NASCC.AB.CA
ALBERTA RACING

2023 Road Course Racing

COMPETITION LICENSING SCHOOL

Conducted By The Northern Alberta Sports Car Club

WCMA.CA
GO RACING!

INTRODUCTIONS (part 1)

- Chief Instructor – Jed Harrison
- Co-Chief Instructors –
  - Brooke Carter, Barry Munson
- Classroom Instructors
  - Jed Harrison, Brooke Carter, Jim Trahan, Barry Munson
  - *experts from the internet*

- Group Leaders – Mike Horner, Sean Finn, Allen Brown
- Instructors - from NASCC & ARCA, Speedfreaks & Track Junkies
- Chief Registrar – Jed Harrison
- Licensing – Sue Wilson
- Other Officials and Workers - Members of NASCC/ARCA
- YOU

Course Agenda

- Classroom Sessions
  - By Zoom Thursday, May 25, by Jed Harrison
  - In live Classroom Sunday, May 28, 2023
    - Brooke Carter, Jim Trahan, Jed Harrison, Barry Munson
- On track sessions
  - Sunday, May 28, arrive by 8:05 am
- Short Debrief after each track session
- Sun, Rain, Snow, Wind, Cold, Hot?.?.?.?

OBJECTIVES

In this school you will learn what it takes to become racing drivers!

- Grant you eligibility to apply for a race license
- Enhance the enjoyment of participation in MOTORSPORT by:
- High Performance driving skills – core to racing
- The Basics of Racing – how to be as safe as possible
  - Safety - paramount - if it isn't safe - don't do it.
  - Skills - like any other, these need to be learned.
  - Knowledge - how and why things happen.
  - Enjoyment - its gotta be FUN.

Outline

- Driver Dynamics
  - Concentration
  - Body Position
  - Vision
- Car Attitude
  - Oversteer, understeer, neutral, angle of attack
- Traction Management
  - Balance
  - Load (weight) Transfer
  - Control/Smoothness
- Race Driving Safety
  - Passing
  - Safety
  - Learning

All contribute to the balance critical in all advanced driving situations.

A lap of the track (part 1)

Video of Chris Saunders in Spec Miata
Chris is a multiple time WCMA Spec Miata Champion

So what is he doing, how is he doing it,
what did he need to know to do it?

