




Arion Hangar Talk*

*Semi official possible name of the Arion Lightning Newsletter.

May 2008

Volume 1, Issue 4

Welcome to issue # 4 of the  Newsletter. In this issue I am adding a section called “**Reader Feedback**”. It will be where notes and messages to me that have to do with newsletter content can be shared with other readers. There is also an important article on **Landings** and “**How to Prevent Landing Incidents**”. You really need to read this.

The goal of the newsletter remains the same. First, “**to get the word out**” on happenings at Arion Aircraft, and second, “**to give a voice**” to Lightning builders and flyers as well. It is **Lightning “Hangar Talk”** sessions put into print. To be successful we will need the inputs from Lightning flyers and builders in order to meet that goal. So it is not only a way for the factory to provide Lightning news, but it is your newsletter as well, and as such its success will depend on you getting involved to spread the word and to help other builders and / or flyers with their project airplanes. So think of this newsletter as an “exchange of information publication”. Send your inputs directly to me at **N1BZRICH@AOL.COM**.

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Other items – **Landings** and “**How to Prevent Landing Incidents**”, by **Nick and Buz**. You really need to read this!!!!!!

Final thoughts -

And now, the rest of the news:



News Flash

. The new **2008 Lightning Demonstrator, N324AL**, was selected by the judges to be the “**Best Composite Homebuilt**” at this year’s Sun-N-Fun fly-in. If you have seen this aircraft you understand what a “wise decision” the judges made. Photos just do not do 324AL justice, even though she sure is photogenic. Call the factory in Tennessee to schedule a demo flight in the brand new, award winning, 2008 Demo Aircraft.



Nick Otterback of Arion Aircraft receiving the 2008 Sun-N-Fun award for “Best Composite Homebuilt Aircraft.”

More Sun-N-Fun Photos:

Tom, “Moostang” Mike, and Nick intently watching a “low level pass” by someone with a beautiful “fuselage” walk by the Lightning booth.



Jim Austin, from Michigan and Florida, tries out the new 2008 Demo cockpit for size. Jim has owned several aircraft over the years, including a twin Comanche and a 1954 Cessna 170B that he bought from me many years ago.



The new demo cockpit and panel.



New Demo has a "clean" wheel pant installation.



The first ever Lightning forum was presented at Sun-N-Fun this year. It was well attended and resulted in lots of good questions by those interested in possibly building a Lightning. Above are photos of **Pete** and **Nick** during their presentation. **Nick** is showing the new Lightning wing tip extensions that have been discussed in a previous newsletter. The new tip was also on display in the Lightning booth throughout the week. **Pete** and **Nick** also plan to give a Lightning forum at Oshkosh this summer. Start planning now so you can be at this great sport aviation event. See you there.

News from the Factory:



“Moostang” Mike watches as Lynn Nelson works on his engine mount. In this photo, the fuselage is inverted to ease the installation of certain items such as rudder and brake pedals. Lynn is building Lightning serial number 60 and already has his “N” number reserved with the FAA (N13LN).

Here is what Lynn said to me in a recent e-mail.

I am pleased with the work of everyone here, and feel that I made the correct decision (to use the builder assist program). With good fortune, my Lightning will be completed in 3 months. We expect to turn the project right side up in the morning, mount the engine

and cowling, and get her ready for paint. I originally had decided to do several of the items myself (like interior, wiring, testing, etc) but have gone to the expedient mode for a couple of reasons. First, I just cannot seem to find the time to do it myself. Secondly, the SYI crew is proficient and does a great job. Lastly, it will greatly speed up the process of getting my Lightning (serial # 60 N13LN) up and flying.

Lynn



More photos of Lynn’s build process. The left photo (fuselage inverted) shows the rudder and brake pedals (pilot’s side) installed. Right photo shows the stainless steel firewall in place and marked for installation of various components. The cabin heat box is already in place.



This is the central beam assembly in Lynn’s Lightning. It is a key part of the Lightning structure as the wing spars bolt into it, as do the gear legs, and control assemblies. In the Lightning kit, all 4130 steel parts come pre-welded and powder coated.

News from the Dealers:

Buddy Carlisle's beautiful new Lightning on display in the **Green Landings's** booth located in the Ultra light area of Sun-N-Fun.



Buddy's panel.



Who are these “sleepy people” photographed at Sun-N-Fun and where are they from? Could it be the “Green Acres” group just after winning the “greased pig catching” contest?

Current Lightning Dealers:

Arion Lightning, LLC, contact Nick Otterback, Shelbyville, TN, 931-680-1781, www.flylightning.net

Lightning Southwest, Greg Hobbs, Marana, AZ, 520-405-6868,

Green Landings Flight Center, Ryan Gross, Hedgesville, WV, 304-754-6010, www.greenlandings.com

Lightning North Central, Tom Hoffman, Neenah, WI, 920-836-2318

Sport Plane Dynamics, Ed Ricks, Glendale, AZ, 623-695-9040

Lightning Australia, Dennis Borchardt, Kingston SE, South Australia, 08-8767-2145

Lightning Brazil – Cimaer Ltda, Claudio Nunes, Brazil CEP 24 900-000, 21-2637-3605, 21-9451-9700

News from Builders and Flyers:

Jim Goad sent the following message.

