ADVANCED CONTACT FLIGHT MANEUVERS

FIXED WING

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UNITED STATES ARMY AVIATION SCHOOL
FORT RUCKER, ALABAMA

FIXED WING FLIGHT MANEUVER GUIDE

PURPOSE: To establish a guide for the Short Field Phase of Fixed Wing Training that can be used as a reference by student pilots prior to and during this phase of training.

SCOPE: This publication covers all aspects of the Short Field Phase of Fixed Wing Flight Training and will be used as the standardization and grading criteria during this phase of training.

TABLE OF CONTENTS

USE OF FLAPS AND BRAKES

Due to the widespread misuse of flaps and brakes and the importance of developing correct techniques, students should have a thorough knowledge of the effects of flaps and brakes and their correct usage, prior to beginning the advanced phase of training.

Flaps are a mechanical means, controllable from the cockpit, of changing the angle of attack of the wings of the aircraft, without changing the attitude of the aircraft. As such, their purpose is to provide the pilot with additional control for more lift or more drag, as his needs arise. This enables the pilot to fly his aircraft safely at speeds which would otherwise become hazardous. Thus, the importance of flaps to short field operations can be readily seen. But the beneficial effects of flaps can quickly become adverse through misuse.

Except in emergencies, the flaps should never be lowered at a speed that is faster than the no flap gliding speed. This is 80 MPH for the L-19 aircraft. The flaps should never be jerked into position. Besides placing a strain on the flaps and their mechanical linkage, it is very uncomfortable to the pilot and passenger (very loud noises usually occur if the passenger is an instructor pilot) when lowering the flaps, and it can become very dangerous when raising the flaps, particularly in a go-around from a landing approach or a pull up from a simulated forced landing. This can be very easily demonstrated by climbing to a safe altitude, lowering the flaps at the correct airspeed and then raising them rapidly. Either the nose of the aircraft must be brought up to a stall or an approach to a stall to maintain altitude, causing very definite losses in control effectiveness or, altitude must be sacrificed to maintain control effectiveness. At critical altitudes, either of these effects become dangerous. This can be eliminated by bringing the flaps up slowly and smoothly, pausing at each notch in the case of mechanical flaps or, in the case of electric flaps, raising them a few degrees at a time. This is called "milking" the flaps up. Its purpose is to allow the aircraft enough time to accelerate to a safe speed as the flaps are raised.

When using mechanically operated flaps, the pilot must be very careful to grasp the flap handle in such a manner that it cannot slip out of his hand and allow the flaps to come up suddenly. Also, in reaching for the flap handle, the pilot must keep his head up, remain alert and not allow his body movement to alter the attitude of the aircraft.

Electrically operated flaps should be checked full range after the engine has been started (to prevent running the battery down), checking the flap indicator for correct readings. Students should learn to judge the degrees of flaps accurately by noting the position of the trailing edge of the flaps against some known position (usually the line of rivets along the rear of the back windows).

Student pilots will be instructed in the correct use of all the various flap settings. They should strive to develop individual judgement in deciding the correct setting for a given situation. The thirty degree flap setting will be used for all take-offs. Full flaps (60 degrees) should not be employed in strong or gusty wind conditions, nor when a cross wind exists.

Brakes should be used only for slowing or stopping the aircraft, emergency directional control or making sharp turns. The only exception to this is the sparing use of downwind brake when taxiing in a strong cross wind. Taxiing with excessive engine RPM and holding the brakes to control taxi speed and steer with is very poor pilot technique. It can cause the brakes to fail at a time when you need them most due to overheating.

Brakes play a very important role in short field operations. They should be very carefully checked during the preflight to insure that no mechanical defects are present. When the aircraft is taxied out of the stall at the beginning of a flight the brakes should be applied to check their operation and determine the amount of pressure needed to achieve the desired reaction. Brake pressures vary between different aircraft and the pilot should always be aware of the "feel" of his brakes.

During the take-off roll the brakes should not be used except for emergency directional control. Good rudder, elevator and aileron control will emiminate the need for brakes. This is very important in short field take-offs because using brakes will slow down the roll and cause a longer ground roll.

Two factors permit the safe use of brakes in the initial portion of a three-point landing roll, when the speed is relatively fast and the stick is held full back. The flow of air over the control surfaces is greater during the initial landing roll and with the stick in the full back position this tends to hold the tail of the aircraft down. Also, the force of momentum in the initial portion of the landing roll is acting parallel to the landing roll. As the aircraft slows down, the downward pressure against the tail decreases and the force of momentum tends to rotate the aircraft around the main gear. For this reason, if brakes are to be employed in the landing roll, they should be used in the initial portion of the landing roll when the speed is relatively fast and very sparingly or not at all when the landing roll slows down.

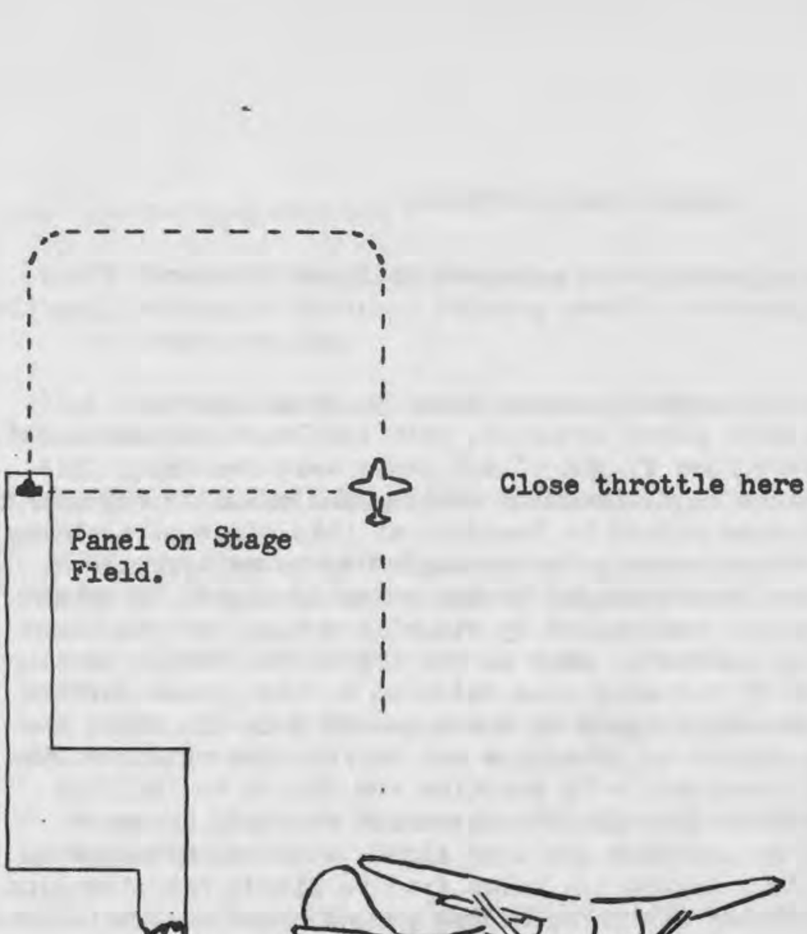
NORMAL POWER APPROACH

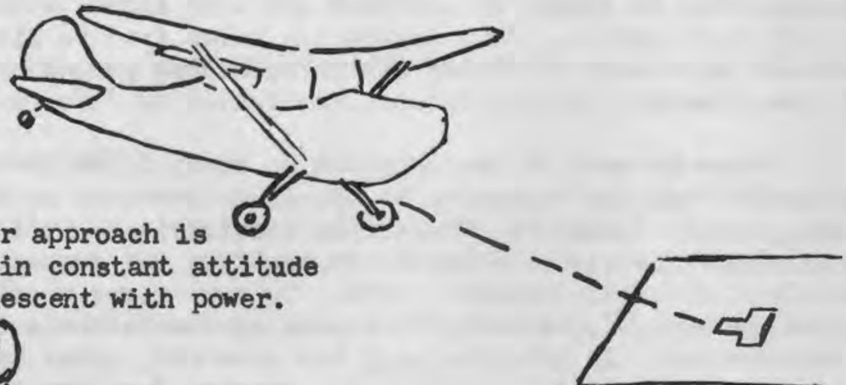
The normal power approach is a maneuver utilized for short field landings. The power approach allows greater accuracy in controlling the point of touch-down.

The normal power approach is accomplished in power approach attitude. This is the highest pitch attitude, with resultant slowest speed, that would sustain controlled flight if all power were removed. This attitude will vary according to the flap setting and existing atmospheric conditions. This attitude should be familiar at this stage of training, and will be further demonstrated prior to beginning power approaches. Power approach attitude is determined by the sense of sight, in which the attitude is gauged and controlled by visually noting the positions of various parts of the aircraft, such as the top of the engine cowling and the bottom surface of the wings, in relation to the ground surface and horizon. It is also determined by the sense of feel, in which the control pressures are gauged to determine and control the attitude. This sense of feel will be developed with practice and should be familiar from prior experience with slow flight. Aircraft control, in power approaches, is judged by attitude and feel alone, without reference to flight instruments. This leaves the pilot free to divide his attention between alertness for other aircraft, proper ground track and variations in the descent.

Power is used in the approach to control the descent line of the aircraft from the beginning of the power approach to the point of touch-down, and to assist in maintaining a sufficient airflow over the control surfaces. The use of power in controlling the descent line should be confined to small changes in RPM. This requires a delicate touch for throttle control. A method for holding the throttle correctly will be demonstrated. In pre-flighting the aircraft, prior to performing power approaches, the throttle should be checked for free and smooth movement. A sticking or jerky throttle action makes small power changes very difficult.

The power approach is normally initiated from the 180 degree side approach. A normal, power-off glide is maintained until the correct approach angle for beginning the power approach is encountered. This may be on the base leg or final approach. The pilot should decide which flap setting he is going to use prior to beginning the final approach portion of the descent. If the power approach is begun on base leg, the turn to final must be started early enough so that a shallow bank will accomplish the turn, or the nose should be lowered during the turn, or a combination of additional power and lowering the nose should be used. This is to compensate for the lift lost in the turn and the resultant accelerated descent.



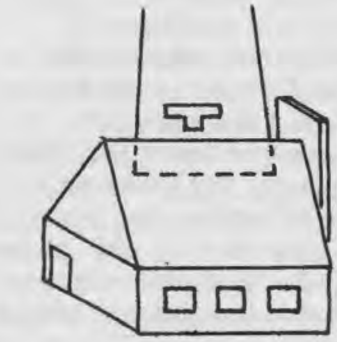


When the power approach is begun, maintain constant attitude and control descent with power.

