

MTU KRC Winter Driving School

SAFE Winter Driving Tips & Techniques For Snowplow Drivers (and Everybody!)

***Mark Osborne
MTU KRC Winter Driving School***

MTU KRC Winter Driving School

- ***What is KRC***
- ***KRC Winter Driving School***
- ***The Basics***
- ***GRIP***
- ***Braking Techniques***
- ***Weight Transfer and Control***
- ***How Stability Control Works***

MTU KRC Winter Driving School

KRC – Research, Development & Testing



KRC – Winter Test Facility

- ***Lot's of SNOW !***
- ***Long Winter's – December to April***
- ***Operate Winter Test Facility***
 - ***Automakers***
 - ***Heavy Truck Components***
 - ***Tier 1's – Tires, AWD, ABS/ESC***

MTU KRC Winter Driving School



MTU KRC Winter Driving School



MTU KRC Winter Driving School



MTU KRC Winter Driving School

KRC Winter Driving School

- ***Started About 18 Years Ago***
- ***Winter Test Facility***
- ***Bridgestone Winter Driving School***
- ***GM Human Factors Research Project***
- ***OHSP Grant – Driving Manuals***
- ***AAA Donation - Video***

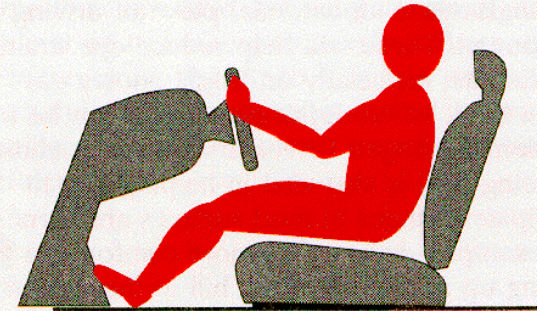
MTU KRC Winter Driving School

KRC Winter Driving School

- ***Now Taught Only on Demand***
- ***Runs 8 am to About 4 pm – 1 Day***
- ***Lots of Seat Time***
- ***Personalized Attention***
- ***Builds Confidence and It's FUN!***

Best Sitting Position

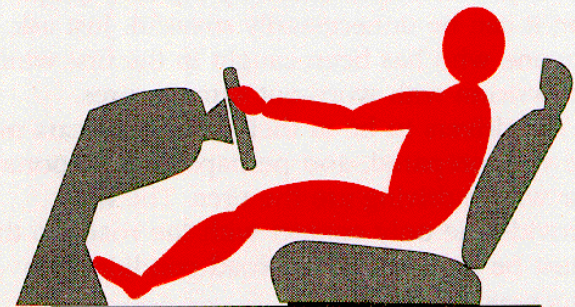
- *Pedal Control*
- *Not Too Close*
- *Not Too Far*
- *Arms Slightly Bent*



PROPER SEAT POSITION



SEAT POSITION TOO CLOSE

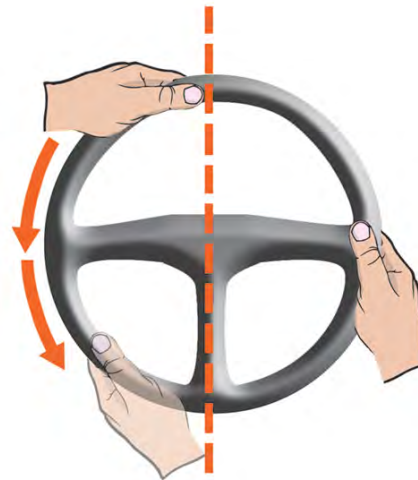


SEAT POSITION TOO FAR

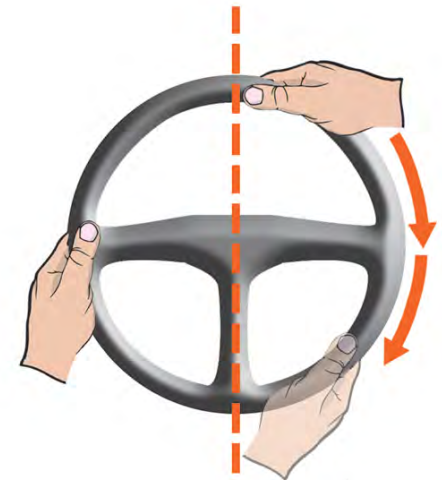
MTU KRC Winter Driving School

Steering Wheel

Hand Position



left turn



right turn

MTU KRC Winter Driving School

- ***Prepare Car **BEFORE** Winter***
 - ***Tires (More on this later)***
 - ***Windshield Wipers***
 - ***Good Battery***
 - ***Carry Emergency Supplies***
- ***Clean Car Off Well Before Driving!***

MTU KRC Winter Driving School

Clear Windows And Headlights!



MTU KRC Winter Driving School

- ***Wear Seat Belts***
 - ***Make passengers wear them***
- ***Buy/Use Other Safety Devices***
 - ***Child car seats***
 - ***Others***

MTU KRC Winter Driving School

-20,00 ms • 1,000 fps



MTU KRC Winter Driving School

- ***Create Space***
 - ***4 Seconds +***
 - ***Create space – Slow Down!***
- ***Avoid Distractions While Driving***
 - ***Cell phone***
 - ***Eating***
 - ***Adjusting the radio***
- ***Use Your Headlights All The Time!***

MTU KRC Winter Driving School



Tires!

- ***Most Important Factor***
- ***Winter Radials On All FOUR Wheels!***
- ***Or Good All Season***
- ***Check Websites – Tire Rack***
- ***Winter Radials For Snow Removal Eq.***
- ***Don't Under-Inflate Tires***

