



Hangar Talk

The “Lightning” Newsletter

May 2009 - Volume 2, Issue 5



Dick Cleavinger’s – “Lightning of the Month”

Please submit a photo of your Lightning for future “Lightning of the Month” consideration.

The goal of the newsletter remains **to get the word out** on happenings at Arion Aircraft, and **to give a voice** to Lightning builders and flyers. To be successful we will need inputs from you 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 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.

Contents in this issue:

Page	Page
2 -Sun ,N Fun Report -	23 - Upcoming Events -
8 -News from the Factory -	24 - Lightning Skunk Works -
15 -News from the Dealers -	25 - Technical Tips -
19 - Current Lightning Dealers -	26 – Engine Clinic / Reader Feedback -
19 - News from Builders and Flyers -	30 - Special Feature: Air to air photos -
22 - Flight Safety -	31 - Final thoughts -

And now, the rest of the news.

Sun 'N Fun Report:



This year's Sun ,N Fun fly-in was a great event for a number of reasons. The weather was outstanding, overall attendance was good, and the Lightning team had a constant stream of interested shoppers and potential customers at their booth and in their Light Sport Mall display area all week long. As far as I know, **World Record Earl Ferguson**, from the Atlanta area, was the only Lightning to fly in, but **Allan Maxwell** from Louisiana was also there in his Esqual.

Overall, we had a good turnout of Lightning builders, owners, and those interested in the Lightning at the Friday get together and corn roast. It is always great to meet and talk to others on the Lightning list and to share ideas and thoughts about this great aircraft. If you missed Sun ,N Fun this year, start planning now to be at Oshkosh and then at the September Lightning Fly-In at Shelbyville.

Below are just a few of the 200 plus photos that I took during the week. I will add comments to some of the photos, but most are self explanatory. I hope you enjoy the week in review of Lightning-related photos from Sun ,N Fun.



Left is the Esqual "LS" (Lightning Stuff) and to the right, Allan's Esqual "SL" (State of Louisiana).

When I arrived in **N31BZ** on Friday the 17th of April, there was an RV-8 just tying down, so I was the second homebuilt to arrive. There were several vintage aircraft already parked and camping in the vintage area at that time. I actually got the better parking spot, the same place I had parked in years past - right in front of the Homebuilt Registration building. **Allan Maxwell's** Esqual is shown above parked just one row behind where I was parked. I had tried to save some parking spaces for Lightnings, but none showed up until **World Record Earl** arrived Thursday after the afternoon airshow. He then proceeded to take a 30-minute taxi tour of the Sun ,N Fun grounds even though I was standing right by the arrival taxiway entrance to the homebuilt parking area, not 20 feet from him, waving my arms for him to see. You know Navy pilots; they always turn left - very predictable. Anyway, when he came taxiing back to the homebuilt area some time later, I got him parked just behind where I was, so it all worked out.



The Lightning team from Tennessee flew into Lakeland on Saturday afternoon. **Nick and Dana** flew the newly certified SLSA LS-1 Lightning and **Mark** flew the silver demo.



The brand new LS-1 Special Light Sport Lightning.

They set up both display areas on Sunday, with the primary one behind the FAA building and the other one in the Light Sport Mall area. This year the Light Sport Mall was just inside the main walk in gate. The Green Landing crew had one of their customer's Lightnings on display in the main Lightning booth. The newly completed white with green trim Lightning belongs to **Bob Haas**, and it is an excellent example of the quality work that has come to be expected in every experimental amateur built Lightning from all the dealers.



Below is a photo of the crew unloading the trailer and another shot of the LS-1.



This is **Bob Haas**'s newly completed EAB Lightning. **Ryan** and his dad flew it to Lakeland to be on display in the main Lightning booth. **Bob** was there to see and hear all the positive comments that his new jet received from the many spectators.



Before the show officially started on Tuesday, they all took a side trip to Fantasy of Flight on Monday.



In the Light Sport Mall area, N325AL, the new ASTM-certified Special Light Sport Aircraft Lightning LS-1, has a constant crowd looking at it and taking photos. **Dave Jalanti**, the Lightning dealer from New York, can be seen below explaining that the LS-1 is the best performing and best valued SLSA on the market.



During the week, **Pete and Ben** gave several forums on the Jabiru engine. Each was well attended and helped to explain how to install, operate, and maintain this excellent “real” aircraft engine. The Rotax dealers like to brag that their engine is used by most of the light sport aircraft. What they fail to explain is that most current light sport aircraft started life as a European microlight aircraft some time ago and there has never been a Jabiru engine dealer in Europe.

Below are two photos of **Pete and Ben** during the Jabiru engine forums. Note that **Ben** has started to wear a cowboy hat which is kind of fitting since his new tactical call sign is **Maverick**. Ask him why.



Because of some unfortunate oversight, a forum on the Lightning aircraft never did get scheduled. Hopefully, this will be corrected for next year. The Lightning forum at Oshkosh was very well attended last year and I am sure that Sun „N Fun will be no exception. For many major fly-in attendees, the forums are one of the most efficient ways to gather information on special topics and I am sure that future Lightning customers would benefit greatly from a Lightning forum.



Above are two cool dudes.

One of the highlights of the week for Arion Aircraft was to be the official press release to announce the newly certified SLSA Lightning. Here are several photos taken during that event.



Although four or five members of the aviation press showed up to cover the event, none of them showed at the exact appointed time; they seemed to just wander up when it suited them. That really surprised me, and it ended up being several mini press releases instead of a major event. I guess I figured that



professionals, in any field, would be, well, more professional. I guess the military in me is starting to show, so enough said about that, but hey, bombs on target **on time**; everything else is bravo sierra.