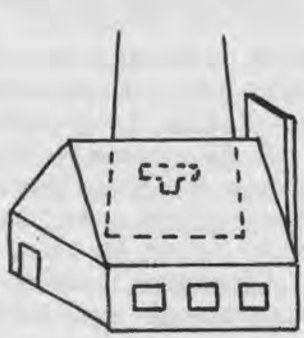
The throttle should be held with the hand in a relaxed position, braced so that the throttle may be squeezed forward and aft. The above illustration shows one method. Students should not hold the throttle in such a manner that sudden, full power application will catch their fingers between the throttle and mixture control.

In beginning power approaches, students experience the most difficulty in using the sight picture to judge the descent line correctly. This results from having nothing to sight over in order to recognize changes in their descent angle from the sight picture. One method of overcoming this difficulty is for the student to imagine some type of barrier (house, tree, wall, etc) off the approach end of the landing strip. He may then use the angle between the top of this barrier and his desired touch-down point to determine the consistency of his descent angle and regulate his descent accordingly. While the desired touch-down point and the top of the barrier maintain a constant picture, with the point of touch-down remaining just above the barrier, the student recognizes that he is maintaining a correct and constant descent. If the point of touch-down moves away from the imaginary barrier, the student's sight picture will change, telling him that he is too high and needs a power reduction. If the point of touch-down moves towards and under the imaginary barrier, the sight picture will change, telling the student that he is too low and needs a power addition. By using this method, the student is able to recognize changes in the sight picture more readily, and may thus maintain a correct descent line with minimum changes in power. Another method of gauging the descent line is to visually measure the distance between the desired touch-down point and the horizon. As long as this distance remains constant the descent is correct. If the touch-down point appears to move towards the horizon, it indicates that the aircraft is low and an addition of power is needed. Individual instructors may have different methods of teaching a student to recognize changes in the descent line in order to maintain a constant descent. If the above appears confusing to a beginning student, he should refer back to it after he has been demonstrated and has practiced power approaches.

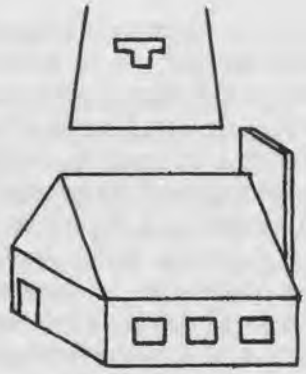
Wind and temperature are major factors in the performance of power approaches. Both horizontal and vertical wind currents will be encountered. In strong, gusty winds it may become necessary, at times, to alter the attitude of the aircraft, by lowering the nose, in order to maintain positive control. In this event, the wind will usually slow the ground speed and nullify any tendency of the ground roll to increase. During cross-wind approaches, the crab method of drift control may be used to a point just prior to where the round-out is started. At this point the crab will be taken out and the wing low method substituted. This is to insure that maximum lift will be maintained in the wing level attitude during the approach. Vertical currents are caused by the passage of wind over sloped terrain and by the reflection of heat from open areas. When high air temperatures prevail, thermals (rising air, usually caused by reflected heat over open areas) and downdrafts (falling air, usually caused by suction from thermals and found over wooded areas, most noticeably along the edges adjacent to open areas) will usually be encountered, particularly in calm or light wind conditions. The pilot should learn to recognize these conditions and anticipate vertical currents, so that he may counteract their effects on the descent line of his approach.



This picture tells me my descent is correct. If I continue to hold this, I will land close to the panel.

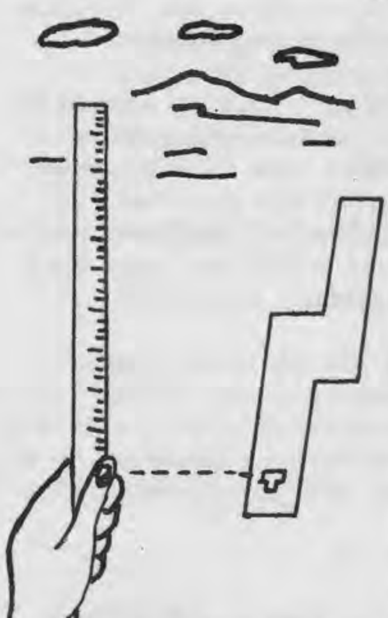


This picture tells me that I'm too low. I need an addition of power.

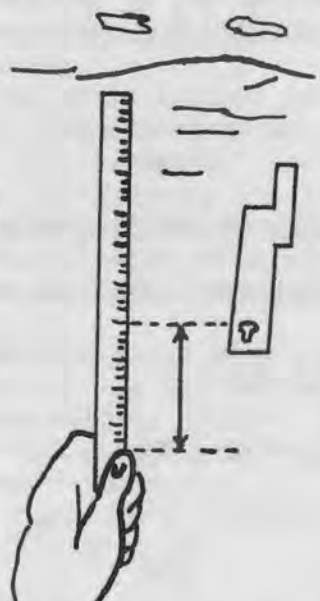


This picture tells me that I'm too high. I need a reduction of power.

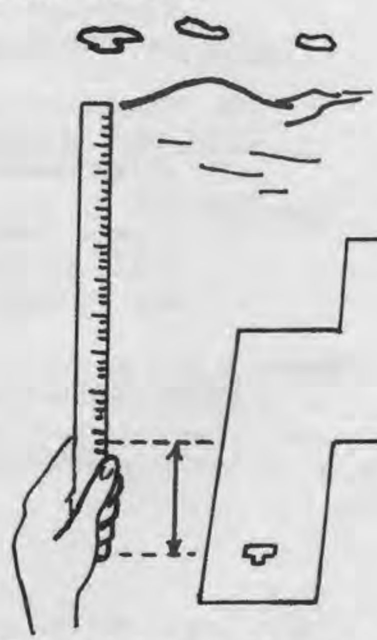
Using angular distance to the horizon



This picture tells me my descent is correct. The distance between the panel and the horizon remains constant.



This picture tell me I am too low. The panel has moved up towards the horizon. I need more power.



This picture tells me I am too high. The panel has moved further away from the horizon. I need to reduce power.

NOTE: This must be accomplished mentally. Keep your left hand on the throttle!

In landing from power approaches, the round-out is started at the same height as a normal, power-off approach. The pitch attitude of the aircraft during the power approach, being higher than normal glide attitude, will require a slower round-out, as the attitude is nearer a landing (3 point) attitude. Proper timing through the use of good throttle and elevator control is necessary for a smooth touchdown. This is essential so that the proper angle of descent can be followed and the landing made at the proper place. As the touch-down is completed, the throttle is closed and the stick is held full back during the landing roll to insure maximum directional control. (If a bounce occurs from the touch-down, throttle may be used to cushion a subsequent round out; high bounces should be recovered by a go-around).

Common Errors:

1. Failure to maintain power approach attitude. This is usually caused by not gauging the attitude correctly by sight and feel or, by attempting to correct variations in the descent by attitude changes rather than power changes.

2. Over-controlling throttle. This is caused by failure to recognize changes in the sight picture until large variations have occurred or, by improperly holding the throttle so that it is difficult to make small power changes.

3. Poor directional control after landing. This is caused by landing with crab or drift; failure to hold stick back after touch-down; attempting to land from high bounces.

4. Bounce landings. Caused by poorly timed or executed round-outs, failure to close throttle after touch-down and failure to hold stick back after touch-down.

Remember:

