

PROJECT GRAVEL REBORN

What does it take to build the ultimate gravel bike?

➔ Regular readers will recall our July issue where we featured a test of a Specialized Crux cyclocross bike that began a process of morphing it into something different than a 'cross-specific race bike. Although we did race the bike, we saw more potential in the Crux than just clearing barriers, and that was based on all the talk of the latest trend in drop-bar usage, the world of what's become popularly known as "gravel bikes." And so the Crux became our first gravel project bike.

However, about the same time we started the Crux project bike, we caught wind of a particularly grueling on/off road race that was six months off in the future. The Crusher in the Tushar is a 69-mile race held in Beaver, Utah, that is a mix between pavement and dirt roads. The dirt sections are rutted, loose mountain roads with golf-ball-size rocks sprinkled on them to keep things interesting. Oh, and lest we forget, it also boasts 10,500 feet of climbing. (That was the part that caught Neil's attention.) And while the Crux would be a great bike for the event, we figured the race would also be a good opportunity to build our own version of the ultimate gravel bike. And so RBA's "Project Gravel Bike" was born.

The intent of the project was twofold: Build a gravel bike to show how versatile a road bike can be across different terrain while utilizing some of the latest technology we could find. Secondly, and perhaps most importantly, build a bike that Neil could win on.





Craig Calfee has been in the carbon frame business since the late '80s. From the Tour de France stage-winning frame he built for Greg LeMond in 1992 to our Dragonfly Adventure, his designs remain among the most distinct and forward-thinking in the industry.



Avid mechanical disc calipers with Scrub Component's LugDrive rotors provided more than ample power, but also consistency, no matter how bad the riding conditions were.

THE FRAME

With time on our side, we were able to blueprint a special bike and debate what the ideal gravel bike's merits would be. We knew we wanted a carbon frame, geometry that was closer to a road bike than a 'cross bike for stability and tire clearance that would allow up to a 35c knobby tire. Knowing that a disc-braked future for skinny tires is soon to arrive, we felt this was the perfect opportunity to begin chasing a disc-specific design as well.

For needs as diverse as these, we knew it would be hard to find a production bike that would be ready to roll, so we went the custom route and could only think of one place to call: Calfee Design. We figured there would be silence on the other end of the phone after we explained what we were looking for, but, in fact, Calfee's Michael Moore jumped at the chance. "We already make what you're looking for." Really? Turns out Calfee began offering what they call "Adventure" geometry on their Dragonfly, Tetra, Luna and Bamboo road frames starting last year. Like all Calfee frames, ours would be crafted by hand at their La Selva Beach, California, factory.

While the Adventure frames use the same tubing as the traditional frames,

the differences begin at the chainstays, which are lengthened by 1.5cm for two reasons. First, it gives the bike a longer wheelbase for better stability over rough terrain, and secondly the lengthened chainstays allow for more tire clearance with minimal tube manipulation. "We build each frame with the minimal amount of clearance necessary," said Michael, "which is usually enough for a 35c tire. To go wider than that, we would need to cut away the tube, and ideally we like to keep it as round as possible."

Additionally, both the seat tube and head tube angles are relaxed by 3/4 of a degree, to 72.25 and 72.75, respectively. "We're trying to create a little more stability than on a road bike, along with adequate tire clearance, but we're not trying to build a truck!"

Recalling how well our Calfee Dragonfly test bike rode last year (*RBA*, June 2011), we happily opted for the Dragonfly Adventure. It uses Calfee's premium, high-modulus tube set—giving it an impressively high stiffness-to-weight ratio—and, of course, Calfee's own jaw-dropping, webbed carbon lugs at the head tube, seat tube junction and bottom bracket. Calfee does offer custom geometry for an additional \$500, but we went with

the stock 56cm geometry, and it fit like a glove. Calfee has a nearly endless array of customizations and add-ons available, which we moderately indulged in.

