The Seminole Flyer

Charter member of the Academy of Model Aeronautics since 1969

AMA Charter Club 216

50 Years of Responsible Model Aviation and Community Support

February 2020

Bittersweet Farewell

Picture-perfect weather greeted fliers and guests on Saturday, February 15th for the club's last official event at the Seminole Radio Control Field at Apalachee Regional Park. The day started early with setup for the charity auction, which was scheduled for 10AM to noon. By the time I arrived around 11, things were hopping!

There seemed to be something for everyone in the auction, and it was great to see so many club members opening their wallets and taking part. Treasurer Bill Ashbaker reports as of this writing that proceeds from the auction amounted to $2,132.12 plus $131.50 in food sales for a grand total of $2,263.62!

Lunch followed the auction, with pylon racing after that to round out the day.

For longstanding club members, this field is part of the long, storied history of the club. But for many of us, it's the only field we've ever known. We got into the hobby here, crashed our first planes here, flew our planes into the trees or dropped them in the lake here. Then we learned to avoid the trees and to land from the lake (heck, just land from any direction!). It's exciting to be moving to a new field and beginning a new chapter in the history of the club. But it's a little sad, too, to say goodbye.

In this Issue

Next Club Meeting

March 19, 2020
Chuy's Restaurant, 904 E. Lafayette St.
Meeting at 7 PM; come early to eat

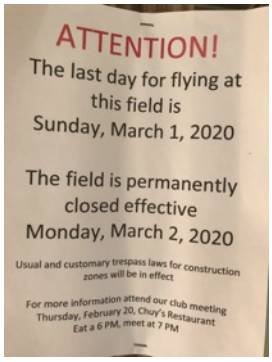
Farewell (cont'd)

The Charity Auction

Beginning the Move

Last Crash

Last Day



Striking of the Colors

Sunday, March 1 2020

Entertaining End to Pylon Racing Winter Series

With the standings tight, the final two pylon races of the winter season promised to be entertaining, and they were. The weather was spectacular, bright blue cloudless sky, cool temperatures, and an occasionally gusty 8 mph breeze. A good crowd was on hand to watch, most having come out to bid on the auction that took place earlier in the day.

The leader going into the last day, Jim McKinnell, suffered an equipment failure in a practice flight and had to sit out the first race waiting for his repairs to dry. This gave the rest of us a chance to eat into his lead. The ooh's and aah's of the spectators told the story.

Planes duked it out in every heat, chasing each other around the course, changing leads frequently, and apparently occupying the same airspace at times. Troy Emmett took a header in the first race but came roaring back to finish first in the second. A midair collision put Gordie Meade out for good, but Chris Starnes was able to fix his plane only to have the prop spin off at the start of the second race. Amazingly, these were the only casualties. Jay Wiggins was the pilot of the day, finishing first in the first race and second in the second.

For the season, flying consistently and staying out of trouble were the winning combination. Below are the final standings of the top five finishes, along with each one's season total and finishes in each of the 6 races of this series. Remember, low score is better.

1st – Marcy Driscoll, 16 (3-4-2-1-2-4)
2nd – Jim McKinnell, 19 (2-2-1-4-7-3)
3rd – Geoff Lawrence, 21 (2-5-3-3-3-5)
4th (tie) – Troy Emmett, 29 (8,7,2,6,5,1)
4th (tie) – Rhett Boudreaux, 29 (8,7,5,2,3,4)
5th – Jay Wiggins, 32 (6,7,8,8,1,2)

A spring series has been scheduled for the new field, with two races in March and two in April (see proposed club schedule later in this issue of the newsletter).

Finally, there are many people to thank for the success of pylon racing:

- ✓ The race committee for organizing the rules and requirements (Troy Emmett, Ed Budzyna, and Marcy Driscoll),
- ✓ Troy and Faith Emmett along with Marcy Driscoll for running the heats and keeping the scoring,
- ✓ Rhett Boudreaux for making and taking charge of setting up the pylons,
- ✓ Robin Driscoll for serving as timekeeper,
- ✓ All the scorers who pitched in and watched one plane at a time, and, of course,
- ✓ All the flyers who signed up, built planes, and participated.

Conditions in China have resulted in a shortage of supplies, with approved race models and parts being sold out at the moment. If members who don't plan to race have planes or parts they are willing to sell, please contact President Jay Wiggins.

Tip of the Month

- Is your battery puffed up? Does it seem not to take a charge like it used to? Is the balance way off? Do you not remember when you bought it? It just might be time to throw it away and buy a new one.
- Don't carry your transmitter and airplane at the same time with the motor on.