MTU KRC Winter Driving School



All Season Radial



Winter Radial

MTU KRC Winter Driving School

Vehicle Control

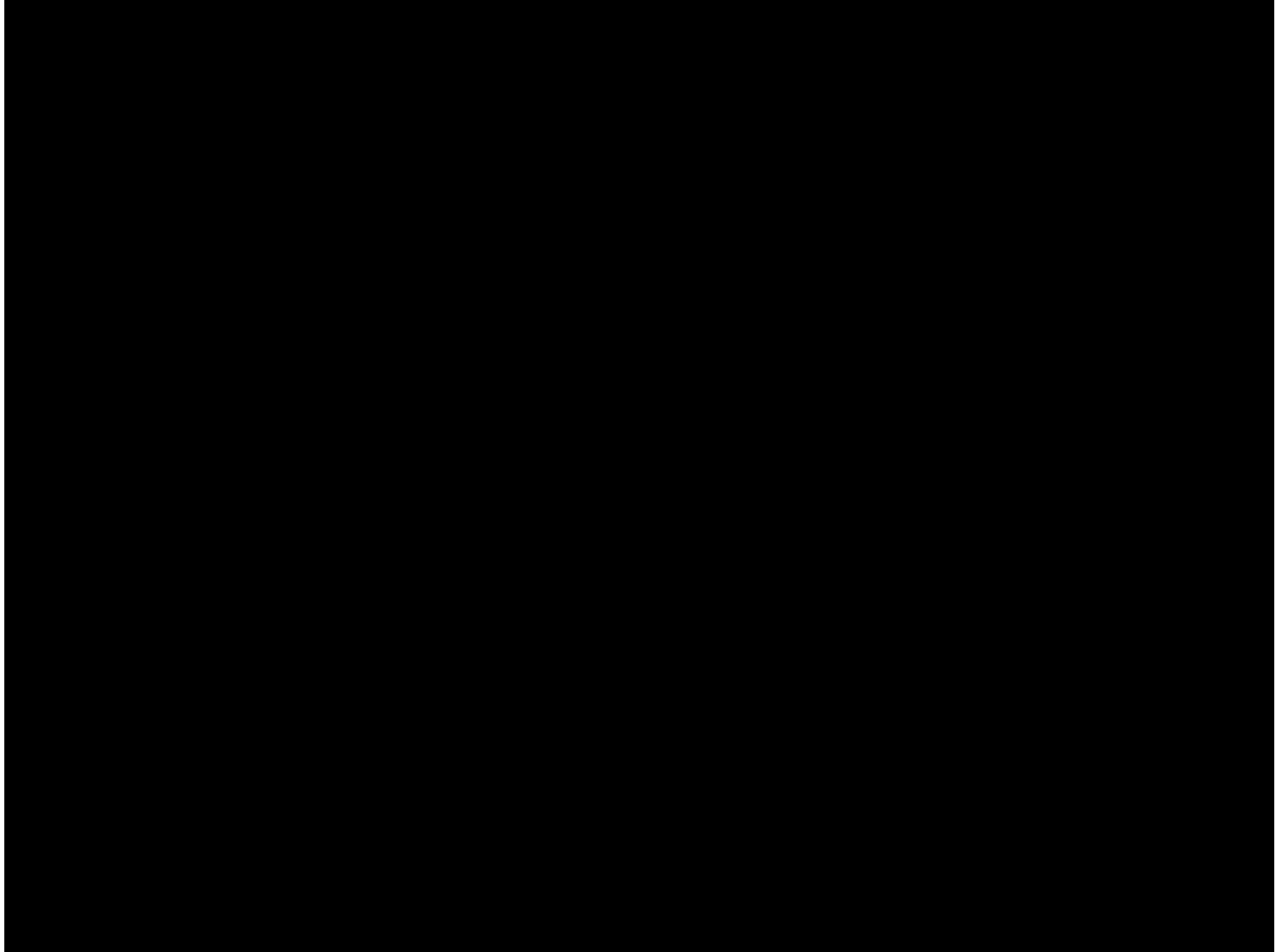


GRIP – ALL VEHICLES

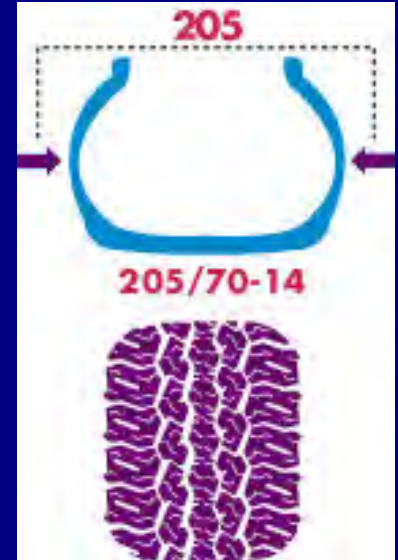
- ***Adhesive Quality - Tire To Road***
- ***Traction, Handling And Braking!***
- ***You Can Not Steer Without GRIP!***

Think GRIP!

MTU KRC Winter Driving School



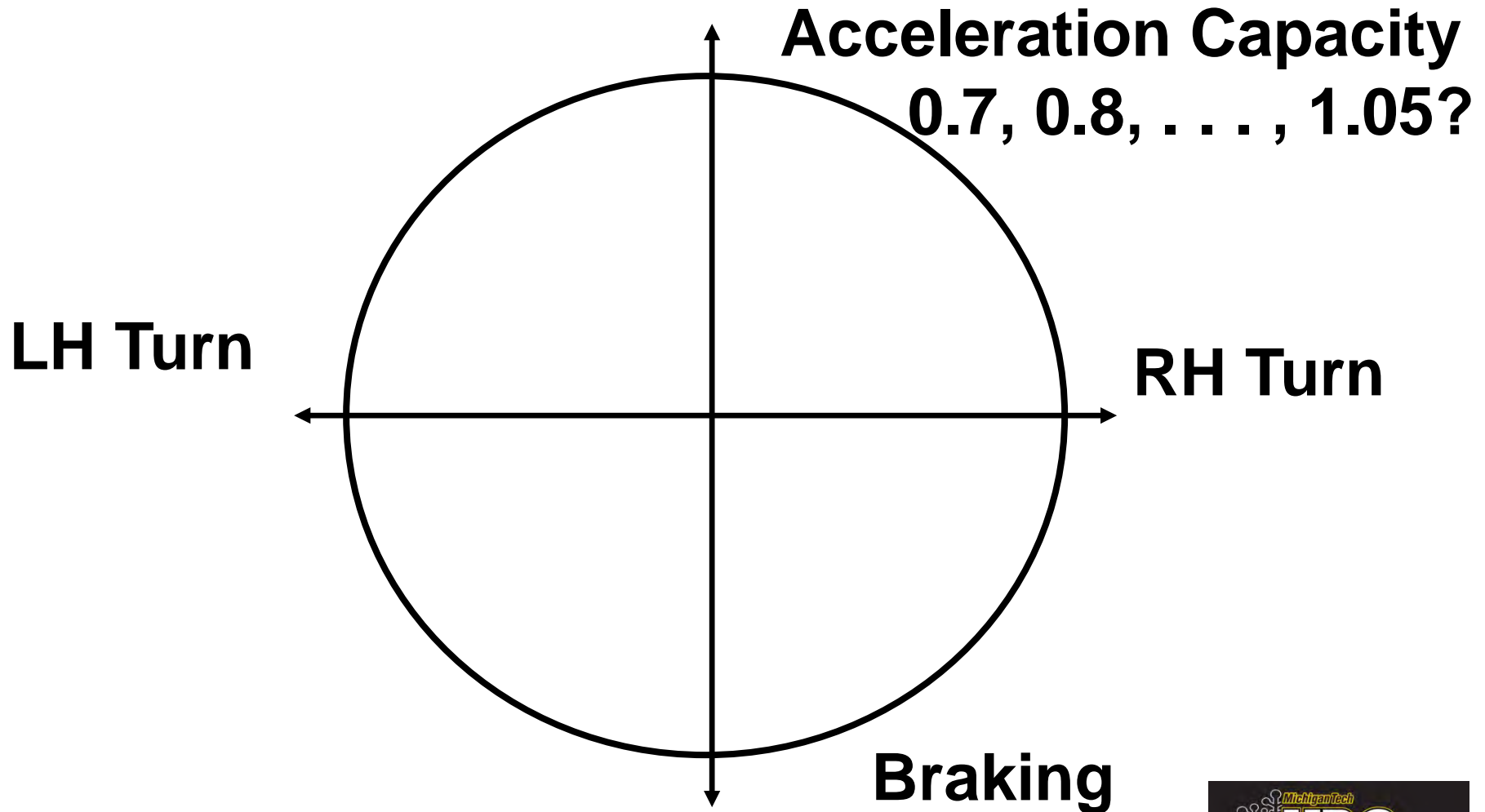
Where's The Grip?



