

December 2007

Experimental Aircraft Association Chapter 33

A monthly publication of the Dr. Alexander M. Lippisch Chapter of the Experimental Aircraft Association, Cedar Rapids, Iowa.

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Velocity Update - Door Handle Project

By John Tvedte

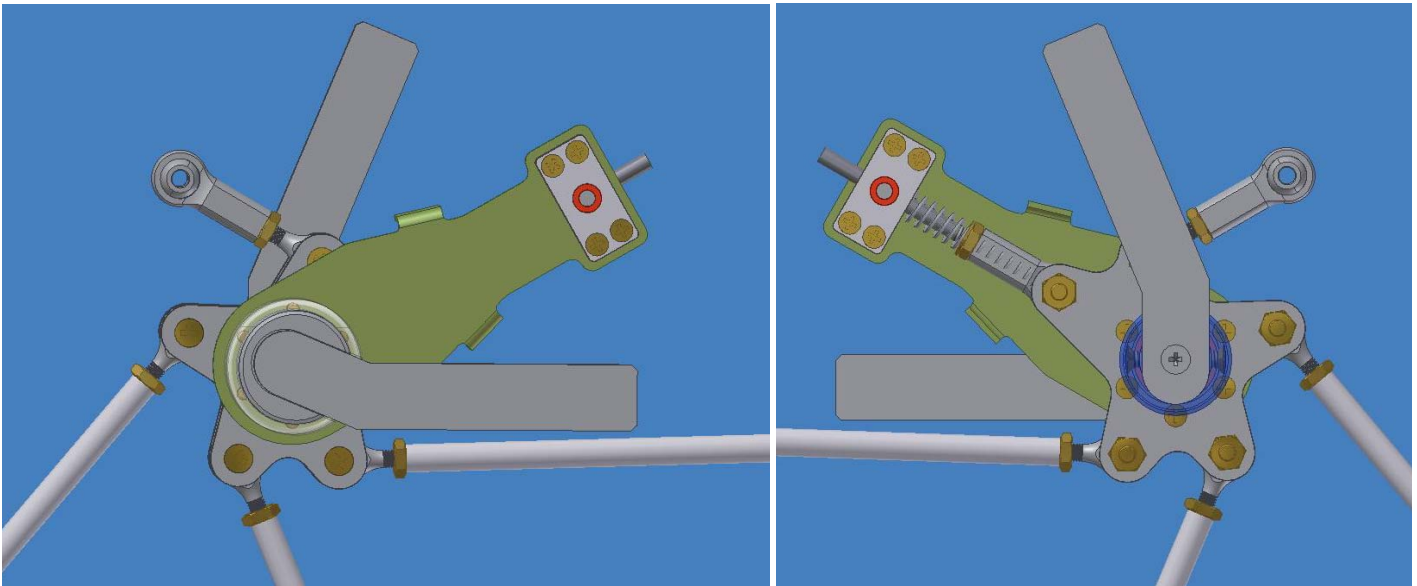
My wife Ann and I are building a Velocity XL-5 Fixed Gear and I remember the first time she opened the door at OSH...Oh the door opened and closed...but it reminded her of an old VW bug she once owned. Needless to say it didn't really inspire initial confidence in the airplane.

The building process has involved a variety of miscellaneous changes and modifications, mostly subtle esthetic changes some practical additions (like recessed tie downs) and a couple complete replacements of what the factory supplies in the kit.

Over the years of building we have met some really great people – two in particular Jerry Kroeger, and Jim Haro have brought some dreams into reality.

Jerry and Jim have been doing machine work for our airplane for the past couple of years. I can only describe their work as art. They





have transformed CAD drawings provided by my brother David into reality – silky smooth and as perfect as one can fabricate.

One of the design goals was to have a door latch system that operated smoothly – and looked great at the same time. Another Velocity builder had shown me his modification of some Glasair door handles. His modification involved welding the main shaft and required a ‘stick’ to poke through the door from the inside to open the door. While I liked the finished look of the exterior, the idea of having to use a stick to poke the handle open was less than appealing.