These next photos are from the Friday corn roast get together at the Lightning booth. As previously mentioned, this is often the highlight of the week for many Lightning enthusiasts as it gives them a chance to meet other "listers" and exchange building and flying information. I wish I had been able to take more photos during this event, but that roasted corn sure was good.

Nick and Dana welcomed everyone and introduced the Shelbyville crew and the Green Acres gang.





Above, standing from left to right, are **Ryan, Al, Clair, Mark, Moostang Mike, and Tom the Thumb. Dick**, the Lightning high altitude expert from Colorado, is lower than the rest in this photo.

Below are some of the best looking guys at the entire fly-in: **Bear, Big Jim, and World Record Earl**. They paid me big bucks to say that. They know it pays to advertise.



Bear and Big Jim



World Record Earl

Most people don't know that besides his home near Atlanta, **World Record Earl** also is living the dream of living with his airplane and has an airpark home right at the Lakeland airport. This photo shown him resting in front of his home and reading the latest Sun „N Fun news. What a life!

And for any new readers, yes, **Earl** really does have a world record that he flew in his Lightning. Check back to issue 1-5 of the newsletter (June 2008) to read **Earl's** world record story.



News from the Factory:

SLSA “Lightning Sport” Update:

This part of the newsletter was written before Sun „N Fun, so the photos and info are from before the LS-1 was completed. However, I think you will still enjoy the photos of N325AL being built. This first photo shows the neat engine installation and the painted air intake ducts. That makes for a great impression when you take the top cowl off during an airshow.



In the past, several Lightning builders have added tie down points to their aircraft. In most cases, the tie down rings are large and thus somewhat obtrusive looking and heavy. Below you can see the solution that **Pete** came up with for the new LS-1. This tail tie down ring is what the Jabiru aircraft has used for some time. As you can see, it is much smaller, but just as strong as the larger ring version that has been used in the past. The Lightning guys will be making this tie down ring available in the near future.



The photo below shows the entire Lightning crew working hard to complete the LS-1 so that it could be inspected and have its time flown off prior to Sun „N Fun.



All of the performance flight testing at light sport parameters for the LS-1 POH and most all the ASTM flight tests for SLSA certification were flown in the current silver demo Lightning with a light sport prop and loaded to the light sport limit of 1320 pounds. There were a total of 25 specific flight profiles that were required for ASTM certification. The only profiles that were not flown in the silver demo were the various spin tests at all CG locations and all flap configurations. All of the spin test flights were flown in the prototype Lightning since it is fitted with a ballastic recovery system. In a future newsletter, or in several

newsletters, I may publish the write-ups on some of these flight tests. I say some, because some of the flight test were pretty benign and not too interesting. The other write-ups may be useful for learning how the Lightning reacts in various flight conditions and even help build confidence in the aircraft since there were absolutely no unusual issues encountered. It is a very well behaved airplane. I love the way it flies.

Finally, you may recall reading the below message on the Matronics list that **Nick** sent out about the first flight. For future newsletter readers, I am going to post it in this issue:

Group,

The Lightning Sport LS-1 Flew for the first time on Saturday, 11 April, under an R&D certificate. The aircraft performed as expected, flew hands off, with only a minor tuning adjustment required for the carb. Initial stall test show a clean stall of 36 knots @1220 pounds, so 45 knots or less should not be a problem with another 100 lbs on board. Will keep ya'll updated and should see the FAA on Wednesday for final S-LSA approval.

Nick Otterback

NOTE: Nick called me at home on 15 April to let me know that they had just received official approval/certification for the Lightning SLSA. So Lightning LS-1, N325AL, is the first (certified, turnkey, store bought, ready to fly - you insert the adjective that you like) Special Light Sport Aircraft from Arion Aircraft. Congratulations are in order to all the Lightning gang that worked so hard to make this happen.



N325AL on the ramp in front of the Arion hangar just after the first flight on 11 April 2009. This flight and the next five hours of flight test were under an R&D certificate. Then on 15 April 2009, an FAA representative looked over all the paperwork, the flight test reports, the pilot's operating handbook, the maintenance manual and the aircraft itself and officially granted an ASTM Special Light Sport Aircraft certification. Now you can buy the best SLSA on the market for \$93,900 for the rest of 2009. Mission accomplished. Well done, Arion team.

Lightning LS-1 Light Sport Aircraft

Performance:

Maximum Speed	140 knots
Cruise Speed	120 knots
Vne	180 knots
Stall (Full Flap)	38 knots
Stall Clean	44 knots @1320lbs
Glide Ratio	17:1
Take Off Roll	400ft
Landing Roll	500 ft (with brakes)
Climb Rate	1200 ft / min
Roll Rate	100 degrees/second
Maneuvering Speed	87 knots
Endurance	4 hr
Range w/ reserve standard tanks	600 sm
Engine	Jabiru 3300
HP	120
Fuel Burn	5.5 GPH

Specifications:

Wing Span	30" 6"
Length	20" 8"
Height	6"6"
Cockpit	41" at shoulders
Width	42" at elbows
Wing Area	102 sq ft
Empty Wt	800 lbs
Gross Wt	1320 lbs
Fuel Capacity	22 gallons / 30 optional
Brakes	Independent Hydraulic
Rudder Pedals	Adjustable even in flight
Construction	Vacuum infused oven post cured fiberglass
Flaps	Electric Std
Trim	Electric Std
Max Loading	+4 G, -2.0 G
Canopy	Forward Hinged Tinted



Lightning Sales and Factory Assist Build Updates:

Carl and Pat Beatrice's Lightning made its first flight on 5 April 2009. Hopefully they will write an article for the newsletter on their build experience, but until they do, I will include a few photos that I made while I was in SYI. Most of the photos are not all that unusual – first engine start, owners standing by their newly completed jet, etc. – all normal happenings for the Shelbyville crew. But the next photo is a first, at least as far as I know. **Carl and Pat** had a local priest come by the Lightning hangar and “bless” their airplane. You can see by the photo below that it was a very serious occasion. I think all the folks present that day were impressed.



