traffic patterns and landings

chapter 7

part III Landing Irregularities

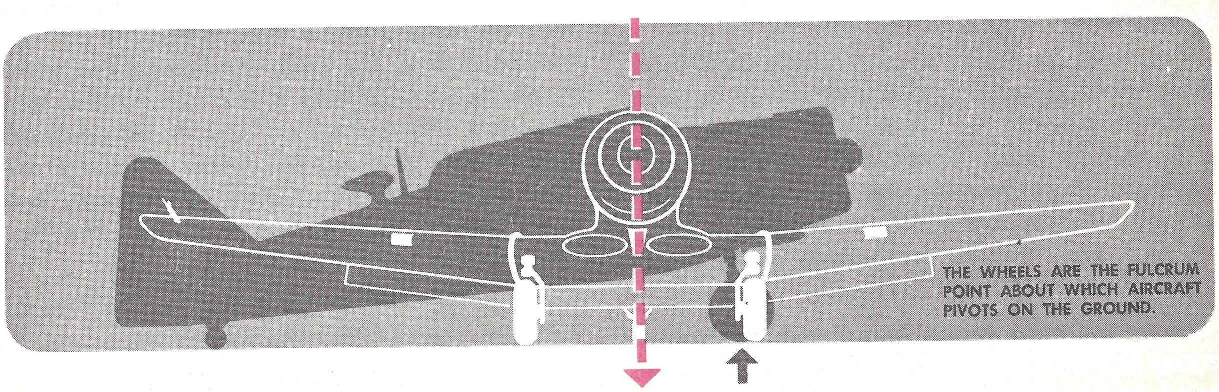
DEFINITIONS OF RELATED FACTORS

This part of the landing chapter is used to accent the problems associated with all types of landings. Any repetition is purely intended to emphasize the importance of proper technique.

The following factors play a prominent part in the causes and effects of landing irregularities. They are defined here and will be discussed in great detail during the remaining part of this section on landing irregularities. A thorough knowledge of how these factors affect landings is invaluable in analyzing and preventing accidents.

Center of Gravity

An aircraft's center of gravity is the point at which the entire weight of the aircraft may be considered as being concentrated. It may also be termed as the point within the aircraft on which it will balance. As fuel is used up, or passengers added, the position of the center of gravity may change, but for one loading condition it may be considered as fixed. Because of its construction, the T-6 aircraft has a fairly high center of gravity. The center of gravity does not change with the angle of attack.



Center of Gravity is Behind the Wheels

DEGREE OF CROSSWIND TO RUNWAY	MAXIMUM FLAP SETTING 0°-45°	0°-25°	0°
0°-30°	0-10	10-20	20-30
30°-45°	0-10	10-15	15-30
45°-90°	0-5 (CALM)	5-10	10-15
	WIND VELOCITY—MPH		

Centrifugal Force

Centrifugal force may be defined as the outward force exerted by a body moving in a curved path. We may say that it is the force that resists the change in direction and attempts to keep the body moving in the original direction. Since all the weight of an object is considered as being concentrated at the center of gravity, it is this point through which the centrifugal force acts.

Ground Loop

A ground loop is an uncontrollable turn during ground operation. This may occur during taxiing, take-off, or especially during the after-landing roll. Structural damage frequently occurs because one wing strikes the ground when centrifugal force forces the center of gravity toward the outside of the turn or swerve.

Since the flaps extend down and below the wing, they present more surface area for the wind to act upon when the aircraft is rolling on the ground. The farther the flaps are lowered, the more surface area is presented to the wind; therefore the more flaps that are used, the greater the effect the wind has on the aircraft.

The main landing gear may be considered as a fulcrum point about which the aircraft rotates. Since the flaps are located behind the main wheels, a cross-wind acting on the increased surface presented by the flaps increases the weather-vaning tendency of the aircraft. That is, by pushing from the side on the increased surface area presented by the extended flaps, the cross-wind has more effect in causing the aircraft to turn, or swerve, into the wind. For this reason, you should use good judgment in planning the degree of flaps to use in a cross-wind. *The higher the velocity and the greater the angle of the wind, the less flaps should be used.*

The wind and flap setting chart above is for your information and guidance:

LANDING IRREGULARITIES AND RECOVERIES

Up to this point we have been mainly discussing normal and cross-wind landings where an ideal situation existed and/or the landing was made correctly. Some of the causes and effects of errors in judgment and improper control techniques will now be discussed in more detail; also, the proper methods used to recover from bad round-outs, touch-downs, and after-landing rolls will be explained.

Normal Landings

First we will take these factors in normal landings and then in cross-wind landings.

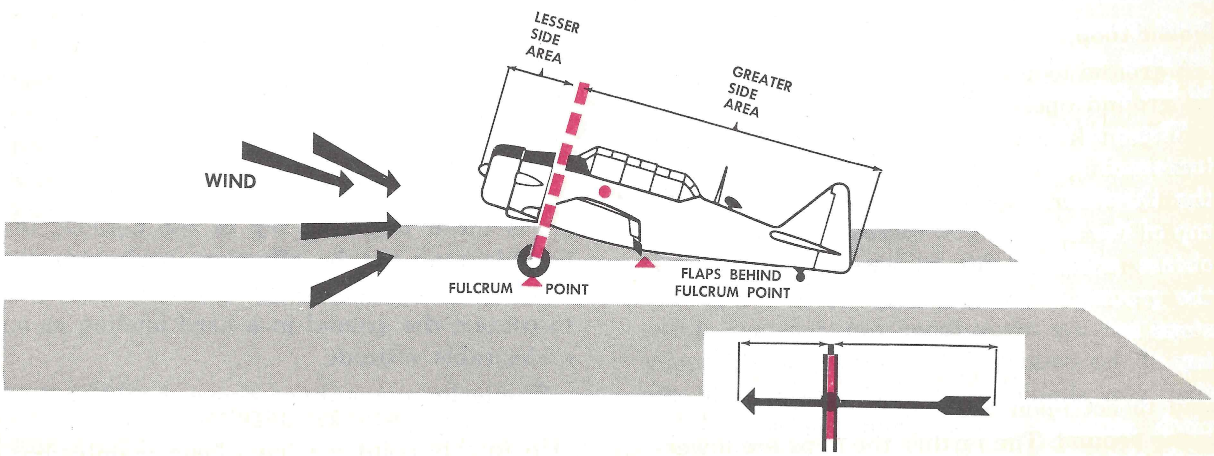
Bounce and bounce recoveries: Improper round-out technique has already been explained in the round-out for normal landings; but it applies also to cross-wind landings. Remember, when the round-out is made too slowly or too late, the aircraft contacts the ground with the main gear first, which usually results in a bounce. The bounce recovery is basically the same for both normal and cross-wind landings; however, an additional control technique must be utilized during a bounce in a cross-wind. A normal bounce will be discussed here, and a cross-wind bounce will be explained in Cross-wind Landings further on in this section.

