

Pigeon Racing: How to Calculate Bird Velocity.

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www.pigeonresult.co.uk

All pigeon clubs have a several charts, forms and envelopes and adopt a logical procedure to perform the velocity calculation by hand. The following procedure helps explain how the computer software *Pigeon Calculator* and *Pigeon Club* calculates the bird velocity.

In general:

Competitors clocks are set against the master clock on Friday night,

The birds are then liberated Saturday morning.

As the birds arrive home the rubber race ring is removed and entered into the clock which records the time the bird arrived home.

All the competitors clocks are struck off Saturday evening.

Every competitor is racing against the master clock, and an allowance must be calculated for each of the competitor's clocks depending on if they are running fast or slow.

Some useful constants. I'm going to adopt seconds as my unit of time and yards as my distance unit.

Number of seconds in a day $24 \cdot 60 \cdot 60 = 86400$ Number of yards per mile = 1760

Number of seconds in a hour $60 \cdot 60 = 3600$

Number of seconds in a minute 60

Calculating the Bird Velocity requires some data collection before the calculation can be performed. I've used some sample data from a real race. The highlighted areas indicate information that must be obtained by any computer algorithm to compute the velocity.

The distance from the race point to competitor's loft this is provided by the Federation

$D_M := 243$ Miles $D_Y := 1638$ yards

day	hour	minute	second	
$d_{MS} := 1$	$h_{MS} := 18$	$m_{MS} := 30$	$s_{MS} := 0$	Master timer strike On
$d_{MO} := 2$	$h_{MO} := 19$	$m_{MO} := 00$	$s_{MO} := 0$	Master timer strike Off
$d_{CS} := 1$	$h_{CS} := 18$	$m_{CS} := 30$	$s_{CS} := 0$	Competitor's timer Strike On
$d_L := 2$	$h_L := 10$	$m_L := 30$	$s_L := 0$	Liberation time
$d_B := 2$	$h_B := 15$	$m_B := 38$	$s_B := 37$	Bird timed in
$d_{CO} := 2$	$h_{CO} := 19$	$m_{CO} := 0$	$s_{CO} := 13$	Competitor's timer Strike Off

The hours of darkness usually do not apply if the majority of birds are released and timed in on the same day. A long race and bad weather can extend the race over a night or two and the birds are deemed not to fly during the hours of darkness. The velocity would be very low without this correction.

$h_{\text{dusk}} := 23$	$m_{\text{dusk}} := 0$	$s_{\text{dusk}} := 0$	Start of the hours of darkness
$h_{\text{dawn}} := 4$	$m_{\text{dawn}} := 0$	$s_{\text{dawn}} := 0$	end of the hours of darkness

The start and end of the darkness is dependent on the time of year, and the latitude and longitude of where you expect the birds to be resting overnight. Fortunately the calculation is done by the federation, because calculating twilight dusk and dawn is not trivial.

$d_B - d_L = 0$ The number of nights from when the bird was timed in and the liberation time

The number of seconds of darkness multiplied by how many dark periods.

$$s_D := \left[86400 + (h_{\text{dawn}} - h_{\text{dusk}}) \cdot 3600 + (m_{\text{dawn}} - m_{\text{dusk}}) \cdot 60 + (s_{\text{dawn}} - s_{\text{dusk}}) \right] \cdot (d_B - d_L)$$

$$s_D = 0$$

There' s a lot of different terminology used in Pigeon Racing but I have tried to use the same terminology used in the Royal Pigeon Racing Association' s (RPRA) Rule Book. Any computer algorithm must of course calculate the result using the guidelines in their Rule Book else the result is not valid.