This photo shows **Mark** wiring up the instrument panel on N767CP. **Mark's** work is always first class – he is a real craftsman. In fact all the work that comes out of the factory shop and their dealers is right up there with EAA award winning standards. Super job!



Some more photos of **Carl and Pat's** newly completed Lightning:

Mark Stauffer makes first engine run on N767CP.



Carl and Pat Beatrice with their new jet – first flight was just after this photo on 5 April ,09; it really did fly hands off.

Carl working on installing his wheel pants. I talked to **Carl** while I was at Sun „N Fun. He reported that he was about 16 hours into the FAA phase one test program. He said he loved the way N767CP flew.



For some reason, I ended up without any photos of **Katie** in this issue, so I am including this one of her in the right seat of the silver demo Lightning giving some transition training to **Carl Beatrise**. The photo was made by **Pat Beatrise** from the right seat of N31BZ.



Dave Jalanti, the Lightning dealer from New York (Lightning Northeast - Jabiru Power Solutions, LLC) was also in Shelbyville building his new demo aircraft while I was there in March and early April. In the photo below Dave is working on his bottom cowl.

This “teaser” photo is an attempt at showing the colors on **Dave’s** jet, a beautiful combination of a burgundy maroon and gold. As you can see, the photo certainly does not do the colors justice. It is going to be another “eye candy” airplane.



News from the Dealers:

From Lightning Southwest:

Johnny Thompson sent in the following article about **Greg Hobbs' Build Center** that is located at **18750 W AVRA VALLY RD, MARANA, ARIZONA, 85653**. I think you will be impressed with the outstanding facilities, service and hospitality that Greg and Crystal have to offer builders in the southwest.



Wow, how about this for a fun place to build a Lightning.

Greg and Crystal Hobbs' Lightning Southwest build center is located on forty acres of beautiful Arizona desert and has its own 2880 foot long by 60 foot wide packed clay private airstrip. They are surrounded by the 190,000 acre Ironwood Tree preserve, with many varieties of desert cacti, including the majestic saguaro. And did I mention some unbelievable sunsets that belong in the Arizona Highways magazine. Currently seven aircraft are here with plenty of room to have two builder assists at the same time.

A weight room, guest kitchen area, and 100 degrees spa are available for our builders and potential buyers that are waiting for their demo flight. Guest rooms are equipped with VCRs and disc players so that you can take advantage of our 500 movie choices. Demo flights usually come with home made cookies.

We are never late for work – we live here. Guest facilities are at no charge for those who buy their kits from Lightning Aircraft West and build at our center.



This guest room has two queen beds, and a private bath/shower bathroom.

A guest room not shown is the Buffalo Stampede room with a queen and a double bed.

Carl is a painter with 15 years of experience. He has worked for many companies, including Lear jet, and currently owns his own company specializing in custom painting - www.hughsmotoart.com.

Carl's paint shop can do amazing things with paint that most other painters only dream of. He often works with pearl paints, candies, and airbrush art. This picture is of our paint booth located in the hanger.



Aircraft interiors are also done on site to customer's tastes. From leather to cloth, fancy or plain, our gal Janneen can do anything you want to make your plane, stylish, and comfortable.



Greg and Crystal say "Come join us on site at our home where you will eat at our table and be part of our family. This is a reflection of how we view our lives - building the Lightning and soaring with the eagles. Life is good."

From Lightning Australia:

The new Australian Demo Lightning had its **first flight on 23rd of March** and all went well.

Regards,
Dennis & Angela Borchardt
Lightning Aircraft Australia



Two more photos of the new Australian demo Lightning.



From Green Landings:

Bob Haas' Lightning flew for the first time on Sunday, 12 April, 2009. It was on display at Sun „N Fun.



Now that you have seen Bob's airplane in the opening Sun „N Fun section and in the above photos, have you noticed anything different? Check out the tips. He put new tips (without the extension) on the short wings. Looks great.

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, WV, 304-754-6010, www.greenlandings.com



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



Lightning Northeast - Jabiru Power Solutions, LLC, Dave Jalanti, NY, dave@jabirups.com



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



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



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



Russia and CIS – AVIA-NIANIA, Moscow, Russia, + 7495518-62-75, avianiania@mail.ru

News from Builders and Flyers:

Paul “Bear” Bryant sent in the following pilot report on N82PB:

PIREP from N82PB: 03/30/09 18:10L

Performed preflight; Autopilot display loosing pixels and backlight intermittent - noted (get RMA from Trutrak and return), right aileron making rubbing noise - removed right side inspection plate and noticed aileron push-pull rod rubbing against Pitot tubing - adjusted tubing - cleared.