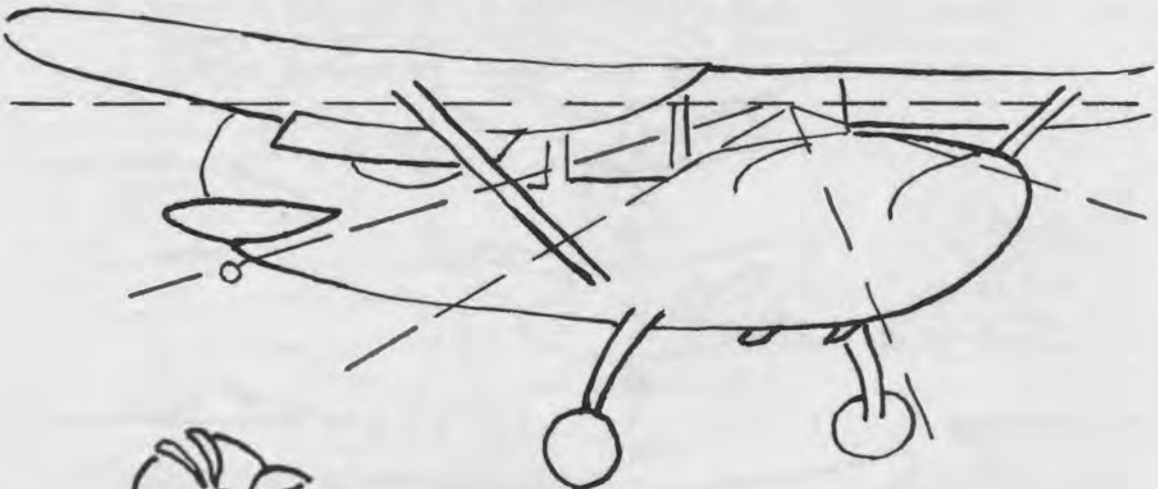
POWER APPROACH ATTITUDE

CONSTANT DESCENT LINE

CORRECT POWER USAGE

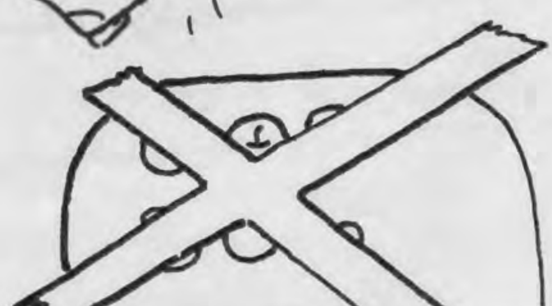
WIND

POWER APPROACH ATTITUDE



BY SIGHT

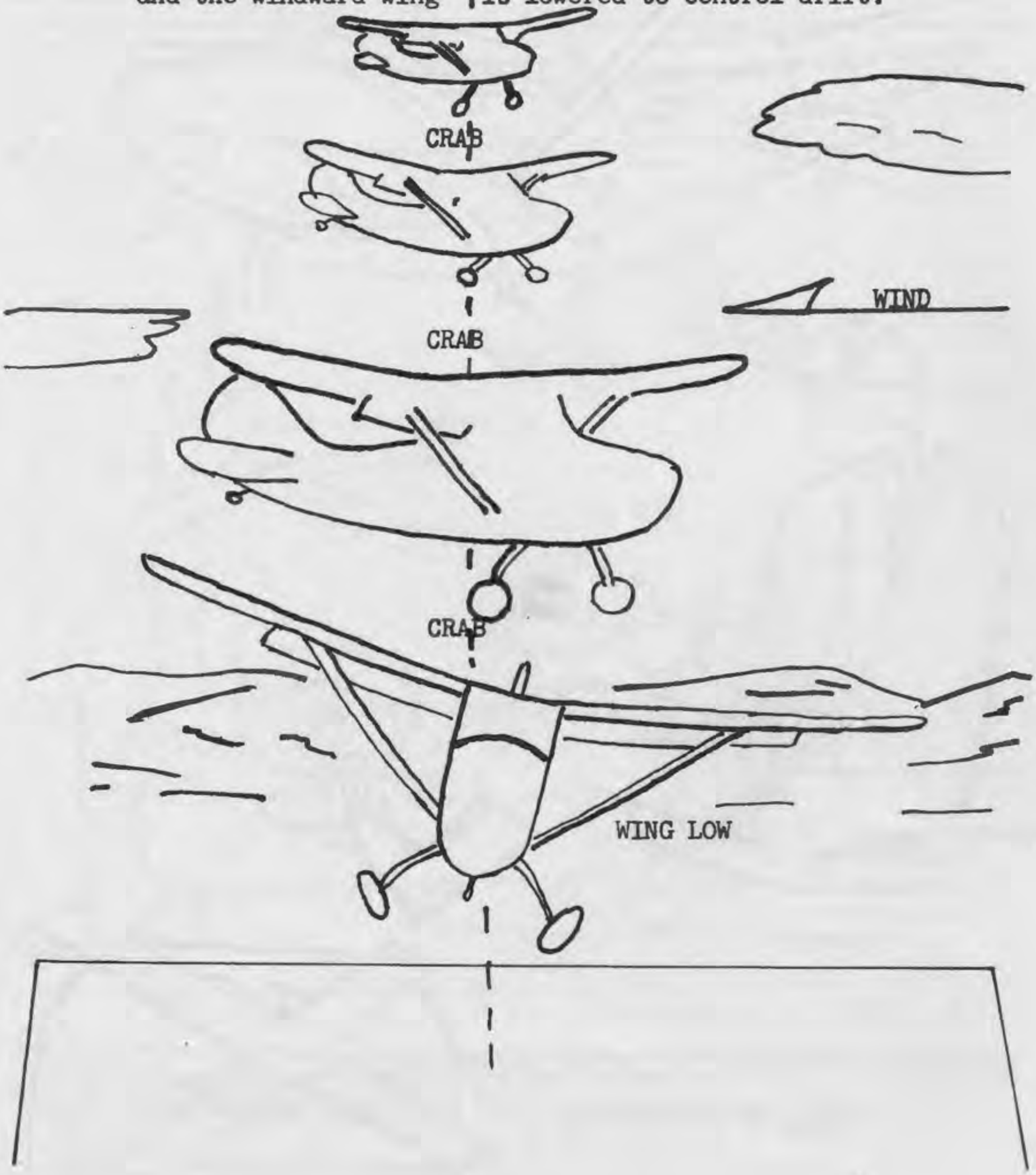
BY FEEL



__NOT__ BY INSTRUMENTS

CROSS WIND APPROACH AND LANDING

In order to provide maximum lift and positive control during power approaches, the crab method of drift control is used for power approaches in cross wind conditions. Just prior to the round-out, the aircraft is aligned to and with the flight path (ground track) and the windward wing is lowered to control drift.



MAXIMUM PERFORMANCE TAKE-OFF

The maximum performance take-off is a maneuver utilized to produce the shortest possible safe take-off roll. This, in turn, reduces ground friction to a minimum and allows faster acceleration in take-off from short fields.

The maximum performance take-off is performed in the following manner:

1. The airdraft is aligned on the take-off strip, with the tail wheel lined up with the intended take-off roll. The thirty degree flap setting is used to provide additional lift.

2. The pilot visually checks behind to clear himself from approaching, landing and go-around aircraft.

3. With brakes held firmly and stick full back, the pilot advances the throttle to the full open position and allows the engine to accelerate to its maximum RPM. He checks the tachometer for take-off RPM prior to beginning the take-off roll.

4. Continuing to hold the stick full back, the pilot releases the brakes and allows the take-off roll to begin. As the take-off roll begins, he releases the back pressure and allows the stick to seek a neutral fore and aft position.

5. Shortly after the take-off roll begins, the tail of the aircraft will begin to rise. The pilot will allow the tail to rise to a position where the tail wheel is just clear of the ground. He will then apply sufficient back pressure to keep the tail in this position and maintain this attitude until the aircraft becomes airborne.

To accomplish maximum performance take-offs in cross wind conditions, the pilot will hold full up-aileron into the wind as he begins the take-off roll. This will combat the tendency of the aircraft to weather-cock. The drag of the down aileron on the down wind side will assist in maintaining a straight course. As the aircraft accelerates during the take-off roll and the aileron becomes effective, he will maintain whatever aileron and rudder pressure is needed to keep the aircraft aligned with the take-off path. As the aircraft becomes airborne, the pilot will continue to hold aileron pressure into the wind, smoothly coordinating into a shallow banked turn into the wind. He will continue this turn until the drift is overcome and then level the wings to continue the climb. The pilot will check visually and frequently during his climb to insure that he is maintaining the correct ground track.

Common errors:

1. Failure to align aircraft with tail wheel straight prior to beginning take-off.

2. Holding back pressure after take-off roll has begun and causing the aircraft to stagger off in three-point attitude. Also, allowing the tail to come excessively high during the take-off roll. This defeats the purpose of the maximum performance take-off.

3. Failure to observe wind sock, or other wind signs, for cross wind. As a result, cross wind take-offs with no cross wind correction.

4. Taking off without flaps. This can be done on stage fields but it is a dangerous habit to carry into strips.

BARRIER LANDINGS

Barrier landings are those in which the approach to the landing is made over some type of obstacle. The obstacle may consist of **trees** hills, buildings, wires or anything which obstructs a clear and open problem to landing on long runways or strips, as they could be cleared by a wide margin and still allow for a long safe landing roll. In short field landings the approach must be made at the slowest safe speed. If this approach to the landing is to be made over a barrier, the descent line must be goverened so the nearest safe clearance of the barrier is attained. This is to insure that the point of touch down is as near to the approach end of the landing strip, as is safely possible.

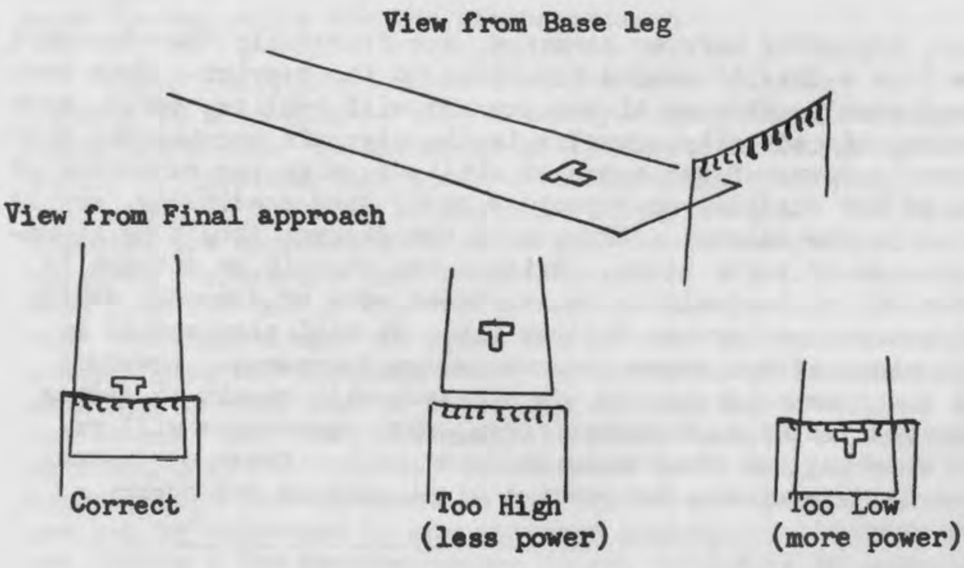
For training purposes, students will be introduced to barrier landings with the aid of a string barrier. This consists of a string, running between the tops of two poles of equal height. These poles are placed far enough apart to allowadequate clearance in the event of a low approach. The poles are constructed of metal and it is imperative that directional control be maintained. The tops of the barrier poles are marked with flags and banners are placed at short intervals along the string to aid in sighting the barrier from the air. A panel is located on the landing strip as the objective of the landing.

Barrier landings are accomplished with power approaches and are begun in the same manner as power approaches. When, on base leg or final approach, a sight picture of the panel resting on top of the barrier is attained, the power approach is begun. The descent is maintained, with power, to keep this sight picture constant. In the final portion of the descent, as the aircraft nears the barrier, this sight picture will change as the panel moves out away from the barrier. At this point the descent will be governed by a sight picture of the panel only, and a normal power approach landing will be executed.

Wind, which effectively alters the ground speed of an approach, will change the descent angle. As ground speed decreases, the angle of descent will increase. This is because the rate of descent remains the same. A reversal is true with increased ground speed. In order for the sight picture to result in satisfactory approaches, the panel position, on the landing strip, will be adjusted to compensate for existing wind conditions. Cross wind landings will be made in the same manner as previously taught for power approaches.

Students, beginning barrier landings, are frequently "barrier-shy". This results from a fear of coming too close to the barrier. This condition is most easily overcome if the student will realize, early, that a good approach, of necessity, results in the aircraft missing the barrier by a narrow margin. Power approach attitude, with the exception of a slightly nose low attitude in strong or gusty wind conditions, should not be altered in the descent. Changes in the descent should be accomplished by the use of power alone. Raising the nose in an attempt to clear the barrier, will result in an increased rate of descent, making it more likely that the barrier will be hit. It will also result in the loss of control effectiveness and can become dangerous. Lowering the nose, in an attempt to shorten the approach will result in faster ground speeds and longer approaches. Long, flat approaches will result in over shooting the desired touch-down point. These errors may be eliminated by maintaining the correct sight picture and power approach attitude.

