RECREATIONAL AIRCRAFT ASSOCIATION
RÉSEAU AÉRONEFS AMATEUR CANADA

**Winnipeg Area Chapter of RAA Canada** **March 2014**

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# *CALENDAR OF EVENTS*

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| **March 21, 2014** | Glen Patterson, presentation on building Bearhawk wing ribs and spars |
| **April 18, 2014** | Still up in the air |
| **May16, 2014** | Still up in the air |

## Glen Patterson presentation on Building Bearhawk Wing Ribs and Spars

Glen Patterson, from Dryden, Ontario will drive in and give a presentation on how he fabricated Bearhawk wing ribs and spar components. The presentation will be in the Lyncrest Flight Centre at 7:30 March 20. Everyone is welcome.

## February Tour to Jeff Bell's

Our February Chapter meeting was a visit to Jeff Bell's shop in River Heights. Jeff has been working on an RV-8 project for awhile and decided to move things ahead with the "Quickbuild" fuselage and wing kits that Vans Aircraft makes available. These are regular RV-8 kits that are shipped to a location in the Philippines where the bulk of the assembly and riveting of the major assemblies is done. Afterwards, the components are returned to Vans and packed with the remaining kit parts and shipped to builders.

Jeff had received his fuselage and wings just a few weeks previously. Visitors were impressed with the quality of the completed components and the others parts supplied. The later Vans kits are provided with computer drawn plans and most people commented on the quality and detail of Jeff's drawings.

Jeff is working in a nice heated shop behind his house which also features a nice variety of aviation art and photos which may be seen in the background of the accompanying photos.

Jeff is looking ahead to planning and installing his instrument panels and is leaning towards a Lycoming O-360 for an engine.

Thanks to Jeff for hosting an interesting evening and we wishh him good success with his project.

*Jeff (in the green shift) discussing project*


*Jeff's shop, cowling at the right side of his bench*

## Mercury Outboard Conversion to Aircraft Engine!

A friend of mine has been in the boat racing for years and is very knowledgeable about the two stroke v6 outboard Mercury engine. After seeing his work and gaining more knowledge about the engine I saw that an aircraft conversion was possible. I borrowed a damaged engine block from my friend and began the long process of inventing a Mercury outboard conversion to an aircraft engine.

The first thing I had to consider was the performance of a stock engine. A fishing motor turns at 5500 rpm to develope the rated 200 hp, so a reduction gear box was needed to bring the propeller rpm down. An Eggenfellner gear box popped up on Barnstormers and through a quick search about the gear box, I found it had a gear ratio of 2.1 to 1. A phone call to the seller and the gear box was on its way. Next big problem was how to couple the engine and gear box together. I wanted some kind of cushion been the two units so I went back to the web and did some more searching. There are many rubber couplers out there and I chose a coupler from a

Toyota driveshaft. Now the machining began. The Mercury and Eggenfellner driveshafts were cut down and both shafts were welded to plates and machined to fit the Toyota rubber cushioned coupler. Next job was to create the engine to gear box adapter plates. Not much of a challenge here, flat plates were cut out and machined to close the engine water system. I made the surface large enough to mate the gear box to the engine. Spacers were machined to get the necessary distance between the two units for the coupler. Only one more problem to solve and that was the cooling system. A 12 volt electric water pump was purchased from Jegs to provide the water flow and a Honda Civic radiator for the cooling.

The rest of the conversion is pretty straight forward. I just need to everything together, build the necessary pieces and mount the unit to the aircraft.

My engine was completely rebuilt and modified to develop 230 hp at 5500 rpm. The unit weighs 240 lbs dry . It's a little on the heavy side because of material choices and the exhaust system. Am sure I could get one to weigh around 220 lbs real easy. My propeller is a Ivo Magum 3 blade with electric adjustable control and the airplane is a Acro Sport I. Feel free to contact me if there are more questions.