I'm keeping my eyes and ears open but please send me your tips at robin.marcy@gmail.com.

FAMU-FSU Engineering Students Ready for Aero Design Competition

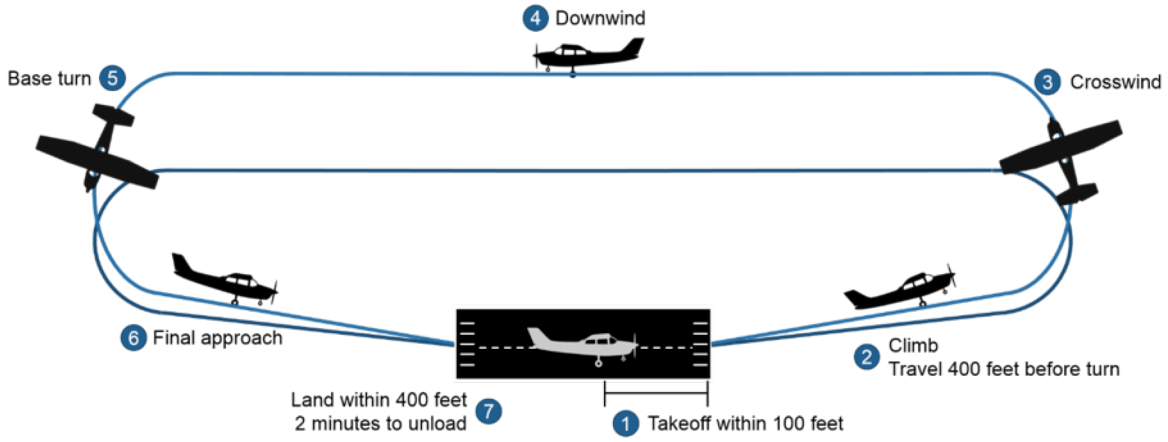
Leah Evans, Team Leader

Project Purpose

The FAMU-FSU College of Engineering is the joint engineering institution for the Florida A&M University and Florida State University. The college is home to 2,500 undergraduate and graduate engineering students majoring in a variety of programs such as chemical, electrical, and mechanical engineering. Senior students in mechanical and electrical engineering must complete a two-semester design project that culminates four years of engineering education. A team of six, four mechanical and two electrical engineers, were assigned the project of using additive manufacturing to create an RC airplane capable of competing in the SAE Aero Design Competition.

About the Competition

Each year the Society of Automotive Engineers (SAE) hosts the Aero Design competition to challenge college students with building an RC airplane. In 2020, the competition will be held in Lakeland, Florida from March 6th to 8th. Teams must build an airplane that can carry large heavy cargo and take off within 100 feet. This includes an unmodified size five soccer ball, approximately nine inches in diameter and one pound in weight. Also included in cargo is a heavy metal plate, the size and weight determined by the team. Shown below is the flight circuit teams must complete with their airplane.



Airplanes must take off within 100 feet, execute two U-turns, land in the same direction as takeoff within 400 feet, and unload the cargo in under two minutes. There are no aerobatic maneuvers and no time limit to flight time, only a two-minute time restriction to unload the cargo after landing. However, there are design restrictions. Competing airplanes must weigh less than 55 pounds, have a wingspan no greater than 120 inches, use a 6S 22.2V LiPo battery, and are capped to 1000 watts of power. Additionally, the use of fiber reinforced materials such as duct tape and carbon fiber, is prohibited. It is not a requirement of the competition for airplanes to be 3D printed; that was an additional requirement given to us by our professor. We expect to be the only airplane manufactured primarily from 3D printing.

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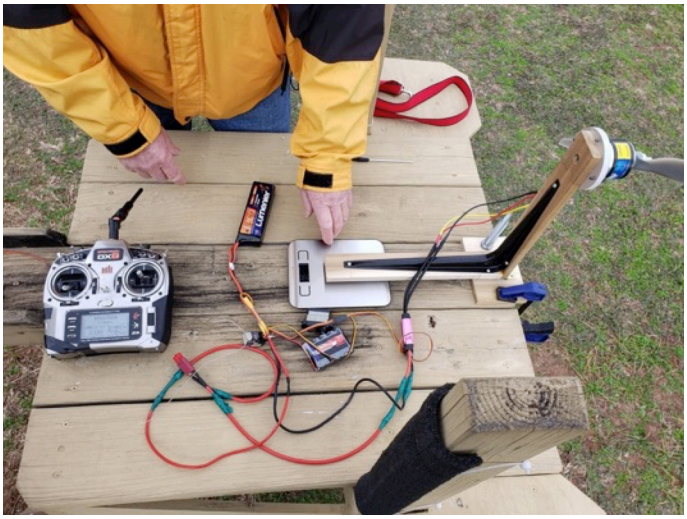
Design Approach

Our team was advised to first determine the wingspan of our airplane because we could get a rough estimate of the performance capabilities of the airplane using the wing planform area. This was paired with the need for selecting a propulsion system that would provide enough thrust to an airplane with a targeted weight of 15 pounds. We're incredibly thankful to the Seminole RC club for opening the field to us to get some flight time, valuable discussions about airplane design, and test our equipment. One such test involved our propulsion system. We created a test stand that we used to run a 16x8E, 18x8E, and 18x10E APC propeller that provided experimental static thrust values.



