Contents

Acknowledgements ix
Preface xi
A Note on Units xiii
Introduction xv
About this Book xxi

CHAPTER 1

Tire Construction and Terminology 1

Construction Terminology 3
Tire Dimensions and Properties 8
  Inflation Pressure 14
  Tire Temperatures 18
  Tire Classification 23
  Selection Between Bias and Radial Tires 24
  Manufacturing, Certification, and Standardization 26

Tire Sizing 28
  Tire Sizing Formulae 28
  Tire Sizing Requirements 30
  Tire Tables 31

CHAPTER 2

Tire Performance and Modeling 53

Mechanics of Pneumatic Tires 53
  Rolling Behavior 54
  Turning Behavior 55
  Vertical Stiffness 58
  Braking Behavior 59

Tire-Ground Friction 63
  Wet Runways and Hydroplaning 65
  Snow and Ice 72
# Contents

Wear 73

**Tire Property and Behavior Models** 75
   - Nasa Technical Report R-64 75
   - Brush Model and Fiala Model 76
   - Beam and String Models 77
   - Magic Formula Model 78

## CHAPTER 3

Undesirable Tire Behavior 81

**Spray** 81

**Debris Lofting** 86

**Tire Failure Modes** 90
   - Modeling Tire Failure Events 94
   - Model 1: Tire Debris Threat Model 95
   - Model 3E: Flailing Tire Strip Threat Model 96
   - Model 3R: Flailing Tire Strip Threat Model 96
   - Model 4: Tire Burst Pressure Effect Threat Model 97
   - Understanding the Impact of Tire Failures 101

References 105

Index 109