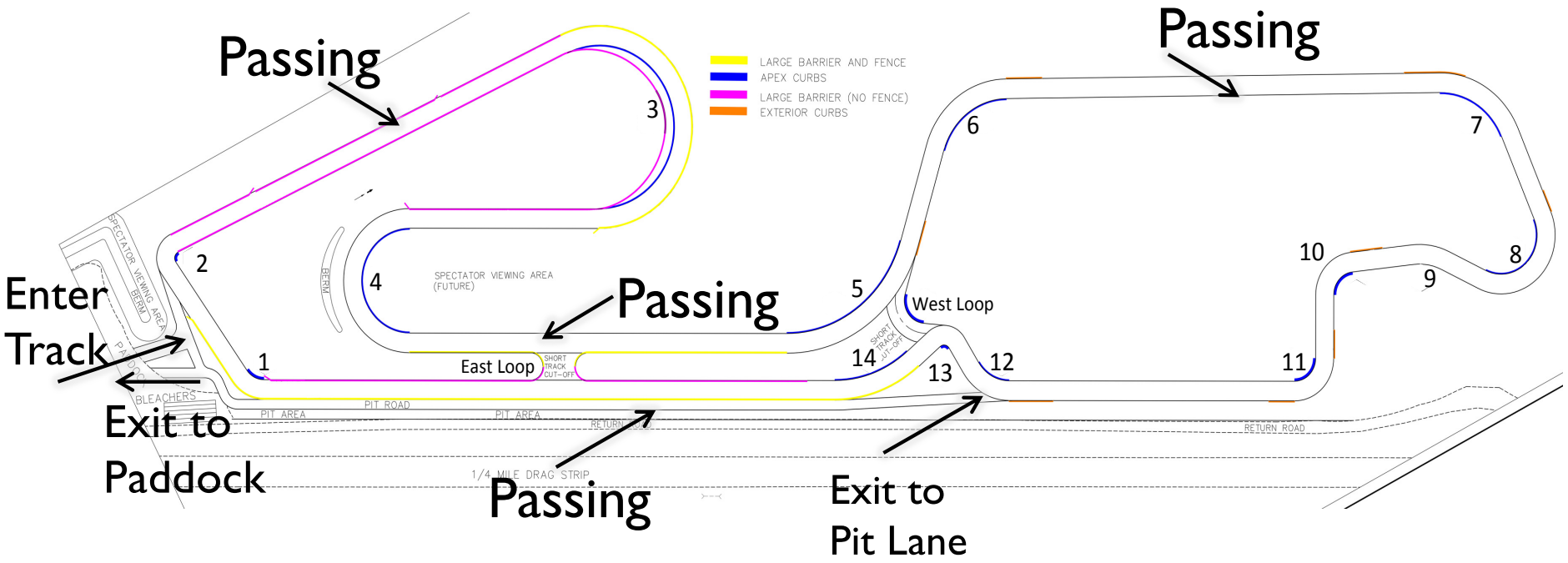
Review track protocol

- Helmets on for all sessions
  - Students will have a green, blue or red label on the window & grid in paddock in their colour run group
  - Lead/Follow instructors try to Grid with your students in the paddock
- Always wait at track entrance to be waived on
- Enter the track under acceleration and keep left
  - don't hesitate once waved on
- Instructor may use hand signals to communicate
- If wheels off – mandatory pit stop
  - 2 wheels off - talk with instructor in hot pit lane
  - 4 wheels off or spin – talk with Chief Instructor in the hot pit lane

Instructor/Student protocols

- We offer a choice, up to each individual
- In car instruction
  - if both student and instructor agree to be in the car together
- Lead/Follow with instructor in a separate car
- Both student and instructor should write to indicate their choice, at least a week in advance of the school
  - nascc.events@gmail.com
- Some of what follows applies only to lead/follow, most applies to all.

Track layout for protocols

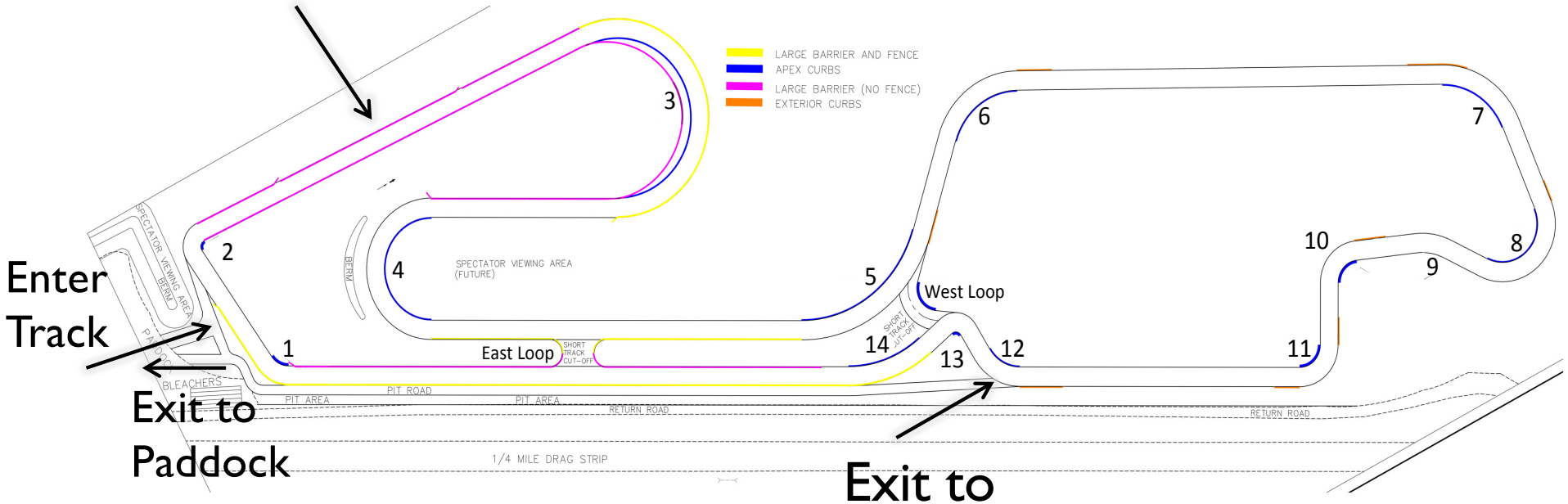


Passing requires a point by

Remember there will be several cars in some passing groups due to lead/follow

Lead/Follow protocols

Lead/Follow position switch



Enter Track

Exit to Paddock

Exit to Pit Lane

On Track Instruction – Instructor in Car

- In-car instructing is allowed if both Instructor & Student agree in advance, otherwise Student and Instructor will do lead/follow as described below
- Helmets worn on track for all sessions