Numerous calculations were also completed to estimate performance parameters such as lift and drag forces on the airplane and the required ground roll for takeoff distance. This was done as an iterative process by changing values of variables until satisfactory results were achieved. For example: weight, wingspan, and airfoil were some of the more sensitive design variables affecting performance results.

Design Overview

Our final design is a semi-tapered rectangular wing located high on the fuselage with a tail boom, traditional vertical and horizontal stabilizer, with tricycle landing gear and steerable nose wheel. The airplane will cargo one soccer ball and one pound of metal weights for cargo. With a gross takeoff weight of 17 pounds the airplane should takeoff within 60 feet on a paved runway. To reduce total weight of the airplane, it is built using a lightweight 3D printed plastic. The use of traditional 3D plastics would have increased the overall weight of the airplane by nearly double. Shown below are the overall dimensions of our airplane.

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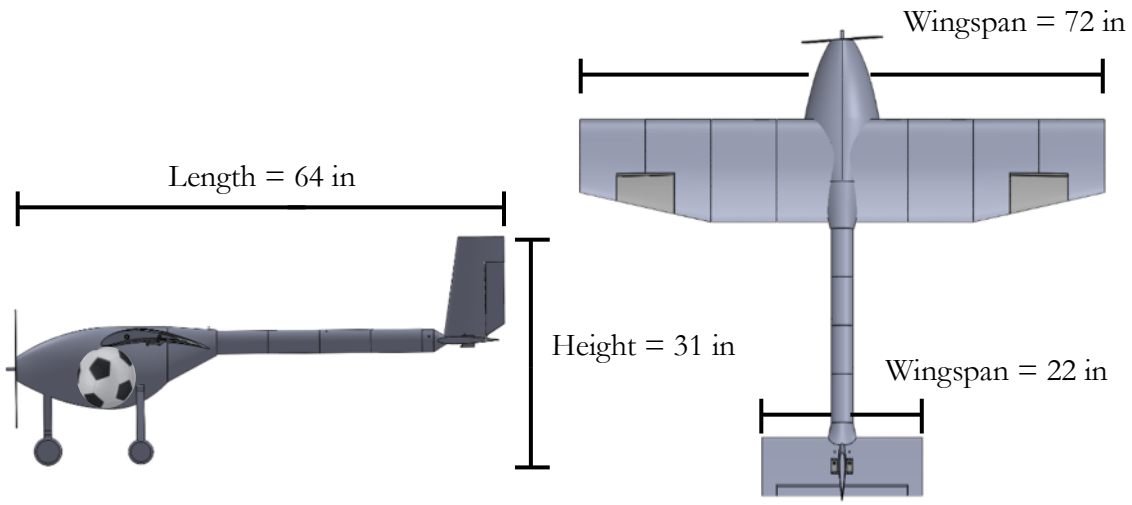
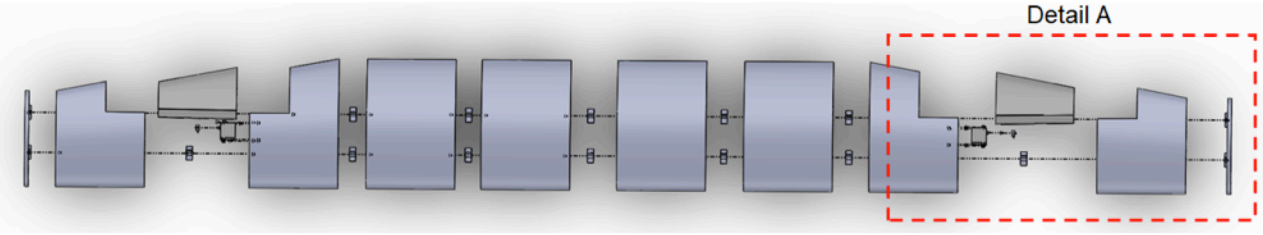


Conventional RC airplanes use balsa wood, foam, and glue for construction. Using 3D printing for construction challenged us to create an airplane that is competitive against conventional ones. Our airplane's main innovative feature is that the assembly does not need glue. Modular pieces attached using removable fasteners allows for quick final assembly and repair. Creating modular pieces through 3D printing requires thinking and designing in nontraditional ways. As designers and engineers, we had to consider the size constraints of the 3D printer and complexity of the part before manufacturing.