Disc-brake mounts cost an additional \$275 on top of the frame's \$4195 price tag, and titanium dropouts with a disc-brake mount were also used. Because of the disc brakes, the frame was designed with the 135mm rear spacing typically found on mountain bikes rather than the standard 130mm road spacing.

The fork was sourced from Utah-based Wound Up Composites, who made it with a custom 380mm axle to crown length, falling right in the middle between their road and cyclocross lengths. Calfee wanted the custom length in order to keep the front end as low as possible in order to minimize geometry changes while still accommodating up to a 35c tire. Wound Up makes the fork with either a non-tapered 1- or 1 1/8-inch steel or carbon steerer; we used the latter option. The final addition to the frame-set was the paint. Calfee offers stock options or fully custom paint schemes.

THE PARTS

Once we had the frame details

With the feel of a road bike and the versatility of a cyclocross bike, the Dragonfly Adventure rode just as we had hoped for.



nailed down, it was time to choose the parts. Since Calfee pioneered the idea of integrating the Di2 battery into a seatpost, it was an easy choice to go electronic. And with the existing (and original) Dura-Ace 7970 Di2 being phased out in anticipation of the newest version, which incorporates the changes found on the Di2 Ultegra drivetrain, the lower-line version was our go-to choice. Our only initial hesitation with using Shimano was our need for a 32-tooth cog on the rear cassette to tackle the steep dirt roads we would be facing, and Shimano says a 28-tooth cog is the biggest the rear derailleur will accept. However, we gave it a trial run on a different bike and realized that a 32-tooth cog would indeed work without issue.

The addition to the Internal Di2 wiring kit, the Calfee PowerPost that houses the battery, was another add-on that totaled \$500 for the two. A unique feature of the PowerPost is that it houses a charging port at the head of the post, allowing charging without removing the post. For the sake of sheer modernity, we had briefly entertained the thought of using Calfee's new internal handlebar-mounted battery, but the prospect of potential crash damage ultimately dissuaded us.

For the brakes, we knew all along that discs were a must for a bike of this nature. We weren't overly concerned about any of the aerodynamic drawbacks that discs have over a standard-caliper road brake; we were more concerned about having the most consistent braking in dusty, muddy or wet conditions—basically anything we could face on a dirt-road adventure. Although hydraulic brakes were what we wanted, none of the known contenders—TRP (sans junction box), Formula, Magura or Avid—had product ready, so we opted for the proven Avid BB7 mechanical brakes.

The choice to use disc brakes meant that we could choose a rim without a brake track, and ENVE's XC 29er tubular mountain bike rim fit the bill. Fortunately, 700c and 29er tires are exactly the same diameter (622mm), allowing us to get one of the lightest carbon disc-specific rims made. Together with Chris King ISO hubs and Sapim spokes, the 28-hole wheelset weighed a mere 1340 grams. We reduced the disc rotor weight by 40 grams when we ditched the stock ones in favor of a pair made by Scrub, a small, Utah-based company

specializing in making ultra-trick rotors with options for an aluminum or magnesium inner carrier and your choice of eight anodized colors.

Tire choice was undoubtedly one of the most discussed aspects of the build. Our choice to go with tubular tires rather than clinchers was obviously race-driven, since they're not exactly the most practical option for everyday riding. But for race day, we wanted the extra insurance against pinch-flats, since tire pressure will need to be as low as the 40-psi range. Although there were many tubular tires that would have been up to the task—Clement, Hutchinson and Vittoria, to name a few—we ultimately decided on the handmade 33c Schwalbe Sammy Slick cyclocross tires due to what we thought was the better tread profile for the race. Their smooth center tread with small outer knobs was the profile we were banking on being the right balance between minimal rolling resistance and traction.

