

## The lie that tells the truth

*Time trialing is an imperfect way of sorting out who's fastest, and there is both art and science to it*

BY CHARLES HOWE

The French call it *la course du vérité*, or the race of truth, but in the real world, its results can be materially affected by changes in wind and temperature throughout the race, not to mention disparities in equipment and other, more subtle factors that determine aerodynamic efficiency. Even relatively small, random wind currents over a short period of time can make a difference.

Nonetheless, the format of a time trial – riders start alone, at regular intervals, with no drafting permitted – provides the best available on-road test of determining the fastest rider. Until the mid-1980s, no more than a standard road bicycle was needed, with gear that did little to reduce aerodynamic drag – perhaps a 28-spoke front wheel (instead of 32), a skinsuit (made of silk, that is), and a cycling cap worn backwards. Now, advanced technology and specialized equipment pervade nearly every aspect of this subdiscipline, but fitness should always receive priority over equipment, so that is where we begin. In this case, we'll assume the targeted event is a flat-terrain course, such as the Presque Isle Time Trial in Erie PA (see [accompanying article](#)).

### Get specific

Whether you are coming off a competition/recovery period consisting of road and criterium racing, or some hilly century rides and long club/group rides with friends, you'll need to work on your aerobic fitness in much the same manner as the recover/rebuild period described here last August: 3-4 weeks of Level 3 ('tempo') training consisting of 1½-4 hour rides over flat and flat-to-rolling terrain. This time, however, you'll need to add some Level 5 work to the mix, in the form of 5-6 × 5 minute intervals to 'peak' aerobic power, plus a couple of practice TTs of similar duration and terrain.

Suggested 4-week time trial preparation period.						
WEEK	HOURS	KEY WORKOUTS				
		Weekday			Weekend	
1	8:30	1:00 – 2 F	1:30 – 2 R	1:30 – 3 F	2:00 – 2/3 F	2:30 – 2 RV
2	9:40	5 x 5:00 – 5 F	1:30 – 2 R	1:30 – 3 F	2:30 – 2 R	3:00 – 3 RV
3	9:40	5 x 5:00 – 5 F	2:00 – 2 F	<b>1:00 – 4 F</b>	2:30 – 2 R	3:00 – 3 F
4	5:00	1:00 – 2 F	<b>1:00 – 4 F</b>	1:00 – 2 F	1:00 – 2 F	RACE

Workout duration is followed by [training level](#) and workout type: F – flat R – rolling H – hilly V – variably-paced (e.g., group ride). **Bold** type indicates practice TTs in full race gear, and include warm-up/cool down

### Attention to detail

Gear Guy showed off some impressive gadgets in the March edition of *Ohio Sports and Fitness*, but time gains from a totally tricked-out TT rig can be compromised by less-than-optimal positioning. For professional and elite riders, the solution may be a session at one of the few low-speed wind tunnels around the country, such as at College Station TX, San Diego CA, or Cambridge MA, at a cost of \$750+ per hour, but this should be used only to obtain the last few percentage points of drag reduction; most improvement comes simply from visual inspection, using guidelines derived from previous testing over the years ([Figs. 1-2](#)):

1. The torso should be as straight and horizontal as possible, with the top of the helmet as nearly even as possible with the top of the back.
2. The upper arms should be comfortably forward, at approximately the same angle as the head tube (side profile), elbows within the outer edges of the hips (front profile). Forearms should be in the same sagittal plane as the legs, level with the ground or angled slightly upward.
3. Keep the head up at all times, of course for safety reasons first of all, but especially if you are wearing an aerodynamic helmet; turning or dropping your head creates drag.

There are also plenty of low-cost ways to save time:

1. Install an [adjustable stem](#) that allows you to get lower.
2. Use a [wheel cover](#) instead of a disc, and install a pair of [skewers](#) that tighten with a hex wrench instead of a lever that sticks out.
3. Rim depth and profile shape determine wheel aerodynamic efficiency, but tires need to fit within the profile of the rim braking surface ([Fig. 3](#)) – and be sure to race on the same tires you warm up on, since cold tires are harder and use more energy.
4. If the course is flat, remove the front derailleur and small chainring.
5. Wear shoe covers and a skinsuit one size too small, or have one tailored to eliminate wrinkles. Pin your race number on from inside the skinsuit with 8 pins.
6. Closely shave legs, arms, hands, fingers, and face the night before the race.
7. Request a later start time, since even a 5° F swing in temperature, as is not uncommon in the early morning, can make a difference of 10 seconds over 25 miles [1].
8. Finally, don't be afraid to experiment; a novel aid to help keep the head up might be to sew a Velcro® tab on the back of the skinsuit at just the right spot so it can attach to the tail of the helmet.

