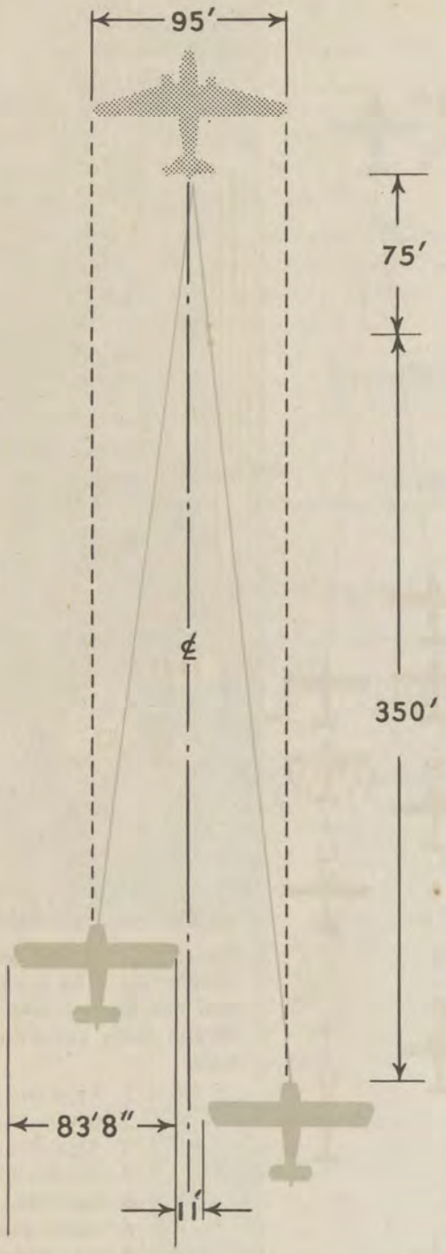



*Figure 3. Double-tow position.*

**10. TOW POSITIONS:** Tow positions naturally vary, depending on whether or not single, double, or triple tows are used.

**a.** Single tow is obviously nothing more than following in trail behind and slightly above the towplane.

**b.** Double-tow operation with I Troop Carrier Command has been standardized to fly the short tow on the left. In operation with C-47's, the pilot of the short tow aligns himself with the left wing-tip of the towplane, whereas the pilot on the long tow aligns himself with the right wing tip, being also alert for the other glider. While in this position, the pilot should always check the angle of tow line so he will become familiar with this angle and can use it as a guide should he be towed by aircraft of shorter or longer wing span. If at any time the short-tow glider presents a hazard and is likely to cause difficulty to the ship on the long tow line, it will be the responsibility of the glider pilot on the long tow line to release first. Wing-tip clearance in flight should be maintained at 10-15 feet. Proper position is illustrated in figure 3.

**c.** During night flight, particularly on double tow, should the pilot lose sight of the tow plane or lose his orientation to the tow plane, he should immediately level his glider by checking earth and sky line and then fly in the direction indicated by his tow line.

**d.** In level flight, both gliders fly at the same distance above the towplane. However, in turning, the glider on the inside of the turn falls in trail behind the towplane and executes a turn identical to that of the towplane. The glider on the outside of the turn climbs slightly and holds a position above and to the right of the glider on the inside of the turn. This procedure prevents all possible damage to the glider on short tow from the tow-rope of the glider on the long tow. Double tow might well be compared with two power planes in right echelon formation.

**e.** Triple tow is not contemplated for general use because of a very limited number of suitable tow-planes. If used, it becomes nothing more than a double tow with the third glider in between on a towline 500 feet in length.



**11. TURNS ON TOW: a.** The use of rudder on tow in normal smooth air is unnecessary since the tow line annuls the effect of aileron yaw. Confidence in this fact is quickly acquired by flying with the feet completely off the rudder pedals.

**b.** In climbing and level turns the glider will continue in the correct tow position and stay in true formation with the towship. The two best check points to watch at the beginning of a turn are the landscape in front of the towplane and the attitude of its wings.

**c.** The glider will roll into and out of the turn with the towship at the same degree of bank. There will be a tendency on the part of the student to over-control in his initial bank which should be corrected immediately.

**d.** The pressure on the controls required to bank the glider into a turn is very light, and when the desired bank has been accomplished, a slight pressure maintained on the opposite aileron will prevent overbanking. In smooth air the turn of the towplane and the glider can be so closely coordinated that the towplane will not appear to move from its proper position. In direct contrast with the relatively slight pressure required in smooth air, heavy pressure will be required on the controls to make the glider respond when the air is rough. Under these conditions close attention to the towplane's position will make the best tow possible.

**e.** In order to maintain the same radius the glider's turn must be started shortly *after* the towship's because of the length of intervening tow line.

**12. LOSS OF CONTROL ON TOW: a.** During the formation flight, while on tow, glider pilots will experience considerable propeller-wash and wing-wake from preceding elements.

**b.** Should at any time the glider pilot find himself with a wing low and the glider not responding to aileron control, he should immediately, but gradually, raise or lower his position on tow until his controls become effective.

**13. LET DOWN ON TOW:** The relative position of the glider to the towplane remains the same, using the same reference points as in level flight. Trim tabs should be used.

**14. RELEASE:** Immediately after release, the glider will tend to climb. This is because of the necessity for trimming the nose up under tow to counteract the downward force exerted by the tow line's attachment position at the top of the glider. The pilot must be ready for this and exert a counteracting forward pressure on the control column in order to maintain level flight. This level flight must be maintained until excess speed, due to tow, is dissipated. The pilot may compensate for the varying elevator pressures during this transition by adjustment of the tab, but it is often simpler to wait until a normal glide speed is established to make the adjustment, which will help maintain the glider at normal speed until landing.

**15. COORDINATION MANEUVERS: a.** Coordination maneuvers, as the name implies, are coordinated turns. The pilot rolls into a coordinated turn towards one point with the attitude of the nose remaining the same in relation to the horizon. As one point is reached, he starts a turn to the opposite direction until the other point is reached and then vice versa. The degree of bank used may vary; however, once a degree of bank has been made, the bank in the turn is not varied. The airspeed is kept constant.

**b.** Coordination exercises are valuable training to students as they develop a better feel of the glider.

**c.** Common errors to look for in students are:

(1) Varying degree of bank in the turn.
(2) Varying airspeed.
(3) Too close attention to the airspeed and not enough attention to attitude of nose in relation to the horizon.
(4) Failure to pick two points for the maneuver.
(5) Attempting to use only one point, rolling the glider from one bank to the other on the point.
(6) Excessive use of rudder or aileron.

**16. LAZY 8'S *(TO BE LEARNED AS COORDINATION EXERCISE):* a.** The pilot should dive until 100 mph is reached; select an outstanding object on the horizon and use it to set an axis for the maneuver. Part of each loop of the eight will be

below the horizon and the remainder above, with the paths between the loops crossing through the axis. The speed of the glider will vary from excess at the bottom of the loops below the horizon to minimum maneuvering speed at the top of the loops above the horizon. This not only continuously improves the student's judgment, but insures that his flying technique will become more and more perfected. It is important that slipping, skidding, roughness on the controls, and approaches to stalls be constantly checked and finally eliminated.

**b.** The more common errors are:

(1) Failure to gain sufficient initial speed, which causes falling out of the top of a loop, or an excessive dive resulting in an unsymmetrical eight.

(2) Watching the glider instead of the points.

(3) Excessive dives.

(4) Improper planning so that the peaks of the loops, both above and below the horizon, do not come to the proper place.

(5) Attempts to hurry through the maneuver.

(6) Roughness on the controls, usually caused by attempts to counteract the results of poor planning.

(7) Slipping and skidding.

(8) Failure to make the portions of the loops above and below the horizon symmetrical.

(9) In side-by-side aircraft the difference in the appearance of the horizon when the pilot is sitting to one side of the center line affords difficulty in turns and other maneuvers requiring a high degree of orientation. More skill in judging the attitude of the ship is necessary.

These maneuvers lend themselves to a wide range of variation by which the instructor can perfect a particular phase of technique on which the student shows deficiency, or eliminate a particular undesirable tendency he may have developed.

**17. STALLS: a.** Stalls should be demonstrated and practiced at an early stage of training. A glider is said to be stalled when the airspeed has been reduced to the point where flying speed is lost and proper control is no longer possible. One of the most important features of pilot training is learning the rapidity with which control effectiveness diminishes with loss of speed. The student should be taught to develop an awareness of the approach of a stall and to sense what is called "critical speed," at which any further reduction brings loss of control. It is evident that the practice of stalls and the development of this sense are of primary importance to the pilot's safety.

**b.** Anyone can recognize a complete stall when it occurs and the more severe or complete the stall the greater loss of altitude is necessary for recovery. It is even more important to recognize the symptoms of approaching stalling speed than it is to recognize a complete stall. With practice a feel of the glider will be developed, which will enable the student to recognize loss of speed and act accordingly. No competent or properly trained pilot will ever approach a stall during the execution of any normal maneuver. In practicing stalls, a gentle entry, with ailerons in neutral, should be demonstrated. The gradual pulling back of the wheel causes the nose to rise until the lower panel of the upper window is on a line with the horizon. This is to be held until glider stalls, if the stall is desired; or until all controls can be felt to be losing effect, if stall approach practice is desired. Recovery from both is the same: with ailerons in neutral, push the nose down with elevators, maintaining level flight with rudder only. It is not necessary to push the glider into a steep dive, as complete control effectiveness results from only a slight increase in air speed.

**18. TURNS IN FREE FLIGHT: a.** The instructor will demonstrate and require his students to practice one, two, and three needle-width turns from 360°, 180° to 90° at a constant air speed of 70 mph, pointing out the difference in radius necessary for each turn and the amount of altitude lost. In a one needle-width turn, it will be noted that the loss of altitude is approximately 900 feet for each 360°. A three needle-width turn will lose about 400 feet for each 360° or 100 feet per 90°. The instructor will emphasize that, because of the large radius and the great loss of altitude necessary for each one needle-width turn, steep coordinated turns will be used in traffic patterns. Turns of two



or three needle-widths should, therefore, be practiced at various speeds.

**b.** The majority of students will have a tendency to climb in right turns and dive in left turns. This is because they are sitting to the left of the longitudinal axis of the glider. It may generally be observed that most students hold the left wing down and fly to the left on tow. This, too, is caused by the student's position in the glider.

**c.** The danger of a mid-air collision will be pointed out and each student directed to look around carefully before each and every turn, and to be certain that the area is cleared before a maneuver is begun.

**19. GLIDER RELEASE:** The releasing of a glider from tow is simple, yet requires absolute standardization, because of the possibility of mid-air collision. The approved technique is to anticipate the cut-off point, merely reach up and disengage the towline release, and continue in level flight until the correct glide speed is attained.

**a.** In double-tow operation, either glider may cut first and each glider pilot must understand that he is responsible for the safe landing of his glider and its load, regardless of the judgment of the other glider pilot.

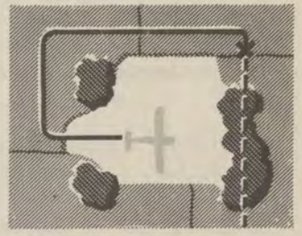
**b.** If, however, the pilot on the long tow intends to release first, he should fly low and to the right of the glider on short tow before releasing, to prevent possible damage from the dangling long tow rope.

**20. APPROACH PATTERNS: a.** The following patterns are illustrated in figure 4:

(1) 90° approach.
(2) 135° approach.
(3) 180° side approach.
(4) 270° overhead approach.
(5) 270° side approach.
(6) 360° overhead approach.

**b.** The release altitude for these patterns will vary with conditions and pattern to be used, normally being from 100 to 400 feet. Should a mission require a high release, the glider pilot will position himself for one of the foregoing patterns in final portion of glide. NOTE: Should release be below 300 feet, towplane pilot will immediately release the towline to eliminate the possibility of its becoming tangled with ground objects.

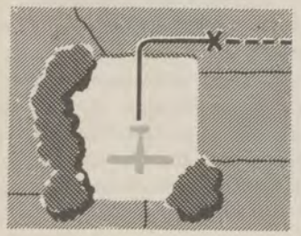
**c.** For night glider landings the 180° side and 270° side approach have proven most practicable.