Buz

Sorry for taking so long to get back to you about some of the things I am doing to my Lightning. In a previous conversation I told you that I replaced my tires with 6 ply and running 28 lbs. of pressure and installed the dowel rod stiffing to the landing gear legs. I managed to get the fairings back on fairly easy by using hose clamps that I found at West Marine which have a smaller screw assembly.



I was never satisfied with the way the canopy sealed and the Home Depot type foam tape was not the quality you would expect to find around a canopy or a door. I went to my local professional automobile paint store and they had several kinds of rubber moldings which they sell by the foot. I bought one foot of everything they had, I laid them along the edge of the fuselage where the canopy closes and I turned them on all four different sides trying to find something that would lay on the lip and look like it belonged there. The end result is that I now have a rubber seal that is the same as around a car door or trunk.

One thing that bugged me was I had a rattle in the airframe at idle. I found out it was the elevator trim servo which is mounted at one end at certain elevator trim adjustments it is laying on the belly of the airplane. The fix for that was just to glue a piece of rubber to the fuselage so that the servo lays on the rubber pad.

I have really been perplexed over the oil temperature, going up at any RPM more than 2850. When the oil temp went up well over 200 degrees the oil pressure would drop down in the low twenties. On the attached pictures you can see my latest discovery. I added a plastic air scoop to the oil air intake and yesterday I flew the airplane at gross weight, ground level temp was in the 80's. I ran engine at 2950 and made a speed run at 3300 at about 3000 feet. The highest I could make the oil temperature go up was 204-205. Most of the time it ran in the neighborhood of 180-190 and the oil pressure was 40-60 lbs.



The plastic scoop is installed with silicone rubber, so I could easily remove it without damaging the appearance of the cowling

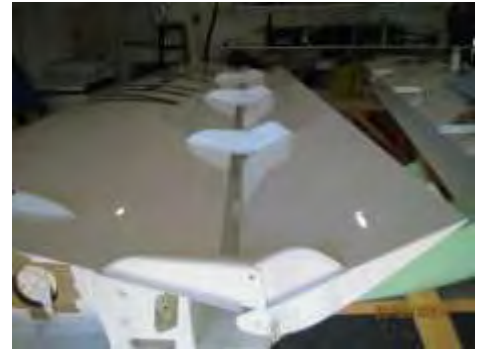


Jim Goad

Here is more great information from one of our "down under" friends. **Pete Disher** from Australia has previously sent photos of his flap gap seal work and his flap hinge covers which were covered in a past issue of the newsletter. Recently I received a follow-up email from him that answered some questions I had asked. He also included some additional photos. Below is his email to me with his photos inserted to match the text. Note his outstanding workmanship. Enjoy.

Hi Buz,

Firstly the flap hinge covers - I've only now just screwed them to the wing using self tapping screws. I attached a sketch that I designed showing what I planned to do hoping I got something near it. I made moulds (3 types, two lengths and one to clear the aileron, fastening to the end of the flap) from rigid polyurethane foam and placed two layers of 7781 fiberglass over them. The flap half of the cover slides inside the wing half. These covers took me a week to make.



The wing/flap gap was easier to do and only took me three days to do. I placed and secured to the wing a length of 16mm white board shelving (as they call it DU), 8" wide with cut-outs to clear the flap brackets. After placing plastic and peel ply, I placed a 3/8" fillet of flock in corner of board and inside face of wing, then placed two layers of 7781 fiberglass mat, protruding out 2 1/2" towards the flap. Clearances for the flap top and bottom is about 0.070".



Editors Note: The left photo shows the flap gap seal in place as the epoxy sets up. The black fabric appears to be "peel ply". On the right you can see the finished flap gap seal and the inboard flap hinge fairing.

I also attached a picture of the park brake placed just over the rudder cables.



Also changed the carby to a Revmaster. I preferred it over the Ellison and Sonex for the slide action is pulling on centre line not to one side where I feel it could rack and jamb.



Pictures also of my pitch trim system that I made. I got the concept from Jabiru, Hopefully mine will be less sensitive and I've added a motor with a potentiometer. Again, working out the geometry and spring balance and making a working model took a week or so, but now is all fitted, just HOPE it works.



Just a few shots of finished upholstery to date. I thought **Johnny Thompson's** seats looked fabulous so, hoping he doesn't mind, I tried to copy them. They do hinge forward for access to rear.



Instrument panel is Dynon 100/120, gps- AvMap, a/p- Trio, and some "steam" in case I can't figure that new stuff out. The instrument panel is rubber mounted on 1/4" 12ply and hinges forward 45 Deg. for more access.

For 20 years I've been looking for a smart looking, slippery, slick design, fiberglass aircraft returning 135Kts for 21Lts. I came across the Esqual and found one for sale, Dennis's, he said you don't want my Esqual you want a Lightning so sight unseen I just had to have one. Having just sold my business a year

earlier, I needed to fill my time in with a build kit and be flying in about 6 months so I organized a trip to Shelbyville for a week, everything just got better in that I have made the right decision.

To add to that and if I could say Buz, your emails along with Brian W are the most informative and constructive I've read, they just confirm that we buyers have made the right decision in purchasing Lightning. Your posts really come through that you enjoy flying the Lightning, how this can be after flying F4s, chasing Migs, I don't know, certainly says a lot for Lightning.

