Biondo Racing Products' Guide to Weather Stations and Predicting
by Peter Biondo (March 2015)

I put together this *weather station guide* to help you get the most out of your weather station. If you are in the market for a new weather station, please consider Biondo Racing Products at www.BiondoRacing.com or 800-332-1320. Our goal with this is to help our Biondo Racing and Spring Fling customers turn on more win lights.

A) Taking Weather Readings

Trailer Based Weather Stations: The first and most important step in predicting your ET or throttle stop settings is taking weather readings properly. If you are using a trailer mounted weather station such as the Altacom 2 or Performaire Weather Center, there is not much you have to worry about as the fan aspirated sensors utilized by these 2 systems will accurately and automatically take weather readings for you all day long. These stationary weather stations use high end weather sensors and incorporate a continuous fan blowing through the sensors which makes it the most fail safe way to get accurate readings with minimal effort. Add a pager to the mix and you have the ultimate in accuracy and convenience.

Hand Held/ Portable Weather Stations: With a hand held / portable style weather station, it is very important to take care in where and how you take your weather readings. To obtain the most accurate readings you should follow these guidelines:

- Allow 10 seconds after turned on for barometer to settle.
- Take readings in the open air, out of direct sunlight, and away from hot vehicles.
- Take readings in the same place every time. (whether in the lanes or the pits)
- Use common sense when taking weather (don't leave it in your hot racecar for all day and hold it out the window to take the weather, it may take up to 10 minutes for the heat to dissipate from the unit.)
- A hand held weather station that has a built in fan to blow over the sensors will be more forgiving in where and how you take your readings.

In summary: you can achieve the same accurate results with a hand held weather station as you would with a trailer based weather station, but it does take a little bit more effort on the users' part.
*At Biondo Racing we use and recommend a trailer based weather station for the highest accuracy, but if this is out of your budget, we can suggest a high quality hand held/ portable weather station.

B) Weather and Predictions

After gathering accurate weather readings from your weather station, the next step is making predictions to your vehicles performance. The most common question I am asked is *"should I do manual predictions or should I use a program to do the predictions for me?"* You should learn how to do the predictions on your own first, regardless of whether you decide to use a program to predict. Like anything else in life, if you really want to master something you should not only look at results but you should look into the "why" and "how" you get to that result. Later on, I will talk about using prediction

programs, but before that I want to share some of the "why's" and "how's" on weather and how it effects your vehicles performance so that you will not only get a good understanding of this, but you will also be able to effectively predict your vehicles performance on your own. After learning this, you could use the information to enter the weather factors into a computer based prediction program if you choose to use one.

C) Predicting On Your Own

As we would all love to be able to push a "magic button" and automatically be able to predict to the thousandth of a second, we also have to realize that there is a lot more to it than that. There are many weather variables and it's important to look at these variables and see how they effect your vehicles performance. This all starts with taking efficient notes- logging all of the (below 4) weather variables in your logbook. Take the logbook home with you and study it. Pretty soon you will see a pattern developing and you will learn how much of an effect each weather variable has on your vehicle, and put a 'factor' or 'weight' on each variable.

I recommend breaking it down the 'weather' into 4 important components:

1) Density Altitude OR Temp

2) Humidity

3) Barometer

4) Vapor Pressure OR Water grains

These 4 variables are what I found to be most effective in predicting. Notice on variable #1, I wrote Density Altitude OR Temp. You should choose one or the other, but no reason to track both as you would be 'double dipping' as Temp already plays a big part in DA. You will also notice #4 where I wrote Vapor Pressure OR Water Grains. Same thing here, pick one or the other as they both move in the same way and it will be double dipping to put weight on both of them.

Gasoline burning vehicles tend to be more effected by Variable #1 (DA or TEMP) and less effected by moisture (humidity and vapor pressure/ water grains). Therefore a big percentage of your cars response to weather will be based on Variable 1. It takes a smaller move of DA or Temp to change your car .01 in ET when running on gas than if you were running on alcohol. Also, the more efficient your engine/ carburetor/ converter combination is, the more it will take for the DA or Temp to move to change your car .01 in ET (a high cubic inch/ high compression bracket car with a big carburetor is likely to move less with a change in Temp or DA than would an 11 second stocker with a 750 Holley).

Alcohol burning vehicles are less influenced by Variable 1 (DA or Temp); it takes more of a DA or Temp change to change your car .01 in ET than if you were running on gas. Conversely, you will put more weight on Humidity and VP/WG (moisture) changes while running on alcohol.

After studying your logbook, you will soon learn how much of a factor/ weight to put on each of these 4 weather variables. It is very important to put a weight on each of the 4 variables, to look at them independently and independently compare them to a baseline run. After looking at them independently, you can tally up the total sum on how much faster or slower the weather is from a previous 'baseline run'.