The following technique should be used only in the event of a slight or moderate bounce. As was stated before, a bounce is the result of the aircraft contacting the ground on the main landing gear, while the tail is being forced down by weight, inertia, and back-stick pressure. This causes the angle of attack to increase, which in turn increases the lift. This condition then causes the aircraft to fly off the ground. The reaction of the aircraft striking the ground adds to this condition, and the magnitude of the bounce depends on the force of the ground contact and the angle the aircraft struck the ground.

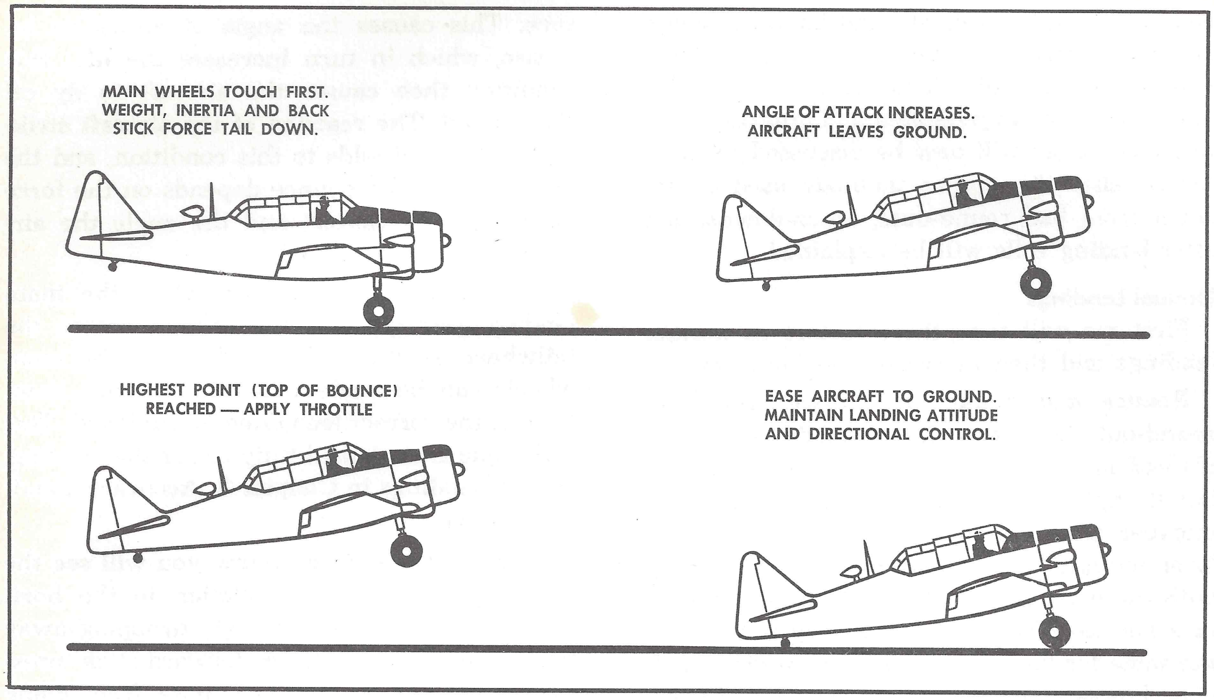
A bounce usually occurs when the main landing gear contacts the ground before the tailwheel. A successful landing on the main wheels can be made without bouncing, however, if the correct technique is employed. This technique is explained fully under the heading, Wheel Landings in Chapter 9, Accuracy Landing Stages.

Whenever a bounce occurs, you will see the pitch attitude rising in relation to the horizon and the ground seemingly dropping away from you. Use whatever forward-stick pressure necessary to keep the nose from going above a normal, three-point landing pitch attitude at any time during the bounce. When you see that the ground is no longer moving away from you, it means that you have reached the top of the bounce.

Now let us look at the situation a little closer. You are in an approximate landing attitude, a certain distance above the ground. Since the initial ground contact was made at a certain speed, and the throttle was closed,



Flaps Increase Weather-Vaning Effect



the bounce merely slowed you down further. Of course, with the aircraft going slower, you have less control over it.

When the aircraft reaches its maximum height in the bounce, it is not going to stay there. Gravitational force tends to pull it down toward the ground. Since it is going slower, the lift has decreased, and it will tend to drop rather fast. In fact, sufficient lift may have been lost by this time to cause the back-stick pressure to be ineffective in holding the landing attitude, and thus ease the aircraft to the ground as it did in the initial round-out.

There is only one thing left to give you the increased lift that is needed in this situation: the throttle. By applying some power at the top of the bounce, you increase the thrust and obtain sufficient lift to ease the aircraft to the ground. Remember, as soon as the ground stops moving away from you, you are at the top of the bounce. It is precisely at this point that you should apply the power. Hold the pitch attitude constant and the wings level with the stick, and maintain directional control with the rudder.

Continue to hold the landing attitude constant with stick pressures, and use whatever power necessary to control the rate of descent to the ground. Be sure to be in the three-point attitude when you again contact the ground, or you might bounce again. As soon as ground contact is made, close the throttle and maintain directional control.