### ***Know thyself . . .***

For our purposes here, intensity and pace refer to the rate of energy expenditure as indicated by a power-measuring system, rather than by speed or time per mile, which are less reliable means of gauging effort during road cycling.

Everyone knows it makes sense to avoid starting out too hard, yet this is an all-too-common mistake, even among experienced competitors, and even those who have previously learned the lesson. A conspiracy of several factors is to blame: the stimulus of competition, energy levels that are extra-high after having tapered and peaked, the fact that perceived exertion takes several minutes to catch up with the actual effort, and overemphasis on starting technique. Start out by restraining your effort at 5-10% under what you plan to average for the entire race (a goal chosen from a practice TT the week of the race that is as similar as possible in duration and terrain to the actual race). For instance, if you typically do 240 Watts for a 12.5 mile TT that takes you 30 minutes ([Fig. 4](#)), you'll want to average 215 W or so for the first minute, then be at 228 W after 4 minutes [2,3]. After that, perceived exertion and prior experience should guide intensity as you slowly progress toward the planned wattage for the duration, continuously evaluating average power output throughout the ride in relation to how you feel and how long there is to go [4].

At least in a flat TT, it's average power output for the entire ride that you want to keep your eye on, much more than current power or even the rolling 30 second average; the goal is to manage the overall distribution of energy output and produce nearly equal values of average power for each half [5], rather than controlling moment-to-moment variability. In other words, it's "macropacing" that counts, not "micropacing," i.e., trying to keep the power perfectly constant, which is next-to-impossible anyway, even on the flattest of roads and with no wind – and even if it were possible, it is apparently not even desirable [6].

### ***. . . and the course***

In order of effectiveness, the means for doing this are:

1. Train on the course – turning repeated laps on the actual race route not only helps develop visual cues for turns, terrain changes, likely changes in wind direction and strength, road hazards, and course distance, it also provides the most specific training possible
2. Preview the course – for more experienced riders, or if there is no opportunity to ride the course repeatedly, arrive early enough on race day to do at least one circuit, even if you are familiar with it from previous experience. In an imaginative description of this process, five-time Tour de France winner Bernard Hinault said it was as though he had video camera in his head, and at the start line, he would press the 'RECORD' button and start riding, making note of every detail along the way. After finishing, he would rewind and pause the tape, then press the 'PLAY' button when the race started [7].

The more you can ride the course, the better the quality and resolution of the 'video.'

3. Drive the course by car – this allows neither subtleties of terrain and road surface, nor wind speed and direction to be appreciated, but is better than nothing if there is no time for a preview lap.
4. Examine course map(s) and profile – these should be used in conjunction with previewing/riding the course, rather than serve as the sole source of information; elevation profiles should be examined with a critical eye, since they can be distorted to give an inaccurate impression of terrain.

### ***Warming up to the task***

An old and venerable time trialing text [8] quotes several professional riders who advocate a pre-race ride of an hour or more, one of them saying you should be “sweating like a pig” before the start. Warm-up routines of similar duration are not uncommon among recreational competitors, but as the author acknowledges, the needs of the pros may be due to the large training loads they maintain, not to mention that most TTs they do are in the midst of a stage race, as opposed to a single event for which they are fully rested. Further, a recent peer-reviewed study found that a regimen of just 15 minutes, progressing from 70-90% of ventilatory threshold, was enough to adequately accelerate oxygen kinetics and improve performance in a 3 km track time trial [9]; a longer, less intense road TT should require even less, especially once you learn to control the early intensity and ease into the effort. Even so, some extra time is included in this suggested routine:

- ▶ Synchronize your watch with official race time, then start with ~10 minutes of easy, light pedaling while checking out equipment.
- ▶ 4 minutes, starting at 75% of the planned average intensity, progressing slowly to 90%. For instance, if you plan on averaging 240 W, start at 180, and end up at 215.
- ▶ 3 minutes very easy, sipping a sports drink.
- ▶ 4 minutes, starting at 90% of the planned average intensity, progressing slowly to 100% by the end.
- ▶ 2 minutes very easy light pedaling, then to simulate the race start, do 1 or 2 hard-but-not-quite-all-out, 10 second jumps from a standstill, separated by a minute’s rest.
- ▶ Put the bike in the gear you plan to start in and roll up to the starting line. Per Rule 3E5(a) of the 2008 USA Cycling Road/Track/Cyclocross Rulebook, you must report to the start line 3 minutes before your scheduled start time, but this is never enforced, and a minute or two are enough of a pause.