Shown below is an example of the modular pieces we created, specifically for the 72-inch wing. The wing is made of eight segments, each nine inches in length, plus the ailerons and end caps.



Detail A in the above photo showcases the integration of the servo motor into the wing. As previously stated, the wing is in segments, and the servo motor is sandwiched between two segments. The aileron and servo motor attach traditionally with a control horn and rod.

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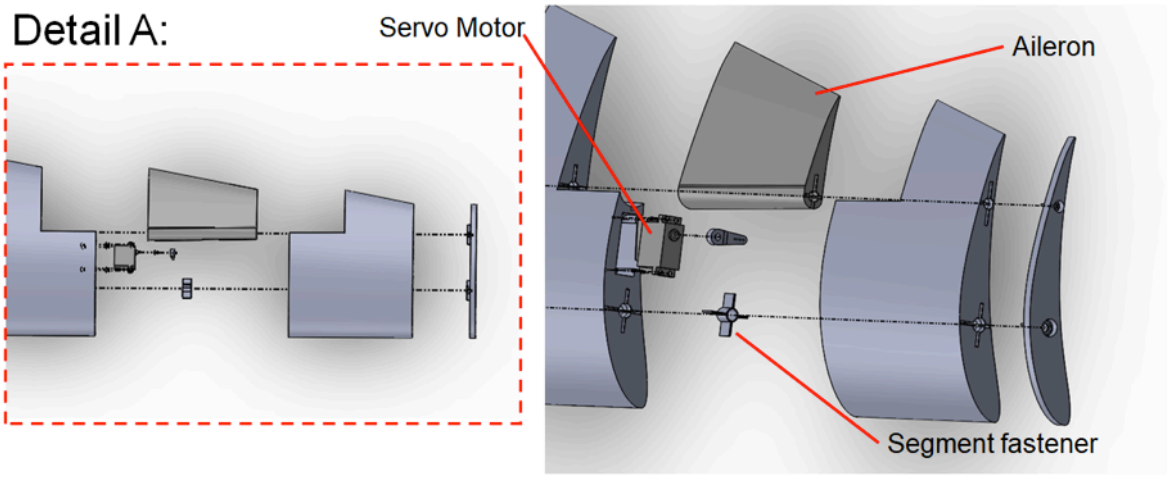
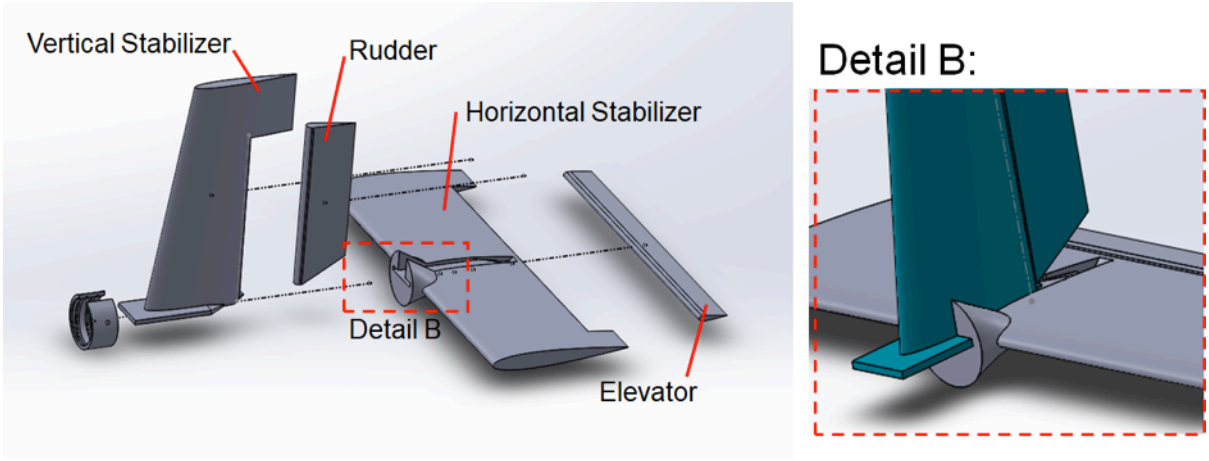


