Smilin Jack Newsletter

EAA Chapter 866

June 2017

Chapter members watch intently as Lenny Duncil does his 3d presentation on the WWl pictures they found in his wifes' grandfather's belongings that were in a basement in her parents' home in Ohio for many years.

President report

Greetings Members and Friends of EAA Chapter 866,

I hope you're having a great start to the summertime season! My two girls just got out of school for their Summer break, and they're excited to have some time off, and go swimming. For some strange reason I've noticed an increase in the amount of perspiration out at the hangar these days. Those big metal airplane sheds can surely gather a lot of heat these days. Summer officially begins on June 21st, but after spending much of my Memorial Day weekend out at the airport working on the Panther project, it feels like Summer might have arrived early this year!

We had a very nice turn-out for our May pancake breakfast. We entertained about 120 guests and saw some beautiful airplanes arrive overhead. As always, it is a team effort to put on the breakfast, and I'm proud of the work that everyone does. From the perspective of the public and the surrounding pilot community, our monthly pancake breakfasts are the most visible aspect of what Chapter 866 is all about. Our great food and friendly service give out a positive impression about general aviation and our little home airport. Thanks again for all your efforts and keep up the great job everyone!!

While the public may see Chapter 866 as a good source of fresh hot flapjacks and coffee, we all know there's a lot more to our club than that. We have an amazingly talented group of folks among our ranks. I've counted up at least a dozen aircraft building projects that are currently underway or nearing completion, and I know of at least another 9 or 10 aircraft that have been successfully completed and flown over the last 5 or 6 years by members of our chapter! That's quite an accomplishment, and all while mixing pancake batter and frying up cackleberries.

Speaking of talented chapter experts, at this month's regular meeting (6/07) we're expecting a special presentation from Mr. Ray Jenkins (EAA 643579). Ray is a Chapter 866 member and also happens to be the FAA Lead for Launch Licensing of commercial space launch operator Virgin Galactic. How cool is that! Virgin Galactic is continuing their development efforts to enable customers to fly to the edge of space aboard their sub-orbital rocket plane called SpaceShip2. As you may recall, this program, as well as the prior SpaceShip1 effort, has its roots with the legendary aircraft designer and renowned EAA member Burt Rutan. So please Don't Miss this meeting, as Ray will be talking about the program and the design and construction of SpaceShip2 as well as the unique launch aircraft called WhiteKnight2.

Speaking of speakers, we can always use some guest speakers. I have a few feelers out to folks that I know, but no firm commitments yet. Let me know if you have a subject to present, or any good leads on speakers.

As a quick reminder, coming up in just a few weeks, at the end of July is the Big Show at Oshkosh! EAA Airventure 2017, also known as "The World's Greatest Aviation Celebration" will be held July 24-30th, 2017. The Blue Angles will be one of the featured performers this year, among many homebuilt aircraft and historic warbirds like TWO B-29's (both "FIFI" and "DOC"), plus C-47's and many others. There will also be a very special gathering of Apollo Astronauts to commemorate the 50th anniversary of the Apollo Moon Landing program! That alone is worth making the trip!

A few of our Chapter members are sure to be at Oshkosh again this year. If you're flying in, be sure to have a Great time, AND to thoroughly familiarize yourself with the NOTAM, which can be found here:
https://www.eaa.org/en/airventure/eaa-fly-in-flying-to-oshkosh/eaa-airventure-oshkosh-notam

Oh, and bring back some great stories and photos to share in the newsletter with the rest of us!