Barrier landings, over the string barrier, are taught and practiced to prepare the student for landings over actual barriers, which he will be required to perform in the next phase of training. While practicing power approaches and barrier landings, the student should critically analyze each approach and landing. He should then decide what corrections are needed, prior to beginning the next approach. If conscientiously performed, this will result in maximum progress.



Avoid the tendency to raise the nose as the aircraft nears the barrier.
Avoid the tendency to lower the nose as the aircraft crosses the barrier.

BARRIER TAKE-OFFS

Barrier take-offs are those in which the aircraft must clear some type of obstacle in the initial portion of the climb. They are utilized for short field take-offs over any type of barrier.

This maneuver is introduced to the student over the same type of string barrier used for barrier landings. The point for beginning barrier take-offs will be marked by the use of panels on the take-off strip. As wind effectively alters take-off roll and ground speed during the climb, the position of the barrier will be changed to fit existing wind conditions.

A barrier take-off can best be explained by breaking it down into two maneuvers. The first, which is the maximum performance take-off, has been previously taught and practiced. This will be performed in exactly the same manner as usual, up to the point of becoming airborne. At this point the second portion, which is the maximum performance climb, is begun.

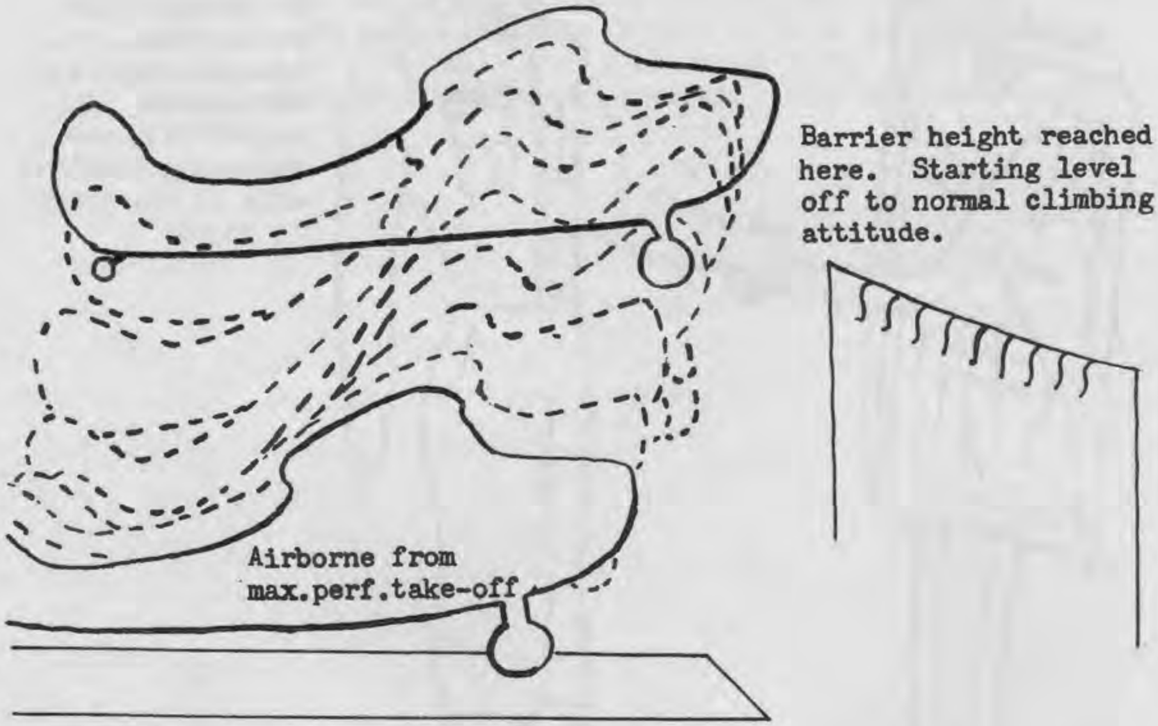
In normal take-offs, the aircraft is held in climbing attitude and allowed to accelerate to normal climbing airspeed. For barrier take-offs, this acceleration is used to obtain the maximum angle of climb, while maintaining a slow and constant ground speed. As the aircraft becomes airborne, back pressure is applied to smoothly raise the nose to the maximum climb attitude. Control pressures must be smooth in this portion of the maneuver. Rough usage will force the tail wheel back to the surface and result in a longer ground roll. During this pull up, the airspeed should not be allowed to increase. This would cause an increase in ground speed, for which, the angle of climb might not be sufficient to clear the barrier. The student should remember that he is practicing with a string barrier. It is better to fly under, or into, the barrier, rather than force the aircraft into a dangerous attitude.

Maximum performance climbing attitude will be maintained only long enough to clear the barrier. The aircraft will then be returned to normal climbing attitude immediately, and allowed to accelerate to normal climbing airspeed.

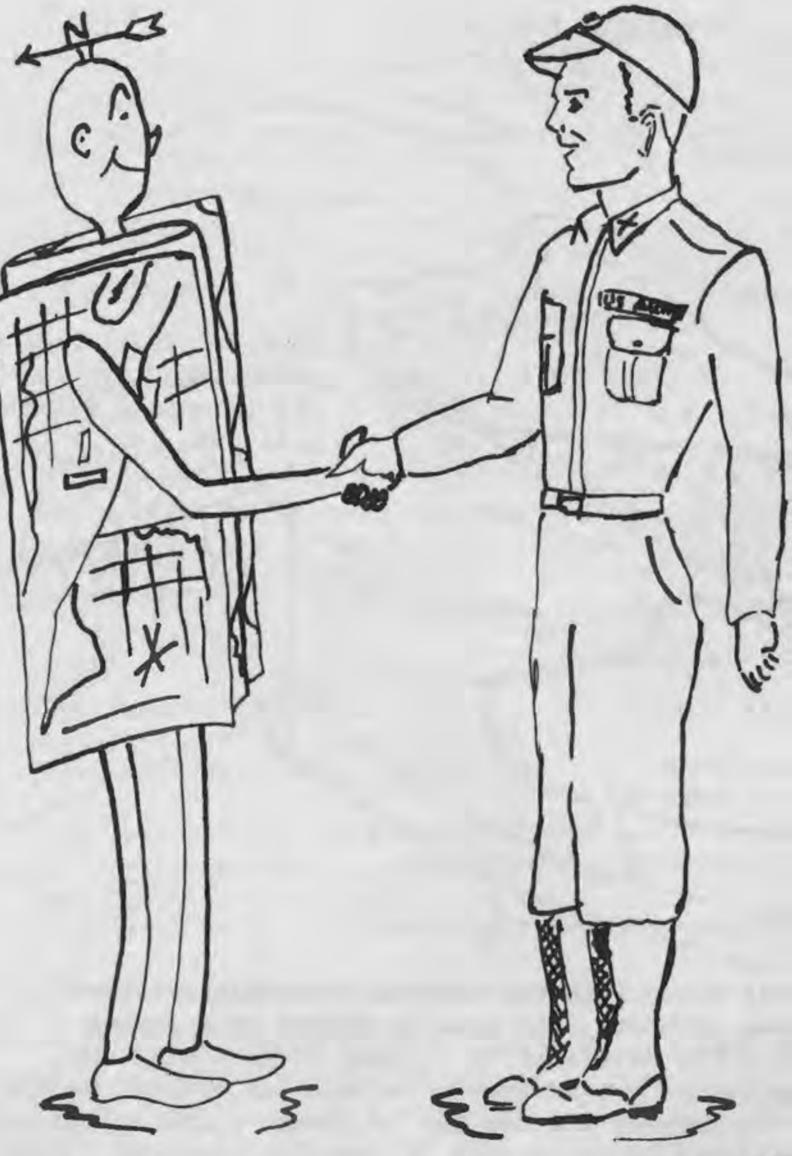
Cross wind barrier take-offs are performed in the same manner previously taught. Full up-aileron is held into the wind prior to beginning the take-off roll. During the take-off roll, sufficient aileron pressure is held to insure positive directional control. As the aircraft becomes airborne, a shallow bank is used to turn the aircraft into the wind and establish enough crab to control drift.

Barrier take-offs are taught and practiced to teach the student the capabilities of the aircraft at maximum performance. In actual short field operations, the student should never substitute this maximum performance for good judgement. Barrier take-offs should be mastered and then avoided when practical. If the aircraft engine should fail while the aircraft is in maximum performance climbing attitude, there <u>will not</u> be sufficient clearance to lower the nose and regain flying speed, prior to the aircraft striking the ground.

BARRIER TAKE-OFF



The barrier take-off is begun with the maximum performance take-off. As the aircraft becomes airborne, the nose is raised in a smooth continuous movement and the acceleration is used to gain altitude, while maintaining a constant ground speed. As soon as barrier height is reached, the nose is lowered immediately to normal climbing attitude and the aircraft is allowed to accelerate to climbing airspeed. Rough usage of controls must be avoided.



KNOW YOUR MAP!
It is your best friend when going from one location to another. <u>But</u>, only if you are thorougly familiar with it and treat it right!

REMAIN WIND-CONSCIOUS!
KEEP ALERT!

STRIPS

The Army aviator will be called upon to utilize existing terrain in performing his mission. He must be prepared to fly his aircraft to and from areas where little or no preparation has been made for aircraft operations. This will require an ability to assess and evaluate landing sites from the air, to insure maximum efficiency and safety. Student pilots gain this ability through demonstrations and practice on prepared strips. Strip operations are the culmination of short field training. They will require the use of all techniques and maneuvers previously learned; plus well developed planning and judgement.

Location: The first factor in strip operations is the location of the strip. The student pilot is provided with a map of the area, on which he accurately plots the positions of all strips. He should become thoroughly familiar with this map; be able to judge distances correctly and recognize ground terrain from map terrain; be able to estimate correct courses for flying from one location to another, without drawing lines on the map. He must be able to use his map in the air, while continuing to divide his attention and remaining alert. The map should receive careful handling if it is to remain the valuable tool that it is. It should be folded carefully into a compact accordian shape. This should be accomplished in a manner that will allow ready access to any portion of the map without making it necessary to completely unfold the map and possibly divert the pilot's attention.

