HANGAR ECHOES

Experimental Aircraft Association ★ Chapter 168 ★ Dallas, Texas

Les Palmer's KR2: A Pocket Rocket Part II: Propeller

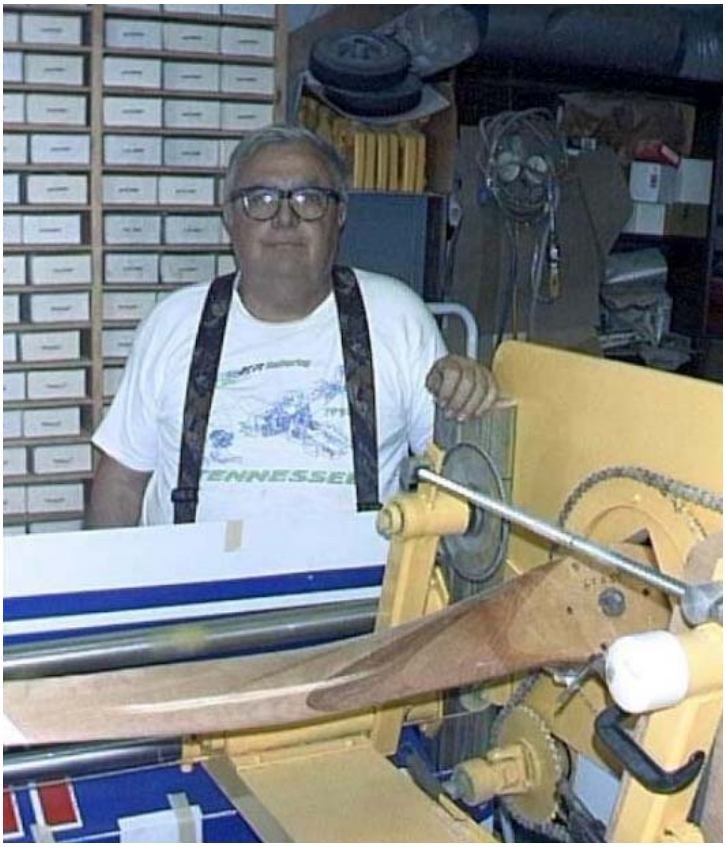
by K. Truemper

In the first part, we looked at Les Palmer's engine installation of the Subaru EJ22 engine in his KR2. Here we focus on the propeller for that plane.

When the EJ22 engine had been installed, tested, and declared ready for flight, Les used the propeller of the previous Subaru EA81 installation for the initial flights. This is not the place to be critical of products or brands, so we will not mention the propeller manufacturer. But that propeller turned out to be a miserable performer. In fact, the propeller was barely good enough for getting the plane off the ground and for investigating the initial cooling problem. Climb and cruise performance were far from the expected results. Even at moderate to low power settings, coolant temperatures hovered near 212 deg F on 70 deg F days. Flying the plane during summer temperatures seemed out of the question. The word that best summarized Les's emotions was DISAPPOINTMENT.

At the time, it was not clear that the propeller was at the root of the problem, and plenty of discussions took place in the hangar at Aero Country. Passersby gave lots of advice, some of it good, but some of it irrelevant. It was hard to figure out what was wrong. Maybe the entire EJ22 installation was a mistake.

To the rescue came Bud Wilson, rather unintentionally. He has a KR2 with the Subaru EA81 engine, quite similar to Les's original installation. Bud had installed a propeller of the manufacturer we shall not mention here, just like Les. After some discussions of the non-virtues of that propeller, Bud became intrigued enough to remove it from his plane and to use instead an old wood propeller that Les had in his shop. It clearly was not the right prop, or so it seemed: wrong chord, not enough pitch, probably lousy performance - these were the comments. Anyway, he installed the thing and you know what? The plane climbed like a homesick angel - that was to be expected due to the pitch - AND it had much better cruise



and top speeds. It also was more quiet and weighed 25 lbs less. Clearly, the previously used prop was a very poor choice.

Now what? There were lots of propellers that could be bought and tried. Surely one of them would be terrific. The thought of the expense was intimidating enough, but really annoying to Les was the fact that he would buy finished product off the shelf. He only buys aluminum, fiberglass, wood, and steel stock, and he makes from these materials whatever else he needs. By golly, he was not going to change and buy a bunch of propellers in search of a good one.

There are several ways to make a wood propeller. (1) One may carve it by hand, using a number of cross-section templates. (2) One may use a copying process to duplicate an existing propeller. (3) One may carve the propeller on CNC

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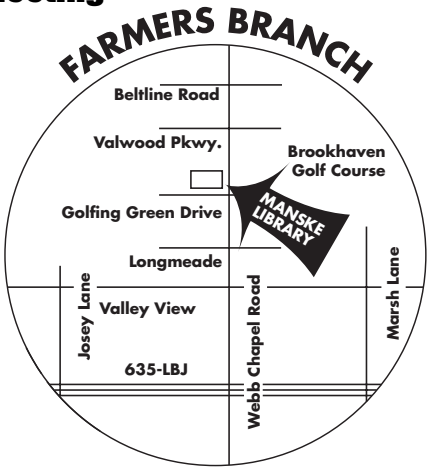
June 4th Chapter Meeting



Our June 4th Chapter Meeting will be held at the Farmers Branch Library, located on the northwest corner of Webb Chapel and Golfing Green Dr. The meeting will be held in the auditorium and will begin at 6:30 p.m. and finish by 9:00.