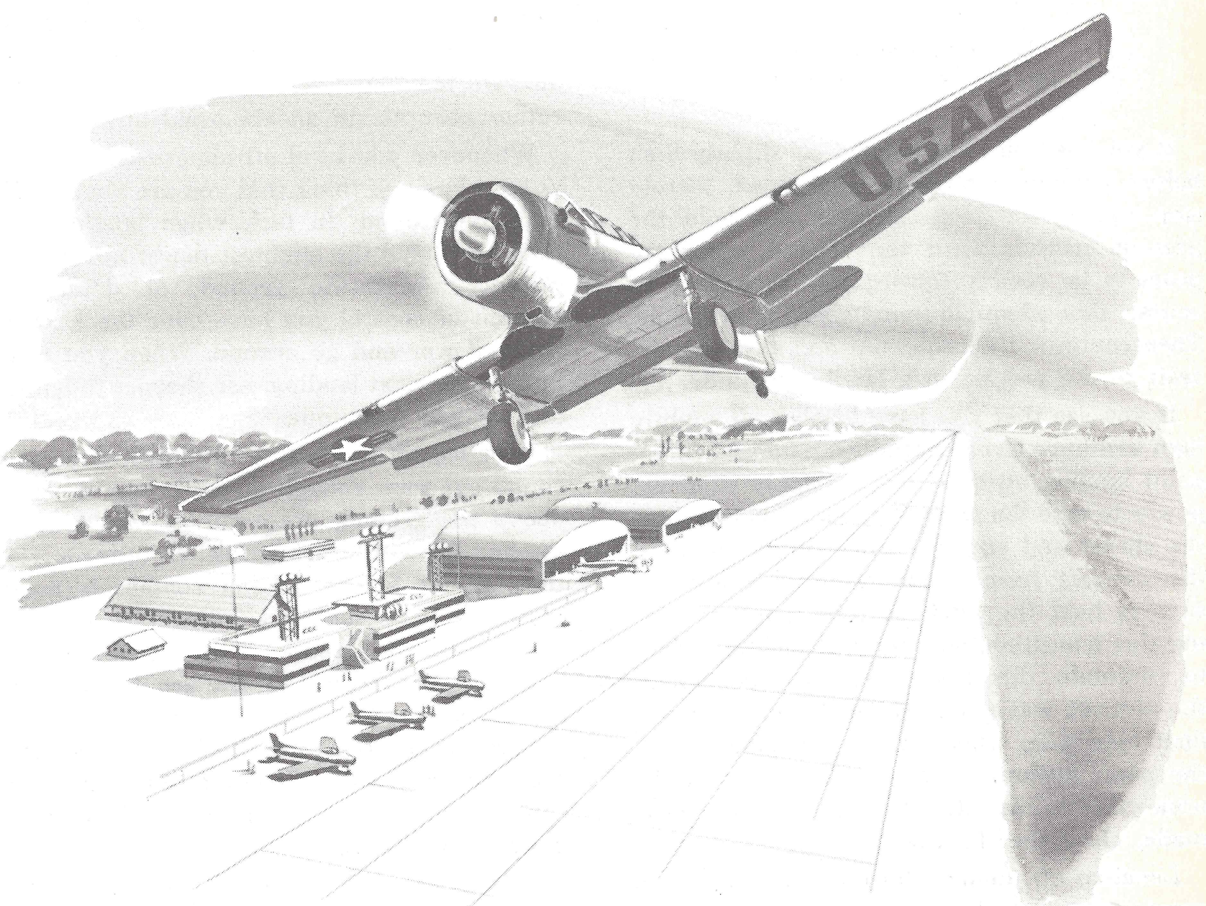
Wait until you are at the top of the bounce before applying power. If you become a little excited and apply power too soon when the aircraft is still going up in the bounce, you will just cause it to go that much higher. Then if you reduce some of the power, you may drop in from too high.

If you wait too long, or after the aircraft starts down from the top of the bounce, the throttle may not be effective in slowing the rate of descent. This condition may cause you to contact the ground in a hard landing or an undesirable attitude.

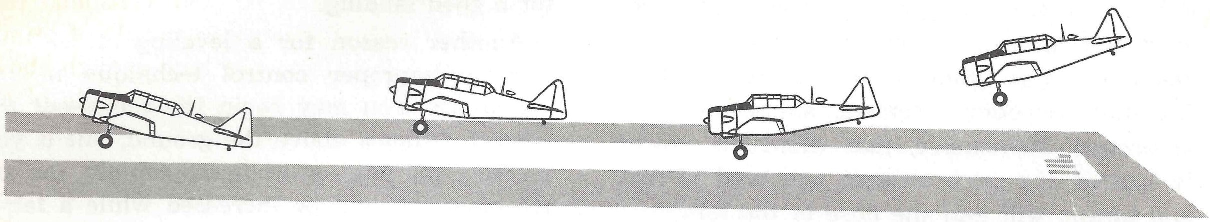
The technique outlined above should be used only in the event of a slight or moderate bounce. If the magnitude of the bounce is great enough to change the pitch attitude abruptly or excessively, and to cause the aircraft to bounce abnormally high, do not attempt to re-land the aircraft. Open the throttle to the sea-level stop, control the pitch attitude, maintain directional control, and complete a go-around. Remember, that when the power is applied, the pitch attitude will tend to rise, and torque will pull the nose to the left.

Leveling off slightly high: At times you will find that errors in judgment of distance will cause you to think the ground is higher than it actually is. This may cause you to begin the round-out a little too soon, placing the aircraft in a landing attitude slightly higher above the ground than it should normally be for a good landing.

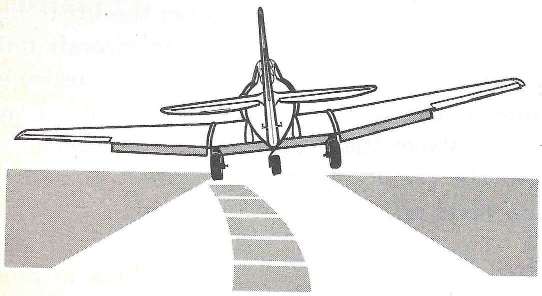
Another reason for a leveling off slightly high is improper control technique in the round-out. You may begin the round-out the correct distance above the ground, but if you increase the pitch attitude too rapidly, the angle of attack will be increased while a fairly high airspeed exists. This causes the lift to develop to such an extent that the aircraft fails to settle in as it should. If you continue to assume a landing attitude, the aircraft remains too far above the ground, and once again you have the same condition as before: a slightly high level-off.



Don't Hesitate to Go-Around



Slight Bounce Resulting from Rounding out Too Slowly and Not Completing Round-out



Torque Pulls Aircraft to Left when Power is Applied

If you see you have leveled off slightly high before a landing attitude is attained, merely stop raising the pitch attitude and hold the present attitude until the ground again appears to be coming toward you, providing, of course, that adequate flying speed is available. Then continue the round-out and ease the aircraft to the ground in a landing attitude.

If you see that you have leveled off slightly high and have already attained a normal three-point landing attitude, merely apply sufficient power to ease the aircraft down. This increases the thrust and supplies sufficient lift to keep the aircraft from dropping in abruptly. Be sure to hold the pitch attitude constant during this transition, and be alert on the rudder to maintain directional control. Remember, the aircraft was trimmed for the glide on the final approach; when you apply some power, the pitch attitude may tend to vary and the nose move to the left. When ground contact is made, close the throttle.

Leveling off abnormally high: Because of a great error in judgment or improper control technique, or both, you may level off abnormally high. In this case, do not try to recover as you did above or try to re-land the aircraft. During the time it takes to ease the aircraft to the ground with throttle, varying forces may act upon the aircraft, necessitating large changes in throttle and control pressures. These may become disconcerting enough to cause you to over or under control, and the aircraft may stall in or contact the ground rather abruptly in an abnormal attitude.

Whenever you level off abnormally high, or at any time you think that you are abnormally high, *go around.* In fact, when landing, any time you have the slightest doubt about your distance above the ground, or doubt the amount of control you have over the aircraft, apply power and go around. When you come in for your next landing, use sharper judgment and control technique.

