



# Runway 15



The Monthly Newsletter for Experimental Aircraft Association Chapter 1541, Lincoln, California

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## On the Horizon: Calendar of Events

For the most up-to-date information, go to the chapter website: <http://eaa1541.org/>

Date	Topic
Saturday, May. 21, 2022	<b>Breakfast</b> at the EAA hangar at KLHM. 8:00 a.m. to 10:00 a.m.
Saturday, June 4, 8 – 10 am	<b>Breakfast</b> at the EAA hangar at KLHM. 8:00 a.m. to 10:00 a.m.

## EAA CHAPTER 1541 INFORMATION

Meetings	Usually the first and third Saturdays of each month held at KLHM Hangar S-12. Details available on the website.
E-mail	<a href="mailto:eaa1541@gmail.com">eaa1541@gmail.com</a>
Website	<a href="https://eaa1541.org">https://eaa1541.org</a>
Mailing Address	EAA chapter 1541, PO Box 1126, Lincoln, CA 95648
Chapter Hangar	Hangar S-12, Lincoln Airport

President	Darren Coomler
Vice President	Jim Hughes
Secretary	Darren Coomler (acting)
Treasurer	Scott Whelan
Chapter Board of Directors	Paul Darbo Christina Duran Michael Lagomarsino Dan Masys Ray McNaught Mary Wick
Web + Newsletter Communications and Tech Counselor	Dan Masys <a href="mailto:dmasys2@gmail.com">dmasys2@gmail.com</a>
Membership	Chapter dues: \$30 per year for individuals; \$40 for families; \$300 for gold

## President's Corner



Welcome Chapter 1541 Members and Friends,

Wow! That's all I can say about our "Brunch with Bud" event last Saturday. I was captivated with his personal story of his early aviation path and his entry into WWII. I was also impressed with the clarity of detail as he explained his flying and thoughts during a dogfight that took place over 75 years ago.

If you missed the event, it was recorded and is available on our chapter's website (go to [www.eaa1541.org](http://www.eaa1541.org), click on the Member tab and then the Membership meetings videos) enjoy and share. Thank you, Dan Masys, for recording, editing, and posting this video. At this location on the chapter page, you will also notice other recently recorded member meeting programs -- have a look!

Come join us next Saturday, May 21st for pancakes and movies in honor of Memorial Day. We will be showing movies of great pilots and aircraft in memory of battles past. (Note that this month we will not be having a member meeting on the 18th, due to the great program earlier this month with Bud.)

Since we are having great member participation during our 1st and 3rd Saturday events, next month we are going to change it up a bit. The first Saturday will be the Pancake breakfast, the third Saturday will be changed to a lunch. The current third Wednesday member meeting will be merged with our third Saturday lunch. We will continue this schedule until the weather changes in the Fall. It's been a while since we have shared a hamburger, so come on out and enjoy a burger and program.

Another change to the schedule is the chapters Board of Directors meeting time, the Board will be meeting after the first Saturday's breakfast. I encourage members to sit in on the Board meeting as we will open a portion of the meeting up for member comments. The Board meetings are a great place to hear what the Board is working on for future events and is also an opportunity for you to get involved.

Hope to see you all next Saturday, May 21<sup>st</sup>.  
Have a great week.

Sincerely  
Darren



## Brunch with Bud

Our May 7, 2022 "Brunch with Bud" event honoring Colonel Clarence E. "Bud" Anderson was an educational and heartwarming event. Col. Anderson grew up on a farm near Newcastle and is the only surviving World War II Triple Ace pilot. He recently turned 100 years old. More than 80 attendees visited our EAA hangar at Lincoln Regional Airport, had a tasty brunch and enjoyed hangar chat and a great presentation by one of the Greatest Generation's most famous pilots.

For those who missed the event, the highlights (including Bud's presentation) are available by clicking on the [EAA chapter 1541 YouTube channel](#).

Here are a few pictures from the event:





Bud's P-51D "Old Crow" from his second combat tour in 1944



The four “top guns” of the 357<sup>th</sup> fighter group in 1944, all multi-aces, with a young Bud Anderson at the far right



Bud smiling on the day his second tour of duty ended in 1945, after 16 ¼ kills and 116 successful missions in a row. Only battle damage in all that time: one rifle sized bullet hole in the bottom of a wing.

**Project Corner**

All chapter members are invited and encouraged to take a few minutes and send us a photo and description of whatever project you are working on now or have recently completed. Send your text and photo(s) to

[eea1541@gmail.com](mailto:eea1541@gmail.com). Fun and education for everyone!

