

BORESCOPING PART 2

Performing Cylinder Inspections

By Scott Sellers

This article is a follow-up to “Introduction to Borescoping: Part 1,” which explains how owners can use borescope images to change the way they monitor cylinder health, allowing them to take preventative steps before serious issues occur. The preferred inspection interval is 100 hours for normally aspirated engines and 50 hours for turbocharged engines.

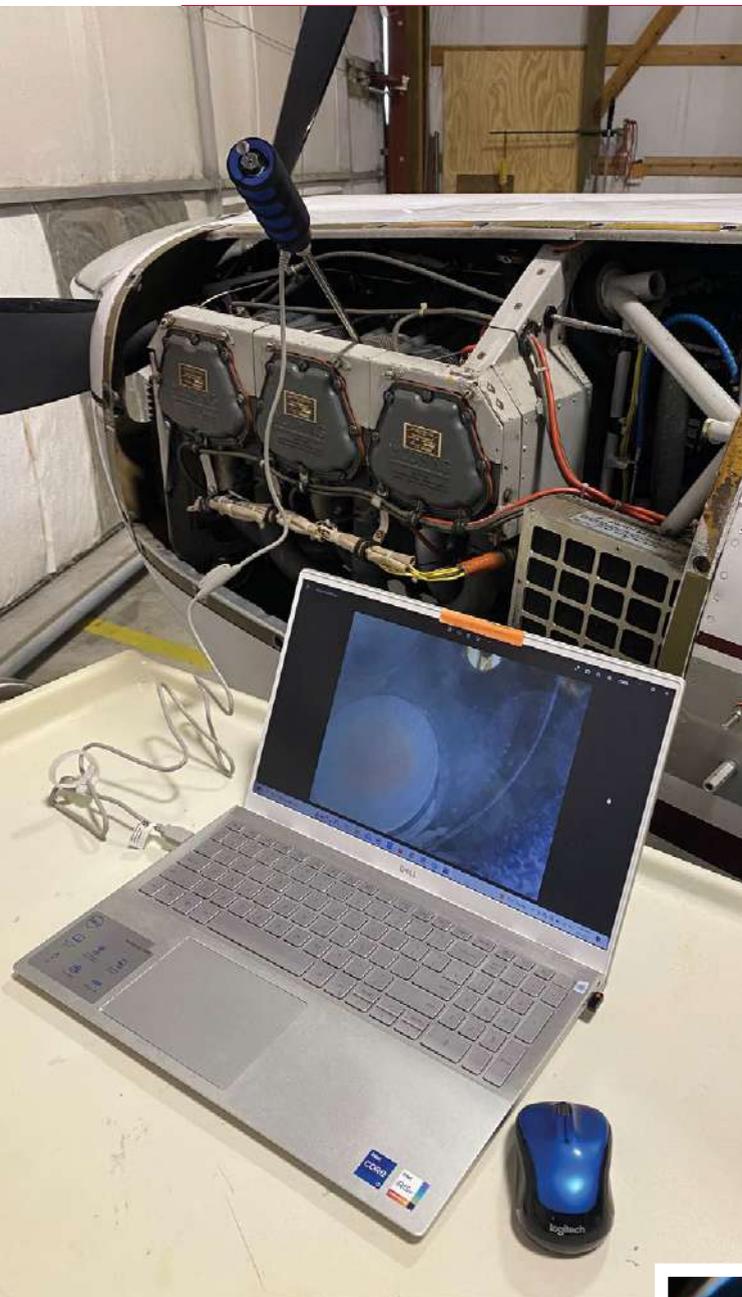
The following information comes from an interview featuring borescoping pioneer Dave Pasquale in Episode 5 of the “Beyond the Hundred Dollar Hamburger” podcast on cessnaowner.org/scott-sellers-podcast, hosted by my brother, Mark Sellers, and me. Dave is a veteran A&P/IA and the originator of cylinder inspection reports, so he’s an expert on this subject.

General Notes

- With this cylinder borescoping process, you will be taking eight photos for each cylinder, numbered #1 through #8.
- Organizing your images matters, since you’ll be accumulating quite a few. You may find it helpful to create an image folder for each cylinder, which makes it easier to compare images from year to year.

