



STEM for All Ages

by Seán G. Dwyer

I found out in college that the best way to really learn something is to try to explain it to someone else. That would quickly make clear what I didn't know, and filling those gaps greatly advanced the learning process. I experienced this again when I started presenting in EAA 838's Young Eagles ground school and later in the Young Aviators program. An example is the answer to the question "What were the 1st names of the brothers who invented the first successful manned aircraft?" Joseph and Etienne would be more correct than Orville and Wilbur, as the Montgolfier brothers' hot air balloon preceded the Wright brothers by 120 years. Recently I learned that Hezarfen and Lagari might be an even better answer, as the Celebi brothers were reputed to make the first intercontinental flight and first manned rocket flight 150 years before the Montgolfier brothers' balloon. But that belongs to another story. The point I want to make here relates to the Montgolfier hot air balloon, which got its lift in accordance with the Ideal Gas Law known as Charles' Law. As a chemist that was significant, but not nearly as significant as finding out that the first flight was followed two weeks later by a hydrogen balloon invented by Jacques Charles (of Charles' Law fame), although his balloon got its lift from a different Ideal Gas Law known as Avogadro's Law. What a way to teach chemistry, but that also belongs to another story.

Similar learning epiphanies occurred when presenting navigation and weather in the Young Aviators program. Learning how carrier pilots navigated with no radio contact with their carriers was interesting,

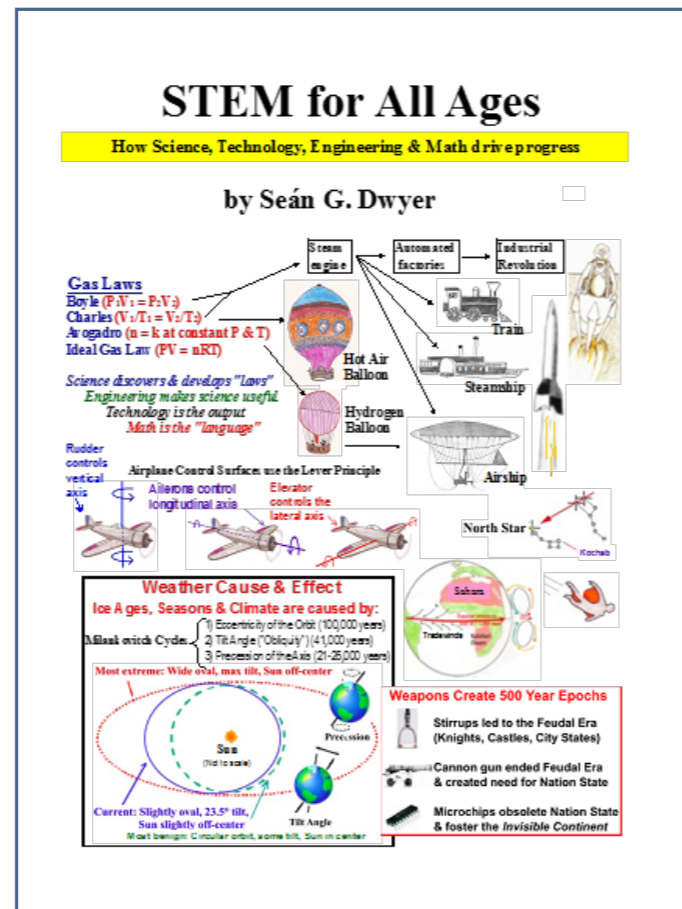
but the real eye-opener was the navigation tools used by Columbus. A mariner's astrolabe looked so much like a Celtic cross that I had to dig further. I found that a broken Celtic cross had been sealed in an Egyptian pyramid about 2,500 years BC, and appeared to be an engineering tool that could also be used to determine the angle between the North Star and the horizon. That is a direct measure of latitude. Was the Celtic cross, the symbol most often associated with 6th century St. Brendan the Navigator, really a pre-Christian Egyptian tool? Having grown up in Tralee Bay, Ireland where St. Brendan also grew up, I knew where the daughter of a Pharaoh – a half sister of Tutankhamen – was buried . . . next to Tralee Bay. But that too belongs to another story.