Leveling off too late: If you fail to begin a round-out soon enough at the proper distance above the ground, your rate of closure with the ground will be fairly fast. In order to stop the descent before ground contact is made, you must raise the pitch attitude to level off just above the ground. This amount of lift will keep the aircraft off the ground until the speed decreases; then the aircraft would begin settling. Since the aircraft is in a level attitude, and not a three-point attitude, it would contact the ground main wheels first and a bounce could result.

This means that as the speed dissipates, you must gradually increase the angle of attack to hold the aircraft off the ground until a three-point attitude is assumed. At this point you must then allow the aircraft to settle to the ground. This particular technique involves a delicate control touch and a sharp depth perception, because you must time the change of attitude to coincide with the rate that the aircraft is attempting to settle to the ground. If your timing is a little off, and you fail to attain a three-point attitude as the aircraft settles, you will touch down on the main wheels first. It is usually at this point that you are also applying back-stick pressure to ease the aircraft down. This combination of back-stick pressure and inertia caused by the ground contact will result in a bounce.

Because of the fast round-out that is needed when you level off too late, the aircraft may mush through the round-out and contact the ground very hard. There may not be sufficient time to attain a three-point landing attitude. This will result in flying into the ground, contacting the main wheels first, and bouncing.

The round-out should be started approximately 75 feet above the ground. This gives you plenty of time to accomplish a slow, smooth round-out and attain a three-point attitude at, or just prior to, the touch-down. If you level off late, you must adjust the attitude of the aircraft when it is just above the ground. Unless your timing and judgment are acute, your aircraft will contact the ground on the main wheels before you expect it, and it may bounce.

Stall-ins: From your study of stalls, you learned that the reason an aircraft stalled was that the critical angle of attack was exceeded. This can happen in any attitude, at any power setting, or any airspeed; it will happen whenever the critical angle of attack is exceeded.

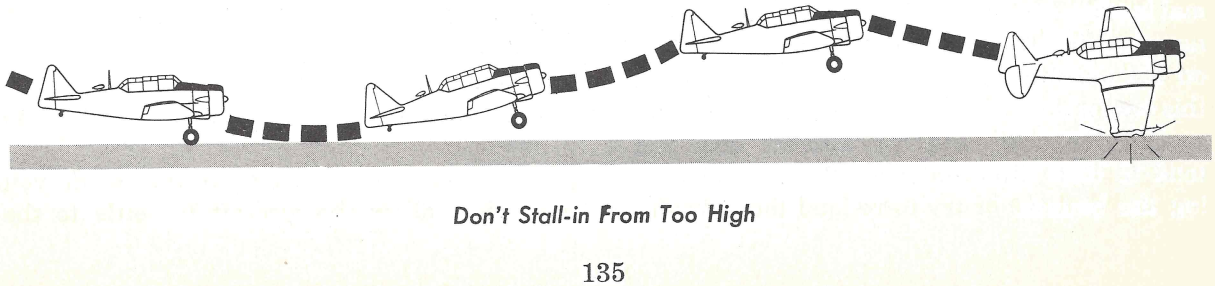
If you were to level off high and maintain a landing attitude, the speed and lift would decrease. As the lift decreased, the aircraft would assume a new flight path and begin settling. If the attitude is held constant, this new flight path will cause the angle of attack to increase. Now if you are high enough above the ground to give this changing angle of attack time to exceed the critical angle, the aircraft will stall. A normal landing utilizes this principle of settling, but the settling starts when the aircraft is near enough to the ground to land before a full stall develops.

If a full stall develops, the aircraft becomes a free falling body, and very little control can be maintained. This means that if you stall in from any distance, the aircraft will contact the ground abruptly. It also means that the aircraft will make ground contact in any attitude it assumes after the stall, which in most cases is unfavorable to the landing.

The conditions described above should make you aware of the need for taking corrective action before you feel the aircraft trying to drop out from under you during a landing. If you happen to level off high and remain high without any apparent settling effect, apply some power to increase the thrust and lift. If you are only slightly high, ease the aircraft down. If you are abnormally high and/or have some doubt about the control you have, smoothly open the throttle to the sea-level stop and go around.

A stall-in can also be caused by an abrupt or fast round-out while the aircraft is actually settling to the ground. The critical angle is exceeded in this manner, and the result is the same. This was described earlier in the section on round-outs.

Over and under controlling: One of the most difficult things you must learn in order to fly an aircraft properly is the amount of control



Don't Stall-in From Too High

to use to obtain a desired result. This also applies to the timing and the proper amount of rudder pressure needed to maintain directional control on the after-landing roll.

There are many instances in which a student has stopped a violent swerve very satisfactorily, only to over control and cause the aircraft to swerve out of control in the opposite direction. Conversely, there are many times when insufficient control was applied and the swerve continued until an accident resulted.

If a large amount of corrective rudder is required, use it; but after it has taken effect, be sure to release enough rudder pressure to keep from swerving in the opposite direction. In other words, give it whatever it needs — no more, no less.

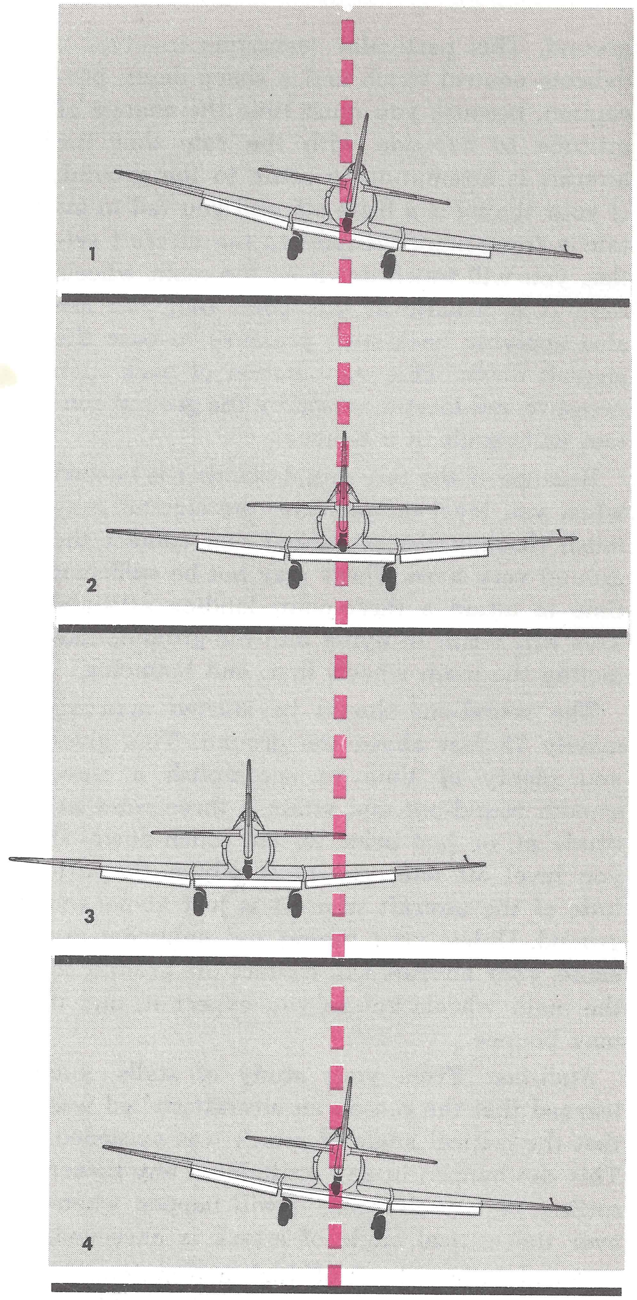
A lot depends on whether or not you apply the corrective action soon enough. The longer you wait, the more pressure it will probably take to correct the situation. Sometimes you can stop a swerve with a very little pressure, while at other times it may necessitate the need for full rudder pressure. Of course, in the case of full pressure, you must be careful to release the excessive pressure as soon as it is no longer needed.