Preparing to Borescope

- Become familiar with your borescope. When I first got my Vividia Ablescope VA-400, I experimented with it at home to get familiar with it before going to the hangar. It’s not difficult to use but give yourself an hour or more to get comfortable snapping photos with it.
- Learn how to connect your borescope to your laptop to view and download images.
- Learn how to remove your top cowl and the top spark plugs in each cylinder. Find a mechanic or airplane owner who can teach you if you don’t know how. It’s not difficult but allow yourself time to get familiar here, too.



Above: With the top cowl and top spark plugs removed, set up your borescope and laptop so there’s easy access to the engine. I like placing the borescope on a rolling cart.

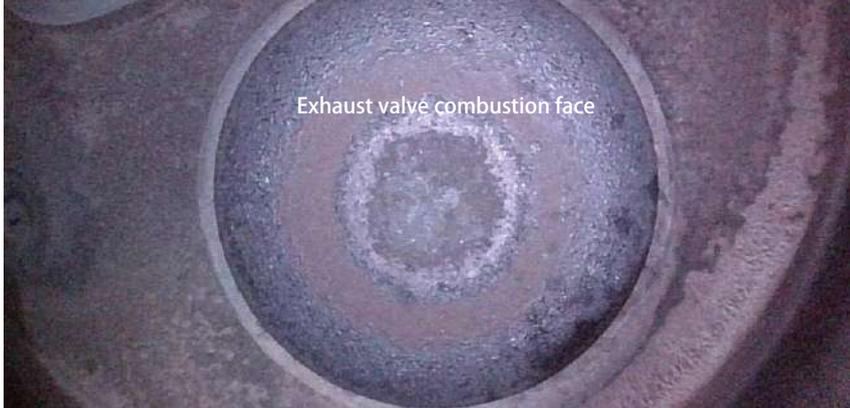
Launch the Ablescope or Windows camera app, whichever you prefer, on your laptop. Look through the spark plug hole with the tip of the scope positioned just far enough in so you don’t see the spark plug threads. Use the scope as the light source and manually turn the engine to position the piston at the bottom of its stroke.

Right: Take Photo #1 of the piston face, looking for impact damage, melted edges, or an oil film.



Borescoping Safely

- Be sure to confirm the ignition switch is working properly to ground your mags because you'll be manually turning the engine. This is critical to make sure the engine doesn't fire. Grounding your P-leads with a jumper wire is an alternate method you can use to confirm grounding.
- For Photos #4 through #7, take care not to get the scope stuck between the valve and the valve seat. If the scope is pinched between the valve and valve seat when taking the guide photo, don't try to pull the scope out or turn the engine. Doing either has a high risk of damaging the scope. If this is a concern, then skip the valve guide images. If you do get the scope stuck, your mechanic will need to remove the rocker cover and use a valve spring compressor to relieve the pressure on the valve to release it.



Borescoping a Cylinder Step-By-Step

For additional information and reference, print Dave Pasquale's Cylinder Inspection Instructions, available at cessnaowner.org/nov22. Review the instructions at home and take them with you to your hangar.

Above: With the scope at the bottom of the cylinder, flex the tip 180 degrees to take a "dinner plate" view of each of the two valve faces to produce Photos #2 and #3. Make sure the valve faces fill the photo frames.

Below: Next, move the piston to mid-stroke so the exhaust valve is fully open. Take a photo of the edge of the valve and valve seat. Then angle the camera up the valve stem so the guide is visible and take a photo. These are Photos #4 and #5.

Photography Tips

- Keep the borescope camera lens clean. It's easy to gather dirt while moving the camera around the cylinder. Use LPS CFC Free NU Contact Cleaner or alcohol to clean the lens. Alcohol is the only cleaner sanctioned by Vividia.
- The cylinder must be cooler than 140 degrees F, which is the maximum temperature for the VA-400. Excess heat can blur the image and damage the scope. I prefer to borescope while the engine is cold.
- Take photos the same way every time for uniformity to allow accurate trend monitoring.
- Hold the camera still while snapping photos for best image clarity.
- Turn the camera light all the way up for best results. Lowering the light causes the computer to brighten the image, which can cause blurring.
- The Ablescope VA-400 comes with a lock on the plunger to hold the bend angle on the adjustable tip. Use the lock as needed for best results. Push the lock collar in to release the lock.