- First Track Session
  - Instructors may drive student car for first 2 – 3 laps to illustrate the line and braking points, stop in hotpits to change seats and then students drive.
  - debrief with instructor after each session, if they do not have another student right away

- 2nd through 5th Track Session
  - Students drive with instructor in car
  - debrief with instructor after each session, if they do not have another student right away

- 6th Sessions
  - Students drive with instructor in car, unless permission to run solo has been obtained from the Chief Instructor

On Track Instruction - Lead Follow

- Student and Instructor do lead/follow as described below

- First Track Session
  - Instructors will lead student
  - Typically 1 instructor, 1 student
  - debrief with instructor after each session, if they do not have another student right away

- 2nd Track Session
  - Students will lead instructor
  - debrief with instructor after each session, if they do not have another student right away
- 3rd (after lunch) & 4th Track Session
  - Instructor leads 3 laps, then switch so students lead
  - Passing car goes off line, car in front slows a bit so they can fit back in

- 5th Session
  - Lead/follow instructors will observe students from corners, and provide feedback during debriefing

- 6th Session
  - Instructor leads 3 laps, then switch so students lead, unless unless permission to run solo has been obtained from the Chief Instructor
  - Passing car goes off line, car in front slows a bit so they can fit back in

Hand Signals 1

Lead/Follow Instructor Hand Signals

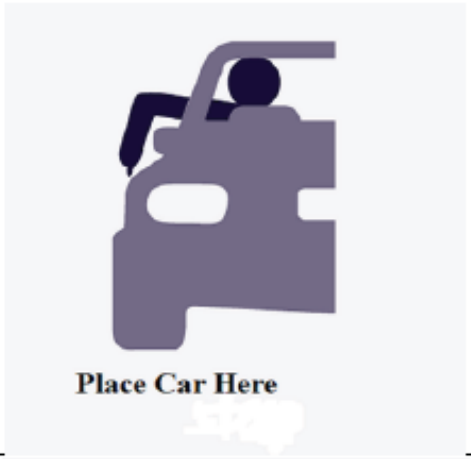
Follow Instructor or Catch-Up: *Tapping Roof*	 Roof Tap Follow Me
Back Off to 3-car lengths: *Open Hand Out Window*	 Back Off to 3-Car Lengths

Hand signals 2

arm out straight, making circular motion – like wheels

Student moves in Front of instructor, on straight between corner 2 & 3

Headlight flash – pay attention to hand signals

Move to Specific Track Location: *Pointing Down*	
Go to Pit: *Vertical Fist Out Window*	

DRIVER DYNAMICS OVERVIEW

The most important part of any race car is the driver.

We'll discuss some important details in this section:

- Concentration & attitude
- Body position
- Vision

Outline (part 2)

- Concentration
- Body Position
- Car Attitude
- Traction Management
  - Balance
  - Load Transfer
  - Control/Smoothness

All of the above contribute to maintaining the balance which is critical in all advanced driving situations.

Concentration

- What is it – definition – ability to focus
- Very Import
- Surprising, but you can loose focus while driving a race car

Body Position

- Torso
- Arms
- Hands
- Feet

Images from Skoda Motor5port & Jonathon Goring Motorsport

DRIVER DYNAMICS
BODY POSITION & VISION

Your position in the car greatly affects vision and your vision controls the car.

Important notes:

- Eyes should be up and forward (green box) not immediate and down (red circle)
- The car will go where you look with **few exceptions**
- Sitting too low or too high in car affects vision
- Bad vision = bad results

**https://blayze.io/blog/car-racing/vision-on-the-racetrack-where-to-look-while-racing

DRIVER DYNAMICS
PHYSICAL CARE

You've got the concentration, attitude & body position sorted, now it's time to make sure *you* are good to go.