Have fun with your projects

Ted Kiebke (218) 234-1172 cell


**The Pilot's Lounge**
**To Abort; Perchance To Live**
**by Rick Durden**

I've always found it amazing when, in midst of the noisy confusion of a crowded room, someone can say something that triggers such a powerful recollection of an event that suddenly I am isolated from the hubbub, aware only of the intensity of my thoughts. It recently happened to me in the Pilot's Lounge at the virtual airport. The weather was great. Pilots who had been hibernating all winter simultaneously decided to head for the airport. Once the rental airplane schedule filled up, it seemed like everyone else -- those who couldn't get on the schedule, those waiting for a turn to fly, or those who had already flown -- headed for the Lounge and the coffee pot. I overheard fragments of a number of conversations without paying much attention until two pilots started discussing the crash of a Cessna 150 on takeoff. It seems that it was an instructional flight in which an instructor who had little Cessna 150 time had chosen to make an intersection takeoff and had selected 10 degrees of flaps even though there were obstructions off the end of the runway. Obstacle clearance climbs in the C150 are made with the flaps up; in the C152 they are made with 10 degrees. It's one of those sometimes critical differences between aircraft types that can bite a pilot who doesn't pay attention. Afterwards, the student said that the instructor made a comment during the takeoff roll that the rpm wasn't where it should be. The airplane used much of the 3000 feet of runway from the intersection to get into the air, then snagged power lines located off the end of the runway and crashed. Both occupants survived, but spent some time recovering from their rather severe injuries.

### Fateful Day

At about that point I stopped hearing anything going on in the room. I was transported back in time about 30 years to a Cessna 150 on a temporary grass runway that had been long closed, but reopened for use for about two weeks during construction that closed the other two runways on the airport. My student was making a normal takeoff. I was tired and not paying full attention. As we trundled down the runway, things didn't feel quite right, but I couldn't put my finger on just what was bothering me, so I did nothing but continue to weigh down the right seat of the airplane. It was only after the airspeed reached about 55 knots and my student raised the nose did I realize that the airplane had used up much more runway than usual. The 150 stumbled into the air. The airport fence and adjacent highway whistled by distressingly close to our wheels. I could see my student looking puzzled as he kept the nose down, seeking best-rate-of-climb speed, 70 knots. Ahead, the trees that had always seemed quite a ways from the airport were no longer quite so far away. The ASI read 65 knots when I took the airplane and pitched it up sharply, hoping to get over those trees. Vx was published as 60 knots. I'd flown early models of the 150 that had a much lower published Vx and had read somewhere that it had been increased on later models to allow for a successful forced landing if the engine failed below 50 feet. From a lot of slow-flight practice with students, I figured I could let the speed get down to about 50 KIAS and, if I got us over the trees, we could fly away from the situation, as there was nothing to hit after that. The 150 cleared the trees. I remember that the speed was 53 KIAS; the airspeed indicator seemed about the size of a pie plate and I was searingly aware of every caustic, downward movement of that indicator needle. Once over the trees, I was able to slowly lower the nose and get to 60 KIAS without losing any altitude. Eventually we climbed to pattern altitude, got our heart rates down to the low triple digits, returned for a landing and taxied back to the office, where we complained about the airplane. I do not recall the cause, but the engine was not developing full power. I was lucky. My student was not particularly large. I was a poor law student and had no fat on me, so even with full fuel, we were below gross weight. Had we been over gross, we would have hit the trees. Bush pilots know from hard experience that weight matters on takeoff: A 10-percent increase in weight increases obstacle takeoff distance 21 percent Nightmare Becomes Reality I suspect that every pilot who has flown more than 40 hours has had a nightmare that involves an airplane that is barely in the air, unwilling to perform and facing a horribly inhospitable landscape. Any attempt to raise the nose just results in loss of airspeed without increasing the distance between one's soft posterior and the numerous obstacles. Trying to turn doesn't help; more sharp, pointy things swim into view while the airplane sags toward the ground as the lift component is deflected from the vertical when the wings are banked. It's even worse when you're wide awake and it's happening for real in a loaded airplane that has been reluctant to leave the runway and is not showing any particular interest in climbing over the trees ahead. How did you get there and what can you do about it? A lot of pilots have asked that compound question just before discovering that the answer to the second half is "nothing" as they hit obstructions after takeoff. The answer to the first half is more complex and worth considering even if the number of takeoff accidents is well below that of crashes on landing. The problem is that hitting something after takeoff tends to be pretty grizzly and, as there is usually a lot of fuel on the airplane, the risk of post-crash fire is very high and the probability of survival low. When the accidents are reconstructed, the striking thing is that, had all things been working normally and the pilot used all of the available runway, the airplane should have cleared the obstruction. So, what's going on? Let's take a look at the real world. The majority of airplanes we fly are designed for a lot of flexibility in flight planning: The pilot can fill the tanks and go a long ways with people in some of the seats, or the pilot can fill the seats and -- with reduced fuel -- make shorter hops. OK, that sounds great, but let's really face facts: Pilots routinely fill the seats with less-than-svelte passengers and fill up the tanks, launching well over gross weight. And, yes, by definition, the pilot is flying an airplane for which there is no published performance data and is thus a test pilot. And, yes, it is illegal. But it has become a habit for one heck of a lot of pilots. Pilots get away with some degree of over-gross operation because, usually, everything else is in their favor and the airplanes were pretty liberally designed to allow for stupid pilot tricks.

