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Skylark Airpark (7B6)
Mailing Address:
EAA1310
54 Wells Road
Broad Brook, CT
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For member contact info

Log in with your 1310 ID:
login.microsoftonline.com

Next Meeting

Wednesday August 10 – 7:00 P.M.
Skylark Airpark Pilot Lounge - 54 Wells Road, Broad Brook, CT

Next Event

Saturday August 13 – Corn Roast

2017 Membership Renewals

Renew your chapter membership through the online store at http://www.eaa1310.org/store, or mail a check payable to EAA Chapter 1310 to the address at the bottom of this page. We'll get your membership card back to you.

Three Year Membership

Save the hassle of renewing every year, and save some money. We now offer a 3 year membership for $60. Save $15.

Chapter Clothing

New chapter logo T-shirts, sweatshirts and hats are in, and will be available at our next meeting and event.
Purchase items online at our store.
Credit cards can now be used for purchasing memberships and clothing at our meetings and events.

The President's Message

Air Venture 2016 has gone into the history books and I am looking forward to hearing from those who attended to describe their trip. Our Jon Witkin Memorial Scholarship winner is finishing her class and has offered to describe her experience, perhaps at the upcoming meeting if she can arrange it. Speaking of Ana's trip, it is not too soon to start looking for next years candidate. There will be more coming in the next newsletter including the application process.

It has been a long time coming but the repaving is just about finished and it looks beautiful. The runway, all taxiways, ramps, roads and the parking lot have been repaved by Tilcon. Also the West end of the runway has been extended by 600 feet. The trees on the East end that were a hazard have been removed. Thanks go to Jack Hildich for the continuing updates on the airport the past month or so. As of now, the scheduled opening is August 6^{th}.

According to our bylaws, the nominating committee chaired by Al Witkin is working to recruit next years slate of officers. If you are interested in holding any of the offices, please contact Alan. I am sure many of you have ideas to improve our chapter and now is the time to step forward and put your mark on chapter 1310.

And last but not least I must commend the core of members who are always volunteering to help out on our many activities. We all know who they are. Please give them a "thank you" when you see them working. Without this core of members we would not have a chapter.

Safe Flying,
Jack

DATE:
SUBJECT: Board of Directors Meeting
PRESENT:

There was no Board of Director's meeting in July.

EAA Chapter 1310 MEETING MINUTES

Date: July 13, 2016

Meeting called to order by Jim Glista, VP at 1905 hours.

Routine Business
13 Members Present
Membership: 54 members 12 unpaid
Property Report: No update

Old Business

Bruce wants additional hanger in same area

More bids received for construction.

Jim went to RC meet. Had a small turnout, about 50 planes. Jim asked if they wanted to put on a presentation. They said they would. The RC pilots said they could mix well with full sized aircraft.

Breakfast, Linc did inventory. Jack to get the perishables.

15 trucks an hour will be coming through with asphalt. People will not be allowed to park inside, on the grounds. Safety will be a concern.

Screens for doors have been purchased.

Clark, disassembled and most of it is gone.

Chapter hanger site prep work will be necessary if we move to the site next to the original proposed site.

New Business

Simsbury Fly-In committee, wants to know if we want a chapter parking area for our aircraft.

Jack Hilditch gave update on HFD. Developers want to take chunks of the land. MDC trying to get parts of the crosswind runway land. They are trying again to get the one through a different method. There is a push to get land through political means by using a study. Need as many people as possible from the GA community, as a show of force, to show up for the meetings.

State is looking to defund CT Aerotech. 100% grad rate, 50% to Pratt. There is a potential for Pratt to be work with state to keep the school open.

Reinbeck EAA appreciation August 6&7, will look at getting a bus together.

Skylark Improvements

The overrun required a lot more work than expected. 2000 tons of extra crushed rock was required.

Trolley museum, trees to be cut some trees so the runway can be seen. Some members of the museum will be at the breakfast on Saturday.

Tree line will be pushed back 100' in preparation of additional hangers.

Fuel tanks are being examined.

There was a general discussion about an open house after the construction is complete. Suggestion was made to do it in conjunction with the chapter corn roast.

Business meeting was adjourned at 2007 hours. EAA monthly chapter video was shown.____

NEXT MEETING

The next meeting will be on Wednesday July 13 at 7:00 in the Skylark Lower Pilot's Lounge.

OTHER ITEMS OF INTEREST

Back to Basics – The following email and its five attachments arrived from Bob Reser

For the past few years the FAA has been emphasizing teaching "risk taking" as a means to reduce the number of Loss of Control accidents and associated fatalities. There are numerous instruments advanced for the purpose of warning about approaching stall and several programs to teach about the risk considerations involved in planning and conducting flight.

To date there has been no consideration of how to conduct flight when caught in an unusual situation. Loss of control can easily be eliminated with some simple training that should be in every student's curriculum…"hands off flight"! There were many early model Cessna 150 and 172's that have a published emergency procedure for this. I have quizzed many instructors and examiners flying these aircraft and none knew about it! Who needs to read the POH of a small aircraft.

Similarly, there is little or no training how to make a successful emergency landing, survival during an off-field landing and other common accident causes.

To enable fixing a problem, there must first be a definition of what needs to be done. As an example, an engine failure requires landing. There must be a landing area chosen, the aircraft, now a glider, must be controlled to land and stop within the chosen area. The pilot and passengers must know how to survive the landing rollout if the area has obstacles. The typical accident analysis in this kind of incident is that engine failure caused the accident. Not at all. Engine failure caused the need to land. The flight control to and the landing touchdown must be at the chosen area. There is no accident until at or after touchdown. If the flight control is inadequate, there will likely be an accident. If there is no better place to land, there will be an accident. FAA statistics find 75% of off-field landings touchdown at or beyond the midpoint of the chosen area. 50% of the fatalities from these accidents occur from overrunning the chosen area. "I won't be low or slow"!

Do we teach students how not to stall? We spend lots of time teaching how to stall and make a recovery. What causes stall? I have quizzed over 200 professional pilots, instructors and examiners. All say exceeding the critical angle of attack causes stall…no, that is "when" stall occurs. The "cause" is the aircraft nose being pitched to the extreme to reach that angle of attack. What can pitch the nose of a dynamically stable aircraft to that extent? Pulling and holding the control wheel aft! What pulls the control wheel? You do!! The only way to stall this aircraft is for you to do it.

I am attaching some files that explain how I see these problems and a possible solution. I only hope you will forward this to all your pilot members and friends.
Best Regards,
Bob

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The story Goes Like This.

An electrical blackout happened in New York City in the early 1900's. For three days techn1c1ans were unable to fix the problem. Finally, out of desperation,John, a long-retired and well-respected electriclan, was called in to help. John walked behind a large transformer, took out his screwdriver and tapped three times on a solenord. The plant sprang back to life and electricity flowed.

Three weeks later, the city received a $1,000.02 bill from John. Curious about the amount, the city controller called John and asked why there was two cents on the end of the bill. John replied, "Well, I charge two cents for tapping, and $1,000 for knowing where to tap."

Over the years, I've been fortunate enough to fly with and observe literally hundreds of pilots. In each case, it was immediately clear when one of them knew-so to speak-where to tap. Specifically, when at the helm of an airplane, they knew how, when, and where to apply specific skills that gave them complete mastery of their machines.

What's singularly impressive here is that in nearly all instances, these skills were not complex. multi-tiered behaviors requiring years of practice to master. Instead. they were often single-step movements whose mechanical simplicity belies their ultimate importance. This may be one reason why some pilots fail to notice, much less acquire, these useful behaviors.

I recently conducted a flight review with a friend who has considerable flying experience. He's a real pro with the yoke and pedal, and the traffic pattern is one of the many places that showcased his performance. With every power or pitch change, he did something that I don't see many pilots do. He re-trimmed the airplane long before it had accelerated or de-celerated to the new flight condition. He wasn't using trim strictly as a reactionary tool to compensate for heavy control loads. Instead, he used it as a proactive tool by estimating - from experience - the expected control loads, then applying an initial gross application of trim, followed by a micro adjustment once the airplane's horizontal and vertical speed stabilized. He gave the appearance of effortless flying because his flying was, essentially, effortless.

On the other hand, I've noticed more than a few pilots over the years that struggle to keep control of their airplane in the traffic pattern. Another fellow I recently flew with reduced power on the downwind leg, lowered the nose, then began a left turn to base leg. During the turn, the airplane pitched further downward and his airspeed increased. Now, it's not uncommon for some left seated pilots to lower the nose in a left turn and raise it in a right one. This is mainly because of the perceptual difference that arises from having the right side of the cowling raise or lower with respect to the left side. which is directly in line with the pilot's seated position.

