KOEHLER KORNER

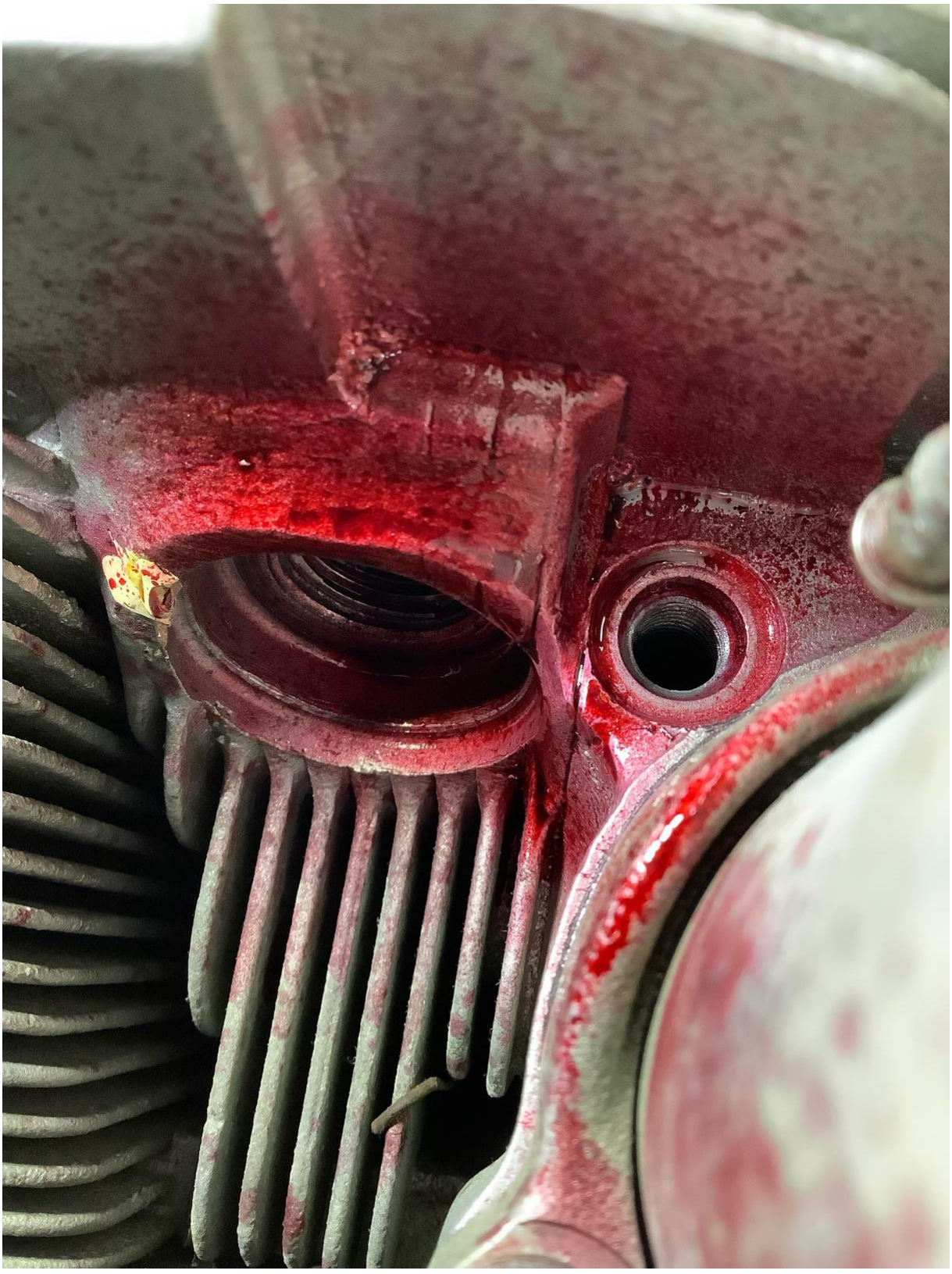
I was minding my own business last month when I received a call from a friend with a Cirrus. Turned out that the plane was in annual and the IA had discovered what appeared to be a crack in one of the IO-520 cylinders! The IA stated that the engine issue was beyond his expertise and had requested help. I was asked to "consult".

Note in the picture what appears to be a crack between the intake port and the smaller fuel injection port. The roughly horizontal crack runs across the roughly vertical web between the two ports. This type of crack is often caused by over tightening the fuel injector.

Before diving into this project, I did an internet search for similar issues. Found a good article written by Mike Busch in which an FBO during an annual had replaced all the cylinders on an IO-520 due to cracks between the intake and fuel injection ports. After the fact the owner contacted Mike Busch who retrieved the supposedly damaged cylinders and performed a dye penetrant inspection on them. Turned out there were NO CRACKS. The owner got a fat refund check (nearly $20k) and all were happy except the IA that had not done a proper inspection. Armed with this example I chose to do a dye penetrant inspection on the subject cylinder. I had purchased the complete Dye Penetrant Kit from Aircraft Spruce a few years ago for a repetitive inspection that is required on older Mooney aircraft.

The process for doing a penetrant inspection is to first clean the surface with an appropriate solvent. Do not sand or file the surface or abrade it in any way. Doing so could actually fill in the crack and hide it. The kit comes with a cleaner that works quite well. Next you spray on the penetrant, which can be in any number of colors, including UV, and let it soak in for at least 20 minutes. Spraying on the penetrant can be quite messy, and getting the dye on your fingers will result in dots of the dye in all kinds of places you may not expect.

It is a messy step as shown here:



Next step is to carefully wipe up all of the dye. Initially, I just wipe with a disposable rag or paper towel, and then gently just wipe the surface with a rag with a bit of solvent from the kit. Do not use enough solvent to immerse or wet the surface. Do not take a chance of washing the dye out of any cracks. I then wait just a moment for the surface to dry. Next step is to apply the developer in the kit. Developer quickly dries to a flat white powder surface that is absorbent of any dye. It will actually wick dye out of the crack and the contrasting color of the developer (white) and the dye (day-glow red in this case) will show a bright colored line.

In this case it is obvious there is no dye color in the area of the suspected crack. The cylinder head was not cracked! I could hear the owner sigh in relief a block away. As a bit of a quality control, note the area just below the injector port in the face of the cylinder where there is a red reaction area. This appears to be a porous spot in the casting. It is not a structural issue, but being there, shows up in the process, indicating we probably did it right.

I then super cleaned the area and left the cylinder clean for the IA to reinstall the parts.

So, what caused the original issue of an apparent crack on the cylinder. I don't know for sure, but it appears to have been just dirt and/or grease smeared in a line. The line was in an area where cracks can occur, so it was easy to assume a crack. Based on the article by Mike Busch it may be an issue on Cirrus aircraft. Something in the cowling/baffling may cause an airflow that deposits the dirt/stain in a location and orientation that looks like a crack.

Moral of the story is to do your homework before jumping into pulling cylinders. Wipe down a suspect crack area to clean it and monitor at regular intervals. Cracks do not go away. They do grow, so do not wait too long to recheck.

One other thought: You can use the developer to find engine oil leaks. Super clean the suspect area, spray on the developer, and then operate the engine for a while. Oil leaks will show up as brown lines. In the old days we used to use Arid Extra Dry Spray Deodorant with Powder. The fine powder in the deodorant acted like the developer. I learned the trick from an old motorcycle mechanic!

Hope this little story helps you better maintain your plane and control maintenance costs.

Keep building, flying, and maintaining.

Dick
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