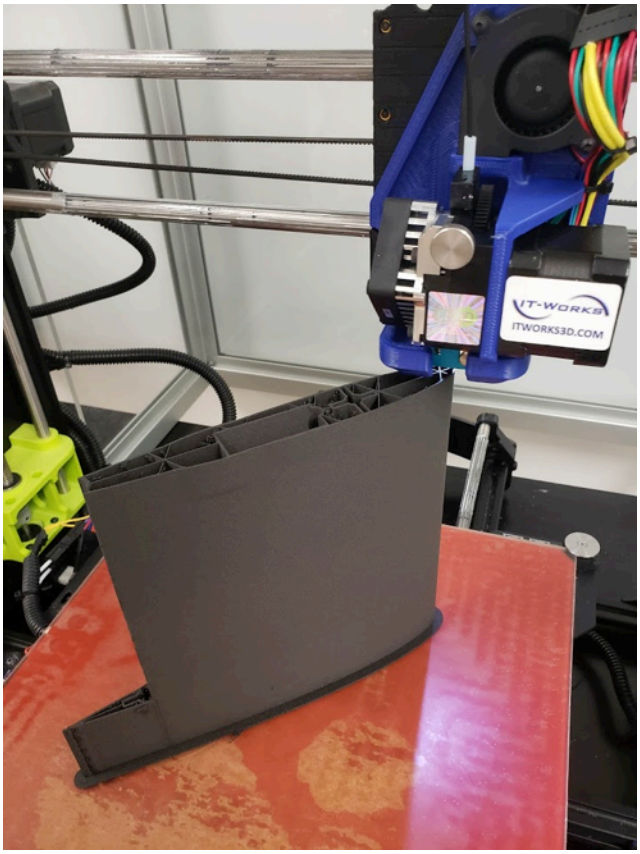
Another modular feature is the integration of the vertical stabilizer to the horizontal stabilizer. The horizontal stabilizer has a cavity in the center that allows for the vertical stabilizer to slide into the cavity and then lock in place, as shown in the photo below and in Detail B.



At the time of submission of this report, the team is still working on designing and fabricating the fuselage.

On the next page are a couple of additional photos showcasing some of the 3D printed parts.

Editor's Note: For anyone wishing to cheer on the FAMU-FSU team, the SAE Aero Design Competition will be held March 6-8 at the Florida Air Museum/Paradise Field in Lakeland, FL. Further information is available at https://www.sae.org/attend/student-events/sae-aero-design-east.


IT-WORKS
ITWORKS3D.COM


RUSH!

3D Printing Basics, Part 4

Dan Ouellet, 3D.DanoSoft.Com

Last time in part 3, I discussed the advantages and disadvantages of both open source and closed source 3D Printers, as well as the benefits and shortcoming of Kit vs. Ready-To-Run machines.

In this installment and the next (parts 4 and 5), I examine the basic calibration of a 3D printer along with some tuning tips.

Printer Calibration Overview

All 3D printers must be calibrated and tuned to ensure that they are printing accurate parts. The process varies depending on the type of 3D printer, but there are many similarities among all printers:

- All frame parts must be secured so that the frame is rigid in all directions.
- All axes must be perpendicular to the other two axes.
- Movement along the axis must be smooth and precise.
- Belts must be tensioned properly.
- The nozzle height above the build plate must be accurate, which is critical for the first layer.
- The extruder must extrude a precise amount of material.

Cartesian 3D Printer Calibration

To make an object, first, the digital 3D object file, typically an STL, is processed by slicing software which calculates where in space plastic should be extruded to make the part on a specific printer. The printer reads the instructions generated by the slicing software and moves the print head precisely along its three axes (X, Y and Z) to the point in space where it needs to extrude the plastic material.

To ensure that the object being made is accurate, it is critical that the printer be able to place the print head where the software expects it to be. Otherwise, it would just be randomly squirting plastic material.

The most important factor for precise Cartesian printer's head placement is to ensure that the printer's 3 axes are perpendicular to one and another.

This is normally done with a square, which is used to verify that the frame is in fact assembled properly and, if not, corrected with braces, shims and spacers until it is, so that all axes are perpendicular to one and another.

Once the frame is square along all axes, it is important to verify and ensure that it is rigid in all directions with no loose parts, so that the axes will remain square.

The next item is to ensure that all movement along the axes is smooth and precise without any interference.
All belts should be tight enough to prevent any backlash. Different printers may employ different means to provide belt tension. However, it is important to note that any belt tension springs should be avoided.

Many low costs imported printers use belt tension springs in their design. Unfortunately, this practice introduces backlash oscillations along the axis movement when operating the printer, which translate to poor surface finish – artifacts caused by head oscillations often referred to as fish scales or shark skin.

