

The UNH Wind Tunnel (Also known as the Flow Physics Facility)

A Conversation Between Durham Administrator Todd Selig and UNH Professor Joe Klewicki, Department of Mechanical Engineering October 27, 2011

Selig: Joe, as you know, there have been a number of complaints about the wind tunnel noise on Columbus Day Weekend.

Klewicki: This is regrettable, as we certainly do not want to bother residents. UNH works to be a good neighbor. Perhaps some background would be useful. Over the past year of operation, we have been working to better understand the characteristics of the facility, including its flow properties, noise generation, and power consumption. During the summer we arrived at a set of operational protocols that, based upon our measurements, factored in energy consumption and noise. Regarding the latter, note that even though at all speeds we believe that the noise generated by the facility is formally within the parameters of the Town noise ordinance, although satisfaction of this ordinance does not mean that noise is not annoying. Overall, our aim is to avoid annoying residents, and thus in these protocols we chose to self-impose operational limitations. On Columbus Day weekend the graduate student who was operating the facility faithfully adhered to the protocols that we established. Unfortunately, he also operated at or near the very top speed of the tunnel for an unusually long period of time, and, understandably, the persistent drone became an annoyance to some Durham residents. The suite of experiments that the student ran is unusual, as its aim was to qualify the full operational capabilities of the facility.

Selig: How often will you be operating the wind tunnel at high speeds?

Klewicki: We have two 400-horse power fans, but each has its own variable frequency drive that allows the speed (and power) of each fan to be continuously adjusted. It is infrequent that we run them at full power, and even less frequent for extended periods. A much more typical time of operation is between two and three hours, and for most experiments we run well below the tunnel's top end. For example, at 50% full speed, the wind tunnel is essentially inaudible off-campus.

Selig: Why do you run the wind tunnel on weekends and at night?

Klewicki: The fans require a lot of power and we have worked closely with our facility and energy folks here at UNH to make sure that we do not exceed peak levels. If we do, then UNH will be billed at a higher electrical rate for 12 months thereafter. So, we identify times when there is not a lot of energy use on campus to run the wind tunnel. We are working now to identify other possible times during the regular workweek, possibly early afternoon, when we can run the tunnel and not exceed peak usage. But again, we will not be running at full power or high speeds for the vast majority of time.

Selig: When UNH came to the Durham Planning Board, we were told that noises probably wouldn't be heard outside of the building but that because this is a unique facility, it was difficult to be exact.

Klewicki: All of those things are true, and in that same meeting we also indicated that some of the relevant factors would only be determinable after the facility was built. It is also useful to note that the wind tunnel is being built in two phases. The first phase is what you see today. We had federal dollars to complete phase two which would have increased its overall size but when the economy collapsed, those dollars went away. The second phase would have enclosed the facility, essentially containing the sound. We continue to work with the federal government to secure the funds to complete phase II. In the meantime due to concerns that have been expressed, UNH is going to pursue grant funding for acoustic filters (that operate somewhat like a car muffler) that will significantly attenuate the sound.

Selig: Do weather conditions influence the noise levels?

Klewicki: Absolutely. There are a lot of factors that we still do not fully understand. On Columbus Day weekend there was very little wind, and the clear skies led to a rapid thermal stabilization of atmospheric conditions in the late afternoon. Atmospheric stability of this type can sometimes cause upward travelling sound waves to actually be reflected back down toward the ground.

Selig: Would it be possible to post an operational schedule of the facility?

Klewicki: We are focusing on the operational protocols that are acceptable to both UNH and Durham. It would be very difficult to conduct research on a schedule because there are so many factors that influence timing. Some of these include, weather, need for repeated measurements, type of model being tested, graduate student schedules, etc.

Selig: Why is the wind tunnel so large? Why didn't UNH build a smaller facility?

Klewicki: The tunnel is 236 feet long and 20 feet wide. It is the largest wind tunnel of its kind in the world. The primary purpose of the facility is study flow along solid surfaces. Such flows are called boundary layers. The unique attribute of our facility is that the flow is allowed to develop over a long distance. The net result is that we have the capacity to probe the turbulence in a specific class of flows, known as high Reynolds number boundary layer flows, with greater precision than anyone else. If the facility was smaller we would not be able to make accurate measurements at high Reynolds number. This wind tunnel allows us to more fully understand the mechanisms that lead to the drag force experienced by ships, submarines, aircraft and automobiles. The high Reynolds numbers accessible in this facility also present a very good modeling environment for atmospheric phenomena, such as dispersion of pollutants in cities, etc. For these reasons, this facility uniquely addresses

scientific and technological concerns important to our national security and long-term energy sustainability.

Selig: Would you be willing to talk with Durham citizens who have voiced concerns about the facility and provide an opportunity for them to view the facility firsthand?

Klewicki: As a resident of Durham, I look forward to an opportunity to talk with my neighbors, and will be arranging an open house and a tour of the facility in November. As soon as I identify a date that works for everyone, I will contact you and ask that you extend the invitation to the community. UNH will also announce the open house on its website.