Remember these 3 important steps in predicting ET:

1- **After using the weather station for a while and taking good notes in your logbook, you will be able to narrow down and put a very accurate number (factor) on each of these 4 variables. In other words, you will be able to narrow down how much of a change each of these 4 variables is needed (independently) to change your car .01 in ET.**

2- **Pick a baseline run that you will be dialing off of. It is <u>very</u> important to use logic and taking care in picking a baseline run to predict from. A baseline run typically should be your most recent previous run you made, or if it's a new day it could be a run that you made on a previous day at the same time of day.**

3- **Take the current weather conditions (looking at these 4 important weather variables and each independent factor). Compare these 4 factors to your baseline run's weather conditions (4 factors). After comparing the change of each of the 4 weather variables independently (and then totaling them up), you can come up with an accurate ET prediction.**

After the 4 weather variables, now factor in Wind and Track Conditions to get a final dial-in:

Wind: Wind is often an underplayed factor especially when predicting ¼ mile performance. It is also the hardest variable to pinpoint because it's always changing and swirling.
Factoring in wind:

- Pick a reference point for how and where you will determine the wind at each track and come up with an average wind reading over a period of 20 seconds. It could be a flag or your hand held windmeter at the 1000' mark, your stationary wind meter on top of your trailer, burnout smoke, or a combination of these.
- A generalized chart (average) for wind would be a 4 mph tail wind = .01, a 7 mph tail wind = .02 and a 10 mph tail wind = .04. The same applies for headwinds except the value for headwinds will tend to be slightly higher because you are going "against the grain" so to speak. Of course your 'wind factor' could be more or less depending on vehicle shape and speed.

Track Conditions: Track temperatures and track prep will also affect your vehicles performance. The ideal track temperature is in the 70 to 90 degree range. Here the rubber on the track is the tightest. The further the track temperature gets from this ideal temperature, the more negative (slowdown) effect on your ET. Too cold of a track and there may not be enough adhesion. Too hot of a track and the surface tends to be greasy and is susceptible to bald spots. As with any other variable, pay attention and share information with your buddies. Have 500 cars been down each lane since the track was prepped last? Is the sun beating down on it on a hot day? How far the track temp from the "ideal temp" is and which direction is it heading? What were the characteristics of this track the last time you ran on it at this time of the day?

D) Prediction Programs

The above 4 weather variables can either be done manually with a paper and pen, or if you have a computer with you at the races you can plug these weather variables (and an accurate factor for each) into a prediction program. This method (which has become very popular) can do the work for you and make your life easy. However, for a prediction program to be successful, you need to pick the correct

variables (formula) and you also need to enter the correct factors on each variable (as suggested, use the 4 weather variables listed above).

If you are looking for a stand-alone prediction program for your computer or laptop, I would highly recommend Crew Chief Pro Software. This computer program is very comprehensive and detailed, more so than the more generic programs that come with weather stations. If you purchased a weather station from us we will give you 10% off the Crew Chief Pro prediction program. Mention this article.

E) Jetting

When it comes to jetting, the common question always is- "Is my car jetted properly?" If you are trying to predict your vehicles performance to the .001 of a second, it is important your jetting be right so that your vehicle responds to weather changes predictably and consistently. There are many ways to see if you are jetted properly; from more traditional ways like reading spark plugs to using modern technology like onboard computers, EGT gauges, and O2 sensors. A more common sense approach is to monitor how much your vehicles performance changes when the air changes. In other words; is your car reacting to weather changes like it is supposed to? If you make a run in the morning where the DA is 1000 feet and run a 10.10 and then make another run in the afternoon where the DA is 1800 feet and your car falls off to a 10.21, chances are you are jetted too rich. If you actually run a quicker ET in the afternoon when the air gets worse, chances are you are too lean. As a rule of thumb, talk to a few of your friends at the races that have reliable cars and compare notes. See if your vehicle is corresponding to what the weather and what the other reliable cars are doing. Another question is "How often should I change my jetting?" If you are trying to get the most out of every run (comp eliminator, pro stock etc), you would have to not only change your jetting every day, but you would have to change them from the morning air to the afternoon air. However, in classes where you are trying to predict performance, it is more beneficial to leave your jetting as a constant. I usually have 2 different jet settings over a period of a race season, one setting that works well for good weather conditions, and one for poor weather conditions. Don't chase it, let the car respond to weather changes. If it's responding well, you will have an easy time predicting. After all, predicting is the name of the game here.

Summing it up

Hopefully this will help you get the most out of your weather station. As you will see and hear, there are a lot of ways to use weather stations in predicting vehicle performance. No matter the case, there are two things you always want to keep in mind: 1) make sure you have a weather station that is accurately gathering data for you and 2) always use common sense, pay attention, and take notes on how the above mentioned 4 weather variables effect your cars performance.

Visit www.BiondoRacing.com or call 800-332-1320 for the latest in weather station and the best pricing. Talk one on one with the racers at Biondo for the best weather station & prediction advice for your specific vehicle/ application.