### How Bad Can It Be?

In the real world, our habits have a tendency to kill us when other variables enter the equation. Because we are sloppy about respecting limitations of our airplanes, we cut well into the designed-in margins (we have absolutely no way of knowing how far) and we don't recognize when the velvet we've been relying on is finally exhausted. We've been flying a couple hundred pounds over gross in the Saratoga HP pretty steadily because, with full fuel, it can only carry two big people and their luggage. Yet we've been putting the spouse and the two kids in and getting away with it. But the kids are getting bigger and one kid really, really wants to bring a friend on this trip. We rationalize: If a couple hundred pounds over gross is OK, what's another 150 pounds? Except that this trip is to that lake resort where the runway is 3000 feet long while home base has 5000 feet. And the resort is at an elevation of 2500 feet. And it's the 4th of July weekend and, because our Sunday-morning departure for home got delayed so the kids could swim one more time, it's now Sunday afternoon and 95 degrees F. Density altitude is way up there and one of the brakes is dragging just a little, just enough so it takes 1200 rpm to taxi instead of 1000. And, oh, yeah, fuel is cheap here at the resort, so we filled up. We go charging down the runway, vaguely aware that things are not happening as quickly as they usually do. We can see the far end of the runway, but the foreshortening effect of distance makes it nearly impossible to accurately estimate how much is left until well into the takeoff roll. We make a quick glance: Manifold pressure, rpm and fuel flow are where they should be. The midfield taxiway intersection goes by and we're looking at less than 40 knots on the airspeed indicator. The idea of aborting the takeoff flashes to mind but the sound of the engine going from high power to idle will get the attention of everyone on the airport, so we'll be admitting to everyone that we screwed up ... plus we're not sure we can stop on the remaining runway and it rained hard last night, so it's going to be muddy off the end and getting stuck will really be embarrassing ... and maybe we won't get pulled out of the muck in time to leave today and we've got to be at work tomorrow and the spouse is going to raise the roof over how much it costs to fly if we can't even use the airplane to get home on time and ... man this one is going to be tight and ... gawd there's the end of the runway, there's no room to stop, we gotta go, we pull on another notch of flaps because we think that obstacle-clearance climb requires two notches but we haven't looked that up recently ... and we're off the ground right near the end of the runway and find the override switch so we can get the gear up right now ... and is best angle 85 or 95? ... and those trees are right here, right now and we're gonna hit and it's gonna hurt ... Hitting trees flying at 85 knots hurts. A lot. It hurts a lot more than hitting them while rolling at 20 knots after having the good sense to abort a takeoff that isn't going well. The forces we face in an impact are a squared function: When we double the speed of the impact, we don't double the force of the impact, we quadruple it. That's a nasty, hard, unbending rule of physics. We will probably be embarrassed if we hit the trees at 20 knots after an abort. We probably won't be embarrassed if we hit those trees 3/4 of the way to the top flying at 85 knots. Or at least, not for very long ... we have to be alive to be embarrassed.

