

Experimental Aircraft Association



TALESPINNERS

Chapter 174

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Chartered since 1966
www.eaa174.org

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<< Next Mtg: Sun, Dec 12, 1:00 PM, Hawk Building >>

Dec, 2004

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Builders' Logbook

CNC In the Home Shop – Part 1

by Kevin Kinney

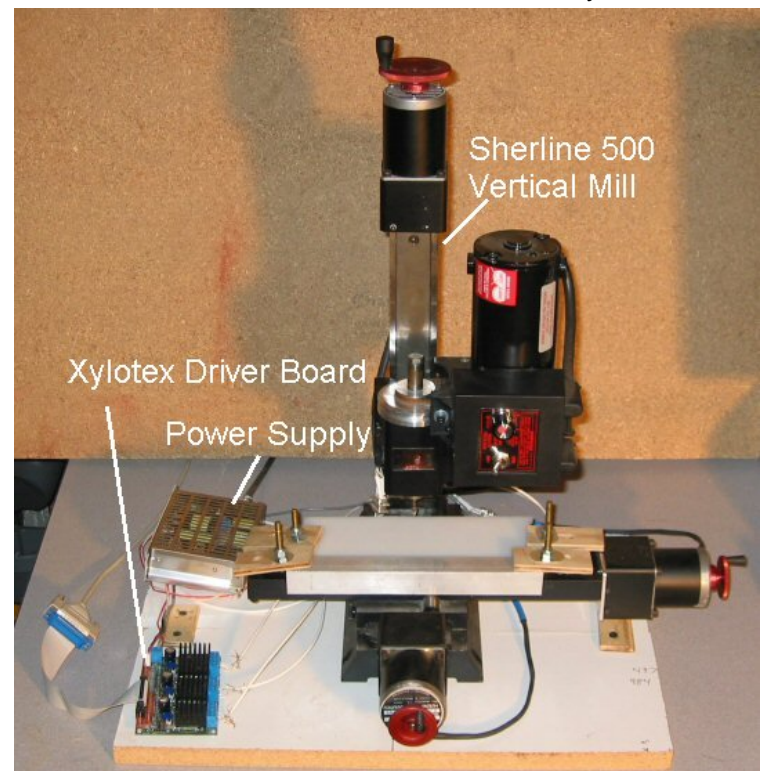
While I'm still a novice, I may know enough to introduce the idea of Computer Numerical Control, or CNC, which is computer control of a mill. While this usually means huge industrial mills, it also includes small hobby mills such as the one in my garage.

This article will be in three parts. The first part will introduce mills in general and parts of a CNC mill setup. The second part will expand on this and describe homebuilder uses for CNC. The final installment will document a CNC project from concept to cut.

As a newcomer to the machining world, I first had to learn about mills. Mills without computer control have been a staple of metalworking shops for a century or more. Until the 80's & 90's, they were multi-ton machines that only professional shops could afford. A company named Sherline introduced a small vertical mill for hobby use. Later they offered a CNC retrofit for their mills.

At a minimum, a vertical mill is a machine with 3 axes of movement that removes material using a cutter. It has a horizontal bed that moves left & right (the X axis), forwards & back (the Y axis) and a cutting head that moves up & down (the Z axis). By adding computer control to a mill, it's possible to create many parts with very little error. For those that went on the Hartzell flyout, you saw CNC machines that took a 6 foot aluminum billet and rough cut a propeller. Finishing is by hand; a tribute to the human eye.

Regardless of the size of a CNC machine, most setups have elements in common. CNC begins with a computer program, often written in a language called "Gcode." Knowing Gcode helps, but isn't necessary as software is available to convert computer drawings directly into Gcode. An example of Gcode is – G02 X1.0 Y1.0 This means cut a circle at 1,1. Using this and other codes, it's possible to create complex projects.



When you have a Gcode program you want to run, you feed it into software that reads and converts it into step and direction signals, called a "pulse train". I use TurboCNC, which takes the above Gcode fragment and tells it to move the X & Y axes a certain distance in a certain direction. Each line of Gcode will create thousands of pulses that are sent to a piece of hardware called a driver board.

The driver board converts the pulse train into a series of voltages it sends to stepper motors. For those unfamiliar with stepper motors, they are small DC motors with interesting properties. The normal electric motor runs relatively fast, produces more torque as it goes faster and isn't very precise. Steppers are relatively slow, very precise, and produce more torque as they go slower. To get this level of precision, a stepper motor has several poles that can be turned on independently. A driver board is responsible for taking the pulses from the computer and selectively powering these poles in a certain order to produce the desired movement.