Long run: From setting the competitor' s clock to striking off the competitor' s clock after the race

$$R_L := (d_{CO} - d_{CS}) \cdot 86400 + (h_{CO} - h_{CS}) \cdot 3600 + (m_{CO} - m_{CS}) \cdot 60 + (s_{CO} - s_{CS})$$

$$R_L = 88213 \quad (\text{seconds}) \quad \text{The Long run in terms of seconds}$$

Short run: From setting competitor' s clock to timing in of the bird.

$$R_S := (d_B - d_{CS}) \cdot 86400 + (h_B - h_{CS}) \cdot 3600 + (m_B - m_{CS}) \cdot 60 + (s_B - s_{CS})$$

$$R_S = 76117 \quad (\text{seconds})$$

The initial variation - the difference between the competitor' s setting time from the master timer. when the clocks are struck on.

$$V_i := (d_{CS} - d_{MS}) \cdot 86400 + (h_{CS} - h_{MS}) \cdot 3600 + (m_{CS} - m_{MS}) \cdot 60 + (s_{CS} - s_{MS})$$

$$V_i = 0 \quad (\text{seconds})$$

The final variation - the difference between the competitor' s clock and master timer when struck off.

$$V_f := (d_{CO} - d_{MO}) \cdot 86400 + (h_{CO} - h_{MO}) \cdot 3600 + (m_{CO} - m_{MO}) \cdot 60 + (s_{CO} - s_{MO})$$

$$V_f = 13 \quad (\text{seconds})$$

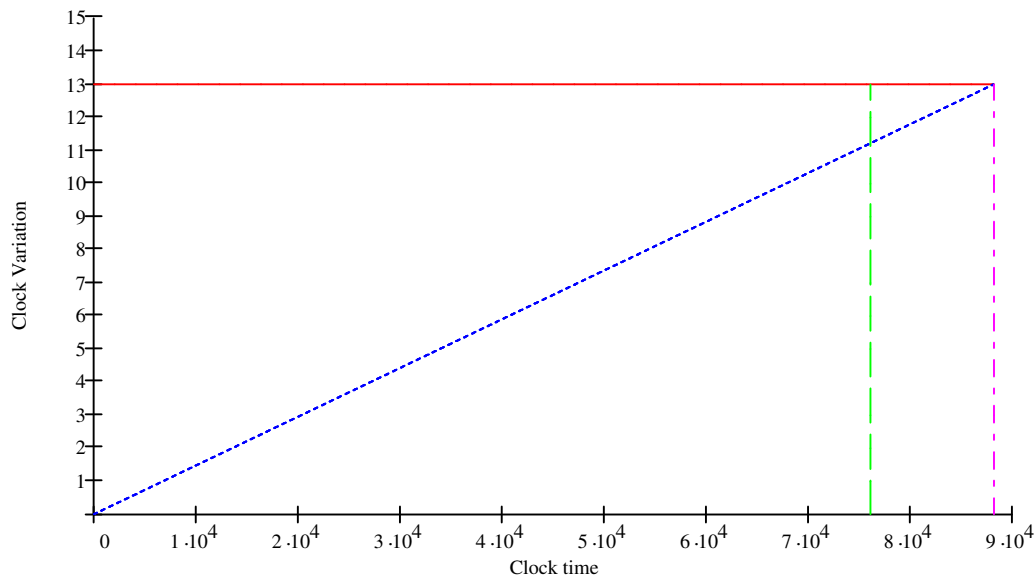
Variation: Net gain or net loss of competitor' s clock divided by the long run, multiplied by Short Run

$$V_N := \frac{V_f}{R_L} \cdot R_S + V_i \qquad V_N = 11.2174056 \qquad \text{Variation (seconds)}$$

Of course the above formula is the equation of a straight line where V_f/R_L is the error or variation rate.

$$t := 0.. R_L \quad \text{Competitor clock time} \quad \varepsilon := \frac{V_f}{R_L} \quad \varepsilon = 0.00014737 \quad \text{variation rate (dimensionless)}$$

$V(t) := \varepsilon \cdot t + V_i$ Variation as a function of time is best explained with a graph



The purple line indicates the Long time and the green line the short time and you can see over the clock on and clock off period the clock has being gaining at a steady rate. So the point when the bird was timed in varies slightly less than the final variation.

Lets remind ourselves of when the bird timed in on the competitor' s clock

Day	Hour	Min	Sec
$d_B = 2$	$h_B = 15$	$m_B = 38$	$s_B = 37$

If a competitor' s clock is running fast - i.e when the bird timed in the competitor' s clock is forward in time compared to the master clock then we must deduct the variation to be correct with the master clock. If we did not deduct the variation then a fast clock would be a disadvantage to the competitor. Of course a slow clock would fall in favour of the competitor - we add the variation in such cases.