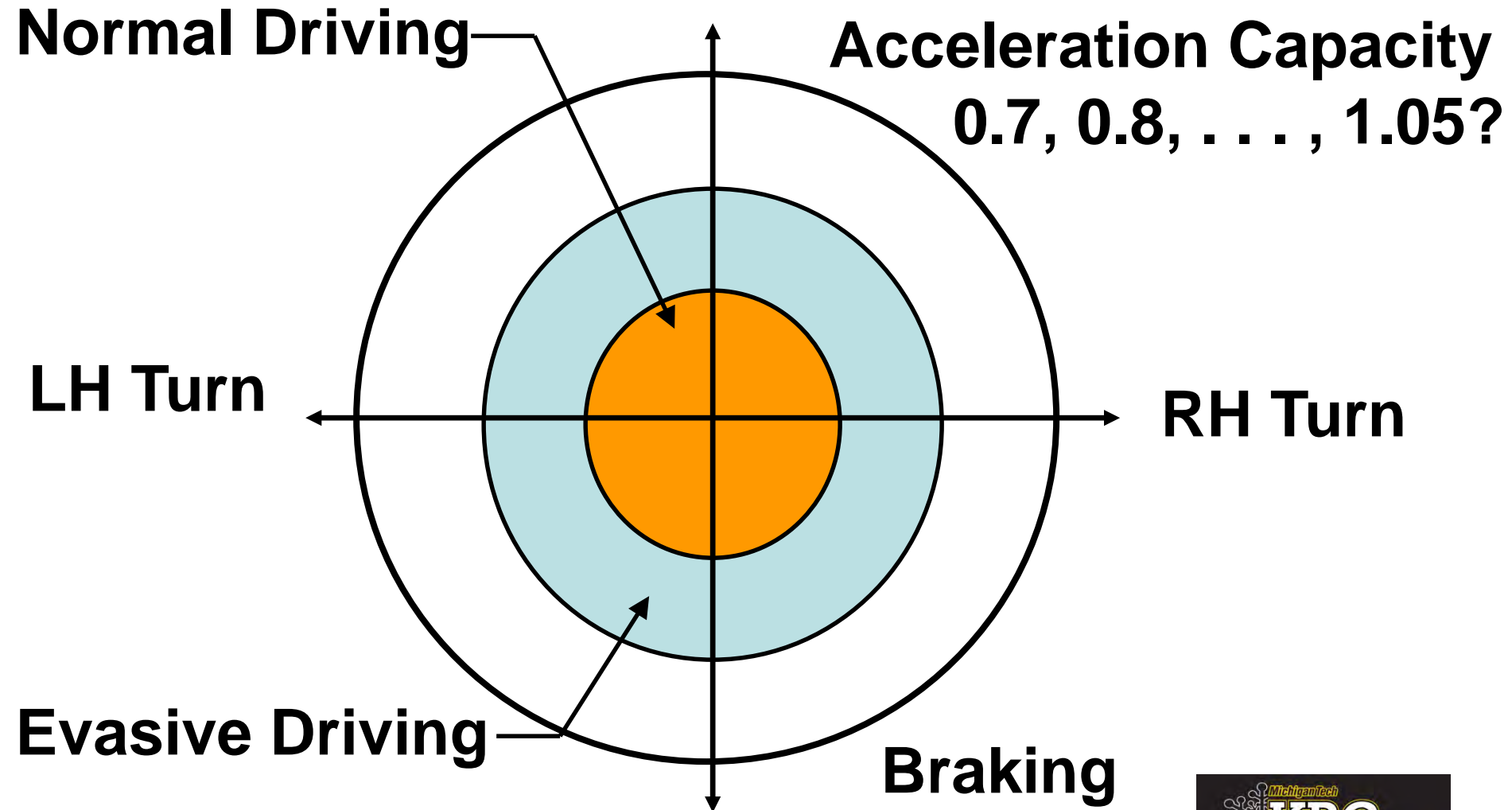
At The Contact Patch!