### Better Dead Than Embarrassed

A buddy of mine who was in the Blue Angels once jokingly told me that when performing in an airshow he'd rather be dead than embarrassed. While he was being facetious, I know one heck of a lot of pilots who are such perfectionists that any mistake at all is perceived by them to be abject failure on their part and in their subconscious, I'm convinced, they believe that it is better to be dead than embarrassed. I think it also explains more than a few crashes. The airlines and military have long recognized that most pilots are successful, goal-driven, reasonably obsessive perfectionists who view mistakes as hideous things. As a result, they teach pilots that aborting a takeoff is not a mistake. They teach that, on every takeoff, there are things that must happen for the takeoff to continue. If those things don't happen, there is something wrong with the airplane and it is the pilot's job to save the day by aborting, even if it means going off the end of a runway, because the chances of survival go way up as the speed of impact goes down. I think the mindset of being spring-loaded to abort a takeoff if certain parameters are not met and that the hero-pilot is there to keep the airplane from killing everyone by aborting is a way to keep on living. It's a little like NASA's approach to launching a rocket: The default answer to the question of whether to launch is "No"; it is up to the hardware, software and humans to demonstrate that everything is working properly so that the question may be answered with a "Yes." For an airplane takeoff, the default should be "abort" unless the airplane demonstrates that it is healthy enough to continue.

**Killer Factors**

Let's look at the things that can cause an airplane to crash on takeoff and see if there are any warning signs for the pilot so we can come up with parameters to be met before we let a takeoff continue.

**Gross Weight.** We've talked about it above. It's a choice made by the pilot. When a 10-percent increase in weight increases the distance over an obstacle by 21 percent, it's worth a pilot's undivided attention and respect.

**Intersection Takeoffs.** Do we really want to make one? Is it that important to save taxi time? In reading takeoff accident reports, it's interesting how often the pilot initiated the takeoff from an intersection. Is it an indication of other shortcuts the pilot is willing to take that cut into the margins on clearing that obstacle?

**Predicted Performance.** Does the manual say the airplane will clear an obstacle in the available distance? If not, attempting to take off is stupid and may be criminal. Over some years of involvement in aviation lawsuits regarding takeoff performance, I've found that a properly maintained airplane will usually meet book takeoff performance, but it truly has to be properly maintained. The engine has to be developing full rated power; the prop has to be in good shape, the tires properly inflated and the brakes not dragging. I've also observed that airplanes picked at random for inspection usually have something that prevents them from matching book performance ... anything from a heavily filed prop or the wrong prop to an engine not making power to low tires. So, I agree with the aviation writers and textbooks that recommend a pilot allow a margin above the book performance numbers for deciding on whether to make a takeoff.

**Power Output.** There is a way to get a pretty good indication whether the engine and propeller combination are developing appropriate power. It's called a static runup. We taxi to a spot where the prop won't pick up all sorts of trash and the propwash won't cause damage, then hold the brakes, pull the yoke or stick all the way aft and go to full power. On a fixed-pitch prop airplane the resulting rpm must be in the range published by the manufacturer in the manual. For example, for a Cessna 152, the acceptable rpm range is 2280 to 2380; for a Cessna 172N it is 2280 to 2400. If the rpm we see on the tach during a static, full-power runup doesn't fall within the acceptable range, it's an automatic abort, as we have no guarantee that the engine is making power (or that something else is wrong if the rpm is above the acceptable range). Assuming the tach is accurate, if the rpm is too low, the engine is not making power or has the wrong prop or improperly pitched prop. If rpm is too high, the prop may have been filed beyond limits, the tips may have been cut down too far, it may have the wrong pitch or be the wrong prop. All of those are reasons that the airplane will not perform per book on takeoff. For a constant-speed prop airplane, it is not as simple: the rpm should be at redline but manifold pressure will depend on the density altitude, which means we have to do some homework to determine the max. manifold pressure attainable before doing a check.

**Dragging Brake(s)/Low Tires.** Keep track of how much power it takes to taxi at your normal speed on flat, dry pavement in light winds. For most airplanes, it will run on the order of 1,000 rpm. If the power needed goes up by about 200 rpm, find out why before making a takeoff (abort the takeoff before it begins because a parameter has not been met).

**Proper Acceleration On Takeoff.** Here's the big one. There is a good rule of thumb that works as a parameter on continuing a takeoff: The airplane will break ground in the available runway length if, by the half-way point of the runway, it has reached 71- percent of the published speed at which the nose is to be raised on takeoff. If the manual says to raise the nose at 60 KIAS, then we better be looking at a speed of at least 42 KIAS at midfield. If not, it's an automatic abort because a parameter has not been met. This go/no-go parameter does not guarantee obstacle clearance; it just gives information regarding getting off the ground in the available runway.