Best Regards,
Les Boatright (EAA Lifetime #563003)
President EAA Chapter 866,
The *Smilin' Jack* Chapter

Some Reminders about upcoming events:

Date	Event	Place/Info
June 1-4th	National Biplane Fly In Junction City, Kansas	Freeman Field, Junction City, Kansas (3JC) http://www.nationalbiplaneflyin.com
June 3	OUR 866 Monthly Pancake Breakfast	Building 10 / 8-10 am
June 5-14	2017 US National Gliding Championships in the Open, Standard, & 15-meter Classes	Crisp County Airport (KCKF), Cordele, GA https://www.flycordele.com/
June 7	Regular Chapter 866 Monthly Mtg	Building 10 / 7:00 PM
June 17	Valkaria Chapter 1288 - Pancake Breakfast (every 3rd Sat.)	Valkaria Arpt (X59) 8-10 am
July 1	OUR 866 Monthly Pancake Breakfast	Building 10 / 8-10 am
July 5	Regular Chapter 866 Monthly Mtg	Building 10 / 7:00 PM
July 15	Valkaria Chapter 1288 - Pancake Breakfast (every 3rd Sat.)	Valkaria Arpt (X59) 8-10 am
July 24-30	OSHKOSH – EAA AirVenture 2017 (Blue Angels) (http://www.eaa.org/en/airventure/eaa-airventure-tickets)	Wittman Regional Arpt (KOSH)
Oct. 27-28	2017 AOPA Fly-In Location #4. Tampa, FL (http://www.aopa.org/fly-	Peter O. Knight Arpt (KTPF)

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PS

The FAST team site for Formation Flying. They are called the *Formation and Safety Team (FAST)*. They have a heavy focus on safety and training! One of my President's 5-Point plan items is to maintain a focus on Safety in our chapter. Anyway, the *FAST* folks have a FREE Downloadable Handbook called "*The Formation Pilot's Knowledge Guide*". I browsed through it and it looks Great!

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http://flyfast.org/content/reference-material

Les

First Flights and Failure Tolerance
Les Boatright, Chapter Prez

As most of you already know, your chapter Vice President Ed Brennan, along with Bob "The Super Builder" Rychel, and yours truly have been collaborating in a team effort to build a Panther Light Sport Aircraft. We've been working on the kit for Four and a Half months now, and we're nearly done. Collectively we have invested nearly 1200 man-hours into the project so far. As we work to finish up several critical systems related to the engine installation, and as we get closer to being ready for the final inspection and the First Flight of the Panther, we've been thinking more and more about systems reliability. One of the wonderful things about the Panther is that it's a simple airplane with very straightforward systems. Having high structural factors of safety that enable aerobatic flight, and also having a relatively low parts count, I like to call it a ROBUST design. It does NOT have many complex features such as retractable gear or a cont

rollable propeller, and there are no lights and no IFR instrumentation. Even so, there are many critical components in even the simplest of flying machines. Items like control surfaces, control linkages, wing spars, fuel systems, power-plants and propellers are just a few that come to mind. As you know, failures of any of these critical elements can have catastrophic consequences. As builders, we must wisely "Stack-The-Deck" in our favor and make sure that failures in critical areas cannot happen.

In the human spaceflight world where I work, the notion of system reliability is taken very seriously. The space business goes to great lengths to analyze and prove out systems before they fly. As you can imagine, astronauts have very few options for dealing with in-flight failures and emergencies. It's not like us in our small airplanes where we can make a cautionary diversion to a nearby alternate airport or if the engine stops, we can glide to a landing in an open field or open stretch of road. Spacecraft systems demand a high degree of reliability. In Truth, that should be our goal as well!! To maximize our safety, and to get the most utility and enjoyment from our personal flying machines, we should strive to make them as reliable as we can make them.

There are several approaches used to achieve high reliability systems. These include using high quality parts, having robustness built into the design (including healthy structural safety margins), using redundancy where it is appropriate, and conducting thorough and rigorous testing to root out any flaws in the design or in the workmanship of a particular part or system. Failure Tolerance, sometimes also referred to as Fault Tolerance, is a term used by NASA and other aerospace companies to describe having redundancy in an engineered system. Here's one definition for it, and then we'll discuss the idea for a bit.

Failure Tolerance: A property which enables an engineered system to continue operating properly in the event of the failure of one or more of its components.

