**Quieter Canards? And Noise Measurement**

**Making it quieter:**

**Mike Schroeder, Denmark: *“****Has anyone invested time/brainpower in how to make our planes quieter from outside?.. I am test flying and soon to undergo noise certification... (EU rules)”*

**Hugh Farrier, Tampa, FL:** *“Is the testing done on the ground or as a flyby? Only things I can think of are a muffler, scalloping the exhaust tips of which there’s not much data or cutting the ends of the exhaust angling down from the top.”*

**Mike Schroeder, Denmark: *“****The testing is done at Maximum Takeoff Mass. You takeoff and make a climb out using Best Rate of Climb. At the end of the runway the measuring equipment is located. You fly the "track" minimum 6 times and your noise has to be within certain limits. The length of the runway and the weather has to be within specific limits.”*

**Klaus Savier, Santa Paula, CA: *“****Back in the 80s I first built a 4-pipe system with the exhaust pipes exiting two on each side, outboard, where the original Brock 2 into one used to exit. That system made excellent power but was slightly noisier.
I then modified that system to exit on the top of the cowl, still pointing aft, the ends were baloney cut to be near flush, the bottom of the cowl was closed up to a straight, sharp TE. That system was even better and reportedly a lot quieter from the ground. It had the nasty tendency to fill with water, lots of it, when parked in the rain. Upon hand start, the water would hit me straight in the face in several pulses. In 1990, after I ditched my last magneto, I realized that I could build a 4 into one system without any external protrusion of the cowl. The pipes went outboard, forward, inboard into the motor mount where I now had space, up and aft to the collector under the turtle deck and then pointing aft through the cowl with a large secondary pipe, centerline above the engine. The engine never ran so smooth and quiet, in the cockpit and especially from the ground. Unfortunately, it was a bit heavier and after several iterations I still lost 6 kts. I still have the system if anyone wants to try it. After that I built the 4-pipe system that exits in the cowl opening, it performs with the best I had, has no external drag, helps the cooling and is noticeably quieter than others but not nearly quiet enough to be certified in Europe. There is a substantial amount of thrust coming from the exhaust so they should always point aft, wherever they exit!
Also, being at the departure end of SZP, I can distinguish the RVs that have mags from those that have dual Plasma CDI, they sound noticeably different and quieter.”*

**Izzy Briggs, Concord, NH:** *“I met a Defiant owner in Norway last month that constructed the exhausts pointing straight up, curving around the cylinder heads, which appears to help reduce noose by shooting the exhaust note up instead of back or into the ground. Looks like the Speed Canard setup without the muffler.*

*The tip of a Long-EZ builder’s plane also showed diffuser holes drilled through.*

*I’ve also seen on Nick Ugolini’s exhaust some scalloped tips that seem to have a positive effect. Maybe look at the tips of assault rifle barrels for more inspiration for noise suppression methods and techniques.*

*American operators don’t have to contend with anywhere near the noise issues of European builders so it’s hard for us to understand the need for options.”*

**Measuring it:**

**Del Schier, Lake City, FL:** *“I am retired from the home and commercial audio business and think that your program is great but I haven’t found much use for it until recently.*

*I fly a 200 mph 4 seat homebuilt airplane called a Cozy IV. See:* [*Cozy MK IV - Wikipedia*](https://en.wikipedia.org/wiki/Cozy_MK_IV) *It is terribly noisy and I have made a couple of measurements of my airplane, and recently, a similar one that seemed much quieter. A support group of hundreds of people that build and fly these aircraft are interested in sharing plots from your app to help find cabin noise reduction solutions.  We all must wear active noise cancelling headphones to make them bearable to fly in. see attached plots.*

*My question is; how much does the calibration change from one iPhone to another?  Is there much difference in the mic gain, response and sensitivity between iPhones?”*

**Oxford Wave Research:** *“Thank you for reaching out to us about SpectrumView, we are always keen to hear from our users. Many of our users apply SpectrumView to fascinating projects in various areas and it is great to hear about your project. A member from our team will respond to you shortly.*[*www.oxfordwaveresearch.com*](http://www.oxfordwaveresearch.com/)*”*

**Further Response:** *“Thank you for getting in touch with us, and sorry for the delay in our response. First of all, thank you for your positive comments about our software.- given your audio background, we are very glad you think it's good!*

*The Cozy IV looks amazing. I'm astonished about home-built airplanes in general, so very much in awe of what you and the support group are doing….Your work looks fascinating, and would certainly be interesting to us. We did some work with Airbus many years ago looking at specific frequencies in certain parts of their planes (*[*https://oxfordwaveresearch.com/our-r-and-d/airbus*](https://oxfordwaveresearch.com/our-r-and-d/airbus) *-noise-profiling/) using Spectrumview.*

*Spectrumview takes the input from the iPhone's microphones and although the generally you will get similar results (same frequency range profiles), it will depend on the microphones, models and distance to the noise sources. One thing that we do not do is measure the absolute noise like an SPL meter. One reason for this is as you say, different microphones may be calibrated differently.*

*What would be useful to do however, is to take an average of several seconds of sound and look at the noise profile (see Spectrumview help for more details). Are there certain peaks that occur. Can they be correlated to specific things occurring (e.g. the motor spinning).*

*We think this could be a fascinating case study and would love to learn more. If you have anything public facing (blogpost,webpage, etc), do let us know, we would love to understand more.”*

**Del Schier:** *“I have posted recently that I am on a campaign to make my Cozy quieter inside and have gotten some great comments.  I am using an iPhone audio spectrum analysis app called SpectrumView.  It is not cross platform but there are dozens of apps for Apple and Google phones.  I have not found one that works on both platforms. SpectrumView is fully usable for free with no ads and data can be captured by doing a screen shot.  For cheap you can upgrade to recording and many other measurement options.*

*I was curious if the data the app measures would be comparable/ calibrated across different model iPhones and got a nice response from the developer; see below.*

*It would be interesting if we share measurements here on our forums.  I would suggest we try to do plots with similar conditions, that is, about 135 kn indicated in level flight and the phone 12” or so in front of the pilot’s face.”*