You must also remember that the brake is the most effective and positive control on the ground. A slight application of brake may be just as effective as a large application of rudder, so use your judgment and use whatever control you think is necessary and most applicable for the situation.

Cross-wind Landings

The irregularities encountered in a cross-wind and the proper techniques will now be discussed.

Bounce and bounce recoveries: During a normal landing when a bounce results and there is no wind drift to consider, the wings are level on the touch-down and during the bounce. In this case a wing does not have to be lowered to correct for drift, and the aircraft does not tend to drift after it leaves the ground during the bounce.



AIRCRAFT TOUCHES ON MAIN GEAR AND BOUNCES.

2. WINGS BECOME LEVEL IMMEDIATELY UPON BOUNCING.
3. AIRCRAFT BEGINS DRIFTING IMMEDIATELY, IF NO CORRECTION IS APPLIED.
4. DRIFT CORRECTION APPLIED IMMEDIATELY COUNTERACTS DRIFT.

Bouncing in a Cross-wind

From your study of cross-wind landings, you have learned that during the round-out, the up-wind wing remained lowered. In fact, the wing was lowered even further through the round-out than it was in the final approach. This technique was used to properly compensate for the drifting effect of the cross-wind. The touch-down was then made on the up-wind wheel and the tail wheel. Weight and inertia then caused the down-wind wheel to settle to the ground. When both main wheels were on the ground, of course, the wings became level.

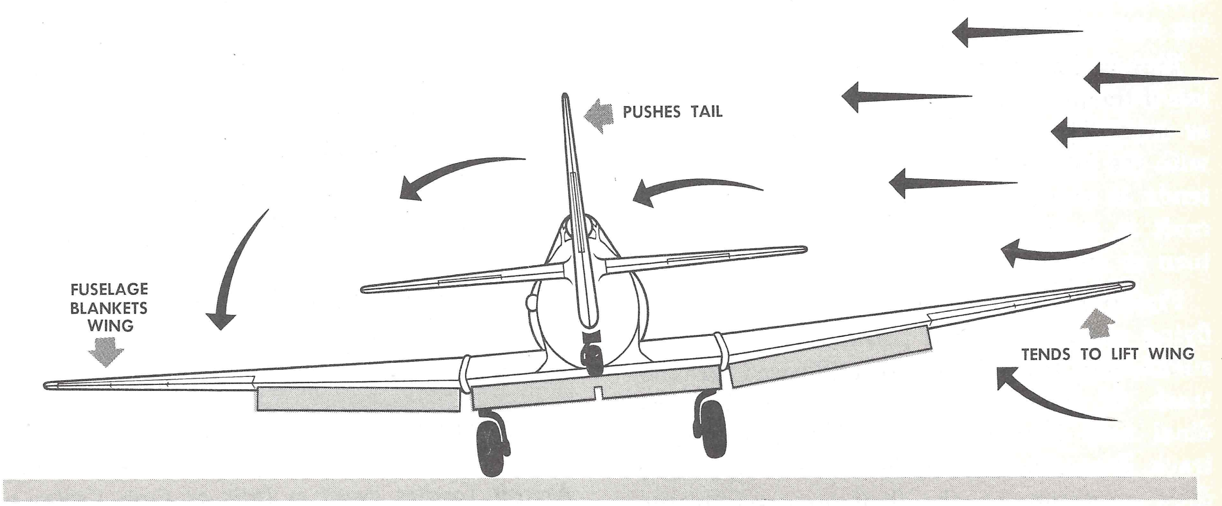
During a cross-wind touch-down, one wing is lowered, but as soon as the aircraft touches down and bounces, the wings become level. This causes the aircraft to begin drifting immediately after it leaves the ground in the bounce. Since it does not stay in the air long during a bounce, you do not have much time to re-establish a drift correction, that is, relower the upwind wing to counteract drift before another touch-down is made after the bounce. You must remember, therefore, that as soon as the aircraft bounces in a cross-wind, you must immediately begin re-applying a sufficient wing-down correction to counteract drift. This must be accomplished simultaneously with the normal bounce recovery. Then, when the aircraft touches down after the bounce, you will have already applied the proper drift correction to prevent the aircraft's contacting the ground in a drift or skid.

The consequences of touching down in a drift and/or crab has been explained in the cross-wind landing and will be analyzed in the next paragraph. Remember, the center of gravity tends to move in the same direction the aircraft is drifting. This causes the aircraft to swerve or turn, and the more it swerves, the more it tries to swerve. This swerve is also aggravated by the cross-wind acting on the side area of the aircraft.

Touch-down in a drift and/or crab: Any aircraft that has a tail wheel must be so constructed that the center of gravity lies behind the main wheels. This means that the concentration of weight is at some point behind the main landing gear.

Since the entire weight of the aircraft is considered to be concentrated at the center of gravity, any centrifugal force acting on the aircraft tends to act through this point. We may also think of this point as the point upon which any inertia, such as the forward momentum of the aircraft, acts.

In the event the aircraft was rolling on the ground, and a slight turn started, the centrifugal force created would act on the center of gravity. Since the center of gravity is consid-



Effect of Cross-wind during Landing

ered the concentration of the weight, it would tend to move to the outside of the turn. Of course, the center of gravity is a stationary point in the aircraft, so as it moved, the aircraft would have to move with it.