A good example of Failure Tolerance in our aviation world is the use of dual ignition systems in most light airplane engines. The failure of a spark plug, the inadvertent disconnection of a plug wire, a chaffed plug wire that grounds itself out, or the failure of a magneto should not result in a critical loss of engine power. There may be a small RPM drop associated with the problem, but the engine will continue to run because it has a Failure Tolerant, or redundant ignition system. In fact, the engine should run in a fashion similar to the way it did when you performed your pre-flight run-up and

mag checks. That pre-flight checklist item is designed to verify that the integrity of the dual ignition system is fully intact prior to taking off.

Another example of Failure Tolerance may be found in many of our fuel systems. In the case of our (low wing) Panther project, we will have an engine-driven mechanical fuel pump, AND also an electrically operated Boost Pump. Having redundancy where the redundant features are different from one another like that is called *Dissimilar Redundancy*. It's a good way to avoid Single Point Failures. By that I mean, suppose we used two identical electrically powered Boost Pumps in series in order to achieve one level of Failure Tolerance. Well, if both pumps were powered from the same electrical bus, then they BOTH could fail at the same time if the electrical bus shorted out or lost power. To avoid such a failure, we would need to have two separate and redundant electrical busses, or use Dissimilar Redundancy.

As our little trio work to finish up the Panther, we are paying particular attention to the fuel system. There are no particular instructions for this part of the build because the Panther was designed to accept a number of different engine options from VW's to Corvairs or UL's, or Lycomings and Continentals. The installation for each will be different. The factory cannot design a custom fuel system solution for every homebuilder's preference. So we have employed the Principle of Best Practices and blatantly copied most of our fuel system arrangement from other well-proven designs. The EAA has many books and resources to help the homebuilder in such areas. An example is shown in the Figure below. This is actually very close to the system we will have for our Lycoming powered Panther. We have added an inline filter and will use a momentary solenoid valve to service the engine primer lines for start-up instead of a manual primer.