Had an approximate application of nose-up trim followed the power and pitch reduction. the airplane would have been less likely to pitch downward, despite the left-right perceptual differences. The way this fellow flew wasn't at all unsafe, just a little less elegant and easy than it could have been. He simply wasn't tapping in the right place.

Getting back to my flight review friend. (He's too modest to let me use his name. I know, a modest pilot. Who says miracles don't happen?) He had another trim strategy that I've always admired. in the pattern, he never used the electric trim. Instead, he applied trim by manually adjusting the trim wheel. When I asked him why he didn't use the electric trim he replied, "It's too slow and I can't feel it working."

Now, don't get me wrong; I love the electric trim. It's extremely useful in cruise flight where small, slow trim adjustments are needed, and I make good use of it in that situation. On occasion, the electric trim is also entertaining, especially when a primary student mistakes its switch for the control wheel's push-to-talk switch. On a few occasions, I've had students call the tower on the downwind leg while repeatedly "keying" the trim. I'm sure that at least one has wondered whether the tower had actually captured him with a Star Trek tractor beam. Never let it be said that being a flight instructor is not exciting.

Using the electric trim in the pattern obviously works (for trimming, not talking). However, it's often just a bit too slow because it uses a small lever (a button] to control a larger lever (the trim tab) to control the airplane, all of which involves a combined gear ratio of approximately a billion to one. So why not cutout the third party and just twist the wheel by hand?

I've recommended this technique in the pattern for years and not just because it provides a faster response. Moving the trim wheel by hand in a small airplane means you know what response to expect from the airplane, primarily because your hand is connected to your brain. This means you can apply sufficient quantities of trim in sufficient time to stabilize the airplane during pitch and power transition.

So that's my two cents worth regarding use of trim in the pattern. And that's because using trim is only worth two cents. Knowing where to use it, when to use it, and how to use it is worth a lot more to any pilot who knows where to tap.

Visit the author's Web site (www.Rodmachado.com).

—HANDS-OFF FLIGHT CONTROL—

A major purpose of initially learning hands-off flight control is to enable pilots to understand the techniques of fingertip control input. They will find properly trimmed flight allows satisfactory performance within the aircraft's design limits and is much easier and safer.

To enable understanding how an aircraft is controlled consider that the aircraft was designed and built to fly. The pilot only inputs control, steering to specific headings and altitudes to accomplish a particular flight.

During ground operation, initial precise control input to the rudder can be done by wiggling the pedals back and forth as deliberate over control while learning the input feel for maintaining the taxi lines. Wiggling controls for precision is actually inputting too much control and immediately removing it by the reversing.

A sample initial flight will be to begin flight from start of taxi to landing roundout only touching the control wheel when changing elevator trim. This is accomplished by using normal flight procedures of pre-flight, engine start, taxi, and engine run-up.

Prior to takeoff, the elevator will be set at an expected Vx indicated-airspeed or other required lift-off indicated-airspeed. With clearance to takeoff, the throttle and mixture are set to maximum thrust and brakes released. Steering is done normally with rudder input.

The aircraft will accelerate and upon reaching the indicated-airspeed as set with the trim, it lifts off, acceleration ceases, and climb begins at the trim-set indicated-airspeed.

Rudder input is continued for directional control toward a distant visually acquired target. Aileron input will not be used unless unusual conditions require more control than available with yawing by rudder. This yawing procedure also allows a new student to quickly become aware of kinesthetic sensing through the seat.

When established in climb and clear of any obstacles, a slight push on the elevator control will allow acceleration and re-trim to Vy as a climb indicated-airspeed for this flight.

The flight will continue climbing until approaching a desired altitude at which the elevator is again gradually pushed to coordinate leveling at that altitude. The aircraft will now be accelerating to the desired cruise indicated-airspeed. Gradual power reduction will coordinate the thrust to this cruise indicated-airspeed. You are now cruising in level constant indicated-airspeed flight…still not touching the control wheel. Probable minor adjustments as necessary to attain the specific cruise criteria.

Additional understanding of flight control requires being aware that the aircraft flies at an angle-of-attack which means the direction of thrust is slightly above the direction motion. This results in a small thrust component-lift at the engine attachment…essentially, a fifth control which causes pitch change with thrust change.

Throughout this flight, the elevator control is touched only to coordinate with thrust for changing indicated-airspeed. All level turn and climb maneuvering in this condition is by rudder yaw and coordinated thrust.

Descent is different. When reducing thrust from level flight, there is reduced thrust component-lift which is part of the elevator trimmed condition so allows some acceleration. Now throughout all descent for constant indicated-airspeed flight, it requires coordinating the elevator trim with any thrust change.

Visual sighting of the runway end as relative to a spot on the windshield (like sighting a gun at a target) and maneuvered to be kept unmoving is a collision course to the landing area.

If using the control wheel for maintaining a precise approach course, again the technique of wiggling the control wheel with fingertips allows learning the feel for that precise control.

It should be noted when maneuvering with minimum or no manual control-wheel input, it is virtually impossible to stall the aircraft.

In the event of inadvertent IMC or any condition losing visual flight reference, turning loose the control wheel and with reference to a turn instrument, it is possible with rudder-only control to make a safe one-eighty turn and fly out of the conditions or with

added thrust to climb to regain visual reference.

For precise idle-thrust and engine-out approaches use visual reference by sighting through a spot on the windshield aimed at the landing spot and keeping it unmoving. Descent rate control is with forward slipping and configuration change.

In high altitude flight conditions, avoiding control wheel input limits in-flight maneuvering to the existing conditions thereby avoiding stall but requires understanding of the prevailing much reduced thrust performance available from the machine.

A local Instructor using these techniques has found Students can be proficient for safe flight control to solo within five hours and completion of PPL requirements within thirty hours.

—PHYSIOLOGY OF MANUAL CONTROL—

From Page 13 of the 2014 March/April FAA Flight Safety-Brief

http://www.faa.gov/news/safety_briefing/2014/media/marapr2014.pdf
By, CFI Gene Hudson, a flight instructor since 1987

Central to the problem of the prevention of unintentional stalls is a general misunderstanding of how and why an aircraft will stall. Too often, we hear discussed the aircraft's stall speed; in fact, the aircraft stalls if, and only if, the wing exceeds the critical angle of attack. That this will occur at a particular speed is only true given a closely defined set of conditions. Any stall speed is only valid at a particular combination of weight and load factor; the critical angle of attack does not change as long as the flap configuration is constant.

A second poorly understood concept is the issue of trim and stability. Pilots tend to think that the aircraft trims to an airspeed; this, also, is only true under particular circumstances. The static stability of an airplane tends to drive it back to a trimmed angle of attack. This will correspond to a particular airspeed only under steady-state conditions.

The stability of the aircraft can be used to the pilot's advantage with regard to stall prevention. In a nutshell, let go of the controls. Once releasing the controls, the aircraft will return to the trimmed angle of attack (regardless of the airspeed) within a little more than a second. Most aircraft will not trim to an angle of attack that exceeds the critical angle of attack; thus, with very rare exception, an aircraft loaded forward of the aft center of gravity limit cannot be stalled in hands-off flight.

Unintentional stalls, then, occur when the pilot applies enough backpressure on the yoke to overcome the natural stability of the aircraft, leave the trimmed angle of attack, and exceed the critical angle of attack. It would seem, then, that we could eliminate unintentional stalls by warning pilots to avoid applying excessive backpressure.

Scientists developed the theory of perception, defining the "just noticeable difference (JND)," or, in other words, the minimum change in a stimulus required to *trigger perception.*

<u>First, any stimulus (yoke pressure) which is constant will fade from perception over a short time</u>. A pilot who is flying in an out-of-trim condition will soon lose the ability to perceive applying any elevator pressure at all. The out-of-trim condition becomes the new zero; <u>the pilot cannot trim it off, because they do not perceive that it is there</u>.

Second, a constant stimulus (i.e., steady backpressure to compensate for being out-of-trim) will elevate the just-noticeable-difference. If the pilot is holding a constant 20 lbs. backpressure, the minimum pressure that can be felt on the yoke is now 2.8 lbs., in any direction.

<u>Every attempt to make a "small" input will become a "small" input plus 2.8 lbs. of additional pressure that the pilot has no way to know is being applied. The result is over-controlling; small, precise inputs are impossible</u>.

<u>Also, the pilot will tend to make unintended inputs, in pitch and roll, across a 5.6 lb. "dead spot" in perception</u>. This can be especially vexing when attempting to accomplish non-flying tasks, such as reading a chart, or dialing a radio frequency; unknown and unintended input up to the limits of the JND may occur.

