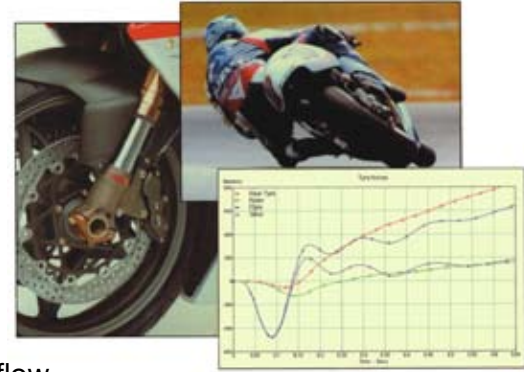


MOTORCYCLE HANDLING AND CHASSIS DESIGN

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List of Chapters:

1 Function and history

- Some basic definitions
- Function
- History
- Front suspension
- Rear suspension
- Spring types
- Load Compensation

2 Tyres

- Weight support
- Suspension action
- Tyre stiffness or spring rate
- Contact area
- Area when cornering
- Friction (grip)
- Braking & driving
- Cornering
- Mechanisms of grip
- Under- and over-steer
- Construction
- Materials
- Summary

3 Geometric considerations

- Basic motorcycle geometry
- Trail
- Rake or castor angle (steering axis inclination)
- Wheelbase
- Wheel diameter
- Other considerations
- Angular motions

4 Balance and steering

- Balance
- Steering
- Gyroscopic effects only
- Gyroscopic with tyre camber force only
- Gyroscopic with tyre camber and steer forces
- Tyre forces only - no gyroscopic effects
- Body lean only - no steering
- Conclusions

5 Aerodynamics

- Drag
- Evolution of the racing fairing

- Internal air flow

- Lift
- Airflow evaluation
- Side wind stability (traditional view)
- Steady state directional stability
- Dynamic directional stability
- Summary

6 Suspension principles

- Springs
- Damping
- Sprung and unsprung mass
- Basic suspension principles
- Other factors
- Lateral suspension
- Summary

7 Front suspension

- Head stock mounted forks
- Alternatives to the head stock mounted fork
- Hub centre steered
- Double link
- McPhearson strut based
- Virtual steering axis

8 Rear suspension

- Effective spring rate
- Chain effects
- Wheel trajectory
- Structural
- Single or dual sided
- Summary

9 Squat and dive

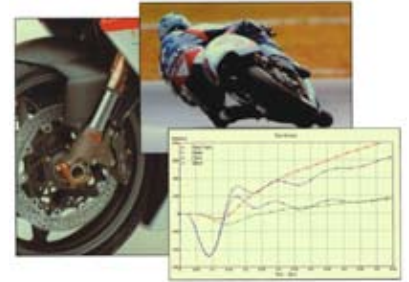
- Load transfer
- Squat and dive
- Shaft drive
- Chain drive
- Aerodynamic squat
- Braking reaction (rear)
- Dive (front)
- Dynamic effects
- Summary

10 Structural considerations

- Fatigue
- Structural efficiency
- Triangulation

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- Beam frames
- Triangulated frames
- Tubular backbone
- Structural comparison
- Fabricated backbone
- Monocoque
- Structural engine
- Conventional multi-tubular
- Twin-spar
- Other types
- Summary

11 Engine Mounting

12 Braking

- The basics
- Effects of CoG height
- Generation of torque
- Hardware
- Discs
- Calipers
- Pads
- Linked brakes
- ABS

13 Materials and properties

- Typical properties of some common materials
- Frame
- Wheels
- Fuel tank
- Brake discs
- Bodywork

14 Stability & control

- Under-/over-steer
- High-siding
- Stability under braking
- Instabilities
- Damping

15 Performance measurement

- Track side
- Laboratory
- Strength analysis
- Measurement and simulation
- Future development

16 Practical frame building

- Welding
- Distortion
- Gussets
- Jigging
- Tube profiling
- Tube types
- Tube sizes
- Frame finishes

- Design layout

17 Case study

- Measurement
- Main frame
- Engine mounting
- Results
- Material
- Swing arm
- Forks
- Caution
- Tuning

18 Future developments

- The status quo
- Future possibilities
- Active suspension
- Rheological Fluids
- Two wheel drive (2WD)
- Two wheel steering (2WS)
- Feet-Forward motorcycles. (FF)

Appendices

A1 Experiments with rake and trail

- Rake
- Trail
- Conclusions
- Post script

A2 Glossary of terms

A3 Units conversion

A4 Gyroscopic effects

A5 Basic physics of motorcycles

- Basic Trigonometry
- Units of angle
- Velocity
- Acceleration
- Mass
- Momentum
- Newton's laws
- Force and weight
- Moments, couples and torque
- Centripetal & centrifugal force
- Addition and resolution of velocities and forces
- Work, energy and power
- Nomenclature and sign conventions
- Normalization

A6 Analysis of mechanisms

A7 CoG and mass distribution of rider

A8 Typical data

Notes