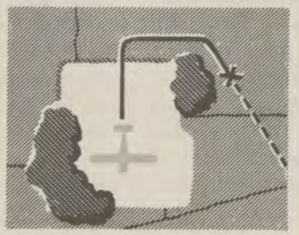
270° side approach

180° side approach

360°



90°



135°

270°

*Figure 4. Approach patterns.*

**21. APPROACH AND LANDING TECHNIQUE:**

**a.** In planning an approach pattern, the glider pilot will keep his eyes and attention on the intended landing spot and rely on his *judgment rather than predetermined ground references* or the flight paths of other gliders which may be carrying vastly different loads. The pattern should be so planned that, regardless of the wind direction or velocity, the glider will not get out of position on the downwind or base legs, keeping in mind at all times that the base leg must be sufficiently close to the landing area to eliminate the need for a long straight final approach, with the hazard of possibly undershooting the area, especially at night.

**b.** Probably the most important factor in preparing to land is to develop a constant normal glide, because only in this way can large numbers of gliders be released and landed in trail in a restricted area. The safe accomplishment of a formation landing can be effected only by the uniform acceptance and practice of flying with a normal glide.

(1) A normal glide may be applied to the B-29 as well as to a glider, and the only fundamental requirements are (1) constant speed and (2) constant rate of descent, or sink. Basically, it is that glide which covers the most ground distance for the altitude dissipated.

(2) The reason for consistency of speed and descent rate is obvious. If one looks down the sights of a rifle at a target which moves spasmodically, his aim is constantly changing and his chances of hitting the bull's eye are very slim. If the target remains static the aim is true and he hits the spot. If, in an airplane gliding in an approach, the nose is erratically deflected to a slower or faster flying attitude, both the speed and the rate of descent are changed, the spot changes position in the sights, and assurance of hitting it is lost. If, however, everything is kept constant, sight may be maintained on the spot, and the glider will maintain its aim right down to that spot.

(3) In the CG-4A the normal glide is approximately 10% of the stalling speed above that stalling speed, and it is a speed which will result in the absolute minimum of "floating" after leveling off for the contact. A landing properly made should be the natural termination of the normal glide. When a proper glide is maintained throughout an approach, no thought need be given the landing, and it will be found unnecessary to learn a "landing technique."

**22. SPOILERS: a.** The glider pilot must be able to fly the glider unassisted. No two people react at exactly the same time. Using the correct degree of spoilers is the pilot's responsibility. The action of spoilers on tow is hardly noticeable and not recommended. Designed primarily to increase the sinking speed of the glider in free flight, spoilers need not be used until the latter part of the base leg or the initial stages of the final approach.

**b.** Gliders other than the CG-4A are equipped with flaps, the effect of which requires an appreciable change in the attitude of the glider. Glider pilots should, therefore, understand fully the effect of spoilers as contrasted to the effect of flaps.

**23. SLIPPING: a. General.** Upon entering the approach leg, the glider pilot can readily estimate the approximate landing spot, based on the glide path with which he became familiar as the result of approaching with a normal glide. He must rely mainly on his glide-angle judgment, but if he is exceptionally high and estimates that a normal glide will carry him far beyond his desired landing spot, he has, in addition to spoilers, another alternative, the slip, with or without spoilers, to be utilized only as an additional emergency control.

**b. The forward slip.** To execute a slip, the glider should be banked (to the left wherever possible, for purposes of better visibility for the pilot and standardization) and full opposite rudder used to maintain a straight track over the ground. At the same time, in order to compensate for the loss of lift, the nose must be brought up by a slight back pressure on the elevators. Constant speed must be maintained during both the slip and the recovery. This requires carefully coordinated control action during recovery. If during recovery the nose



is allowed to swing free by sudden release of the rudder, the result will be a very abrupt and sharp increase in speed. Normally the recovery from a slip should be effected high enough above the ground so that the last 25 feet of altitude are lost with the glider in a normal glide.

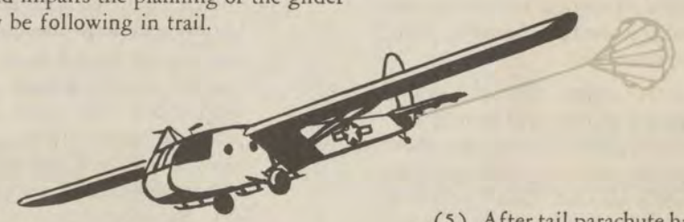
**c.** It should be realized that the design of the glider is such that a steep slip cannot be held over any considerable length of time, because of the insufficient amount of rudder control.

**d. The slipping turn.**

(1) This is what the name implies, a turn with top rudder. The amount of the slip, however, is controlled and the slipping done deliberately. It may be made very gentle or very violent, depending on the degree of bank or the amount of top rudder used, or both. It is usually used during the last 90° turn for the spot.

(2) Every student should be adept in the technique of slips, but it is even more important that his judgment of glide be perfected. From a safety angle one complements the other, for by the proper use of both absolute accuracy is assured under the most unfavorable circumstances.

**e. "Fish-tailing."** "Fish-tailing" or rocking from a left slip into a right slip and back again is dangerous and impairs the planning of the glider pilots who may be following in trail.



**24. USE OF THE TAIL PARACHUTE: a.** The tail parachute is an approach aid for dissipating altitude by allowing the nose to drop without gaining speed. The effect is very similar to that of flaps and the tail parachute should be considered as the last resort to be employed, only after spoilers and slipping have proven insufficient corrective measures.

**b.** The rate of descent may be increased from the normal 500 feet per minute to as much as 2,000 feet per minute, with the glider gross-loaded, depending on air speed. The normal glide speed will be maintained, however, descending at 1,000 to 1,500 feet per minute unless this rate of descent is insufficient. The actual technique is as follows:

(1) Unless in an emergency, glide speed should be less than 70 mph.

(2) Pull tail parachute opening release and maintain a speed varying from 60 to 90 mph, this being governed by the rate of descent necessary. Should the glider pilot believe he will undershoot using a speed of 70 mph, he should reduce glide speed to approximately 65 mph to lengthen his glide. If it is apparent he will overshoot using 70 mph, he should increase his glide to 90 or 95 mph maximum. This will allow a glide angle of approximately 45°.

(3) If it is obvious even at lowest safe speed that the glider will undershoot, the glider pilot should pull the tail parachute release handle to free the tail parachute and allow the maximum glide range for his glider.

(4) If overshooting condition prevails throughout the glide, landing should be made with parachute attached.

(5) After tail parachute has opened, the glider pilot should not be alarmed by the "tugging oscillation." This will increase and decrease with speed, but at no time will the glider be uncontrollable.

(6) If the glider approach is made with the tail parachute open at a slow speed, the pilot should be on the alert to land the glider quickly because the tail parachute will dissipate flying speed rapidly and allow very little time for "leveling off" or "rounding out" of glide.

**25. EMERGENCY STOP TECHNIQUE:** The CG-4A glider is designed in such a way that the nose skids can be used effectively with either the tactical or training types of gear. Wherever possible the training-type gear will be used, since it facilitates dispersal and ground handling and makes possible the evacuation of usable gliders with the pickup device. The description of the emergency-stop technique which follows assumes that the glider is equipped with a training-type gear.

**a.** On the approach leg, the glider pilot should depress his toe brakes to make sure his brakes are operative and to determine how much pressure must be applied before braking action can be expected. This procedure should be cultivated until it actually becomes habit. The 2 or 3 seconds required

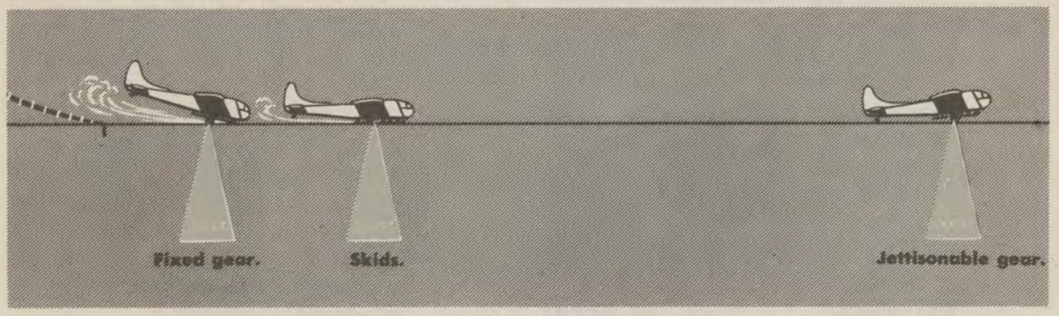



***Figure 5. Comparative runs, CG-4A with different types of gears.***

do not really divert this attention and are important since the test may necessitate changing plans, should brake failure be expected.

**b.** Immediately after landing, the pilot should apply brakes for a second or two, and then, if necessary, use the controls lightly to place the glider on its nose and apply necessary pressure until the desired stopping place is assured. Good judgment, however, should prevent stopping in too short a distance, which might result in shifting of the glider load.

**c.** The use of the emergency-stop technique should be employed only when absolutely necessary, and is considered strictly an emergency procedure or last resort.

**26. LANDING GEARS—COMPARISON. a.** The type of gear with which the glider is equipped has considerable bearing on the number of gliders that can be landed in any given area.

(1) The fixed gear which is equipped with brakes has proven to be the best gear for general use because it gives the glider pilot positive control of his glider on the ground and enables him to spot it almost at will.

(2) Since the jettisonable gear is not equipped with brakes, the glider can be braked only by forcing it up on its nose, braking action being developed by the drag of the nose skids alone. If the glider has not been braked before the elevators lose their effectiveness, the glider cannot be put on its nose and will roll until its momentum is expended or until it contacts some solid object.

(3) Gliders equipped with either training or tactical gear have the distinct advantage over gliders landed on skids in that they can be moved around after landing. Should one land short and clog up a particular landing area, a few men can easily and quickly roll it out of the way. The employment of wheel-type gears permits the most complete saturation of a given area.

(4) Gliders landed on skids are immediately immobile unless motorized equipment is available or a tactical gear is at hand for instant installation. In either case, considerable time is consumed before the glider can be moved, resulting in the necessity for other gliders to land elsewhere and possibly crash. Once a glider pilot commits his glider for a skid landing by touching the skids on the ground,



he has no further control. The glider will continue to move forward until its momentum is completely expended. The actual distance a glider on skids will move forward after first contacting the ground is dependent on the weight of the glider and soil condition of the landing area. A glider equipped with skids alone, however, is best adapted for water landings.

(5) The accompanying chart illustrates the comparable landing runs required for a glider carrying the same load landing on the same terrain, when equipped for the three types of landings discussed.

**27. DISPERSAL: a.** The dispersal of gliders on the ground after landing is dependent on many factors, the principal ones being:

(1) Accessibility of cover.
(2) Condition of the terrain.
(3) Number of gliders in the field.
(4) Type of landing gear used.
(5) Availability of men or vehicles.
(6) Alternates.

**b.** Normally briefing will include the details of the dispersal plan. The real problem of dispersal is in night landings which require adequate moonlight or some visible type of light reference. Glider pilots have been trained to disperse from right to left, left to right, in a series of columns, or in circular patterns, and all landings are made to specific locations on the landing area. (See Fig. 6.)

**28. WATER LANDINGS. a.** It is more than likely that glider missions will require flights over water and for that reason the possibility of a forced landing on water must be anticipated. Water landings with the CG-4A glider have been successfully made with and without landing gear. The wheels merely serve to slow up the forward motion slightly. The procedure is almost identical to landing on the ground, but the glider must be in a tail-low, three-point attitude.

**b.** When contact is made on smooth water in this position, a fully loaded glider has planed forward about 200 feet. Using both the doors and the emergency exits, there is ample time to unload the personnel before the glider settles to wing level, in which condition it will remain until removed from the water.

**c.** In another instance, pinked tape had been used to seal the nose section and inspection plates in the fuselage and the glider remained afloat for more than an hour, drawing only some 18 inches of water after being unloaded.

**d.** Water landings have been made where the glider was practically flown into the water. The initial impact forced water through the nose section and resulted in the rapid filling of the glider with water, great confusion among the troops being transported, loss of equipment and the total loss of the glider because of an impossible salvage problem.

**e.** ***It is recommended that the technique of water landings for gliders be demonstrated to glider pilots prior to their actual assignment on missions involving flight over water.***

## Chapter V

## Curriculum, Advanced Flying School

**29. GENERAL: a.** The primary function of the Training Command Advanced Glider School is to give the student a substantial background of smooth flying technique. The methods taught are approximately those used in tactical procedure, but the introduction of actual tactical problems is relegated to Troop Carrier Command's Advanced Tactical Training School.