To avoid the unintentional stall, we need to develop the habit of flying the aircraft in trim and hands off. An airplane which is in trim and flown hands off is (with rare exception) impossible to stall. The natural (static) stability will drive it to and hold it at the trimmed (not stalling) angle of attack; flying hands-off ensures the pilot will not force the aircraft away from the trimmed (not stalling) condition.

If you develop the uneasy feeling that this methodology involves a radical change in the way we fly, you would be correct. It requires discipline, thought, and practice to achieve truly in-trim and hands-off flying skills, but the rewards are worth it: better stall resistance, smoother ride for the passengers, more precise control of the aircraft, and lower pilot workload.

This is what all pilots are striving for…less workload. It is well known pilots are lazy, otherwise they would go out and get a real job!!

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<u>Base to Final Turning Stall</u>

In a low indicated-airspeed, high drag configured turn, if the aircraft is overshooting the final approach, it seems to be human nature to want to continue into a steep bank and pull the control wheel in an attempt to correct back to the runway extended centerline.

A steep banked attitude while inputting aft elevator control results in increasing the “g” loading with associated increase of the stalling indicated-airspeed. Added aft elevator control also increases angle-of-attack allowing additional slowing.

The slow indicated-airspeed steep turning stall often is considered the result of restricting increased bank angle with aileron control while using rudder to attempt “steering” the turn. When beyond 45-degree bank, rudder input with the turn primarily causes nose-up/down steering pitch, but the control combination results in a cross-controlled condition. Pulling the elevator causes increased aerodynamic loading with increased stalling indicated-airspeed and slowing by increased angle-of-attack that is always the cause of any stall. Cross-controlling rudder input does contribute to a stall.

The high angle-of-attack required to stall is always relative the direction of motion. The nose up attitude normally learned to be associated with approaching a stall will now be in a very different direction. The steep banked descending attitude has the direction of motion turning and descending. There is no visual reference to indicate being pitched very high nose up. In the turn, this hides the real attitude from the pilot, especially the descending turn.

There must be a practiced and drilled discipline for pilots to always be aware, and know how to make this turn safely. If you have to pull the elevator control in a slow indicated-airspeed steep turn, it may be time to abort the approach.

What is really happening?

We know stall occurs when exceeding the wing critical angle-of-attack. The FAA handbook and tests say exceeding the wing critical angle-of-attack CAUSES the aircraft to stall. I have quizzed many professional Flight Instructors and Airline Pilots and all gave the FAA test answer; exceeding the critical angle-of-attack as the CAUSE of stall.

I have adapted a series of questions for these people.

Exceeding the wing critical angle-of-attack is not the CAUSE, but is WHEN stall occurs.

What then ALLOWS the aircraft to attain this extreme angle?

Everyone agrees, pitching the aircraft up.

What ALLOWS the aircraft to pitch up? Pulling the control wheel.

What pulls the control wheel? The pilot!

Is there any other way to stall an aircraft? No!

The pilot must input aft elevator control to ALLOW stall. In any maneuver, reducing aft elevator input is required for stall recovery.

Upset from wake turbulence or extreme autopilot input to the elevator is all maneuvering the pilot has done or allowed, but only with aft control input during recovery will there be actual stall.

En-route complacency allowing the autopilot to do something dangerous is not an excuse. The pilot is responsible at all times for the conduct of the flight.

Pilot input controls pitch, but not just with elevator input. The engine power setting contributes also.

I have found no text that describes the part engine thrust plays in aircraft pitch control, but aircraft in slower flight have considerable nose-up pitched attitude above the direction of motion. Vy flight will have at least six to ten degrees wing angle-of-attack and any slower flight begins approaching the wing critical angle-of-attack, which for most wings will be 16-20 degrees pitch above the direction of motion.

These pitched up attitudes direct the engine thrust at some angle above that direction of motion and result in an added thrust-component vector of lift acting at the engine attachment along with the large thrust-component sustaining the direction of motion.

Sine of six-degrees is one-tenth (.1). At Vy, one-tenth or more of the level flight sustaining thrust for constant indicated-airspeed is lifting at the engine attachment and acting over the fuselage as the moment arm to the center of pressure.

The sustained level flight engine lifting also contributes to the longitudinal balancing along with the elevator aerodynamic loading or lifting at the tail. The engine lifting allows less nose-up elevator trim for setting angle-of-attack when coordinating at a desired indicated-airspeed.

Adding excess thrust, from a trimmed indicated-airspeed, increases the engine lifting causing climb angle with increasing altitude at that same indicated-airspeed. There is merely more lift at the engine attachment and the added excess thrust component in direction of motion sustains the climb.

Descent with its reduction of power reduces the extent of the engine lifting contributing to the current angle-of-attack. This reduction of angle-of-attack allows some initial acceleration when beginning descent.

Now throughout all descent, being below the level flight sustaining thrust setting, to maintain a constant indicated-airspeed, it requires continuous coordination of elevator trim to compensate for the related thrust-component lifting caused by power changes.

So, you are in a landing configured descending turn trimmed for the slowed approach indicated-airspeed. If over-shooting the turn occurs, aft elevator input and increased bank considered necessary to cause turn, results in additional slowing toward stall. There is no visual reference of extreme nose-up attitude in this turn.

The stall warning horn sounds and you add lots of power, you instantaneously add those few degrees of nose up trim effect from engine thrust-component lifting related to the newly trimmed slower indicated-airspeed from manual elevator aft input with its increased “g” loading.

You were already at a slowed indicated-airspeed set with elevator trim and with the additional angle-of-attack from the increased aft elevator input, the power input instantaneously caused exceeding the wing critical angle-of-attack with immediate low altitude approach stall, and you will never know why.

The same old way. We have a training industry considered poor by the system yet no definition of a solution for the condition. Many decades of accident statistics have resulted in similar results time after time. Added programs to make pilots aware of these studies are everywhere, but still little changes.

Highly experienced Flight Instructors typically feel they are doing things correctly. In fact, they often are hesitant to admit there could be changes. It is true, many of these people have developed techniques through experiences of trial and error that go beyond the textbooks and result in satisfactory training. The problem being, they may not know why their developed techniques work and only they know them.

Throughout all the history of flight training, the textbooks have and continue to have mistaken and missing information about basic aircraft control. The past few years of my suggesting change, the responses are often "I know how it’s done, so don't tell me differently".

To date, the logical solutions when encountering adverse conditions, if the risk seems to be too much, don’t fly. If encountering risk, reverse course or land.

Statistical analysis has listed different causes leading to accidents, but no definition of these problems for solution…let's figure out what and how we should control flight when encountering a problem.

If something totally unexpected happens when airborne, there needs to be a solution. What is the solution for engine failure off-field landing, inadvertent IMC encounter and flying a safe instrument 180 turn, stall on final approach, or lack of available thrust at high-density altitudes?

We must first define how to handle these problems. Before understanding emergency control, every pilot needs to understand how basic aircraft control works.

The Mar./Apr. FAA Flight Safety Brief, page 13, is an excellent explanation of the physiology of manual control input. This message attempts to explain a solution to some of the problems identified from the decades of accident statistics.

A Student’s first flight should be demonstrating how control works. Make this initial flight without the Student touching the control wheel from start of taxi until roundout for landing, thereby allowing fixing the use of rudder as a primary control while observing how thrust component-lift affects control for maneuvering.

—FORCES—

Motion for flight is reaction to applied forces. The direction of applied forces will often have reactive forces in different directions than the applied force. The forces acting on the machine then have the effect of component-force reactions acting 90-degrees from each other.

The aerodynamic lift in level or climb flight attitudes is often slightly aft from vertical so has a large vertical component-lift and a small aft component-drag and in descent will have the large vertical component-lift with a sustaining thrust component-forward from gravity acting at the center of mass.

The aircraft travels with an angle-of-attack directing the engine thrust slightly above the direction of motion so acting at the engine has a large thrust component-forward and small thrust component-lift. In descent, with reduced or loss of engine thrust, gravity component-thrust maintains the sustaining thrust with loss of altitude.

The gravity force acts from the center-of-mass directly toward the earth so in level or climb flight attitudes has a constant large gravity component-load and small gravity component-drag that in descent becomes sustaining gravity component-thrust.

The different frictional forces from displacement and flow of the airmass by the aircraft motion cause a reactive drag force in the opposite direction of motion.

—BALANCE—

All forces have moments acting through their moment arms to an effective center-of-load point of rotation. Flight control is adjusting these forces for the balance to cause desired motion.