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Instead of using belt tension springs, the belts should be of the correct length and rigidly tensioned, strictly through mechanical means.

On many printers, without a proper belt tensioning mechanism, it is possible to use the axis motor itself to tension the belt. This is done by removing all but one of the motor assembly bolts and pivoting the motor assembly on the remaining bolt to insert the belt on the motor pulley, then pivoting the motor assembly back into position to tension the belt. The original bolts can then be reinstalled to firmly secure the motor assembly.

On Cartesian printers, the belts are usually relatively short. Their proper belt tension should be quite high, almost to the point where the belts sound like a base string when pinched. They should never be loose enough that it is easy to pinch two sides of a belt together. This is different for other types of printers that employ much longer belts.

The next step is to level the print surface with the other two axes.

This is normally done mechanically with adjustment screws (manual) or through software with a probe (automatic), or a combination of manual and automatic bed leveling. The actual means vary from one manufacturer to another, and for each different printer model.

The important item when leveling the bed is that the entire build plate surface should be leveled with a gap to the nozzle of 30~50 microns (~ 0.002”).

A simple way to accomplish this is to use a standard piece of typing or copy paper as a feeler gauge to measure the distance between the build plate and the nozzle at various points around the build surface. Paper works well for this application, because it is easy to feel if the nozzle is too close or too far from the build plate. In other words, it should be possible to push a strip of paper between the build plate and the nozzle, while feeling just a slight amount of friction between the two.

Smooth and rigid metal feeler gauges can also be employed to measure the distance between the bed and the nozzle. However, extra care is required because a metal feeler gauge can easily displace the printing head by a significant amount, with little feedback.

Having used both methods, I prefer to use a strip of standard paper to a metal feeler gauge when leveling the bed on my own printers.

Extruder Calibration

The next item of importance when making an object is to ensure that the extruder is in fact feeding the correct amount of material. Since all extrusion is calculated by the slicing software, it is important to confirm that the extruder does so or is calibrated it to do so.

A common way to verify the extruder feed rate is to simply ask it to extrude a known amount of material, then measure if it extruded that amount with a ruler, a tape measure or a caliper. In other words, using control software, instruct the extruder to feed 100 mm of filament, and measure that it, in fact, extruded 100 mm.

If it did not, then calculate the difference, and adjust the printer software to compensate. Re-run the extruder calibration and compensation until there is less than a 1% error. Even better, calibrate to an extrusion error of less than ½ or ¼ percent.

When adjusting the printer software or firmware to compensate, the only precise software adjustment possible usually is the actual number of steps that the extruder motor must turn to feed a given amount of material. Typically, this is the number of steps per mm of extrusion. The settings are usually found in the firmware of the machine and the means to change them varies from printer to printer.

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It is important to note that since the extruder can only feed material through friction with the filament, the actual diameter of the filament has an impact on the feed rate; i.e.: If the filament is not exactly to specification, whether 1.75mm, 2.85mm or 3mm diameter as the case may be on a specific printer, the difference must be taken into account when calibrating the extruder. This means that even a 1% difference in filament diameter will yield a 1% error in calibration of the extruder.

Since most filament manufacturers only provide a tolerance of +/- 0.05mm in the actual diameter of their filament, it is possible that the filament used for extruder calibration could introduce an error of up to 3%.

Personally, whenever I intend to calibrate an extruder, I look for filament of accurate diameter. Doing so makes the process much simpler.

Movement Calibration

Most modern 3D printers arrive from the factory with the proper axis travel calibration. However, it is important to verify that the printing head does travel the correct distance along all axes. This is done in a similar fashion as the extruder calibration.

Instruct the printer to move its printing head a known distance along one of its axes, then measure if it in fact moved the head that amount with a ruler, a tape measure or a caliper. In other words, using control software, instruct the printer to move its printing head 100 mm along one of its axes and measure that it in fact moved 100 mm.

If it did not, then calculate the difference and adjust the printer software to compensate. Re-run the movement calibration and compensation until there is less than an error of less than ¼ percent.

Repeat the test for the other axes.

Once again, when adjusting the printer software or firmware to compensate, the only precise software adjustment possible usually is the actual number of steps that the axis motor must turn to move the head a given distance. Typically, this is the number of motor steps per mm of travel. The settings are usually found in the firmware of the machine and the means to change them varies from printer to printer.

Printing Test Parts

The final step in calibrating a printer is to print a test part designed for that purpose.
Some common calibration test prints:

- XYZ Calibration Cube, typically 20mm X 20mm X 20mm
- 3DBenchy
- Cali-Cat
- Calibration Ruler

The calibration cube is a good way to verify that a printer prints accurate parts of the correct dimensions. Slice and print the part, then measure with a square to ensure that all sides are in fact square. Then using a caliper measure to ensure that the cube is of the correct size on all sides.