High Reconnaissance: When the strip has been located and positively identified, the pilot begins his high reconnaissance. To insure that all features of the strip may be readily and clearly seen, the high reconnaissance is accomplished 400 to 600 feet above the terrain, varying according to the terrain and access to available forced landing sites. There is no set pattern or procedure to follow in performing the high reconnaissance. It may be done downwind, upwind or crosswind. In combat conditions, circling the strip would possibly reveal its position to the enemy. For this reason the student pilot should strive to achieve expediency in performing the high reconnaissance, without sacrificing thorough consideration of all factors involved. The high reconnaissance should be performed with enough lateral distance from the strip to allow the pilot to make his observations from a comfortable angle, and near enough to insure that all features are clearly seen.

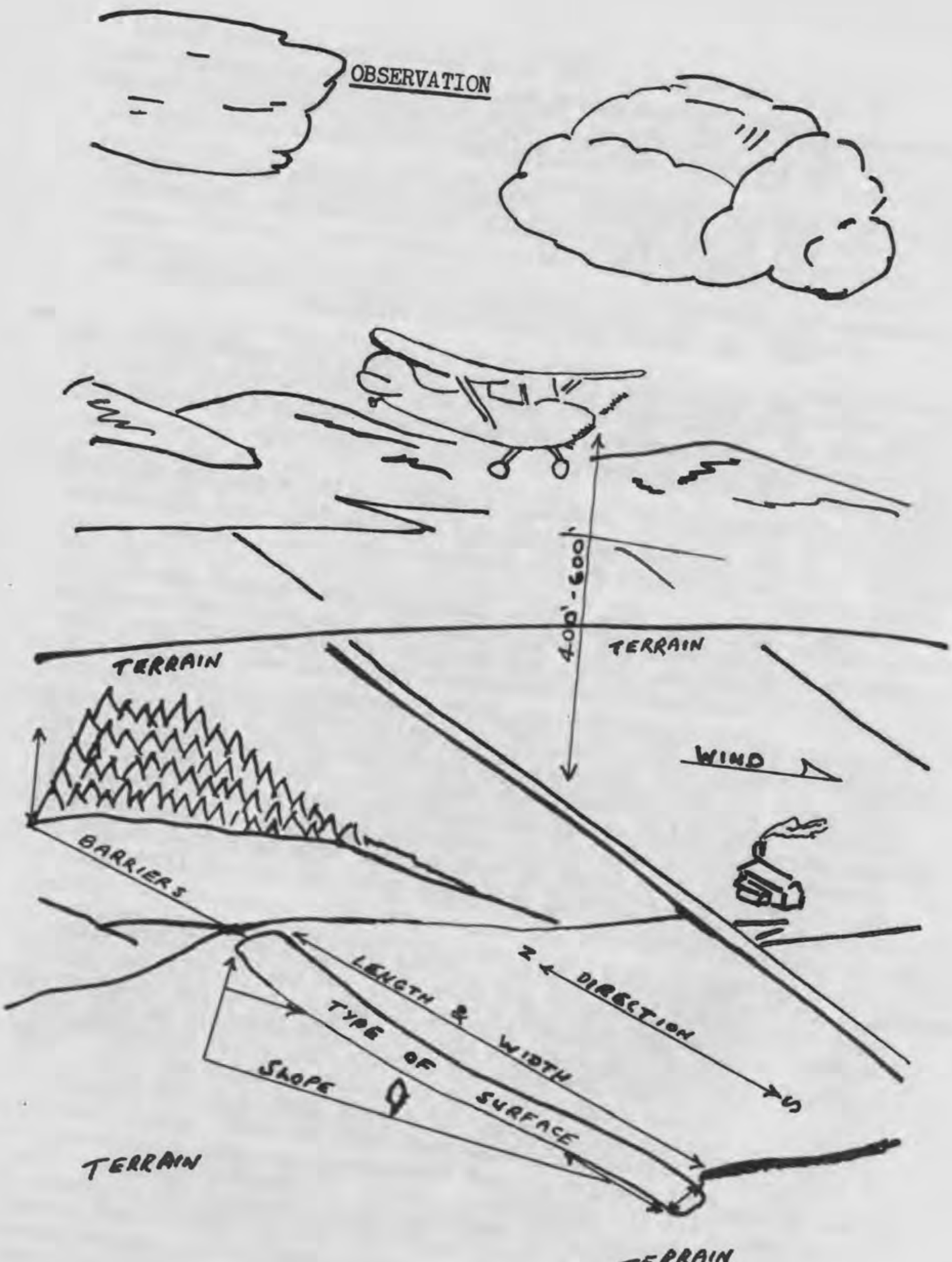
During the high reconnaissance, the pilot determines:

1. The headings of the strip. This can be accomplished by comparing the strip to his compass heading, or by judging the strip against known section lines or landmarks.

2. The wind. The successful pilot is always wind conscious. He

does not rely on the wind remaining constant and knows that he will frequently encounter varying wind conditions only a few miles apart. He uses all ground signs available; smoke, windmills, clothes lines, dust, water surface, etc. He is always aware of the drift of his aircraft. He constantly estimates the direction and strength of the wind.

OBSERVATION



3. The best terrain. The pilot determines the best forced landing terrain around the strip and its relation to the strip. This may be a field, a road or any type of terrain he considers safe for a forced landing.

4. Type and Dimensions. The pilot determines the type of surface on the strip and estimates its length. He considers the width of the strip.

5. Slope. The pilot determines the slope of the strip, if any, and gauges its extent and steepness.

6. The approaches. The pilot considers the approaches to the strip and estimates the height and distance out of any barriers present. He examines the barriers to determine the best location for placing his approach.

7. Direction of landing. Considering the wind, the approaches, the slope of the strip and terrain, the pilot decides on the direction of his landing.

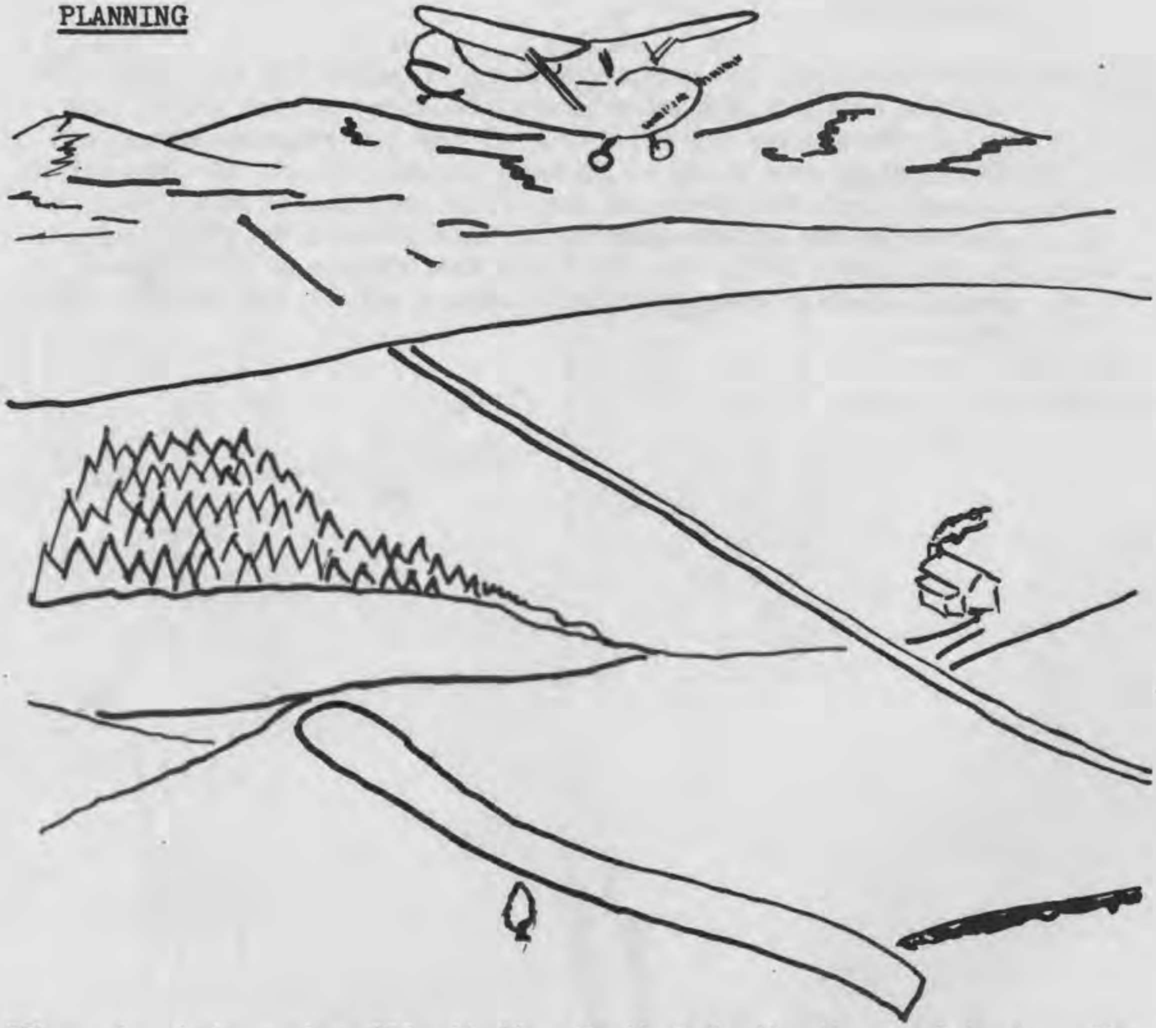
8. The touch-down point. Using his knowledge of power approaches and barrier landings, the pilot determines his touch-down point, according to existing conditions. The touch-down point duplicates the panel used previously in power approaches and barrier landings. In selecting the touch-down point, it is usually better to select something vertical, opposite the touch-down point, that stands out, a bush or brush pile, post, etc. This will better enable the pilot to see this point throughout his approach. If nothing vertical is available the pilot selects some point such as a break in hard surface or a bare spot in the sod, or anything that varies in color or texture from its surroundings.

9. The go-around point. Using his knowledge of the climb capabilities of his aircraft, and taking into consideration the flap setting he intends to use, the length of the strip, the slope of the strip, the barriers he will have to clear, the wind and terrain, the pilot selects the go-around point. This is the point at which the pilot will initiate a go-around if a safe landing is not assured. It is particularly important that the pilot select some prominent feature to mark this point, in order that he will not pass it, unknowingly, during the landing approach. The go-around point bears no direct relation to the touch-down point and may, at times, be the same as the touch-down point. Or, it may be a point on the approach which is reached prior to the touch-down point, as in the case

where very high barriers must be cleared in climbing out of a short field.