**b.** For this reason, the training concentrates on transition to gliders; smooth, coordinated flight;

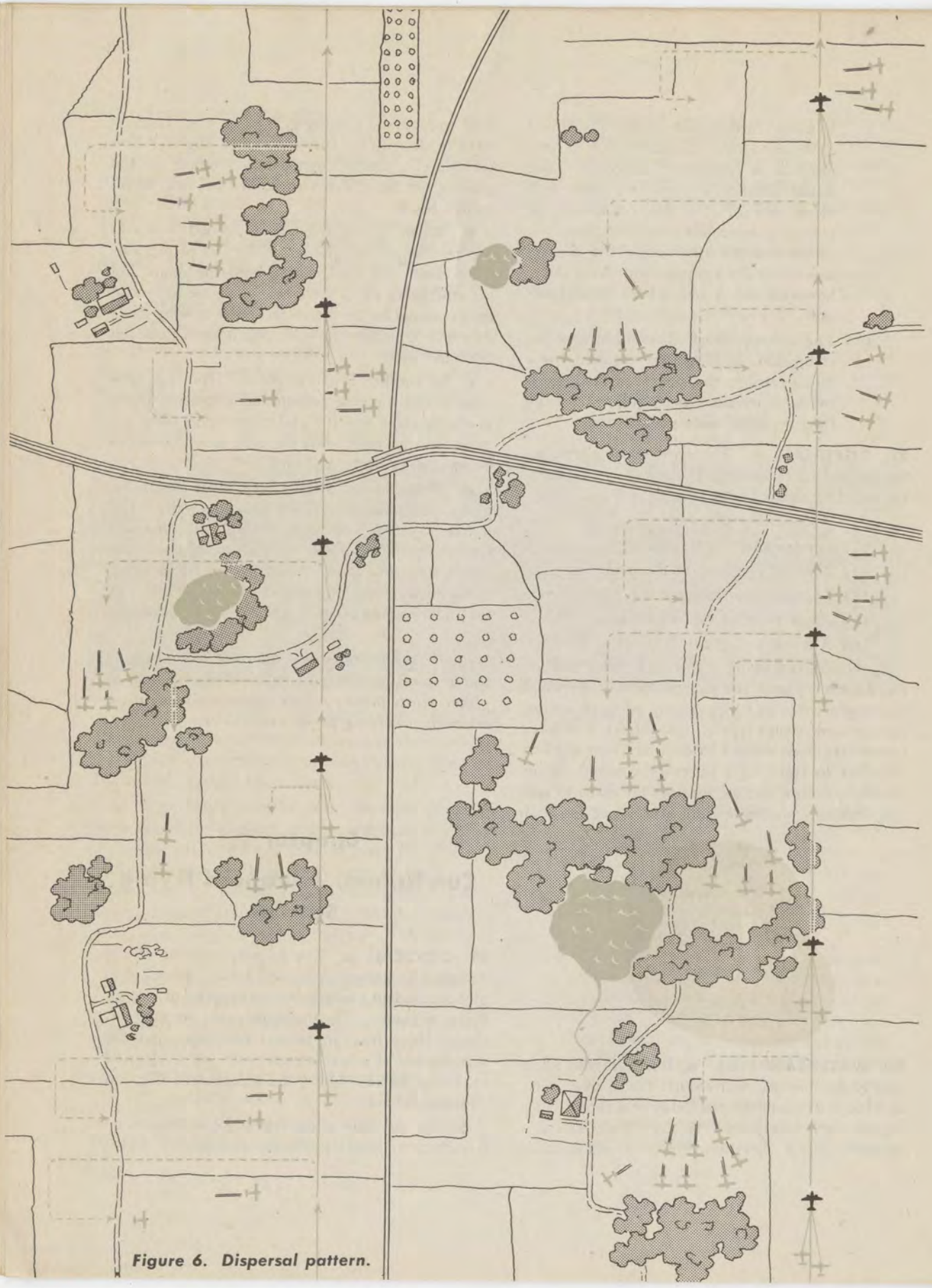


*Figure 6. Dispersal pattern.*

precision approaches using the normal glide; various approach patterns; and elementary dispersal of gliders on the ground. These lessons are taught both in daylight and at night under lighting conditions which graduate easily to the more difficult conditions in the tactical training.

**c.** It is considered that students who master these lessons and are graduated will find the Tactical Training School a simple step in progression.

**30. ORIENTATION AND FAMILIARIZATION** ***(For beginner):*** One day prior to the beginning of flight training, the students will report to the line for a period of orientation and familiarization. They will read and understand AAF Regulation 60-16 and post flying regulations, and will be thoroughly conversant with all safety regulations, pyrotechnic signals, light signals, the use of railroad fuzees, smoke candles, as covered in Training Memorandums.

**31. PREFLIGHT RESPONSIBILITIES. a.** A primary responsibility of the glider pilot is to determine the airworthiness of his airplane based upon the mission for which it is to be used. He must be trained in a preflight routine until it actually becomes a habit. This being the case, the glider pilot will determine *before take-off* that his glider is in proper operating condition and will make the following inspection.

1 ***Flight plan.*** Check thoroughly and understand complete flight plan, including weather, altitudes to be flown, designation of airport, alternate, estimated time of arrival, and landing plan at destination.

2 ***Communication.*** Check to insure complete understanding of standard communication methods and signals between glider and tug.

3 ***Covering on aircraft.*** Inspect general condition, particular attention being paid to all control surfaces.

4 ***Nose skids.*** Inspect for wear and cracks, also tension on skid drag cables.

5 ***External empennage tie rods or brace cables.*** Check for proper tension and if tie rods are used see that they are in proper alignment with air flow in flight.

6 ***Jettison or tactical landing gear.*** Check tactical landing gear (when used) to make sure gear is locked in place, and that release lever will actuate both hooks, locking the gear in place.

7 ***Load.*** Determine that load is within weight limits, within center of gravity limits, and properly lashed. If no pay load is carried, ballast must be placed and secured in glider in accordance with current Technical Orders.

8 ***Lock device to hold nose in raised position.*** Note general condition and make sure lock device is free from oil, paint, rust, or foreign matter.

9 ***Check Forms 1 and 1A.***

10 ***Flight instruments.*** Inspect in accordance with general inspection for all airplanes.

11 ***Nose lock.*** Be sure nose lock is definitely engaged and lock handle in proper position and safetied.

12 ***Spoilers.*** Check for proper functioning and be sure they will close.

13 ***Controls.*** Check for free movement. *IMPORTANT!* Push elevator control to forward limits to insure that stop is adequate and that control will not lock in that position. Also check ailerons and rudder to make sure that external locks have been removed and full free movement is assured.

14 ***Glider tow-line release.*** Check release jaws to insure closed position when indicator pin is flush with hex nut, also that release lever is working freely.

15 ***Control tabs.*** Set control tabs to neutral position.

16 ***Brakes.*** Check parking brakes and hydraulic individual rudderbrake operation.

17 ***Altimeter.*** Set altimeter to read same as towship altimeter: namely, at sea-level altitude, if on a cross-country mission; at zero or ground level, when landing on same airport.

18 ***Radio.*** If radio communication is used, check radio with towplane. If intercommunication is installed, check with towplane and other glider, if on double tow.

**b.** This preflight routine must precede every flight made by the pilot throughout his flying career.

**32. INSTRUCTION PRIOR TO TAKE-OFF AND FAMILIARIZATION FLIGHT (for the beginner):** **a.** The student is to occupy the co-pilot's seat for the initial familiarization flight. The instructor will check the position of the student to insure a comfortable position, sufficient cushions, and adjustment of rudder control to enable the student to reach the controls easily. He will make the first take-off and landing, allowing the student to follow through lightly on the controls, and to fly the glider briefly on tow and off tow. In the air he will point out landmarks around the area, the correct position on the tow, use of trim tabs, etc. He should also explain length of tow, altitudes used, the cut off, signals used, and landing pattern of towplanes and gliders.

**b.** The importance of repeating the cock-pit check spoken by the rope hookup men of the ground crew will be impressed upon the student.

**33. PHASES.** The minimum requirements for advanced training of CG-4A glider pilots are divided into three phases: (1) transition phase, (2) tactical-landing phase, and (3) night-operation phase.

## Phase I—Transition

The transition phase consists of a minimum of 5 hours and 10 landings. During this part of the training emphasis will be placed on the following maneuvers:

**34. TAKE-OFF. a.** Technique of maintaining straight path on runway behind tow plane.

**b.** Technique of the use of rudder and brakes in maintaining a straight path under crosswind conditions.

**c.** Speed and feel of glider before becoming airborne.

**d.** Position of glider relative to runway and prop wash while tow ship is still on runway.

**35. TOW POSITION.** Relative position of glider to tow ship during climb, straight and level flight, and let down.

**36. OSCILLATION.** Technique for correcting tentency to oscillate on tow, stressing pilot relaxation.

**37. LOW TOW.** Technique for flying glider into low-tow position and proper trim tab adjustment for maintenance of that position.

**38. TURNS ON TOW.** Technique of correctly following tow ship through turns.

**39. RELEASE.** Technique of dissipating excess speed and assuming glide speed.

**40. USE OF TRIM TABS.** Familiarization with position and action to a point where operation can be effected without visual reference.

**41. STALLS.** The CG-4A glider has unusually safe stall characteristics. However, full knowledge of how to anticipate the approaching stall and of how to recover from a stall should be attained through practice.

**42. COORDINATION EXERCISES.** Various exercises may be practiced in learning to coordinate the controls throughout the speed range of the glider. The type and amount necessary will depend upon the individual ability of the student and will be indicated by the instructor.

**43. TURNS.** Turns of varying bank will be practiced with emphasis on coordination and maintenance of constant glide speed.

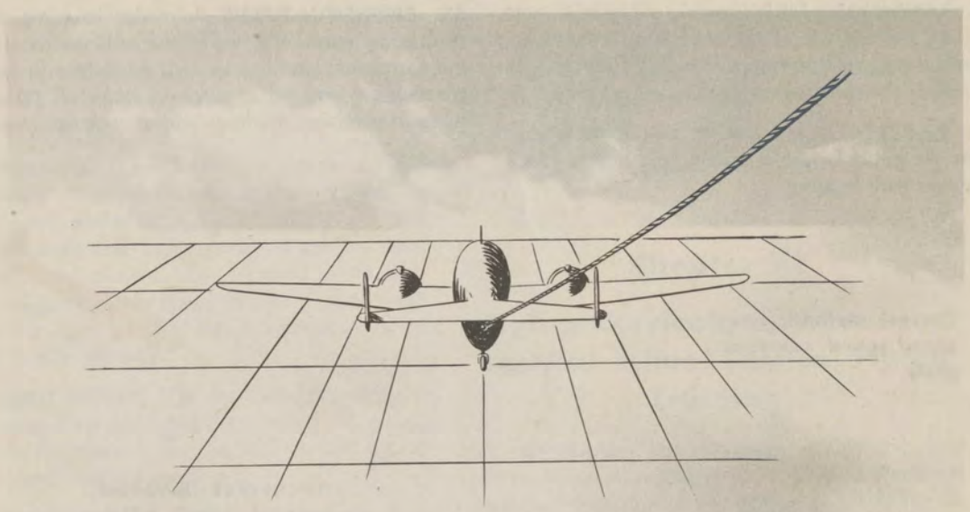
**44. NORMAL GLIDE.** The most important technique to be learned by a glider pilot is the approach to a precision, restricted landing, and maintenance of a constant glide is the basic prerequisite of this technique. A student must discipline himself to learn the maximum performance glide speed and to maintain it throughout descent, whether straight and level, or in turns.

**45. SLIPS.** Forward slips and slipping turns.

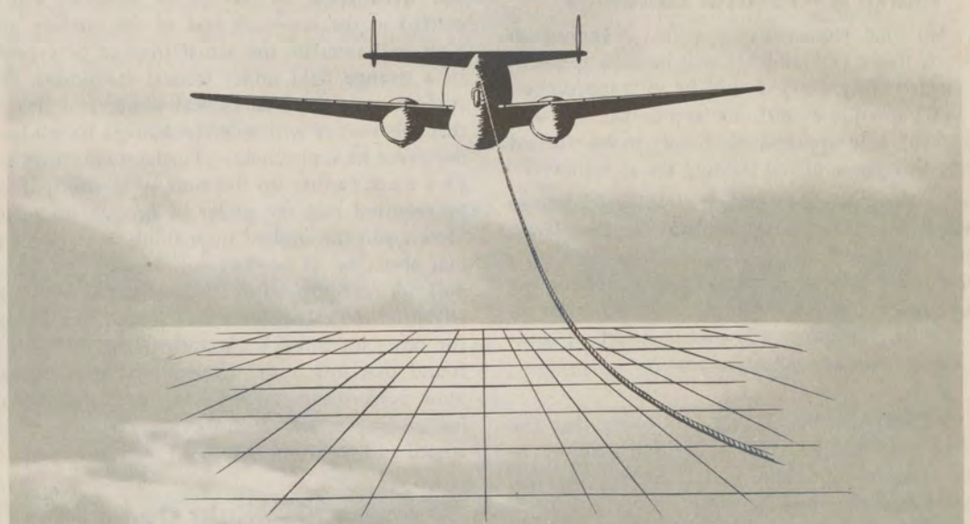
**46. SPOILERS.** The proper use of spoilers will be learned as a material aid in making restricted landings, since they allow the pilot a control over his rate of descent at any given air speed. The combination of slips and spoilers will be found to afford a great amount of flexibility in this regard.