Presenting the causes of weather, seasons and Ice Ages also demanded additional study on my part. Inevitably, the topic opened the door to global warming, but the real eye opener was to learn why native Americans never invented the wheel. OK, you guessed it. That also belongs to another story, two stories actually. Too many stories! What to do? Why not put them into a book? I did!

The nearby image is the front cover. You can find the book on the websites of Amazon.com or Barnes and Noble if you search under my name in the book or author sections. It is also available as an eBook, although only on the AuthorHouse website at the moment (<http://bookstore.authorhouse.com/Products/SKU-000860393/STEM-for-All-Ages.aspx>). In addition to all the material that I regularly present in Young Eagles or Young Aviators ground schools, the book also addresses globalization in the Digital Age, anthropogenic global warming, historical epoch changes, paradigm paralysis, and most importantly Cause & Effect analysis in all the topics. So it is not just about what happened, but why it happened, plus the consequences. My goal for the book and for all the presentations I do for the youth programs that take place in EAA 838 is to make science, technology, engineering and math more interesting. The Industrial Age is history, and we are in the Digital Age with a whole new set of rules.

(p.s. One hint that the publishers might not appreciate: If you are downloading the eBook to an iPad, I recommend that you select the PDF version and not the ePub version which they recommend for an iPad. I find it easier to read)

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President's Corner



Daryl Lueck,
EAA Chapter 838 President

Well, another month has gone by and it's still hasn't gotten warmer. New records are set every day, unfortunately, it's the records for snow and sub-zero temps.

We have our first scheduled Young Eagles event on Saturday, March 8th. I don't know if the weather will cooperate, but I know of several pilots who are having hangar door

issues. They're frozen to the ground, with 4 inches of ice on the outside. If you can get your airplane out, we sure could use the help flying!

Our first Movie Night in February was a success. We had 15 people attend for Planes! A good time was had by all. This month we'll be showing Captain Phillips, with Tom Hanks, on Saturday, March 15th. Hope to see you there.

We only had 10 people attend the Chapter Meeting in February. I'm hoping that it was weather related. The program was an excellent presentation on the Wildcat pulled out of Lake Michigan. Hopefully we'll have more people on March 20th!

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Movie Night

Sat - March 22 - 7:00pm

Captain Phillips



Racine EAA Chapter 838

Supported Programs

Meetings
Third Thursday's 7:00 pm
Social 6:30 pm

March 2014
Volume XXVI Issue 3
www.Eaa838.Org

Explorer Post 218

For high school students and is co-ed, meetings on the second and fourth Thursday each month at 7:00pm at the chapter building.

Upcoming Explorer Post 218 meetings:

Mar 13- Kai Cooper, ATC for 3 years in Milwaukee. He was a Flight Instructor from Kenosha and past member of Racine CAP

Apr 10- Bob Greco, a past Post 218 member speaking about aerodynamics with a focus on wing design.

Aviation Explorer Club Post 5218 (AEC)

Our "next step" program is intended to cultivate the initial spark and keep interest alive until they are able to join our Aviation Explorer Post at age 14. The AEC program we offer is designed for youth ages 11-13. Our club is coed, chartered with the Boy Scouts of America, and sponsored by EAA Chapter 838.

We should begin our 2014 schedule in May. If you are interested in joining us, please contact us at post218@eaa838.org

Young Aviators Program

2014 Summer Program

August 4th - 8th



Young Aviators Program

By Seán G. Dwyer

Once again, applications are being accepted for Young Aviators week-long program (August 5-8). While the program is one that everybody who is interested in aviation wishes that he or she could have participated in as a teenager, flying is just the appetizer. The main course is STEM. That stands for Science, Technology, Engineering and Math. If you know any boys or girls age 14-18 who would benefit from the experience, encourage them to apply via the Young Aviators website (www.young-aviators.com).

Every day, Monday through Friday, successful candidates will fly, simulate, fabricate, and learn from an eclectic group of instructors who can be described as having "been there, done that". In daily flights the student will sit in the left seat with a CFI in the right seat. Time will be logged and can count towards a flying license. Similarly, simulator time will be conducted with a CFI to enhance the learning process without the distraction of engine noise or having to look out for other traffic. In the Fabrication Hangar, students will start with a flat sheet of aluminum and learn how to cut, shape, bend and rivet to produce a finished airplane part. We were surprised to find how much the girls enjoy this class, but it is a cross between "Shop for Nerds" and skull surgery's requirement for precise drilling of holes. The Fabrication Hangar instructors have a lot to do with making it such an enjoyable experience. They include 2 home-builders of aircraft, one with an A&P rating and 30+ years of experience teaching shop to teenagers.