This month's speaker will be Addison Airport Manager David Pierson. The topic will include those issues that airport managers face operating a large airport and how they affect the pilots and residents.

June 8th Fly-In

Our monthly fly-in will actually be a fly-out to Ada, Oklahoma with the Granbury chapter to visit the Gami facility there. The plans are to arrive in Ada by 10 am and tour the facility and listen to the presentation. They will provide lunch around noon.

Gami produces several products including thier popular Gami fuel injectors, a supplemental alternator, and are working on a full fadec system. They have also added a turbocharger to the lineup. With their in house test stand they do extensive testing to determine engine horsepower. More information can be found at www.gami.com.

Since this is far for those without planes, if you wish to go, plan to be at the June Chapter meeting and we will see if we can get you hooked up with a pilot and an empty seat.

E.A.A. Chapter 168 Directors' Meeting

The June BOD meeting will be held on the 11th at the Farmers Branch Library at 7:00 p.m. The minutes from the May 14th BOD meeting (recorded by Pat Johnson) are as follows:

• Attendees: David Cheek, Pat Johnson, Michael Stephan, Ralph Haroldson, Don Christiansen, Scott Christiansen, Monroe McDonald, Jerry Mrazek, Bruce Fuller, Ann Asberry, Mel Asberry.

• Next Chapter Meeting will be June 4, 2002 in the Farmers Branch Library at 6:30 p.m. The speaker will be Addison Airport Manager David Pierson.

• Fly In for June will be on the 8th at Ada, Oklahoma. We will be touring the Gami plant with chapter members from Pecan Plantation. Please arrive early as the tour starts at 10:00 a.m. Lunch will be provided and the day should end around 3pm. It's a great opportunity to learn!!!

• The next Board of Directors meeting will be on June 11th. We'll also meet at the Library at 7.

• Newsletter Assembly will be on June 22nd. Mel and Ann Asberry are hosting a fly-in/drive-in potluck lunch. Arrive around 11 a.m. and bring side dishes, salads, chips and or desserts. They'll provide the fixings for hot dogs. Please call them for directions if needed.

• Michael Stephan updated our finances.

• Advertising in the Newsletter. Please update NOW with Sam! He's volunteered his time to take care of our advertisers.

• A Thank You card and gift certificate was sent to the Whitesells for keeping the chapter trailer at their house. We really appreciate it!!!

• We will be flying a small group of Yong Eagles on June 2nd at Lancaster airport. See Jim Quinn for details.

• Mark your calendar for July 7 fly-in at Hicks for Breakfast.

June 22nd Newsletter Assembly

The July issue of Hangar Echoes will be assembled on Saturday June22 at the home of Mel and Ann Asberry.This assembly is something different. It is a fly-in/drive-in potluck lunch. Arrive around 11 a.m. and bring side dishes, salads, chips and or desserts. They'll provide the fixings for hot dogs. Mel and Ann live at 2464 CR655, Farmersville. If you need directions call Mel or Ann at (972) 784-7544. More details on page 4.

Upcoming Events

Local

• June 1st - Annual Pancake Breakfast Fly-In, Mid-Way Regional Airport.

• June 1st - Annual Central Texas RV Fly-In & Lunch Waco, Texas.

• June 7-9 - Lake Texoma Ultralight Gathering Gordonville, Texas.

• June 21- EAA Chapter 34 Lake Whitney Camp Out Lake Whitney, Texas.

• July 8th - Chapter Breakfast fly-in to Hicks.

National

• Jul 2-11 U.S. Nationals, Standard Class Glider Competition Hobbs, NEW MEXICO

• July 23 - 29 - Airventure 2002

• Sept. 27, 28 - Southwest Regional Fly-In

A Message from the President

Sam Cooper

I hope that a number of you have been able to take advantage of the plethora of local sport aviation activities that were available in May. We had a very full local calendar that offered a number of different options. If you did not, we still have a number of events coming up in June that promise a nearly equal dose of sport aviation. In particular, the 6/8 fly-out to GAMI in Ada, OK and the 6/22 Chapter Summer Picnic fly-in at Shortstop should be a lot of fun. I hope to see you at some of these events.

In May I was fortunate enough to take a vacation with relatives on a sailing cruise in the Bahamas (see disclaimer below). To do this I had to take a small airline flight from Fort Lauderdale to Chub Cay in the Bahamas. It was an appropriate start to the vacation.