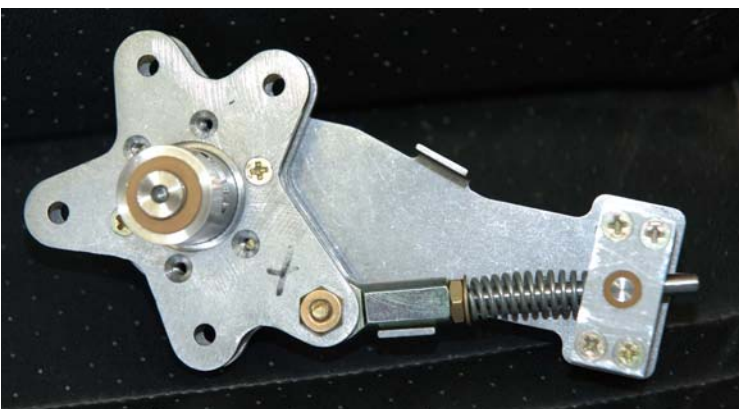




Thinking that we could modify the Glasair parts, I talked with Justin Fishbaugh who helped me place an order for handle parts. We actually were able to modify the parts and fit them into the door. Our 'machining' left quite a bit to be desired - however, we didn't need a stick to open the door. My brother David thought we could design a considerably nicer system if we could machine all of the parts rather than modify.

We had been working with Jerry and Jim on our side yoke system and that was progressing very well – perfectly smooth. This gave us the incentive to design a completely new handle system fit to the Velocity. We used Autocad Inventor and Solidworks to create a 3D solid model of the system as well as shop drawings.

The design goal was for a system to operate smoothly – we decided up front to use an all bearing solution. Having had good results with Rulon bearing material, we made the choice to use it in this project, along with rod end bearings. Measurements were made of the original factory system. This allowed us to determine if we could design a 'drop in' replacement. Fortunately this turned out to be very possible. One of the nice things about the Glasair handles is that the outside handle is independent of the inside - within about 60 degrees. This allows the outside handle to be flush mounted, while still allowing the inside handle to open and close the latch system. The outside handle will swing approx 30 degrees each way prior to engaging.



We went through at least 11 iterations of the design – refining it each time. The original factory system does not use bearings for the aluminum push rods, and it does not take into account the arc that results from the movement of the bell crank. This results in friction and binding. One has to use enough force to overcome this friction and then push the door handle through over center and then continue pushing to close the door. Our system takes



the arc into account and works smoothly with no friction – letting the over center spring function – which latches or unlatches the pins. We retained the original secondary locking system – once the door is latched it automatically prevents the handle from being moved. A further refinement concerned the ends of the pins. We made them more bullet (ogive) shaped – this results in less of a transition when the pins move into the receiving tubes. There can be small alignment issues with the pins and tubes – and this shape prevents the lip of the pin from hitting the tube, the pins slide into the tubes with a more even pressure. The handles are aluminum, while the base plate is 4130 steel, with the handle sockets and bearing retainers SS. The push rods are aluminum, and the bell cranks and pins are SS.

Installation of the handles went smoothly. We had to remove the orig handles and modify the area with a couple layers of triax. The only ;'goof' was that the angle was slightly off for the baseplate. It's not a problem, because the trim piece easily fits over it and covers it completely. We used Aeropoxy (grey goo) to mount the handle to the door. SS rivets where also used to hold it in place. It took a couple days to install mostly waiting for the epoxy to cure. Two of the pins had to be cus-