Important things to consider:

- Hydration & caloric intake throughout the race day is critical
- The healthier you are, the faster you are (cardio, muscle, etc.)
- Don't underestimate how car prep can help (coolsuit, water bottle, paint)

RACING & HPDE CONCEPTS
CORNERING – GENERAL PRINCIPLES

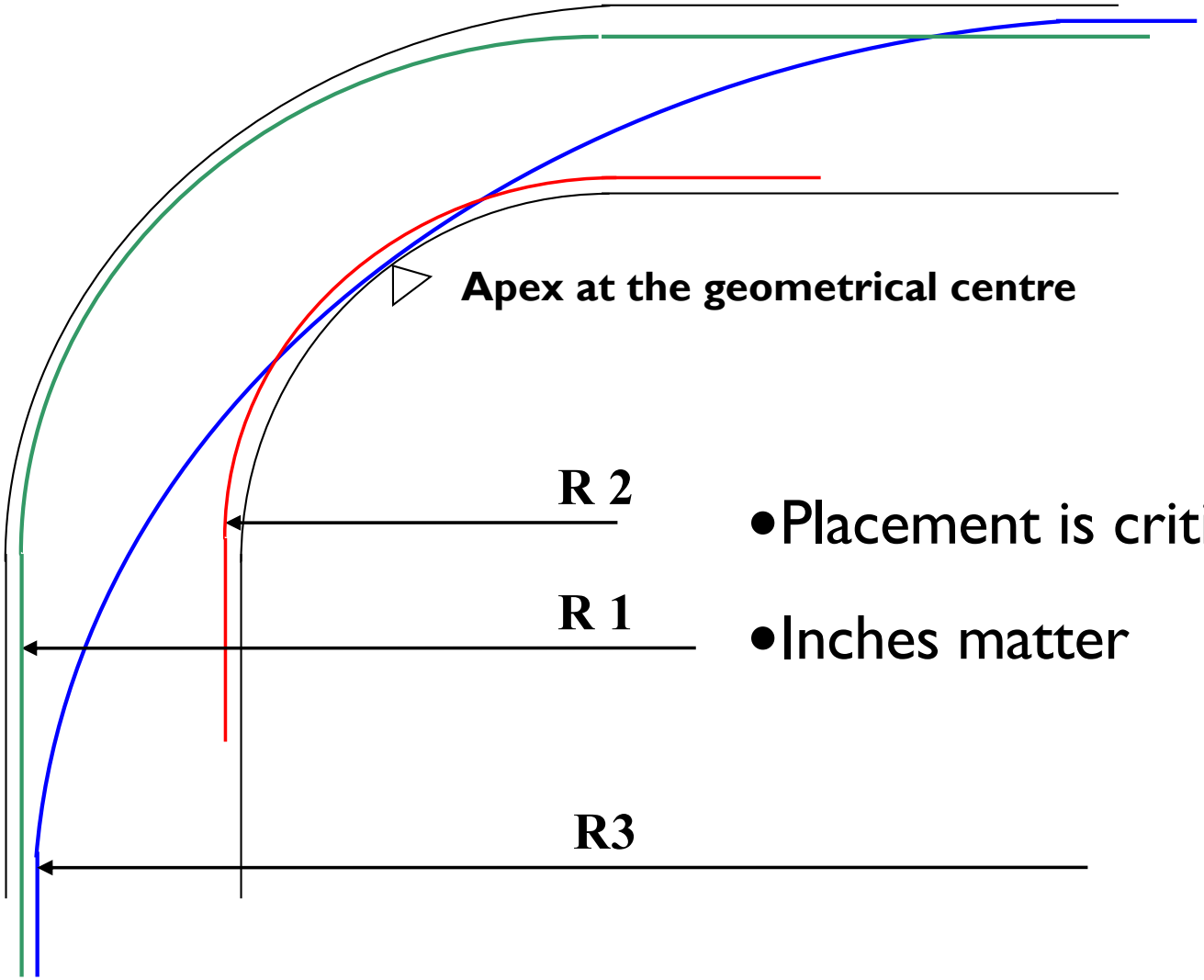
The optimum path – this is "the racing line"

Cornering - General Principles (part 3)

- Optimum path called "the line"
  - Primary focus is on acceleration
  - Secondary focus is on corner speed
- The process:
  - maximize the radius of the corner
  - to minimize the traction needed to turn