If it is not, then the slicing software or printer firmware or both must be re-calibrated for precise axis movement.

The venerable 3DBenchy (Jolly 3D printing torture-test) is a well-known calibration print that has been around for a few years. It is designed to offer a large array of challenging geometrical features for any 3D printers, and touch on 24 different issues related to additive manufacturing. The included PDF user guide explains what is tested and how to measure and interpret the results.

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Download the official 3DBenchy, slice and print to check your 3D-printer's result for dimensional accuracy, tolerances, warping and deviations related to changes in printing parameters and material types.

It is challenging for most 3D printers, but the small volume (15.55 cm3) typically prints in well under two hours and does not require much material.

Part 5

In the next installment, I will take a closer look at Delta Printer calibration.

Useful links to sites with additional information

- Common Calibration Test Cube 20mm
  - URL: https://www.thingiverse.com/thing:1278865
- 3DBenchy – Jolly 3D Printing Torture Test
  - URL: https://www.thingiverse.com/thing:763622
- Cali-Cat – Calibration and Torture Test
  - URL: https://www.thingiverse.com/thing:1545913
- Calibration Ruler
  - URL: https://www.thingiverse.com/thing:25763
- The online store for the objects that I design
  - URL: https://www.myminifactory.com/users/DanoSoft

Club Meeting News

Jeff Owens, Secretary

The meeting was called to order at 6:56 PM on Thursday February 20, 2020 by President Jay Wiggins. Twenty-five members and two guests were in attendance.

Member Recognition – Jay Wiggins – Steve McFadden, Joe Satterwhite, Jim Bussey, Dave Bussey, Sandy Jaffe, Theo Titus, Gordie Meade, Geoff Lawrence, Jay Wiggins, and Jeff Owens for transporting the donations given by Carol Harris to the flying field for storage in the container; The Board of Directors for holding two meetings since the last club meeting to organize the auction of the donations and the move to the new field; the BoD for pricing and arranging all the items for the auction on February 15; Geoff Lawrence for getting the lawn mower serviced; Marcy Driscoll, Troy Emmett, and Ed Budzyna for organizing the pylon racing on February 15; Ed Budzyna for bringing Krispy Kremes; Rhett Boudreaux, his son Steve, and Ray Humphries for cooking the food on February 15; Steve McFadden for donating the food; Bill Ashbaker for completing a grant application to AMA for field improvement funds; Jim Ogorek for arranging for a storage unit to be used during our move; Leah Evans for bringing and introducing her professor who is overseeing their RC engineering project; Dave Bussey for providing a nice PA system to the club at a greatly reduced cost.

Vice-President's report – Rhett Boudreaux – reported on the food preparation for the Auction/Fly-in/Pylon Racing event on February 15. No additional activities are planned pending our move to our new field.

Secretary's Report – Jeff Owens – The minutes of the January meeting were posted on the web and in the Newsletter. One addition concerns a motion that passed unanimously at the January meeting to approve the purchase price of the new container, even though it slightly exceeded the previously authorized amount. The minutes were approved with that addition.

Treasurer's Report – Bill Ashbaker – The report was presented and approved by the membership. An interim report on the money raised at the auction was presented. Some items are still being auctioned off and a final report will be given when that is completed.

FAMU FSU College of Engineering RC Project – Leah Evans – the design of the aircraft is complete and the construction is coming along well – it is about 75% complete. Approval has been obtained for taxi test once construction is complete. Approval for flight testing will follow once the taxi tests are complete.

Field Update – Jay Wiggins – there will be a work party on Saturday February 22 at 10:00 AM to move all of our remaining equipment. Some will go to our storage unit and several of the starting tables will be installed at the new field. The auction for three remaining motors will be closed at 10:30 AM. The portalet will be moved to the new site on March 2. The construction project was rebid on February 12 and bids will be opened on March 5. We have permission to use the new runway during regular landfill hours (see the Safety Report below.) In addition, we have permission to use the flying field in Iron City, Georgia.

Safety Report – Jim Ogorek – when we move to the new site, normal safety rules will be in effect even though we will not have fencing, pilot stations, etc. Use care, announce take-offs and landings, and keep all aircraft north of the field. DO NOT fly over the road that is south of the new field. Do not park on any area that has been

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filled and leveled for the construction of the new facilities. All members should display their name badges so that County employees can identify us as club members with permission to use the new field. The normal landfill hours are Monday – Saturday from 8:00 AM until 5:00 PM. We must leave the facilities by 5:00 PM in order to avoid complaints from County employees who must verify that we have left by the time their shifts are over.

