

EAA CHAPTER 32 NEWS

Jim Bower, Editor

February, 2004

The February meeting is upon us earlier than expected due to the crazy schedule we suffered in January.

Hopefully, all the ice has melted off your driveway and you can make this month's meeting! We'll see you there on the 22nd!

INFORMATION HOTLINE

314-286-9932

**CALL THIS NUMBER FOR INFORMATION ABOUT
UPCOMING EVENTS**

February Meeting

(Make up meeting due to icy conditions on January 25th)

The meeting started with the Pledge of Allegiance.

At the January Executive Committee Meeting, Secretary Tom Baker submitted his resignation as Chapter Secretary. Open nominations were taken at the General Meeting and Jim Bower was nominated as Chapter Secretary. Dave Domeier made the motion and Bob Rockford second the motion. Any other interested parties can add their name to the nomination at the February 22nd meeting, immediately prior to the vote.

Smartt Field Aviation Advisory Board is planning to hold an Airport Open House on June 12, 2004. President Laura Million suggested that Chapter 32 combine the ARC Open House to coincide with the Airport Open House. Young Eagles has already committed to fly kids for the Open House. After a discussion, the consensus was reached to just fly Young Eagles at the Airport Open House and delay the ARC Open House till later in the year.

Treasurer Gale Derosier presented the cash flow report for 2003 for the Chapter. See the attached. The 2004 budget will be developed from this report.

Gale Derosier presented the Chapter membership with the Chapter Building Utilization Guidelines. He asks that the membership read it and make any suggestions. Dave Domeier made the motion to table the discussion until the February Chapter Meeting to give the membership time to read the guidelines. Jim Hann second the motion. Additional copies will be at the February Meeting

Ted Boerding presented the Chapter with a demonstration of a security system that he has used for his house. The X-10 Security system can be purchased by units and expanded as the Chapter sees the need. President Laura Million asked Ted to write up a summary of what units and the cost for the 3 doors, 3 windows and motion detectors. Anyone wishing to read more about the system can go to the website, www.x10.com.

Ken Blackburn has asked the Chapter and the ARC Building Committee to go through the items stored in the Smartt Field Hanger and to determine what can be kept and what can be discarded. He has a member that wants to rent the loft area that is currently holding ARC building materials. Ken will also present rule changes for the Smartt Hanger Lease at the February 22nd meeting.

Bob Pratt has donated a meat cutter to the chapter. After a discussion, the consensus was reached that the Chapter will accept the meat cutter and donate it to Killroys

The meeting was adjourned. Troy Townsend gave his presentation on his experiences with Powered Parachutes.

LM(2-10-04)

Dues are Still Due

If you have not already done so, please send your \$60.00 annual dues to the treasurer, Gale Derosier (28 Woodmere Point Court, St. Charles, MO 63303). This needs to be done before the end of February, because your friendly editor starts compiling the Chapter Roster. I KNOW you don't want to be left out of that most excellent who's who of the cream of St. Louis aviation aficionados, so please do it ASAP. Not only that but (gasp!) you won't be getting this newsletter any more, either!

Newsletter Deadline: The deadline for submitting articles, pictures, want-ads, etc. is two weeks prior to our regular general meeting. Please submit these items to the newsletter editor via e-mail (jimbower@hotmail.com), snail-mail (10350 Toelle Ln. St. Louis, MO 63137), or phone (314-869-8971).

Safety Thru Education

mr. bill

OLD STUFF - CALCULATED EPR BY THE EEC IS SENT TO THE VIA ON THE EAD.”