Our example 2,000-pound aircraft at its optimum Vy indicated-airspeed and 200 pounds of thrust will be in motion at an air-encountering angle of at least 6-degrees angle-of-attack so will have a continuous 20 or more pounds of thrust component-lift (sine 6°= .1) acting at the engine contributing to the total lifting forces.

This engine-lift acts along the fuselage as its moment arm to a center of pressure. Coordinated with the elevator-pitched aerodynamic loading, this total lifting maintains the balance at an angle-of-attack for a specific indicated-airspeed.

The difference with ground and inflight balance in an aircraft is that all current forces act at fixed positions. On the ground, the lifting forces are the landing gear and the only loading is gravity at the center of mass.

When airborne, engine lifting at the attachment of the engine, and the elevator and horizontal stabilizer aerodynamic loading are acting at their structural placement on the empennage. The center of mass (gravity) acts at its current location.

Change of any one balance-control force in these locations causes a change of the fulcrum position near the aerodynamic center of lift, moving slightly forward or aft and becoming a new center-of-pressure or effective center of gravity. Acting at their attachments, elevator aerodynamic lift/load forces combined and with engine thrust component-lift set the balance for a specific indicated-airspeed angle-of-attack.

The basis of static loading is the designed aerodynamic load/lift limits of the stabilizer and elevator controls ability to maintain required balance. Loading is critical and not maintaining the loading limits could lead to loss of aircraft control. Manufacturer published tables and charts enable loading an aircraft within its design balance limits.

—LIFT—

There are two sources of lift in an aircraft, large aerodynamic lifting acting outward from the top of the wings and fuselage, and thrust component-lift acting outward at the engine attachment.

Aerodynamic lift is reaction to displacement of mass-of-the-air by an airfoil. It requires an equivalent mass-of-the-air displacement away to cause the opposite reactive force away lifting the aircraft load.

An aircraft **load** is the sum of all forces acting away from the bottom of the aircraft. This includes the mass weight of the aircraft always directed toward the surface from the center-of-mass plus any negative aerodynamic lift from the stabilizer/elevator acting away from the bottom at their attachment, and centrifugal maneuvering **"g"** loading acting opposite the current effective center of pressure.

An aircraft engine turning a propeller accelerates by blasting airmass rearward, to which the reaction force called **thrust**, propels the aircraft forward in a direction of motion. Accelerating to a velocity at which the aircraft fuselage and airfoils displace sufficient mass-of-the-air away, there becomes a reactive force outward as **aerodynamic lift**, equal to the mass of the aircraft plus any aerodynamic load.

At the instant lift becomes equal to the aircraft mass plus any aerodynamic load, acceleration ceases. There now becomes a **sustaining** thrust maintaining the aircraft lift and any **excess** thrust at that moment becomes **climb,** motion angled away, with increasing altitude and/or if leveling, acceleration.

Thrust component-lift occurs when elevator pitching moves the direction of engine thrust above the direction of motion. Thrust component-lift is equal to the current total engine thrust multiplied by the Sine of the angle of pitch so changes with thrust change. We call this pitched angle of the longitudinal axis above the direction of aircraft motion the **Angle-of-Attack.** It is causing the size of the frontal area of the machine that is encountering the airmass so determines the volume of deflected mass.

With use of the mass-of-the-air, aircraft **sustain** the lift for flight with as little as one-pound of thrust for 10-12 pounds of aircraft mass. Any potential thrust greater than current sustaining thrust is available as **excess** thrust for maneuvering. From level constant indicated-airspeed cruise, adding excess thrust will increase the thrust component-lift causing the nose to increase pitch while the added forward component of that excess thrust sustains the new direction of motion with increasing altitude, **climb**.

An aircraft with addition of sufficient excess thrust could continue pitching to an attitude that the nose would be as much as 90-degrees climb angle, climbing straight upward. At that time, the thrust would be equal or greater than the total aircraft load. This is an extreme example as few aircraft have sufficient thrust to fly in this manner. In this extreme situation, forward thrust would be zero and motion would be vertically away. The power available in most aircraft will allow no more than 10 to 12 degrees climb angle at lower altitudes.

The pressure caused by impacting and displacing the airmass determines the reactive **lift forces**. Mathematically deducing the displacement pressures involves the load of the aircraft, the area of wing and fuselage bottom surfaces, and the frontal area displacing the air. A small aircraft at its Vy indicated-airspeed will have approximately one-pound per square inch encountering pressure and a resulting reactive lift pressure of approximately one-tenth pound per square inch. The wings have lots of square inches. (2 wings @ 14 ft. x 5 ft. ea. x 144 = 20,160 sq. in. x .1 lbs./sq.in. = 2,016 lbs., the aircraft weight)

—ENGINE THRUST—

A method to determine approximate engine thrust output can be by use of the sine of a six-degree angle (sine = .1). If in hands-off trimmed level flight at a 6-degree pitched longitudinal angle as the aircraft angle-of-attack, the sustaining thrust will be approximately 10 to 12 percent of the gross weight. The potential vertical thrust of gravity is the mass of the aircraft. The 2,000 lb. aircraft requires the same amount of vertical lift plus any aerodynamic loading.

Similarly, an engine out 6-degree descent will be using sustaining gravity component-thrust of one-tenth the gross weight. A 2,000-pound aircraft will require 200 pounds sustaining thrust. The 6-degree angle-of-attack level flight is close to Vx or Vy in smaller aircraft.

At a 12-degree (sine = .2) longitudinal pitched-up aircraft angle-of-attack, sustained level flight will require thrust equal to two-tenth of the gross weight. The 2,000 lb. aircraft now requires an additional 200 pounds of sustaining thrust.

A six-degree aircraft angle-of-attack in a six-degree pitched climb will require 200-pounds sustaining thrust for indicated-airspeed, plus 200-pounds excess thrust to sustain the six-degree climb angle.

Thrust available from an engine is dependent on the current density altitude. The power rating of a typical small aircraft engine/propeller combination may be 600-pounds thrust at sea level on a standard day. If it takes 200-pounds for sustaining Vy, then there will be 400-pounds excess thrust available for climb and maneuvering.

If this aircraft can fly only to 15,000 feet altitude, it will then be producing only 200-pounds thrust. This is a loss of 400-pounds thrust, 25-pounds per thousand feet altitude. This means at 5,000 feet there is 275-pounds excess thrust available and at 10,000 feet only 150 pounds of excess thrust.

How this affects normal flight operations is that you don’t have very much excess thrust for maneuvering at high density altitudes. On a 5,000-foot elevation hot day, the density altitude can easily be 8-9,000 feet.

A landing in high density-altitude conditions will be normal but true airspeed and groundspeed will be significantly higher so requires longer landing rollout. The visual perspective of the ground when maneuvering low will show you are moving much faster. This is similar to the visual if landing with a tailwind.

How does this affect a takeoff and maneuvering? You won't have 400 pounds thrust for takeoff with engine rpm limitations and reduced propeller efficiency; the acceleration will be slower requiring significantly more runway. Even with a long runway, it will be prudent to use short-field takeoff procedures. This means at liftoff, remain in ground-effect for acceleration, at least to Vx or greater. Obstacles that might exist require much consideration. Planning this low powered takeoff should include consideration of takeoff roll plus stopping distance for abort.

Reduced thrust in this example means there will be limitation to maneuvering. At lift-off, the potential 400 pounds of thrust immediately changes to 200 pounds sustaining thrust and only 200 pounds for maneuvering. At this time, climb rate will be much less and level turn bank angle greatly reduced.

From this, you can easily see that high-altitude maneuvering, often called mountain flying, requires consideration of the much reduced excess thrust available. At 10,000 feet, maximum level-turn bank angle is approximately 20-degrees with the 150-pounds excess permits climb at less than 4-degrees climb pitch…not both at the same time. Operation at higher density altitudes quickly reduces the excess thrust and may require descent for maneuvering.

Remember, on a hot day, a 12,000-foot density altitude may occur at 9-10,000 feet and you will have only 75-pounds excess thrust. That means the maximum bank angle for a level turn is less than 15-degrees bank. Climb pitch will be less than 2-degrees, again, not both at the same time.

--Thrust Component-Lift--

In level flight, the small angle of aircraft attitude above the direction of motion is the angle-of-attack that determines the indicated-airspeed (pressure-speed). Most small aircraft, traveling at Vy indicated-airspeed, require 10% -12% of the gross weight as thrust at an angle-of-attack of 6 to 8 degrees. The sine of 6-degrees is .1 so in level flight, a 2,000 lb. aircraft requires 200 lbs. thrust, and there is an associated thrust component-lift force at the engine attachment of at least 20 lbs.