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**TOTAL WARM-UP TIME = 26 minutes**

### ***Last, and least important***

All too frequently when the subject of time trialing comes up, starting technique commands a disproportionate amount of attention. It gets the lowest priority here, but does rate some mention.

Most often, the starting interval between riders is one minute, but 30, 20, and even 15 seconds may be used. Again, make sure your bike is in a low enough gear before you roll up to the start area. Once you are securely held, backpedal until one foot is forward, either in the 10 o’clock position if the left foot is forward, or at 2 o’clock with the right foot forward. Take a slow, deep, easy breath . . . let it out . . . then relax and repeat. Start your timer when the starter’s countdown reaches 5 seconds. At 2 seconds, squeeze the front brake, rise up from the saddle, and shift your weight to the forward pedal. As the holder releases you at the command of “GO” (they should neither push nor restrain you), release the brake and do something of a “¾ sprint” for 12 seconds – but no longer [10] – as you work your way up a few gears and build speed, then settle into the aero position and concentrate on the pacing schedule described above – not on trying to catch any riders ahead of you.

## REFERENCES

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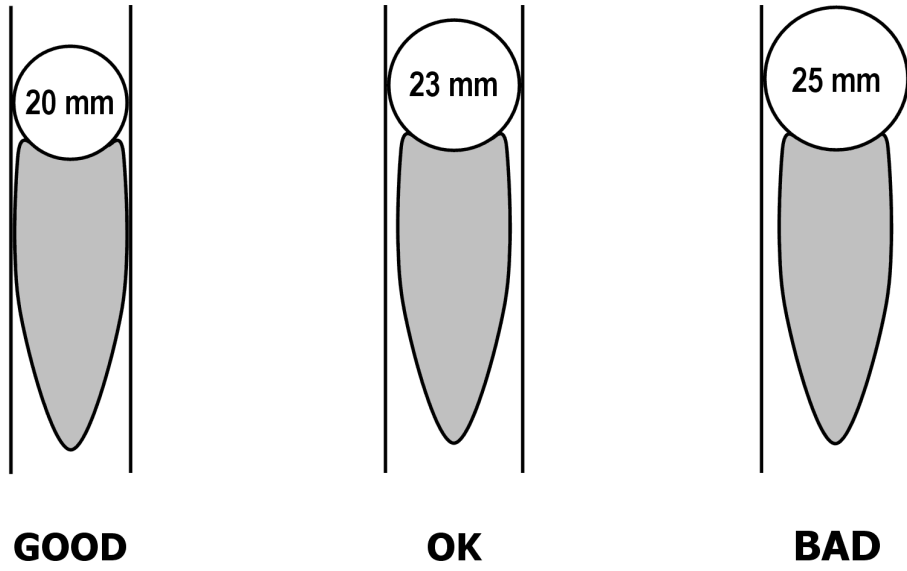
## ILLUSTRATIONS