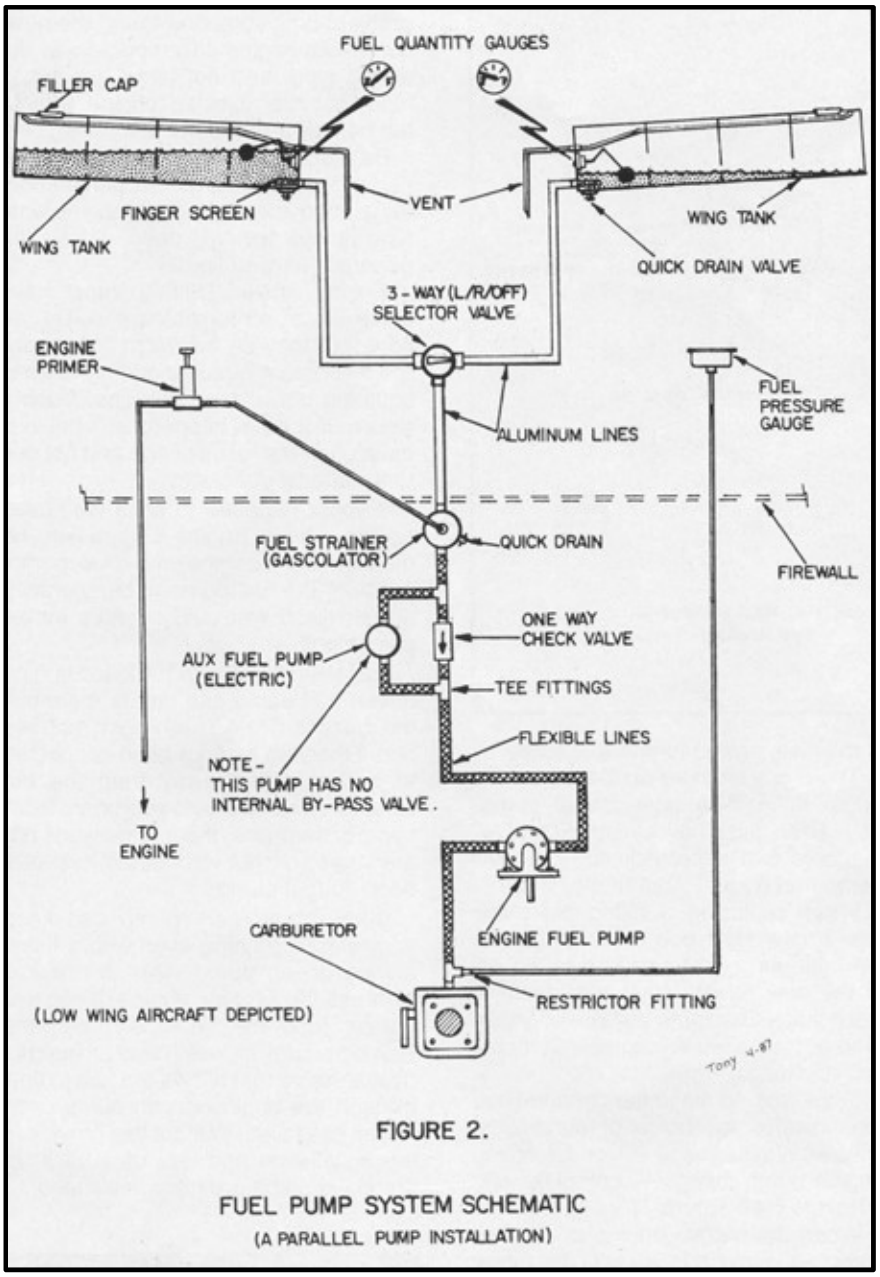
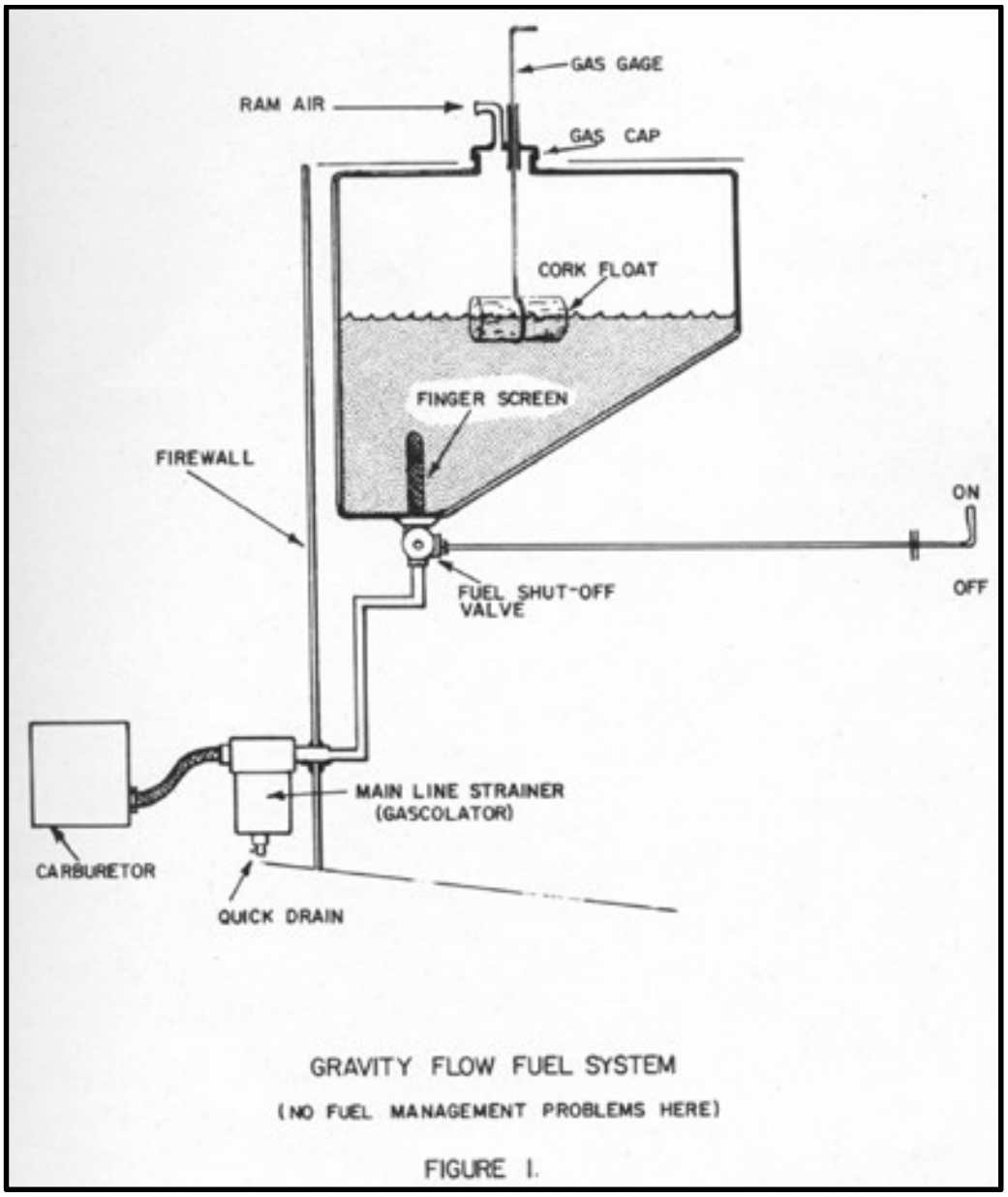


