

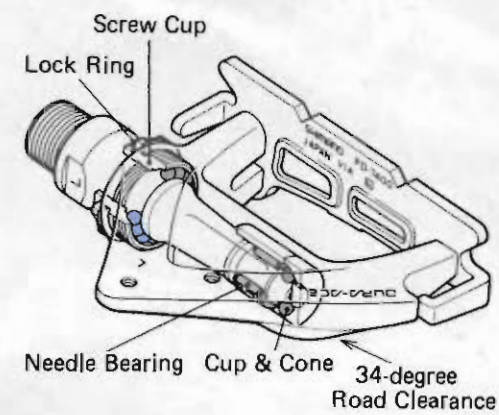
More Cornering Clearance and Pedal Load Handling Capability

To ride faster

The New Dura-Ace pedal is a revolutionary design. This new design offers more strength and load carrying ability through a unique bearing configuration plus an amazing 34 degrees of road clearance resulting from a shortened axle. This gives racers the confidence to go faster and dive deeper into turns at speed without worrying about pedal contact and possible spills. The aerodynamic triangular shape of the pedal was carefully developed to insure the lightest weight with maximum structural strength.

The New Dura-Ace pedal comes in two models with steel or alloy back plates. The pedal body is of all high-strength alloy construction with a nickel chrome-molybdenum axle having precision polished bearing surfaces. The bearing layout is particularly fascinating and the most advanced feature of the pedal. Besides utilizing conventional inner and outer ball bearings and cones, the pedal incorporates a taperless roller bearing positioned just inside of the outer ball bearing at the load center to take up the heavy vertical loads encountered in racing, especially sprints. This three-bearing design

assures adequate dispersion of heavy vertical and lateral bearing loads. Another feature is that the dust cap has been eliminated. The outer bearing and axle are completely covered by the pedal body with the outer bearing cone being anchored in the body. The adjustable cone has been moved to the crank side of the axle and a special tool is required for adjustment and disassembly. Sealing at the crank arm end is done with a close tolerance reverse



thread on the cone adjuster. This novel design means that bearing clearance can be adjusted quickly and cleanly without exposing any of the inner mechanisms. The wedge-shaped aerodynamic body accepts either alloy or steel New Dura-Ace toe clips and provides two directional adjustments: 24 millimeters of fore and aft adjustment plus 28 degrees of radial adjustment. Three sizes of toe clips coupled with this adjustability guarantee that a wide range of shoe sizes and placement positions can be accommodated. The large 34 degree road clearance angle is a vast improvement over conventional quill designs which only offer 29 degrees at most.

Designed to withstand the severe rigors of racing applications, the New Dura-Ace pedal also lends itself exceptionally well to long distance loaded touring due to its excellent sealing, strength, and durability. Making the crucial point of contact where human power is first transmitted to the bicycle, the New Dura Ace pedals deliver the best possible balance of weight, strength, durability, and cornering clearance.

Features of the Pedal



- 1. Sharp cornering**
 - 34° Road clearance: The New DURA-ACE pedal achieves the world's highest Road Clearance in a mass-produced pedal.
- 2. Upgraded durability**
 - Compound structure of needle bearing and cup & cone bearings: We adopted a compound structure of needle bearing and cup & cone bearing to support the axle. The bearings in three places disperse thrusting and radial forces, greatly upgrading durability of the pedal.
 - Nickel/Cr-Mo axle
 - Sealed mechanism: The New DURA-ACE pedal has no axle hole on the outside of pedal body. And a counter multiple-thread is provided in the direction of rotation on the inside of the axle, completely excluding water, sand, mud, etc. when the pedal rotates.
 - Anodized finish for alloy rear plate
- 3. Fully adjustable toe clip for best fit**
- 4. Easy maintenance**
 - Tool for cone adjustment included
 - Adoption of changeable front/rear plates
- 5. Compact, lightweight design**

- 2. Compact and simple design**
 - Built-in lock washer
 - Double-etch anodizing for a high-tech appearance.
- 3. Lightweight design**
 - Except for the ball race and lock washer, all the parts (including the cones) are made of high strength aluminum light alloy.