Depending on the placement of the horizontal stabilizer, there may be a certain amount of aerodynamic loading created on the stabilizer from propeller blast. Elevator trimmed hands-off level flight will have loading on the elevator to balance the aircraft at a particular angle-of-attack for the desired indicated-airspeed.

The elevator-balancing load for the angle-of-attack of a given indicated-airspeed incorporates the level flight sustaining thrust component-lift. With tractor powered aircraft, adding thrust will add lift at the engine attachment so without changed elevator, causes a climb angle and directs the motion upward sustained by the added excess thrust component-forward. There is no change to angle-of-attack other than a possible small elevator loading from propeller-blast. Any deceleration noted will show the effect of prop-blast.

To level at the higher altitude, reduce the thrust to the previous sustaining thrust as used at the lower altitude. Though velocity (true airspeed) within the airmass increases, the angle-of-attack will remain constant for the elevator-trimmed indicated-airspeed.

Descent is different! Any reduction of sustaining thrust reduces both a portion of the thrust component-lift and any prop-blast incorporated into the current angle-of-attack with the elevator trim. This will allow some acceleration by gravity component-thrust forward.

Now in all descent, any change of thrust will change the thrust component-lift affecting the angle-of-attack. All constant indicated-airspeed descent maneuvering will require re-trimming elevator with any thrust change.

—ANGLE-OF-ATTACK—

To maintain constant lift from the airfoils at different velocities, it requires coordination of the aircraft longitudinal angle above the direction of motion. This angle is the angle-of-attack and can refer to the angle of wings encounter to the airmass or to the angle of the longitudinal axis meets the airmass. This attitude of the aircraft directs the engine thrust slightly upward from the direction of motion so there becomes a large thrust component-forward and small thrust component-lift occurring at the engine attachment.

No matter the reference, a smaller angle of encounter requires higher velocity of encounter (high indicated-airspeed) and larger angles of encounter at slower velocities generate the same constant lift of the aircraft load.

For this reason, for acceleration, reduced angle-of-attack allows acceleration and either added engine thrust or gravity component-thrust of descent causes acceleration. Alternately, increased angle-of-attack allows deceleration and reduced engine thrust or gravity component drag of climb causes deceleration.

Change of thrust component-lift affects aircraft balance. You may even consider engine thrust component-lift a fifth control as thrust change causes a pitch change and can significantly affect the aircraft balance.

Longitudinal balance of the aircraft is by coordination of stabilizer/elevator position and thrust component-lift. Normal loading of an aircraft places the static center of gravity forward of the center of aerodynamic lift. This allows dynamic stability of the aircraft but requires the stabilizer and elevator to cause negative aerodynamic lifting (loading) to maintain that balance for flight.

When properly coordinated with the thrust component-lift, the aircraft will attain a specific angle-of-attack attitude at which it encounters the mass-of-the-air. This angle of encounter results in a frontal area of the fuselage and wings thereby determining the volume of airmass displacement. A larger frontal area caused by a larger angle-of-attack displaces a greater volume of mass in a given time so requires less encountering pressure. This means at higher angles-of-attack, the aircraft can sustain its lift while traveling at a slower velocity. The opposite is also true, reduced angle-of-attack requires greater velocities to displace the required mass-of-the-air in a given time.

The elevator establishes angle-of-attack by coordination with a current thrust setting. The angle-of-attack determines the indicated-airspeed the aircraft is flying. Reducing the angle-of-attack **allows** acceleration and coordinated thrust increase and/or gravity component-thrust of descent **causes** acceleration. Increasing angle-of-attack **allows** deceleration and upward zoom against gravity or coordinated decreased thrust **causes** deceleration. Operation below Vme with its increased induced drag will require coordinated increase of thrust after slowing.

The coordination of stabilizer and elevator position with the sustaining thrust component-lift determines angle-of-attack. Elevator trim setting can fix the angle-of-attack to a neutral position of the elevator control and acts similar to a cruise control. Any time releasing manual elevator input, the aircraft will resume that angle-of-attack originally set with elevator trim. Thrust increase causes added component-lift to cause climb angle and if reduced, its component-lift reduces the angle-of-attack.

Indicated-Airspeed is the reading from the aircraft speed indicator. The indicated-airspeed indicator sensing comes from an open-ended tube (pitot tube) mounted facing forward into the oncoming airmass. The small pressure of this encountering mass moves the indicator needle. The instrument is calibrated in miles-per-hour and/or nautical miles-per-hour.

Indicated-airspeed then is a pressure reading and does not indicate a velocity across the ground or velocity within the airmass. It is only indicating the frontal pressures affecting the aircraft. Calibration normally has areas delineated to show maximum, minimum, and different structural and operational indicated-airspeeds as pressure force limits.

Engine placement determines the effect of thrust component-lift. Engines placed aft of the center of lift push the aircraft while engines placed forward pull the aircraft. Thrust increase with aft engine attachment results in the nose pitching down while the tractor-engine pitches the nose upward.

Aft attached, **pusher-engines** have the elevator and thrust component-lift aft of the center of pressure so for constant angle-of-attack (indicated-airspeed) flight, if one changes the other must change in the opposite direction so requires continuous coordination of both controls.

Forward attached, **tractor-engine** aircraft, have thrust component-lift acting forward of the center of pressure and stabilizer/elevator load is aft of the center of pressure. In this case, if in level constant indicated-airspeed flight, there will be a small thrust component-lift coordinated with an elevator load/lift causing the angle-of-attack balance.

An increase of tractor-engine thrust will add some thrust component-lift, which will cause the nose to lift changing the direction of thrust into a climb angle and sustains the climb in a new direction of motion. The elevator position has not changed so the original coordination of the thrust component-lift and elevator load remains the same. The aircraft climbs at the original indicated-airspeed.

A decrease of tractor-engine thrust from level flight is different. When reducing thrust from coordinated level flight, the thrust component-lift incorporated into the angle-of-attack balance reduces. This is a small reduction of both angle-of-attack and reduced sustaining engine thrust resulting in descent with an associated increase of indicated-airspeed as gravity component-thrust adds to maintain the required sustaining thrust.

Now throughout all descent, just as with the pusher-engines, to maintain constant indicated-airspeed, the elevator must be coordinated with any thrust change until again maintaining level flight.

Vy is the most efficient indicated-airspeed for distance over time and **Vme** (loiter = .75 Vy) is the most efficient for time airborne. This means it requires additional thrust to sustain a greater or lower Vme indicated-airspeed. Slow indicated-airspeed flight is often difficult for pilots. It takes very little increased angle-of-attack to require a large thrust increase.

Aircraft design usually allows hands-off, full power, maximum nose-up elevator trim, flight without stall. Manually adding aft elevator in this slowed condition can attain the wing critical angle-of-attack…stall.

Vx is the indicated-airspeed that causes the greatest gain of altitude versus distance traveled and normally used for attaining obstacle clearance. Vx is slightly slower than Vy during lower altitude operations.

— VISUAL FLIGHT —

Visual flight is controlling the attitude of the aircraft toward sighted targets to make them unmoving relative a point on the windshield. This is flight by collision course. By maneuvering to cause a sighted object to be unmoving relative a point on the window the aircraft will eventually reach that object. I call this **directed-course** flight.

A point in the distance ahead or on the horizon held unmoving becomes a constant heading. The horizon held in a constant position across the windshield maintains a constant pitch attitude. The wingtips held equal distance above the horizon is a wings level attitude.

When approaching a destination area, as that sighted area moves down the windshield toward the lower center of the windshield, beginning descent and maintaining the area unmoving causes the aircraft to descend directly to that area. This procedure as a visual approach will have the aircraft at approximately 1,000 feet AGL when 1-2 miles away from a destination.

When flying an approach to landing, maneuvering to sight the approach end of the landing area as a targeted point, centered unmoving on the windscreen will cause the aircraft to fly directly to that point allowing a controlled spot landing.

This approach procedure if always maneuvered to be on a standard glide path results in every approach to landing being essentially the same.

— TURNING FLIGHT —

Flight maneuvering involves turning flight. A coordinated level, constant indicated-airspeed turn involves aileron attitude roll with coordinated rudder input to a desired bank angle. The instant leaving wings level flight, the aerodynamic lift becomes angled causing reduced vertical aerodynamic component-lift. All texts describing turns suggest pulling the control wheel to add vertical lift. The problem is, pulling the control wheel causes increased angle-of-attack and slowing.

We earlier learned we get added thrust component-lift with use of excess thrust. So now, in our turn, if we coordinate added thrust when rolling into the turn, we can cause the nose to track level along the horizon in the turn, without pulling the control wheel, a horizontal climb. We have a level, constant indicated-airspeed turn, without touching the elevator control.