**Controls.** They are rare, but extremely ugly takeoff accidents ... the ones due to locked or jammed controls or badly mis-set trim. While those should have been caught during the pretakeoff check, pilots still miss them and try to fly with the control-lock engaged, a jammed elevator control or the trim rolled all the way forward. The parameter is that when we go to raise the nose on takeoff, if the control wheel does not physically move aft when normal or slightly more than normal pressure is applied and the nose does not start coming up, a parameter has not been met, so abort the takeoff. This one will probably involve running off the end of the runway, but it is almost invariably better than trying to continue at high power.

**Braking.** For a takeoff abort, close the throttle instantly and make sure it is completely at idle, hold the control yoke/stick slightly aft of neutral and apply heavy braking to the point of sliding the tires. If you ever get a chance to ride with a test pilot on a max brake effort stop, it's an eye opener. Get on the brakes as hard as you can. If you slide the tires, back off a bit, but only a bit. Raise the flaps to put more weight on the wheels. Don't worry about calling the tower, you're busy. If you are going off the end of the runway and have the time, pull the mixture to lean cutoff, cut the master, turn the fuel selector off and pop the cabin door(s) open slightly. Keep trying to make the airplane go in the direction you want and keep trying to stop the airplane until it does come to a complete stop. Don't give up trying to make the airplane do what you want it to do.

### Abort-Analysis Checklist

If we take the above and boil it down into an abbreviated mental checklist of parameters that must be met or we save the day by aborting the takeoff, we get something along the following lines:

#### Lineup Check

- Are the trim tabs, flaps and fuel selector(s) properly positioned? If no, abort. If yes, continue.

#### Takeoff Roll

- At full throttle, is the rpm is in the acceptable static range on a fixed-pitch prop airplane? With a constant-speed prop, are the manifold pressure, rpm and fuel flow where they should be for the elevation and temperature? For a turbocharged engine, are manifold pressure, rpm and fuel flow at redline? If not, abort. If yes, continue.

- Airspeed indicator off the peg and moving without jerking within 5 to 10 seconds of going to full power? If no, abort. If yes, continue.

- At the mid-field point on the runway, has the airplane reached at least 71 percent of the published speed for raising the nose? If no, abort. If yes, continue.

- At the published speed for raising the nose for takeoff, can the yoke/stick be moved aft and does the nose begins to come up? If no, abort. If yes, continue. It's up to the airplane to demonstrate to us, as pilot in command, that it is capable of performing on takeoff. It's up to us to assure that it is doing what it's supposed to do and, if not, to abort the takeoff and live to fly another time. Aborting a takeoff isn't a failure on the part of the pilot; it's a pilot showing the right stuff by recognizing the wrong stuff and taking action to keep people alive.

## 2014 Membership Form

# Winnipeg Area Chapter RAA

☐ **Full $25**

**Required Information**

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|---|---|---|
| **Name** | | **OFFICE USE ONLY** |
| **Mailing Address** | | **Renewal Date** |
| **Phone(s)** | | **Chq. Cash Other** |
| **E-mail** | | **Initials** |
| **Are you an RAA national member? (1)** | ☐ **Yes** ☐ **No** | |
| **Do you give permission for your information to be made available to other Winnipeg RAA members?** | ☐ **Yes** ☐ **No** | |

**Optional Information**

| | | | |
|---|---|---|---|
| **Do you own an aircraft?** | ☐ **Yes** ☐ **No**<br>**Make/model:**<br>**Registration:** | **Are you a member of other aviation groups?** | **EAA:** ☐<br>**COPA:** ☐<br>**Others:** |
| **Are you building or restoring an aircraft?** | ☐**Yes** ☐ **No**<br>**Make and model of project(s):** | **What Pilots licences and ratings do you hold?** | |

**RAA Winnipeg contributes $15 per member towards the insurance program maintained by RAA national. This program provides liability insurance to cover local chapter events.**

**Please make cheques payable to: RAA - Winnipeg Chapter**
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**1) Notes: The $15 does not provide membership in RAAC.**