10. The method for low reconnaissance. Considering the wind, the terrain and the obstacles along the sides of the strip, the pilot determines the direction of the low reconnaissance and the side of the strip he intends to make it on. If the terrain is equal off both ends of the strip (all bad or all good), he plans the low reconnaissance so that he will be traveling into the wind. This will give him the advantage of a slower ground speed, both for forced landing safety and better observation.

PLANNING



"There is strip number 000--it lies North & South--the wind is from the northwest at approximately 5K--there is good terrain all around, except off the north end--it is a sod strip--1200 feet long and 80 feet wide--there is steep upslope on the last quarter of the north end--there is shallow downslope in the last 100 feet of the south end--the tree barriers off the north end are 300 feet from the strip and 30-40 feet high--I will land towards the north--my touch-down point will be the hedgerow on the east side--my go-around point will be the small tree on the west side--I will make the low reconnaissance on the west side towards the south--I will plan my take-off towards the south--"

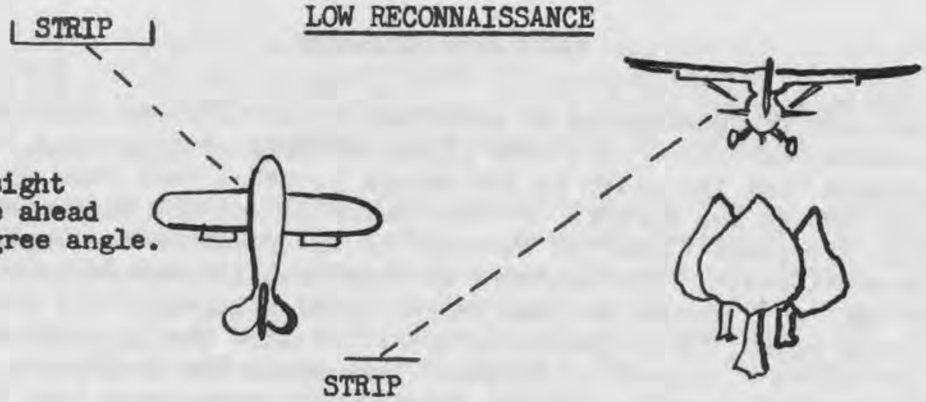
If he has good terrain off one end of the strip and bad terrain off the other, in light or calm wind conditions, he would plan his low reconnaissance so that he would be traveling towards the best terrain. If the wind is strong enough to make low flying downwind hazardous (generally considered to be ten MPH or above) the pilot should plan his low reconnaissance so that he will be traveling into the wind, regardless of terrain. Obstacles, along one side of the strip, which would prevent the pilot from getting low enough to properly observe the strip, would require that the low reconnaissance be done on the opposite side. If a cross wind exists, and both sides of the strip are equal, i.e. all good or all bad terrain, the pilot should plan to make his low reconnaissance on the upwind side of the strip. This will enable him to crab the aircraft away from the strip during the low reconnaissance and gain a better view of the strip.

11. The direction of take-off. Considering the wind, the length of the strip, the slope of the strip, the barriers and the terrain off the ends of the strip, the pilot plans the direction of take-off and his route of climb. He does this in a manner that will insure maximum safety during the take-off and the climb to safe altitude. Generally, he will plan his take-off in the same direction as the low reconnaissance and for the same reasons. In light or calm wind conditions, he will consider a possible down-slope take-off, the end of the strip which has the lowest barriers and the best forced landing terrain off the ends of the strip in selecting the direction of take-off. In strong wind conditions he would plan his take-off into the wind.

In beginning strip operations the student pilot meets his first stiff test in division of attention. This is particularly evident during the high reconnaissance, in which he must combine control of the aircraft, alertness, ground observation and planning. Ground track maneuvers, practiced in earlier training, bear a resemblance to strip operations in this respect, but they do not require consideration of as many factors. In beginning strip operations, the student must make a conscious effort to maintain proper division of attention. If he concentrates his attention on ground observation and planning, he will very likely be flying the aircraft in an uncoordinated manner and not be alert for other aircraft. This can progress to the point where it becomes dangerous. It is a common error with students beginning strip operations.

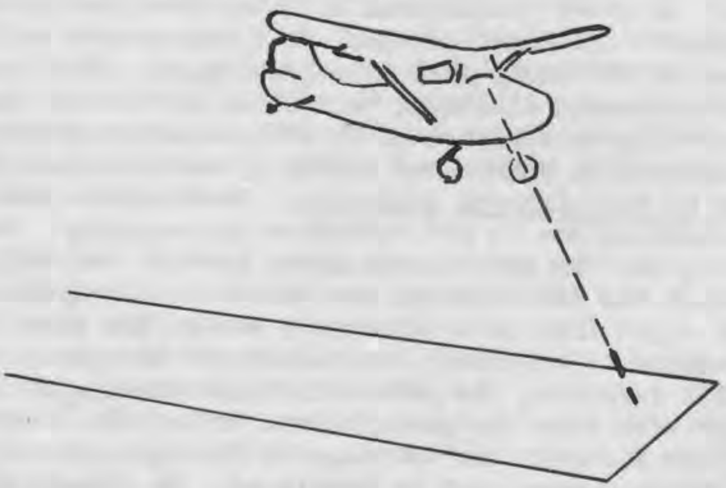
Maximum progress can best be attained if the student pilot presents his planning orally to the instructor pilot, either during the high reconnaissance or on the ground after the landing. This will aid the instructor pilot to insure that the student is making his observations correctly, considering all factors in their proper relationship and planning accordingly. See illustration for example.

LOW RECONNAISSANCE



Line of sight should be ahead at 45 degree angle.

Line of sight should be down at 45 degree angle. Lateral distance from strip will be governed by height at which low reconnaissance must be flown to clear highest obstacle in path by 10 to 40 feet. As height increases, lateral distance will increase to maintain 45 degree angle.



As the aircraft moves along the strip, during the low reconnaissance, the pilot inspects the entire surface of the strip for hazards to the ground roll of the aircraft. As the aircraft or the line of sight of the pilot reaches the far end of the strip, the low reconnaissance is completed. The pilot immediately applies power and establishes a climb into the wind or towards the best terrain, calculating the direction that will allow maximum forced landing safety under existing conditions.

a. LOW RECONNAISSANCE

The low reconnaissance is performed at an altitude which will clear the highest obstacle in its path by an altitude of 10-40 feet. This will insure that the pilot is low enough to get a good view of the strip and high enough for safety. At the completion of the high reconnaissance, the pilot flies the aircraft to the position for beginning the low reconnaissance. The approach to this position should be made in a manner that will insure maximum forced landing safety. All other factors being equal, it is generally better to have the approach made into the wind where a cross wind exists. This gives the double advantage of a slower ground speed for forced landing safety and more time to judge the approach correctly so that the aircraft arrives at the correct position for beginning the low reconnaissance.

Under reasonably smooth atmospheric conditions, the low reconnaissance is accomplished with a thirty degree flaps setting and an airspeed of 70 MPH. Turbulent or gusty wind conditions may make it necessary to increase this speed so that enough control effectiveness is maintained to insure a comfortable safety margin. The pilot plans and executes his approach so that he will be at the proper altitude and speed to perform his low reconnaissance at a point not more than 300 feet from the end of the strip, and on the side he elected during the high reconnaissance. He plans the lateral distance from the strip, according to his altitude above the terrain, in a manner that will enable him to look down at the strip at a 45 degree angle. When the pilot has reached low reconnaissance altitude, he applies sufficient power to maintain this altitude and an airspeed of 70 MPH, or more, depending on turbulence. This airspeed is maintained solely by attitude and feel and <u>not by reference to the airspeed indicator</u>. Looking into the cockpit during a low reconnaissance is not condusive to longevity As the low reconnaissance begins, the pilot looks ahead towards the strip at a forty-five degree angle and down towards the strip at a forty-five degree angle. As this sight line moves along the strip, the pilot inspects the entire surface of the strip for hazards to the ground roll of the aircraft. With practice, the pilot will also be able to determine the speed of the wind from his ground speed during the low reconnaissance. When the aircraft has traveled to the opposite end of the strip, the low reconnaissance may be completed. He immediately applies full power and establishes a climb towards the best terrain, or into the wind, according to existing conditions. Power is reduced to normal climbing power as a reasonably safe altitude is reached.

If the pilot discovers a hazard during the low reconnaissance, he will need to re-plan his approach for landing to avoid the hazard. This will be accomplished after climbing back to a safe altitude. When he has re-planned his approach for landing and selected new touch-down or go-around points, as applicable, or if he found the surface of the strip satisfactory, the pilot is ready to begin his approach for landing. More than one low reconnaissance can be made if the pilot deems it necessary, however each should be made in the safest manner for low observation and not for the purpose of determining best landing direction.