This procedure works through all turns to a maximum bank angle at which the coordinated thrust has increased to maximum power. In most small aircraft, this is approximately a 30-35 degree bank angle.

A turn continued beyond that held level with maximum thrust will require descent or alternatively, coordinated aft elevator with acceptance of reducing indicated-airspeed to maintain level flight.

Usual flight is at indicated-airspeeds greater than Vy, which allows acceptable indicated-airspeed variations during maneuvering flight. However, landing approach maneuvering is typically at or slightly below Vy and requires consideration before inputting aft elevator and its slowing.

High angle-of-attack level flight requiring significant increased power can reach maximum thrust, and adding any manual aft elevator input, quickly approaches the wing critical angle-of-attack.

—INADVERTENT STALL—

It is not obvious that in minimum indicated-airspeed descending flight, adding power can cause stall.

The fact remains it can happen. In descent, there is a substantial reduction of the thrust component-lift normally contributing to angle-of-attack. For maintaining the constant indicated-airspeed, added aft-elevator control and/or nose-up elevator trim maintains the desired angle-of-attack for slowed flight.

If a slowed, hands-off level flight is operating at 12-degrees angle-of-attack, the corresponding thrust component-lift is contributing as much as 6-degrees to that angle.

Reducing to idle thrust removes 4-5 degrees of the angle-of-attack, so allows acceleration. It requires adding aft-elevator or nose-up elevator trim to maintain the original constant indicated-airspeed. Now in a descent, the stabilizer is contributing 10-11 degrees of the angle-of-attack.

Low Indicated-Airspeed and Approach Stall

All low indicated-airspeed maneuvering flight is subject to inadvertent stall. A turn when in a slow indicated-airspeed situation requiring added power, while already holding the control wheel aft for altitude control, can potentially cause immediate stall from the added thrust component-lift increasing the angle-of-attack.

When in a descending steep turn at reduced thrust with the elevator trimmed for very slow indicated-airspeed flight, the aircraft can be at a 12-14 degree angle-of-attack. Added thrust for reducing descent rate or leveling will cause considerable thrust component-lift, adding as much as 3 to 5 degrees to the angle-of-attack…immediate stall. It requires coordinated release of aft elevator control to avoid attaining critical angle-of-attack.

—INADVERTENT IMC—

An encounter of weather and/or losing visual reference at night requiring instrument flight control requires knowing how to maintain control to avoid becoming disorientated. A Pilot that has been trained to fly aircraft by continuous trimming to hands-off will be able to release the control wheel and by sighting the turn and bank or attitude instruments, using rudder steering only, establish a standard rate turn (20-25 degrees of bank) for one minute then reverse rudder to zero turn and fly out of the conditions.

Additionally, if trained in use of thrust component-lift, by adjusting power as needed to climb or descend, it is possible to fly safely any time visual reference is lost with reference to a bank indicator…just don't touch the control wheel!

This procedure is in the emergency section of some older Cessna 150 and 172 POH's. I have questioned over 150 Flight Instructors and at least five Examiners who fly these aircraft and none had ever heard of this procedure! Who reads the POH of small aircraft?

With practice, a pilot will quickly learn satisfactory control to fly safely back to visual conditions.

When maneuvering in this manner, there will be some minimum descent while in the turn. If the encounter is weather related, a small descent often aids in exiting the conditions, however adding a small amount of power would maintain a level turn and if deemed necessary, even more power causing climb to assure terrain clearance.

If losing visual reference in night VFR, again by turning loose of the control wheel and maintain zero turn on the turn-and-bank instrument, it is probable, using excess thrust for climb, to again attain distant lights or references. At the same time, climbing increases terrain clearance. The flight continues with reference to the turn-and-bank or attitude indicator for maneuvering or turning back.

—CROSSWIND LANDING—

When encountering crosswinds for landing, we need to consider a few basic criteria. Determine the crosswind component. This is relatively easy. Any reported winds are subject to change so by the time you get to final approach, it may be different, and at touchdown again different. You will be flying visually with a heading correction for tracking the extended centerline and can sense how close the reported information may be. With all winds, close is good enough. You just have to fly the airplane visually.

If the wind direction is more than 50-60 degrees (sine 60 = .9) away from the runway heading, consider the total wind as crosswind. If the wind is 40-50 degrees (sine 45 =.7) away, three quarters of the reported wind is crosswind. A wind 20-40 degrees (sine 30 = .5) away, one-half of the reported wind is crosswind. Close is good enough.

Now maneuvering on final approach will require a heading correction turned into the wind. Your small aircraft approach speed minus any headwind component will have you in the vicinity of 60 knots…one mile per minute. Anticipate a heading correction of one degree for each knot of crosswind. Visually turn to stop any drift, whatever it takes.

Fly inbound and when on short final, you can begin rudder input for a sideslip maneuver to align the aircraft longitudinal axis parallel with the runway and simultaneously roll into a banked attitude toward the wind to cause the aircraft to track the runway extended centerline. This side slipping maneuver can be input according to pilot technique. Some start the slip on short final others input the slip during roundout or flare.

In any case, in this banked attitude the airplane will touchdown first with the upwind main gear. The momentum of the airplane is trying to continue down the runway as the other main gear and nose wheel complete the landing. Immediately turn the controls into the wind and maintain directional control with rudder and nose-wheel steering.

In unusually strong winds, rudder control may be minimal and will decrease with slowing. Anticipate adding power for propeller-blast to allow continued rudder control while at the same time reducing the impact of the crosswind weathervaning the tail.

Handling extreme winds with up to full power landing and braking could be possible. Anytime not maintaining positive control of the aircraft, consider immediate full power for directional control and possible rolling takeoff and go-around.

Extreme winds result in much reduced groundspeed so if it becomes an emergency, find a runway, taxiway, road, or field aligned into the wind. With a 40-60 knot headwind, the landing groundspeed can be close to zero.

—OFF-FIELD LANDINGS—

For whatever the cause, engine failures do occur. No amount of planning can prevent an eventual engine failure someday to someone.

There are standard procedures for initiating an emergency landing. The problem is that statistically, seventy-five percent of off-field emergency landings touchdown mid-field or beyond on the chosen landing site. One-half of the fatalities from these landings occur from overrunning the landing site.

The engine out landing approach requires maneuvering the approach end of the chosen site referenced unmoving on the windshield and keeping it there. This is early establishment of a collision course to touchdown and allows better control of the approach path and approach indicated-airspeed.

Mentally, it is difficult to convince oneself not to be a little high and a little fast. A way to handle that is lots of prior consideration and use of idle-power approach landing technique of normal training that all approaches having the landing spot unmoving.

The accident does not occur until at or after touchdown. Occupant survival is the primary consideration from touchdown to stop. At some point, control may be lost. From that moment, protect the head in any way possible. It is imperative to be conscious when stopped.

- **In-flight Engine Failure --**

An incident requiring immediate landing often requires touchdown into unprepared surfaces. Such an off-field landing can be into rocks, trees, gullies, and other kinds of obstacles. This may mean immediate dismantle of the aircraft at or shortly after touchdown and often the nose wheel will catch resulting in being upside down.

There is usually little time to make decisions about what to do so it is imperative to have previously made a plan. This includes previous consideration of what it may look like and how you may feel when seeing probable obstacle encounter.

Continued flight to a spot touchdown is paramount. Visually fix the approach end of the chosen site centered and unmoving on the windshield and keep it there.

Though you want to touchdown at a minimum velocity, do not let the aircraft stall. The aircraft is gliding sustained with gravity component-thrust and normal control at least until touchdown. At or shortly after touchdown you will recognize if you can no longer control the aircraft. At that time, you are likely experiencing rapid deceleration and possibly dismantle of the machine.

Upon recognizing loss of control, you will think, “I’m now a passenger, I have to be conscious when this thing stops!” At that time, you will be leaning forward against the shoulder harness and use whatever means possible to protect your head…you must be conscious when stopped, and when stopped, immediately leave the aircraft while helping any passengers.

Thinking of this basic procedure in advance allows you a plan. Innovation and invention during an incident is too late. Things will be happening very rapidly but if aware, you will think it is all in slow motion.

How much time does it take to touchdown and stop in rocks and trees? Maybe two, three…five seconds. How long is that? Count, one thousand, two thousand, three thousand, four thousand, five thousand…see, that can be a lot of time. You can likely do a lot of things during that time. Most importantly, you want to be protecting your head!

—AIR DENSITY AND YOUR AIRCRAFT—

Maintaining a constant indicated-airspeed pressure, when climbing to higher altitudes into the gradual thinning air (reduced mass per volume of the air), requires that the velocity (true airspeed) within the airmass must gradually increase to maintain the mass encounter required for constant indicated-airspeed pressure.