FIGURE 2.

FUEL PUMP SYSTEM SCHEMATIC
(A PARALLEL PUMP INSTALLATION)

Let's consider for a moment if we had a high-wing airplane with fuel tanks in the wings. Then we could achieve *Dissimilar Redundancy* in the fuel system using the most reliable delivery method ever, gravity. Gravity is 100% reliable, and is the reason why most high wing airplanes do not need an auxiliary electric Boost Pump to achieve a high reliability system.

It only takes a little reading in aviation publications and reports to learn that the #1 cause of homebuilt accidents (by far) is engine stoppage or loss of power. And the #1 cause for loss of engine power is related to Fuel delivery, with causes such as Fuel Starvation, Fuel Contamination, or lack of adequate fuel flow. Therefore, careful attention to detail is critical. Many fuel delivery systems in our light airplanes do not have much in the way of redundancy or Failure Tolerance. For example, consider a flying machine with a single fuel tank, a single fuel line, a single fuel shut-off valve, a single debris screen, and only one pump (or maybe no pump). From a Failure Tolerance perspective, this might sound like an accident waiting to happen (see Figure below). After all, such a system has NO levels of Failure Tolerance, or put another way, it is said to have a Zero-Fault-Tolerant design.



GRAVITY FLOW FUEL SYSTEM

(NO FUEL MANAGEMENT PROBLEMS HERE)

FIGURE 1.

And yet, this is pretty close to what you will find in a J-3 Cub, or a Pietenpol, and we all know that both have very reliable fuel systems. This is where the whole concept of Failure Tolerance can get a little tricky and requires thoughtful consideration.

The Truth is, providing a truly Fault-Tolerance design for EVERY component in a system is normally NOT an option. The associated redundancy brings a number of penalties. These penalties may include an increase in weight, size, complexity, power consumption, cost, plus more time to design, fabricate, install, and test the additional components. Therefore, it is wise to thoughtfully examine a number of alternatives and make a determination about which components should be Fault Tolerant and which do not need to be. We can do this by asking ourselves a few questions.