Each stepper motor powers a lead screw. A nut on the screw is connected to the bed which moves the X or Y axis and therefore the part you are cutting. A third screw moves the cutting tool up or down.

In my setup, I have a DOS-based PC that runs TurboCNC, a gcode interpreter program. I feed Gcode to TurboCNC and it moves the mill as I programmed it. (This is sometimes different than what I WANT it to do.)

The PC is hooked to a Xylotex driver board which is then attached to the 3 steppers on my mill. I have Sherline 5000 I picked up used from Ebay. With some tweaking, it accepts Dremel bits which are cheaper than tool quality bits but are acceptable for my required level of precision. The size of the bed is 3" by 8". It's not big, but it is big enough to cut parts used in making a larger CNC mill. I hope to do this sometime in the future.

As to costs – I bought a used CNC'd Sherline from Ebay for \$400. I added \$300 of accessories and a \$100 driver board. Any software I use is free, as was a used PC. For \$800 I have a small, though functional, CNC operation.

I have since run across plans that would have enabled me to build a CNC machine from scratch for a fraction of that cost. (Isn't it always the way?)

This has been an overview on CNC with a brief introduction to my shop. In the next article, I'll cover

what a CNC can do in general and what it can offer homebuilders. The third & final article will address a project from concept to cut.

Sources for further information:

Sherline: www.sherline.com
TurboCNC: www.dakeng.com
Xylotex: www.xylotex.com
CNC plans: www.crankorgan.com

It's Not Too Late! (to pay your 2005 Chapter Dues)



Don't wait for the stall warning horn to start blasting!
Send your dues to treasurer Phil Cady today!
(Still only 16 bucks - cheap!)

Write your check out to "EAA Chapter 174",
and mail to:
Phil Cady

Cincinnati, OH 45255



**Please include your EAA membership
number and expiration date on the memo line on
your check.**

Remember: You must be a national EAA member
to become a chapter member.



Next Meeting: Christmas Party !!!

Sunday, December 12th is the date of our Chapter Christmas Party. Note that it's a week earlier than our usual meeting date, since it's the second Sunday of the month instead of the third.

The Chapter will supply ham, salads, snacks and beverages. Main dishes and desserts provided by members are welcome and will be appreciated.

Wood Meets Tin at Chapter 174 Fundraiser



John Duteil and his son got twice the thrills out of their flight on the Ford Tri-Motor in Chapter 174's October fundraiser. First, they both got to fly in the "Tin Goose" classic airplane. Then, John got to roll his own classic Ford Model A Woody right alongside the winged giant, and took this memorable picture of the two classic 1929 vehicles. Say, did Ford ever make boats?...

photo by John Duteil, provided by Howard Wells

2005 Lecture Series at Wright-Patterson

Some of our members have expressed an interest in the programs offered at the US Air Force Museum at Wright-Patterson. Here's the recently published lecture series schedule for 2005, which can also be obtained at www.wpafb.af.mil/museum/pa/pa.htm.

Admission is free. Doors open at 6:30 p.m. Lectures are held in the Museum's Carney Auditorium. For more information, or for special seating arrangements (hearing impaired), contact the Museum's Special Events Office at (937) 255-3286, ext 312. Filming or videotaping the lecture is not permitted.

WINGS AND THINGS GUEST LECTURE SERIES

Monthly (excluding June, July, August and December) at 7:30 p.m. Features an exciting array of speakers who impart a diversity of perspectives on USAF heritage.

- January 20: Col. (Ret.) Jerry Ellington, "My Life as an Air Force Forward Air Controller with the Army's 1st Brigade of the 101st Airborne Division"

- February 24: Mr. Thomas Reed, "An Insider's History of the Cold War"
- March 17: Maj. Gen. (Ret.) Larry Garrison, Panel presentation with RF-86 pilots
- April 27: Col. (Ret.) Leo Thorsness, "Do What's Right – Help Others"
- May 19: Col. (Ret.) Charles DeBellevue, "The Air War in and Around the Hanoi Area"
- September 14: Mr. Robert Dorr, "American Helicopters in Combat"
- October 19: Maj. (Ret.) Ed Rasimus, "Rolling Thunder to Linebacker"
- November 17: Mrs. Florene Miller Watson, "Early Women Pilots in WWII in the Ferrying Division"



November Chapter Meeting Minutes

The November meeting of EAA Chapter 174 was opened on the 21st when Vice President Todd Winemiller asked everyone to join him in the Pledge of Allegiance.