It was this statement going through my headphones as I stared at the computer screen late one Saturday night while I was doing the computer based Boeing 717 ground school. As I kept replaying it I started laughing, repeating to myself boy that was a mouthfull. I also was saying what does it mean??? Well, if I told you I would have to shoot you and hey they are thinking about giving us guns now so Watch out, that's Captain Barney Fife to you!!! B717 school is over and as we say at the airline I now have a “type rating” for typing stuff into the computer so the computer can fly the airplane better than man. The old DC-9 was like a Piper J-3 Cub, minimal instruments, basic round dials and gauges. Just start the engines and away you go. No not now. I must wait ten minutes for the computer to warm up. Then I have to tell it where it is and where “we” would like to go. Then I have to tell it how we want to get there. It does offer some suggestions. Then I must tell it how much it weighs and where the balance point is. Then I pull a round button to start the “motors” (yes they are motors because they are made in Britain and “they” call them motors). Then I must tell it what speeds the airplane should takeoff at. Seems to me to be a lot of manual labor for the pilot who has two really big/smart computers on board. Well, after the typing is done the fun begins. In thirty years some nice pilot features have been added. Auto-Spoilers deploy automatically on the B 717 if the captain aborts a takeoff. Great to have because on the old DC-9 you had to retard the throttles, then reach over to the spoiler handle and pull UP-BACK-then UP to deploy the ground spoilers, then go back to the throttles and pull the sub-throttles to get reverse thrust working for you. All this time you are smashing the break pedals to the floor making that anti-skid stop the machine. On the 717 your hands can stay on the throttles where they belong. We also did not install the Auto-Brake System. I would not even have to step on the brakes with this option. On the normal takeoff in the DC-9 when it is time to rotate one would raise the nose of the beast at 2 degrees per second to 15 degrees pitch up. The 717 you must haul back on the yoke to get to 22 degrees pitch up (in about 4 seconds) because this rocket wants to climb because of all the power. The real strange thing is the basic six instruments are now displayed on one flat plate computer screen. The airspeed and altitude are now vertical tape indicators. Oh and the screen next to it shows your compass and course. Just in case you might need it on that second display it will show you any traffic (TCAS), any weather, any predicated turbulence, and any terrain that is rising around you. Also on that same display you get the present wind and direction and speed, true airspeed, ground speed, the time, elapsed time, a count up or down timer. Overload. Too much information!!! You bet but underneath it all is a great new DC-9 airframe with a bunch of power and power is good. That computer stuff... that's for the young kids. Well, that's all I have figured out about this thing up until now. Take care and remember takeoffs are optional. Landings are mandatory. Oh OK. The calculated EPR (Engine Pressure Ratio) by the EEC (Electronic Engine Control) is sent to the VIA (Versatile Integrated Avionics) on the EAD (Engine Alert Display).

NEW STUFF- Hello from the world down under (Dallas-Fort Worth). Last month I mentioned that I would be out of the loop for a while. With that someone asked that if you're an AIRLINE TRANSPORT PILOT can't you fly all the airplanes? Well, the airplane flies the same. It is the **VERBAGE**. The trouble is learning all the different names for the same exact equipment on a different airplane. I do not have time here to bore you with the names. Actually after a week of school I do not have them all mesmerized yet. But I am learning. By the time you read this I **WILL** know all the names and will be in the "stimulator" yanking and pushing on the controls. So enjoy the RV round table discussion. Take care and safe flying.

A dirigible made the first controlled flight in St. Louis at

The Worlds Fair in 1904. Side note. Octave Chanute begged the Wright Brothers to attend this World Fair with their machine. Chanute felt that if the Brothers displayed their machine that they would get money and "help" from others adventures who had "knowledge of flying" in order to get their machine into the air.

From the President (Again)

New Social Time!

We are going to try something new with our social time. Rather than eating after the meeting, we are going to open the doors at noon, gather for pot luck at 1pm, and the General Meeting will start at 2pm. If you are not able to attend until 2pm, there is always food left over and we can eat again after the meeting and program. This will also help keep lunch at lunch time, so you can go home and actually eat dinner!

Food

Also, this January meeting, we would like to hold our first Chili Cook-off. If you have a great chili recipe, bring a pot to share. If you can't bring chili, other potluck items can include things that go well with chili, like corn bread, Frito Chips, etc.

Cash Flow Report 1/1/03 Through 12/31/03

INFLOWS

Uncategorized	1,580.25	Accts Rec
T-Shirts and Apparel	119.00	
Food fundraisers	955.30	
Calendars	240.00	
Inc EAA	10.00	
Fund Raising	3,708.00	
Seed Reimbursement	22.00	
B-17	7,260.00	
Builders Conference	478.00	
Misc. Donation	80.00	
Rental Hangar	4,780.00	
Misc income	117.50	
Food Vouchers	10,315.50	
Christmas Party	1,168.00	
Pledges	624.00	
Dues	7,801.00	
Young Eagles	1,373.00	
TOTAL Accts Rec	-39,051.30	
Entrance Fees	100.00	
Interest Income	49.89	
Xfer From Checking	0.00	
TOTAL INFLOWS	40,181.47	