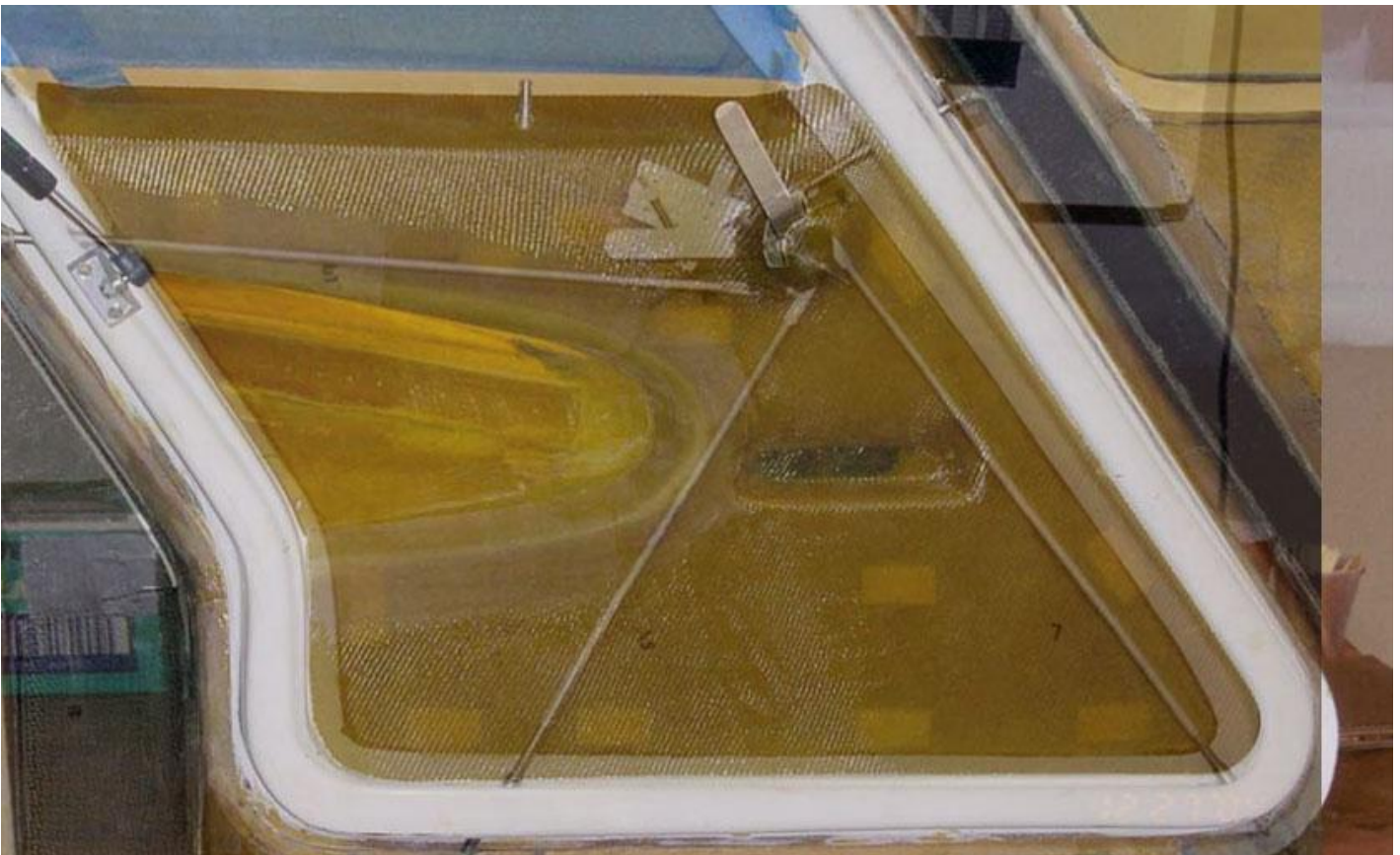


tom length. I made a couple out of aluminum to fit, and Jerry and Jim took them and made me copies out of SS. They fit perfectly.

The aluminum and SS were hand polished by my friend Andy Millin. I had been sending Andy pictures and updates of the parts. As we approached completion, he offered to polish them. I gladly accepted his offer and shipped the parts to him. He did a fantastic job, the pictures don't really do justice to how nice they look – they almost glow. He also suggested some SS torx screws to hold the inner handle and handle body. He cut those to proper length, and polished them as well.

I am very pleased with the results. The door system is silky smooth and has a great fit and finish.

The next project is to finalize the paint scheme, finish the keel (center console) design, and continue working on the avionics wiring.



Last Meeting - Key Historical Advances in the Theory of Flight



For our November meeting we took advantage of the Beem's auditorium in the Cedar Rapids library. Don Gurnett, Chapter member and University of Iowa professor of Physics, gave a presentation detailing the historic progression of the various theories leading to our understand of why our airplanes actually make it off the ground.

While it is generally accepted that airplanes do fly, the "Bernoulli's Law" ex-

planation of flight, which we all learned in ground school, is in fact completely wrong and the real reasons that a wing can create lift is some what more complicated and far more interesting.

Don's notes for this presentation can be found at http://www-pw.physics.uiowa.edu/~dag/lectures/Flight_Dec12-2003.pdf There is lot of math involved and if you are like me and your calculus skills are some what rusty, it maybe difficult to follow the formulas. Don, however, was quite expert



in translating the math equations into more easily understood principals. And judging by some of the pictures of the audience, I was not the only one who was fascinated by Don's presentation. A big Thanks go to Don and we hope to take him up on his offer to continue this presentation on to the physics of the supersonic realm.