Features of the Brake

- 1. Successful combination of high braking force and smooth control**
 - By greatly reducing the friction of the arch levers, cables, return spring, etc., and by increasing the efficiency of the arch output relative to lever input, high braking force plus smooth control have been successfully combined.
- 2. Improved durability and higher braking efficiency**
 - Both durability and braking efficiency have been greatly improved by increasing the machined precision of the arch's sliding surfaces. A special resin is used where the spring contacts the arch in order to prevent any decrease of braking efficiency, and decrease wear.
- 3. Quick release: "click & quick"**
 - Click mechanism built into quick release: By incorporating the click mechanism in the quick release, the arch quick release is secured anywhere, with confidence that it will not slip.

4. Aerodynamic design

- CAD design: An even further computer developed aerodynamic design of the NEW SHIMANO 600 EX brake adds rigidity to the arch and suppresses vibration and noise.

Features of the Brake Lever

- 1. Improved lever operation**
 - Lever shaft and cable attachment positions moved: The most important factor for the brake lever is its operation. The positions of the lever axle and cable attachment have been moved upward, thus improving the amplification factor of the input (the hand's force applied to the lever) transmitted to the cable. The result is a greater output than before in relation to the light force applied, thereby improving the efficiency of the lever itself.
- 2. Anatomical design**
 - Full-fit design: By applying the principles of anatomical design to the shape of the lever, bracket and bracket cover.
 - Compact design
- 3. Increased durability**
 - As one way in which to improve durability, special spacers are used at the lever shaft. And, in order to prevent squeaking after long use, the diameter of the wire attachment shaft has been reduced, and special spacers are used.

4. Improved maintenance

- One-touch cable installation: The cable attachment is above the lever.
- Easy lever position adjustment: The lever band's installation bolt can now be adjusted with the cable taut.
- Instantly-solderable inner cable end employed.

Features of the Freehub

- 1. Upgraded durability of the wheel**
 - Uni-balance system
 - Improvement in the spoke hole: By changing the conventional spoke hole angle of 110 degrees to 90 degrees and the flange thickness of 3mm to 3.2mm, we prevent spokes from being broken and together with the uni-balance system, make possible a wheel with enhanced durability.
- 2. Cassette system**
- 3. Improvement in shifting performance**
 - New UG gear: We designed the new UG gear to have a toothtip shape that allows positive catching of the chain.
- 4. Highly precise rotation**
 - Special treatment for the ball race: A special heat treatment and precise machining are used in manufacturing the ball race. This reduces variation of rotation, thereby assuring smooth rotation.

5. Upgraded durability

- Sealed mechanisms for the rotating parts

6. Easy maintenance

- Lubricating port in the dust cap and freewheel body: The secret is that an oiling port is provided on the freewheel and the greasing port on the dust cap is easy to open and close.

Features of the Freewheel

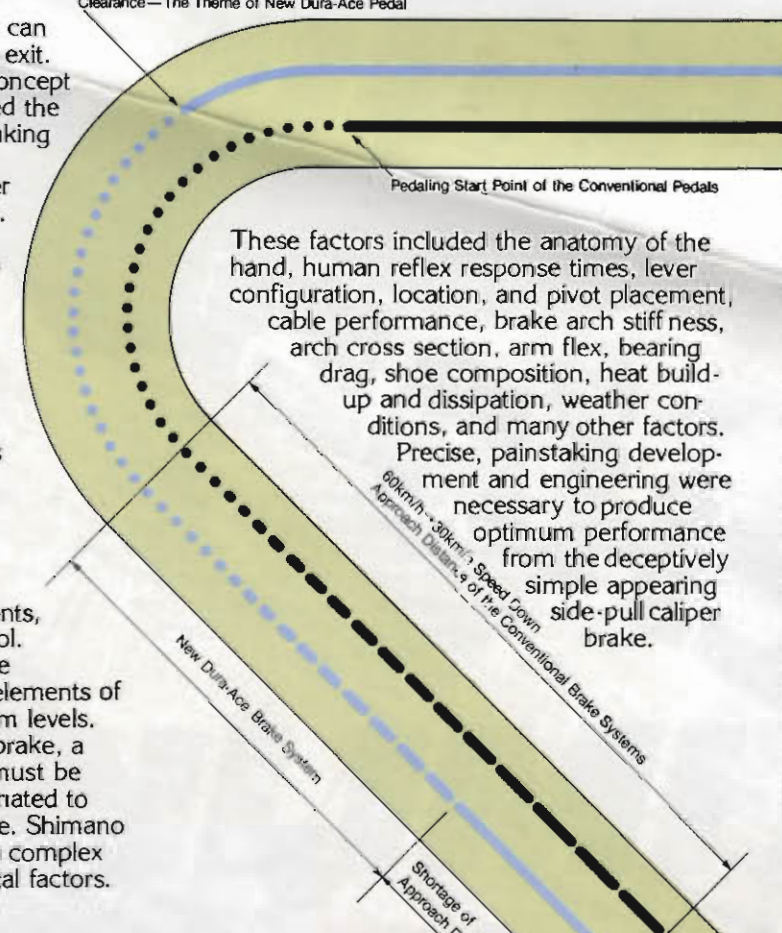
- 1. Improvement in shifting performance**
 - New UG gears
- 2. Highly precise rotation**
 - Special treatment for the ball race
- 3. Upgraded durability**
 - Sealed mechanism
- 4. Easy maintenance**
 - Lubricating port in freewheel body
 - Spine sprocket: Spine sprockets, from second to low, serve to facilitate quick removal and assembly.