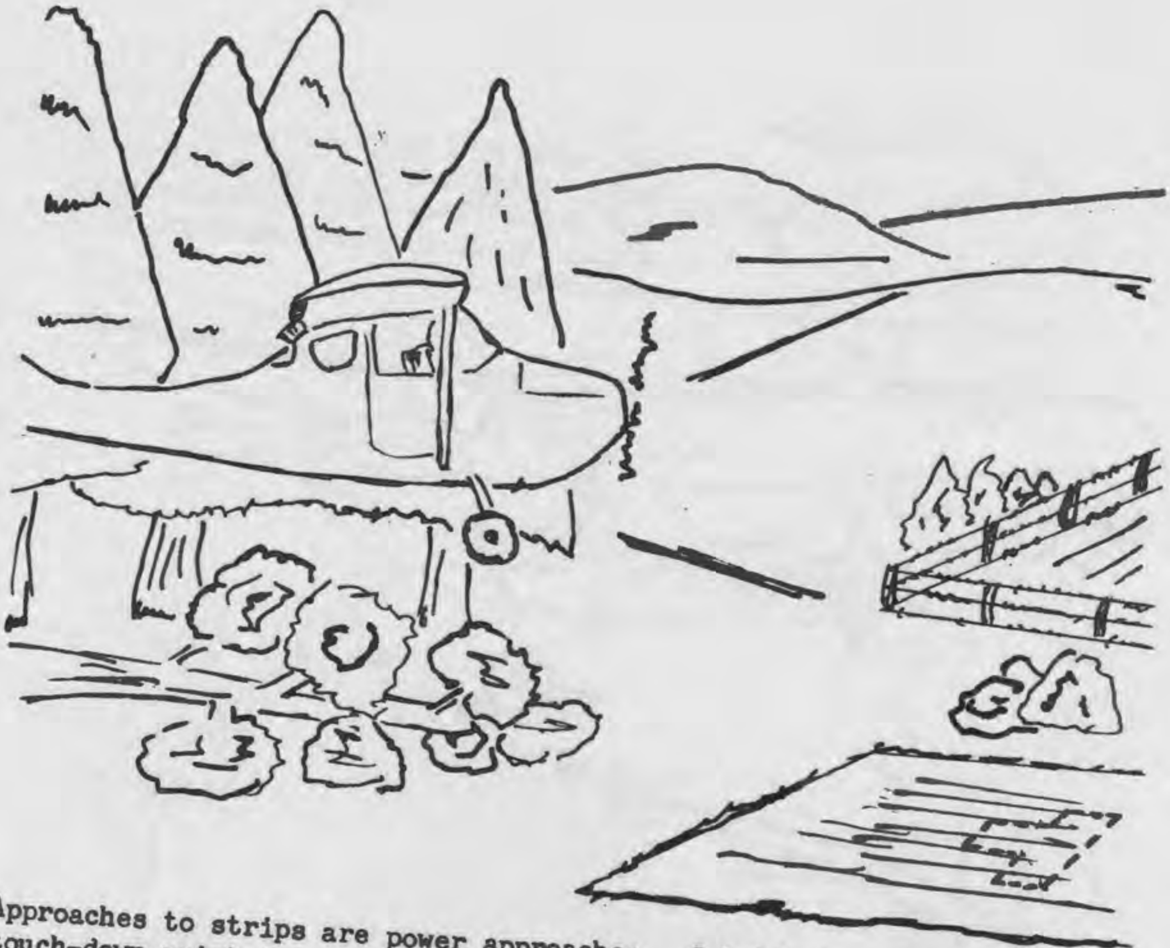
b. APPROACH AND LANDING

All approaches to strips are power approaches. This is true whether the landing is to be made on an open end strip or over a barrier. These power approaches are the same as those practiced previously in power approaches to a panel and barrier landings. The pilot simply substitutes his selected touch-down point for the panel.

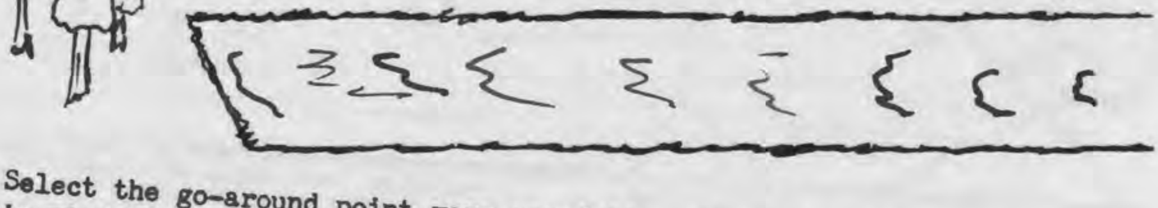
After completion of the low reconnaissance and the climb to safe altitude, the pilot flies the aircraft to the position for beginning the approach for landing. He plans the base leg for the approach in the same manner that he selected his approach for low reconnaissance, either taking advantage of good terrain or into the wind, dependent upon existing terrain and wind conditions. The approach and landing are then accomplished. Students should remember that there are no traffic patterns around strips and another pilot's planning may differ widely from his. For this reason, alertness must be maintained in watching for other aircraft during all strip operations.

The best insurance for safe operation in strips is the careful selection of, and rigid adherence to, the go-around point. Pilots should allow a safe margin of error when selecting their go-around point. Bear in mind that atmospheric conditions of wind, temperature and density, which are not always predictable by the most experienced pilots, have a definite effect on the landing and climbing characteristics of the aircraft. Select the go-around point carefully, so that it will allow ample room for a safe climb out. Then, keep the go-around point in mind throughout the approach. In initiating a go-around the primary interest is to make a safe climb out to a safe altitude. Decisions about go-arounds should be positive. If there is any doubt about successfully completing a safe landing, go around immediately. The go-around should be started with the application of full power. If carburetor heat is on, it should be removed after the application of full power. The flaps should then be raised to thirty degrees. During this time the aircraft should be held in the climbing attitude. Anticipate the effects of full power and hold the aircraft straight and in the climbing attitude. Remember, when raising the flaps, you are, in effect, decreasing the angle of attack of the wings. Do not jerk the flaps up! Bring them smoothly up to the thirty degree position. Keep alert for other aircraft and continue the climb to a safe altitude.

Upon landing, the pilot brings the aircraft to a stop as quickly as is safely possible. If there is another qualified occupant of the aircraft, the pilot may have him dismount and direct the taxiing to a safe parking area. If not, the pilot will shut down his engine and make a foot reconnaissance to a safe parking area. This will be accomplished prior to moving the aircraft off the strip.

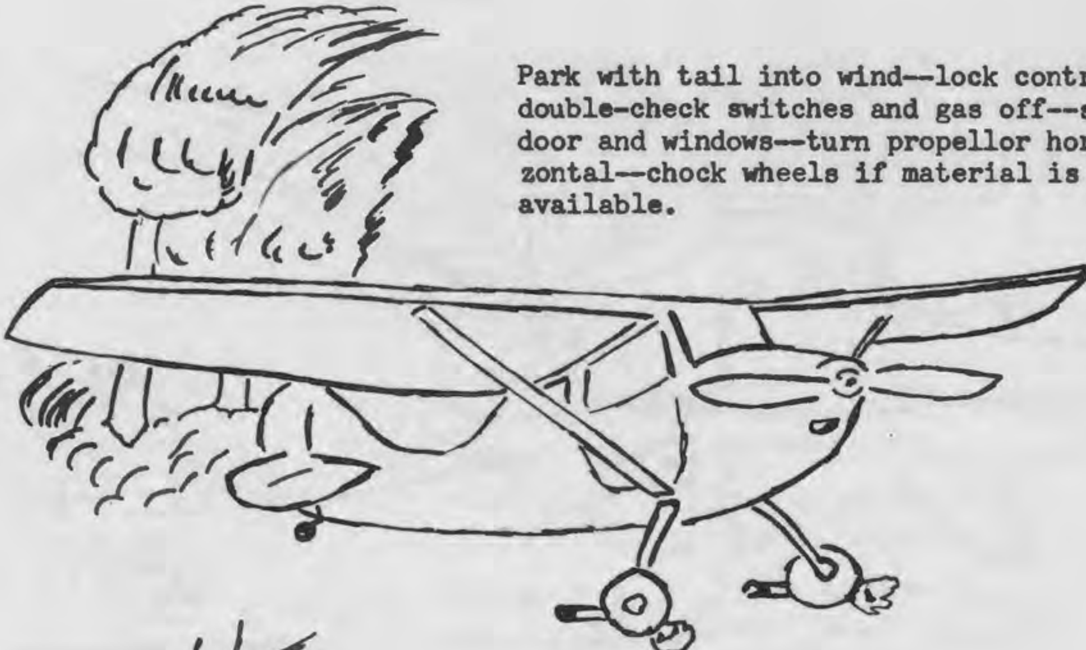


Approaches to strips are power approaches. Substitute the selected touch-down point for the panel you have been using.



Select the go-around point very carefully, then stick to it. Keep it in mind throughout the approach!

Park with tail into wind--lock controls--double-check switches and gas off--shut door and windows--turn propellor horizontal--chock wheels if material is available.



That portion of the strip which lies behind when you begin the take-off roll is of no value--USE IT ALL--look around!

c. PARKING THE AIRCRAFT

After the aircraft has been taxied to a safe parking area, it is parked with the tail of the aircraft into the wind. This is done so that the wind will exert a downward pressure against the horizontal stabilizer and elevator, with the controls in the locked position. The pilot checks to insure that all switches and gas are off, prior to leaving the aircraft. He closes the door and windows and turns the propeller to the horizontal position. This will prevent damage to the propeller from a possible nose-over. If any suitable material is available, he chocks the wheels of the aircraft. When this has been accomplished, the pilot is ready to begin the ground reconnaissance.

d. GROUND RECONNAISSANCE

The ground reconnaissance is performed to determine the condition of the strip. During the ground reconnaissance, the pilot will:

1. Visually examine the surface of the strip and adjacent taxi and parking areas, noting the positions of any hazards to ground operation of the aircraft.