**47. APPROACH PATTERNS.** During this transition phase only the 180° side approach will be used.





*High tow position.*



*Low tow position.*

*Figure 7.*

**48. LANDINGS.** Little stress should be laid upon landing the CG-4A; if the normal glide is maintained throughout the approach the landing will be simply the termination of that normal glide.

**49. DISPERSAL.** The student will learn to disperse the glider by use of rudder and brakes in accordance with briefing.

**52. PRECISION TURNS.** In order to equip the student to handle the traffic problems pertinent to the formation landings he will encounter in later training, he will be required to make all pattern turns to precision headings and at constant speeds.

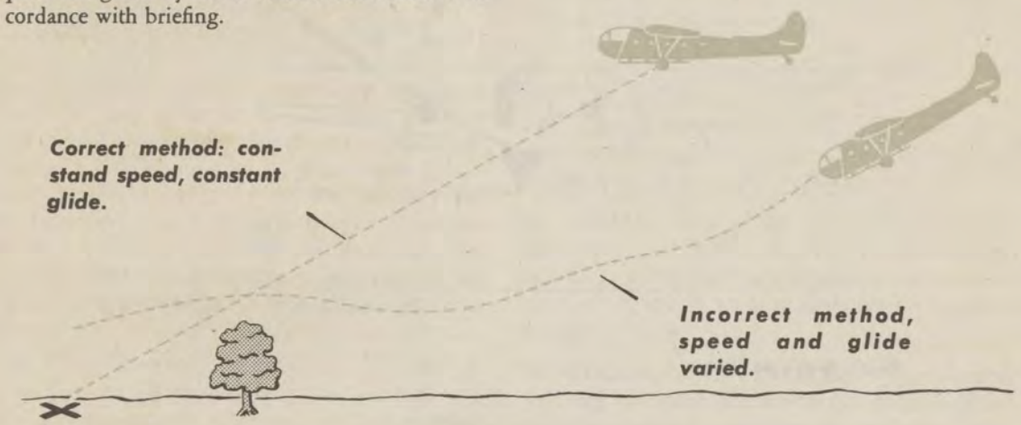



*Figure 8. Landing over an obstacle.*

## Phase II—Tactical Landings

**50.** No time requirement specified; a minimum of thirty-five (35) landings will be accomplished, of which twenty (20) should be 90° approaches, ten (10) should be 180° side approaches, and five (5), 270° side approaches. Points to be stressed during this phase of the training are as follows:

**a.** Throughout the practice of tactical landings it will be necessary to utilize all of the knowledge gained in Phase I. The instructor will stress each of these items before each day's flying. It is in this phase that the student will find the emphasis on the normal glide, since a low-altitude tactical landing allows time only for an approach.

**51. APPROACH PATTERNS.** In order that the student may acquire confidence in his ability to make accurate approaches and restricted landings, regardless of the angle to the field at which he is towed, he will be required to practice, in addition to the 180° side approach, 90° approaches and 270° approaches. Since all standard patterns terminate with a 90° approach, the student can use this as his basis for planning any other approach.

**53. BARRIERS.** A barrier or obstacle will be erected at the approach end of the landing area. This will simulate the actual trees to be expected in a strange field under tactical conditions. The student must think in tactical terms, and imagine that this barrier will severely damage his glider in the event he undershoots. Furthermore, there will be a mark farther up the runway at which it will be required that the glider be brought to a stop. Here again the student must think in terms of actual obstacles. If he does not, he will find that he will not be equipped to handle the training at the advanced tactical school where actual trees are used for obstacles through the curriculum. It will be found that unless the student masters the maximum performance glide he will be unable to land his glider without a theoretical crack-up at this school and an actual one at the tactical school.

## Phase III—Night Operations

**54. GENERAL. a.** It is considered that additional transition in high tows for night work is unnecessary; therefore, the night phase will be devoted to tactical-type landings.



**b.** All lessons learned in the other two phases may be applied in night flying. The main difference lies only in the student's ability to follow the lights of the tow ship, a lesson which can be learned with little practice.

**55. LANDING.** It will be quickly discovered that even when the student cannot actually see the ground upon which he is landing, the glider will make a smooth and light contact if the approach glide has been normal. For standardization purposes a slightly higher speed may be used at night than in the day time. But this increase must never exceed 5 miles per hour.

**56. NIGHT VISION.** The use of lights inside the glider cockpit would impair the pilot's night vision, so the student must know the position and use of every control without visual reference.

**57. APPROACHES.** Two types of approaches will be taught at night, the 180° side and the 270° side.

**58. PROFICIENCY CHECK.** Each student will be given a proficiency check by supervisory personnel or an instructor other than the one to whom he has been assigned. No student will be graduated from an advanced glider school until he is proficient in the following maneuvers:

- **a.** Take-off technique.
- **b.** Correct low and high-tow position, day and night.
  - (1) During take-off.
  - (2) Climbing.
  - (3) Straight and level.
  - (4) Trimming glider for straight and level flight.
- **c.** Recovery from bad tow position.
- **d.** Standard cut-off procedure.
- **e.** Stalls.
- **f.** Turns of one, two, and three needle-widths; constant standard air speed.
- **g.** Gliding, constant speed.
- **h.** Spirals, constant speed.
- **i.** Traffic pattern.
- **j.** Use of spoilers and slips.
- ***k.** Spot landings from 200 feet altitude with 90° approach.
- ***l.** Spot landings from 300 feet altitude with 180° approach.
- ***m.** Spot landings from 400 feet altitude with 270° approach (alternate).

* All landings will be over hurdle up to simulated barrier with gliders fully loaded.

# Chapter VI

# Flying Curriculum, Advanced Tactical School Tactical Flying Training

**59. GENERAL.** The sequence is divided into phases which are progressive and stress the most important fundamentals of tactical glider flying. It will be noted that night training is planned concurrently with daylight training.

**60.** As previously noted, AAF training standards for glider pilots and Troop Carrier Command directives have recommended familiarization rides in the British "Horsa," in an automatic-tow glider, and a flight in a glider being retrieved by the glider pickup device.

**61.** Until late in the second phase, the student will be encouraged to plan all approaches without resorting to slips, using only good judgment and spoilers.

**62.** Night flying will closely approximate the curriculum used in daylight, except that only 180° and 270° approaches are contemplated.

**63.** Every landing will be graded.

**64.** The preflight check will be accomplished just as previously described for Advanced Flying Training.

## Phase I—Orientation—First Week

**65.** It will be noted that the outline to be followed is flexible. No specific maneuvers or group of maneuvers need be practiced in a specific day. However, all maneuvers outlined in the following will be practiced to the extent that pilots will be proficient before going into the next part of the

phase. The four phases are conducted in four successive weeks. Gliders will be loaded with sand ballast to 75 percent, or more, of their normal gross weight.

**66. Part I:**—One or more flights single tow, altitude approximately 5,000 feet. The purpose of these flights is for refresher purposes, orientation, and familiarization. The glider pilot will be instructed in the following:

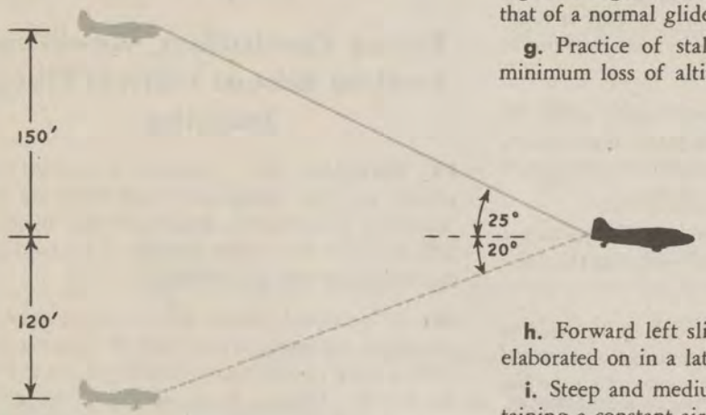



***Figure 9. Angular limits for towing.***

**a.** Pre-flight check, including Forms 1 and 1A.

**b.** Correct method of take-off, stressing normal climb to a position out of disturbed air approximately 20 feet above the ground.

**c.** Correct position of glider during towed flight, approximately 10 feet above tow ship to avoid disturbed air in the form of wing-wake, etc.

**d.** Maximum angular distance of tow above, below, and to one side, stressing the fact that the tow ship can be controlled and straight flight path maintained by the tow pilots when glider is flying at a much greater angle than normal behind C-47 and C-53 type aircraft. (See Figure 9.)

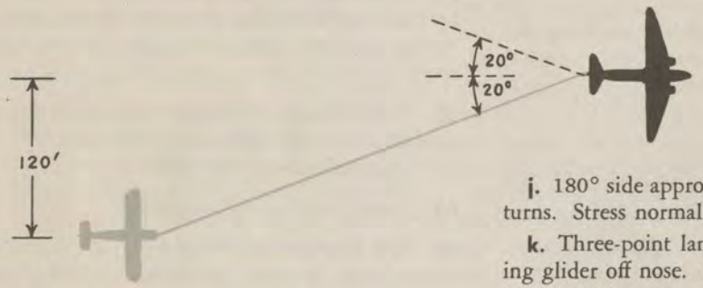
**e.** Relaxation during flight on tow. Stress alertness and minimum use of controls.

**f.** Release, stressing the importance of maintaining level flight until excess speed is dissipated into that of a normal glide.

**g.** Practice of stalls and stall recoveries, with minimum loss of altitude.

**h.** Forward left slip and recovery. This will be elaborated on in a later phase (par. 72).

**i.** Steep and medium turns, checking and maintaining a constant air speed with proper control.




**j.** 180° side approach for landing, using two 90° turns. Stress normal glide throughout.

**k.** Three-point landing, using brakes, but keeping glider off nose. (First step of emergency stopping technique.)

**67. Part II:**—Numerous flights double or single tow, in pattern, release altitude 400 feet, executing 180° side pattern with two 90° turns, practicing the following in addition to foregoing lessons:

**a.** Method of box orientation and correct location for release.

**b.** Procedure to assume normal glide speed after release.



**c.** Level-flight turns during approach, constant speed throughout turns, and the maintenance of straight glide path during final approach.

**d.** Bringing glider to a stop in 600-foot roll, maximum.

**68. Part III:**—Numerous flights in pattern, using 90° approach, release to be 400 feet altitude, double or single tow. This is probably the most important phase of glider instruction inasmuch as all landing patterns to follow will end in the 90° approach from approximately 400 feet altitude or less. Pilots will practice religiously what they have learned up to this point, with special emphasis on the following:

**a.** Pre-flight check, correct take-off procedure, correct double and single-tow position, and standard tactical release procedure.

**b.** Alertness and *foresight* in *judging point of release*. Stress the importance of *not releasing by habitual reference to a known ground object*. Always judge the intended point of landing and dispersal by considering each landing as a different problem.

**c.** Improving glide speed throughout pattern with emphasis on the importance of constant-speed level-flight turns.

**d.** Constant rate descent from approach turn to landing point. "S" turns during final approaches not permitted.

**e.** Three-point accuracy landings and normal use of brakes, practicing emergency stop technique.

## Phase II—Landing Patterns—Second Week

**69.** Phase II is primarily for the purpose of learning and becoming more proficient in standard tactical landing patterns. In addition to patterns, glider pilots should be taught how to accept the importance of absorbing briefings, the importance of air discipline and the use of alternate maneuvers and plans. All landings in this phase will be made over a 15-foot obstacle and gliders will be dispersed up to a point measured 600 feet from the base of the obstacle. Throughout all approaches glider pilots will be encouraged to judge normal glides *down over* the obstacle, and to introduce accuracy without depending on slips. Pilots should be instructed to maintain a position during the approach glide that will permit them to turn to one side of the obstacle and not go through it if they have misjudged their glide or pattern. Slips will be introduced in later phases and will be of much more benefit if pilot has judged a good glide and has not depended on slips to put him in landing position.