My build is certainly going well and I am enjoying it. Since I've been building I ran into this guy, Cyrus, who drops in 2 to 3 times a week, he is building a Wheeler Express at the airport, It's now finished and he has been quite interested in the Lightning and in what I am doing and how I'm doing it, in fact, his suggestions, help and advice has been tremendous, the only problem he keeps finding little extras that could be done. At the start he suggested that the trim tab could easily be placed into the elevator and do away with the bungee cords, he said he would do all the calculations to figure it out, I thought it too adventurous at the time but in hindsight....I didn't know at the time but Cyrus, was a professor in aeronautical engineering at one of your universities up until the early 90s.

As for the build manual, I only know the Lightning and I have no problem with it, although Cyrus says the manual is very good, ever so much better than most, in fact Wheeler Express did not even have one. As for the Lightning aircraft, he is quite impressed, looking forward to me finishing it.

Thanks for your interest Buz, only too pleased to help if I can.

Regards

Pete Disher

Dick Cleavinger from **Colorado** is quickly becoming the Lightning “**high altitude**” expert. Below he covers some issues he is correcting on his Arion Lightning N213RC.

Hi Buz

Good to see you again last week. I am attaching the squawk sheet of the problems I've had with my Lightning. I don't think any of them are unique to 213RC except perhaps the canopy latch ball coming off in my hand. You described my wing angle of attack problem precisely in a forum message a few weeks ago. I am hoping that **Mark** can make room in his schedule for me this summer to get the wing right, try a new gear alignment, and get the trim servo kit installed.

Issues with 213RC:

The Bing altitude compensating carb does not provide mixture adjustment but is supposed to keep the fuel/air mixture where it should be under all conditions. The engine ran rich at SYI as new.

Nick straightened a

bend in the carb inlet scat hose to help but it was still rich. He changed to a smaller main carb jet and it seemed to run ok. When I flew it home to Colorado it was too rich again. **Nick** sent me some carb jets and I changed the main jet from a measured 2.28mm (probably 2.30mm) to a measured 2.20mm main jet. The engine runs smoothly now at altitudes between 5k and 10k feet but is rough again and presumably rich in the 10k to 14k range. I would consider changing to a carb with manual mixture control if a good one were available that could be easily adapted to the Lightning environment.



The aircraft had a pronounced left roll bias to start with. I have taken this out with differential flap adjustment and the roll is now neutral but I'm not happy about having unnecessary flap drag to correct things. I am hoping to be able to adjust the angle of incidence of a (the right) wing and get rid of the drag from the flap offset.

From the beginning I have needed to use considerable braking during takeoff to keep the airplane going straight down the runway. After about 60 hours of use my right brake failed from overuse. Looking into this problem I found that the rudder travel was 12deg right and 17deg left. A little material has been ground off the vertical stabilizer / rudder interface. This has improved rudder travel to about 15deg right and 17deg left. I can now take off with only moderate brake use during takeoff.

The unbalanced rudder motion results from a right lateral offset of about 1/4th inch in the mounting of the rudder on the vertical stab. I believe this offset causes a right yaw trim error. At speeds above 135mph or so, significant left rudder is required to keep the turn and bank ball centered. I have installed a trim tab on the rudder that is 10in long and 2in wide and is set to about 15deg to starboard to force the rudder to port at speed. It works well and I no longer need to hold left rudder to keep the ball centered at higher speeds.

Most owners are reporting some gear leg oscillation or shimmy. The Lightning gear is similar to that in RV's and they have apparently had the same problem. The RV drawing shows wooden molding bonded to the gear leg inside the fairing to stiffen or dampen the shimmy motion. This apparently helps. Some of the Lightning owners have said that they are trying better (6 ply) tires to help the shimmy problem. I have not seen any discussion of the results of this change. I was getting some shimmy during takeoff and landing but I didn't think it was a serious problem until my right gear leg fairing came off during a landing at KBDU. The rivets holding it together had pulled through the fiberglass. I am starting from scratch with these and have ordered new main gear leg fairings from Vans and will be getting those made after sun-n-fun. I plan to use more and better (non pop) rivets on the fairings this time.

Canopy closure was a problem until mid February of this year. Upholstery material was blocking the holes that the locking pins move into. I got that cleared up shortly after I got here, but after that the left canopy closing handle came off and the screw that holds it in place had fallen off of the latching pin and is somewhere in the frame.. I drilled a hole in the canopy frame, got the latching pin out of the frame and had the hole in the pin threaded. I then had a part made to screw into the pin and threaded to hold the latching handle. My cabin is now much quieter and less breezy. It was pretty cold at 13k ft in January with a canopy that would not close.

I am anxious to see the new pitch trim system. I have found the bungee trim to be less effective than I would like and am looking forward to a more stable control system.

Cheers, **Dick**

Johnny Thompson sent this short update on his Lightning. "I received the Special Airworthiness Certificate on 17 Apr after a 3 hour inspection that found no gigs. Under the new system it took almost a month to get the inspection scheduled. I completed several hours of ground taxi working on the brakes, made new seats that would fit taller people, and other adjustments. The aircraft was flying great in



Phase 1 when on April 24 I met with a small incident that we will talk about in next newsletter. In the mean time work with your EAA Flight Advisor long before you finish the build.”

Editor’s Note: Johnny flies out of an airpark in Arizona that often has cattle on the runway. No, he didn’t have a “mid-air” with a cow, but some of the photos he sent show what a “target rich” environment his runway can be. On the right is a “taxi test” photo.