Preflight complete. Got ATIS-winds perfect, nice vis, looks like I'll have to taxi a little for a 35R departure. Contacted ground, cleared to taxi to Runway 35R intersection M departure - negative class B today. Mmm. Little wheel shimmy on the taxi-Noted- need to check that-Lightning group has been talking about it. What's this? Magnetic heading off about 20 degrees. Need to check all directions; probably needs magnetometer calibrated. GPS up and running. Taxi complete, now Run-up: complete all in the green. Over to tower: ready for takeoff. Cleared 35R. Nice smooth take off, right rudder, speed check - rotate - yep light winds. Start my turn to the beaches. What's that from the tower? Ahhh traffic 12 o'clock 3 miles SE bound; good had that on my TAS, but now I know location. Cleared traffic. On my west bound heading now – mmm, mag heading off about 22 degrees. Watch altitude 1200 ft, keep below Tampa class B until I get to US 19. All instruments in the green. Ok slow climb to 3000', 100 MPH, trim it up. There you go. Fantastic view - 20+ mile vis. Clearwater Beach off the nose. Not a ripple in the air...alright, a north bound heading...mmm, mag heading only off by 5 degrees. Auto pilot on, capture heading and alt hold. Ahh, perfect. Ok turn back to the south. Check GPS heading south . Mag heading 190. Ok slow turn back to the west heading now should be 270. reading 300....over to the east 090, reading 120....OK got to calibrate the magnetometer. Let's turn on the moving map and check out the XM

WX. Seems to be clear in all directions...scan out to 300 miles, still no WX. Ok lets turn on the terrain warning. Ahh, nice display; green and blue; no reds or yellows...lets descend and see if I can get this to change. OK there's some towers out there and I'm about 600 feet off the ground. Oh what's this alert: "obstruction" ok acknowledged it. Look outside: radio towers-cool. Sun is almost on the horizon- what a beautiful evening...OK ATIS on, got it, contact tower, report right base for runway 17L, squawk 0137. Get back below the class B airspace...from tower keep speed up, aircraft on 5 mile final runway 17L....keep my speed up...hey this is a Lightning! From the tower, Aim for the numbers clear to land number 1.(of course I'm number 1). OK check speed, alt, flaps. Carb heat on slow it down, drop flaps. Got the VASI, high. Drop flaps down to 30 degrees, watch the speed, keep nose down looking good. Traffic behind me cleared to land so I better make this a good landing.(I better make them all good). OK full flaps, nice speed, more wind then reported. Wind check: 200 @ 11, That's not what the ATIS reported. OK adjust...nice alignment, good speed, nose down. 100', 75', 50' 25' 10', flair, hold it off...hold it off...touch down, nice roll out...tower, exit Lima contact ground 121.9...ground then took me to places on the airdrome I had never seen before, but I got back to the "landings" fine.

Logged 1.3 hours; total time on the bird 35.1 on my way to 40.

What a nice flight and now I've got a few things to work on.

Bear



The following came in from Johnny Thompson. Look at the fantastic work.

While waiting for my new wings we thought it would be a good time to complete the mounting of the wheel pants and leg fairings.



Sometime back **Greg** had started inserting the leg fairing into the wheel pant which gave it a more secure joint and cleaner look. Others may have done this but just thought I would pass this along for those like myself that did not know how to do this. It takes quite a while to cut the slot in the wheel pant, slowly start with the rear section first (ONLY after you have completely finished mounting the wheel pant). Before starting to cut I realized the fairing must also be fitted to the exact location and have a way to remove/installed and be sure it is in the same place each time.

I cut the piano hinge into two pieces which allowed me to insert an upper and lower pin into fairing. It also had allowed me to remove the fairing while leaving the pants installed which made it a lot faster to cut the opening in the pants. I left this modification in case I would ever like to remove the fairing without removing the pants.

At the top of the fairing to fuselage I drilled a 1/8" hole into the fuselage that when the hinge pin is inserted the upper fairing is held into the same place and will not move in flight. Later I enlarged the hole and inserted a 1/8" brass tube insert to prevent the pin from wearing through the fuselage glass.



End Results:



I like the fit and the fairing is very secure. Originally I had made the fit very tight causing the wheel pants to slightly bend with pressure against the fairing. Rubbing is not good as it turns into holes so I took off the pressure and gave some clearance for movement. Let you know if it works.

Final wheel project. I took a left over piece of the leg fairing and made a covering for the axel. I built the end from floc (sp) and inserted a 1/2" pin that goes into the axel when fitted. Will let you know how this works out.

Johnny Thompson, Tucson, Arizona



Flight Safety:

The following message came in from Johnny Thompson, one of the Arizona gang, and in it he helpfully shares information of a safety aspect that could save someone's life or airplane. I thank Johnny for taking the time to write this up for the newsletter. Take heed and learn from Johnny's incident.

Thought I would report on an explosion in the left wing tank of my lightning while I was dusting the dirt off the wing last Wednesday.



Around 7:30 am I had my plane outside in the sun so I could do a final polish of the newly painted cowling and also improve the appearance of my year old paint on the remainder of the aircraft. I completed the polishing about 8:30 am and moved the plane back into Greg's hanger where I was going to reweigh it because of the new paint. Last year I had defueled the aircraft and removed the wings so I could install a new type on low fuel warning system that is independent of the current fuel probes. NOTE: This is not required for safety, I just do it cause I like to have something to do and being a retired military pilot (Army) I am use to triple backup systems and lots of lights and switches. I use the standard fuel probe with GRT, the fuel flow from GRT(which I recommend for those who like to fly long distance/hours), and the new electronic optical system that will visually and audibly note when the fuel take is below 2 gallons in left, right or both tanks. I do have a 4th warning system for low fuel if all this fails, the prop stops.