We call this velocity within an airmass “true airspeed”. The increased velocity maintains a constant mass encounter for a constant sustained lift. The airplane flies at an indicated-airspeed pressure. The temperature, wind, and density altitude affect the current conditions of the air, but only the encountering air displacement pressures and related reactive forces affect the aircraft lift.

As long as indicated-airspeed pressure is at or above the required minimum, it continues to fly in the direction controlled. If your aircraft does not have the engine power to maintain a minimum indicated-airspeed pressure, it will continue to fly, but will descend adding gravity component-thrust to sustain the set elevator pitched indicated-airspeed.

In descent, supplemental gravity component-thrust will always add to maintain the sustaining thrust, until the engine power available is again capable of level flight…or contact with the earth’s surface.

In higher altitude, temperature, or humidity low air-density conditions, the engine cannot intake a mass of oxygen for burning enough fuel to produce its maximum rated power.

Though increased velocity compensates the effect of reduced density on the indicated-airspeed pressure, the fixed-sized intake ducting causes reduced availability of oxygen dramatically affecting the engine power possible. Higher altitudes, temperatures, and levels of humidity all mean reduction of oxygen intake for burning in the engine. In these conditions, the reduced excess power available dramatically affects maneuvering capability and at times may not be sufficient for flight.

- **High Altitude Flight --**

The normal assumption as taught is that aircraft will not fly as well at high-density altitudes as at lower altitudes. This is a very broad generalization based on limited understanding of the physics involved. It is not just the air; it is engine power and propellers. The reduced availability of oxygen for burning affects all engines so in many situations there may not be sufficient excess thrust available for takeoff or safe maneuvering.

With low-density air, the engine cannot produce the maximum rated power and rpm limitation of the engine will not turn a fixed pitch propeller fast enough to cause the normally expected mass thrust. These are huge factors against attaining required acceleration for takeoff and performance when airborne.

With combinations of high elevation, high temperature and/or high humidity, and there being no visual reference of reduced thrust during ground operation and takeoff, it requires very careful planning and consideration of all factors related to the aircraft performance to assure any safe takeoff. An understanding of the atmospheric density and the factors related to engine power is essential.

—Air Density and the Pilot—

The regulations require beginning use of supplemental oxygen when above 12,500 feet. However, the need for oxygen relates to an individual’s actual physical condition.

Many pilots would be safer if they considered using some oxygen when operating at substantially lower altitudes. Though not showing or feeling symptoms of hypoxia, lowered physical response can still affect the operation.

Additionally, passengers on longer high altitude flights will find, using supplemental oxygen, they also will feel better at the end of the flight.

SUPER LEGEND REALITY CHECK

LIAISON BRIEF

Newsletter of American Legend Aircraft Company

LEGEND LIAISON BRIEF **ISSUE NO. 34, DATE: 20 JULY 2016**

NEWS Super Legend Reality Check

So many aircraft are available to choose from when looking for that next perfect flyer. However, in truth, the field narrows quickly when what you seek is simple flying coupled with the ability to go anywhere. That's the legacy of the famed Cub. It's proven its worth as both a pleasure plane and a workhorse.

For more than 85 years, the Cub's design has been modified and enhanced, with the occasional bungling. Its study is a lesson in purity, and for that reason alone many a pilot will attest to their fascination with the type. But today there's really only one true Cub. In keeping the Cub true to its roots, the Legend Cub excels in purity, pleasure and power.

The Super Legend from American Legend Aircraft Company is the perfect flyer.

The Legend Cub is available in the widest array of engine choices and each of them boasts, foremost, dependability and power. There, too, is an aspect of brand loyalty that rests deep in the hearts of pilots. With these in mind, what's not to love about choosing between Lycoming and Continental when selecting your new aircraft?

Following the choice of engine, the purist pilot wants to be sure that selecting an airframe, avionics, and all the amenities will serve his/her needs throughout their ownership of the aircraft.

In a Legend Cub one knows with certainty that the airframe is built to last. Chromoly steel tubing and aluminum structural members coupled with synthetic coverings have withstood the test of time. But durability is only part of it. Carbon fiber adds strength and assists the airframe in carrying its load. As an EAB, the Legend Cub is approved up to 1,750 lb GTOW, yet it's built lighter than ever before, maximizing payload.

Avionics are the configurable component most pilots enjoy installing and retrofitting in their aircraft today. A far cry from Cubs of the past, Legend Cubs are equipped with the latest in digital wizardry offering moving maps, situational awareness and a litany of other productivity resources at the press of a finger. Our intelligent Cub panel has been so successful that we've nicknamed it the SmartCub.

Feature for feature, the Legend Cub is known to have it all, from full dual controls to its combination door/window on both sides of the aircraft. If there's something missing, that's because it hasn't been invented yet or fails to fit the formula for simplicity, affordability, and the ability to go anywhere. Take a closer look at the Legend Cub before buying your next aircraft.

For more information on the Legend Cub, Super Legend and Legend AmphibCub, email us at info@legend.aero or call 903-885-7000.

NEWS Oshkosh Preview

Greg Koontz is scheduled to perform once again in the Super Legend HP, this time at the world's greatest aviation celebration in Oshkosh, Wisconsin. Attendees at AirVenture 2016 will be treated to a one-of-a-kind performance in the Titan powered Legend Cub.

See Greg Koontz perform in the Super Legend HP at AirVenture Oshkosh 2016.

Expect amazing things, not the least of which will be Greg deftly landing on the top of a moving pickup truck. For anyone interested in the Legend Cub, AirVenture Oshkosh will be a chance to see these beautifully manufactured aircraft up close and in action.

Stop by the American Legend Aircraft Company booth (#356 in the Main Aircraft Display area) to see the Titan powered Super Legend HP, the 115 horsepower Super Legend powered by Lycoming and standing on Carbon Fiber Amphibious Floats, and the classic Legend Cub with Continental O-200 engine.

To see the full Greg Koontz Airshows schedule, visit www.gkairshows.com. For advance information on the Legend Cub, the Super Legend, and the new Carbon Fiber Amphibious Floats, email us at info@legend.aero or call 903-885-7000.

LIFESTYLE This Lady Loves Her Taildraggers

Maureen Sherwood is an experienced taildragger pilot based in San Luis Obispo, California. She started taking flying lessons as the young wife of a Navy pilot back in the early 1970s. Today she's the proud owner of a new AL18 Super Legend.

This Lycoming powered Super Legend is one's modern day romance with a "first love."

"My husband really wanted me to learn to fly so I decided to take flying lessons while he was deployed. We bought our first airplane, a J-3 Cub, upon his return from his second tour to Vietnam. At first I was intimidated by having to hand prop to start and having no radios or navigation equipment. Once I gained confidence in reading charts and navigating by landmarks, I grew to love the J-3. We met another young Navy pilot and his wife who flew their own Aeronca L-3. It was so much fun as young couples to fly formation in and out of little dirt airstrips around our home base of Hanford, California.

"Unfortunately my marriage didn't last, but fortunately my love of flying provided many adventures to come. Even after I earned advanced pilot certificates and flew high performance airplanes, I never forgot my 'first love,' my J-3 Cub. By comparison to other advanced 'user friendly' airplanes, the J-3 provided a true feeling of flight that must be primordial. I have been lucky to have owned several other taildraggers during my flying career including a Taylorcraft BC-12D, Piper PA-18 Super Cub, Citabria 7KCAB, Decathlon, Pitts S-2B and Sukhoi Su-2.

"My present husband and I are fortunate to currently own a Cessna 180. We just acquired an American Legend Super Cub AL18 which we flew back to San Luis Obispo from Sulphur Springs, Texas this past February. I am grateful that my husband now shares the love of taildraggers that has been my passion for over 40 years."

The AL18 Super Legend is powered by a 115 horsepower Lycoming YO-233. It outperforms a 150 horsepower Piper Super Cub having superior power-to-weight ratio. Newly manufactured in the U.S.A., the Super Legend is the next generation of Cub.

For more information on the super performing Super Legend, visit www.legend.aero or call 903-885-7000.

TECHNOLOGY **Get Your ADS-B On, Plus $500 Back**

The days of the transponder-less Cub lie in the past. In the 1930s, minimalism was just fine. Today it makes good sense to fly with a basic avionics package and this includes at least an altitude reporting transponder. Far better is the NextGen technology referred to on the pilot's end as ADS-B.

While your modern instrument panel is certain to be equipped with a radio and transponder, compliance with ADS-B is likely to be your next avionics acquisition. For American Legend Cub owners there are solutions already afoot. And if you install in the fall, the FAA is offering you $500 cash back.