**A Project Becomes an Airplane!**

**Ernie Brock** writes:

I did the first engine run on my RV-14 a couple weeks ago and last week I had the FAA inspection.

-Ernie Brock



Ernie with his RV-14’s new airworthiness certificate and operating limitations document.

Reprinted here as referenced by our April member program on borescopes, which is available online as a YouTube video [here](#).

**Savvy Maintenance:  
Borescope Ascendancy  
Time to topple the venerable  
compression test?**

*By Mike Busch  
Originally published in AOPA Pilot magazine,  
May 1, 2017, with 2022 updates added at the  
end of the article.*

The differential compression check has been a mainstay of piston aircraft engine maintenance for 80 years. Like anything else in aviation that's been around for a long time, various old wives' tales have evolved about the procedure, passed on from journeyman mechanic to apprentice, and later taught in A&P schools and documented in various textbooks and advisory circulars. Ask your mechanic why he performs a compression check a certain way or interprets the test results as he does—and, if he's honest, he'll probably answer, "That's the way I was taught to do it, and that's the way I've always done it."

One pervasive old wives' tale has it that compression readings in the high 70s are excellent, in the low 70s are good, in the high 60s are marginal, in the low 60s are poor, and anything below 60/80 is unairworthy. Another widely accepted old wives' tale is that an engine with compressions in the low 60s is a "tired engine" that will not put out full rated horsepower. Both are dead wrong.

More than three decades ago, Continental Motors issued a service bulletin (M84-15) debunking the first of these superstitions by establishing a new go/no-go criterion for compression tests: the master orifice tool. Mechanics who followed this guidance were astonished to find that compression readings in the low- to mid-40s were deemed acceptable by Continental.

This 1984 guidance was based on a series of engineering studies performed using an IO-550 engine mounted in the dynamometer test cell at the Continental factory in Mobile, Alabama. Those studies revealed that when the compression ring gaps on the IO-550's pistons were filed oversize intentionally to reduce the compression of all six cylinders to 40/80, there was no measurable loss of horsepower output (although there was an increase in oil consumption). This effectively debunked the "tired engine" old wives' tale.

## Enter the borescope

Nineteen years later, Continental threw mechanics another curveball by issuing Service Bulletin SB03-3 (which superseded M84-15), directing that a borescope inspection of each cylinder be performed at each annual and 100-hour inspection, and any other time that a compression test is done. It further made it clear that the borescope, not the compression tester, was to be the gold standard for assessing the airworthiness of a cylinder. It directed that if a cylinder flunks a compression test but the borescope reveals no obvious cause for the low compression, then the engine is to be flown for at least 45 minutes and the compression test be redone. Only if a cylinder flunks its compression test twice in a row (with at least 45 minutes of flying in between) is it deemed unairworthy.

Continental's SB03-3 was pretty shocking to mechanics when it was first published in March 2003. In those days, few GA maintenance shops owned a borescope (unless they did a lot of turbine work), and there was no training available to mechanics on how to use one to inspect a piston aircraft engine cylinder. Most A&P schools still don't teach anything about how to use borescopes in piston engine maintenance.

The service bulletin recommended using a low-cost rigid optical borescope—the Lenox Autoscope, which was so named because it was designed for automotive use, and at more than \$2,000 was one-tenth the cost of the fiber-optic borescopes being used for turbine engine hot-section inspections. Still, lots of mechanics and small GA maintenance shops were not amused by being told that they had to shell out two large to buy one of these instruments. Fourteen years later, some A&Ps still don't own a borescope.

## Eyeballing the combustion chamber

I was an early adopter of borescopy. Having gone through the painful experience of pulling cylinders because of low compression readings, only to find nothing physically wrong with them, I was anxious to adopt this more enlightened way of evaluating cylinder condition. I borrowed a Lenox Autoscope from a shop on my field and began inspecting the 12 cylinders on my Cessna 310. It was an eye-opening experience, almost as if I could climb inside each combustion chamber—or at least stuff one eyeball inside.

## Visual diagnosis

By inserting the scope through the top spark plug hole and twisting and turning it, I could get a decent view of the intake and exhaust valves, the cylinder walls, and the piston crown. I found it spellbinding. Direct inspection of the combustion chamber provided a much better picture and deeper understanding of the true condition of the cylinder, compared with the crude, indirect assessment provided by the differential compression test.