OUTFLOWS

A.R.C. TOOLS	243.49	Accts. Payable
Hgr Rent	3,744.00	
Hgr Construction	7,815.45	
TOTAL Accts. Payable	11,559.45	
Bank Charge	29.30	
GEN OPS	40.00	
Office Supplies	40.70	
Program Supplies	1,389.38	
8602 Telephone	283.32	
8605 Signage	2,070.89	
8611 Misc Exp	39.19	
TOTAL GEN OPS	3,863.48	
LANDSCAPING	66.49	
Misc.	1,579.75	
OPS EXP		
2003 PROMO	88.00	
2004 FUND RAISING	4,769.92	
2006 INSURANCE	1,283.00	
2016 INSURANCE	-250.00	
2101 FOOD COSTS	1,123.40	
2202 FOOD VOUCHERS	9,525.00	
8210 POSTAGE	412.00	
8500 NEWSLETTER	825.00	
8700 Entertainment	273.98	
9006 YOUNGEAGLES	31.34	
TOTAL OPS EXP	18,081.64	
UTILITIES		
Electric	264.88	
Water	200.00	
TOTAL UTILITIES	464.88	
TOTAL OUTFLOWS	35,888.48	
OVERALL TOTAL	4,892.96	

So You Want To Be An Aircraft Designer?

From Russ Erb, EAA Chapter 164, Edwards, California

That's the real question you are asking when you take up that time honored homebuilder's hobby of aircraft design modifications. If you feel you are qualified to do this and understand the risks involved, then do so and enjoy. If you have not had the appropriate engineering training, and your engineering techniques are best described as "eyeball engineering" or "TLAR" (that looks about right), realize that there are risks involved in design changes, and you're probably better off just building your aircraft to the plans. Besides, if you have to make major design changes to make the aircraft do what you want it to do, maybe you're building the wrong aircraft.

Purpose

I am writing this article in response to a request from Mike Meador. After reading some of my previous writings, he felt that I would be able to respond with the benefits and pitfalls for some of the many modifications that builders have asked Bob Barrows to approve.

It never ceases to amaze me how many unqualified people think they can "improve" a design, but don't understand the design process. Of course, with sufficient study they could learn enough about aircraft design to be successful, but typically they don't bother. After all, college students spend years learning about engineering and design.

Think about how a designer might respond when, after years of effort making everything work together, some yahoo comes along saying the design is okay but here's how to make it better. Usually said yahoo does not see the disadvantages of his proposed modification, or its impact on other parts of the design. Thus, the purpose of this article is to give you some insight into the design process and hopefully make you think twice about that modification you might be proposing.

Not All Modifications Are Bad

However, before I get any farther into this, let me make the point up front that I am not saying that all modifications are bad. The Bearhawk plans intentionally leave a lot of latitude for the builder to personalize his or her airplane. In fact, you can't get away from it. You may have noticed that drawings 29-32 detailing the firewall forward engine installation were not included in your plans package. There's a good reason for this--they don't exist! Bob realized that the biggest variation in Bearhawks would be what engine was installed, so he didn't even bother drawing up his installation because he knew yours would be different. While I don't share Bob's allergic reaction to electricity, I do know that my arms are allergic to an improperly hand-propped engine. Therefore, I will be installing an electrical system, complete with starter. However, we will see that there is a difference between modifications which don't affect the primary aircraft structure and those that do.

Defining Your Mission

No, this isn't trying to describe the Alamo or San Jose. This is simply deciding what you plan to do with your completed aircraft. Knowing what your planned mission is will help you answer many questions. For instance, if your desire is to cruise at 25,000 feet at 300 knots, you will know that you don't want to build a VP-1 Volksplane. The Glasair III is a fine aircraft, but would not be a good choice if you want four seats to carry yourself, your spouse, and your two kids. When deciding what aircraft you want to build, you should start with an aircraft design reasonably capable of completing the mission without modification.

The "Design Propagation Nightmare"

Design is characterized by a series of compromises. A design is not optimized to do any one thing, but to do everything adequately. A design optimized for strength would probably be too heavy. A design optimized for minimum drag would probably be difficult to build and maintain.

A design is like a house of cards--if you move one card, it affects all of the other cards. It has been said that changing the number of screws in the spinner would eventually require a new tailwheel. Changing one item will change another, which will change another, which will change another, until an incredible amount of seemingly unrelated things have been changed. This is what I call the "Design Propagation Nightmare."

A classic historical example was designing the Spirit of St. Louis. Charles Lindbergh went to San Diego to visit the Ryan Company and was suitably impressed with the Ryan M-2 Mailplane. It looked like it would suit his mission of flying from New York to Paris. It was a three place aircraft with low drag, an efficient design for its day, and a good, reliable engine. Sounds perfect, except it had one minor problem--it didn't have sufficient range to fly from New York to Paris, which, of course, was a major mission requirement.