I have chosen (arbitrarily) that a +ve variation represents a fast clock and -ve variation a slow clock in the previous graph.

$V_N := -1 \cdot V_N$ $V_N = -11.2174056$ This just helps me from computer algorithm point-of-view

$B_T := d_B \cdot 86400 + h_B \cdot 3600 + m_B \cdot 60 + s_B$ The number of seconds since the clock was struck on.

$B_T = 229117$ (seconds)

$B_{TA} := B_T + V_N$ $B_{TA} = 229105.7825944$ Bird Time adjusted (seconds)

We then need a technique to convert the seconds back into days,mins and secs to make the intermediate results more readable. The trunc function just removes all the whole part to number and frac function trims the fractional part.

$$B_{TAday} := \frac{B_{TA}}{86400} \quad B_{TAday} = 2.6516873 \quad \text{The number of days}$$

$$\text{trunc}(B_{TAday}) = 2 \quad \text{The truncation indicates it' s the next day on from when the competitor' s clock was struck on.}$$

$$\text{frac}(B_{TAday}) = 0.6516873 \quad \text{The fractional part of the day can then be converted into hours by multiplying be 24 hours/day}$$

$$H := \text{frac}(B_{TAday}) \cdot 24 \quad H = 15.64049517 \quad \text{trunc}(H) = 15 \quad \text{Hours}$$

$$M := \text{frac}(H) \cdot 60 \quad M = 38.42970991 \quad \text{trunc}(M) = 38 \quad \text{Minutes}$$

$$S := \text{frac}(M) \cdot 60 \quad S = 25.7825944 \quad \text{Seconds}$$

The Flying time is the corrected time less the liberation time less any darkness periods.

$$L_T := d_L \cdot 86400 + h_L \cdot 3600 + m_L \cdot 60 + s_L \quad L_T = 210600 \quad (\text{Seconds})$$

$$B_{FT} := B_{TA} - L_T - s_D \quad B_{FT} = 18505.7825944 \quad (\text{Seconds})$$

Again we need to turn the seconds into the more familiar days,hour,mins,secs

$$B_{FTday} := \frac{B_{FT}}{86400} \quad B_{FTday} = 0.2141873 \quad \text{The number of days}$$

$$\text{trunc}(B_{FTday}) = 0 \quad \text{frac}(B_{FTday}) = 0.2141873$$

$$H := \text{frac}(B_{FTday}) \cdot 24 \quad H = 5.14049517 \quad \text{trunc}(H) = 5 \quad \text{Hours}$$

$$M := \text{frac}(H) \cdot 60 \quad M = 8.42970991 \quad \text{trunc}(M) = 8 \quad \text{Minutes}$$

$$S := \text{frac}(M) \cdot 60 \quad S = 25.7825944 \quad \text{Seconds}$$

The final velocity is required in yards/min (the convention) - on a good day a pigeon can fly 1760 yards/min that's a 1 mile/min.

$$D_Y := 1760 \cdot D_M + D_Y \quad D_Y = 429318 \quad \text{The distance in yards}$$

$$\frac{D_Y \cdot 60}{B_{FT}} = 1391.94761792 \quad (\text{yards/min}) \quad \text{Bird Velocity}$$

60 secs/min hence the multiplication by 60, but from a manual calculation point of view you can prep up the Competitor's yardage multiplied by 60 (what they call sixtieths) and then just use the corrected flight time in seconds.

$$D_Y \cdot 60 = 25759080 \quad \text{Often referred to as sixtieths}$$

I can hear all you mathematicians cry out and say it's not velocity but merely average speed. Velocity being a vector with a magnitude and direction. Although the direction is implied by the vector Race Point to Loft. The birds in no way are forced to fly in a straight line but the term velocity has become the accepted terminology in the world of pigeon racing.

This is not the full story because we must consider how the computer stores numbers and performs addition, subtraction, multiplication and division to ensure the result calculated to required accuracy, but that's another story.

Pigeon races are often a close run affair so accuracy and fairness of the results is essential.

References

"The official rules RPRA 2003" available for download www.rpra.org

see rule 192 and Appendix E