These images were captured with a ViVidia Ablescope VA-400 (below). The quality is pretty spectacular for a \$200 scope. [see note at the end of this article for borescope updates]



*Lycoming O-320 exhaust valve. Note the symmetrical “bullseye” appearance indicating a healthy valve.*



*This is a very sick exhaust valve on the verge of failing catastrophically. Note the asymmetrical appearance: That’s bad!*



*Closeup of the healthy O-320 exhaust valve, with a good view of the seat and valve-sealing surface.*



*O-320 cylinder barrel and piston. This jug is very worn: Note the vertical scoring and lack of crosshatch.*

A compression test could tell you that air was leaking past the exhaust valve, but with the borescope you could tell whether it was because of a benign glob of lead on the seat that would quickly resolve itself the next time the engine ran—or a malignant, warped or

eroded valve likely to fail catastrophically in the next 10 hours. How cool was that?

Over the years, the compression test has proved untrustworthy and prone to false positives, resulting in tens of thousands of cylinders being removed unnecessarily (including a few of mine). That's why the SB03-3 guidance calls for any disqualifying compression test that is not corroborated by borescope evidence be retested after flying for at least 45 minutes. That's excellent advice. I've seen many cases where a cylinder that flunked the first compression test easily passed the second one. In one notable case involving a Cirrus SR22, a cylinder that tested at 38/80 (and that the shop doing the annual wanted to yank) wound up measuring 72/80 on the retest after a one-hour flight.

SB03-3 did not go so far as to recommend that borescope inspections should replace the venerable compression test. Continental couldn't do that, because the requirement to perform a compression test is written into the FARs (Part 43, Appendix D). But SB03-3 did all it could to convey that Continental is no big fan of the compression test for determining cylinder airworthiness. (A senior Continental executive once confessed to me that if they could've dropped the compression test altogether, they would have.)

Continental's guidance on borescope inspections has saved owners millions of dollars in maintenance costs. I consider SB03-3 to be the best thing ever written on the subject of how to decide whether a cylinder needs to come off. It has saved owners of Continental engines millions of dollars in maintenance costs. In my view, it's high time that Lycoming followed suit and revised its archaic guidance on the subject. (Last year, Continental incorporated the contents of SB03-3 into its new Standard Practice Maintenance Manual M-0, so it no longer exists as a separate service bulletin.)

### Today's scopes: wow!

In the computer industry, Moore's Law (named after Intel co-founder Gordon Moore) states that the number of transistors packed on an integrated circuit will double every two years. Something similar has taken place in borescope technology in the 14 years since SB03-3 was published. Today's borescopes use tiny, cheap, solid-state CCD cameras to replace the costly optics that were previously required. The result is the current crop of scopes is both vastly better and an order of magnitude cheaper than the benchmark Lenox Autoscope.

My current favorite is the ViVidia Ablescope VA-400 scope, which you can purchase on Amazon.com for less than \$200\*. It comes with a USB cable that can be plugged into any notebook PC or Android tablet, and with software for both Windows and Android that can capture both still photos and videos. In addition to its impressive image quality and excellent lighting, the ViVidia scope has the unique ability to adjust its viewing angle from zero degrees (looking straight down at the piston) to 180 degrees (looking backwards at the valves), or anything in between. (By contrast, the \$2,300 Lenox Autoscope has a fixed 90-degree viewing angle and no capability for capturing images.)



*The ViVidia Ablescope VA-400 viewing angle can be adjusted from 0 degrees to 180 degrees by pressing the plunger on the handgrip.*

With scopes of this quality available for \$200, there's no excuse for any A&P not to own one and to use it as his primary means of assessing

cylinder condition. In fact, anyone who does owner-performed maintenance should consider buying one.

Compression testers lie all the time. Borescopes never do.

Mike Busch is an A&P/IA.

### 2022 update

\*Time and technology march on. The latest competitor to the Vividia ablescope, which is also available now for \$200 on Amazon, is made by Teslong. It has the same 180 degree articulating head to look back at the intake and exhaust valves, with a convenient holder for a cell phone, and software for both iPhones and Androids. It is available at

<https://www.amazon.com/gp/product/B08V4DYP1S>

And there are now many similar products.



2022 Teslong articulating borescope

Dan Masys  
EAA 1541 Tech counselor

## Sightings

Just another morning at a small town airport, KLHM.  
Not many places you'll find three bizjets sharing the ramp with a 1943 N3N Navy biplane.