**70. Part I:**—Flights, double or single tow, release altitude 300 feet, demonstrating and practicing 135° approach. This approach will no doubt be used considerably in tactical operations because it eliminates the possibility of the succeeding aircraft over-running gliders in free flight. Also, should a formation, when nearing the intended landing zone, be out of position for a 180° approach it could effect a turn towards and approach the landing area at an angle which would result in the 135° approach. This approach differs from all others because the glider should effect a 45° turn soon after releasing, putting it in position for a normal 90° approach. Throughout these flights the glider pilot should concentrate on box orientation, the same as will be used in a 180° approach, and always concentrate on the landing spot after releasing. He may utilize part of the angular downwind leg and turn of the 90° approach for speed dissipation and position, or may immediately effect a 45° turn.

**71. Part II:**—Flights double or single tow, 180° side approach, release altitude 300 feet. It is planned at present that in most maneuvers, both day and night, operational, tactical or otherwise, the 180° side approach will be used. Throughout this lesson, glider pilots will perfect judgment and timing of release, box orientation to an intended landing mark, correct procedure for tactical release, and the reducing to and maintaining of normal glide speed. Anticipating the formation phase tc follow, the straight glide path in final approach should be stressed. It will be well to stress here that during the glide flight, gliders should be, for the most part, in trail, and the gliders preceding in a formation landing should be in the field of vision of the glider pilot when concentrating on his landing spot. Pilots will be cautioned to be on the alert at all times, and instructors will explain the importance of this for the formation landings which

are to follow in later phases. Accuracy over the landing obstacle will be graded strictly.

**72. Part III:**—Numerous flights double and single tow. Approaches will be alternated between 180° and 135° patterns, and altitudes will vary from 200 to 500 feet. The glider pilot will not be forewarned of the approach pattern, but should be able to recognize the pattern well back from the intended releasing point. This lesson is primarily for the purpose of utilizing the most important alternate maneuver, THE FORWARD SLIP. Much can be said about slips and the various methods of slipping.

**a.** It is desired that all glider pilots employ left forward slips. The reason for slipping to the left are:

(1) To give the pilot better unobstructed visibility of his intended landing point, also to allow his guard pilot or co-pilot in the right seat to know automatically in what position to look for other aircraft.

(2) To avoid confusion as mentioned before, in formation release, glider pilots will land in trail; also will maintain straight glide path. If all slips are made to one standard pattern, the gliders following will be able to anticipate the preceding glider's move, thereby avoiding confusion.

(3) While slipping up-wind, of course, is desirable, the effect of the slip is just as great and flight path can be maintained regardless of wind direction.

**b.** Pilots during this lesson will plan all approaches high, and intentionally slip.

**c.** During maneuvers witnessed in the past, many glider crashes would have been eliminated had the pilots known how to obtain the maximum results from slipping.

**d.** During the later phase of this lesson, students should attempt to use slips only in the latter portion of approach leg. They should practice normal glides to a point that will bring them in approximately 30 or 40 feet too high, then recognize the correct time to use the slip so as to put them in position to glide over the obstacle with approximately 10 feet clearance. At all times caution should be used against picking up glide speed during slips.

NOTE: It is contemplated that in combat all gliders will be equipped with tail parachutes.

## Phase III — Pattern Proficiency and Elementary Formation — Third Week

**73.** The purpose of this phase is to introduce all possible landing patterns, as illustrated in figures 4 and 6. In tactical operations, often the tow plane pilots will not be able to navigate to the correct position for a certain planned approach.

**a.** It is altogether possible the approach to the intended landing area will be made from an unpremeditated direction, and the towplane pilots or glider pilots may not recognize the area until directly over the field. Therefore, it is natural to assume the glider pilot will release, using 360° overhead approach into landing area.

**b.** If the approach is directly over the landing area and the direction of the formation is crosswind, the glider pilot will release and effect a 270° landing pattern.

**c.** If the approach is from up-wind, the 180° side or overhead approaches will be used.

**d.** It is inadvisable to plan a straight-in approach because, at a low altitude, the pilots will be unable to see their landing area before it is too late to release, thus causing an overshoot.

**74.** In a later part of this phase elementary formation will be introduced.

**a.** If flying single tow, formations will be two-ship elements in right echelon position, or three-ship elements in right echelon. (See Fig. 10.) If double tow, the ships will fly in column with approximately 1,000 feet spacing between each tow ship.

(1) Much progress should be noted at this point. Glider pilots should be proficient in glide angle, glide speed, and landing in a restricted area.

(2) Briefings should be given frequently and pilots checked on their ability to absorb and accept the use of alternate plans, and their judgment in general should be observed closely.




***Figure 10.***
***Flight formations, right echelon.***

**75. Part I:**—Numerous flights, double or single tow, release altitude 300 to 400 feet, 270° approach, using slips when necessary. The following should be stressed in addition to all lessons previously learned:

**a.** The use of the alternate plan if necessary.

**b.** Air discipline throughout.

**c.** Emergency stopping technique, if necessary, and general dispersal.

**76. Part II:**—Numerous flights single or double tow, releasing altitude 300 to 500 feet, 360° overhead approach pattern.

**a.** The same procedure should be followed for this type approach as outlined in the preceding part for the 270° approach.

(1) It must be remembered that the downwind leg of the 360° approach will prohibit the pilot from seeing his intended landing point. He should, therefore, pick a point some distance away from the intended landing area and judge by this until such time as he turns on his base leg, flying by the mental picture, so that he is oriented from the location by which he is judging.

(2) If on double tow, it will be well to follow in trail. However, each pilot should judge his own pattern and approach and not depend on the preceding pilots in the flight.

**77. Part III:**—Elementary formation, single tow; the maneuver to be practiced is not a tactical maneuver. It is strictly a training exercise to acquaint pilots with formation flying, also to standardize the glide speed of all pilots in their particular flights.

**a.** The maneuver consists of a 3,000-foot altitude release from two- or three-ship element formation in right echelon.

(1) Following take-off, the tugs will effect a 180° turn using a 10° to 15° bank, and assemble in formation, picking up each succeeding ship after the 180° turn.

(2) They will then climb in formation to 3,000 feet and fly directly over the intended landing area (which will be a square, 600 x 600 feet, surrounded by a 15-foot obstacle), each glider pilot will release at exactly the same point and immediately execute a 45° turn to the left

(3) The lead glider pilot will reduce his speed to normal glide, and each succeeding glider will follow in trail, maintaining a spacing of approximately 300 feet between gliders.

(4) Should any pilot be gaining on the one preceding him, it is obvious he is gliding too fast or not following directly in trail. Should any pilot be falling behind the one preceding him, he is obviously gliding too slow or not following directly in trail.

(5) Throughout this maneuver, which is a spiral with each glider following in trail, the glider pilots can exercise their judgment by keeping in position. Position can be held by flying a smaller arc or a greater arc than the preceding

gliders, or at times by using a slight level-flight slip.

(6) When the altitude is reached where it becomes necessary for any one glider pilot to put himself on a base leg, he must keep on the alert for other gliders in formation, starting the approach at his own discretion.

**d.** It is of utmost importance that air discipline, in the far right or left corner, as instructed in briefing, and each succeeding glider will disperse with wing tips approximately 10 to 15 feet apart. When the front row is completed, a second row may be started in accordance with the briefing, using the same dispersal plan.

**c.** It is highly important that all gliders be landed in the direction outlined in briefing. No crossing of glide paths or angle approach to the landing area will be tolerated. If glider pilot cannot glide to the landing area without an angle approach, thereby giving an interception problem to the other gliders in the formation, he must land outside the landing area in another portion of the airport, and permit the other gliders in the formation to land as planned.

**d.** It is of utmost importance that air discipline, planning, alertness, and constant normal glides be stressed.

**78. Part IV:** A 90° approach, in formation, altitude 300 feet, two-ship right echelon if single tows; 1,000-foot spacing in column if double tows, stressing the following:

(Hereafter when "formation" is referred to, unless otherwise specified, it will be two-ship elements in right echelon, or double tow in column with 700 to 1,000 feet separating elements.)

**a.** Preparation for flight.

**b.** Ability to fly in towed flight in formation, instruction in how to avoid slipstream, etc.

**c.** Tactical release in formation; level flight after release and no pull-ups; also lowering to the approximate level of tow plane during approach for release. See Fig. 11 illustrating position just prior to release.

**d.** Alertness to aircraft following and glider preceding in formation cut.

**e.** General plan in 90° approach.



**f.** The use of slips, or judgment in using the alternate, if not in position to complete maneuver as briefed.

**g.** Landing, dispersal, emergency-stop technique.

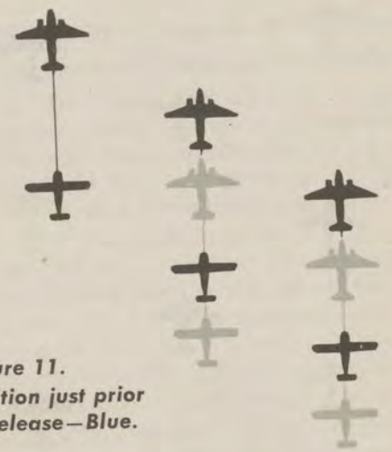


***Figure 11. Position just prior to release—Blue.***

**79. Part V:** This phase will be a repetition of Part IV. The approach plan and briefing should coincide. However, instead of landing in a marked area on the airdrome, a small satellite field adjacent to the airport will be used. Instructors will stress that glider pilots be on the alert to properly select their release location. This will be the first test of the ability of glider pilots to perform tactical missions successfully.

## Phase IV—Formation and Tactical Problems—Fourth Week

**80.** The purpose of phase IV is to acquaint pilots with formation and tactical problems simulating actual maneuvers. Throughout this phase, pilots will utilize formation tactical releases, and all patterns practiced. At this point, they will appreciate the importance of the additional flying training, and the need of maintaining complete standardization.

**81. Part I:** Flights, double or single tow, in formation, landing in marked restricted area on airport or glider tactical training area, release altitude 300 feet using 180° and 270° side approach. It is contemplated that 135°, 180° and 270° approaches will be used more than other patterns, both for night and day operational landings. The following points should be stressed and graded religiously throughout this phase:

**a.** Take-off and ability to maintain, with ease, the proper position on double or single tow. Alertness to accompanying ship when on double tow.

**b.** Recoveries from and avoiding slipstream or prop-wash banks.

**c.** Tactical release at correct location. (NOTE—*No predetermined reference.)*

**d.** Alertness for other gliders and towships in formation, immediately following time of release.

**e.** Ability to plan and follow in trail in pattern, keeping preceding glider in field of vision while concentrating on landing area.

**f.** Normal glide and constant glide speed.

**g.** Alertness to all gliders in formation throughout glide pattern and landing. (Grader will determine whether pilot is flying his own pattern or being influenced by other pilots in the formation who may be wrong.)

**h.** Use of slips in a manner to derive maximum reduction in altitude and not to obstruct or endanger other gliders flying the same mission.

**i.** Landing and emergency stop technique.

**j.** Use of alternates.

**k.** Ability to absorb and comply with briefing.

**82. Part II:** Flights, double and single tow, in formation, landing in restricted portion on airport or tactical training area. Release altitude 300 feet using 135° approach pattern.

**83. Part III: a.** Numerous flights in formation double or single tow, landing in restricted portion of airport or tactical glider landing area. Release altitude 300 feet, 270° side approach to be flown.

**b.** The 270° side approach will enable a landing pattern to be effected with ease when towplane run is 90° from desired direction for 180° approach.

(1) In execution, simulating a tactical landing in a small field, the towplane run will be in a direction 270° from landing direction and far enough to one side to permit glider pilot to see the area while seated in a normal flying position. Glider pilot will release after passing the area and reaching the proper position to put him on a downwind leg for a 180° approach pattern. Immediately following release, pilot will execute a 90° turn on to the downwind leg for the completion of standard 180° approach. The 270° pattern will be used extensively, particularly during night missions. For both day and night missions, it permits perfect "'box orientation."

**84. Part IV:** Flights in formation, double or single tow, landing in restricted portion of the airport or tactical glider landing area. Release altitude variable, 300 to 500 feet. Approach pattern variable, using any of those heretofore practiced.