Upcoming Events:

Virginia Festival of Flight is 14-15 June this year and will be at **Suffolk, VA**. The new location for this Regional Fly-In will allow the event to continue to grow. No event was held in 2007 because of the planning process for the change of location, but in years past this regional fly-in has been attended by Green Landings, the Lightning dealer from West Virginia. Hopefully they will be there again this year with their demonstrator Lightning.

Oshkosh is 28 July to 3 August. Several of you have indicated to me that you are planning on attending Oshkosh with your recently completed Lightning this year. I am hoping that we have between five and ten Lightnings attending, so start your planning process now. As I mentioned in the first newsletter issue, **Bill Hubbard** was at Oshkosh in 2007 and that qualifies him and his “jet” as a part of Lightning history, as his Lightning was the first Arion customer aircraft to attend Oshkosh. I have not heard yet if **Nick** or **Pete** plan on giving a Lightning Forum at Oshkosh, but I certainly hope so. **Pete** normally gives a well attended forum on the Jabiru engine, so I am sure a Lightning specific forum would be well received by many attendees hoping to learn more about this great aircraft.

Next Jabiru Engine Seminar (that is not “sold out” already) **is 5 to 7 September**. Call **Dana Otterback** at Arion in Shelbyville to sign up (931-680-2800). I have attended this seminar and I consider it a “must” for anyone with a Jabiru engine or anyone considering one. It is money well spent.

The 2008 Lightning Fly-In will be 27 September at SYI. This is the second annual event and you should start planning now to attend. Those attending last year had a great time. This is a fly-in for anyone that is interested in the Arion Lightning, not just those that are building or flying Lightnings. Good food, hangar talk, demo rides, informational briefings, and other “fun” activities are on the schedule. There will also be a “Metal Aircrafters Anonymous” meeting chaired by **Mark**.



Lightning Skunk Works:



Question #1- Who is this guy and why does this spy photo show him “studying” this aerobatic aircraft?



Question #2 – Who is this guy and why are these “judges” checking him out?



Question #3 – Looks like he won an award. Were any other “prizes” collected?

New Section, **Reader Feedback:**

This new section will contain messages that I get from readers that really don't fit the **News from Builders and Flyers** section. Anyone can write info for this section - you don't have to be a Lightning builder or flyer. Now the first entry in the new **Reader Feedback** section:

Hi Buz,

A copy of the April 2008 issue of "The Arion F.L.A.S.H. crossed my desk this morning and I wanted to comment on **Jim Langley's** article "**How I chose the Lightning**". **Mr. Langley** began his search with detailed list of what he wanted - outstanding! All builders should do this. It is an honor that the **Sonex** made his "short" list of acceptable designs. This email has nothing to do with Sonex vs. Arion, it is simply to comment on **Mr. Langley's** quoted estimated cost to build a **Sonex**, and your inserted opinion on its fit for people over 6'-2".

Sonex Aircraft has always been out front with our total cost to build, and we publish a very detailed cost worksheet on our website (<http://www.sonexaircraft.com/kits/pricing.html#completecsts>) so each builder can accurately crunch their own numbers. Having said that, it is hard to come up with a total cost of \$55,000 for a completed Sonex.

Factoring in every available Sonex airframe option, including our recently introduced completed spars pre-machined aluminum angle parts options, a completed Jabiru 3300-equipped Sonex airframe would be \$39,000 (assuming \$18,000 for the engine), less paint and instruments. This leaves \$16,000 in **Mr. Langley's** budget for paint and instruments, which would nicely equip an IFR airplane, to say nothing of a day-VFR sport plane.

I'd also like to comment on the editor's note that was added in red to the bottom of page 3, under the photo of the Sonex. You interject the editorial opinion, "Having been in a Sonex, I see no way for two 6'2" people to fit comfortably in a Sonex". This is a subjective comment and I'm not sure why it needed to be included in **Mr. Langley's** article, which you later describe as "scientific". Everybody has an opinion, which is why we have choices in our market. I am 6'-0" and my brother is 6'-4" and we fly comfortably together. I've seen others much shorter decide the plane was too small. I'm sure the Arion airframes experience similar subjective opinions. There was no need for you to interject your opinion into **Mr. Langley's** article.

Let me close by saying I know **Pete** and **Ben** and **Nick** and the whole operation in Shelbyville and I think they have a great operation, provide outstanding support to their customers, and their airframes are very attractive. I personally built a Jabiru 3300-powered Sonex which has given me 340 hours of trouble-free flying over the last 4 years. I hope to someday swap rides with **Nick** and get a ride in an Arion and give him a ride in my Sonex.

Blue Skies,

Kerry Fores, Sonex Aircraft LLC

Next is Kerry's follow up message:

Hi Buz,

Thank you for the reply, and thank you for the offer to print my response in your next newsletter. You are welcome to do so.

Depending on when you may have sat in the Sonex demo plane, you probably experienced our "standard" seat cockpit (which mine has and Tony Spicer's has) and not our lowered seat, which adds 1" to 1.5" more of headroom and is standard on the Waix and Xenos, and an option for any Sonex builder. Regardless, "fit" is wildly subjective and as I'm sure you know once an "opinion" grows legs it is hard to hobble. If someone implied in print that the Lightning is too fast to be LSA compliant, well, there it is forever, and now Arion will forever have to fight that misinformation.

I'm sure you understand that my letter was not to "sell" the Sonex, but to keep in check opinions which can too quickly become "fact" in today's internet world.

The electric airplane is going well. We publish the progress we wish to share with the public here: <http://aeroconversions.com/e-flight/> I think there will be a major update tomorrow.