Around noon after the aircraft had set untouched for over three hours I took a polishing rag I normally use to clean the canopy, 80% Polyester - 20% Polyamide, and started to dust off dirt that had settled onto the wing from a wind storm we were having. I started outboard moving inboard, as I touched the fuel cap (cap was installed and locked) the tank exploded. I felt and saw the top skin rise, a 6 foot section of the top skin on the trailing edge split at the glue joint and flames came out removing the hair on my arm and embedding fiberglass in my glasses. As seconds passed I noted the fire was out and then remembered it was defueled.

After about 10 seconds I composed myself and noted the top surface could be rejoined, not too bad. I then looked below and knew I had just bought a new wing. The tank had ruptured outboard (can't see where else) and the wing had numerous large tears and cracks around the tank area.

This was an accident caused by static electricity, a rare one. I have been in aviation professionally for 40 years, as a pilot, military and civil test pilot, R&D, trained aviation accident investigator, Maintenance officer and A&P, aerospace engineer. I might have been able to prevent this by having the aircraft grounded, using a rag of different materials, properly removing all fumes from the tank, etc. Please note, tanks are more prone to have an explosion when low or empty of fuel. Weather is also a major factor.

I got off lucky. We can reduce the possibility of this happing to any of us. I will review everything, test static transfer between the fuel cap and housing and try to come up with a solution if necessary. Please

note, if we just follow good safety procedures this most likely would have never happened. A DEFUELED TANK IS A BOMB WITH THE SAFETY OFF.



These photos show the wing trailing edge and the bottom area under the fuel tank.

I would like to add that the lightning is an excellent structurally designed aircraft. I am positive that if I had this damage in flight the aircraft integrity would remain sound and make a safe landing.

I want to thank Nick and Pete for helping me with replacement parts at a very reasonable cost. Once again I see Arion going the extra mile to take care of the lightning family even in these difficult financial times. I have had over 15 aircraft in the past and Arion support is at the top in support and service.

I will follow up with recommendations

Johnny Thompson

Note: When Nick first got the phone call on this from Johnny on 1 April, because of the unusual nature of the incident, I actually thought the Arizona gang was playing an April fool's joke. Alas, it really happened. We can all learn from Johnny's "happening" and hopefully never need to make an unusual phone call to Nick.

Upcoming Events:

15 - 16 May - Jabiru Engine Seminar at Shelbyville, TN.

30 - 31 May - Virginia Regional Festival of Flight.

27 July - 2 August - Oshkosh AIRVENTURE.

25 - 27 September (most likely date) - Lightning Fly-In at SYI.



Lightning Skunk Works:

I have two secret skunk works photos for you this month:

First, the new Jabiru 1100 40 HP engine.

Up to this point, this new engine has been kept completely under the wraps by the Jabiru engine factory, not because it was such a totally new concept, but because the Jabiru engine folks just didn't want the word to get out until they were ready to make a public announcement as to the availability of this new engine. This project has been under development for some time, but until now no photos or details were available. So, you can say you saw it here first. Ladies and Gentlemen, the **new Jabiru 1100**; a two cylinder 40 HP engine.



Next, **Mark Stauffer** tries out the back seat of the soon to be introduced **Lightning "FM"** (Family Model). It will be future competition for the RV-10. Order yours now. November Oscar Tango.

Technical Tips:

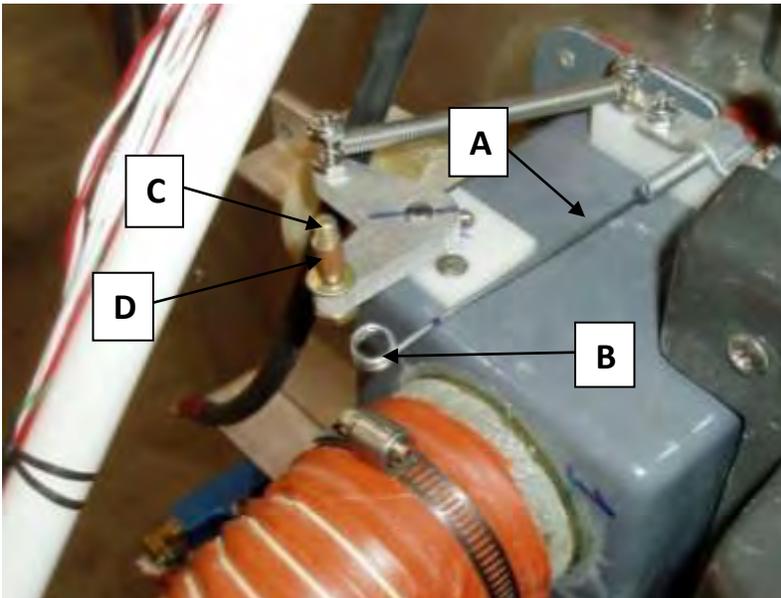
This month we have two technical tips: some additional info on **wheel pant experiments** and a **new way to connect choke, carb and cabin heat cables**.

First, **Dick Cleavinger** has been experimenting to improve a gear leg shimmy situation that he sometimes has. His latest efforts have involved balancing his wheel pants. The photos below show the right wheel pant after balancing, and you can see that Dick has it pretty well evenly balanced. So far Dick reports mixed results, but is continuing his efforts. More to come.

Dick Cleavinger, N213RC, Lightning #42.