Classroom sessions range from the upstream Physics and Chemistry that enable aviation, to the application of these laws in the cockpit. Classes on weather are not limited to reading meteorology charts, as they also include learning about the causes of weather, seasons, and Ice Ages. Navigation includes "How did Columbus do it?" (dead reckoning) and "How did carrier pilots at the Battle of Midway do it?" (dead reckoning, but faster and for less time). Classroom instructors include an airline captain, a corporate Chief Pilot, an engineer from the Lockheed Skunk Works, and a scientist (that's me).

One of the things that I try to get across to the students is that STEM is not just an acronym for four independent fields. STEM is actually an overlapping continuum. Knowing that an airplane will go up if it pushes enough air down (Newton's 3rd Law) is science. But without control that is just enough information to get you killed. That is where engineering comes in, and science would be just a hobby without that. The process of designing and fabricating control surfaces is engineering. The output of combining science and engineering is technology, e.g. rudders and ailerons. Math is simply the language whereby scientists, technologists, and

engineers talk to each other.

How much does the program cost? Approximately \$2,800 per student. That is a lot, but the student fee is only \$795. How can that be? Generous donors in the Racine community and aviation world make it possible. They understand the benefit of STEM education in the Digital Age. Financial aid is available for qualified candidates for whom the \$795 would be too high. We do not want anybody to be left out because of finances.

Acceptance means that the student has won a scholarship, something that looks good on a resume or college application. Unfortunately, application is no guarantee of being accepted, as logistics limit us to just 12 kids, and more will certainly apply. (If you can figure out how to schedule more than 12 students in a program that uses 3 airplanes, 2 simulators, 10 hours in the fabrication shop, 12 hours of classes and 3 hours of guest speakers, we would like to hear from you. But it all must take place in a single week)

The selection criteria include age appropriate maturity, grades, interest in aviation and STEM in general, and the ability of the candidate to participate in the program. That last requirement includes being tall enough to see over the panel of a Cessna 172. Applicants for additional financial aid will also need recommendation letters from teachers, which is why the deadline for applications is May 10th.

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An Airplane Renews a Pilot's Passion

Bob McSpadden

I lucked into my first airplane ride in a Cherokee 140 when I was 15 years old, and for the next two years, all my lawn-mowing money went straight into the cash register of the local FBO.

In 1977, 10 hours of dual in a Cessna 150 with fuel could be had for \$210. Those two years until I reached age 17 and could become a private pilot seemed to take forever. But during that time I went to ground school with my dad, and fell into the rhythm of my new economic reality: Mow three lawns, fly one hour

I barely managed to stay current during college, but after entering the U.S. Air Force my flight economic model reversed. I added ratings and flight time and actually got paid to do it. With my logbook padded by lots of multiengine jet hours, I landed a major airline job in the 1990s and started pushing the career autopilot button. Thirty-five years had passed since that first Cherokee ride, along with more than 17,000 hours spent mostly at cruise, transoceanic crossings, warzone entries followed thankfully by warzone exits, and instrument approaches in near-zero visibility. Happily, my number of takeoffs was still equal to my number of landings. But as I accomplished my career goals, I realized I had lost touch with the simple, joyful aspects of flying that first attracted me as a teen. I also realized that I wanted to pass on that love of flying and see if it might catch on with any of my five kids.

At EAA AirVenture in Oshkosh last year, with my brother-in-law Mike, my only goal was to buy a T-shirt. After two days of renewing old acquaintances and bumming around the flight line, Mike spotted a 1963 Piper Colt with a shiny red finish and a "For Sale" sign. While the rest of the crowd was entranced with the airshow, I chatted with the Colt owner, an airline mechanic named Greg.

The Colt had been born a year after me, and it served as a trainer for 20 years before finally ending up in the hands of an A&P. It would take 25 more years for that individual to strip the airplane to the tubular frame, meticulously stretch the new fabric, zero-time the Lycoming O-235, update the upholstery and headliner, add toe brakes, comply with the airworthiness directives, and complete a supplemental type certificate tailwheel conversion. Greg and his partner, Gary, became co-owners during the rebuild.