MTU KRC Winter Driving School

Friction Circle Concepts

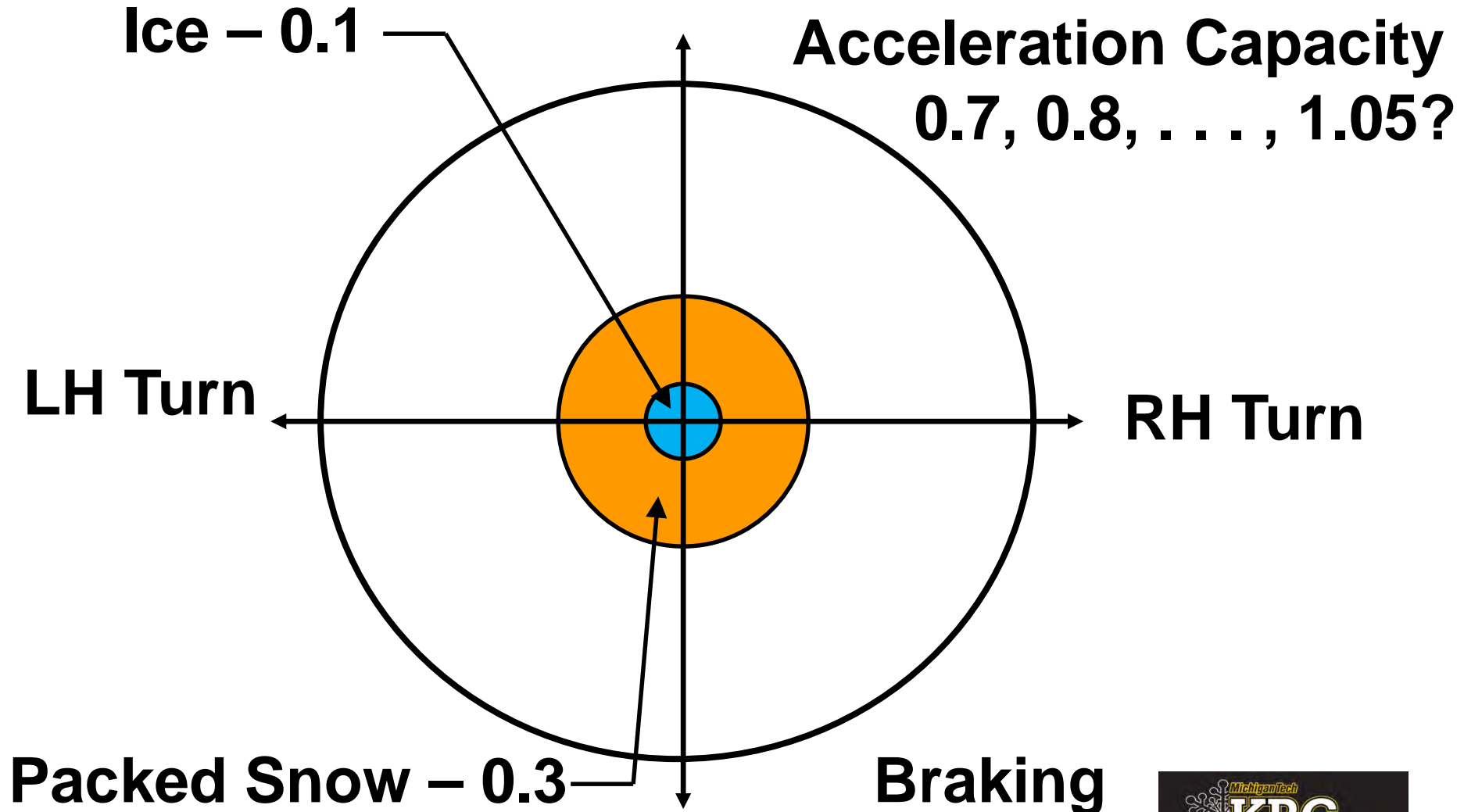


Friction Circle Concepts



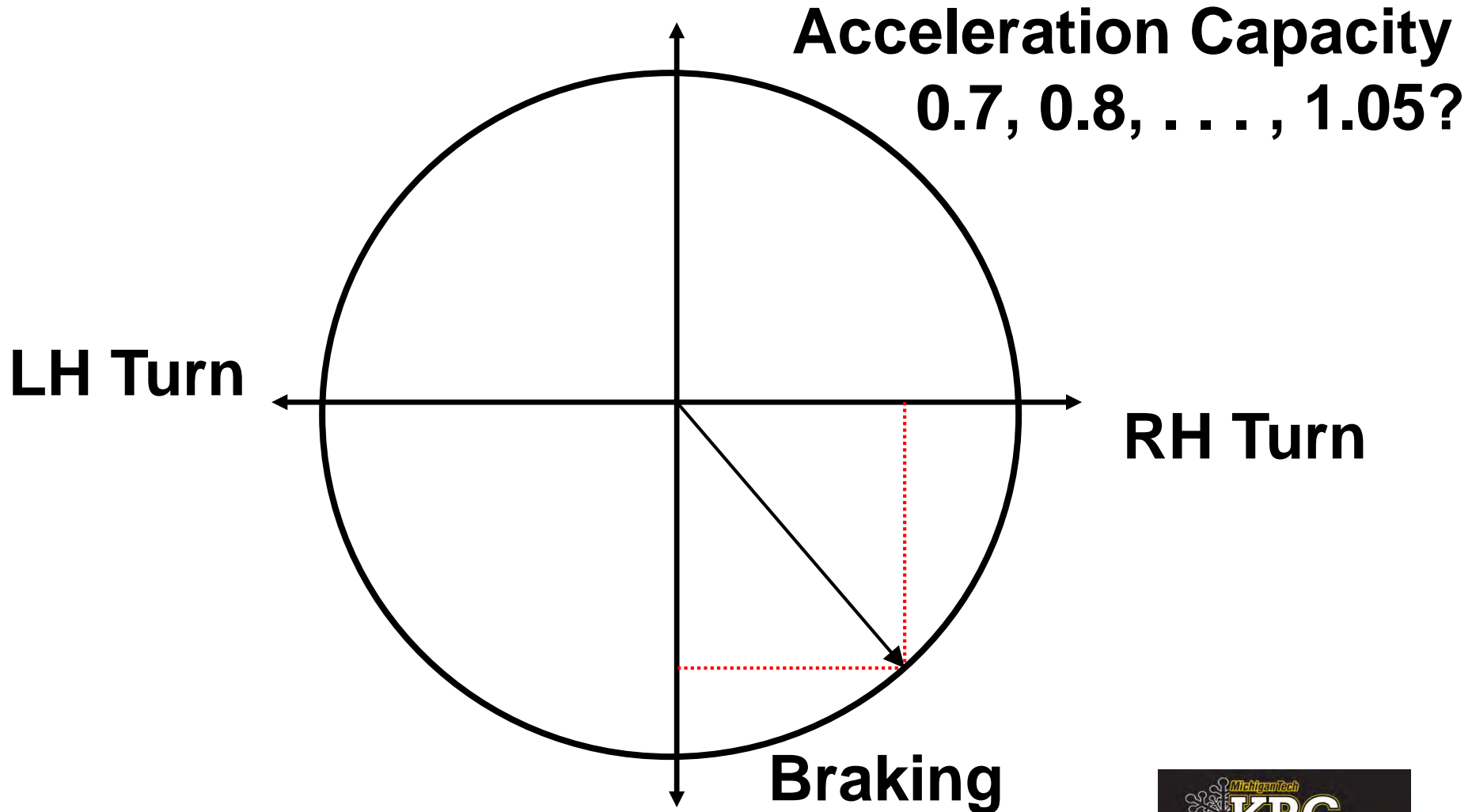
MTU KRC Winter Driving School

Friction Circle Concepts



MTU KRC Winter Driving School

Friction Circle Concepts



MTU KRC Winter Driving School

Cadence Braking (Any Wheeled Vehicle!)

- ***Cadence Braking Is Pumping***
- ***Crisp Lock, Then Release (Let Roll),
Then Lock, Then Release, Etc.***
- ***Lock & Roll!***
- ***No Prolonged Lock-up!***

MTU KRC Winter Driving School



MTU KRC Winter Driving School

Threshold Braking (Any Wheeled Vehicle!)

- Hold Brakes At The Point Just Before Brakes Start To Lock***
- Lock Brakes For Short Period, Back Off Slightly – “Find Threshold”***
- Difficult To Do On Slippery Roads!***

MTU KRC Winter Driving School



MTU KRC Winter Driving School

ABS Braking