I began life as a Monnett friend, then early Sonex builder (s/n 9, "Metal Illness", AirVenture 2006 Bronze Lindy Winner, plans built). I was "in" on the Sonex before it was public knowledge and that eventually led to me being hired as the first full-time employee. I've been here almost 6 years and love it! I remember the "old" days when Pete, Ben or Nick would drive down from Neenah, WI with engines in their truck for us to ship to our customers. They were smart, they left cold Wisconsin behind!

We won't be at Sun and Fun. We pulled out last year as the cost to attend vs. the return was too small. We are hearing that from more and more vendors. But I'll miss the Spring break!

I was Air Force as well, though only did four years. B-52 weapons loader in Minot and then Guam in the early 80s. You? Interesting that you sign "Blue Skies", I've been doing that for 10 years! Very similar, you and I.

Blue Skies,

Kerry Fores,

Sonex Aircraft LLC

And now from an early Lightning builder and flyer, **Rick Bowen**:

Hi Buz,

Hope your trip home was a good one...The day looks nice, but winds are kinda' strong.

Maybe you had some kind of tail wind after the trip you had TO SYII!

Hey, I have another newsletter name for you---I attached a little design we did just to give you ideas....

Was trying to say "**Shock and Awe**"...I thought that was a cool name for a newsletter which now will feature the Lightning-but could easily incorporate other planes as Arion develops them.

Of course, underneath the "Shock & Awe", there would be something to the effect of - "The Newsletter for builders, pilots, and dreamers of Arion Aircraft"

Or something like that! Just another thought to think on.

Later,

Rick



Editors note: Readers, what say you about Rick's suggestion?

And now from a long time Lightning lister, **Mr. Scotty**:

First, SYI Skunk Works - - CONGRATULATIONS. You have made a great plane beautiful. There will be more of these awards to come for these planes.

Second, **Johnny Thompson** - - your paint job is close to what I would like to do, when and if my plane gets out of my mind and into reality. See attached picture.

Here is the attachment. It is probably too much paint for the composite material, but I love that paint scheme for some reason. It would probably cost as much as the kit for the paint job. But hey - as the pillow on the couch says, "fly first class or your kids will".



Editor's note: The photo of the boat that Scotty sent is a Fountain Powerboat. This is a "go fast" boat from a company started by Reggie Fountain many years ago. They build their world champion boats near Washington, NC. I visited their factory years ago and their boats are impressive. An interesting fact - they have one model called the "Lightning" that can be had in several different lengths: 33', 35', 38', 42', and 47'. The 35' Lightning list a top speed of 100 mph +. That's impressive.

Other Items:

Below is what I consider a "must read" article. Some recent landing incidents prompted the article and the goal in writing it is to hopefully prevent future similar happenings. Feedback requested.

Landings

and

“How to Prevent Landing Incidents”

a combined effort by

Nick Otterback and Buz Rich

Whenever an aviation incident or accident happens, it seems the first question that everyone asks is, “what happened?” Well, if you look closely at the “bent aircraft” it is often pretty clear what happened. The more important question or questions, certainly when your goal is to prevent future similar incidents, is “how and why did it happen?” In more specific detail, the questions should center on “what series of events led up to the incident,” and “how do we prevent this type of incident from happening again?” Although such things as an “act of God”, a mechanical problem, or even a design flaw can sometimes be the cause, in reality, most of general aviation accidents and incidents boil down to pilot error. The term pilot error covers lots of possibilities, but the bottom line is that the pilot either performed incorrectly (or failed to correctly perform in a timely manner), or exercised poor judgment or decision making skills. Good flight training, both initial and recurrent, plus quality transition training when you are checking out in a new aircraft, are the ways we have to help prevent pilot error. More on that later, but the EAA’s Flight Advisor program was designed just for this type of situation.

Recent Lightning Incidents:

Recently the Lightning community has seen a few landing incidents which are worth discussing in order to learn from them and to help Lightning pilots prevent future incidents. The purpose of this discussion is not to point fingers or place blame, but rather to inform and educate our present and future Lightning pilots, builders, and owners. By reviewing these past incidents we hope to prevent any further landing incidents.

Here is a rundown of the Lightning “botched landing” incidents to date. Three landing incidents have occurred during initial phase one testing, one during recurrent training (owner with an instructor), and one was after a cross country flight. Below we will discuss the specifics of each landing event, but first here are a few words on the damage to the aircraft involved. In each case the same damage occurred – failure of the lower nose gear leg socket on the motor mount and subsequent failures of the nose gear leg itself and damage to the motor mount. Actually, that’s good news from a design point of view. This is how these parts are designed to fail when they are over stressed during a hard landing on the nose gear. The purpose of this designed “crush path” is to prevent a transfer of “over load” stresses thru the entire structure to the cockpit area. In all cases, the Lightning held up very well and no one has been injured. A new motor mount and nose gear leg will fix the aircraft structure and some fiberglass work will fix the cosmetics on the lower cowling.

Arion Aircraft Thoughts:

However, being the proactive and safety conscious company that Arion Aircraft is, we have gone back to the Lightning drawings to insure that some design flaw did not exist. We wanted to be sure that the nose gear leg socket did not fail at a lower load than expected. We wanted to double check for the correct design geometry. To this end, we have spent hours going thru these items again and we are now happy to report that the structural performance of all parts under normal flight operational conditions are exactly as called for in the design.