How critical is the component? In a car, the radio is not critical, so it could fail without affecting the safety of the trip, and thus it has less need for Failure Tolerance. However, in an airplane or spacecraft, the two-way radio serves as a critical link to the ground enabling the crew to gather important information about the flight. One level of Fault Tolerance may be achieved by installing a second radio, and TWO levels of Failure Tolerance, (WITH Dissimilar Redundancy) could be achieved by adding a portable hand-held radio. Just make sure the batteries aren't dead.

How likely is the component to fail? Some components, like the main wing spars, the engine crankshaft, or a rigid aluminum fuel line, are not likely to fail. In those cases, Failure Tolerance is not needed, and the risk of failure is mitigated by having a ROBUST design.

How expensive is it to make the component Fault Tolerant? Requiring that a J-3 Cub carry a redundant engine, for example, would not be practical. It would be too expensive economically, and prohibitive in terms of weight and space required to haul it around.

An example of a system or component that passes all of the above questions is the aircraft braking system. While the actual brake mechanisms are critical to safely steering and stopping the airplane, they are not particularly prone to sudden failure (a low likelihood for question #2). Also, brakes tend to fail progressively with wear and usage. This is sometimes referred to as *Graceful Degradation*. Finally (question #3), it would be prohibitively expensive to double-up on the master cylinders, brake lines, reservoir, calipers, and fittings, and it would add considerable weight to a light airplane without a proportional benefit to safety. So in this example, rather than choosing Failure Tolerance for the brakes, the risk of brake failure is typically mitigated by way of Robust hardware and designs, plus having knowledge about the typical failure modes and failure histories for braking systems.

In summary, as we approach the First Flights in the Panther, we're thinking about things like Failure Tolerance and Robustness of the design. We're reflecting on questions about system criticality, common types of failures and their likelihood of occurrence. Our goal is to leave nothing to chance. For the Fuel delivery system, we have looked toward best practices for fuel systems, and aimed to eliminate needless complexities. During our pre-flight inspections, we will look for common problems, such as loose fittings, leaks, blockages, contamination of any sort, kinks in lines, or lines too close to heat sources such as exhaust pipes. Then we'll check and re-check everything related to fuel quality and delivery. We won't give Murphy a chance! And after all that, we'll mentally prepare for those first few flights around the traffic pattern at Dunn. We will confidently take to the air and expect the engine to quit anyway! In doing so, we will have a mental plan ready for that outcome ahead of time. After all, in our single seater Panther, the pilot is Zero-Fault Tolerant.

I also discovered this FAST team site for Formation Flying. They are called the *Formation and Safety Team (FAST)*. They have a heavy focus on safety and training! One of my President's 5-Point plan items is to maintain a focus on Safety in our chapter.
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The Cub

Ray Thomas, Ben Charvet and Kathy Anderson have formed a partnership to restore the Cub that Ray has owned for a long time. About two years ago the plane was damaged in a landing incident and Ray decided that this would be a good way to get it flying again. After the restoration the three of them are going to try and wear the Cub out by flying it a lot, just for fun! Ben sent me the following picture and words for the newsletter. ……. Larry

The cub partners have been making slow but steady progress on our restoration. The fuselage tubing was all sandblasted, and only one small tubing repair was needed. We are using the Stewart system of paints, and it went on very smoothly. We are hoping to start covering the interior this weekend. There are hundreds of small details to be cleaned and painted as we reassemble, complicated by the fact we didn't take it apart!

It sure is fun to be working on such an interesting piece of history……Ben Charvet

This month's flying

Larry Gilbert

Nothing to brag about as far as flying this month. Loretta and I just went up one morning just to have fun looking around and bore some holes in the neighborhood airspace. I spent a little time with Bob Rychel in the front seat and some with Les Boatright doing a little currency stuff.

My dermatologist cut off a piece of one of my ears and told me not to use headphones for a while so I listened and didn't fly for about a week.

