

SECTION 020

THE FIT KIT STORY

by William L. Farrell

During the summer of 1979, my wife Shelly and I started a training camp for aspiring cyclists in the small town of Danbury, New Hampshire. We called this camp the New England Cycling Academy. During the early sessions, I became aware of two very serious problems with our students. The first problem was that several of our newer students were experiencing severe knee pain because the cleats on their cycling shoes (circa 1979 Duegis with the pre-mounted adjustable cleats) had been incorrectly installed. The second problem was that there was an unreasonable amount of poorly fitted equipment.

Interestingly, much of this poorly fitted equipment had been purchased from shops where dealers and staff had the best intentions of servicing their customers, however they had insufficient knowledge in the area of the bicycle-body relationship, frame sizing, component selection and the foot, shoe and pedal relationship. Furthermore, most shops had no standard procedure to properly select and fit a bicycle to their customers.

To address the first problem of the incorrectly installed cleats, I spent the next two years developing a number of techniques and pedal devices (many failed) that could accurately determine whether the cleat was correctly installed and adjusted so that no medial or lateral rotational stress was being induced on the knee. Just when I had thrown in the towel on this problem a friend looked over some of my sketches and said these magic words; "Bill why don't you just make the pedals rotate." Bang! That subtle suggestion was the breakthrough that I'd hoped for. After completing some sketches, I machined a functional prototype that I called the ROTATIONAL ADJUSTMENT DEVICE (R.A.D.). With the first cleats I aligned, I immediately knew that the R.A.D. would become an important and useful invention to prevent "equipment induced" knee injury to our students. Little did I know the impact this small invention would have on the entire bicycle industry during the next fourteen years.

The initial fitting system to systematically select the properly sized frame and component selection, evolved during the first two years through a time consuming process using nearly 3,000 profiles ranging from elite racers to experienced touring and sport CYclists.

By 1981, the patent applications had been filed for the ROTATIONAL ADJUSTMENT DEVICES and the fitting system was integrated into registered trade name of THE FIT KIT. During December of 1982, Ed Pavelka, then the editor of Velo News arranged a meeting with myself, Ed Burke and Eddy Borysewicz at the Olympic Training Center in Colorado Springs, CO. I was immediately given the task of analyzing the position and aligning the cleats for 60 junior cyclists and permanent residents at the OTC. THE FIT KIT was then introduced to the members of the U.S. Elite Athlete Program in January of 1983. Since that time, THE FIT KIT went on to become official equipment for the coaches and members of the U.S. National Cycling Team.

The elite level competitors at the U.S. Olympic Training Center were the most sensitive cyclists that I have ever worked with. These elite athletes developed their positions as a result of years of riding, trial and error, and by making periodic modifications and adjustments that were practical and gave them the best long term results.

While many initially criticized me for the number of elite level racers that were being used to derive information for building the initial tables of THE FIT KIT, I recognized that whenever a substantially large base of riders, coaches, mechanics, and framebuilders started to give their input, a solid selection procedure and a consensus of thinking and standards would emerge.

How THE FIT KIT continued to apply to a sport and recreational cyclist can only be appreciated by the fact that most top level road competitors must be in the saddle for several hours on a daily basis. The comfort factor is extremely important to road racers since they need to put several riding hours in comfort in order to reach their potential as top level competitors.

One of the more important considerations in selecting the frame was the seat tube angle. After four years of work in this area, I initially coined the term the "Q" factor. However because this has been confused with another parameter (the width of the bottom bracket) I now refer to this as the THIGH/INSEAM RATIO. The THIGH/INSEAM RATIO is now used to advise the dealer on the selection of the steepest seat tube angle to be used when selecting road and criterium frames. This is done on the basis of the individual's thigh length. I've found that many individuals who selected seat tube angles with too steep an angle could not position their saddle far enough to the rear to allow their knee to be positioned over the pedal's axle. When the saddle is set too far forward and too low, there is a tendency for the knee to have a harmful amount of closure angle when the pedal passes through the highest point in the rotation. This can ultimately lead to another form of severe knee injury that is induced through a poor bicycle/body relationship.

I also found that the top tube lengths on many bicycle frames were too long for some individuals. This was most apparent in women and young males.

When THE FIT KIT system was originally conceived I was aware that for a fitting system to succeed with the dealers and coaches in our industry I had to establish criteria that have continued to work through fourteen years. The following eleven areas have always been the foundation for the success of THE FIT KIT:

1. The data used to produce the tables for THE FIT KIT is from several sources with a broad base of profiles.
2. The material must be printed in a usable form such as tables that are easily interpreted by the dealers and their staff. Using sizes based on simple linear equations will not work for the wide range of human cyclists. Each increment in the body measurement works on a curve and has a unique value for the subsequent bicycle measurement. This process can now be done with both the tables in this manual and with the FIT KIT PC 2.5 software program for personal computers.
3. The information must be limited to fitting the bicycle to the individual. Details such as fork rake, trail, front center and wheelbase etc., while important, do not initially relate to the bicycle/body relationship.

