Freshman Seminar: The Art and Science of Motorcycle Design

2009-10 (FRS 108) ; 2010-11 (FRS 102) ; 2011-12 (FRS 104)
Tiger Cubs were in production from 1954 – 1968. It was a very popular learner bike and off-road bike that was not subject to road tax.

Triumph: TIGER – TIGER CUB – TIGRESS
“The surgeon's judgment is simultaneously technical and deliberative, and that mix is a source of power. This could be said of any manual skill that is diagnostic, including motorcycle repair." SCAS p. 25
"A washing machine, for example, surely exists to serve our needs, but in contending with one that is broken, you have to ask what it needs." SCAS p.16

"The overall name of these interrelated structures, the genus of which the hierarchy of containment and structure of causation are just species, is system. The motorcycle is a system. A real system." ZAMM p.101
A motorcycle is an engineering system, but what is engineering?

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And all components must work together. Motor vehicles integrate industries.
We study evolution of motorcycle design and compare performance. Consider horsepower – Tiger Cubs have 200 cc engines, but 1958 is 10 Hp and 1965 is 14 Hp. Why are they different? – Better breathing and more RPMs – Hp = Force x Velocity
Tubular frame, swing-arm rear suspension, front fork suspension, and single “lung” 4-stroke engine
Take it apart, inspect for wear, clean and repair everything
FRS 108 “Clutch Team”
"I've a set of instructions at home which open up great realms for the improvement of technical writing. They begin 'Assembly of Japanese bicycle require great peace of mind' ... (T) here's a lot of wisdom in that statement." ZAMM p.164

"'But they're (the assembly instructions) are from the factory.' John says. 'I'm from the factory, too' I say 'and I know how instructions like this are put together. You go out to the assembly line with a tape recorder and the foreman sends you to talk to the guy he needs least, the biggest goof-off that he's got, and whatever he tells you - that's the instructions.'" ZAMM p.165
An Artistic View of Our Transmission – FRS 102 “Trans” Team
K’NEX TRANSMISSION

and

CLUTCH TESTBED
“Top End” Team
Barrel Bore Video

Why re-bore? – wear, barrel not cylindrical
What we did – measure, add .020”, measure, hone
Stock barrel – 63mm dia. x 64mm stroke
“Frame, Fork, and Wheel” Team
Mid-semester interlude – learn how to drive our Model T
Re-Assembly
Ready to Roll
Start your engines – not so easy
Rides around the Parking Lot

"... pistons and wheels and gears all moving at once, massive and coordinated" ZAMM p.87
Ask the experts ...

Prof. Arnold
(MATERIALS)

Prof. Smits
(FLUIDS)

Prof. Ju
(COMBUSTION)
"The Tiger Cub is a winner all the way" says ROGER VANDERBECKEN

TIGER CUB

200 c.c. T20

Easily the most popular 200 c.c. lightweight today. For value, economy and safety, easy handling, there is nothing to equal the four-stroke O.H.V. "Tiger Cub." First choice of the rider who wants "real motorcycling" at lowest cost.

SPORTS CUB

200 c.c. T20S/S

Exhilarating to ride on the road and readily adapted to most forms of competition, the "Sports Cub" has earned an enviable reputation for speed, reliability and superb handling in tough events like the Belgian Lamborelle Trial and the Scottish Six Days. This is the model for the man who wants to get to the top quickly.

First sports type handlebar available if required.
FRS 102 Bike (1963) before Restoration
FRS 102 Bike (1963) after Restoration