Having discussed all of the incidents in depth with witnesses and the pilots involved, we have a good description of each event and what caused the incidents. Each event is covered below using a compilation of the pilot's account and eyewitness description of the incidents. Obviously we are not the NTSB or the FAA and these descriptions are not to be held as such. These summaries are for informational and educational purposes only and therefore should only be used only for those purposes.

Specifics on each landing incident:

Incident #1: During recurrent training the aircraft was being flown by the owner and a CFI. The attempted landing took place on the owner's private strip during gusty cross wind conditions. The owner of the aircraft considered the wind conditions to not be good for a landing at his air strip. However, with the encouragement of the instructor, the landing was attempted. The aircraft bounced on the sod runway and came down hard on the nose causing the nose gear to dig into the runway. The nose gear and subsequent parts collapsed. During the incident there was also an apparent total breakdown in crew coordination as it was unknown to either pilot as to who was actually flying the aircraft. The owner did not know if he was to continue the landing or if the CFI had taken control. This aircraft had completed phase one flight testing and had been found safe for normal operations by the owner/builder.

Incident #2: The incident occurred at the end of a longer cross country flight and the attempted landing resulted in a bounce and PIO. The nose gear leg then impacted the hard surface runway, causing its failure along with the related parts. The pilot had sufficient hours in type and conditions were reported as good VFR and light winds. The bounce and PIO were likely the result of not using a full stall landing technique and resulted in the nose gear impacting the runway. This aircraft had completed phase one testing.

Incident #3: The incident occurred during the initial test flight of the aircraft. It was noted by the owner/builder that this was to be the first of two planned "crow hops" to take off and then set back down on the runway by a hired "test" pilot. The aircraft had been run for some 30-45 minutes on prior days to check for leaks and engine tuning. It was noted that all appeared to be smooth except for a rough idle which was thought to be an unbalanced spinner and prop combination. The aircraft was accelerated down the runway, lifted off and when at 5-10 feet the engine began to vibrate severely and the aircraft was set down hard on the turf runway resulting in bent main gear and failure of the nose leg assembly. The hired pilot reported that the aircraft had to be set down for fear of running off the runway into houses. The pilot's account of the event and the owner/builder report of the event do not match, however it is evident that both poor planning and poor judgment was involved. The decision to do an initial flight on a short field, the decision to try "crow hops" on a short field, and the decision to attempt a flight with suspicious engine operation are all questionable. It was later found that a push rod in the #3 cylinder was not on the rocker and was lying in the push rod tube. This was most likely due to improper first start procedures, the pre oil pump up of the hydraulic lifters. Also the owner/builder should have investigated the rough idle situation during ground runs. The aircraft was on its initial flight of phase one testing.

Incident #4: The hired "test" pilot, not the owner builder, departed on a local flight during phase one flight testing. The pilot returned some time later and attempted to land with a 15-20 mph tail wind on the turf runway. The aircraft was witnessed to pass about midfield still in the air at well above landing speed with no flaps. The pilot attempted to land the aircraft on the last ¼ of the runway. Touchdown speed was well above stall and the resulting hard landing on the nose at the end of the runway, caused the failure of the nose gear leg assembly and related parts. It was noted that the airspeed indicator had not worked on previous flights. Once again we see lots of poor decision making and judgment on this incident. Airspeed operation is easy to check on the ground. A downwind landing using no flaps is almost unbelievable, particularly if your airspeed is not working. Not going around when not firmly down within the first 1/3 of the runway is another poor judgment decision. Change any one of these poor judgment items and you probably break the chain of events that led to this incident. The aircraft was in phase one flight testing and being flown by a hired "test" pilot.

Incident #5: The owner/builder attempted to land the aircraft at a much higher approach speed than that called for in the POH. The pilot was unsure if the airspeed system was working properly and reported that the speed over the fence with landing flaps deployed was about 75 knots. The advised approach speed with 30 degrees flaps is 60-65 mph. The aircraft touched down on all three gear legs and bounced; the pilot feared a stall and over compensated with forward stick causing the aircraft to land on the nose gear leg first resulting in its failure along with damage to the related parts. The pilot later related that this incident occurred on an unplanned flight. He had planned a few high speed taxi tests and inadvertently allowed the aircraft to get airborne. The attempted landing (with normal flaps down setting) at a significantly higher speed than recommended was most likely the cause of the bounce. As it is unlikely that the aircraft was actually near stall speed, a go around would have been a better action, instead of the forward push on the stick. The aircraft was in phase one flight testing.

Arion Aircraft Actions:

Arion Aircraft is very proactive about Lightning transition training and the basic aircraft design. As mentioned above, they have completed a thorough review of the nose gear leg mounting design. No problems with the design have been found, and actually the failure mode designed into the system has in reality, kept individuals from being injured by the “botched landings” incidents that have been discussed. After talking with the pilots involved and gathering as much data as we could on each incident it is our conclusion that the problem is not with the design, but instead with how pilots have prepared themselves for the initial flights or, in other words, the transition training (or lack of) that they received before attempting to fly the Lightning. Sport aircraft like the Lightning are generally much lighter on stick forces and react quicker to control inputs than do General Aviation aircraft, and therefore require some amount of familiarity before a pilot attempts to solo. Add to this situation a possible lack of recent flying proficiency and the “stresses” involved on an initial flight and you have greatly increased the likelihood of an incident occurring. (Once again I will mention the EAA Flight Advisor program as the proper way you can prepare for transitioning to a new aircraft and to prepare for initial flights.)