- ***Pump The Brakes For You - Very Fast***
- ***Does Not Lock The Wheels***
- ***Use Firm Pressure!***
- ***Doesn't Always Stop You Faster!***
- ***Allows SOME Steering Control***
- ***Limiting Factor – TIRES!***

MTU KRC Winter Driving School



MTU KRC Winter Driving School

Panic Avoidance (Without ABS)

- ***You Can't Brake (Lock Your Wheels)
& Steer On Slippery Surfaces!***
- ***Brake Then Steer***

MTU KRC Winter Driving School



MTU KRC Winter Driving School



MTU KRC Winter Driving School

Panic Avoidance (With ABS)

- ***You Can Brake & Steer On Slippery Surfaces!***
- ***There Are Still Limits***
- ***Limiting Factor – Tires!***
- ***Always Think GRIP! CONTROL!***

MTU KRC Winter Driving School



MTU KRC Winter Driving School

Weight Transfer

- ***Helps To Provide Control***
- ***Transfer Weight To Tires That Need***

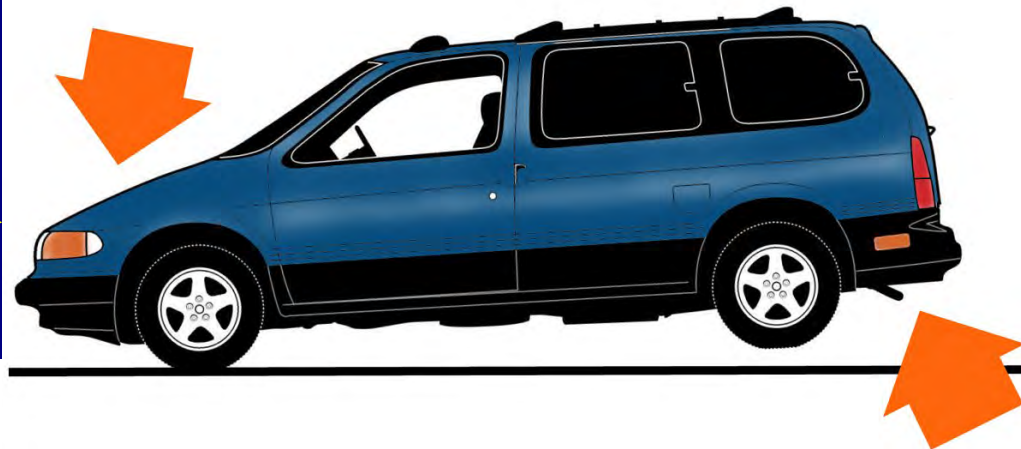
GRIP!