Brakes That Help You Go Fast

Brakes for faster riding?

In bicycle racing, the faster you can enter a turn, the faster you can exit. With this simple but essential concept in mind, Shimano has developed the New Dura Ace brakes. Ideal braking performance shortens the approach distance needed to enter a turn to the absolute minimum. This is one of the main areas where component performance can increase overall speed through a winding course where braking is needed. Shortening the approach distance entails braking at the last possible moment with the confidence that your brakes will respond predictably and precisely to lever input. When entering a turn at high speed, it's important to have overall stopping power. This stopping power is divided into two elements, braking force and braking control. The New Dura Ace brakes were designed to provide these two elements of braking performance at optimum levels. To design the optimum racing brake, a number of interrelated factors must be carefully considered and coordinated to produce maximum performance. Shimano engineers had to grapple with a complex variety of human and mechanical factors.

Expansion of Road Clearance—The Theme of New Dura-Ace Pedal



These factors included the anatomy of the hand, human reflex response times, lever configuration, location, and pivot placement, cable performance, brake arch stiffness, arch cross section, arm flex, bearing drag, shoe composition, heat build-up and dissipation, weather conditions, and many other factors. Precise, painstaking development and engineering were necessary to produce optimum performance from the deceptively simple appearing side-pull caliper brake.

These areas have been carefully analyzed and incorporated into the New Dura Ace brakes. The New Dura-Ace brakes are in the classic side-pull design but offer a new computer designed arm cross section which puts the bulk of the metal where it's needed most for maximum rigidity with minimum weight. The result is greater stiffness and braking power. An additional benefit of this new cross section is that wind resistance is reduced. Available in standard or short reach models, the New Dura-Ace brakes have a new modified arm configuration and lever design that provides more precise control and braking force proportional to lever movement. An alumite surface treatment has been applied for long term corrosion and discoloration resistance. The handsome high-tech gray one-piece shoe holders and tire guides hold shoes with an improved composition for better wet and dry braking. The spring stop pins are resin coated. This provides a smoother action through reduced spring friction. The latest in high-tech manufacturing techniques have been applied to give closer tolerances all around. This new precision also works to reduce vibration and eliminate pad squeal while enhancing the new arm design to give a tight, rigid feel. We believe the New Dura-Ace brakes have established a new level of braking performance. Racers can go faster knowing that they can rely on the New Dura Ace brakes to deliver the ultimate in braking performance.

Features of the Front Chainwheel

- 1. Enhanced strength and rigidity**
 - In addition to cold forging the arms, we designed a longer axle joint. This was found to reduce chainwheel deflection even when pedaling forces are high.
- 2. Modern design**
- 3. Greatly enhanced machining precision**
 - Complete fitting of chainwheel to crank arm
- 4. Improved efficiency**
 - We improved the tooth shape of the chainwheel so that the gear teeth have a greater contact area, thereby assuring much better efficiency.
- 5. Upgraded durability**
 - Sealed Mechanism
- 6. Easy adjustment**
- 11-ball retainer**

Features of the Head Set

- 1. Upgraded durability**
 - Titanium plating of lower cone race.
- 2. Anatomical design**
 - Composite radius ball race: We designed two different radii for the ball race. This composite radius design protects the ball race from impact load.
 - Sealed mechanisms: An O-ring seal in the lock nut keeps rain and sweat from entering the fork stem.

THE UNLIMITED CHALLENGE



NEW
DURA-ACE