**a.** This lesson will be known as the unknown approach and is practiced for the purpose of determining alertness of glider pilots in navigation, their constant knowledge of wind direction, and their recognizing and using the appropriate approach.

(1) In execution, the leading towplane pilot in formation will fly an approach to the landing area in correct position for a landing pattern all glider pilots should recognize.

**b.** The following should be checked and stressed, as usual:

(1) Preflight check.
(2) Take-off.
(3) Tow position.
(4) Alertness.
(5) Planning.
(6) Navigation.
(7) Recognition of pattern from any direction of approach.
(8) Landing over and to obstacles.
(9) Accuracy.
(10) Emergency stop technique and dispersal
(11) Respect for equipment.
(12) General headwork and ability to absorb briefings.
(13) Normal glide.

**85. Part V:** Maneuvers will be flown simulating actual combat missions, both day and night. All missions will strictly follow problems based on simulated Field Orders.

# Section II
# Miscellaneous

## Chapter VII
## The CG-4A

**86. GENERAL.** The CG-4A glider is a 15-place high-wing land monoplane built in accordance with the Army Air Forces Specification 1025-2.

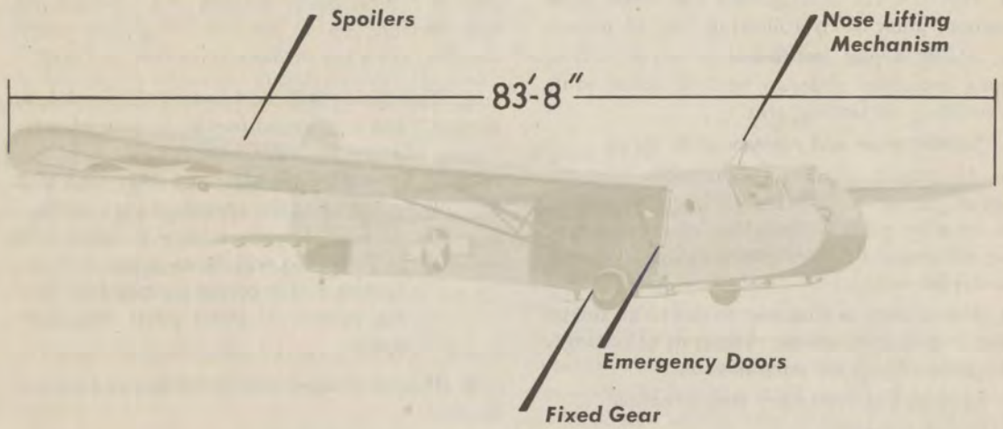



*Figure 12. CG-4A.*

**87. DESCRIPTION: a.** Fuselage: fabric-covered, steel tube.

**b. Wing:**

(1) 2-spar, strut-braced.

(2) Span, 83 ft. 8 in.

(3) Area, 851.5 sq. ft.

**c. Tail wheel:** non-steerable, full swivel.

**d. Undercarriage:**

(1) Fixed spring oleo type, hydraulic brakes.

(2) Jettisonable reinforced steel axle, no brakes.

**e. Flight controls:**

(1) Ailerons and elevators, inverted columns, dual control.

(2) Rudders—conventional, dual controls.

(3) Brakes—toe, pilot only.

(4) Trim tabs—overhead, crank operated.

(5) Spoilers: Lever-operated, dual controls.

(6) Acceleration chute—overhead levers for

(a) opening

(b) releasing

**f. Locking devices:**

(1) Jettisonable gear—overhead lever.

(2) Nose-release lever, between pilot seats.

**g. Fuselage equipment:**

(1) General description: Fuselage equipment consists of seats, safety belts, tie-down fittings, nose lifting mechanism, and flight-report holder.

(a) Cockpit seats: non-adjustable, and mounted directly on the fuselage.



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

(c) 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.

(d) The nose-lifting mechanism is so designed that the nose may be automatically raised by means of a ¼-ton truck carried in the cargo compartment; reference T.O. 09-40CA-5.

**88. EMERGENCY DOORS:** Located halfway between cockpit and entrance doors.

**89. SPEED LIMITATIONS:** The maximum allowable indicated air speed in free flight, or on tow, is 150 mph. However, a speed of 115 to 120 mph is preferable. The unloaded glider stalls at about 45-50 mph. A full load increases the stalling speed to between 55 and 60 mph. Spoilers can be used through all speed ranges but increase the stalling speed of the loaded glider approximately 5 mph. Reference T.O. 09-40CA-1.

**90. MANEUVERS:** The CG-4A glider is restricted from all acrobatic maneuvers.

**91. STALL CHARACTERISTICS: a.** An approaching stall is telegraphed to the pilot far in advance of the danger point. If a stall occurs, recovery may be made with a very slight forward motion of the control column. A fully loaded glider may be stalled and recovered with a loss of as little as 30 feet in altitude.

**b.** Furthermore, it may be landed in a normal glide without changing its attitude, which allows the pilot to make night landings without visual reference to the actual point of contact.

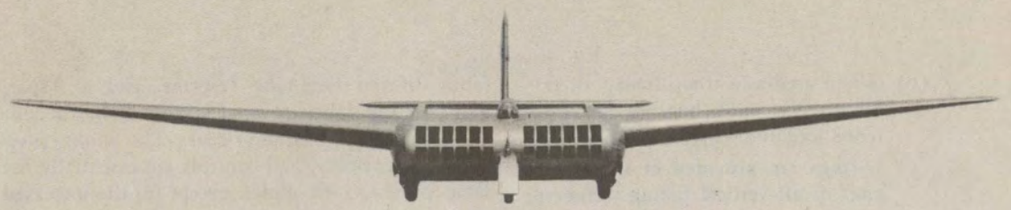
## Chapter VIII
## Other Gliders, American and British

**92. TYPES IN USE: CG-13:** The CG-13 glider is a 42-place high-wing land monoplane. It has a fabric-covered steel-tube fuselage, and a 2-spar, plywood and fabric-covered wing. It has a non-retractable tricycle landing gear. The wings, fuselage, tail assembly, and controls are essentially the same as the CG-4A glider, except for the increased cargo capacity. The nose has been somewhat streamlined. Maximum allowable indicated airspeed is 180 mph. This glider is designed to carry a useful load of approximately 10,000 pounds and has advantages over the CG-4A glider as a heavy equipment carrier. It can carry a 1½-ton 6 x 6 truck or it can carry one 105-mm gun with jeep and ammunition, in addition to being used as a personnel carrier. The fact that it can carry the artillery piece and its prime mover is a distinct advantage in itself. The combination load in one glider eliminates the extra ground handling operation, and the additional tow lines and hardware required for present double-tow glider operation. In the landing area, it decreases by one-half the number of gliders required, and thereby eliminates confusion and possible hazard to other aircraft. On the other hand, it lands faster than the CG-4A and requires larger landing areas.

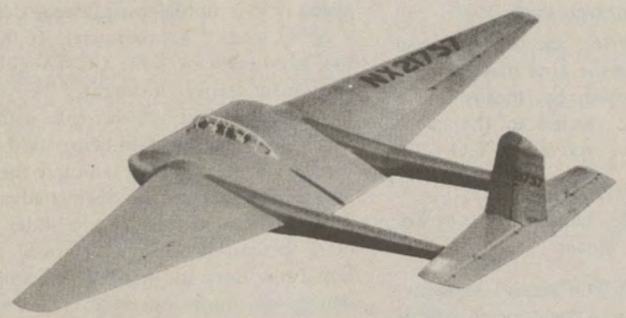
**93. FUTURE GLIDERS:** At present the following gliders are in the experimental stage:

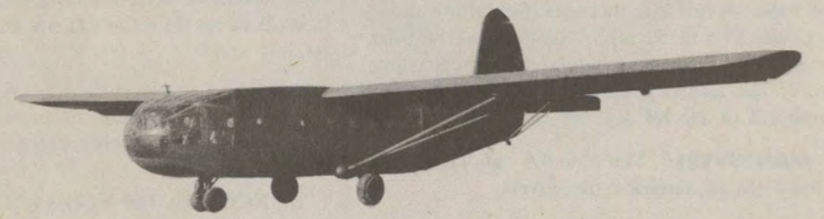
**a. XCG-14:** The XCG-14 "Chase" glider is a high-wind land monoplane, streamlined to give minimum drag at high speeds. It is to be a 15-place glider, carrying comparable loads to the CG-4A, but aerodynamically clean enough to be towed behind fighter aircraft.

**b. XCG-16:** The XCG-16 "Bowlus" glider is of the flying-wing type with a twin-boom tail. This glider is of a very clean design and can be towed by twin-engine aircraft at high speeds with minimum drag. It is designed to accommodate airborne artillery equipment, carrying the combination of jeep and 105 howitzer or gun, with the necessary airborne crew and considerable ammunition. Loading is in the wing which is divided into two compartments. This glider is loaded through the forward portion of the nose which has a hydraulic nose-opening device. As a personnel carrier, in addition to the pilot and co-pilot, it will carry 40 airborne troops.

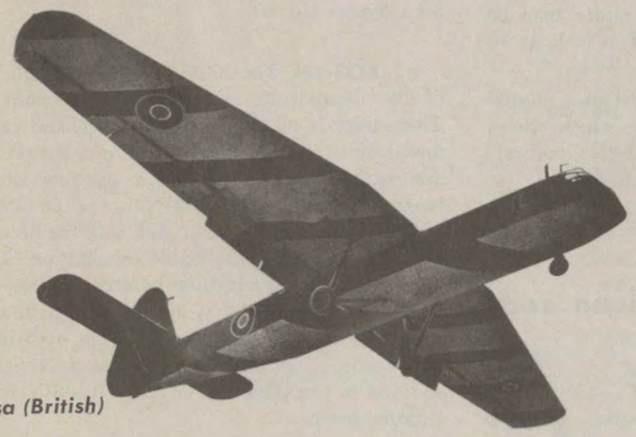


XCG-16





CG-13



Horsa (British)



Figure 13

**94. HORSA (British): a. General:** The Horsa I glider is a wooden cantilever high-wing monoplane equipped for the transport of troops, military equipment, and light vehicles. The components are constructed in separate subsections.

**95. Description:**

**(a) Wing:**

(2) Area—1,104 sq. ft.
(1) Span—88 ft.

**(b) Fuselage:** semi-monocoque, constructed in three sections; nose, center and rear.

**(c) Undercarriage:** jettisonable, rubber block shock absorbers; castoring nose-wheel; main skid used when gear has been jettisoned, mounted on rubber blocks.

**(d) Controls:** (1) Ailerons and elevators—dual column.
(2) Rudders—conventional.
(3) Trim tabs—elevators only.
(4) Flaps, pneumatic, actuated by compressed air from small tank in cockpit.
(5) Brakes—pneumatic, actuated as flaps above.

**(e)** The Horsa "tow drag" is comparable to the double CG-4A tow or the single CG-13 tow.

**(f)** One distinctive feature in this glider is the large-surfaced flaps which will extend themselves to an angle of 80° thereby permitting a very high rate of descent without materially increasing speed.

## Chapter IX

## Towships, American and British

**96.** The following American types have been used for glider towing. (This list taken from T.O. 01-1-143. Other gliders than those listed may be towed. List refers only to actual accomplishment.)