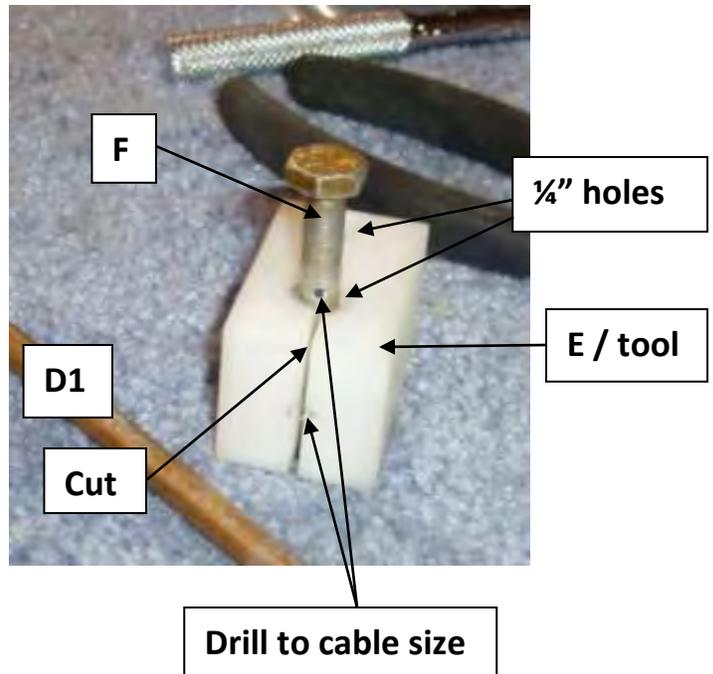


This next tip comes from the Jabiru builders at SYI. I think it was from Mark "Possum" Phillips.



Instead of using solder to secure the choke, carb or cabin heat cables (A) to the actuator, they have come up with a more secure way to coil (B) the end of the cable so that it fits around an AN-3 bolt (C) with a bushing (D) over it. This bushing can be made from aluminum or copper tubing (D1) that fits over an AN-3 bolt.

The process requires that you fabricate a new tool (E) made from nylon or other hard plastic material. The nylon block tool (E) has two ¼ " holes in it, one to accept a modified AN-4 bolt (F) and the other to allow some play when coiling the cable end. The tool is also cut as shown in the photo all the way to the second ¼" hole and the center of the cut is drilled to allow the cable to run through to the modified AN-4 bolt when it is inserted in the tool. The AN-4 bolt is modified by center drilling it to accept the cable.



To operate the tool, insert the cable end to be coiled into the small hole drilled into the tool and into the hole in the AN-4 bolt. Then clamp the tool closed to hold everything in place. With a 7/16 wrench turn the AN-4 bolt head until you have 3 or 4 wraps to form the coil. Remove the clamp and cut off the short piece of cable that is inside the AN-4 bolt to free the coil you have formed. You can use a Dremel cutoff wheel to make this cut.

Of course the key to successfully using the tool is accurate measurements. I suggest a practice coil or two on a spare length of cable to see what specific measurements you will need. Once you have the measurements, and mark where the coil should be, the same measurements from that mark should work for every coil you make.

Describing how to make this tool and the actual use is much easier if you can watch someone use one. So the next time you are in SYI, have them show you the tool and watch them make a coil. Once you see the tool in action, you will quickly understand the steps required to form the coils. Do I have you all confused now? Probably, but it really is a slick tool and a great way to insure the cable ends do not come loose.

Engine Clinic:

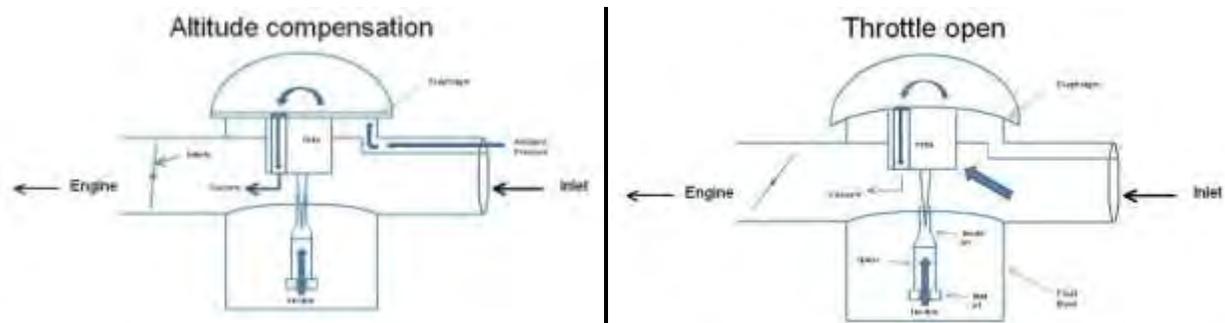
Last month we started a new section to the newsletter: **The Engine Clinic**. Below is the continuation of Pete Krotje's initial article for this section on the Bing altitude compensating carburetor. I invite all of you to submit future Engine Clinic articles so that this section can become a permanent part of future newsletters. Now, here are Pete's latest words of wisdom.

Now that we know the forces that work together in the carb to regulate the mixture, let's look at how those forces are influenced by outside factors.

When a Jabiru engine leaves the factory the carb is set up for use in a Jabiru airplane with a Jabiru propeller. The outside factors acting on the engine, then, are the airframe and the prop. We all know that each airframe has its own characteristics and each prop is different from another. These two factors are what put the load on the engine. The prop loads the engine based on its length, pitch, and blade design. The airframe loads the engine based on its weight and drag. Therefore each different combination of prop load and airframe load may require a different carb setup to allow proper mixture delivery.