VIVIDIA ABLESCOPE VA-400 V5 REVIEW

By Scott Sellers

Vividia's new Ablescope VA-400 v5 is an eye-popping improvement over the early version of the VA-400 that we've been using for years. The improvement in image clarity between the old 640 x 480 pixel images versus the new v5 (1,280 x 720 pixels) can certainly make a difference in decision-making when it comes to assessing cylinder condition.

The other change with the v5 product is that the single button on the handle replaces the light control and shutter button formerly on the USB cord. The single button now controls the



High-resolution image of valves and head taken by Vividia Ablescope VA-400 v5.

camera shutter and the three positions for light intensity, simplifying operations of the unit.



Vividia Ablescope VA-400 v5.

For PC users, there's a choice of either the Vividia Ablescope viewer app at vividia-tech.com/download.html, which works on my Dell Inspiron 15 5000 laptop running Windows 10, or the Windows Camera

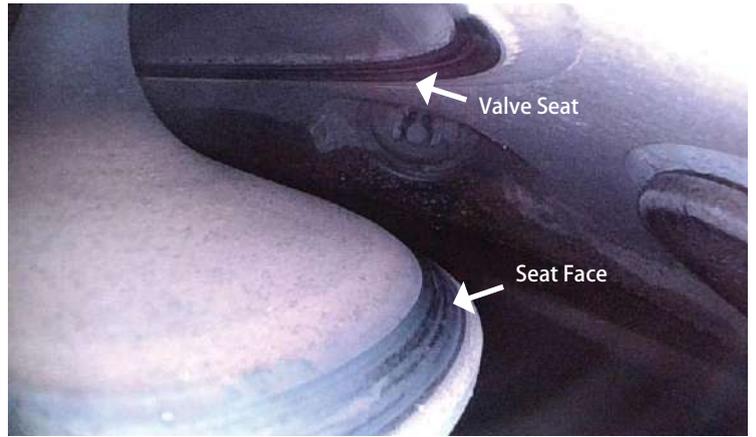
app. I found the single button on the scope handle using the Windows Camera app works to control the light but I was not able to snap photos with the button, so I left-clicked the camera button on the right side of the screen, which worked fine. Video for both methods worked well via left-click as well.

For Apple users there's a digital viewer app for downloading for MacOSX that is compatible with Mac microscope software from Plugable Technologies with timed-shots, single shots, and movie capture modes. I have not used the VA-400 v5 with Apple products but understand people have good results using their iPads or iPhone with Vividia's AirBox App also listed at the above link.

Aircraft Spruce has the VA-400 v5 priced at \$249.98, and the unit comes with a durable metal carrying case. When I called the company that produces the Vividia line, Oasis Scientific (864) 469-0919, and explained that my old VA-400 was not working properly, they offered a substantial discount to purchase the new v5 unit rather than spending the \$100 repair charge for the old scope. So if you have an old VA-400 and want to upgrade, I suggest calling to see if they'll offer you a similar deal.



Ablescope carrying case.



Above: Repeat step 5 for the intake valve for Photos #6 and #7.

Below: Move the piston to the bottom of the stroke and take photos of the cylinder wall. To help reduce the glare of the cylinder wall, push the scope against the piston, angling the tip toward the cylinder head to catch the hone pattern. This is Photo #8, which completes the cylinder inspection sequence. Go to the next cylinder, following the same sequence for remaining cylinders.



There's no better way than cylinder borescope inspections for hands-on owners to participate in their airplane's preventative maintenance while improving operational safety and saving money. With a little practice and experience, your hands won't even get dirty while borescoping.

Coming Up

Part 3 of this borescoping series will cover the typical valve lifecycle, explaining changing valve conditions and preventative maintenance options to avoid removing cylinders unnecessarily. 