With these thoughts in mind and hoping to come up with some additional recommendations for transition training, we went out to test a few of the situations mentioned above. The aircraft used was our new Demo with one pilot aboard and 10-15 gallons of fuel. As a starting information point, everyone should know that on a relatively lightweight, low wing, high aspect ratio sport aircraft like the Lightning, when you deploy the flaps, the nose will tend to pitch down causing the need for nose up trim to keep stick pressures trimmed off. The more the flaps go down, the more up trim will be required. Now having established that fact, let's look at some “botched” landing attempts that we looked at to try to replicate some of the landings that resulted in the incidents covered above.

Please note that none of the below described “techniques” should be used when correctly landing your Lightning!!!

The first landing attempts were made with 10 degrees of flap and an over the fence speed of 80 mph which is way too fast for a normal landing in the Lightning. These “fast landing” attempts resulted in a touch down speeds of near 70 mph. The aircraft will not land on the mains alone at this speed and must be flown on, touching all three landing gear at once. After a slight bounce the aircraft bobbed down the runway until decelerating below stall and it then rolled out normally. There is not a lot of nose down pitch moment with this amount of flaps and when properly trimmed the aircraft felt neutral and did not porpoise down the runway. With 20 degrees of flaps and the same speed the results were about the same as above, but perhaps slightly more pronounced.

Perhaps now is a good time to review flap operation and the two ways that flaps change the way an airplane flies. Flaps can do two different things to your airplane – increase lift and increase drag. Normally the first 10 to 15 degrees of flaps result in an increase of lift by changing the wing's camber (you now have a different, higher lift airfoil – that is why we recommend 10 degree flaps for takeoff). Many pilots think that flaps will slow the airplane, but the first approximately 15 degrees of flaps have a very

small increase in drag, but an increase in lift that will allow you to maintain altitude at a slower airspeed. When you extend the flaps to 30 degrees or more there is little to no effect on wing lift, but instead, there is a significant increase in drag. Flap extensions of 30 or 40 degrees on the Lightning allow us to achieve a much steeper descent angle on final approach without an increase in airspeed.

At 30 degree flaps, the Demo aircraft (as loaded for this test) did not have enough up trim to fly completely hands off, but remember the Lightning is a light aircraft and with the conditions used during this test (half fuel and one person aboard) the CG was quite forward, resulting in an even greater pronounced downward pitch. So with 30 degrees of flaps, things start to get interesting. When touching down at 70 mph, the aircraft nose, because of the flap setting, is far enough down that the nose gear contacts the runway first. This "nose first" contact causes the nose to "bounce" or pitch back up with an increased angle of attack. Since we have not fully stalled the aircraft onto the ground as should have happened, the aircraft is flying again. Since in this situation you already have excess landing speed and the aircraft's tendency with flaps down to pitch over, there is no need for a stick push but instead, you should add power to execute a go-around. Or, if the runway is long enough, as the nose comes down, simply re-flare the aircraft and land it on the mains in a stalled condition.

The above condition (trying a 30 degree landing with too much speed) is what seems to be the cause for three of the five incidents listed above. Couple this extra speed in a light aircraft with a forward CG, and a pilot that does not properly react to the situation, and you have a very high probability of a landing incident.

For additional testing, we explored "full stall" landings at 1-3 feet above the runway. This was to determine how the aircraft would react - would it "bounce" back up and try to fly again, or would it stay on the ground? We also wanted to determine the actual attitude of the aircraft in a "full stall" condition at various flap positions. The reason for this experiment was to dispel the thought that some pilots were reluctant to land in a stalled condition for fear of a tail strike. In each situation during this test the aircraft was flown at 60-65 mph over the fence, a normal flare was executed and the aircraft held off the runway until it stalled between 1-3 feet above the runway. In each case when the aircraft stalled it touched down on the mains first with the nose following. There was no resulting bounce back into the air as the aircraft had quit flying and the gear had done its job. There was also no "tail strike". The only way to get a "tail strike" is if you have excess speed (energy) and pull the stick back fast enough that the pitch attitude changes quick enough to cause the strike. Note: The above examples are not the preferred way to land your airplane; they were done as test situations only to simulate some of the landing incidents covered above.

Arion Aircraft Recommendations - some suggestions and tips on how to properly land a Lightning:

- First off, airspeed control is very important in the pattern and especially on final. Hey, I bet you have heard that before.

- Good speed control in the pattern leads to good speed control on final (and therefore in the flare), and that's exactly what you are looking for to achieve consistently good landings. Most pilots that we have given transition training to have initially had erratic speed control in the pattern and tended to be too fast. Being fast in the pattern results in large patterns and often dragged in final approaches. Both of those situations are not good.

-Being fast in the pattern often leads to being fast on final and in the flare. Therefore, most people are trying to land their airplanes too fast. Several things can happen if your speed on final and in the flare is too fast. First off, if you try to fly the airplane onto the runway at a speed above stall you stand the chance of bouncing back into the air as discussed above. Or if you try to hold the airplane off the runway until the proper speed, you will use up lots of runway. And speaking of that, does everyone remember

the “old” saying, “if you are not firmly on the runway by the first third of the runway, go around”. If you follow that advice you will probably never run off the end of the runway as some have done.