On Saturday morning, my cousin and I arrived at the "terminal," Hangar 73 at Fort Lauderdale Executive airport at 8:30 AM, an hour early as requested. Since the door was locked, we waited outside on picnic tables, while keeping our bags away from the ants. The Bimini Island Air (BIA) receptionist/gate attendant arrived shortly. We moved inside to enjoy the air conditioning. When BIA was ready to process us, they asked how much we weighed and weighed the luggage on a portable bathroom scale. We were under the strict weight limits, but some fellow passengers had to remove about 40 pounds of ice from their cooler to meet them. When we were ready to board, the passengers (all five of us), walked out to the Cessna 400 series twin. The crew of two quickly finished loading the Cessna, and then carefully seated us in the aircraft (the heaviest passengers were further forward). Everyone had a window/aisle seat. Getting in last, the pilot closed the door and carefully briefed us on how to open the door and window exit in case of an emergency.

The pilot and trainee co-pilot quickly started the Cessna's engines and we taxied out to the east end for takeoff. Since I was seated on the left side facing forward, I could see the radio stack in the panel. The radios looked like standard Cessna IFR instruments from 15-20 years ago. The amusing part was the Garmin GPS Map 295 installed on top of the glareshield providing the pilot with "backup" flight information.The pilot left it on the numbers page, not the moving map. I did not see any weather avoidance instruments in the panel. The flight to Chub Cay was an uneventful 80-90 minutes, but we never climbed higher than about 5,000 feet AGL. During the last part of the flight we were able to watch the colorful patterns of the shallow banks we were flying over. The pilot made a nice landing on the no tower, unmarked Chub Cay runway and backtaxied to the ramp area. After unloading, we carried our bags about 30 yards past the open air "waiting area" gazebo and into the air conditioned terminal (about 20' x 15'). After the pilot checked in, we were able to clear customs and immigration with the officer. Then it was just a short bus ride to the boat at the marina. It was a good "grassroots" commercial aviation way to start the vacation.

Disclaimer: The boat was built in the 1950s, is an ex-ocean handicap racer and has been in my relative's family for years. The boat has an ice-box, pump toilet, no shower and no air conditioning. We are the crew. It is essentially camping on the water. I tolerate the sun, heat and humidity to enjoy the sailing and snorkeling in usually quiet, isolated Bahamian waters. Lifestyles of the rich and famous it is not, but I certainly enjoy it.

As I write this column on Memorial Day weekend, I hope that you were able to spend some time remembering those who have fought and sacrificed for the freedoms we enjoy. That struggle continues as we work to maintain those freedoms that some would take away from us.

Let's keep building, restoring and using our flying machines.

Sam Cooper

Chapter News and Notes

By Michael Stephan

Ann Baeureis passed away.
Sad news to report that Ann, wife of Bo Bauereis, passed away on Thursday evening, May 23rd, at the nursing home where she has been for about 4 months. The service was Tuesday afternoon, May 28. It was held in McKinney at the St. Peter Episcopal Church. The entire Chapter 168 family sends our sincere condolences to Bo and the Bauereis family.

The Chapter Trailer
Since we rarely use the chapter trailer, the Board decided to sell it. The trailer needed repairs along with the annual registration fees, so selling it released the chapter of those responsibilities. The trailer now has a new owner, and Sam Cooper removed the chairs and other stuff that was in the trailer and is now storing it for us at his house. And, a big Thank You to the Whitesels who have stored the trailer for many years. We appreciate your care for the trailer.

Lancaster Young Eagle Event
On June 2nd Jim Quinn has lined up about 8 enthusiastic youngsters interested in a Young Eagle flight. So, at Lancaster airport we will have a few kids to fly. If you are interested in helping out let Jim know at jquinn2@swbell.net or at (972) 788-2593.

SWRFI Update
The SWRFI Board of Directors continues its work in preparation for this year's fly-in in Abilene. This year's fly-in will have a few changes. One is the arrival procedure. The displaced threshold of the past is gone, so be sure and read the current procedure that is on the website (www.swrfi.org). Second concerns the airshow. The board decided to not have an airshow and instead have more fly-bys of factory and other participating aircraft. Since we will not need close the airspace for the airshow, attendees will have more time to look at airplanes and have a more flexible arrival and departure window. Third, there will not be a Saturday night banquet. Awards will be presented at the airport on Saturday afternoon. You can then take you award and celebrate at one of the fine establishments in town. We are also looking to add a few more participant flying activities. The focus for this year's fly-in is to "simplify." Keeping it simple eases the burden on the volunteers and at the same time make it more flexible and hopefully more enjoyable for those attending.

The Board also voted to have a site selection committee investigate new possible locations for future fly-ins. At the last board meeting, the list contained 12 sites of which several have already declined. In June the list will be pared down to three locations for 2003. The site selection committee is also researching a move of the fly-in from the fall to the late spring, i.e. third weekend in May or the second weekend in June. More details as they come.

If you have any questions, our chapter's representatives are Bo Bauereis and David Cheek. Also on the Board from our Chapter is Jerry Mrazek (airport liaison), Monroe McDonald (aircraft operations), and me (Michael Stephan - secretary).