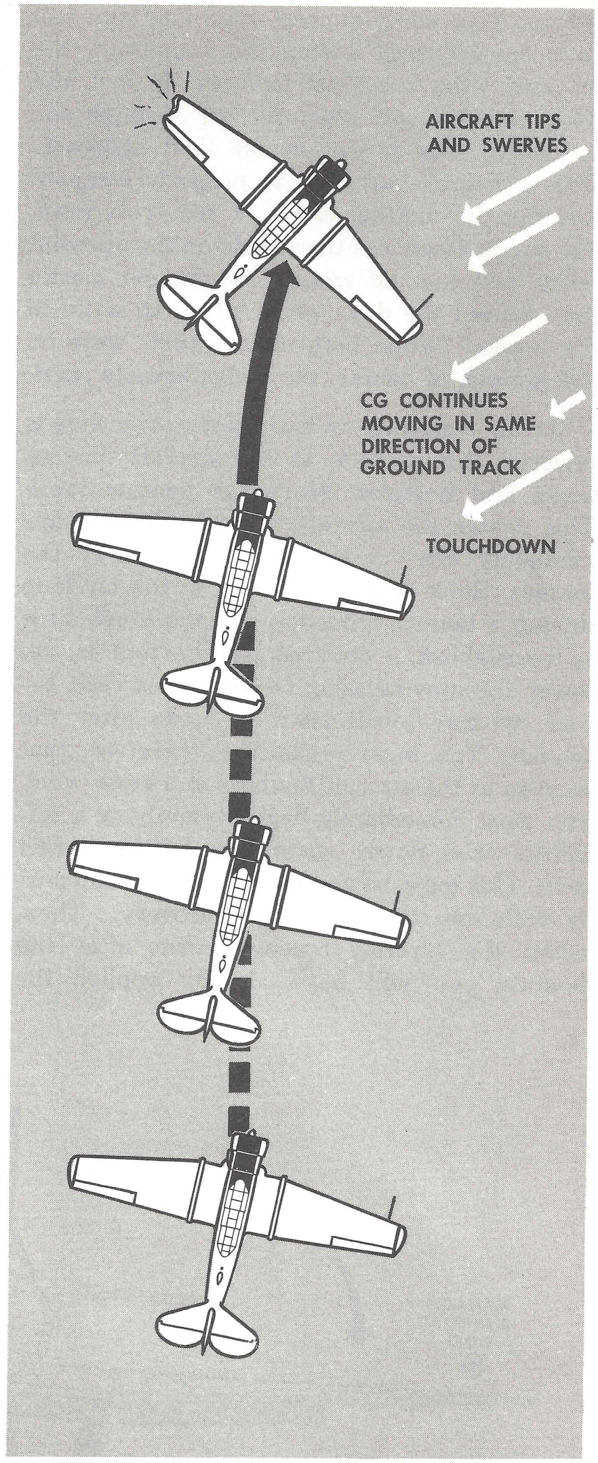
Since the center of gravity is behind the main wheels, that part of the aircraft behind the main wheels would tend to move to the outside of the turn. The farther the center of gravity moves, the faster it causes the aircraft to turn. This causes a greater centrifugal force which also causes the turn to increase. You can conclude that the farther the aircraft turns or swerves, the more it tries to swerve.

For this reason you can also see the importance of keeping the aircraft going straight and not letting a swerve start in the first place. It is much easier to keep a swerve from starting than to stop it after it begins. It is also easier to stop a swerve immediately after it begins than it is after the swerve gets a good start.

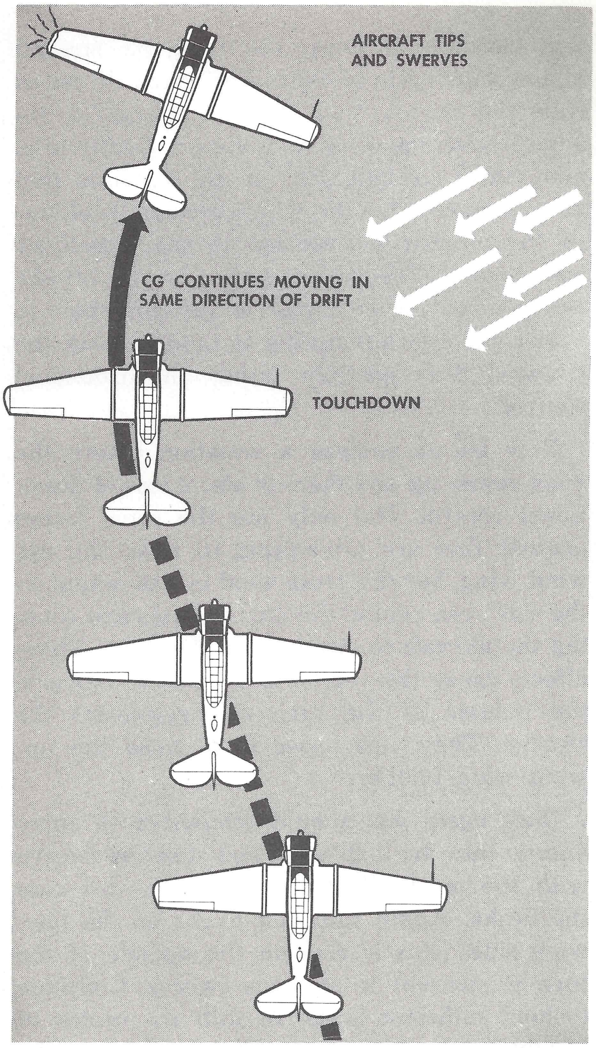
Whenever the aircraft is rolling straight, that is, when the longitudinal axis is aligned with the intended ground path, the center of gravity is pushing straight ahead and directly between the wheels. At any time this alignment is disturbed or changed, the center of gravity is forced to one side or another. This is what causes the aircraft to begin turning and swerving.

This is exactly the same condition that exists if the aircraft touches down in a drift and/or crab. The longitudinal axis is not aligned with the ground track, so the center of gravity tends to move in the same direction the aircraft is moving. This causes the aircraft to turn or swerve.

Flying in a crab was explained previously as flying with the aircraft pointed into the wind sufficiently to make good a desired ground track. Of course, this means that the longitudinal axis is not aligned with the ground track. Remember, the recommended method of drift correction on the final approach is the wing-low method. This method allows the



Aircraft Touches Down in Drift or Crab. Center of Gravity Continues Forward in Original Direction Causing Swerve to Develop.