Crank duties went to the California-made Lightning Cranks. Their hollow, tubular carbon arms and CNC-machined aluminum spider make them light, but they're also compatible with nearly every bottom bracket on the market. What chainrings to mount on the Lightning Cranks gave us much pause—not so much what brand to use but what size. Since the loose conditions at the Crusher would make out-of-the-saddle climbing an impossible luxury, we knew we needed low-enough gearing to scale up to a 15-percent grade while seated. This meant that compact (110 BCD) would be the only option, and having a 34-tooth inner ring would offer a welcome respite on the steepest pitches. We still needed enough top end for the descents and paved sections, so we settled on a 50-tooth outer ring. Both chainrings came from Praxis Works who, like Shimano, use a forging process to optimize their stiffness and tooth shape. For some peace of mind, a K-Edge chain catcher was added for a little insurance against a rogue downshift.

Without a doubt, the straight-up, coolest component of the bike can once again be credited to the renowned carbon genius of Craig Calfee. The one-piece BarStem is definitely trick, but the integrated Garmin mount knocks it out of the park. For \$200 (plus paint costs), Calfee can turn any carbon stem and handlebar into a one-piece work of art, but getting the Garmin mount will



California-made Lightning cranks were the preferred choice due to their stiffness and low weight. The cranks are also compatible with most of the bottom bracket designs on the market, including the PressFit 30 used on Calfee's exquisite bottom bracket lug.



With so many contenders to choose from, the wheels were probably the most thought-about aspect of our project bike. In the end, we gave the nod to a pair of ENVE 29er carbon tubulars mated to Chris King hubs and Sapim spokes and they're wrapped with Schwalbe tires.

From the Chris King headset to the one-piece BarStem with an integrated Garmin mount, the cockpit had plenty to talk about.



come with an additional \$200 hit. Our one-piece combo started life as a Specialized carbon bar and ENVE stem. Last was the custom-colored Fizik Aliante Carbon K:lum saddle, which came directly from the factory in Italy.

THE RIDE

After so much planning and anticipation, getting on the Calfee Adventure for the first time was a long-awaited reward. Somehow, inexplicably, it rode exactly how we had envisioned it. Since cyclocross tires undoubtedly add a sluggish feel to any bike on the road, we first tested it with 25c road tires to get a feel for the frame's stiffness and responsiveness. With our Dragonfly test from a year ago still fresh in our mind (still the smoothest bike we've ever ridden), it was easy to compare the differences we felt in geometry between the two bikes. It came as little surprise that the Adventure's geometry gave it a feel not unlike the latest crop of endurance-style bikes, like that of Specialized's Roubaix and Trek's Domane. The longer wheelbase and slightly relaxed angles don't give it quite the same zing when sprinting or accelerating on a climb as the Dragonfly Road, but it's a trade-off we were happy to make.

Switching over to the dirt tires was what we had been waiting for, and we weren't disappointed. It didn't take long at all to realize that underneath us was the fastest all-around bike we could have imagined. With a weight of 17.8 pounds (nearly 2 pounds lighter

than our Crux project bike), the frame has good power transfer while still being forgiving across the rough, geometry that gives us more stability and a lower center of gravity than what a cyclocross bike could give, and superlight wheels with fast-rolling tires. We opened up a whole new world of Strava KOMs typically reserved for the mountain bikers to strive for. Descending down a dirt

The Calfee PowerPost features the Di2 battery integrated inside, with a charging port at the seatpost's head.



road (faster than we'd ever dare on a traditional road bike) is where the differences between the Dragonfly Adventure and a cyclocross bike really manifest themselves. The 7cm bottom bracket drop of the Adventure is about 1.5cm lower than that of a typical cyclocross bike, making for a stark contrast in high-speed stability.

And whether it's dirt or pavement, disc brakes are sweet! Our one concern of not having enough modulation to keep the tires from breaking traction while braking turned out to be unwarranted. Yes, they have more power than we really need, but there was also enough modulation to keep us from ever having more brake than we could handle.