June Assembly/Picnic Details

From Ann Asberry

Mel and Ann Asberry are hosting the first EAA Chapter 168 Picnic and newsletter folding, Saturday June 22.

Driving directions to ShortStop Airfield:
East on highway 380 from McKinney approx. 18 miles to Farmersville, or travel north on highway 78 out of Garland. After you pass the Dairy Queen on highway 380 it is approx 1.8 miles to County Road 653, turn left. This road will "T" into County Road 655, turn right. The house is 1/4 mile on the right. Address is 2464 CR 655, phone metro (972)784-7544. PLEASE do not park off the side of the driveway but go all the way to the hangar and you will be directed to parking there.

Hot Dogs, fixins' and drinks are provided. Please bring a side dish, chips or desert to share. Plan to arrive around 11, lunch will be served about noon.

If you plan to fly in, PLEASE be up on your short field techniques and call if you have any questions or if we've had rain within the previous three days. Unicom is 122.75, left hand pattern. The field is 1500 ft, packed white rock surface with grass encroachment on the sides and ends. Please go ALL THE WAY TO THE END TO TURN AROUND. The approaches are clear, no power lines or trees with a railroad on the south end. Observe the railroad east and west to see if a train is approaching. Do not land until the train is past the runway. This event is rain or shine as we have plenty of room inside for all.

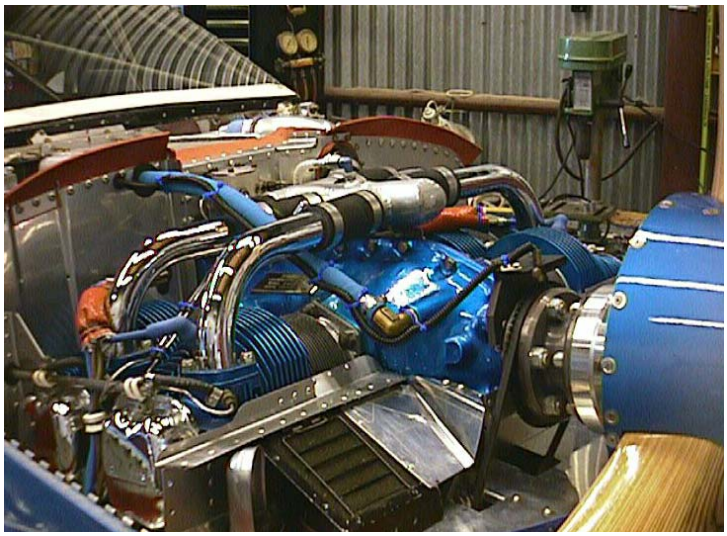
May's Mesquite Fly-In

By Michael Stephan

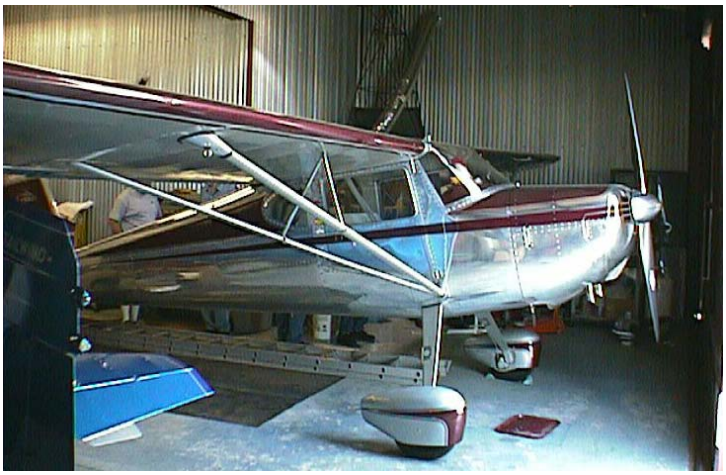
Even with the wind gustin' several flew out to Mesquite and even more drove in. Pat and Ben Johnson hosted the group and Pat prepared a delicious breakfast. As with most airports around the area, we have several members whose airplanes reside at Mesquite, and after getting our fill of food we took a tour of their projects.

Ben Johnson's RV-6 was getting ready for the paint booth. During the first year of flying, Ben has flown an incredible amount of hours on this bird.

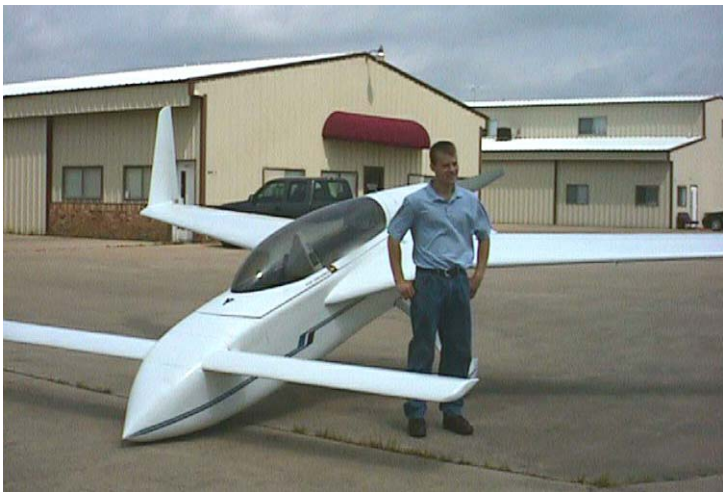
Next it was over to Bob Lidster's hangar for a look at his rebuilt Whitman Tailwind. After a taxi incident, Bob reworked the engine on the Tailwind. He now has a turbocharged Continental O-200 under the cowling. He has a beautiful engine installation as the pictures show. Bob's attention to detail is second to none.