"Must have taken a lot of hours to make all those improvements," I said to Greg.

The mechanic looked at me and, with great patience, replied, "You have no idea."

The engine log book showed just 2.3 hours since overhaul.

Then, like my six-year-old daughter Nikki's impulse to buy a candy bar in the checkout line, I got the bug. I quickly snapped a cellphone picture of the airplane and sent it to my wife, Beth, with a short note. "It costs about as much as the used Suburban we bought last year. What do you think?" Beth, a lifelong St. Louis Cardinals fan, answered quickly. "As long as we call it Redbird."

Immediately, I felt like I was 15 again—excited but clueless. I took Greg's business card and promised to call, then spent my remaining time at Oshkosh learning as much as I could. The wealth of general aviation knowledge made me realize how little I really knew about current GA operations and aircraft ownership. I hadn't read a VFR sectional chart in 20 years, and I soon discovered that they could be loaded on an iPad. My weather briefings at work are prepared neatly by dispatchers for preflight review, and in the GA world I learned that I no longer had to know the local FSS phone number to get a briefing. My head began swirling with questions about fabric maintenance, annual inspections, advantages of alternators over generators, GPS receivers, transponder requirements, engine break-in procedures, and ADS-B.

My single-engine flying experience as a teen had been buried under decades of type ratings, transport jets, and Level-D flight simulation. GA flying would be so different, and I had a lot of catching up to do. This was not going to be like buying a used car. I had to start from scratch.

At home in Parker, Colorado, I delved into the enormous amount of information on buying airplanes through the AOPA member website. I also found hangar talk with wiser GA pilots invaluable. With a combination of both, I prepared an offer contingent on an aircraft logbook review and a prepurchase flight and inspection. Two weeks after first seeing Redbird, I traded a down payment for the keys. Much to my relief, my employer announced a new pilot contract on the very same day.

Greg and Gary replaced the stock generator with an alternator, upgraded the wiring, and installed a used Garmin 496. I felt very good about the airplane when the two professionals handed it over. With the promise of VFR skies and a couple of days off, I gladly assumed the right seat for the two-day trip home from Illinois. With my meager tailwheel experience literally decades old, I offered the left seat to a GA pilot named Ted, who agreed to be pilot in command.



Racine EAA Chapter 838

AOPA

Meetings

Third Thursday's 7:00 pm

Social 6:30 pm

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Volume XXVI Issue 3

www.Eaa838.Org

On the first day, I picked the brain of my flying companion about everything from airspace to leaning techniques while he questioned me about airline flying. As we cruised at minimum safe VFR altitudes over the Midwestern landscape, my internal E6B woke up and started figuring wind drift, fuel burn, and dead reckoning. A friend had graciously arranged an overnight hangar in Larchwood, Iowa, near my brother-in-law Mike's home, where more than 20 friends and relatives turned out to see my new toy. The joy of flying was coming back.

Day two brought strong headwinds, and our groundspeed fell to just 77 knots—about half the rotation speed of the airliner I fly. I wasn't in a hurry, though. After a fuel stop in Yankton, South Dakota, we continued on. Soon we were over the Lewis and Clark Reservoir, a familiar landmark I was accustomed to seeing from seven miles high—but now only the clouds were high overhead. My smile came back wider than ever.

At home in Colorado, I've flown with each of my kids and explored the magnificent Front Range from the air. Owning and flying this simple airplane has given us a new perspective and fresh insights on the place we live—and the joy that is nowhere else to be found except in the lower altitudes. Aviation, which for so long had been a purely professional pursuit, is now a shared activity that brings our whole family together. Nikki, our youngest, seems the most enthusiastic and adventurous, and asks to go whenever the windsock looks tranquil.

Redbird has only been a part of our family for a few months, but I feel profoundly different as an aviator. For the first time in a very long time, the challenge, wonder, and pure enjoyment are back.

Bob McSpadden flies for a major U.S. airline and lives on a residential airpark near Denver.

IFR FIX: Sorry, Wrong Number

By Dan Namowitz

Two go-arounds and a rejected takeoff would provide a day's worth of drama at many airports. When they all happen at once, on one runway, with the go-arounds head-on, only luck averts disaster.