THE VERDICT

The Calfee Adventure "Project Gravel" bike opens the door to a whole new world of riding, one not limited by a dirt road—even a heavily rutted, rock-strewn road that a Jeep wouldn't drive on. Though built with an eye toward optimum performance at the Crusher, it's still going to be logging plenty of weekend miles exploring every nook and cranny of the Santa Clarita Valley. Throughout the bike's design and build process, there was one quote found on the Crusher website that acted as continual inspiration: "Regardless of what bike you choose, at some point in the race you will have chosen the wrong one." We'll see about that. ■

THE STATS

Price: \$5070 frame and fork, \$13,700 complete (estimated)
 Weight: 17.8 pounds
 Sizes: 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66cm (custom geometry available for an additional \$500)
www.calfeedesign.com

PARTS DIRECTORY

Arundel: www.arundel.com
 Avid: www.sram.com
 Calfee Design: www.calfeedesign.com
 Chris King: www.chrisking.com
 ENVE Composites: www.enve.com
 Fizik: www.fizik.it
 K-Edge: www.acecosportgroup.com
 KMC: www.kmccchain.us
 Lightning Cranks: www.lightningbikes.com
 Praxis Works: www.praxiscycles.com
 Schwalbe: www.schwalbetires.com
 Scrub Components: www.scrubcomponents.com
 Shimano: www.shimano.com
 Wound Up: www.woundupcomposites.com

TRIAL BY FIRE (& Mud)

After months spent building the bike, the time came to see if it worked **By Neil Shirley**

➔ The Crusher in the Tushar is a race in Beaver, Utah, that is as brutal as the name suggests. Three factors contribute to its difficulty: the 69-mile race includes more than 40 miles of dirt roads, with 10,500 feet of climbing, and all of it at extreme altitudes. The event is the brainchild of a former teammate of mine, Burke Swindlehurst, who grew up in the area and trained on the very same roads as the race. He was a mentor to me during my early years on the road, so it was a big deal for me to be competing in his race.

It also created the perfect opportunity to act as a bike designer/product manager, because once we'd secured an entry, we set about building the perfect bike for the event that would embrace some of the newest thinking in dual-purpose road bike technology.

The already brutal course was made even more challenging by a surprise storm. Neil leads the race on the Project Gravel bike, with eventual winner Tyler Wren and Ryan Trebon following.
Photo: Catherine Fegan-Kim





This was the second year running of the Crusher. And knowing that the event was sold out (despite Burke more than doubling the 150 entries available over last year) gave us an indication about the growing popularity of the gravel bike segment of the sport. As an 11-year veteran of professional racing, Burke's goal, he states, was to simply "put on a race that I would have wanted to do as a racer. Too often racing these days just becomes the same thing. I wanted to challenge the riders with the course and create an event they would be talking about the rest of the year."

THE REAL WORK BEGINS

For the first time since I've been at the magazine (has it really been a year and a half already?), I was feeling some pressure coming down from above. This pressure was not just to get in enough riding time to thoroughly test products—no, this time it was for the pride of the magazine. For the six months that made up the prep time to build the bike and train—between Facebook posts and random quotes—I was aware that the *RBA* team was expecting me to do well.

Although it has only been two years since I've quit racing full-time, and despite still riding frequently, I knew my level of "race fitness" was not what it once was. While by no means out of shape by most standards, it was clear that my 8 to 10 hours of riding a week wasn't going to make me a podium contender. I also realized that equally as important as my approach to increasing fitness was reducing my weight. If you want to climb faster, you need to increase your power or lose weight, so, I figured, why not do both? Ten weeks before the event I started the plus-five, minus-10 regimen. My plan was to gain 5 percent in power at threshold and lose 10 pounds—go from 160 pounds to 150.

Training began in earnest in May, which just happened to coincide with NUUN's Strava Challenge to log nearly 1500 miles for the month, an average of 48 miles every day. This was just the motivation I needed to get going and kickstart my training. I focused most of my ride time around steady, aerobic miles and minimized the time above threshold in order to get in the volume necessary to build my endurance base. I finished the month with 1550 miles and 91 hours of saddle time, but the best part was,

I wasn't trashed; I felt stronger and stronger as I piled on the miles. My targeted weight loss of 1 pound per week was on track and wasn't leaving me famished, since it equated to only a 500-calorie deficit each day. Basically that was the equivalent of losing the butter on

my baked potato at dinner and the scoop of ice cream for dessert—nothing too significant, really.