- Next, whatever happened to full stall landings? Sure, with a nose gear aircraft you can often get away with a fast touchdown, but in doing so you are increasing the chances of a bounce as covered above. For a normal landing a full stall situation should be what you are looking for – you want to touch down with as low a speed as possible so you stay on the ground and you have dissipated as much energy as possible. One theory to get good landings is “instead of trying to land, you should try not to land.” That causes you to continue increasing back stick to hold the aircraft a foot or so off the runway until you have dissipated the speed until it touches down at the stall speed. (Note: Heavy crosswinds can be an exception - not only to speed in the flare, but in the amount of flaps used. Discuss these situations with your transition instructor).

- What does the proper landing attitude look like? When instructing in tailwheel aircraft we have the transitioning pilot sit in the cockpit and “memorize” what the three point attitude looks like (the three point attitude is the proper landing attitude for a full stall landing in a tailwheel aircraft). Why? Because that is the picture the pilot should be looking for at touchdown. The same technique will work in a nose wheel aircraft. Have someone push the tail down to the landing attitude while the transitioning pilot is in the cockpit. While in that position the transitioning pilot should memorize what the landing attitude looks like. Note where the horizon meets the canopy or panel – then look for this picture during landings. This “picture” can also be demonstrated by the checkout pilot by doing the first few landings as the transitioning pilots learns what to look for.

-Here is one final suggestion for teaching good landings and what the proper full stall landing picture looks like. I use this teaching technique when transitioning people to my Cub. First, find a long runway and have the “student” fly a normal landing approach. Then when just before a normal touchdown (only a foot or so above the runway), have them add just enough power to transition to slow flight just above the runway and just above the stall. Sound easy? It is probably a little more difficult than you think, but after mastering this exercise, by controlling pitch and power, you will begin to realize what the full stall landing picture looks like and that picture will probably require you to use your peripheral vision as the nose attitude may be too high to see straight ahead. (Note: Once you have perfected this exercise in calm winds or winds right down the runway, you should then practice it in crosswind conditions. This will perfect your rudder and aileron inputs when executing crosswind landings.)

EAA Flight Advisor Program:

Now that we have discussed the Lightning landing incidents and made recommendations as to how to prevent them, let’s talk a bit about how to go about preparing yourself for your transition into the Lightning. As a long time EAA Flight Advisor (and Technical Counselor), I want to encourage you to take advantage of the Flight Advisor program. Most EAA chapters will have a Flight Advisor, but if your chapter does not, or the one in your area does not have experience with the type of aircraft you are preparing to fly, you can check with EAA to find an advisor to work with you. The web address is: <http://www.eaa.org/flightadvisors/>

A Flight Advisor helps the pilot conduct a self evaluation as well as an evaluation of the flying characteristics of the aircraft. The pilot then uses that evaluation to decide whether he or she is capable of flying that airplane. If not capable, the Flight Advisor explains where and how he or she can get the proper instruction, or alternatively find someone to make the initial flights. So if you have recently completed your Lightning (or any aircraft, experimental or certified, that you have not flown before) I highly recommend you use the services of an EAA Flight Advisor.

Perhaps during the building period you did not take the time to stay proficient, or maybe you are getting back into flying after a long layoff, or you are transitioning to a new type of aircraft. In either case, now is **not** the time to let your “EGO” get into the way – ask for some help and recommendations. The Flight

Advisor can help prepare you to safely make those first flights successfully. Obviously, recent “hands on” proficiency is very important. Lots of past experience is a big plus (especially with your insurance company), but when something is "not quite right" it is often the recent hands on proficiency that comes into action - or perhaps "reaction" is the better word. Not just reaction time, but how your "hands" react to what your eyes are seeing. Past experience in lots of different aircraft will help tremendously, but recent hands on flying time in a similar reacting and similar flying airplane is just as important, if not more so.

It has been well documented that the accident or incident rate on the first few flights in experimental aircraft has gone way down since the Flight Advisor program was started many years ago. Based on those statistics, often insurance companies will not even cover the first few flights if the Flight Advisor program has not been used. I really do believe in the Flight Advisor program and have had a 100% success rate with those I have "advised". The real key to preparing for the first few flights is having the pilot evaluate his (or her) own personal capabilities and that take into consideration past experience, recent currency, and recent proficiency in a similar aircraft. Once that is done, the pilot and the Flight Advisor can come up with a program to prepare the pilot for that first flight. Ideally, the pilot can get some time in the same type of airplane, but if that is not possible, the Flight Advisor can make recommendations as to what other aircraft would make a good transition trainer.

Once you are ready for that first flight, the Flight Advisor will also have recommendations on how to plan for that flight and what the specific flight profile should be. Actually, that was the topic of a presentation at last year's first ever Lightning Fly-In at Shelbyville. We may cover that again in the future.

Fly safe,

Nick and Buz

Final Thoughts:

From National Geographic we learn that lightning is a **giant discharge of electricity** accompanied by a brilliant flash of light and a loud crack of thunder. The spark can reach over five miles in length, raise the temperature of the air by as much as 50,000 degrees Fahrenheit, and contain a hundred million electrical volts.

Some scientists think that **lightning may have played a part in the evolution of living organisms**. We do know for sure that the **Lightning Aircraft** has played a major part in the evolution of Sport Aircraft and the “ultra intelligent” living organisms that chose to build and fly them.

Blue Skies,

Buz Rich

N1BZRICH@AOL.COM (Contact me directly for newsletter inputs – I need your help to keep this newsletter both interesting and informative.)