MTU KRC Winter Driving School

Weight Transfer

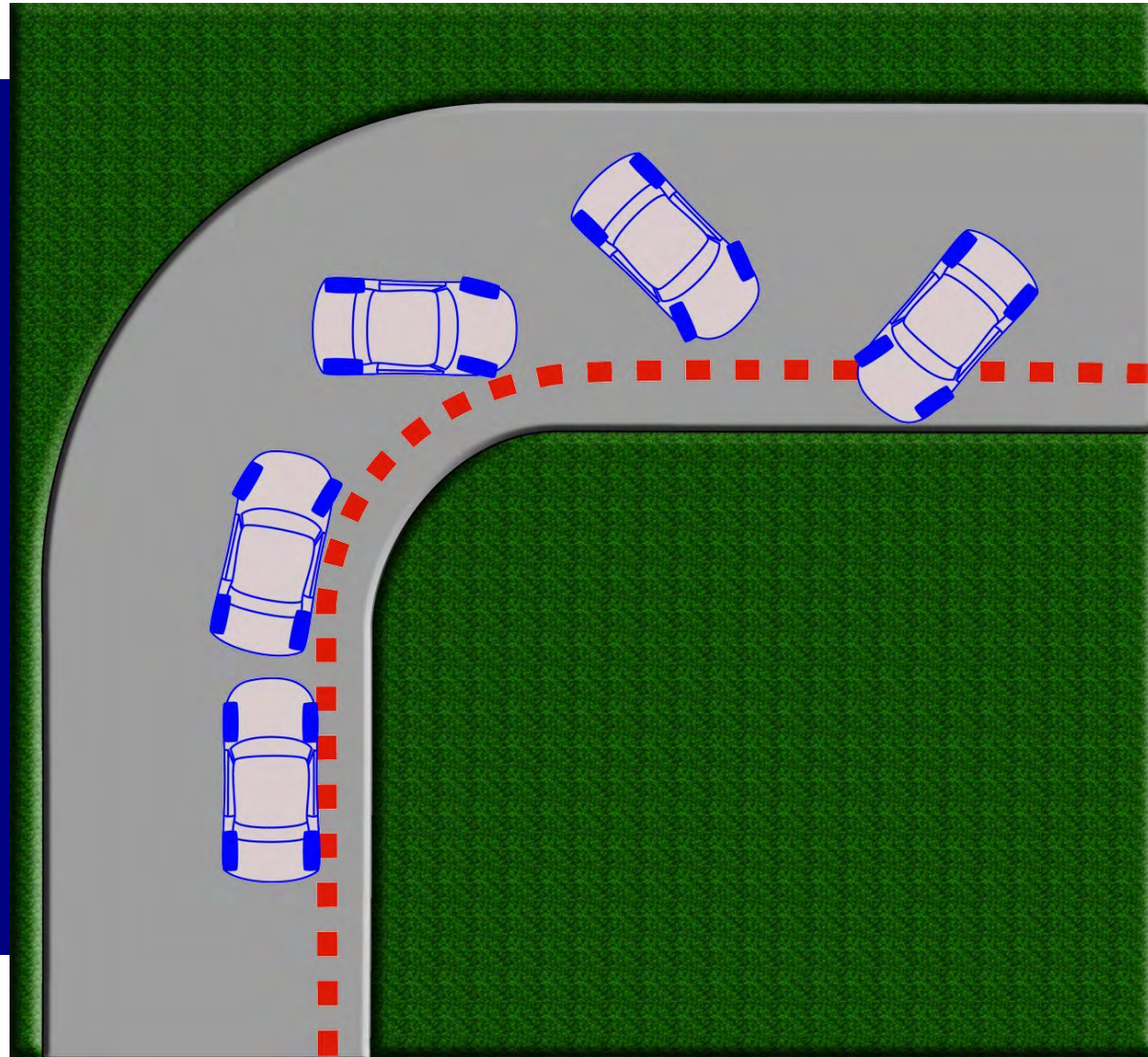
Acceleration →

Braking →



MTU KRC Winter Driving School

Oversteer



MTU KRC Winter Driving School



Oversteer

- ***Loss Of GRIP - Rear Wheels***
- ***Low Speeds & Take – Off***
Steer In The Direction Of The Slide
Ease Off Throttle
- ***High Speeds***
Steer In The Direction Of The Slide
Ease On The Throttle

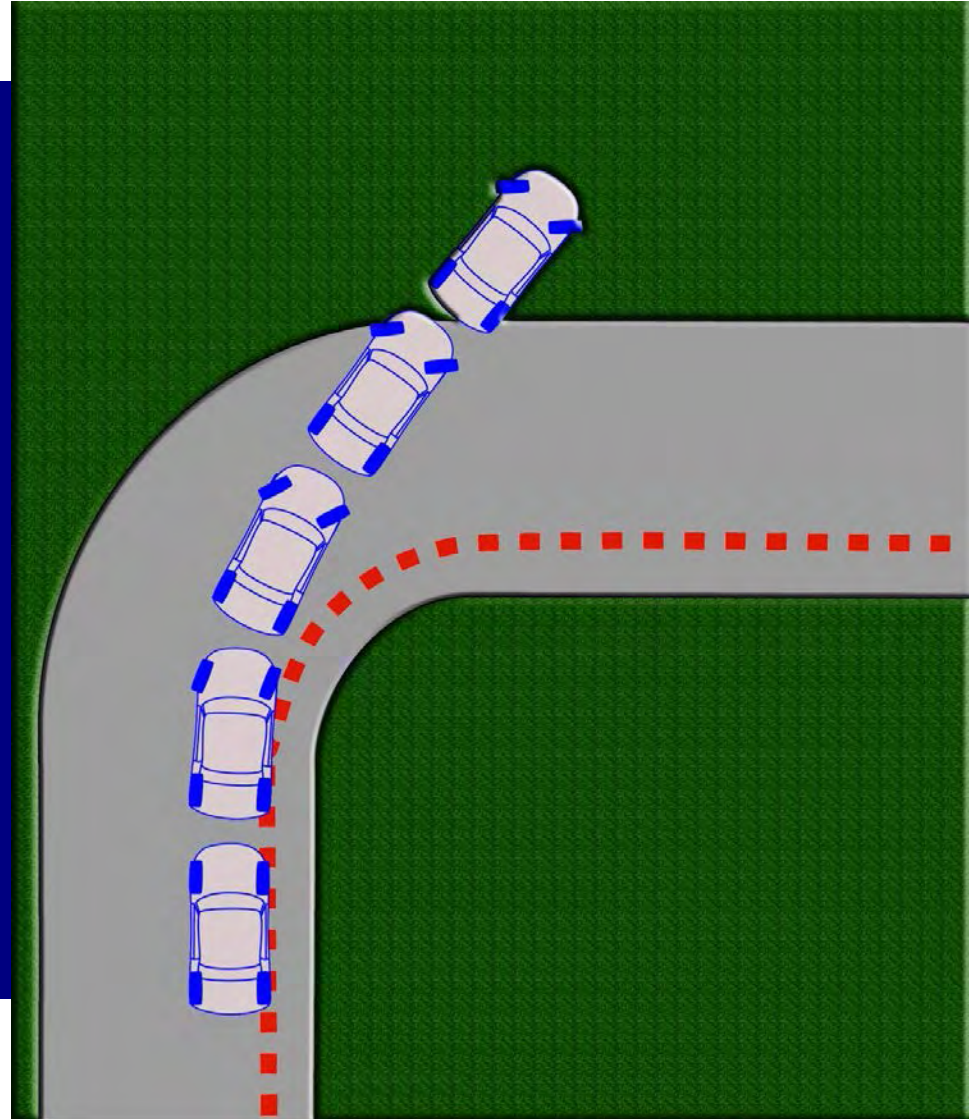
Oversteer For Snow Plows

- ***Use The Same Methods!***
- ***Low Speeds***
 - Steer In The Direction Of The Slide***
 - Ease Off Throttle***
- ***High Speeds***
 - Steer In The Direction Of The Slide***
 - Ease On The Throttle***