Training Report – Geoff Lawrence – the trainers have been taken to Geoff Lawrence's house and Mike Atkinson's house for safekeeping during the move. They are ready to go, if needed.

Old Business – Jay Wiggins (for Marcy Driscoll) The final standings for the current round of racing are:

First Place – Marcy Driscoll
Second Place – Jim McKinnell
Third Place – Geoff Lawrence

New Business – A proposed Club Calendar for the year was discussed. Most dates are tentative due to the move to the new site and the currently unknown construction schedule. Once the situation is clarified a new Club Calendar will be posted on the club website.

Robert Tilden gave a brief presentation on the FAA Remote ID proposal. All club members are urged to submit comments using the information supplied in emails from AMA.

The meeting was adjourned at 8:37 PM.

SEMINOLE RADIO CONTROL CLUB
2020 CLUB CALENDAR
REVISED 2/20/2020

Pylon Racing: Saturday, January 18, 1:30 PM
Pylon Racing: Saturday, February 15, 1:30 PM
Spring Field Closing Fun Fly: Saturday, February 15th
Pylon Racing: Saturday, March 7
Pylon Racing: Saturday, March 21
Pylon Racing: Saturday, April 4
Pylon Racing: Saturday, April 25
*New Field Opening Fun Fly: TBA
4th of July Firecracker Fun Fly: Saturday, July 4th
July Meeting with Barbeque and Night Fly: Saturday, July 18th
Labor Day Fun Fly: Saturday, September 5th
Field Closed (Track) October 2 – 3rd
**Veteran's Day Fun Fly: TBA
Field Closed (Track) November 7th
Field Closed (Track) November 13th
Field Closed (Track) December 4 – 5th

*Date dependent upon construction readiness.

Regular club meetings are held on the third Thursday of each month at Chuy's Restaurant, 904 E. Lafayette Street. There is no obligation to purchase food or beverages, but members are reminded that the restaurant is not currently charging the club a fee for using its party room.

Flying at the New Field

Starting Monday, March 2nd, pilots may fly at the new runway during regular business hours of solid waste. That's 8AM - 5PM, Monday through Saturday. 5PM means that you are OUT OF THE GATE before 5PM. A club member's failure to heed this could easily result in us losing this privilege to fly. Other pertinent issues include:

- 5PM means out of the solid waste gate.
- Regular safety rules apply, especially the infinite safety line.
- Regular fuel hours apply.
- Please do not drive on the shoulder of the runway or any area that has been filled.
- Bring what you need. The only equipment at the new runway is the starting tables and the windsock.
- The runway is subject to closure on very short, or even no notice due to topdressing, mowing, etc. As soon as construction begins, you will be notified, and the facility will be totally closed until completion.

Seminole Radio Control Club
Tallahassee, FL

Officers

President	Jay Wiggins (moonangelb@gmail.com)
Vice-President	Rhett Boudreaux (geobatch@aol.com)
Secretary	Jeff Owens (jfolso@comcast.net)
Treasurer	Bill Ashbaker (bill.ashbaker@comcast.net)
Field Safety Officer	Jim Ogorek (jim.ogorek@yahoo.com)
Field Marshall	Gordie Meade (lmeade@fsu.edu)
Training Coordinator	Geoff Lawrence (k4nkc@comcast.net)

Media Managers

Webmaster	Jeff Owens (jfolso@comcast.net)
Newsletter Editor	Marcy Driscoll (robin.marcy@gmail.com)

Flight Training

Primary flight training is available by appointment on Saturdays from 10:00 AM until 2:00 PM when the weather is nice and not too breezy. Contact the Training Coordinator or one of the instructors to make an appointment:

Geoff Lawrence 850-591-6879
Jeff Owens 850-545-7482
Bill Ashbaker 850-656-5932
Jim Ogorek 850-766-2477
Mike Atkinson (Tuesday only) 850-251-2694
Troy Emmett (Large Aircraft) 770-546-6199

Field Hours

Electrics/Sailplanes	30 minutes before sunrise until 30 minutes after sunset 7 days/week
Gassers/Nitros	10 AM until 30 minutes after sunset except Sunday Sunday gasser/nitro flying begins at 12:00 PM All gassers and nitros must have a suitable muffler.

The Seminole Flyer is a publication of the Seminole Radio Control Club of Tallahassee, FL. We welcome and encourage items for publishing in The Seminole Flyer. Please submit your suggestions to robin.marcy@gmail.com in Word format. Thank you.

www.seminolerc.com