Keep in mind that when I say "carb setup" I refer to the combination of jets and needles in the carb itself.

A higher load on the engine will influence the carb forces to produce a richer mixture. To illustrate let's visualize an aircraft in level flight at cruise power setting. Now, put more load on that engine by raising the nose. More load is put on the engine. If we want to maintain the same rpm we must open the throttle. When we open the throttle the butterfly opens farther. Remember last month that we said that the vacuum to the top of the diaphragm was shielded from the carb by the butterfly so opening the butterfly will decrease the shielding and increase the vacuum force to the top of the carb. The result is a diaphragm that pulls up farther drawing the tapered needle out of the needle jet – allowing more fuel to pass.



If we are still at the same rpm we are using the same amount of air but more fuel is allowed through resulting in a richer mixture.

Let's compare two aircraft – a Lightning and a Zenith 701. There is no question which airframe has more drag. If we use the same prop, that prop will deliver the same load to the engine and the only difference is airframe drag. To achieve a level cruise flight at 2700 rpm the throttle on the Lightning will be quite far closed from normal cruise rpm. However to pull the draggy Zenith along more power is required, hence a more open throttle. The more open throttle will cause a richer mixture. The conclusion: a Jabiru engine on a Lightning cannot have the same carb setup as a Zenith 701. Any combination of airframe and prop that puts a different load on the engine (causing a different throttle position) will require a different setup.

Now that I've said that, I need to backtrack and note that there is another way to make the load match the carb setup and that is to change the propeller. Different props place different loads on the engine so all we have to do is find a prop that delivers the load that matches the carb setup. Obviously this would have to be a prop with far less pitch on the Zenith than on the Lightning but it can be done. Props are much more expensive than jets so it is easier to just change the carb setup than to change props until the mixture is right!

To determine the right carb setup we have to fly the aircraft and have enough instrumentation on board to show what is going on with the mixture (in other words EGT temp). Once we know what is going on we can make adjustments to the carb jets to achieve optimum EGT's. The goal would be to achieve a full throttle, full power climb out EGT of 1200 F while at the same time creating an EGT of 1300 to 1350 at cruise rpm.

Full throttle fuel flow is limited by the size of the main jet. At full throttle the vacuum at the top of the diaphragm pulls the needle up and out of the needle jet making the main jet the limiting orifice in the fuel delivery system. If full throttle EGT's are low the mixture is too rich, too much fuel is being drawn through the main jet and the jet needs to be smaller.

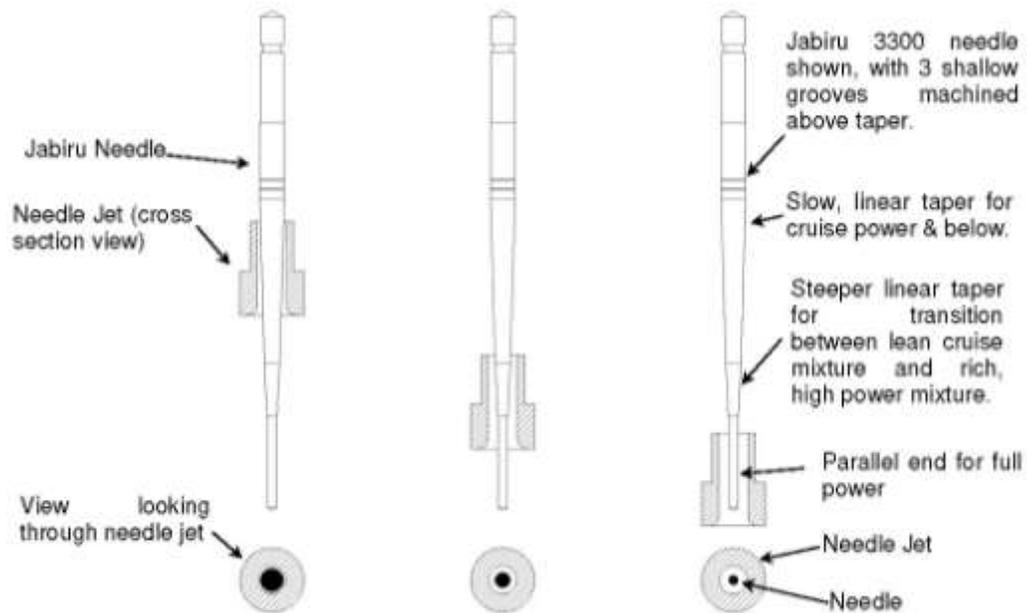


Figure 2. Needle Jet (Jabiru Needle)

In the drawing above idle position is at left, cruise position is center and full throttle is at right.

At throttle settings from 1/4 to 3/4 throttle the needle jet becomes the limiting factor in fuel delivery. As the throttle is reduced from full throttle the butterfly shields the top of the diaphragm from engine vacuum reducing the upward pull on the diaphragm. The tapered needle descends into the needle jet reducing the size of the orifice, making the needle jet the limiting orifice size in the delivery system. If EGT's are to low at cruise rpm then the needle jet needs to be smaller to reduce flow. If EGT's are too high the needle jet needs to be larger.

The process to find the right combination is strictly a trial and error endeavor. Fortunately Bing jets are not expensive. The aircraft we build are called experimental and achieving the proper carb setup is just another one of our experiments.