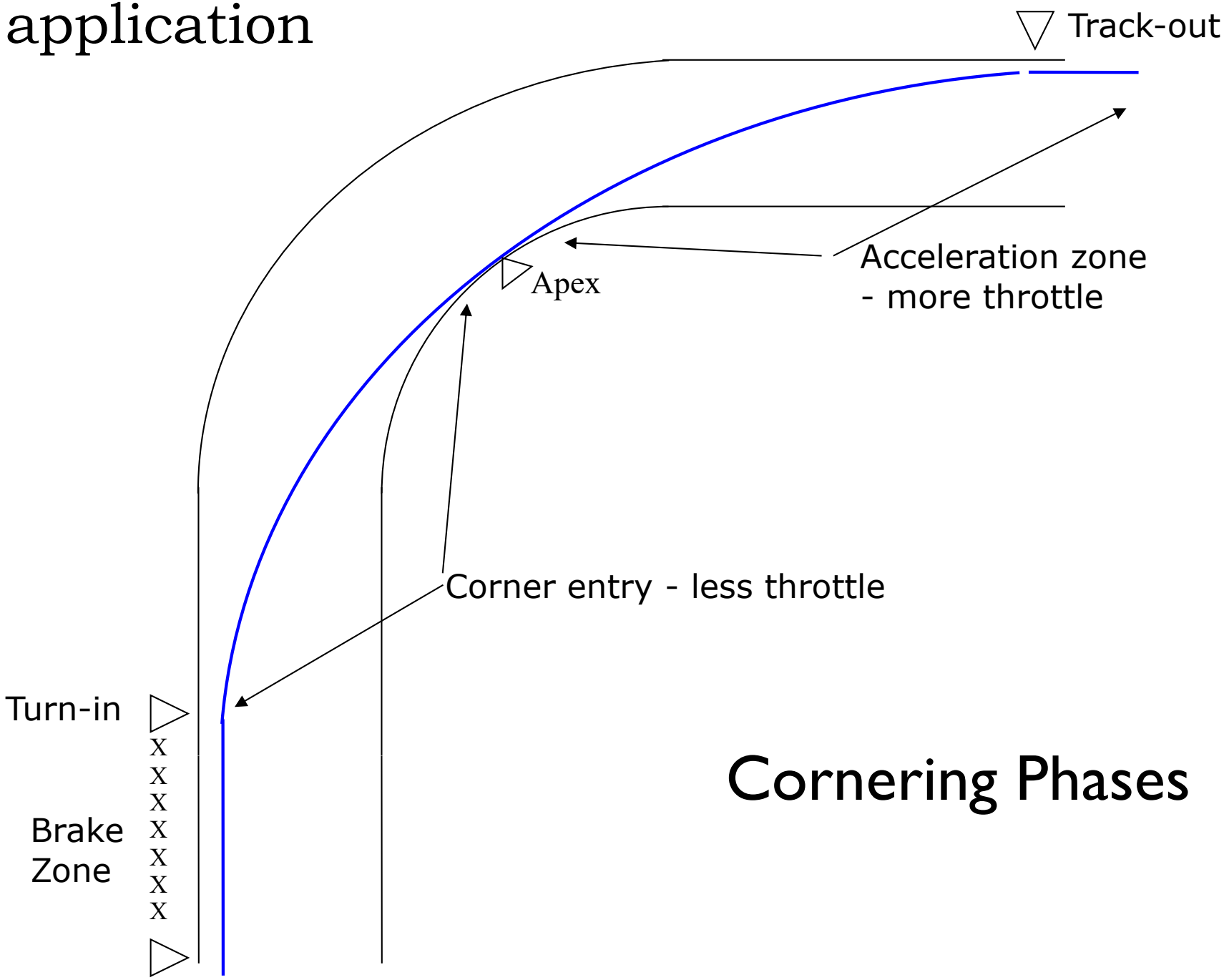
Road Racing Basics

"The Line" – largest Radius



- Placement is critical
- Inches matter

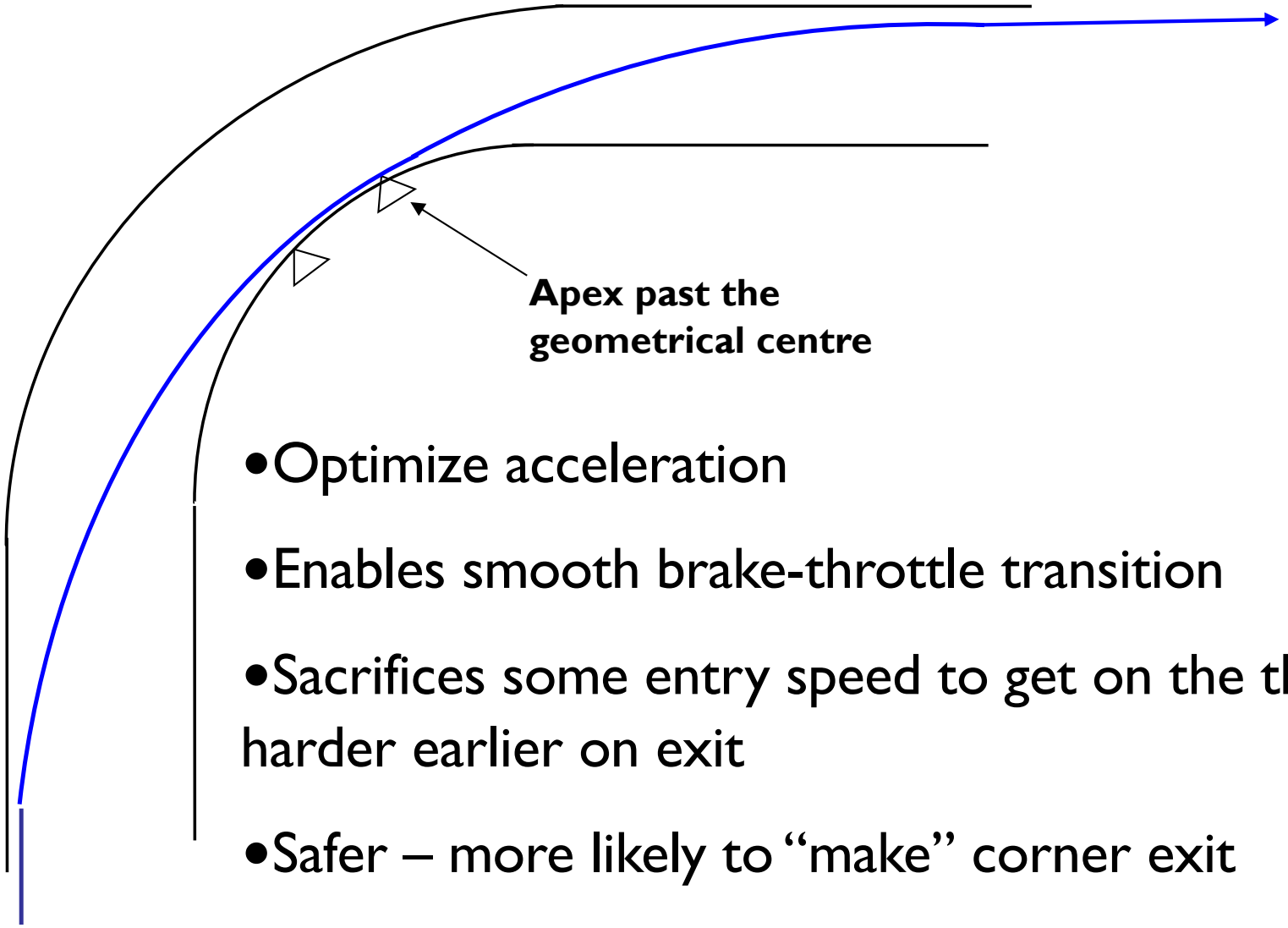
Braking & Throttle application



Cornering Phases

Road Racing Basics

"The Line" with Late Apex



- Optimize acceleration
- Enables smooth brake-throttle transition
- Sacrifices some entry speed to get on the throttle harder earlier on exit
- Safer – more likely to "make" corner exit

Road Racing Basics
"The Line" (part 3 con't)