October's meeting minutes were approved and published in the newsletter.

Phil Cady gave the treasurer's report, which was accepted by the members. Phil also announced the dues were now late if they hadn't been paid yet.

Phil has assembled a pool of about 450 kids for Young Eagle rides. He has also contacted Home Depot about possible sponsorship. Phil said we will be looking for a new YE leader in January.

Kathie Doyle reported that Hal Shevers has donated a damaged propeller for the chapter to use for its award plaques. Many thanks to Hal for that and his other contributions to the chapter. Howard Wells spoke about his ideas for the award trophies.

Todd mentioned his plan for a Special Events, or FUNdraising, committee for 2005.

Tech Counselor Gary Collins showed the form blocks Howard used in crafting the new fuel tank for Tom Jenkins' Volksplane.

Norm Beaudette informed that the deadline for the Dec newsletter is Dec 1. He thanked Gary Collins for his article on the fuel tank and noted that Kevin Kinney has promised to write a series of pieces for the newsletter.

Librarian Ray Kneipp Jr said he has a supply of boxes for any member who wants to box his magazines.

Possibilities for the next fly-out were discussed with the Pheasant Farm and Bluffton, OH being mentioned. Lee will check for a restaurant at the North Vernon, IN airport.

The Christmas party will be on Dec 12 with the same format of members bringing pot luck food.

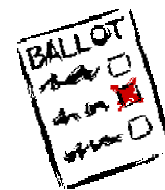
Officer candidates for 2005 were elected by acclimation. Todd Winemiller will move to president as stipulated in our by-laws. Pete Eide will be vice president with Kevin Kinney taking over as secretary. Phil Cady will keep his position of treasurer. Congratulations and Thank You to all.

Under old business, Hal has informed us that the power and heat will be turned off in the old terminal building on January 15. Hal has the Hawk building ready to move into as our new headquarters.

Phil announced that Howard Wells and Gary Collins will be nominated for the Tony Bingelis Award for their work as Technical Counselors for our chapter.

The meeting was adjourned at 2:46 PM, after which Gary Collins gave a very interesting program about the Culver Dart.

Respectfully submitted,
Lee Jewell, Secretary



Chapter Election Results

Executive Officers for the Chapter's 2005 business year were elected at the November meeting. Here's the lineup:

- o President: Todd Winemiller
- o Vice Pres: Pete Eide
- o Secretary: Kevin Kinney
- o Treasurer: Phil Cady

As directed in our bylaws, 2004 president Tom Jenkins will join the 2005 board of directors, and Todd will appoint at least 3 additional board members. Installation of officers will take place at the Christmas party.

*Merry Christmas and
Happy New Year!*

*From the Chapter 174 Board,
Advisors and Chairs*



Hangar Flying

with Stu Faber

Dec, 2004



FLYING SPORT CAR. Former chapter member Jerry Siddall sent me an article from the Akron-Beacon Journal about a business man, Raymond Williams in Akron, who has bought the rights to build a modified version of the Swift, once built by the Globe Aircraft Co. and later another company up to 1951. It was a two place, 160 mph, all metal low wing of which about 800 are still flying. Plans are to beef it up to take a larger engine for more speed. It will include all the bells and whistles and sell for between \$250,000 and \$500,000 to the Porsche-Ferrari class of pilots. Plans are to build possibly 200 per year somewhere around Akron, OH.

DARING DOGS. An article in the Fall issue of the Friends Journal of the AF Museum tells about a parachute wearing dog that traveled with the cargo flights during the Berlin Airlift. It reminded me of the parachute jumping rescue dogs used in Alaska during WW II. Almost all of Alaska was remote back country and downed crews were hard put to make their way out after a crash or emergency landing. The 11th Air Force had several rescue crews, made up of a medic and several experienced woodsmen, which could be dropped into remote areas to aid downed crews. They usually needed some transportation to make their way to the nearest clearing, lake, or river where they could be picked up by UC-64s equipped with skis, floats, or sometimes wheels. Needed cross country transport could be provided by parachuting in a sled and its dog team. Each dog had its own chute. For rescues there were a hand full of UC-64, Noorduyn Norsemen, planes kept handy. It usually took two planes to transport a full rescue team. The team was usually 3 or 4 men, supplies, and 5 or 6 sled dogs plus a sled. The UC-64 was a Canadian built plane, expressly designed for bush country flying in cold climates. It was powered by one 550 hp R-1340 engine, had a large high wing, fowler flaps, sturdy landing gear and a payload of 8 passengers or 2800 pounds. The UC-64 could be put on wheels, skis, or floats, depending on the time of year. It was well adapted for short fields and could be started fairly easily even in very cold temperatures.