MTU KRC Winter Driving School



Understeer



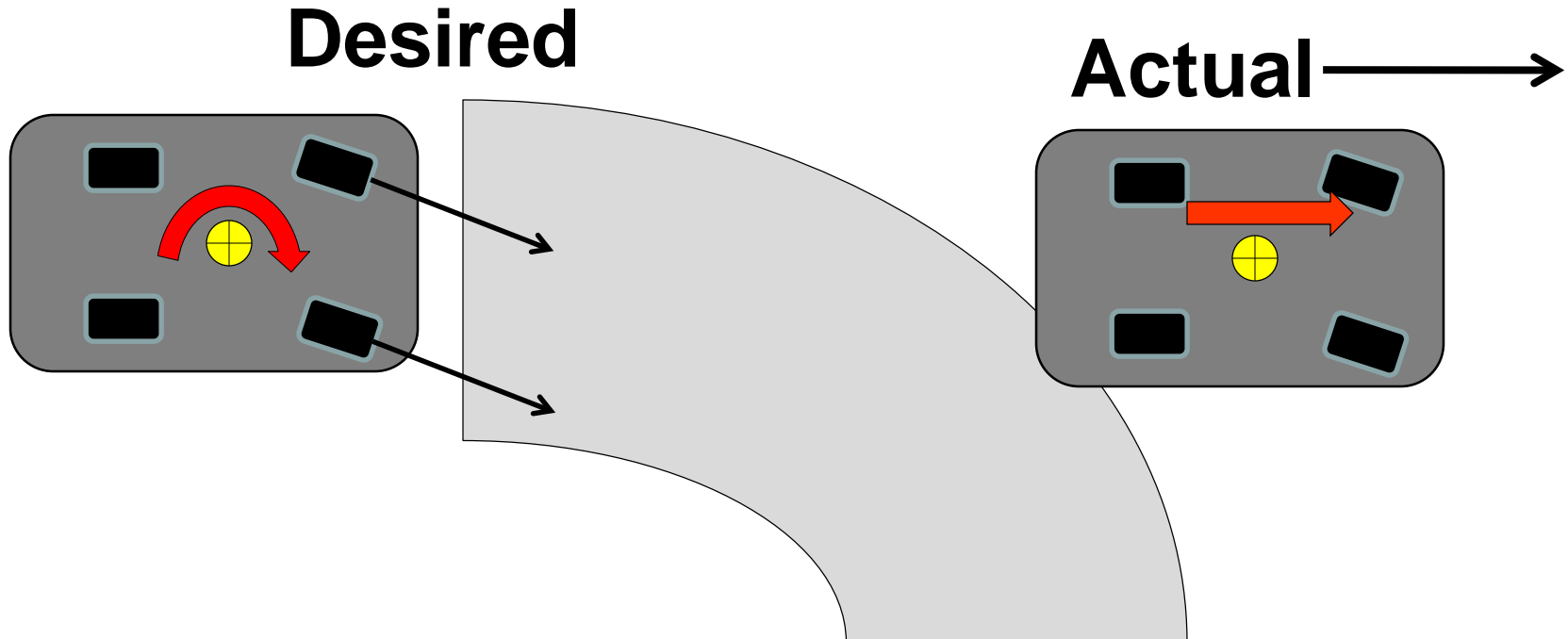
MTU KRC Winter Driving School



Understeer

- ***Loss Of GRIP To Front Wheels
Either Spinning Or Not Rolling***
- ***Don't Accelerate During A Turn!***
- ***Use Lift Throttle***
- ***Use Lift Throttle & A Brake Tap***
- ***Adjust Steering Wheel***

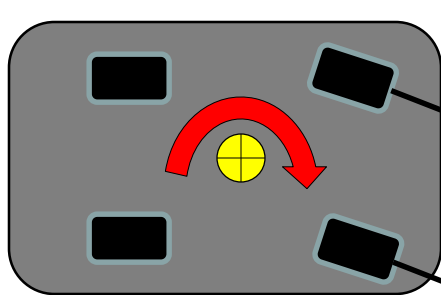
Understanding Stability Control



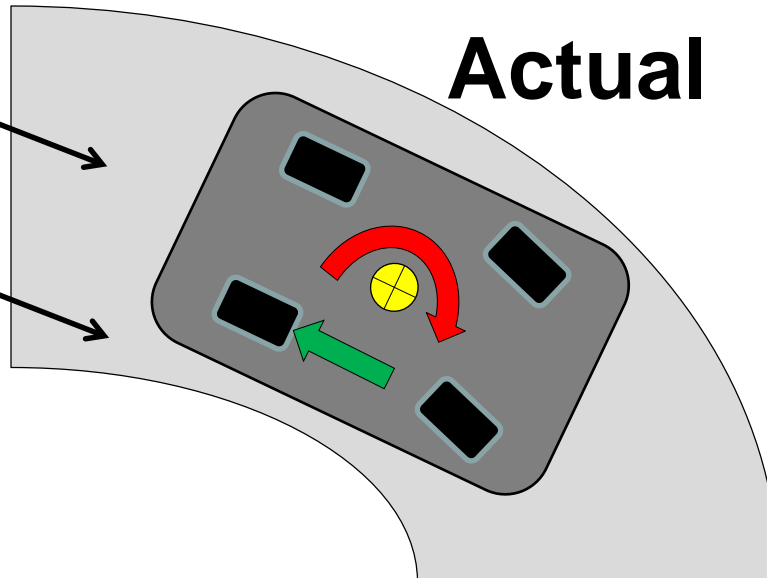
Understeer or "Pushing"