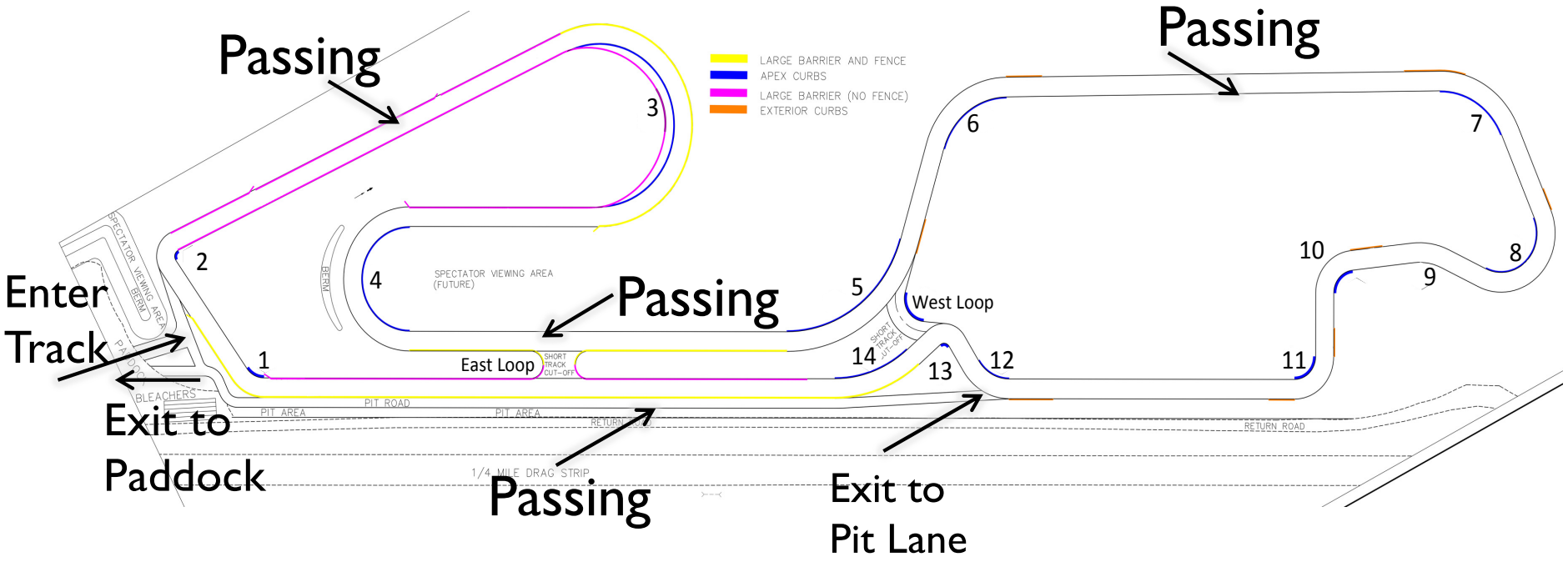
- Corners do not exist alone
- 3 types of corners:
  - Type 1: Corner preceding a straight (most important)
  - Type 2: Corner following a straight (2nd most)
  - Type 3: Corner leading directly to another corner (least)

  Mastering these concepts helps you analyze and understand a new track quickly and efficiently.

Road Racing Basics
"The Line" con't

- Type 1 corner: Corner preceding a straight
  - important – entrance to a straight
  - Examples at Castrol – Turns 2, 3, 4, 6, 11, & kink
  - Exit speed
    - most important onto long straights
  - Objective - begin acceleration as early as possible
  - How? => Late apex - past the geometrical center of the corner