I never was involved with the rescue unit but I did crew a UC-64 used as a trainer for fighter pilots newly assigned to Alaska to give them about 50 hours of additional instrument flying and navigation experience to prepare them for the Aleutian Islands' foul weather.

I never heard how the dogs felt about the experience.

SUICIDE BOMBERS. In 1942, a scientist who did research on bats came to the government with a plan to devastate Japanese cities by simultaneously releasing thousands of bats over a city at night. Each would have a tiny incendiary device attached and when they hid for the day in crevices in buildings the devices would fire up and burn the buildings. The Mexican free-tailed bats were plentiful in the U.S. southwest but they only weighed about a half ounce, which seemed to limit the payload. However tests showed that they could fly well with about a half ounce payload. In use, a large number would be packed in a container attached to a parachute which would release them as the container neared the ground and allow them to fly free. They would be kept cooled and hibernating until they woke up just before release. Under top government orders a small group of scientists began an extensive and very secret research program to design an effective tiny incendiary, a method of attachment, and all the other things needed. However, in late 1944 the program was suddenly shut down with no explanation. It was speculated that there may have been two factors. LeMay was planning the fire bombing raids which were so damaging to the cities, and the atom bomb was looking like it would work. There was no objection from the animal rights people but then it was secret, and the bats weren't consulted. *From Bat Bombs by J. Couffer.*

LEAD BALLOON? Well, what about an aluminum one? Still sounds silly, but it worked. An early balloonist, Ralph H. Upson, after making several fabric balloons, joined Goodyear during WW I. He also visualized an aluminum one and later, with support from others including Stout of the Metal Airplane Co. built several record setting aluminum free balloons. He found that they tended to be lighter than the usual fabric ones. The Navy agreed to buy one 150 ft. long airship of aluminum and work was started. It was built in lengthwise halves laid flat on the floor. Lengthwise overlapping 18 in. wide strips of 0.0095 aluminum were formed and riveted to each other, then sealed from inside so as to form a section of the skin and eventually the blimp shape. 12 cross frames were riveted to the skin. Three and a half million rivets were very rapidly set ¼ inch apart by machines that did 3 at a time. The rivets were made by the same machines from wire coils. The airship used about 200,000 cu. ft. of gas, carried a load of 3000 lb, and was powered by two Wright 220 hp J-5 engines. It gave more or less trouble-free service until 1941 when it was scrapped just as the Navy started a blimp building program.

I think I will get a riveting machine like that and rent it to RV builders.

Upcoming Events of Interest to Chapter Members



- **Dec 12, Sun. Chapter 174 Christmas Party and Installation of Officers.** Hawk Building, next to Old Terminal Building, Clermont County Airport, 1:00 pm.
- **Jan 14, Fri. Behind the Scenes Restoration Tour,** USAF Museum, Wright-Patterson AFB, Dayton, OH, 12:15 pm. Free tour, pre-registration required, all visitors must be at least 12 years of age. Call 937-255-3286 for more information.

- **174 Jan 16, Sun. Chapter 174 Meeting.** Hawk Building, Clermont County Airport, 2:00 pm.
- **Jan 20, Thurs. Wings and Things Guest Lecture Series.** Col. (Ret.) Jerry Ellington, "My Life as an Air Force Forward Air Controller with the Army's 1st Brigade of the 101st Airborne Division". US Air Force Museum, 7:30 pm.

Forget to pay your chapter dues???

Still only 16 bucks! Please send a personal check to:

Phil Cady
435 McIntosh Drive
Cincinnati, OH 45255

Make the check payable to "EAA Chapter 174", and please include your EAA membership number and expiration date on the check. Thanks!



Don't Delay! Only dues-paying members will receive next year's newsletters!

Next Chapter Meeting
Sunday, December 12th, 2004, 1:00 PM

Christmas Party!

Hawk Building
Clermont County Airport
Batavia, OH