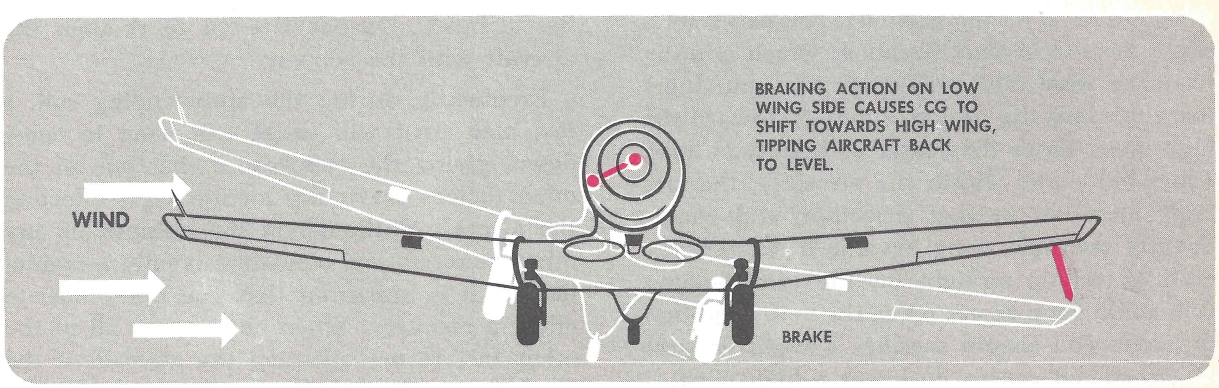
Landing in Crab (Result is the same as Landing in Drift)

longitudinal axis to be aligned with the ground track. At times you may find yourself correcting for drift by crabbing on the final approach. If you round-out and touch down while the aircraft is still in the crab, the aircraft will contact the ground while it is moving sideways in relation to the ground track. This condition can start a swerve in the manner that was explained previously.

From this information on the consequences of touching down in a drift and/or crab, you can conclude that the main thing to remember is to have the longitudinal axis aligned with the ground track when the touch-down is made. There are three factors that will cause the longitudinal axis to be out of line with the ground track during touch-down. They are: drifting, caused by insufficient or no wing-low cross-wind correction; crabbing, caused by coordinated or uncoordinated control pressures; or combination of drifting and crabbing.

Wing coming up on the after-landing roll: There are many instances during cross-wind landings when the up-wind wing will come up on the after-landing roll. This can happen when there is a loss of directional control, and also when there is no loss of directional control. Let us first analyze the condition of the up-wind wing coming up when the aircraft is rolling straight and there is no loss of directional control.

Anytime an aircraft is rolling on the ground and a wind is affecting it from the side, the



Use of Brake to Level Wings

upwind wing is receiving a greater impact pressure from below than is the other wing. This causes this wing to produce more lift. The wind is also acting more on the keel area above the center of gravity than it is on the area below the center of gravity. The keel area is the area of the entire side of the aircraft.

The greater lift on the up-wind wing may cause it to rise. The pressure of the wind on the keel area may cause the aircraft to tip away from the wind, giving the same effect. The combination of these effects is sufficient to raise the up-wind wing high enough to cause the other wing tip to strike the ground, even though directional control is maintained.

In your study of directional control, you learned that the rudder was used to maintain directional control, and the ailerons were used to keep the wings level. In the event a wing does come up, you should immediately apply more aileron into the high wing to attempt to lower it. The sooner this aileron control is applied, the more effective it will be. Don't wait until the wing is way up; apply the additional aileron control the instant it starts up. The farther you allow the wing to rise before you try to correct for it, the more area is exposed to the impact pressure of the wind. This makes it more difficult for the aileron to be effective, and you may not be able to lower the wing.

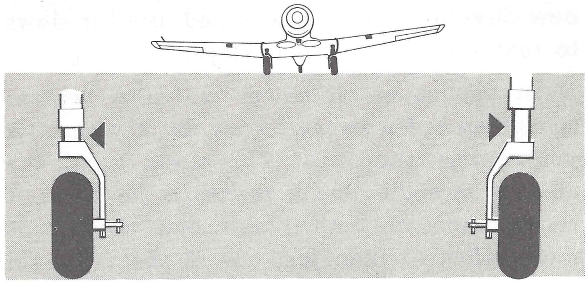
If the up-wind wing continues to rise, even though you applied full aileron into it as soon as it started up, you still have a chance to lower it. By applying brake on the low-wing side (that wheel is on the ground), you can start a slight swerve in that direction, which is away from the wind. This will cause the centrifugal force to move the center of gravity toward the high wing. Since the center of gravity is fixed (does not move within the aircraft), the aircraft must tip in that direction, and consequently the high wing lowers. When the aircraft is rolling straight on the after-landing roll, and a wing comes up, is the *only* condition in which you should sacrifice a *slight* amount of directional control to lower a high wing.

Since a certain amount of directional control was sacrificed to lower the wing, the aircraft is now moving in a slightly different direction from the original path. Do not attempt to re-align it with the original direction. Continue to maintain a straight path in the direction that was assumed after the wings became level, until the aircraft has slowed to taxi speed, or has stopped. This means you may roll off the runway, but it is better to do this than to over-control in attempting to re-align with the runway, thus possibly losing all directional control.

Now let us analyze a situation where the wing comes up and there is also a loss of directional control. Not only are the same forces present that are attempting to raise the up-wind wing, but the cross-wind is also acting on the side area behind the main wheels and causing the aircraft to swerve into the wind. These effects cause the center of gravity to move to the outside of the turn and aggravate the swerve. They also cause it to raise the up-wind wing further.

Once again you should remember to apply aileron into the high wing and stop the swerve with the most effective control, in this case the brake. Apply sufficient brake on the low-wing side (this is also on the outside of the turn or swerve) to stop the swerve. Continue to hold sufficient brake to shift the center of weight to the high wing. This will cause the wing to lower. When the wings become level, maintain the direction that was assumed until the aircraft has slowed to taxi speed or has stopped. Do not attempt to re-align the aircraft with the runway.

Frequently during the after-landing roll, a low oleo strut will cause one wing to come down, giving the appearance that one of the other factors previously mentioned is affecting the aircraft. Although in the absence of any other factors a low oleo strut is only a mental hazard, it is important that you know how to effect a recovery. When any one or all of the other factors are affecting the aircraft at the same time, a low oleo strut can cause serious consequences. This situation is simply remedied by evenly applying a slight amount of pressure on both brakes.



Low Oleo Strut

Ground Loops

As already explained, a ground loop is an uncontrolled turn during ground operation of the aircraft. This can happen anytime during taxiing, take-off, or the after-landing roll, if the centrifugal force acting on the center of gravity is great enough to overcome any or all corrective action.

As you already know, the center of gravity is located behind the main wheels. As long as the aircraft is rolling straight, the center of gravity is moving straight ahead and in the same direction the longitudinal axis is pointed. This tends to keep the aircraft rolling straight.