After a few days of recovery to start off June, I decreased volume by around 20 percent so I could shift focus from endurance miles to adding more structured training for the race itself, specifically, long climbs at a pace that was less than enjoyable to ride at. Although I couldn't match the exact length of the 4000-plus-foot climbs I would be facing at the Crusher, I made the best of the terrain around Santa Clarita Valley, where the climbs maxed out at around 2000 feet of vertical gain. One day each weekend I tried to simulate the race, hitting 10,000 feet of total climbing for the ride while trying to keep the distance under 90 miles. With each ride I could feel the progression in my fitness, allowing me to not only climb faster with fresh legs, but, more importantly, keep those fresh legs later into the ride.

CRUNCH TIME ARRIVES

By the time the race was just two weeks away, I knew that the required work had been done. It was time to freshen up by cutting back the volume by another 15 percent while keeping the intensity level the same. My preparation had gone as well as could be expected; I exceeded my goal of losing 10 pounds by losing a total of 12 pounds while still attaining the 5 percent increase in power I was hoping for. All told, I took my power-to-weight ratio from 4.8 watts/kilogram to 5.5 watts/kilogram for a 30-minute effort. This equates to a monstrous 14 percent increase! I was thrilled to be able to meet my training goals while still juggling family commitments with a full-time job. It was certainly a big undertaking.

“...by the midway point, I too became a victim of the blistering pace. Mud-splattered and gasping like a fish out of water, my sea-level lungs just weren't getting enough oxygen to keep up.”

I figured that since my family had been so patient with me with all my neuroses around training and diet that they should at least get some fun out of it. So with my wife, two daughters, my project bike and some spare wheels, we all piled into the car for the 490-mile trek to Beaver, Utah.

When we rolled into town, I knew that my bike was dialed and my training complete; all that was left was to actually do the race. Everything in my control had been planned out and accomplished, but as it turns out, there were things out of

my control, like weather—and outside of Southern California, it has been known to change. I had been watching the weather all week; it was forecast to be in the upper 80s and dry. Instead, what I awoke to was rain and 50-degree temperatures—the hard man's race just got harder. Even with the weather surprise, there wasn't really anything to change in my equipment setup other than another application of Lilly Lube on the chain and throwing on my Mavic Helium jacket, which had fortunately found its way into my bag when I was packing.

THE RACE ARRIVES

After a quick rundown of the course details by the start-line announcer, which did little to soothe my nerves, we were underway. The first 10 miles were relatively flat and offered the only paved road we would be seeing for a while. As we swung off the main road to tackle the first climb, we hit a 21-mile dirt section. The climb that would take us deep into the Tushar Mountains left its mark on the 40-strong pro field immediately. And within a few miles the group had been whittled down to five riders, which included last year's winner and Utah resident Tyler Wren (Jamis/Sutter Home Pro Cycling), myself and cyclocross star Ryan Trebon (Cannondale), who proceeded to turn the screws to everyone.

“Where the project gravel bike equipment choices really began to shine was the option to go with disc brakes.”

However, by the midway point, I too became a victim of the blistering pace. Mud-splattered and gasping like a fish out of water, my sea-level lungs just weren't getting enough oxygen to keep up; I had to settle into my own tempo and let the small group go. Ultimately, my pacing strategy paid off. Mountain bike pro Jay Henry and I closed what had stretched out to a one-minute gap to the leaders before cresting the 1-hour-and-15-minute climb, and just in time to tackle one of the most hair-raising descents I have ever done. Not even in my days of pro mountain bike racing would I have wanted to face a descent like this. The plunge into the valley below was filled with stretches where we hit 40 mph, barreling down the gravel-strewn road, dreading the one rock that would be your tire's undoing. Oh, and did I mention the washboard that made you feel like either bike or body could break in half at any moment?