1. **C-47-C-53 Series:**
   **2 fully loaded CG-4A's 1 Horsa, or 1 CG-13**
2. **C-60A:**
   **2 fully loaded CG-4A's, or 1 CG-13**
3. **C-46A:**
   **2 fully loaded CG-4A's**
4. **B-17F:**
   **2 fully loaded CG-4A's**
5. **B-24D:**
   **1 fully loaded CG-4A**
6. **B-25C:**
   **1 fully loaded CG-4A**
7. **P-38:**
   **1 fully loaded CG-4A**
8. **A-25A:**
   **1 fully loaded CG-4A**

**97.** Although not contained in above mentioned T.O., the following American towships have been used:

1. **C-54:**
   **3 fully loaded CG-4A's**
2. **PBY:**
   **2 fully loaded CG-4A's**
3. **OA-9:**
   **1 fully loaded CG-4A**

**98. British types:**

1. **Dakota (C-47):**
   **2 fully loaded CG-4A's, 1 Horsa**
2. **"Whitley V":**
   **2 CG-4A's or 1 Horsa**
3. **Halifax:**
   **2 CG-4A's or 1 Horsa**
4. **Hudson (6) (7):**
   **1 CG-4A**
5. **Lancaster, Wellington, Albemarle:**
   **1 CG-4A**

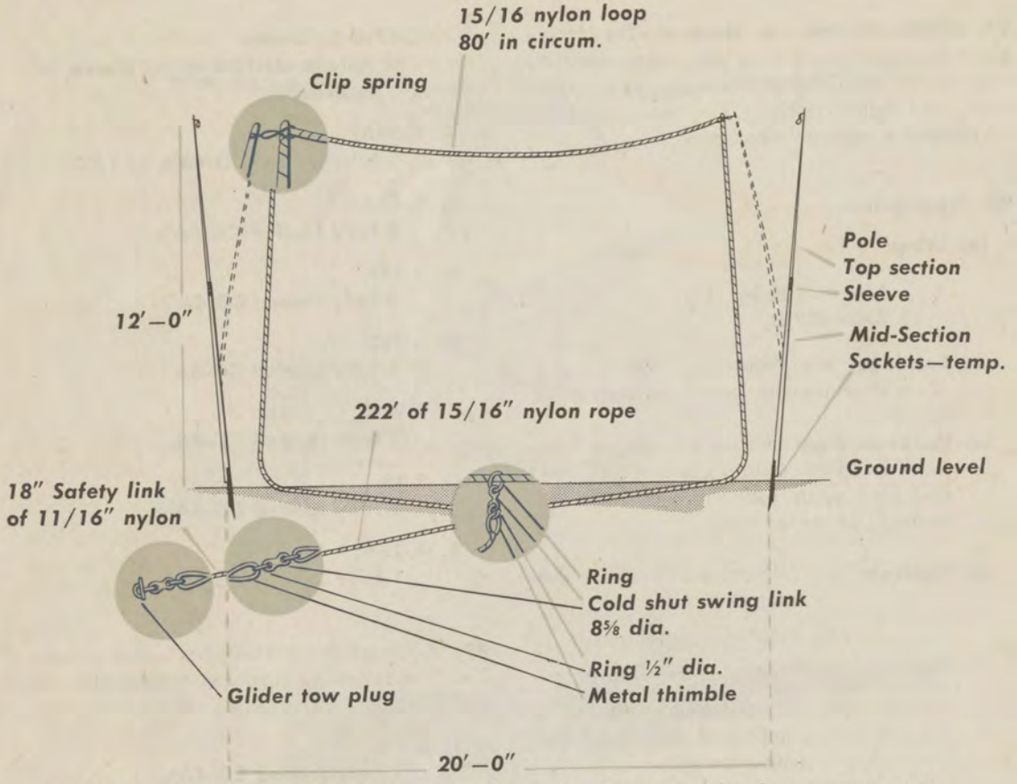



*Figure 14. Pick-up, ground-station poles, nylon loop, and leader arrangement.*

## Chapter X
## Glider Pickup

**99. GENERAL:** The present glider retrieving equipment is manufactured by the All-American Aviation Company who pioneered the development of picking up mail by a plane in flight. The unit with which Troop Carrier Command airplanes are being equipped is known as the Model 80X and necessitates a slight modification of the airplane when installed. The pickup system is designed for the non-stop launching by airplane of a glider having a gross weight not exceeding 8,000 pounds. A larger unit, to pick up gliders weighing 16,000 pounds, is under development.

**100. ENERGY-ABSORBING UNIT:** The composition and operation of the energy-absorbing unit installed in the airplane are covered in detail by

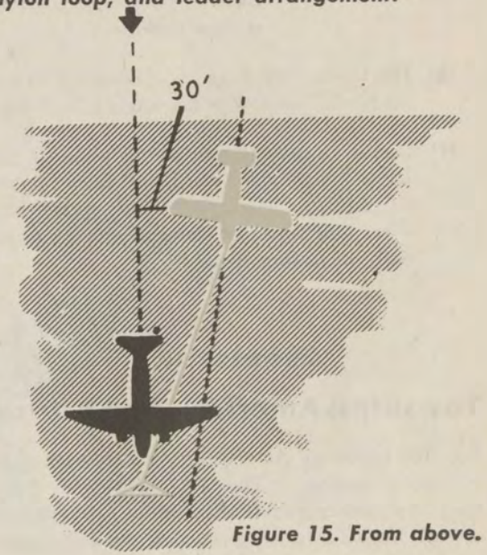
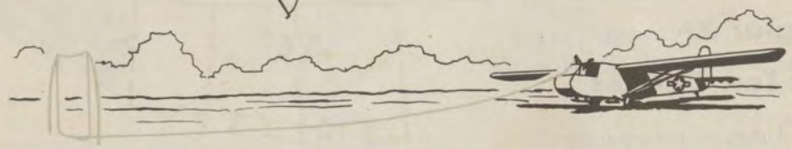



*Figure 15. From above.*



Technical Orders and warrant careful study, both by the pilots and the operator of the unit.



**101. LOAD LIMITS:** The weight limits of the device are such that the glider can be picked up fully loaded, which means that, tactically, a group of glider pilots could be evacuated from enemy territory by this means, or wounded personnel quickly and safely returned to base hospitals.

**102. GROUND STATION:** The composition of the ground station is illustrated in a series of four sketches, pages 30 and 31. The illustrations, however, are indicative of the present type of ground pickup station and subject to change or modification.

**103. EXPERIENCE, GLIDER PILOT:** The glider pilot flying the glider which is being picked up should have had previous experience and thoroughly understand the operation of the equipment. He, likewise, should be a better than average pilot.

**104. COMMUNICATION WITH PICKUP PLANE:** Radio communication with the pickup airplane is extremely important, but a simple panel signalling system can be substituted.

**105.** After the airplane contacts the ground station, the glider pilot should:

**a.** Fly the glider off the ground as soon as possible.

**b.** Stay slightly to the left and below the airplane to avoid chafing the fuselage or empennage of the pickup airplane by the steel cable.

**c.** Assume the normal tow position after the acceleration period is completed.

**d.** Except in emergency, do not release the glider end of the towline under 1,000 feet of terrain clearance. Remember the loop leader and cable may total as much as 1,300 feet.

***The glide path is sufficiently steep to clear obstacles. There is no period of level flight.***

***Power is being applied shortly before contacting station.***

***Lowest point in trajectory is here.***

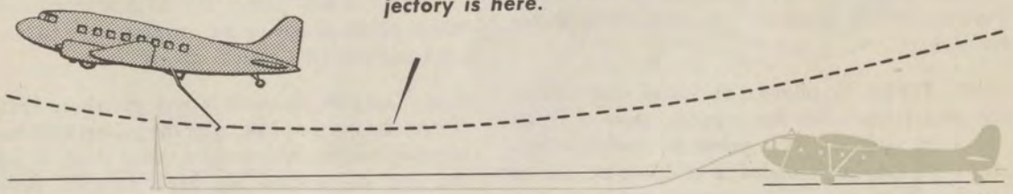


*Figure 16.*

**106. TRAINING GLIDER PILOTS:** A recommended familiarization training period for glider pilots will include a thorough knowledge of the various elements of the entire mechanism and their limitations, a demonstration of the operation in the airplane and on the ground, plus at least one familiarization ride as co-pilot of the glider, before actually flying the glider being picked up.

## Chapter XI

## Automatic Tow Devices

**107. EXPERIMENTS:** Automatic tow equipment is being experimented with in order that gliders may be towed under instrument conditions. The D-1 model developed to date is an adaptation of the standard A-3 automatic pilot. The direction and elevation corrections are derived from a feeler arm attached to the towline. Glider operations, under instrument conditions, would nevertheless still require "contact weather" at point of departure and point of intended landing.

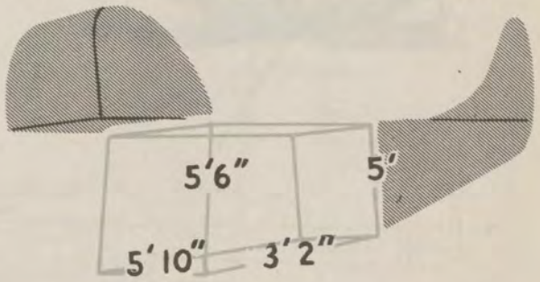
## Chapter XII

## Utility Installations

**108. GENERAL:** Gliders may be used on occasions for the transport of special equipment to spots which are inaccessible by other means. The glider and equipment would then be retrieved by means of pickup.

**109. TYPES:** A number of special installations are under study for this purpose, such as repair shops of various sorts, a group aid station, a unit for evacuation of wounded, a field kitchen, and so forth. Some types of equipment, such as radios, radar sets, weather stations, and photo laboratories are designed to be transportable by air and may be carried in gliders on special missions.

**110. MOBILE GLIDER REPAIR UNIT:** Now standard equipment for Troop Carrier Squadrons is a mobile glider repair unit which is designed to be carried in a CG-4A or any larger glider. This is a complete shop for first and second echelon maintenance of gliders. It is carried in cabinets on a trailer which may be towed by any army vehicle.




The shop includes a generator, various power tools, and a shelter which is set up to house the shop during operation.

## Chapter XIII

## Emergency Release Signals and Procedure

**111.** Regardless of whether or not radio or interphone communication has been provided, there must be a thorough understanding between the towplane pilots, glider pilots, and the ground crew personnel, of accepted standard signals. The accepted hand and light signals are illustrated.

**a.** There must also be signals for the emergency release of gliders, particularly on combat missions, where either gliders or the towplane may be damaged and rendered beyond control.

**112.** Likewise, missions where parachute troops jump from the towplane, after the gliders have been released, necessitate a positive visual check to indicate that the towline has been dropped, before jumping the parachutists.

**113.** To prevent the rope from snapping back into the glider, it is the glider pilot's responsibility to release first. In cases of emergency, the towplane can signal in one of the following manners:

(1) Lowering the landing gear.
(2) Rocking the towplane's wings.
(3) Using interphone or radio.
(4) Flashing formation or landing lights (at night).



***Figure 17.***
***Standard signals for glider crews.***

***1.***
***Closed fist toward glider pilot—close release.***

***2.***
***Open hand toward pilot—open release.***

***3.***
***Two hands extended over head—hold where you are STOP! or RED light.***

***4.***
***Beckoning motion with one hand—take up slack in towline. or WHITE light.***

***5.***
***Arm extended over head in forward motion—clear for take off. or GREEN light.***

## Chapter XIV

## Unscheduled Glider Releases

**114. GENERAL:** It is doubtful if any one agency in the Army Air Forces can supply an up-to-date and accurate tabulation of all unscheduled glider releases and glider accidents, with reasons for their occurrence. Therefore, the material which follows must be accepted as a cross section of the unscheduled glider releases and glider accidents which have occurred in the accomplishment of aircrew training with I Troop Carrier Command. This information is based upon all types of glider flying missions from the initial ferry trip from the manufacturer to participation in actual Airborne Troop Carrier maneuvers. Likewise, it must be remembered that these statements involve only the CG-4A glider when towed with the approved type of towline and accessories illustrated in figure 18.

