Introduction

The simple answer to torque steer:

“Revo” Suspension

- Dipl. – Ing. Michael Frantzen
- Dipl. – Ing. Jasper Bouma
- Dr. – Ing. Wolfgang David
- Dipl. – Ing. Marc Simon
- Dipl. – Ing. Lauri Ohra-aho

Ford Forschungszentrum Aachen
Index

- "Torque Steer"
- RevoKnuckle
- Results
Wheel Forces and Moments

Suspension Projects - The RevoKnuckle
Suspension Projects - The RevoKnuckle

Wheel Forces and Moments
Wheel Forces and Moments

- Focus or Mondeo Knuckle
- King pin axis
- Wheel center
- 50–75 mm
Disturbing Forces and Moments

• No "Torque Steer" on symmetric conditions
"Torque steer" on asymmetric conditions
Suspension Projects - The RevoKnuckle

Tire Conicity
Suspension Projects - The RevoKnuckle

Torque Steer Contributors

- Road Conditions (friction and surface)
- Vehicle State (cornering, roll, acc.)
- Weight Distribution (loading)
- Suspension Geometry (kingpin offset, camber, caster, tolerances)
- Tire Quality (Conicity, wear, profile)
- Wheel Geometry (size, uniformity, wheel offset)
- Engine (torque, alignment)
- Differential (friction, self locking effect, Torsen differential)
- Drive Shafts (alignment, length, symmetry)
Index

- „Torque Steer“
- RevoKnuckle
- Results
Suspension Projects - The RevoKnuckle

RevoKnuckle – RevoKnuckle Joint Concepts

Ball Joint

Roller Bearing

New FFA / ZF Patent Application

Vehicle Dynamics
Research & Advanced Engineering
Copyright © Ford Motor Company 2004
Advantages concept

- Improved Vehicle Dynamics Performance
  - Torque Steer
  - Wheelfight
  - Steering Nibble
  - Brake Judder

- Reduced torque steer sensitivity to changes in tire size (low aspect ratio) and tire conicity

- Fits to McPherson package, no body changes

- Less expensive than Double Wishbone suspension

- Lighter than Double Wishbone suspension

- Smaller Kingpin offset vs. Double Wishbone suspension: 20-30 vs. 40 mm
Index

• „Torque Steer“
• RevoKnuckle
• Results
Kinematics Results

- LF Wheel Travel vs. Toe
- LF Wheel Travel vs. Caster
- LF Wheel Travel vs. Camber
- LF Wheel Travel vs. Tire Patch Lat. Disp.

Copyright © Ford Motor Company 2004

Vehicle Dynamics

Research & Advanced Engineering
Suspension Projects - The RevoKnuckle

FEA Results

Mondeo Knuckles V7
B.C. 1, STRESS_23, F20XL_6_MAX
STRESS Von Mises Averaged Top shell
Beam stress: Von Mises, maximum point
Min: 0.00 N/mm² Max: 435.05 N/mm²
B.C. 1, DISPLACEMENT_8, F20XL_6_MAX
DISPLACEMENT XYZ Magnitude
Min: 0.00 mm Max: 1.96 mm

348
Driving Results

Results from Driving Evaluation:

- Significant reduction of “torque steer effect”
- Improved vehicle dynamics performance
- No additional error state
- Promising Concept for front driven high performance vehicles