They also have a very nice Cessna 140 in the hangar which they flew to Oshkosh.

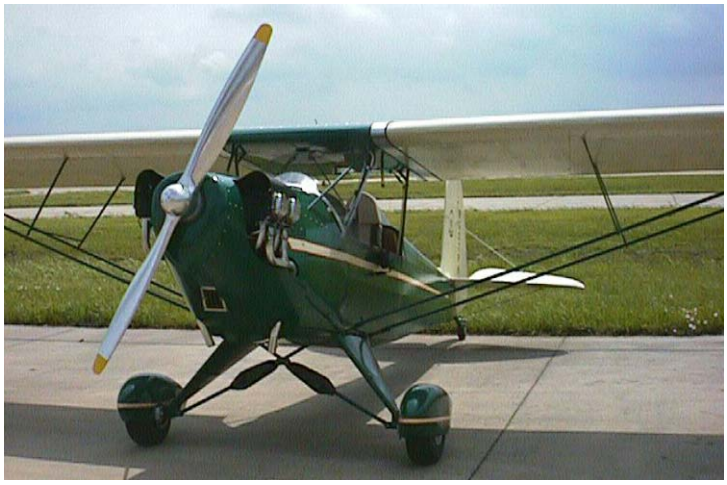


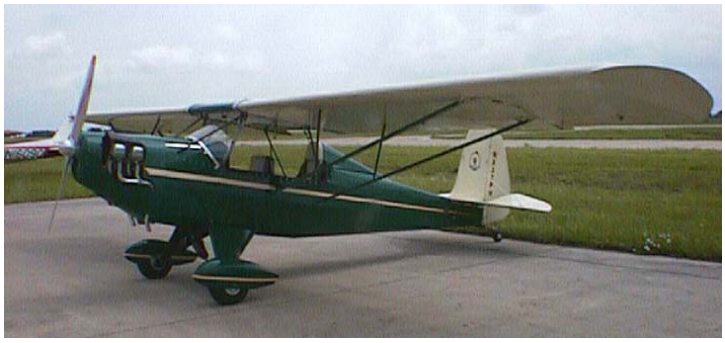
However, those airplanes that flew in likewise received quite a bit of attention. Don Christiansen's RV-8 was admired by several in attendance.



Leon Rausch flew his Vari-eze in as well. Leon also gave an introduction ride to young man and you couldn't wipe the grin off his face.

Later in the morning, Mike Hoye and his Pober Pixie II dropped in for a visit. Seeing the plane again and getting a chance to talk with Mike about it was quite educational and inspiring. Mike said it was one challenge after another building the Pober Pixie II, but he added that he enjoyed every one. It sure is a beautiful airplane.





Jim Quinn arranged for a few Skyline students to get a Young Eagle ride, but the weather was a little too gusty to take a first-timer up. So, we have a few rain checks to honor.

In all, we had a great time on a pleasant day. We thank Ben and Pat for their hospitality, especially Pat for preparing breakfast. This month we fly out to Ada, Oklahoma, and for July we are heading out to Hicks for breakfast at the restaurant. See you then.

Continued from page 1

equipment where a computer program drives the carving tool. Choice number 1 was too tedious, since several propellers had to be produced. Choice number 3 involved considerable costs.

That left choice number 2. Les made phone calls, looked at some propeller copying processes, and decided on a design that could be built with parts he had in his shop, such as electric motors previously used for heating/cooling installations, and reduction gearboxes. He even used the take-up wheel and cable of an old garage door opener.

Lots of problems had to be solved. There is not enough space here to discuss them. After weeks of trials and refinements, he was done. The photo shows the finished machine.

It accepts a propeller, the "pattern." and a wood piece consisting of bonded-together layers, the "blank." A sensor wheel traces the pattern and transmits its movement to the cutting wheel, which converts the blank into the propeller copy. Here is a picture of the result of an early trial, where a 2X6 wood piece has been converted into half a propeller.