It was all the result of a basic misunderstanding. A Cessna 172 pilot was flying a practice GPS approach while the safety pilot broadcast traffic advisories on unicom. Unfortunately, unicom wasn't the common traffic advisory frequency (CTAF)—a distinction often missed when pilots use the term unicom for both. After the near one, the Cessna's pilot filed with the Aviation

Safety Reporting System, noting, "I had not looked at the frequencies as he was handling communications."

Fair criticism?

After completing the RNAV (GPS) RWY 26 approach to Tennessee's Knoxville Downtown Island Airport, "I removed my hood and proceeded to make the final approach under visual conditions," the pilot wrote. "My safety pilot had been making all of the traffic announcements on the frequency listed for UNICOM on the approach chart, 122.95."

In the flare, "I saw another aircraft at the opposite end of the same runway I was landing on. I immediately initiated a go-around, and turned to the left to enter the upwind leg, as he was already rolling down the runway for takeoff."

The departing aircraft aborted, causing an aircraft on final behind it to start a go-around of its own. It "turned to the right to enter the upwind," placing it "directly into my flight path. I saw him at the very last minute, and he passed no more than 100 feet below me."

A refresher: How do you maneuver to keep traffic in sight during a go-around? The Private Pilot Practical Test Standards expects a pilot to maneuver "to the side of the runway/landing area to clear and avoid conflicting traffic." Assuming two left-seated pilots flying the two aircraft, did both follow this convention?

In the climbout, "my safety pilot noticed another frequency on the approach chart, labeled CTAF. He had not noticed this frequency before, and switched to it to make the announcements." (The Knoxville CTAF is 126.6 MHz.)

A refresher: The Aeronautical Information Manual explains that a designated CTAF "may be a UNICOM, MULTICOM, FSS, or tower frequency and is identified in appropriate aeronautical publications."

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Cockpit Management Critique.

Aviation Safety Connection

Go to: <http://aviation.org>

Cockpit Concepts: February 5, 2014

The recent Cockpit Concepts and LinkedIn discussion of "What's Next?" brought to mind a chapter that I was asked to write for a book on aviation human factors. Perhaps mercifully, the book was never published and this particular effort long forgotten. However, since this chapter does present specific applications of both "What If?" and "What's Next?" as possible pilot aids for improving cockpit management and discipline skills, I'd like to direct your attention to the Aviation.Org Library where it, "An Airmanship Essential," is posted. I am also providing a direct link for ease of access at: <http://aviation.org/linkedin/AnAirmanshipEssential.pdf>.

The motivation for this effort was quite simple. The intent was to stress positive thinking and action, to develop and maintain the mindset of being involved. Too often emphasis seems to be placed on what not to do rather than what to do.

In this chapter/article, Flight 9642, a Fokker F27 turboprop passenger flight, is followed in detail—in fact, all known communications or presented or summarized in an effort to ensure all known and relevant information is presented. As the flight progresses, the flight crew's actions are reviewed and analyzed with respect to professional management practices. The term "cockpit management" is developed and defined—the skillful use of resources and the control of activities to safely accomplish a flight's mission—and management principles are introduced as the flight proceeds in an effort to demonstrate how these principles might be employed in an actual operational setting.

Managing the flight and developing in-flight strategies are discussed in some detail. Team management fundamentals are introduced, including the importance of defining, assigning and communicating tasks. The process of evaluating choices (pilot judgment) and taking action (decision making) is examined from a management perspective with the objective of minimizing the possibility of human error. And, the primal concept of management control—evaluating progress and correcting towards a predetermined objective—and its relationship to maintaining situational awareness is emphasized throughout.

The published accident report is quite critical of the crew's performance, both as a team and individually. While this assessment may well be justified, it is not the purpose of this analysis to pass judgment but, instead, to use this flight and its events to demonstrate how a systematic approach to managing the flight might have averted disaster. In defense of the crew, it appears the company's flight department policies were not clearly defined, the policies in effect were laxly enforced, and the pilots' training in standard operating procedures (SOPs) and crew resource management (CRM) was inadequate. These organizational criticisms also appear in the accident report.