Where the project gravel bike equipment choices really began to shine was the option to go with disc brakes. With seven switchbacks on the descent, the brakes' superior stopping power allowed me to wait until the last second to scrub 30 mph of speed before going into each of the corners. The wet weather was never even a factor in braking performance, whereas the rim-brake users wouldn't have the same thing to say. By the time I reached the valley floor, I had counted numerous rock hits that would have pinch-flatted

If we had time to look up from the wheel in front of us, we would have realized how spectacular the Tushar Mountains are.
Photo: Christopher See



any clincher tire; this was the sole reason I opted for tubulars, since they are much less prone to pinch-flatting.

The jaunt through the valley provided a welcome sight: a flat, paved road! As we traded even pulls out front, soon enough it was time to head uphill again—and that, of course, meant more dirt. The 5000 feet of climbing in the first two hours of racing started revealing some chinks in the armor of those in the lead group, with Tyler Wren's teammate, Jamie Driscoll, the first to drop off the back. Once we looped back around to the final eight-mile climb (the very same white-knuckle descent we had finished 10 miles earlier), I knew that this would most likely be the deciding factor in the final podium placings. The steep wash-board gradient kept us riding at around a dismal six miles per hour, which still ended up being too much for everyone except Tyler and me.

While the climb itself was hard enough, Burke's idea of having the King of the Mountain to sprint for at the very top seemed downright cruel—nothing like sprinting at over 10,000 feet of elevation! I managed to pip Tyler for the KOM, which came with an unexpected bonus of \$100 in single bills thrust into my hands by an exuberant race fan—you've got to love passionate spectators! The last 12 miles of the course continued upward toward our ultimate destination: Eagle Point Ski Resort. But, fortunately, there were a few short descents where I could catch my breath; I was really feeling the efforts of the day. With about five miles to go, the elastic between Tyler and me snapped, and I watched the win ride away. With third place still minutes behind us, I was able to comfortably ride in without having to worry about getting caught. When I crossed the finish line, it was safe to say, the Crusher had crushed me.

WHAT DID WE LEARN?

I thought for sure that I would finish and have a list of things I would change in future equipment setup choices. But, the project gravel bike was pretty much perfectly dialed for the course, and any type of gravel riding for that matter. If anything, the 32-tooth cassette wasn't totally necessary since the 30-tooth cog was the lowest cog I used, but it's not a bad idea to have that bailout gear, either. As hydraulic disc-brake technology becomes more accessible with road brake/shift levers, that will be one upgrade we'll be excited to make since it will be a good way to reduce a bit of weight and keep the elements out of the cables.

The Adventure geometry that Calfee



The bikes ridden by the top three were all different but had one thing in common: disc brakes.



The top-5 Crusher's were: 1st-Tyler Wren (Jamis/Sutter Home), 2nd-Neil Shirley (Road Bike Action), 3rd-Jay Henry (Tokyo Joe's), 4th-Alex Grant (Cannondale), 5th-Reed Wycoff.

picked for us was ideally suited to gravel riding; it gave me an advantage nearly everywhere on the course compared to the cyclocross bikes and mountain bikes used by the other riders in the top five overall. Even on the extreme descent, the only rider that dropped me was on a mountain bike, but he paid the greater price for a less efficient bike on both the pavement and the climbs.

When it came to my own training, I do have to say it was nearly ideal. If I could go back in time, the only thing I would change would be getting in

some altitude training. Twelve days at altitude could have made all the difference in allowing me to match the accelerations during the race. As it was, I could only ride at my own pace and pick off the other riders by riding steadily up the climbs. Now for next year, I just need to convince the higher-ups to give me a couple of weeks off to do some altitude training so I can aim for one step higher on the podium.

For the ultimate gravel experience, put the Crusher in the Tushar on your calendar next year. ■

www.tusharcrusher.com