CHAPTER 1

Equipment

Triathlon is an equipment-intensive sport. To compete, you need to have gear for swimming, biking, and running (which adds up to a carload), and there are many added extras that are nice to have during training. Although the fitness and strength of a rider are the biggest determining factors in performance, equipment is a key area where improvements can be made. Obviously, you will go faster with less energy on a 19-pound, titanium, triathlon filly than a 40-pound, discount-store steed. A fast bike will make any rider, regardless of his or her level, faster. Energy-wise, equipment improvements are free speed. Dollar-wise, however, they can be very costly.

On average, the power produced to pedal a bike along a flat road is spent as 60% rider drag, 12% rolling resistance, 8% wheel drag, 8% frame drag, 8% bike/rider inertia, 0.5% wheel inertia, and 3.5% miscellaneous forces. While the area in which you can achieve the biggest performance gains is rider drag, every little bit helps. This chapter will help you select the best, most efficient equipment for your cycling needs.

HELMETS

Helmet companies have produced a lot of nice data demonstrating that helmets do not make your head heat up and that a helmet is more aerodynamic than your bare head. The bottom line, however, is safety—helmets save lives. Everybody, including me, has a story about a crash that has ended with a helmet split in two. So get a good helmet and wear it every minute you are on the bike.

Be sure that your helmet has been approved for cycling by the Consumer Product Safety Commission (CPSC) and that it fits properly. A helmet does not work if it rolls off your head during a crash. Cycling helmets are designed to be crushed (rather than your skull) on impact, and once they are crushed you need to replace them. Frequently check the condition of your helmet; a new one is vastly cheaper than a trip to the emergency room.

THE BIKE

There is a dizzying array of bikes available, made from different materials, built with different geometries, and optimized for different purposes. To determine the type of bike that is best for you, consider the primary event in which you will compete. Short course or long course? On road or off road? You want the fastest machine to handle the job you are giving it. Weight, handling ability, aerodynamics, and comfort will all factor into your decision. In shorter events, weight and aerodynamics are most important, and a degree of comfort can be sacrificed for speed. In longer events such as the ironman, comfort becomes paramount to continued optimal performance over long periods of time. The slower speeds and rougher terrain of off-road events make agility, handling ease, and the weight of the bike more important than aerodynamics.

When looking for a new bike, you have a lot of choices. The best way to find the bike that fits your needs, abilities, and body type is to consult with a qualified bike fit professional. A bike fit expert will measure you and help you research the best bikes that are both in your price range and suit your needs. (See Chapter 2 to determine the perfect machine for you.)

FRAME

Materials

The frame material defines the weight, strength, stiffness, durability, and cost of a bike. Most frames are constructed of steel, aluminum, titanium, or carbon fiber. Each metal has unique characteristics around which the frames are designed. For example, aluminum frames have large-diameter tubes with thin walls compared to steel frames.

Steel is cheap and easy to work with, thus it can produce the least expensive frames. Compared to the other frame materials, it is heavy, but improved steel frames with Reynolds 831, Dedacciai, or Columbus tubing can rival the lightest frames built from other materials. A well-made steel frame will last many years with proper care, but steel can rust, which is a major drawback in humid climates.

Aluminum is reasonably priced, lightweight, rustproof, stiff, and responsive, and aluminum tubes can be easily and cost-effectively formed into aerodynamic shapes. An aluminum frame can be too stiff and uncomfortable on long rides, however. It is difficult to repair and only has a life expectancy of about five years.

Titanium is smooth, supple, light, responsive, rustproof, and absorbs road shock for a comfortable ride. It is half as dense as steel and makes the lightest frames available. A titanium frame is very durable and will last forever. It is the most expensive of the frame materials, however, and is difficult to repair.

Carbon Fiber is four-times stronger than high-tensile steel for the same weight. It can be molded into any shape, and its fibers are oriented to make it stiffer laterally than vertically. This means a carbon fiber frame will not flex with hard pedaling but will still absorb road shock. Carbon fiber is rustproof, but it can be difficult to repair and is usually expensive.