**115. CAUSES:** Unscheduled releases of gliders do not necessarily result in glider accidents, except where the glider pilot's state of training or lack of

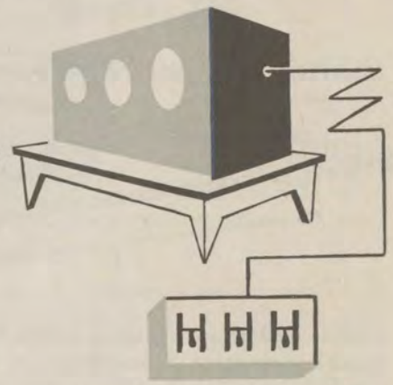
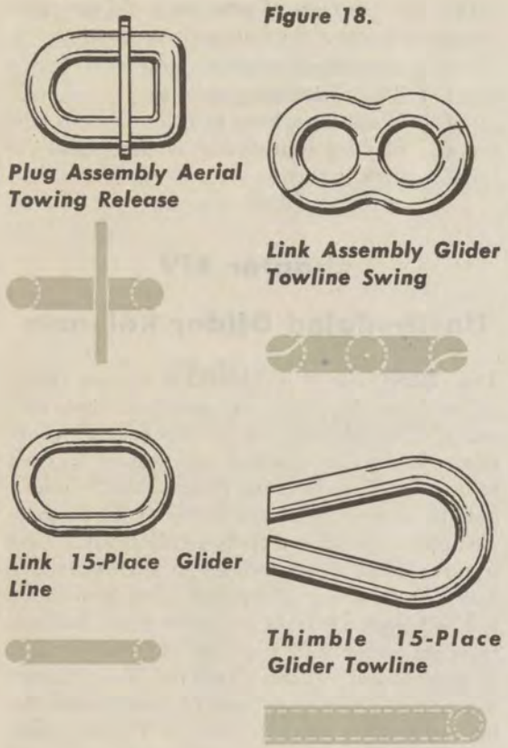


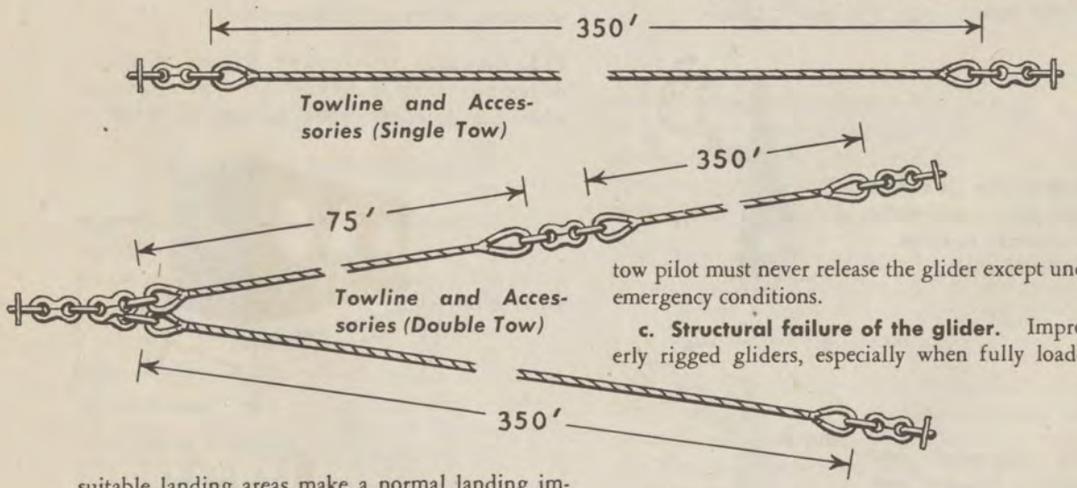
*Figure 18.*




are discussed in the order of their relative frequency:

**a. Faulty towlines or towline accessories.** The importance of towline inspection cannot be over emphasized and although ground crew personnel are required to accomplish the inspection, both the glider pilot and the tow pilot should, wherever possible, make an additional visual inspection. A Technical Order is in the process of publication which deals fully with the method of inspection of the towline and its accessories, plus the disposition of defective towlines and accessories. The most important part of this visual inspection is the proper seating of the plug in the glider towline attachment cylinder.

**b. Emergency operation of towplane.** On double-tow operation, where long distances and formation flights are involved, the towplane pilot is occasionally confronted with emergency conditions that warrant the immediate release of gliders. C-47A and C-53 type aircraft cannot tow two fully loaded gliders on one engine, but in case of engine failure an effort should be made by the towplane pilot to assist the glider pilots in releasing over a suitable landing area if at all possible, remembering that the release of the towline without warning may cause it to penetrate the nose of the glider and result in possible injury to the glider pilot. The tow pilot must never release the glider except under emergency conditions.




**c. Structural failure of the glider.** Improperly rigged gliders, especially when fully loaded, suitable landing areas make a normal landing impossible. However a knowledge of the causes should better equip the pilot to take steps toward their avoidance. The most common causes of these



have peculiar flying characteristics often referred to in such terms as "tail flutter," "wing-heaviness," "nose-heaviness," etc. Likewise on double-tow operations, midair contacts may puncture wing fabric and necessitate landing immediately.

**d. Glider pilot loses towplane orientation *(night).*** The crew chief must observe the take-off through the astral dome to warn the pilot of the towplane should either glider encounter difficulty, thus endangering the successful take-off of the towplane. It should be noted here, that wing overlap should never be permitted, in taking off or in tow, because should the glider on the short tow accidentally release, the glider on the long tow could not prevent overrunning and colliding.

**e. Shifting loads *(due to improper lashing);*** changes in flying characteristics of glider. The major portion of a glider pilot's flying is done with simulated loads or only partial loads. Therefore, when participating in maneuvers with actual payloads, such as vehicles, artillery weapons, and communications equipment, flying characteristics of the CG-4A glider are changed materially. On recent maneuvers gliders were released prematurely because of improperly lashed loads.

**116. DAMAGE CAUSES IN SUITABLE LANDING AREAS:** The following is intended to emphasize the factors which cause glider damage in suitable landing areas:

**a. Errors in judgment:**—This principal factor is largely attributed to poor judgment which in most cases is nothing more than a lack of adequate glider flying experience or disregard of accepted glider flying standards.

**b. Misinterpreted briefing:** The importance of briefing (par. 27 *b*) cannot be overlooked. Actual instances are on record where gliders landed in the same field at the same time flying in opposite directions. Other instances are known where fields appeared similar from the air, but vastly differed as to type of terrain.

**c. Excess glide speed:**—The danger of this type of glider flying has many times been demonstrated, especially in night landings where a long flight parallel to the ground has damaged other gliders which had been safely landed. In two cases, excess glide speed together with the use of emergency-stop technique resulted in flipping gliders over on their backs, with serious injury to personnel and equipment.

**d. Improper use of emergency-stop technique:**—The emergency-stop technique was developed as a controlled maneuver and is not considered a landing attitude. After a normal landing has been effected, it should be employed as additional braking action. Frequently, especially at night, glider pilots have literally flown gliders into the ground, in the belief that they were executing the proper use of the emergency-stop technique.

**e. Limited visibility:**—Blowing dust, ground fog, and defective windshields all hamper vision, particularly at night. This must be realized and, if necessary, the windshield broken out before attempting to land in order to permit the maximum possible vision.

**f. Brake failure:**—Simulated tactical operations require dispersal of gliders after landing which is largely accomplished with the use of brakes, especially where CG-4A gliders are equipped with the training-type gear. In the landing procedure discussed in a preceding chapter it was recommended that the glider pilot check his brake action while on his final approach so that he can anticipate brake failure.

## Chapter XV

## Instrument Weather Conditions

**117. WITHOUT AUTO TOW EQUIPMENT:** The CG-4A must not be flown on tow under instrument weather conditions. Under no circumstances will a tug pilot fly into a cloud bank or a condition where visibility is poor.

**a.** On long cross-country flights the weather at departure airfield and airfield at destination must be "contact". In flight the tow may be high to clear local weather conditions, but CFR conditions should exist along the route.

## Chapter XVI

## Forced Landing Procedure

**118. IN UNITED STATES:** The Pilots Information File prescribes in detail the action to be taken in the event of a forced landing within the United States, the most important requirements being:

**a.** Secure necessary medical attention.

**b.** Report to commanding officer of nearest Army Air Forces station:

(1) Location of accident or forced landing.
(2) Nature and cause of landing.
(3) Extent of injuries, if any.
(4) Assistance required.
(5) Action taken to care for the injured.

**c.** Secure all available evidence or testimony.

**d.** Establish guard to protect aircraft.

**e.** Arrange for movement of personnel to their destination.

**f.** If there are damages to private property, secure a statement on WD Form 17.

**g.** Make no statements to civilians about the accident.

**h.** Enter complete statement on Form 1A and take it with you to your organization's operations officer.

**119. IN THEATERS OF OPERATIONS:** In a theater of operations, it is the pilot's responsibility to know exactly what is expected of him in the case of a forced landing. The glider pilot must ascertain that required medical kits, signalling devices, and emergency rations are in his glider prior to take-off and that personnel in his glider are instructed in their purpose and use.

## Chapter XVII

## Mooring of CG-4A Glider

**120.** Since the CG-4A Glider is a light-wing-loading aircraft, it is very likely to be damaged or blown away by winds of comparatively low velocity. Proper mooring of the glider is therefore imperative. Correct mooring may be accomplished by the following method:

**a.** When possible glider should be stored under cover to avoid weather and winds.

**b.** If hangar space is not available, permanent mooring rings should be firmly installed into hard surface ramps or ground within glider dispersal area. Such rings should be installed so that the mooring rope, when attached to the glider mooring ring located at wing-strut juncture, is at an angle of 30° from perpendicular outward and forward. (See illustration.)

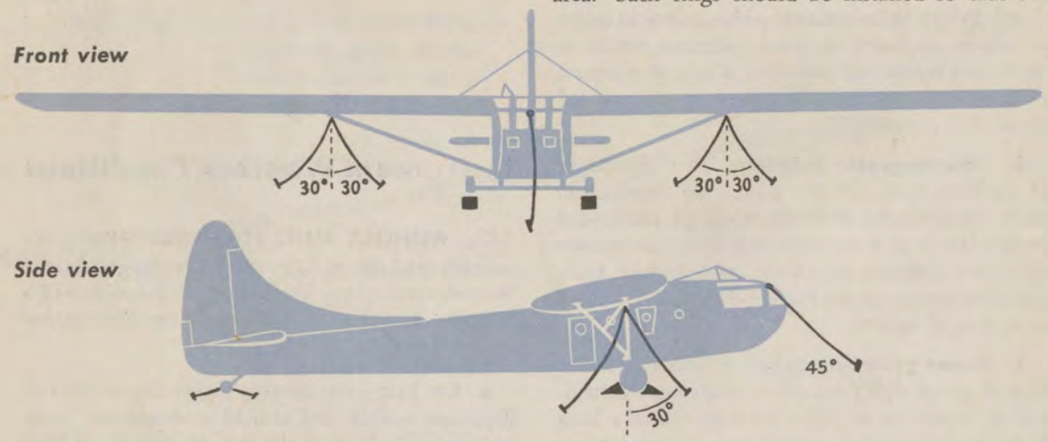



*Figure 19. Tie-down methods CG-4A.*

**c.** Tie-down rope from tow-line release mechanism should tie to ground mooring ring at an angle of approximately 45° from perpendicular.

**d.** Tail wheel should be tied down to tie-down rings approximately 12 inches directly aft of tail wheel.

**e.** Tie down ropes will be at least ¾-inch diameter hemp rope or equivalent.

**f.** Wheel chocks or sand bags will be placed fore and aft of wheels on all parked gliders. (See illustration.)

**g.** Glider should, at all times, be moored heading into prevailing winds if possible.

**h.** Suitable locks must be tightly fixed in place on all controls so as to prevent any movement of controls during winds. *If this is not strictly adhered to considerable damage is sure to result.*

**i.** Spoilers to be tied in open position on all moored aircraft. (See illustration.) Mooring spoilers will be made and used on all gliders when moored.

**j.** Moored gliders should be inspected daily for condition and tautness of mooring ropes and presence of mild in cabin and wings. Parked gliders will be thoroughly ventilated daily in order to prevent moisture resulting in mold forming in any of its parts.

**k.** While gliders are being operated, should a sudden wind be experienced making it impossible to properly moor gliders, ground-handling crew should immediately install control locks, turn glider with tail into wind, block wheels and lock brakes. This procedure is only to be used in case of emergency. If time will permit, glider mooring kit should be used and glider moored at present location in accordance with foregoing instructions, attaching glider-release mooring rope to trucks, tractors, jeeps, or any other vehicles obtainable at present location.

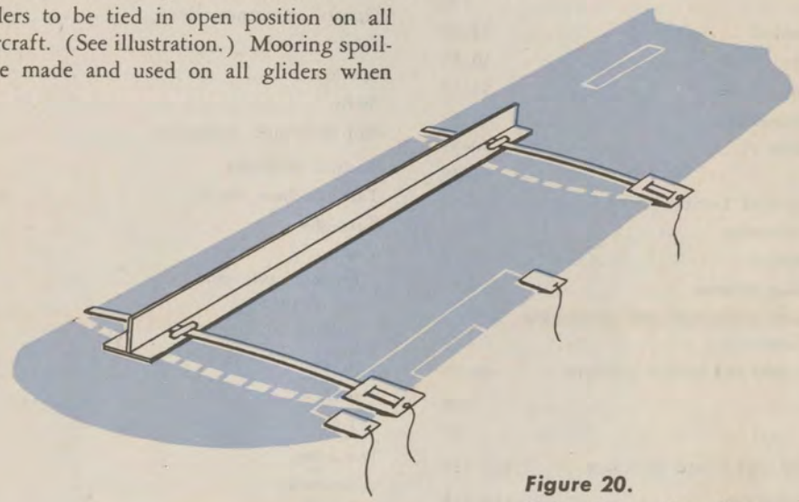


*Figure 20. Wingtip showing mooring spoilers and aileron locks.*

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