Slow Flight

We like to do maneuvers just for fun and proficiency and slow flight is a good one to do. Below is what the ACS says about slow flight. (Airmen Certification Standards) Replaces the PTS (Pilot Test Standards) for private pilot

Under the ACS guidance, slow flight is trained and tested at an airspeed that is five to 10 knots above the stall warning activation speed. Properly performed, the maneuver should not activate the stall warning system at all. But if it is activated, the pilot is expected to take prompt and positive stall recovery measures. If a stall warning is activated during a practical test, following the stall recovery procedure would not be grounds for failure. Failure to take any corrective action and ignoring the stall warning, however, would be considered unsatisfactory.

As the speed approaches the target slow flight speed, which is an airspeed just above the stall warning in the desired configuration (i.e., approximately 5–10 knots above the stall speed for that flight condition), additional power will be required to maintain altitude. During these changing flight conditions, it is important to trim the airplane to compensate for changes in control pressures. If the airplane remains trimmed for cruising speed (a lower AOA), strong aft (back) control pressure is needed on the elevator, which makes precise control difficult unless the airplane is retrimmed. Slow flight is typically performed and evaluated in the landing configuration.

Common errors in the performance of slow flight are:

• Failure to adequately clear the area

• Inadequate back-elevator pressure as power is reduced, resulting in altitude Excessive back-elevator pressure as power is reduced, resulting in a climb followed by a rapid reduction in airspeed

• Insufficient right rudder to compensate for left yaw

• Fixation on the flight instruments

• Failure to anticipate changes in AOA as flaps are extended or retracted

• Inadequate power management

• Inability to adequately divide attention between airplane control and orientation

• Failure to properly trim the airplane

• Failure to respond to a stall warning

Since learning to fly a couple of years ago, I've always done things a little differently than the above.

First of all the J3 Cub that I learned in didn't have a stall warning device (except in the summertime) You J3 flyers know what I mean by this!

We just slowed the airplane to where if we pulled any harder the airplane stalled. After flying around in planes with no stall warning devices for a few years I moved up to Cessnas and Pipers with stall warning devices and slow flight was not considered slow flight unless the stall horn was going off or the red light (stall warning) was on!

We don't have a stall warning alarm in the 7ECA so we shoot for 55 mph. The book says stall occurs at 51 mph and that seems to be just about where it happens. AS the flying handbook says, this slow flight puts us in the landing configuration. I say that's right especially if you intend to do full stall landings with the tail dragger. Also, if you want to do the safest landing in a nose dragger you'll be landing as the stall alarm device is sounding! This is the safest landing because you're landing at the lowest possible speed. Comes in handy on short fields too! Also it makes it more comfortable to use VX on takeoff! For these reasons, I like practicing slow flight at the speed where any reduction in power or increased back pressure is going to cause a stall. This means the stall warning will be sounding if you have one of these. Now, an awful lot of home built planes I've seen don't have stall warning devices and when you start flying your new machine around I think it is

a good idea to practice slow flight to become familiar with how it will be handling at landing speeds and when using VX on takeoff.

Those who have flown with me know I don't like to trim for no back pressure on the elevator control when doing slow flight and this is in case you have to make a quick evasive maneuver to avoid something flying around up there with you like another plane or a buzzard! Also, on takeoff if you have all of that trim in for VX and the engine quiets down you're gonna really have to push to avoid the stall! If you're on short final and the airport lawn mower guy is working and listening to itunes with the earbuds in and turns out onto your runway in front of you and you have to go around, full power is going to bring the nose way up and again, you will really have to push to go up instead of pull! Understand?

Got company at our hangar on Saturday. Jeff Wilde and Emma, his granddaughter flew over to Dunn from Southerland in his Kitfox.

Jeff said all of grand kids love to fly with him!

Chapter officers

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Monthly Bkfst Sat June 3,

8:00 am Bldg.10

Dunn Airpark, Titusville

Monthly Meeting Weds, June 7

7:00 pm Bldg. 10

Dunn Airpark, Titusville, Fl