Geometry

Frame geometry is determined by the length of the tubes and the angles at which they intersect. The geometry of a bike dictates how it will handle, steer, and perform. The most common frame geometry is the double diamond shape (see Photo 1.1). The front triangle is comprised of the top tube (A), seat tube (B), and down tube (C). The rear triangle is comprised of the seat tube (B), seat stays (D), and chain stays (E). Several alternative frame designs are available. The Kestrel KM40 Airfoil looks like a double diamond design but is missing the seat tube (see Photo 1.2). Softride beam bikes have a unique design with a shock-absorbing beam, on which the rider sits, extending out from the head tube.

PHOTO 1.1 *Standard double diamond frame design*

PHOTO 1.2 *The Kestrel KM40 is a carbon fiber bike with no seat tube.*

Seat-tube angle is calculated as the degrees the seat tube deviates from horizontal. A seat-tube angle of 80 degrees sits relatively upright and is referred to as "steep" or "aggressive." A seat-tube angle of 73 degrees is more laid back and is referred to as "slack." A steep seat tube puts the rider forward on the bike into an aggressive, aerodynamic position. A slack seat tube puts a rider farther back on the bike, making it handle in a more stable and agile manner.

COMPONENTS

Gears

In order to select the correct gears for your bike, an understanding of gearing is necessary. Bikes come with two or three front chainrings and eight, nine, or ten cogs on the rear hub. When gearing is written in shorthand, the front chainring is listed first, followed by a slash and then the rear cog. For example, a gear that uses the 53-tooth chain- ring and 12-tooth cog will be written as 53/12. (Experienced cyclists are familiar with the effort required to ride this gear, and 53/12 is a meaningful term to them.) The largest and smallest chainrings and cogs would be described as 53/39 and 12-23. Other methods used to describe the gears on a bike are gear development and gear inches.

Gear development, measured in feet, is the distance the bike travels in one pedal revolution. Changing the combination of chainrings and cogs will change the gear development. Gear development charts can be consulted to compare gear development figures for every gear combination. For example a 53/19 has a gear development of 19.3 feet.

Gear inches is a ratio comparing gears determined by dividing the number of teeth on the chainring by the number of teeth on the cog, then multiplying the result by the diameter of the wheel in inches. For example, a 39-tooth chainring and a 25-tooth cog on a 27-inch wheel (700c) would be:

$$(39 \div 25) \times 27 = 42.12$$

Gearing semantics are related to gear development. A 42/19 combination has a gear development of 15.3, and a 53/13 combination has a gear development of 28.25. We say the 53/13 is a "bigger" gear than the 42/19. Shifting up a gear refers to increasing the gear development and the load. (You shift "up" to a bigger gear and "down" to a smaller gear.) The confusing part is that, visually, the size of the cogs do not match the above descriptions but are reversed. When you move the chain to a smaller cog your chain moves down the cogs, but you are shifting up and selecting a bigger gear.

When determining what gears to put on your bike, first decide the largest and smallest gears you need; the gaps in between can subsequently be filled. To set up your bike to train in hilly terrain or for a hilly race, you should increase the size of your biggest cog. This will give you a smaller (easier) gear for pedaling uphill. Also consider your abilities. A rider who prefers to pedal at a fast cadence should select a smaller gear combination than a rider who prefers a slower cadence.

The most commonly used gears are:

- 700c wheels 53/39 and 12-23
- 650c wheels 55/42 and 12-23
- 26" mountain bike wheels 24/34/46 and 12-32

Pedals

When selecting a pedal model to use, you should consider the amount of float and stability you require. The degree of float on most pedals is adjustable. As the degree of float increases, the amount of stability the pedal provides the ankle and knee decreases. Athletes with stability issues, such as weak hip and knee stabilizing muscles, should choose a pedal with a larger platform and less float to keep the legs stable and in correct alignment throughout the pedal stroke.

Wheels

The two dominant factors affecting wheel performance are weight and aerodynamics. There is not one particular wheel on the market that is "the fastest," as this distinction also depends upon the course profile and the wind conditions. On flat, straight courses, aerodynamics are more important than weight. On hilly courses, or ones with many turns requiring frequent accelerations, wheel weight becomes increasingly important over aerodynamics. It is more difficult and requires more energy to accelerate a heavy wheel up to speed, but once at speed, the aerodynamics of the wheel determine its performance. You must analyze your goal racecourse and decide the opti-