Long Range or Long Time ?

Oehler's emphasis on instrumentation designed to improve long-range predictions goes back to a meeting with Pete Gould in 2011. In anticipation of the meeting, Dr. Oehler outlined his thoughts.

With the great interest in sniper rifles and long-range shooting, better predictions are required to increase the probability of first-round hits. There are many learned discussions regarding ballistic computations and which drag function to use. A simple method to characterize the flight of a given projectile over an extended range is lacking.

McCoy and others have noted that several ballistic parameters (such as drop and wind drift) are primarily a function of initial velocity and time-of-flight. During the portion of the flight where the velocity remains a significant part of the initial velocity, the parameters remain relatively independent of the specific drag function.

We've noted that a bullet's flight can be best characterized by muzzle velocity and time-of-flight over a long distance approaching the maximum expected range of use. Computing an average ballistic coefficient using these three parameters yields exact drop and wind drift at the specified long distance. It matters little which drag function is chosen; fit is forced to be exact at the specified distance and is extremely close at intermediate ranges. Extrapolations beyond the range at which the measurements were made are more dependent on the chosen drag function. A drag function matching the particular bullet will give the best predictions at ranges exceeding the measurement range.

It is relatively easy to accurately measure muzzle velocity with a chronograph. You can measure range with a laser rangefinder. It is very difficult to measure time-of-flight simply because the beginning of the time interval is located at the gun and the end of the time interval is located far away. This requires either hard wires or a specialized radio link.

Previously, equivalent information has been obtained with precision Doppler radar systems. The initial cost of the System 88 will be a fraction of the Doppler system cost. Only one system operator will be required. The faster firing rate will make it easier to collect statistically significant samples. The system will be man portable and not dependent on electrical power.

Much has been accomplished since 2011. The System 88 has been developed and it has seen significant practical use. The principles outlined years ago have been validated by field test and we're still learning more. The System 88 provides the required time-of-flight measurements over extended ranges. This provides

- Accurate drop predictions without requiring specific drag functions and claimed ballistic coefficients.
- Observation of ballistic coefficient uniformity over long distance.
- Confirmation that ballistic coefficient is affected by both bullet and barrel.

We don't claim to have invented the importance of time-of-flight measurements; Newton anticipated that three centuries ago. We developed the instruments to make the measurements practical. Shooting without long-range time measurements is akin to relying on a bore-sight instead of getting an actual zero.

If you want to read deeper, there are several "white papers" by Dr. Oehler shown on the home page pull-down menu.