UPDATES NEEDED Welcome

Bicycle Maintenance and Repair II
Harford Community College
Continuing Education & Training Div.
Fall 2012

Maintenance II - Similar to I

The Four “T”s Outline
- Types
- Tools
- Trouble
- Tips
Each Topic Includes:
- Advantages
- Disadvantages
- Ideal features
- Optimized performance methods
- Theoretically perfect design

Maintenance II - Different from I

Expectations for this class
- Pace Acceleration
- Specialty Tool Use
- Grease versus screwdriver
- Quick review of concepts
- New topics - bearings
- Lets get to it
Review of Concepts - Fasteners

Types
- Nut and Bolt
- Rivet
- Nail

Threading Directions
- Left hand
- Right hand

Threading Dimensions
- Thread pitch
- Hole size
- Included Angle

Threading Designations
- Metric
- English
- Machinist

Class of Fit
- A - made to fit, preferred fit
- B - can fit, not preferred
- C - looks like it fits, but does not

For Maintenance II class use:
- Sutherland’s Handbook for Bike Mech.
- Manufacturers’ specifications
- “How To” books
Review of Concepts - Derailleurs in General
- Parallelogram principle & movement
- Different styles - same purpose
- Purpose of set screws
- Position of Jockey / Tension Pulley
- Derailleur Capacity
  - rear - teeth total difference, max size
  - front cage - shape, capacity

Review of Concepts - Brakesets
- Types / Styles of brake pivots
- Lever design
- Techniques for adjustment
  - Brakepad height, clearance, toe
  - Lever positioning
- Getting a “clean” cable run

Review of Concepts - Drive Train
- Chains
  - Pitch and width
  - Taking apart
- Chainwheels & Freewheels
  - Attachment methods
  - Sizes and spacing
- Gear Ratios
LET'S ROLL -
Session one:
Bearing Design

Bearing Types

Load forces
Radial Loading (load plane ⊥ to axle)
Thrust Loading (load plane ∥ to axle)

Reasons for each
Bearing Types

- Ball versus Roller
- Sealed or Shielded or Covered
- Caged versus Loose
- Also material types such as ceramic or steel in the races or balls/rollers

Bearing Design

- Speed of Rotation of the Rolling Elements
  - Center of element at $v_m = (v_i + v_f)/2$
- Speed of Rotation of Element around own axis
  - Center of element at $n_w = (D_r/D_w)n_Mi$

Bearing Design

- Effect of Contact Angle $\alpha$
  - At thrust, $\cos \alpha = 0$
  - get equation reduction $n_m = -0.5i_m$
Hubsets

Front Hub ball sizes
10 @ 3/16” (most older ones)
9 @ 7/32 (Campy & Zeus)
12 @ 3/16” (Normandy)
shielded units

Hubsets

Rear Hub ball sizes
9 @ 1/4” loose
Disk brake exceptions
Shielded units
sizes vary
often much smaller

Hubsets

Rear Hub Dimensions
axle length
overlock nut dimension
difference is called “Dimension A”
28.5 mm thru 35 mm on five speeds
34 mm min / 36 preferred on R6/U7
38 mm thru 40 mm on U8
up to 45 on UI-D 10
**Hubsets**

- Rear Hub Dimensions
  - Adjusting Dimension A without changing axle
  - Use of behind-freewheel spacers
  - Cassette hub differences

**Bottom Brackets**

- Shell Types
  - One piece (Ashtabula)
  - Three piece cranks
    - Cotterless
      - Hollow axle with bolt
      - Solid axle with nut
    - Cotterpin
  - Two piece crank style
  - External bearing style
Bottom Brackets

Taper concerns
- Cotter pin diameter and taper
- Cotterless axle taper

Spline concerns
- Pattern
- Depth

Split axle concerns

Bottom Brackets

Shell Widths
- 68 mm English road
- 70 mm Italian road
- 74 mm Offroad
- BB-30 Cannondale Design
- 90 mm Trek 2007 Design
- Other?

Bottom Brackets

Ball Sizes
- 11 @ 1/4” per side
- 14 @ 3/16” per side

Retainers
- 9 @ 1/4”
- 10 @ 1/4”
- many others, smaller balls
Bottom Brackets

Thread sizes
English
  LH / RH
  1.370 * 24 TPI
French
  RH / RH
  35mm * 1mm
Italian
  RH / RH
  36mm * 1mm

Bottom Brackets

Thread sizes (continued)
Raleigh
  1 3/8" * 26 TPI
Swiss
  LH / RH
  35 mm * 1 mm

Bottom Brackets

Markings may determined thread type
Viscount (and other?) to [fill and] tap
Early Fisher, Klein (now 2008 others)
threadless, press fit bearing
Cannondale BB30, Shimano BB86
(Editorial cmt.) Seeing Madone / BB90
opening non-standard designs
Bottom Brackets

Axle Lengths
  Drive side
  Non-drive side
  Distance between races
  Overall length

Adjusting apparent dimensions with fixed cup spacers

Bottom Brackets

Axle tapers
  Using taper to make fit
  Unacceptable insertion

Axle end shape
  traditional square
  splined

External bearing / two piece

Black Slide - end week two
Pedals

Styles - pedal / foot interface
Toe Clip Style (attach w/5x.8 bolt)
Clipless: Cinelli M-71, Time, Aerolite, Cycle Binding, Speedplay
Clipless: Look, Shimano SPD & SL, Eggbeater, Sampson, Willgo

Shoes & bolt pattern for each style:

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Pedals

Ball Sizes
Normally 10-12 @ 5/32"
Campy Super Record 16@1/8"
Roller bearings in lieu of balls

Thread Sizes
English 9/16”x20TPI, RH&LH thread
French 14mmx1.25TPI, RH&LH thread
Italian 9/16”x20TPI, RH&LH thread
USA 1/2”x20TPI, RH&LH thread

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Pedals

Markings on wrench flats
Markings on crank arms
Markings on pedals

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Pedals

Bearing Design Differences
- Traditional inner / outer cup & cone
- Sleeves to replace ball bearings
- Roller bearings on outer side
- Single bearing (drop cage)
Dustcap removal
Bearing repacking

Headsets

Removing the stem
Alignment is critical
Thrust Load on lower headtube race
Traditional design vs. aheadset
Press-in cups vs. frame integrated

Freewheels / Freehub Cassettes

Diversity of removal tools
Ratcheted to allow for one way operation
Loose bearings but not adjustable
Alignment – Wheel Truing

- Note: wheel has four types of spokes
- Each pull left/right and up/down
- Adjustments up and down
- Adjustments side to side
- Correcting for wheel dish

Alignment – Wheel Truing

- Get wheel straight first
- Have spokes seated in hub
- Have nipples seated in rim
- Relieving the stresses
- Getting final tension correct
Alignment - New terms

- Cutting Metal
- Tap
- Die
- Face
- Bending metal
- cold setting

Procedure

- Face bottom bracket
- Tap bottom bracket
- Mount on alignment fixture or tool

Procedure

- Check main triangle planer
- Check rear triangle parallel planes
- Face head tube
**Procedure (fork)**

- Face crown race
- Cut steerer tube threads
- Cut steerer tube to length
- Install headset

**College Schedule (typically)**

- Maintenance I & II every semester
- Maintenance III on suspensions
- Maintenance IV on wheel building
- My First Bicycle Tour (Touring I)
- Touring II (summertime)

**LET'S ROLL**