It's better to be seen, and an ADS-B equipped Legend Cub is a step in the right direction.

American Legend Aircraft Company has approved the installation of a FreeFlight Systems Model 1201 with WAAS GPS coupled with a Trig Avionics ADS-B Out capable transponder. Owner/pilot, and first FreeFlight ADS-B customer, Dick Parsons has been flying Legend Cubs since 2006. A retired commercial pilot, Parsons has amassed well over 1000 hours in Legend Cubs following his airline career. Why did he do it? Equipped with a WAAS GPS and 1090ES transponder, he's able to meet the FAA requirements of ADS-B compliance. Moreover, the system provides subscription-free weather and flight information direct to digital displays in his cockpit. It's more information available in his Cub than when he was flying the airlines.

Other ADS-B options for the Legend Cub include a NavWorx ADS600-EXP supporting panel-mounted and portable devices via Wi-Fi, and a Lynx NGT-9000 from L-3 with touchscreen display. ADS-B offers some great advantages now, not the least of which is enhanced situational awareness in the cockpit.

To plan the installation of ADS-B in your Legend Cub or other aircraft, call today 903-885-7000.

NEWS Legend Aircraft Magazine, Download Your *FREE* Copy Now

The completely revised Legend Aircraft Magazine is in its second printing. Inside, there's knowledgeable advice on choosing the right aircraft, tailwheel training tips, and everything one would expect when buying or building their very own Legend Cub.

Legend Aircraft Magazine, from American Legend Aircraft Company—the premier producer of the finest American-manufactured sport aircraft available today, is a must-read for anyone who appreciates flying for pleasure, and for going places.

To request your complimentary printed copy of Legend Aircraft Magazine, please visit www.legend.aero or call 903-885-7000. View Legend Aircraft Magazine online or download the PDF.

EVENTS Visit Us at the World's Greatest Aviation Celebration

[AirVenture Oshkosh]
July 25-31, 2016
Oshkosh, Wisconsin
Wittman Regional Airport [KOSH]

See the Legend Cub and Super Legend at this and other great events in 2016. Call 903-885-7000 to schedule a demo flight.

Astronics Offers Special EAA and Online Pricing for New Enhanced Vision Systems for Experimental and Homebuilt Aircraft

X1+HR Introductory Price of $16,800 During EAA AirVenture

EAST AURORA, N.Y., July 18, 2016 - Astronics Corporation (NASDAQ: ATRO), through its wholly-owned subsidiary Astronics Max-Viz, has established special lower prices for its two newest Enhanced Vision Systems, designed for experimental and homebuilt aircraft. The special prices will be offered online and at EAA AirVenture, held July 25-31 at Oshkosh, Wisc., where Astronics will be located at Booth #3077.

"Special EAA pricing will help us introduce our two new Enhanced Vision Systems to experimental and homebuilt aircraft pilots during the largest gathering of adventurous aviators in the world," said Astronics Max-Viz Executive Vice President Elliott Troutman. "This reduced introductory pricing will be available for a limited time and more information is available by stopping by Astronics Booth #3077 or going online to www.max-viz.com."

The new Max-Viz X1+HR (highresolution) system will normally be offered at $18,000, and is available at the introductory price of $16,800 during EAA. The Max-Viz X1 EVS, recently introduced at $6,000, will be $5,700 during the event.

The X1+HR sensor uses a 640x480 pixel resolution long wave infrared thermal imager with electronic zoom to assist pilots of experimental and home- built aircraft, which often operate from unimproved airstrips with wildlife and other obstacles. It is compatible with any display that accepts NTSC or PAL/Analog RS-170 signals.

The Astronics Max-Viz X1+HR EVS is similar to the recently introduced X1 EVS while also providing top end features in terms of the quality and resolution of the image presented.It is a big step up for experimental and home builders looking for a sophisticated system that adds a tremendous safety component to their flying adventures.

Both lightweight systems allow pilots to see temporary obstructions, such as wildlife and construction barriers, which may not be visible and which are not in any synthetic vision database. They enhance safety for the experimental pilot community by enabling pilots to see up to 10 times further than unaided human vision in visibility-obscured conditions, such as smoke, haze and light fog, in daytime or nighttime. Both systems are uncertified for experimental flying enthusiasts.

For more information, go to max-viz.com

X1 EVS Introductory Price of $5,700 During EAA AirVenture.

ANNOUNCING...

The Andy Anderson EAA **Build Center**

If you're building a plane ~ or want to ~ you'll want to read this!!

Located at the Morse State Airport in Bennington, VT, **the Build Center will provide fully-insured, heated hangar space, utilities, tools and** *shop equipment, for just $20 per month!*

Building an airplane can be one of the most frustrating ventures that many of us will embark on ~ it doesn't have to be that way ~ EAA can help!

At the Build Center, you'll be around other builders, who can help, suggest, encourage, and willingly share their knowledge.

The Center is operated by EAA Chapter 1375 and there are still several spots open in the build hangar.

CALL US TODAY FOR MORE INFORMATION - (802) 491-9243

SIMSBURY FLY-IN PARKING PROCEDURE FOR SKYLARK PILOTS

Let Bill Thomas wdthomas421@gmail.com know if you plan to take your plane to Simsbury fly-in. He's arranging an area for people from Skylark.

UPCOMING EVENTS

Last year we had 15 airplanes fly in. How many will come this year???

Hi, Fellow EAA'ers:

Please pass along to your Chapter members this special invitation to attend the 31st Annual Simsbury Fly-In And Car Show, to be held this year on Sept 18 at Simsbury Airport (4B9) in Connecticut.

This year, we are inviting your members to fly to our show in a group. We'll park their aircraft together in our display area, where they will be welcome to display signs to advertise their Chapter affiliation. We'll be back in touch in early September to ask how many members you expect to attend, so we can reserve space for your Chapter.

We are the largest Fly-In in New England, attracting 15,000 spectators and displaying 750 beautiful airplanes and autos of every type and vintage. We especially welcome antiques, amphibs, classics, small warbirds, rare and unusual aircraft, and of course homebuilts, light sports, ultralights, and helos. If you're proud of it, bring it and show it, even if it's a spam can !

Our show is designed to be like a special kind of country fair. There are lots of activities for the entire family. Over 150 businesses participate, including many of the "national" aviation names. We feature new aircraft and car dealer displays, two live bands, Ben and Jerrys and many other fine food vendors, kids activities, free aviation seminars, formation flying, Old Rhinebeck Aerodrome, judging and trophies, a banner tow pickup demo, crafts, souvenirs, biplane rides, LifeStar medivac helicopter, radio control model aerobatics, a championship robotic team, the Flying Octogenarians, powered parachutes, breakfast, lunch, and much more. Handicapped parking and restrooms are available. Pets on leashes are welcome. You can see full details at ww.simsburyflyin.com.

IMPORTANT: if you are flying in, FAA Arrival Procedures will be in effect - see our website for full info.

It's a great show, and we hope to see you here on Sept 18.

And don't forget...

EAA Chapter 1310 Corn Roast & Cookout

Saturday August 13 11:00 AM to 2:30 PM

We get the freshest corn available. Picked the morning of the event. Also hamburgers and hotdogs with all the fixings.

It's all you can eat for a $7.00 donation.

Fly in to see the new Skylark Airpark.

The runway, taxiways, ramp areas and parking lot will be reconstructed and repaved by the time of this event.

The east end of the runway that was an overrun area will be paved giving a full 3200 foot length

2016 Local Aviation Event Schedule

Reoccurring Events

Chapter 1310 Meetings – 2nd Wednesday 7 PM April-October
2nd Saturday 10 AM November, January, February, March at Skylark Airport

Chapter 166 Meetings – Last Sunday of month 7:30 PM (Except July, Nov & Dec) at UTC Customer Training Center

Chapter 324 Meetings 1st Wednesday of month, 7 PM Simsbury Airport

Chapter 27 Meetings – 3rd Sunday of month, 10 AM at Meriden Airport

Chapter 1310 Events (Subject to change)
Saturday August 13 – Corn Roast & Cookout
Sunday September 18 – Simsbury Fly-In
Saturday September 24 – Taildragger, Vintage & Experimental Safety Seminar
Saturday October 8 – Young Eagles Flights at Skylark
Saturday October 22 – Pancake Breakfast
Saturday December 10 – Annual Dinner

If you have a topic you would like to see covered in our monthly newsletter, please send a note to Fred Goff at fmgoff@yahoo.com.

EAA Chapter 1310, Inc.
54 Wells Road
Broad Brook CT 06016-9612