A 2X6 piece turned into half a prop

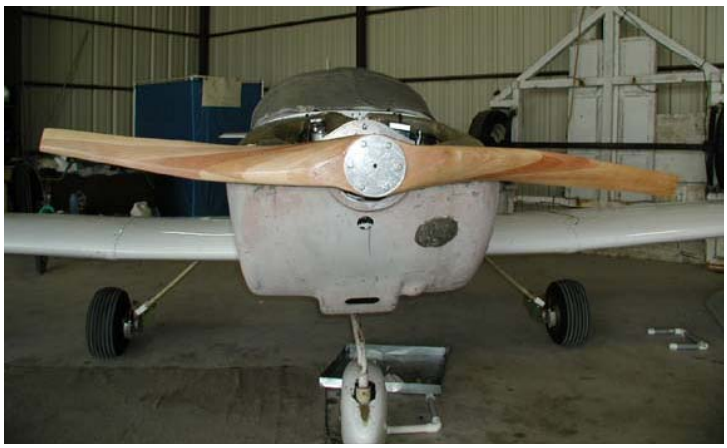
A disadvantage of the method is that one must have pattern propellers. They do not have to be airworthy. In fact, they may have been constructed from foam pieces, or plaster, or Bondo, or whatever can be easily shaped. Les searched and called and inquired to find pattern propellers. He located a builder in Pennsylvania who had used output of the Prop Optimizer PC program sold by Bates Engineering (Sport Aviation has their ad) to create a rather odd-looking propeller that had astonishing performance in an RV6/Subaru installation. The builder shipped the prop for a trial flight and agreed that Les could copy it.

The trial flight with that propeller was on a Sunday that won't soon be forgotten. At takeoff rpm, the prop produced a high-pitched screeching sound like a howler monkey in distress, plus a low-frequency wow-wow like a gorilla in heat.

The test flight drew pilots, mechanics, and visitors out of the hangars at Aero County. What they heard was terrifying, but what they saw was impressive: The plane climbed and had top speed like never before.

Following the test flight, the propeller was measured. It had been completely handmade from templates, had irregular chord and pitch, and an uneven surface. Les decided to copy one half of the propeller using a large, non-laminated chunk of wood. He manually reshaped and resurfaced that half-propeller using Bondo and lots of sanding, until it was dimensionally consistent and had smooth and flowing surface. Using it as pattern, he carved a real propeller for the next test flight. This time, the horrible noises were gone, but the performance was impressive as before. The pitch was a bit too small, so he created yet another one with increased pitch. This was easy to do since pitch changes are readily accomplished by offsetting the blank relative to the pattern.

Here are pictures of the final propeller for KR2 with Subaru EJ22. Odd looking, isn't it?



Now to the performance. Keep in mind that the current KR2 does not have any fairings for the wide main wheels. On an 80 deg F day, at 2000 ft MSL, climb rate was 1800 fpm at 110 mph. Max speed was 165 mph at that altitude, with the engine turning 5100 rpm and the propeller turning 2700 rpm. Cruise speed was 150 mph at 4800 rpm for the engine and 2500 rpm for the propeller.

Coolant temperature never exceeded 205 deg F during climb. During cruise, coolant temperature was 180 deg F. Once the main wheels have been faired, max speed and cruise speed should increase by at least 10 mph. Les's grin went from ear to ear when he saw that performance.

In the works is a fail-safe fuel delivery system for the fuel injected EJ22 engine. Since that system may be of interest to other builders, we will cover it upon completion and testing as Part III of Les's KR2 saga.

If you want to talk with Les about his propeller carving machine or propeller making, his number is 972-241-4387.

Newsletter Assembly at the Capens

By Michael Stephan

Last month we packed up the newsletter and headed over to the home of Ralph and Alane Capen to fold and stamp a little, eat and talk a bunch, but mainly to look at the RV-6 that Ralph is building. Ralph is doing great work in assembling the craft. Some of the more interesting things I saw were the addition of wing tip tanks, which go well with an iron butt and high capacity bladder, and a three blade prop. Ralph spent much of the time asking and fielding questions. He is quite proud of his RV and well he should be. We look forward to seeing it in the air soon.

Here is some background on Ralph:

1997 was a most eventful year. He got his pilot's license and met his wife Alane that year. Their first date was in a plane. That method seems to work quite often.

Growing up he built models and built and flew Radio Controlled airplanes. His interest in building led to his building a kit car. He then got the urge to build his own plane, so about a couple of years ago bought the RV kit. While doing work with the Reserves, Ralph's conversations about his project has inspired one of them into building an RV as well. Once the RV is built, Ralph and Alane plan to travel many places, see children and grandchildren up north and visit with family that are scattered out in several states.

Horse Power

By Jerry Mrazek

If you are a flyer of airplanes, you are probably interested in horsepower. Horsepower is required to make an airplane climb off the ground and to sustain flight for long periods. Power is defined as the "rate of doing work." This is a classic definition that is not necessarily limited to engines but the concept of horsepower was derived as the result of the replacement of the horse with an engine. In the 18th century the coal mines of Scotland used horses to haul coal and water out of the mines as part of the normal operation. The advent of the steam engine offered an alternative to the cumbersome and labor intensive practice of using horses for this purpose. James Watt is commonly given credit for inventing the steam engine. The fact is though that the steam engine was invented by two English engineers; Thomas Savery and Thomas Newcomen. Originally steam engines were used to pump water out of the mines. Watt studied and documented the characteristics of steam and invented several very significant improvements to the machines. Watt invented methods of reducing the heat losses in steam engines and better lubrication schemes, both of which significantly improved the efficiency of the engines.