Next Meeting – Holiday Banquet - RSVP required

For our Holiday banquet, John Anderson has once again secured the Coe College, Clark Alumni House. The banquet will be Thursday Dec 13th. 6pm cash bar, 6:30pm dinner starts. Our own Marv Hoppenworth will give a presentation about the early history of Chapter 33 and the EAA fly-in during the Rockford years and share some slides from that era. We will have a buffet of Roast beef and Chicken with several choices of sides & Cheese Cake for desert. Cost - \$20.00 per person and guests are welcome. We must have an accurate head count so please RSVP to John Anderson via joanderson@unitedfiregroup.com or call at 319 310 7089 by December 8th. **Note:** If you cannot make it after you have RSVP positive, please let us know as we will have to pay for meals ordered but not consumed.

Clark Alumni House is located on Collage Drive NE, just off of First Ave. There is a horse shoe drive in front of it for those who can't walk far and ample parking at the rear off of 14th Street. Check out this interactive map <http://www.coe.edu/admission/campus/>

Officer Elections

During our November meeting we elected some new officers. Todd Millard was nominated for President and Mark Navratil was nominated for Vice-President. The vote in-favor of Todd & Mark was nearly unanimous and the motion was carried, overruling Todd & Mark's tongue-in-cheek votes opposed.

Congratulations to our new President and VP and we are all looking forward to another exciting year for Our Chapter.

Fly Market

FOR SALE GOLD WING aircraft in flying condition - Ken Dodson 319-629-4669

FOR SALE Wing & tail parts for UltraLite type airplane. Any Offer - John Banes 319-846-2033

FOR SALE Mustang II 1st flight was December 2004. ~145 hours total time on airframe ~145 hours total time on zero timed rebuilt engine, O360 A1F6 180hp Lycoming Engine rebuilt by Aerosport Power w/ new cylinders, new counter-weighted crank, new alt., new starter, new mags. Installed Rieff whole engine heater (can be left plugged in all the time.) ~20 hours total time on brand new Hartzell CS



scimitar prop. 42 gallon fuel capacity. 3 axis electric trim. IFR equipped with standard gauges. AS, AH, ALT, electric T&B, DG, VS, 3" G-meter Audio Panel with Marker beacon Terra by Trimble coms (2) Terra by Trimble NAV/ILS w/digital ILS display Terra by Trimble Transponder with Altitude Encoding. Nave 121 VOR ADF DME Rocky Mountain Instruments microMonitor engine display with all sensors. Built in AM/FM Stereo CD player (works really cool) Lowrance 1000 GPS mounted and powered by the aircraft Tru-Trak two axis autopilot w/ vertical speed control (nice) wired in to track with GPS. One Bose headset X and a Marv Golden headset modified with noise reduction. 180 knots true at 6500' with 24x24 power settings. Very nice cross county machine Gross weight set at 1800 lbs. Empty weight 1175 lbs. CG is perfect for maximum loading. \$85,000 firm. She's still a bargain even at that and I'm not budging a penny. So if you don't want to pay that much don't bother to call. - Tom Meeker tomomeeker@msn.com 319-899-0037

FOR SALE P-38 Lightning ultralight for sale. - Dan Knoll at 848-4406 for details.

FOR SALE 2000 Phantom X1 Ultralight, 125 total hours, Rotax 447 engine, BRS 750 parachute, 10 gal tank, Great Flying Aerobatic Airplane, More info available at www.phantomaeronautics.com \$7000 or make an offer, - Jerry Maxwell Phone (319) 393-8560

Chapter 33 Calendar

Dec 13 6pm Chapter 33 Holiday Banquet, Marv Hoppenworth, Early Chapter 33 history, Coe College, Clark Alumni House.

Jan 26 11:30am–2:30pm 11th Annual Chili Fly-In, Greenfield Municipal Airport

Feb 1-2 17th Annual Midwest Aviation Maintenance Symposium and Trade Show. The Hotel at Gateway Center Ames, Iowa Sponsored by the Iowa Chapter of PAMA

Apr 23-24 Iowa Aviation Conference. Sheraton West Des Moines Hotel, for more information visit www.iawings.com



I have heard of short landings, but...

In The December 2007 Issue...

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