4. The selection of frame and components' sizes must rely on consideration of what is readily available and used in the industry. Requiring crank lengths of 184.3 mm continues to be unrealistic. However with the advent of CNC machining capability, the possibility will someday allow us to have access to custom crank sets that are not outrageously expensive.
5. The FOOT/SHOE/PEDAL RELATIONSHIP **must** to be considered as the basis for the actual fitting procedure. Because cycling shoes represent the only "immovable" connectors of the body and the bicycle, using this area as the foundation for fitting is crucial
6. The dealer and staff needs a complete, standardized system that included guidelines for:

SELECTION OF THE FRAME SIZE

SELECTION OF COMPONENT SIZES

A PROCEDURE FOR THE INITIAL ADJUSTMENT OF COMPONENTS

INSTALLING AND ALIGNING THE CLEAT SO THAT NO INJURIOUS STRESS

WOULD BE PLACED ON THE KNEE

A RECORD KEEPING SYSTEM THAT COULD BE MAINTAINED BY THE DEALER

7. THE FIT KIT must work as one system, be portable and produce earnings for the dealers.
8. The initial and final adjustments of the components must be done on the actual bicycle that the individual would be using and not on a device that merely duplicates position without the systematic use of accurate measurements and objective mathematics.
9. The dealer and/or framebuilder using THE FIT KIT needs enough flexibility to interpret the tables and then make a knowledgeable decision.
10. Every FIT KIT dealer and staff member needs access to FIT KIT SYSTEMS via a telephone number and later a fax (603-448-4957) for advice and consultation concerning any bicycle fitting problem.
11. The dealer and his staff needs to be in complete control of the assessment from the initial BODY MEASUREMENTS to the final equipment rolling out the door. The dealer and his staff needed to feel as though he had done the best possible job in creating a developmental position for their customer.

In the spring of 1984, Shelly and our two infant children, Christopher and Kelly left our teaching positions at the Cardigan Mt. School, Canaan, NH and started the New England Cycling Academy as a full time enterprise. During those early days the SHIMANO AMERICAN CORP. supported our efforts by supplying us with such items as the Dyna Drive adaptors, some special wrenches and a substantial amount of cycling equipment to insure that THE FIT KIT would succeed. In fact, SHIMANO AMERICAN CORP. purchased the very first FIT KITS. By 1985 we were also working closely with LOOK and other shoe and pedal manufacturers. We then went on to develop a frame alignment system and became distributors for several lines of bicycle tools and related products. Additionally, we also started a technical school and hosted several Managers/Mechanics workshops throughout the U.S. and Canada.

During the summer of 1988, I developed an initial set of tables to be used with "ATB" (ALL TERRAIN BICYCLES or MOUNTAIN BIKES), Collecting profiles, assembling data and compiling the tables for the "ATB"s was time consuming and difficult but eventually the numbers started to "fall into place" and the tables were compiled. The New England Cycling Academy also developed the first software package (THE FIT KIT PC.) This initial computer program and updated versions are still chugging away in hundreds of shops.

It was also at this time when the New England Cycling Academy became heavily involved with a point of sales computer systems for retail bicycle dealers. By 1989 we were selling tools, software, computers, technical training, pedal systems, fax machines etc., etc., etc. By 1990 Shelly and I had sold our controlling interest in the New England Cycling Academy to an investor/management group to fuel the revenues needed to support our growing and diverse operation. Just when I thought that we would become the powerhouse for providing technical dealer support to the bicycle industry, WHAM!! the recession of 1990-1991 hit us hard. The margins that we previously needed to survive with the point of sales computers deteriorated exponentially. We just couldn't produce the required sales to support our entire product line. THE FIT KIT, however continued as a stable and needed product. Late in the summer of 1991, our investors decided to liquidate the New England Cycling Academy. The entire FIT KIT along with trademarks, patents, applications, proprietary research and inventory was set to be sold by a bank holding a secured loan. Thankfully, Dick Ring, my friend, mentor and long time cycling coach for twenty years came to the rescue of THE FIT KIT and contributed a large amount of his lifetime savings. When the New England Cycling Academy died in 1991, THE FIT KIT was allowed to survive and continue its original work which was to **provide the system and the education for the precision fitting of the bicycle to the cyclist.**

During the next two years, Dick, Shelly and I not only built the new company, FIT KIT SYSTEMS to continue the sales and development of THE FIT KIT but we also realized our long time dream of reestablishing our original training camp as the NORTH AMERICAN SCHOOL OF BICYCLE RACING. Now in its third program year, the NORTH AMERICAN students have allowed me to continue with my research and development of equipment to enhance all of our existing FIT KIT dealers. We now have 1,100 dealers world-wide.

I must thank many people in the industry for their support in seeing that THE FIT KIT and the R.A.D. continued to thrive during the past years. Special thanks must go to Robert Plunkett and the others at SHIMANO AMERICAN CORP who have continued to supply me with tons of new shoes, pedals, axles etc. They have given invaluable input so that I could develop the necessary adaptors for the very successful SPD pedal systems.

Finally, there is the most honored individual of all, THE FIT KIT dealer who has religiously done his or her best to provide their customers with a proper developmental position and a superior foot, shoe and pedal relationship with all types of pedal systems. Investing in THE FIT KIT and the numerous hours that they have spent fitting bicycles to customers of all sizes is so greatly appreciated.