In 1788 Watt invented the flyball governor for the steam engine. This was the first contribution to the field of servo mechanisms. The advent of steam engines created a need for a rating system that would allow engine designs to be compared in terms of performance. Watt developed the concept of "Horsepower." He studied the capabilities of real horses and worked toward a rating that allowed engines to be compared to the method of doing the work that had been employed for decades. He conducted experiments and found that horses could haul coal at the average rate of 22,000 foot-pounds per minute. That is, he found that a horse could raise 100 pounds of coal a height of 220 feet in about a minute. He arbitrarily raised this figure by one-half to establish the current value of 33,000 foot-pounds per minute and stated that this value would be called one horsepower. Lifting the coal a distance is work. The rate of lifting the coal is power.

One can visualize an engine that is set up to turn a drum on which a cable is wound. Let's say that the radius of the drum is 1 foot. If an engine is capable of delivering 100 foot-pounds (abbreviated, ft-lb) of torque at an rpm of 1000 revolutions per minute, then it could lift 100 pounds at a rate of 6283 feet per minute (the product of circumference of the drum times the rpm of the drum). Lifting 100 pounds at this rate requires 628,300 ft-lb per minute of power. If one horsepower is defined as 33,000 ft-lb per minute, then 19 hp is required.

We don't use steam engines much these days because the internal combustion (IC) engine is much more compact and considerably less trouble to maintain. Another characteristic of IC engines is that they usually have a much higher horse power-to-weight ratio than do steam engines. This makes them a much better choice in airplanes. Power is generated in a reciprocating IC engine by controlled burning of a fuel-air mixture and applying the resulting pressure to a crankshaft through a piston and connecting rod. Clearly, the actual torque developed from this operation is far from constant. In addition, a four-stroke-cycle engine (typical of aircraft engines) only has a power stroke on each cylinder every other rotation of the crank shaft. This fact makes the actual torque history look very cyclic. The more cylinders an engine has

the smoother the torque history. It would also be expected that the more cylinders the engine has, the less vibration would be experienced.

Torque is the ability of the engine to do work. Its power is the rate at which the engine can do work. Usually, in this country, the torque output of an engine is measured by a loading device such as a Prony Brake or a dynamometer. Many Hot Rod shops have dynamometers available to test cars. The theoretical torque of an engine can also be estimated but one must also estimate the losses caused by friction. A brake type measuring device measures the actual torque output and this is the reason that in the United States we prefer to use this method of rating the torque of an engine. An accurate measurement of the torque is so important because the horsepower of an engine is proportional to the product of the torque and the rpm. The expression for horsepower as a function of torque and rpm can be written as follows:

$$HP = \frac{2\pi TN}{33000}$$

Where π is 3.1416
T is the torque
N is the rpm

The maximum horsepower is of course achieved at full throttle. It is the full throttle value that is usually published. The torque can be found experimentally and the above expression can be used to solve for horsepower. The torque found in experiments will be averaged by the measurement equipment and will represent an average value, void of the variations discussed earlier.

An airplane doesn't fly on torque alone; it needs thrust. The common torque converter we use is a propeller. The purpose of the propeller is to convert the rotational power of the engine into thrust horsepower. The next discussions will cover "Thrust Horsepower Available" and "Thrust Horsepower Required."

Pet Peeve of the Month

Mel

What really gets to you about aviation? Send me your pet peeve and we will try to publish one each month. I'll start it off with one of mine:

I hate hearing "Clear Prop" and the starter turning at the same time! After yelling "clear prop" please wait at least 5 seconds. Give someone a chance to get out of the way or reply.

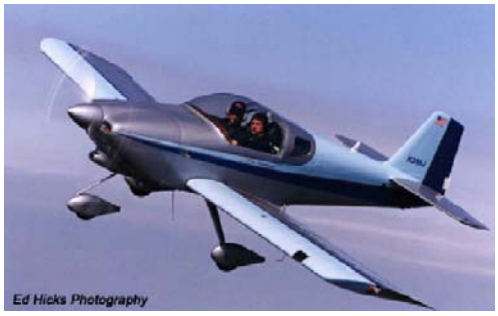
EAA Book & Video Sale

By Sam Cooper

EAA National is selling books and videos out of their catalog at a substantial 50% discount to EAA members. This is being done through the Chapters by having the Chapter place one order with National EAA. Come to the June Chapter meeting with your checkbook and place your order with Michael Stephan (the Treasurer). Michael will write one check to accompany the order to EAA National. The catalog will be at the June Meeting. Note: This sale is for a limited time only. The June Meeting is the best chance to get in on this great deal. Contact the Treasurer if you can not attend. We will mail the order by the middle of June.

For Sale; Services, Parts, etc.