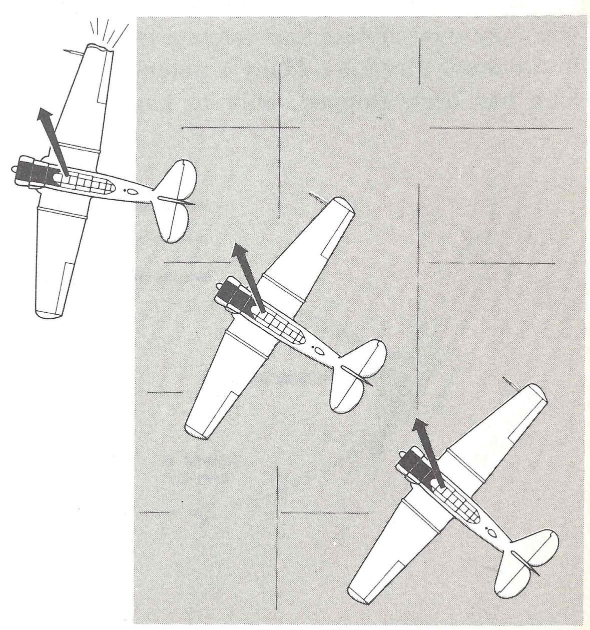
Anytime the aircraft begins to turn or swerve, this alignment is disturbed or changed. The center of gravity, located behind the wheels, continues to move straight ahead because of inertia. It is now no longer moving in the same direction the longitudinal axis points. It is now moving sideways in relation to the aircraft, and since the wheels may be regarded as a fulcrum point, it causes the aircraft to turn or swerve even more. For this reason you should try to prevent swerves or to stop them as fast as you can; the farther you let the swerve go, the harder it is to stop it.

As the swerve progresses and the aircraft turns farther, the centrifugal force acts at a greater angle relative to the longitudinal axis. That is, the farther the aircraft turns, the more the center of gravity is being forced directly sideways in relation to the longitudinal axis. This gives the force a greater mechanical advantage, which is virtually impossible to control. When this happens, the aircraft is in an uncontrollable turn — in short, a ground loop.

You can see that a ground loop can place a great and unnecessary strain on the landing gear, even if nothing else but a turn resulted. Usually other things will happen, however, that damage the aircraft extensively. Since the center of gravity is fairly high in the T-6, it not only aggravates a turn, but causes the aircraft to tip away from the direction of the turn. This tipping effect causes the outside wing tip to strike the ground.

During ground loops in a T-6 that are not particularly severe, the outside wing tip will nearly always strike the ground. During a particularly severe ground loop, however, the entire outside wing may be bent or strained, the landing gear may be sheared off, and the propeller may strike the ground. In other words, extensive damage is sustained by the aircraft.

The faster the aircraft is moving, the more inertia is present. You must remember, therefore, that with a greater speed there will be more force present to aggravate a swerve or



CG Gains Greater Mechanical Advantage as Swerve Develops turn. Conversely, the slower the aircraft is moving, the less inertia there is to overcome, and the swerve or turn is easier to control. This is apparent during taxi practice. When you taxi slowly, it does not take as much rudder pressure to control the S-turns, as it does when you are taxiing faster. You have also noticed during taxi practice, that if you are taxiing too fast, the change of direction during the S-turns had to be made slower. That is, the turn was made slower and with a greater radius. This was done to insure that the greater centrifugal force acting on the center of gravity would not cause the turn to tighen, or the aircraft to tip excessively.

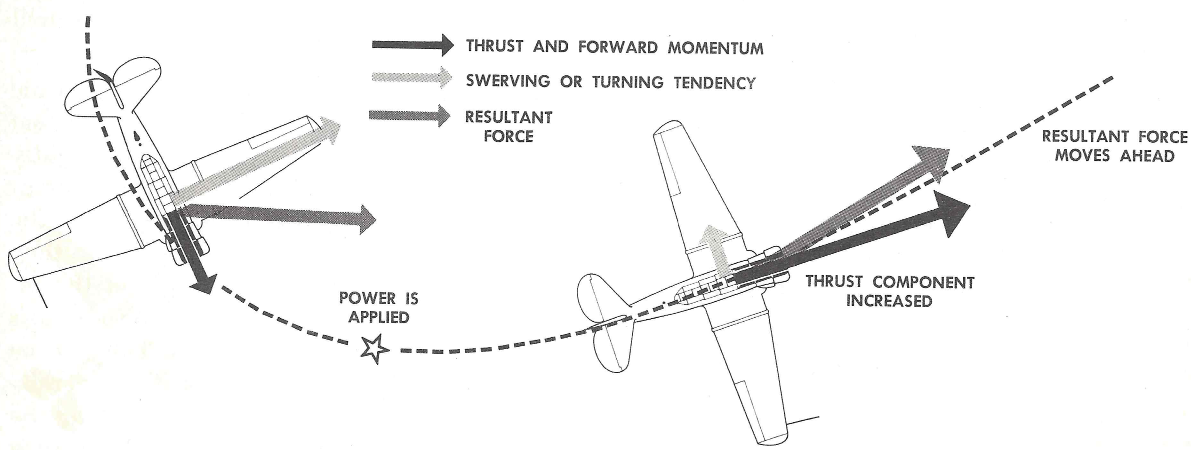
What to do about ground loops: The best and most effective control for ground loops is to prevent them. That is, don't let a swerve start. Use fast and sufficient rudder control to keep the aircraft rolling straight.

If a swerve has developed and rudder control is ineffective, remember the most effective swerve control is the brake. Apply sufficient braking action to the brake on the outside of the turn to stop the swerve. When you have it stopped, do not attempt to realign the aircraft with the runway, because you may overcontrol and cause a ground loop in the other direction. Many a potential ground loop has been stopped, only to have the aircraft enter one in the opposite direction. Allow the aircraft to roll straight ahead in the new direction that was assumed, until it slows to taxi speed, or until it stops.

An application of power will also help to straighten out a swerve. By using the throttle you increase the thrust. This tends to pull the aircraft straight ahead, resisting the turn. A combination of both brake and throttle is more effective than just one of them. To aid these controls in stopping a swerve, hold the stick as far back as possible. This puts more weight on the tail wheel, causing more ground friction. This gives the tail wheel more steerability, and also makes it more difficult for the turning force to skid the tail wheel sideways, as it tends to do when the turn tightens.

When you get the ground loop stopped, remember to release any pressures that you used to stop it, or they will cause you to turn in the opposite direction.

Ground loops can happen with, or without, a cross-wind acting on the aircraft; however, they are most common during cross-wind landings because of the weather-vaning tendency of the aircraft. For this reason, you should be especially alert during the after-landing roll in a cross-wind. Keep your cross-wind correction applied.



Thrust Resists Turning Tendency