2. Pace off and measure the dimensions of the strip and possible taxi and parking areas.

3. Determine the type of surface of the strip and its condition.

4. Estimate the height of barriers off the ends of the strip and measure their distance from the strip.

5. Check the wind direction and strength.

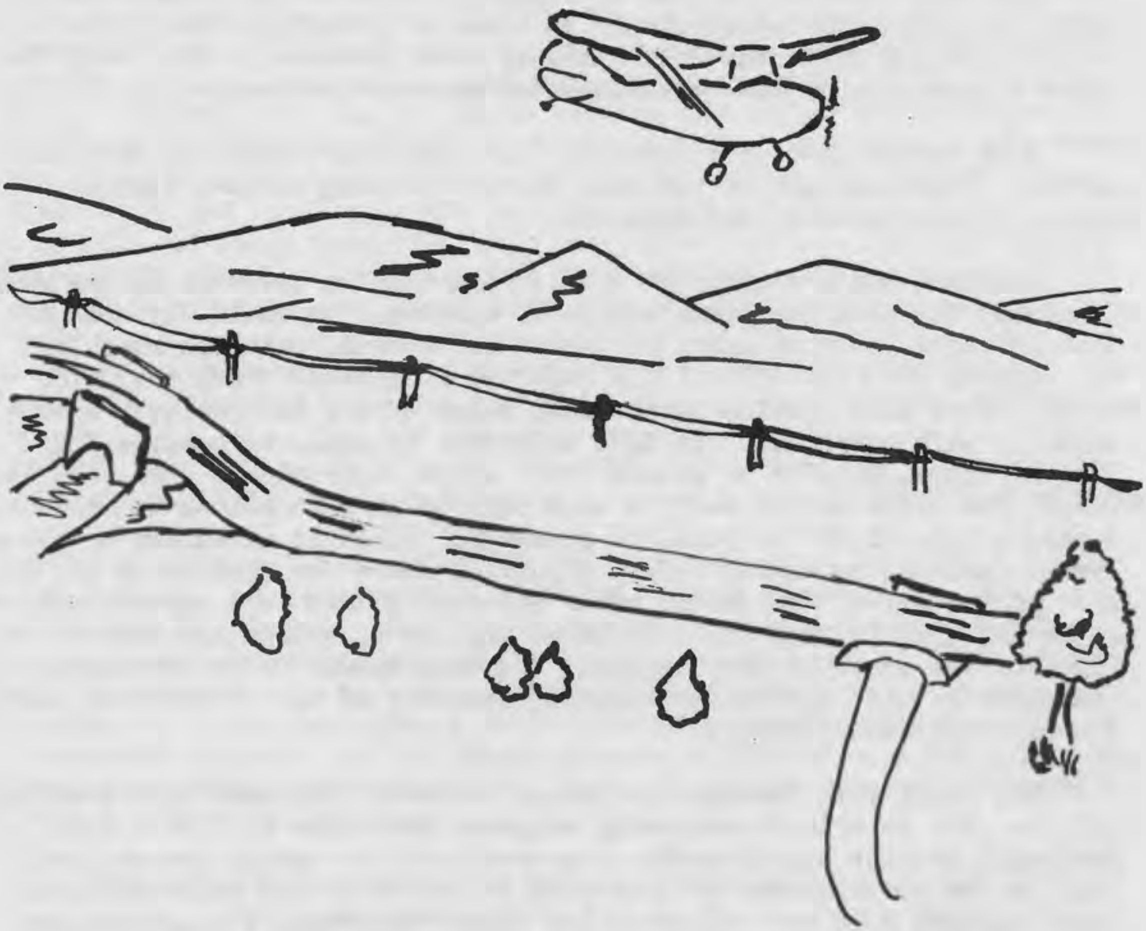
During training, the student pilot will orally report the findings of his ground reconnaissance to the instructor pilot. This should be done in a clear, precise and orderly manner. The student should have a pad or notebook so that he can draw a rough sketch of the strip and note his findings during the ground reconnaissance.

e. TAKE-OFF

During the ground reconnaissance, some feature of the strip that was not observed correctly from the air, or a possible wind shift, may change the best direction of take-off. For this reason, the pilot should always re-consider all factors in planning the take-off, prior to deciding on the direction of take-off. After he has decided on the direction of take-off, the pilot taxies the aircraft to a position which will allow the maximum length of the strip to be used for the take-off. Prior to arriving at this position he makes a short cockpit check of the following seven items:

1. Fuel selector on desired tank.
2. Mixture full rich.
3. Carburetor air in "Ram filtered air" position.
4. Flaps at thirty degrees.
5. Magnetos checked and on BOTH.
6. Fuel pump on.
7. Area checked for other aircraft.

The pilot should visually check ahead, on both sides, behind and above prior to taxiing onto the strip and before beginning take-off. All take-offs from strips, with the exception of most road strips, will be maximum performance, until airborne. Maximum performance climbs should only be used where necessary. The climb out route should be pre-planned to provide maximum forced landing safety.



Check closely for hazards along the sides of a road, such as trees, poles, signs, ditches, culverts, washouts, wires, etc.

If culverts are present, select the portion of the road between culverts for landing and take-off.

ROAD STRIPS

The Army aviator will, on occasion, be able to use ground traffic roads in performing his mission. In areas of otherwise unsuitable terrain, roads may offer the only means of safe operation. This will require a knowledge of the techniques and hazards involved.

Road strips involve essentially the same type operation as normal strips. This consists of the high and low reconnaissance, landing, ground reconnaissance, and take-off.

Location and selection of road strips will be governed by the geographical location the pilot wishes to achieve. He would fly his aircraft to this location and then select the nearest suitable road for his landing and take-off. After locating a suitable road, the pilot would select that portion of the road which offers the greatest advantage for safe operation. In this selection he would be considering length, width, hazards to ground roll, slope, approaches, wind, and terrain. The pilot should bear in mind that it is much better to select a straight portion of the road, if possible. If it is necessary to use a curved portion, he should select a portion where the wind is on the inside of the curve. He should never attempt to land on a curved portion where the wind is from the outside of the curve, unless the wind is very light or the curve is very gentle. The wind should be on the inside of the curve so that the weather-cocking tendency of the aircraft willhelp the aircraft around the curve.

The pilot must develop his ground distance judgement accurately so that he will be able to correctly estimate the width of a road and determine whether his aircraft wing-span could be safely accomodated. This can be accomplished by comparing the width of the road with some known factor, such as a truck or bus width, a garage, a house, or any other object that will give him an accurate comparison. After estimating the width of the road, it then becomes simple to estimate the lateral distance of hazards or obstacles along the sides of the road by comparing it to the width of the road. After the road has been located and the pilot has selected the portion of the road he intends to use, he is ready to begin the high reconnaissance.

In addition to the factors considered during the high reconnaisance for strips, the pilot should check closely for hazards along the sides of a road, such as trees, poles, signs, ditches, culverts, washouts, wires, etc. He must make sure that there are no wires crossing the road over his intended landing and take-off paths. He must observe vehicle traffic on the road and insure that the road is clear prior to making his approach.

The pilot determines the direction of landing, selects the touchdown and go-around points and plans the low reconnaissance in the same manner employed for normal strip operations. During the low reconnaissance the pilot will carefully observe the road and the sides of the road for any hazards to the approach and ground roll of the aircraft.

Approaches for road landings will be governed by the length of the selected road strip. If a short road strip is to be used, a normal power approach should be used to the landing. If the road strip is long enough to eliminate the need for short field technique, the approach should be made with a nose low attitude which will result in a faster speed. This will provide more positive directional control, which is essential for approaches to road strips. Also, where possible, turning approaches to roads should be avoided. A longer and straight final approach gives the advantage of more time to establish drift correction and line up the landing path accurately. This should not be carried to extremes. Landings on road strips are made in the center of the road. This prevents the crown of the road from veering the aircraft to the sides. Positive directional control must be maintained throughout the landing roll.

On a long road strip, either a wheel landing or a three-point landing may be made. The successful pilot should be able to perform either type of landing with positive control and confidence.

Taxiing the aircraft on road strips should be done at slow speed. This will insure that the pilot has positive directional control and allow him ample time to thoroughly check his lateral clearance. The aircraft should be kept in the center of the road, except for turning around. When the pilot desires to turn around, he will taxi the aircraft to the side of the road towards which he is going to turn, allowing room to pivot about the inside wheel. Stopping the aircraft, he then visually checks to insure that the tail of the aircraft will remain on the road as he makes his turn and that his wings and tail will clear any obstacle on the side of the road. Pivoting slowly about the inside wheel, he continually checks the clearance. When turning around on curves, the turn should normally be made to the outside of the curve, as roads are usually banked and the turn should be made towards the high side. In extreme situations, it may be necessary to stop the engine and turn the aircraft around by hand, using improvised chocks when necessary to preclude rolling down slopes or into ditches.

Take-offs from extremely short strips will be maximum performance. On longer road strips the take-off should be started in the same manner as a normal take-off from a runway. As the tail comes up the pilot applies forward pressure to hold the aircraft on the ground until enough speed is built up to insure positive control effectiveness when the aircraft leaves the ground. This will help to prevent drifting on take-off.

The pilot must remember that he should never use any portion of a road strip for landings or take-offs which was not included in the high and low reconnaissances.

STANDARDS OF PERFORMANCE AND LIMITATIONS

1. USE OF FLAPS:

a. Not to be lowered above 80 MPH indicated air speed. (Except in emergency.)

b. Use of flaps will be smooth.

c. When used for accuracy landings and forced landings the degree of flaps may be increased but never decreased.

2. USE OF BRAKES:

a. During landing roll heading will be held within ± 5 degrees when using brakes.

b. Will not be used during take-off roll except for emergency directional control.

c. If brakes are used hard enough to cause the tail wheel to leave the ground it will be considered unsatisfactory.

3. POWER APPROACHES:

a. Selected pitch attitude will remain fairly constant up to the point of round out. The maximum pitch attitude for any approach is level flight attitude.

b. Landing will be three point, on or within 100 ft. beyond the panel.

c. Angle of approach will not be excessively steep or excessively shallow.

d. Throttle and elevator use will be coordinated.

e. During an approach in a cross wind, proper cross wind technique will be employed.

4. MAXIMUM PERFORMANCE TAKE-OFF:

a. 30 degree flaps will be used.

b. Brakes will not be used during take-off roll except for emergency directional control.

c. Heading will be held within ± 5 degrees.

d. During take-offs in a cross wind, proper cross wind technique will be employed.

5. BARRIER LANDINGS:

Same standards as for power approach.

6. BARRIER TAKE-OFF:

Same standards as for maximum performance take-offs plus:

a. Maximum angle of climb will be held <u>only</u> long enough to clear the barrier.

7. HIGH RECONNAISSANCE:

a. Selected altitude will be 400 to 600 ft. above the terrain.

b. Selected altitude will be maintained within ± 50 ft.

c. Information listed in the description of a high reconnaissance will be correctly evaluated and utilized.

8. LOW RECONNAISSANCE

a. Selected M.S.L. altitude will be maintained.

b. Maneuver will be graded by the instructor or check pilot, as he deems necessary and proper.

9. APPROACH TO A STRIP:

Same standards as for power approach. Landing will not be accomplished beyond the selected go-around point.

10. GROUND RECONNAISSANCE:

a. After completion of a ground reconnaissance, the student should be able to give a reasonably accurate description of how operations could be conducted from the strip.

11. TAKE-OFF FROM A STRIP:

Same standards as for maximum performance take-off and barrier take-off. The angle of climb in excess of normal climb should be the minimum climb necessary to safely clear the obstructions.

12. ROAD STRIPS.

a. Standards for high and low reconnaissance of a road strip will be the same as for any strip.

b. Regardless of the speed used on the approach for landing, power will be used throughout the approach.

c. Landing will be made on the center of the road.

d. Heading during the landing roll out will be held within $\pm$ 3 degrees.

e. Heading during take-off roll will be held within $\pm$ 3 degrees.

f. Take-off will be made on the center of the road.

g. Student will be proficient in both wheel landings and three-point landings on roads.

h. No part of a landing roll or take-off roll will be made over culverts or between posts or signs which are close to the road.

Army Ft McPherson Ga 1648/59