Vans Aircraft RV-6A: TT 550 hours, 550 since major on 180 hp Lycoming with C/S Hartzell prop, electric flaps, vacuum system with AI and DG, Transponder, PS Engineering intercom, Swifttronics FC-100 fuel flow computer, Electronic International OAT, EGT & CHT. Asking $50K
• Call Ken Nordman 214-330-4677



1959 SuperCub. Selling 1/2. ADS based. Restored in 1994. 100 hours SMOH and Restor. CD/AM/FM, King Radio and in great shape. Call Doug Wall 214-707-9255 or doug.wall@ubspainewebber.com

King KX-175B TSO nav-com radio $675.
• Call Monroe McDonald 214-352-1564

Directional Gyro Vacuum, perfect condition, hardly ever needed resetting. Sacrifice at $225 or best offer.
• Call Dave Davidson 972-530-4067

Apollo 618 Loran w/tray & antenna $200
Collins VIR 351 nav unit (working well when removed) $400
Noise cancelling headset, mike inop, $35.
• Call Harry Gresham, 214-348-2772; cell 214-289-313; Fax 214-348 6565; hgresh@juno.com

Oil Breather Separator, New, still in original packing. $35
12V Lighted Compass, pedestal mount, $50
• Call Dick Flunker 972-396-0018

Kennon dust cover for aircraft up to 31' wingspan. Made of Dupont Tyvek. Used very little. Aircraft Spruce price over $300. My price $150
• Call Mel Asberry 972-784-7544

Aviation ads (For Sale, Wanted, Etc.) can be placed by Chapter 168 members free of charge. Send to: Chapter 168 Newsletter, 1102 Hills Creek Drive, McKinney, Texas 75070 or brott@mindspring.com

EAA CHAPTER 168 OFFICERS

President Sam Cooper
scooper9@flash.net 972-424-6930
Vice President Dave Cheek
dcheek@nortelnetworks.com 972-272-5332
Secretary Pat Johnson
214-321-6590
Treasurer Michael Stephan
mstephan@shr.net 972-857-3327

Flight Advisors
Mel Asberry metro 972-784-7544
m-asberry@ti.com
Mike Hoye 972-771-8162
Gene Spaulding 972-661-9229
genebs@wtd.net

Technical Counselors
Mel Asberry metro 972-784-7544
m-asberry@ti.com
Owen Bruce 972-231-3946
Don Christiansen 972-298-6531
Steve Marchand 972-475-0571

Board of Directors
Don Christiansen 972-298-6531
Scott Christensen 972-527-5890
Bruce Fuller 972-980-0215
Ralph Haroldson 214-358-3710
Monroe McDonald 214-352-1564
Jerry Mrazek 817-265-0834
mrazek@flash.net
Jim Quinn 972-788-2593
jquinn2@swbell.net
Don Wilcox 972-235-1854

Hangar Echoes Layout Editors
Tom Davies artguy@anet-dfw.com 972-247-1409

Hangar Echoes Content Editors
Marvin Brott 214-726-9117
brott@mindspring.com
Michael Stephan 972-857-3327
mstephan@shr.net

Advertising
"Volunteer needed"

Data Processing
Jerry Mrazek metro 817 265-0834
mrazek@flash.net

Librarian
Michael Stephan 972-857-3327
mstephan@shr.net

Tool Custodian
Vern Williams 314-618-1005
Fly-In Ground Control "Volunteer needed"
Meeting Refreshments "Volunteer needed"

Safety Officer
Mel Asberry metro 972-784-7544
m-asberry@ti.com

Website Editors
Jim & Jane Quinn 972-788-2593
jquinn2@swbell.net

Young Eagles Coordinator
Jim Quinn 972-788-2593
jquinn2@swbell.net

Membership
Michael Stephan 972-857-3327
mstephan@shr.net
Don Christiansen 972-298-6531

New Website Address: **www.eaa168.org**

Experimental Aircraft Association
Dallas Chapter 168
P.O. Box 168
Addison, TX 75001-0168

DALLAS CHAPTER 168 MEMBERSHIP APPLICATION/RENEWAL FORM

New Member ❑
Renewal ❑
Info Change ❑

Membership dues for EAA Dallas Chapter 168 are $20.00 for one year. Name tags are available for $7.00.

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Experimental Aircraft Association
EAA Aviation Center
P.O. Box 3086
Oshkosh, WI 54903-3086

National EAA membership:
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Fax (920) 426-6761

Name _____
Copilot (spouse, friend, other) _____
Address 1 (or business name) _____
Address 2 _____
City _____ State ___ Zip _____ Mapsco _____
Phone homework _____
e-mail address _____
EAA # (168 membership requires National EAA membership) _____
Pilot/A&P Ratings _____
EAA office (past or present) or additional notes _____

I am interested in helping with: Fly-ins ❑ Programs ❑
Newsletter ❑ Young Eagles ❑ Young Eagles ❑ Officer Position ❑

Plane or project (% complete) or interests

(Example) Thunder Mustang	25 %
(Example) RV-6	flying %
	%
	%