



Der Flügtag

EAA Chapter 958 New Braunfels, TX
Where every day is a good flying day!

January 2014 Issue

Experimental Aviation



The Success Continues...

EAA Chapter 958



The Leader In Recreational Aviation

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January Chapter Meeting CANCELLED

Chapter 958 has lost its meeting place at the New Braunfels Airport for January through February and perhaps March (see Prez Sez). Members are encourage to contact Chapter officers if they know of a suitable alternative location for holding the monthly meetings.

Prez Sez

Greetings 958

I will start my first Prez Sez with a long overdue Thank You to Gary West. He donated two books at the October Chapter meeting. The titles are "Make Better Landings" by Alan Bramson and "Kit Plane Construction Second Edition" by Ronald J. Wanttaja. Any Chapter member can check out these titles for review. You can contact me via phone, e-mail or at a chapter meeting. We now have four books and one DVD.

To close out 2013 the Christmas party was held at Fahrenheit Bar and Grill. About twenty members, their spouses and other family attended. It was MC'd by out going President Guy Bowen. There was most certainly more room to maneuver around the tables. The food was good, although some expressed a little slow in coming. This was due in part to the size and number of personnel in the kitchen and the wait staff. But all seemed to enjoy. The white elephant exchange was as always great fun. Many thanks to Julie and Richard Weber for the dessert which always accompanies them.

On to 2014, we (Chapter officers) were contacted this last week on 8 January by Management of the New Braunfels airport. They informed us that the conference room will be occupied and unavailable for our use this month and next. Possibly into March as well. Due to the short notice and the Chapter having no alternate meeting place, January's meeting will in all probability be cancelled. The Chapter officers are looking for some place to have the February meeting. So please watch your e-mails for updates. This issue along with a few other items need to be addressed by the Chapter membership as a whole. It is time to renew you chapter membership and please send along current contact information with your dues.

As many of you know I am not a pilot nor do I own a plane. This year I do hope to make some changes in this regard. But this does present me with some challenges when trying to arrange presentations for our Chapter. I have had over the past few years many questions about a number of things. Some have been answered by internet searches, others by some of you in conversation. Having had some members express their thoughts and observations about their questions and concerns, I have tried to arrange presentations with these in mind. Although without your input and perspectives we are at a loss for content.

Our Chapter covers a large geographical area. We have members living within a fifty to sixty mile radius of New Braunfels. To me this is a prime location to see substantial growth of membership. We must include activities which inform, educate and promote aviation in all its forms. These activities must include at times spouses, other family, friends, and possibly new members. I ask all members to take a little time, think of what you wish to see and obtain from you Chapter membership. I would appreciate all of you contacting me. Let me know via phone, e-mail, smoke signal etc., how or if we will proceed as a Chapter.

At this time I ask all members to attend the meetings. Remember you have a voice and a vote as to where we go from here.

Thanks,
Phillip Steele, Sr.
Topauger@ATT.net

Chapter 958 Christmas Dinner/Party Held at Freiheit

Many Thanks to all who helped make the Christmas Dinner/Party a success. A great time was had for all who attended. Special thanks to the Webers for the wonderful desserts and Barry Genaske for the photos.





WANTED

Photos and information about members projects and shop tips, tricks and ideas for the newsletter

Tools for Sale

Dan Dickson has a fantastic tool assortment for sale. See craigslist 4210270973 posting for more photos.



Various aviation metalworking / mechanical tools for aircraft building and repair.

Pneumatic drills, rivet gun kits, shears, nibblers, regulators, air vacuum, hoses, ratchets, etc. Clecos, cleco pliers, side grip clamps, deburrers, bit countersinks and cages, punches, metal drill bits, reamers, threaded collets, calipers and gauges, squeezer kit w/3 heads, C-arm riveter, various size bulk rivets, chucks, bolt gauge, rivet fan spacer, bucking bars in various shapes and sizes.

Spare sheet metal stock material in various thicknesses. (Not all tools shown in photos)

Unknown amount invested over the years, but its a bunch! Selling all as a lot for \$3200, firm!

Call Dan Dickson, 512 847-8968 or 512 775-8939.

Keywords: airplane, helicopter, RV aircraft kits, A&P, metalshop, kitplane, EAA, metal shop, homebuilt, experimental

EAA staffers are currently installing the control system on the Zenith CH 750 that employees are building. We will bring you further updates on this project in an upcoming issue of Experimenter.

Flight Control Forces Breakout and Friction

By Ed Kolano

An airplane's flight control system is the physical connection between the pilot and the plane. It provides the mechanism to maneuver the plane while constantly communicating with the pilot through forces and displacements. This tactile feedback

has a major influence on the pilot's opinion of the airplane. Heavy control forces make the plane feel stiff while light forces can give the impression of oversensitivity. A similar argument can be made for control displacements, but pilots rely more on control

forces (unless displacements are large) when judging an airplane's responsiveness. Most of us fly planes with reversible control systems. Move the elevator during your walkaround, and the stick moves—reversible. That's why you have to exert a force on the stick to deflect the elevator away from its trimmed position. Dynamic pressure exerts a force on the deflected elevator that creates a hinge moment, which becomes the force you feel on the stick. Some flight control systems employ springs, which create a stick force when the stick is displaced. Some have bob weights, which create a stick force when the plane is flown at other than 1g. Some have dampeners that create a force proportional to how fast the stick is moved. Servo and anti-servo tabs also augment the stick force. Flight control system gizmos abound. And there's friction. There's always friction.