Now at this time, a typical homebuilder might think "No problem! We'll just put in a larger fuel tank." If only it were that simple. The Spirit of St. Louis makes such a good example of the Design Propagation Nightmare because Lindbergh was not interested in increasing the endurance of the airplane by a couple of hours. He needed to increase the fuel capacity by 750%! Adding this much fuel impacts the design in two major areas--volume and weight.

Volume was a problem because there wasn't enough room in the wings or a header tank for that much fuel. The large amount of fuel compared to the aircraft's empty weight (fuel fraction) meant that it was possible that the aircraft's center of gravity could change drastically as the fuel was consumed. To minimize the change in cg, all of the fuel tanks were concentrated around the cg. Additionally, Lindbergh did not want any fuel tanks behind the cockpit for fear of getting trapped between fuel tanks in a crash, especially during takeoff. The most obvious effect of this decision was that the fuel tanks totally blocked his forward visibility.

Lindbergh decided that this was an acceptable impact for several reasons. Taildraggers are notorious for poor visibility on the ground, so what's a little less visibility? Most of the flight would be over water on instruments with no landmarks to see anyway. Lindbergh was also confident that there would not be any other aircraft on his route that he would need to see and avoid.

The increased weight dictated that more wing area was needed to keep the wing loading to an acceptable value for the available power and to keep the cruising speed close to the best range speed. Donald Hall, the designer, chose to keep the same chord, allowing him to use the existing wing ribs and the same fuselage attachment. Wing area was increased by increasing the wing span. With a larger wing span, the longitudinal and directional stability were both decreased. The solution to both of these problems was to either enlarge the tail surfaces or to lengthen the fuselage. In this case, Donald Hall decided it was easier to lengthen the aft fuselage than to redesign the tail surfaces. Lengthening the aft fuselage threw the cg out of whack, so the nose had to be extended to compensate.

The increased span also decreased roll performance, but since roll performance was not important to this mission, the ailerons were not changed.

The increase in span did create an increase in wing bending moments, which required beefing up the wing structure, which added more weight.

The increase in gross weight required a stronger landing gear, which again adds more weight, and may cause more drag. More weight and drag requires more fuel, which increases the weight, and the cycle repeats.

The end result was that the NYP (as Ryan Aircraft designated the design) was a totally new airplane except for the tail feathers, all because of a "simple little change."

The vast majority of modifications, especially those typically added by EAAers, all have one thing in common--they add WEIGHT! In my extensive studies, I have only found one instance where adding weight is a good thing. Racing sailplanes carry water ballast to increase their gross weight, which increases the airspeed for best glide without changing the glide ratio. Even in this case, the water ballast is jettisoned prior to landing to restore the landing speed and weight back to an acceptably low value. In every other case I have ever looked at, adding weight will be a detriment to aircraft performance.

Now that we've discussed modifications in general terms, let's look at some specific modifications that have been proposed by Bearhawk builders, presented here in no particular order.

Cockpit Adjustable Rudder Trim Tab

Very few if any similar production aircraft have rudder trim tabs. For the flight conditions that a Bearhawk is likely to see, there is very limited usefulness for one. During takeoff, you are actively controlling the rudder in an effort to remain lined up with the runway, so rudder trim would be of little use. During the climb, a constant rudder deflection will probably be required to keep the ball centered, but this is only for a limited duration (If you can't hold the rudder for a few minutes, maybe you should visit the gym more frequently). For cruise flight, a fixed tab can be ground-adjusted to trim the rudder. You're probably going to cruise at pretty close to the same conditions most of the time, and the propeller effects on directional trim are small over the limited range of cruise airspeeds. For descent, you will probably be at similar airspeeds to the cruise conditions, so rudder trim changes would be minimal. In the landing phase, the rudder will be actively controlled as in the takeoff.

A cockpit adjustable rudder trim tab could be installed without significantly affecting the primary structure. However, the benefit gained would be very small compared to the time and effort required to install it and the weight that would be added at the tail end of the airplane, which is probably the worst location to add weight (because of its effect on the cg).

Another possible way to get the same result much simpler would be to install some sort of bungee trim system on rudder system. This could be as simple as a lever in the cockpit attached to a spring attached to the rudder cable. It doesn't affect primary structure, is much simpler than implementing a tab on the rudder, and the added weight is closer to the cg. A similar system could be considered for aileron trim as well.

Continued Next Month

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