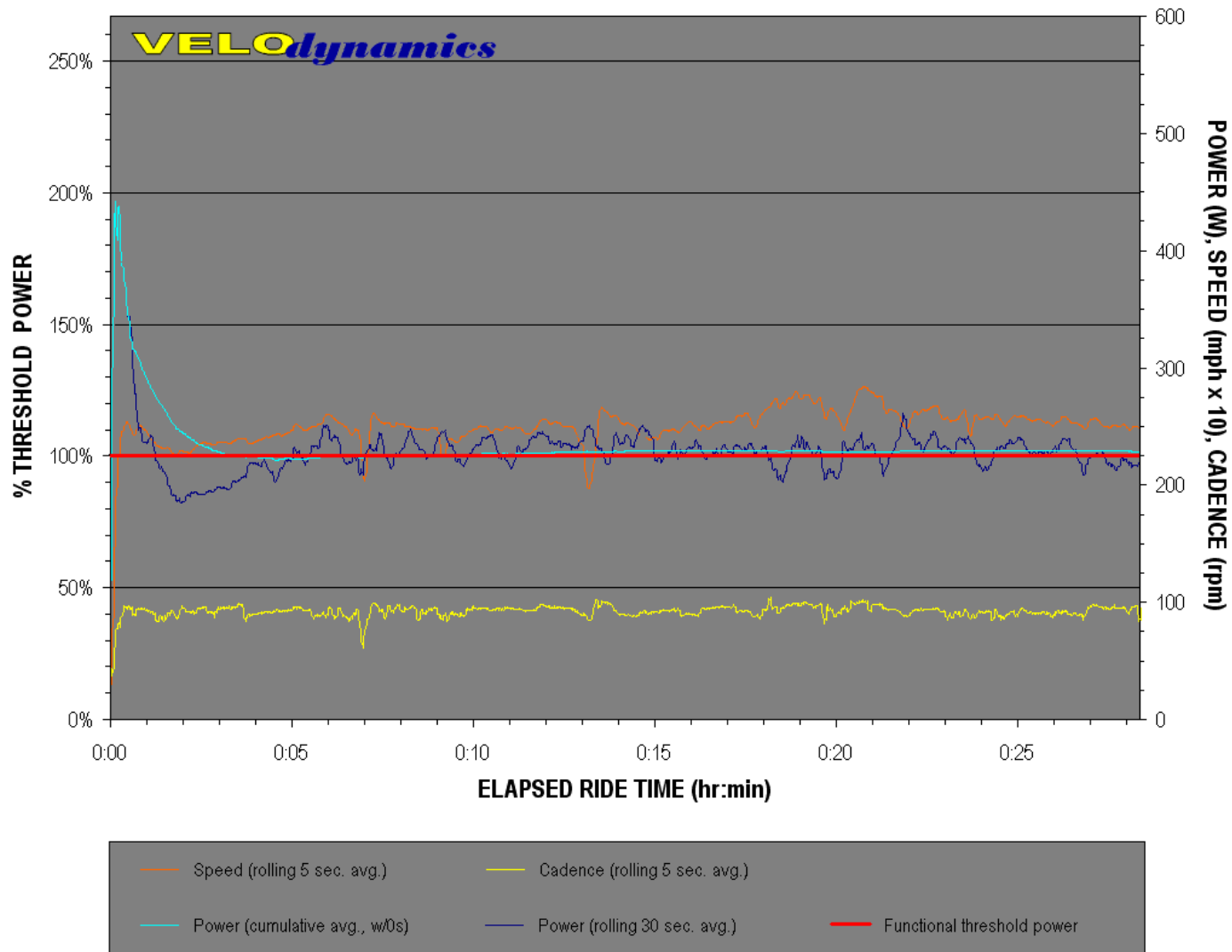
**Fig. 1.** Chris Baldwin (ex-Navigators Professional Cycling Team) is shown here en route to winning the 2003 U.S. National Time Trial Championship. He also won it in 2005.



**Fig. 2.** Three-time Presque Isle Time Trial winner Jay Joslyn demonstrates both exemplary form – and the need to keep the head up.



**Fig. 3.** Tire widths for maximizing wheel aerodynamics.



RIDE SUMMARY		6/19/05
Rider:	CH	
Event:	Presque Isle ITT	
Level - conditions:	4 F	
Body mass:	70	kg
Functional threshold power: (= 60 min TT power)	225	W
	3.21	W/kg
	13.06	W/kg <sup>0.67</sup>
Recording interval:	1.26	sec
Ride time:	0:29:56	h:m:s
Pedaling time:	0:29:56	h:m:s
Distance:	12.4	mi
Avg. speed:	24.9	mph
Avg. cadence:	92	rpm
Pedaling %:	100%	
Avg. power (w/coasting):	229	W
Avg. pedaling power:	229	W
Max. 1 min. avg. power:	292	W
Max. 5 min. avg. power:	236	W
Aerobic continuity:	97%	
Intensity factor:	1.05	
% of threshold	102%	
Training stress score:	55	
<b>NOTES:</b>		
5th of 33, Men 45-54; 26th of 112 Men overall		
61/52°F, 75% RH, 767 mmHg, 3-7 mph E		

**Fig. 4.** Speed, cadence, and power data from a well-paced, flat-terrain time trial.