Friction

Friction is the resistance encountered when two objects in contact move or attempt to move relative to each other. To overcome this resistance, the force applied must be greater than the opposing friction force, and friction always opposes the applied force. This relative motion can be sliding, such as dragging a chair across the floor. It can be rolling, such as, well, rolling a bowling ball down the lane. Flight control system

friction sources include bearings, cables in pulley channels, pushrods through guides, cable-bell crank connections, and control surface hinges.

Zero friction is impossible, but the less friction, the better.

Before a flight control surface can be deflected, the pilot must apply enough force to the cockpit control to overcome any friction. As the control is moving, friction must still be overpowered by the pilot in addition to the force of the air load on the surface and any other force-producing

components such as springs in the system.

Friction always adds to the required cockpit control force, and it works in both directions.

Friction causes a hysteresis effect. Let's say there's a constant 2 pounds of friction in the elevator system.

The pilot begins pulling the stick back; but nothing will happen until his pull force exceeds 2 pounds, then the elevator begins to move. So now let's say the pilot has 3 pounds of stick-pull applied to maintain the

deflected elevator. As he relaxes his pull, nothing will happen until his pull decreases below one pound. This is because the friction is still "applying" 2 pounds of resistance (in the opposite direction now) against the restoring force caused by the air load on the deflected elevator. The friction can prevent the stick and elevator from returning to their pre-displaced positions, leaving the airplane out of trim. Beginning to see how friction complicates precision and pilot workload? We could talk for pages about the ramifications of friction while maneuvering, but for now let's focus on friction's effect during the initial control displacement.

Breakout

Control system breakout is the cockpit control force needed to deflect the control surface from its trimmed position. It's the initial force necessary to just get the surface moving. Because friction is present whenever the control system is exercised, any measurement of breakout always includes friction. Hence the phrase "breakout plus friction."

While friction alone can be measured while flying off-trim, such as during static stability testing, breakout plus friction can't be separated. It's measured simply by slowly applying a force—let's say a pull force to the stick—and noting how much force is applied when the airplane first responds; that is, pitches nose-up in this case. Do pilots care about the numerical value of breakout plus friction? Probably not, but the effect on airplane handling qualities can be huge.

Analogy time. Go to the fridge, get a gallon jug of milk, and place it on a table. Using one hand, move it exactly one-quarter inch. Too much breakout plus friction makes small, precise inputs difficult. Try the same thing with a marble. Too little breakout plus friction can lead to overcontrolling.

Breakout can be added to a control system in a variety of ways. Preloaded springs is one example. No control motion will occur until the force of the spring preload is overcome. Mechanical cam arrangements can provide breakout using springs without the penalty of increasing the force requirement as stick displacement increases.

A little breakout is usually desirable. Without it, the pilot might have trouble finding the trimmed stick position, especially with friction present. Having a tactile reference for the trimmed stick position is handy (okay,

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bad pun). Imagine if you had to visually check stick position after every input.

Too much breakout makes small control inputs difficult, particularly if the control force gradient beyond the breakout is shallow. For example, let's say this airplane

has a breakout (breakout plus friction, actually) of 5 pounds, so it takes 5 pounds of stick pull to move the elevator. If that same airplane requires only 6 pounds of stick pull to maintain level flight in a 30-degree bank, altitude control could be a challenge as the pilot attempts to target that 6-pound pull when nothing happens for the first 5 pounds of exertion. Of course, we don't think in terms of pounds of this and that, but this situation will likely result in the pilot pulling and pulling, then getting too much airplane response. That's when we creative adapters start reverting to workarounds, such as trimming for small temporary changes instead.

The right amount of breakout plus friction is enough to preclude making inadvertent control inputs but not so much as to make small control inputs difficult in any axis.

The relative magnitudes of stick forces in the pitch and roll axes is called control stick harmony. For the past 70 years or so, it's been generally accepted that the best ratio between roll and pitch is 1:2. Breakout plus friction in pitch that's about twice of what it is in roll feels right to most pilots. Ever watch a plane come into the flare and exhibit a wing rock for no apparent reason? Could be the too-low roll breakout plus friction resulted in the pilot making an inadvertent lateral stick input as he pulled back to flare. Then the rocking occurred because he then had to find wings-level while overcontrolling the tiny roll forces while applying increasing pitch control force to complete the flare. Okay, I've wandered a bit from pure control system breakout and friction, but this mechanical characteristic is just one ingredient of the control system stew. And that stew is just one course in the flying banquet. So the point to be made is even something as seemingly minor as breakout plus friction can have a profound effect on the airplane's apparent stability and the pilot's opinion of its handling qualities.

Ed Kolano, EAA 336809, is a former Marine who's been flying since 1975 and testing airplanes since 1985. He considers himself extremely fortunate to have performed flight tests in a variety of airplanes ranging from ultralights to 787s.