The airman skill-set requires the ability to cooperate and work effectively as a team member. In brief CRM terms, the pilot-in-command sets the tone for disciplined flight management and ensures the division of responsibilities is established. In addition, the captain involves the subordinate crew member in the decision making process and keeps the team fully informed of actions to be taken. The second-in-command also ensures management principles are employed. Should one pilot miss an assignment the other pilot needs to take initiatives to fill the void. The co-pilot fulfills his or her role by asking questions, making suggestions or otherwise raising concerns. Diplomatic contributions from a confident associate do produce meaningful results.

Flight 9642 is one demonstration of the need for airmen throughout aviation's broad spectrum to assume this responsibility for being proficient cockpit managers. The demands are great, but the opportunities greater still. If today's airman prepares himself or herself for each flight, anticipates circumstances that might be encountered and develops personal strategies to deal with change and adversity, then this airman will be a confident professional, proud of his or her accomplishments and will, in the process, gain peer respect.

This chapter/article is one person's point of view on CRM with regard to both the individual pilot and the cockpit team. It is the synthesis of personal study, conversations, education and experience. It also is an incomplete view that deserves a critical eye. The knowledge and experience of this readership is boundless and pleasantly unforgiving of slip-ups. Your assessment and critical commentary would add great value to the subject matter and is eagerly solicited. Many thanks.

--Bob Jenney

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FAA Safety Team

Maintenance Safety Tip 1403 - Keeping Combustion Heaters Healthy

Notice Number: NOTC5196

Aircraft combustion heaters are great. When “healthy” they provide comfort and a sense of well-being. However, if they become unhealthy, they can be deadly. You, the AMT, are the heater doctor and it is your job to conduct a “physical” on each one.

The next time you maintain an aircraft with a combustion heater keep in mind that a carbon monoxide leak, a fuel leak, or fire could likely be catastrophic. Heaters require special attention. Components such as combustion liners, air pressure switches, and fuel regulator valves have been so problematic that the FAA has issued Airworthiness Directives (ADs). Do you know if an AD applies to the combustion heater installed on the aircraft you work on? If not, take time to research AD's, review maintenance records and manufacturer instructions, talk with the aircraft owner, and find out. If ADs do apply, read each one carefully. What does the AD require? Has the AD been complied with in the past, or if it is recurring, when is it next due?

Even if there is not an AD for your particular aircraft, consider the operating environment, age, and operating time to assess if additional heater physicals are prudent. You are the doctor. Are you confident the heater will function safely until its next physical?

A good place to start your AD research is <http://www.faa.gov/> where you will find links to Airworthiness Directives. Another useful link for an AMT is <http://www.faa.gov/mechanics/>. [Check it out!](#)

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Racine EAA Chapter 838

The People

Meetings
Third Thursday's 7:00 pm
Social 6:30 pm

March 2014
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www.Eaa838.Org

Welcome

New Chapter Members

Ko Kryger	February 2014
Dan Mouw	February 2014
Oliver Kotcke	December 2013
Lawrence Stys	December 2013
Rebecca Schmitt	September 2013
Matthew Borgardt	September 2013
Robert Clarke	August 2013
Bill Myers	June 2013
Bill Schalk	June 2013
Michael Ratchford	May 2013
Merritt Adams	Feb 2013
Michael Arts	Feb 2013

EAA Chapter Distribution

Chapter 18	Milwaukee
Chapter 217	Kenosha
Chapter 414	Waukegan
Explorer Post 218	Racine
Steve Hedges	AOPA

Monthly Meetings

Boards Meetings	Second Thursdays	7:00 pm
Chapter Meetings	Third Thursdays	
	Social	6:30 pm
	Meeting	7:00 pm
Shop Night	Every Monday	7:00 pm
Explorer Post 218	Second Thursdays	7:00 pm
	Fourth Thursdays	7:00 pm
Young Eagles	Second Saturday	9:00 am
	(March - November)	

Upcoming Meetings & Speakers

Mar 21 st	Dave Mann	History of Battan Airport
Apr 17 th	Jarrett Tessar	VFR Cross County Planning
May 15 th	Steve Myers	SR-71 Blackbird
Jun 19 th		
Jul 17 th		
Aug 14 th		
Sep 18 th		
Oct 16 th		
Nov 20 th		

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Newsletter		
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Young Eagles	Tracy Miller	847-420-5098
	Chapter Building	262-634-7575