Understanding Stability Control

Desired

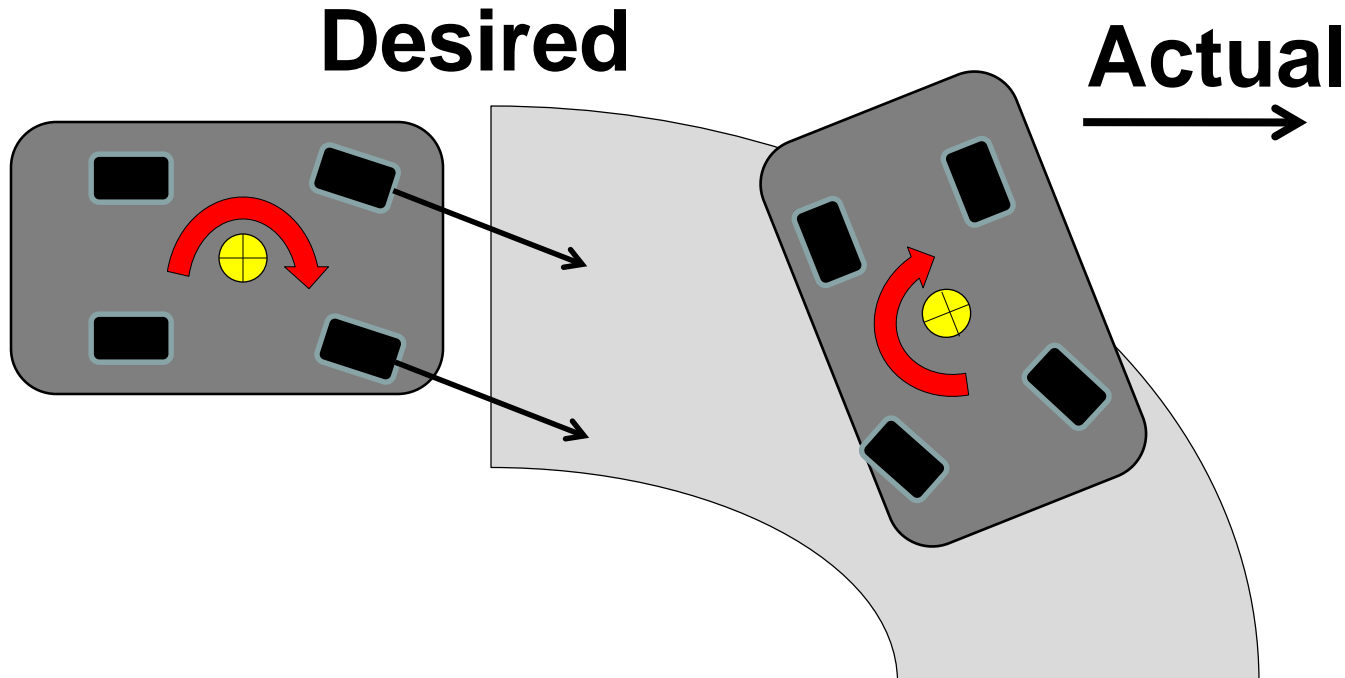


Actual



Understeer or “Pushing”

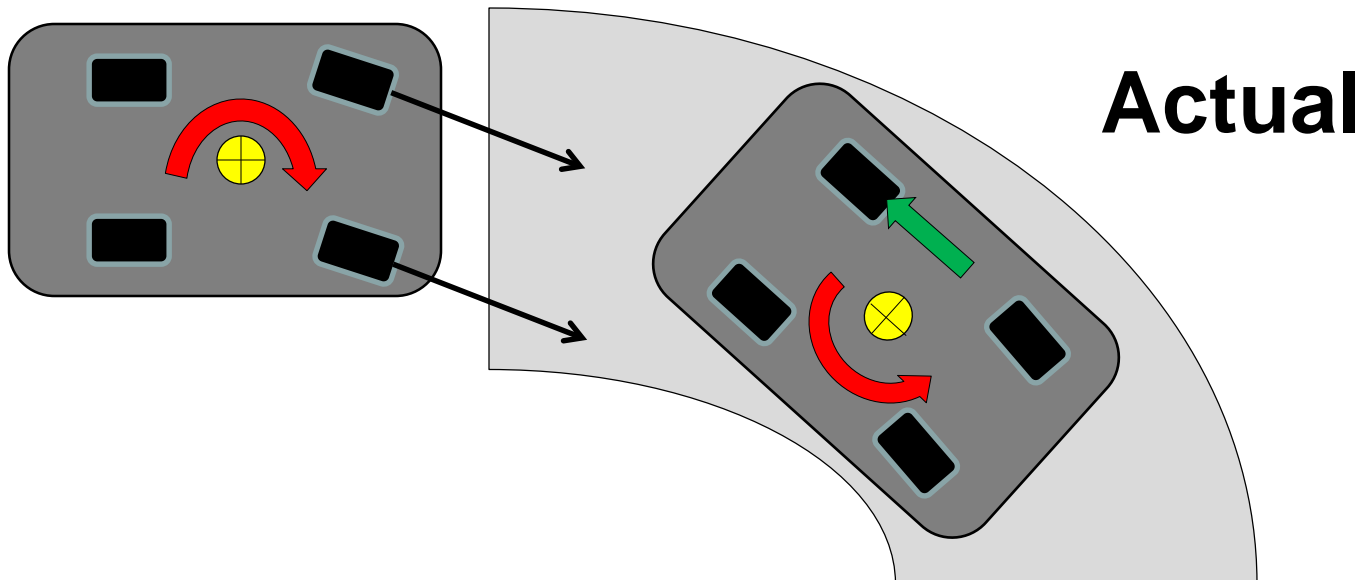
Understanding Stability Control



Oversteer or “Fishtail”

Understanding Stability Control

Desired



Oversteer or “Fishtail”

MTU KRC Winter Driving School

Other

- ***Steering – Not Too Much***

Steer Back

Be Smooth!

- ***Look Where You Want To Go***

Look Far Ahead – Focus!

MTU KRC Winter Driving School

Cars Vs Trucks

- ***Cars – 4,000 lbs. Empty***
5,500 lbs. Full
37% Increase
- ***Snow Plow Truck –***
25,000 lbs. Empty
50,000 lbs. + Full
Over 100% increase!

MTU KRC Winter Driving School

Cars Vs Trucks

- ***Vehicle Dynamics Are The Same
For All Vehicles***
- ***Vehicle Characteristics Will Affect
The Response Times***
- ***Do All Possible Preparations To
Minimize Effects***

MTU KRC Winter Driving School

Remember

- ***Prepare BEFORE Winter***
- ***Look Where You Want To Go!***
- ***Don't Always Hit The Brakes***
- ***Think GRIP & Control!!!!!!!***
- ***Smooth Steering, Braking And Acceleration***

MTU KRC Winter Driving School



MTU KRC Winter Driving School

Wrap-Up!

- ***Techniques Work For Any Surface***
- ***Techniques Work For Any Vehicle***
- ***Speeds And Anticipation Vary***
- ***Slow Down!***

MTU KRC Winter Driving School

***To Learn More About Winter Driving
Attend
The KRC Winter Driving School***

(906) 487-2626

mosborne@mtu.edu