Pete Krotje

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NOTE: If you have not attended one of the Jabiru engine seminars, I highly recommend that you do so. The information presented on engine installation, operation, maintenance and overhaul is well worth the cost of attending the class. Call Jabiru USA to get scheduled.

Reader Feedback:

This section will contain messages that I get from readers that really don't fit the News from Builders section.

This message came in from Gary Winkler and includes a question on rudder trim that might be helpful to others.

Buz,

I finally have the spinner on my plane with the Prince prop. This weekend I will fly the altitudes and RPMs to try and get the final numbers. Now that I have completed the Lightning rocket, I will take some pictures and write my short story about the build experience.

I find that when I climb to altitude, set the elevator trim tab to take the pressure off the stick, that I have to fly with a bit of right rudder pedal push down to center the ball in the attitude indicator? My thought is because I have to use up elevator trim to level the plane, that this is enough to twist the aircraft a bit and then I apply the right rudder to take this out. The plane will drift just a bit to the right when the up elevator trim is in if I do not add the rudder. When I add the rudder I actually gain about 3 to 4 mph and I can hear a bit of a change in engine rhythm. Any thought?

Gary

Gary,

I look forward to getting your prop test data and certainly the article for the newsletter. I am currently running a 62FK60 (it did well on my trip to SYI - I am still here) and I posted some numbers for it for the trip out here. I really have not flown my airplane while I have been here because Nick is keeping me busy flying all the test profiles required for the FAA when they come to look at the new SLSA lightning that will meet the ASTM requirements. Of course those flights are the fun part, but writing up all the reports is more like work. Have also been doing prop testing here, but the props I am testing are for the light sport model and we are looking for one that will only give 120 knots at 2850 rpm.

As to your rudder question, what you are seeing is normal. You can set up your aircraft to be in trim at some specific speed range and everything will be fine at that speed. However, as you speed up or slow down, the rudder trim will naturally change. As you add power to go faster than your trimmed speed range you will need to add some right rudder. If you pull power to go slower, you will need some left rudder. You can also see a similar effect when in trimmed flight by pulling the nose up or pushing it down. The ball will go from one side to the other depending on positive or negative G or pitch force. No big deal in an airplane like the Lightning which doesn't require much rudder to stay in coordinated flight, but you really need to keep the ball centered in an aerobatic aircraft where we are talking some major Gs, and as you slow down not having the ball centered can cause some maneuver you really weren't trying to do. Keep up the good work.

**Blue Skies,
Buz**

SPECIAL FEATURE:



Pete sent me the following air to air photos just after they got back to Tennessee. The new Special Light Sport LS-1 Lightning is featured in most of the shots that were made on the way to Sun „N Fun and on the return flight. **Nick and Dana** are flying the LS-1 and **Mark** is flying the silver demo in the photo that shows both aircraft. I think that **Chris Brooks**, the newest member of the Arion and Jabiru USA team was the photographer.

Dana and Nick in N325AL, the new SLSA LS-1 Lightning on the way to Sun „N Fun.





***Route formation** is used when the flight lead does not need the wingman (or wingmen) to be in a tight fingertip formation position. For example, it can be used during radio frequency changes, when there is a need for more diligent lookout (traffic or visual navigation), or whenever the flight lead wants the wingman to be able to relax and not work so hard. It is also a good starting position (about one or two wing spans out) for new wingmen just learning to fly formation. Later he can practice in the standard fighter fingertip position that is only about 3 feet wingtip separation from lead. That of course takes more practice. Nick and I are thinking of having a formation clinic (briefing and formation flight training) as part of this fall's Lightning fly-in. Let us know if you think you would be interested in learning some formation basics.

Final Thoughts:

Sun „N Fun was great this year. The weather for the flight down, while there, and the flight home was outstanding. However, as always when you have been on a long trip, it is good to get home. The photo below was made just after I unloaded the airplane. Yes, I actually got all that luggage and equipment to fit in the baggage compartment and the right seat.

When packing for a trip in your Lightning, don't just start stuffing baggage in wherever it will fit. Some thought and planning will go a long way to insuring you remain within your CG limit and that any baggage

is secure where you have it stowed. And speaking of CG, it helps if you know what various pieces of your soft sided luggage weighs when you have them packed full. My largest bag is almost always 20 pounds and the smaller one is 10. I also know how much my tie-downs, tent, sleeping bag weigh. You should have a good feel for what your standard equipment weighs. It will keep you out of CG trouble if you know the weights and place it in your aircraft in a way to provide a safe and secure flight. I have a scale in my hangar if I am not sure about something.

I normally try to put the heaviest items as far forward as possible. When I am flying alone, that means the seat next to me. Another consideration is to make it easy to get to the first thing you will need when you get there. That normally means the aircraft tie-downs. Mine are kind of heavy, so I put them in the co-pilot seat and then my soft sided luggage in the seat on top of the tie-downs. Be sure you secure these items with the shoulder harness and seat belt and make sure when they are belted down you still have full stick travel in all directions. This point is obviously critical.

In the baggage area, I try to put the next heaviest items on the right side (to offset my weight) and as far forward as possible. The shoulder harness will help hold these items in place. The lighter things go on the same side that I am on. You get the picture.

And speaking of the picture, the photo below really does show all the things that flew home with me from Sun „N Fun. I actually have more when I fly to Oshkosh since I am normally there for at least two weeks. Thank goodness Sun „N Fun and Oshkosh are in the summer so you can take short pants instead of long ones and you don't need any coats or other cold weather gear.

See you at Oshkosh.



Blue Skies,

Buz Rich

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