Track Corner Numbering



Passing requires a point by

Remember there will be several cars in a passing group during lead/follow

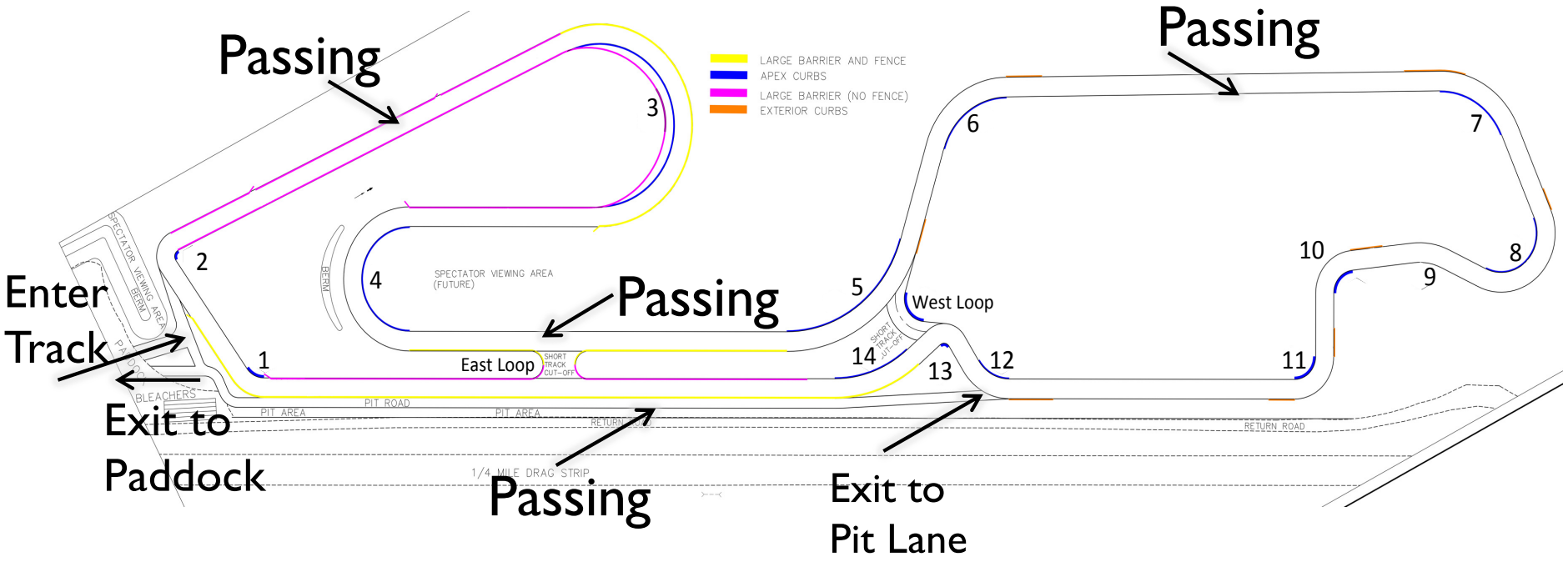
Road Racing Basics
"The Line" con't

- Type 2 corner: Corner after a straight
  - Exit from a straight
    - Objective – carry speed deep into corner
    - Early apex – before or near geometrical centre
    - Entry speed -most important
    - Examples at Castrol – Turns 1, 5, 6, 7, and 12

Road Racing Basics
"The Line" con't

- Type 3 corner: Corner leading directly to another corner
  - Objective – set-up following corner
  - Correct placement –most important
  - Want the angle of attack into the next corner to be optimized
  - Apex location – varies
    - Depends on which corner is sacrificed and the best attack position on the dominant corner

Track Corner Numbering



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Road Racing Basics
"The Line" con't

- Type 3 corner: Corner leading directly to another corner
  - Objective – set-up following corner
  - Correct placement –most important
  - Want the angle of attack into the next corner to be optimized
  - Examples at Castrol – Turns (8, 9, 10) and (12, 13, 14)
  - Note: Castrol has some unique corners that are a combination of corner types at different points in the corner, notably turns 3 and 4

CAR CONCEPTS
CAR ATTITUDE

(part 4)

Four key concepts to car attitude in context of racing.

1. Neutral
2. Oversteer
3. Understeer
4. Braking

Not that kind of attitude.

Neutral – Car Attitude

- The gentle attitude, everything is lovely and under control
- Front wheels LEAD the back ones
- Or rear wheels follow the front wheels
- all wheels have the same level of adhesion

- CRITICALLY IMPORTANT –
  - When entering a yellow flag region car must be neutral
  - When approaching and passing safety vehicles car must be neutral

- Now, off to watch the video on oversteer and understeer

Oversteer

- Rear wheels lose traction before the front
- Characterized by “swapping ends”
- Correction - turn into the slide
- Always remember - in reduced traction conditions - wet, snow, gravel, ice - you must **react earlier** than in the dry!

Understeer

- Front wheels loose traction before the rears
- Characterized by - turning the wheels and *nothing happens !*
- Feeling - “oh crap”
- Correction:
  - - RWD-lift, allowing the front wheels to regain traction.
  - - FWD- lift gently, reduce steering imput

Alternative Definitions

- Oversteer – hit the wall with the back of the car – scares the passenger
- Understeer – hit the wall with the front of the car - scares the driver
- Horsepower – how fast you hit the wall
- Torque – how far you push the wall after you hit it.

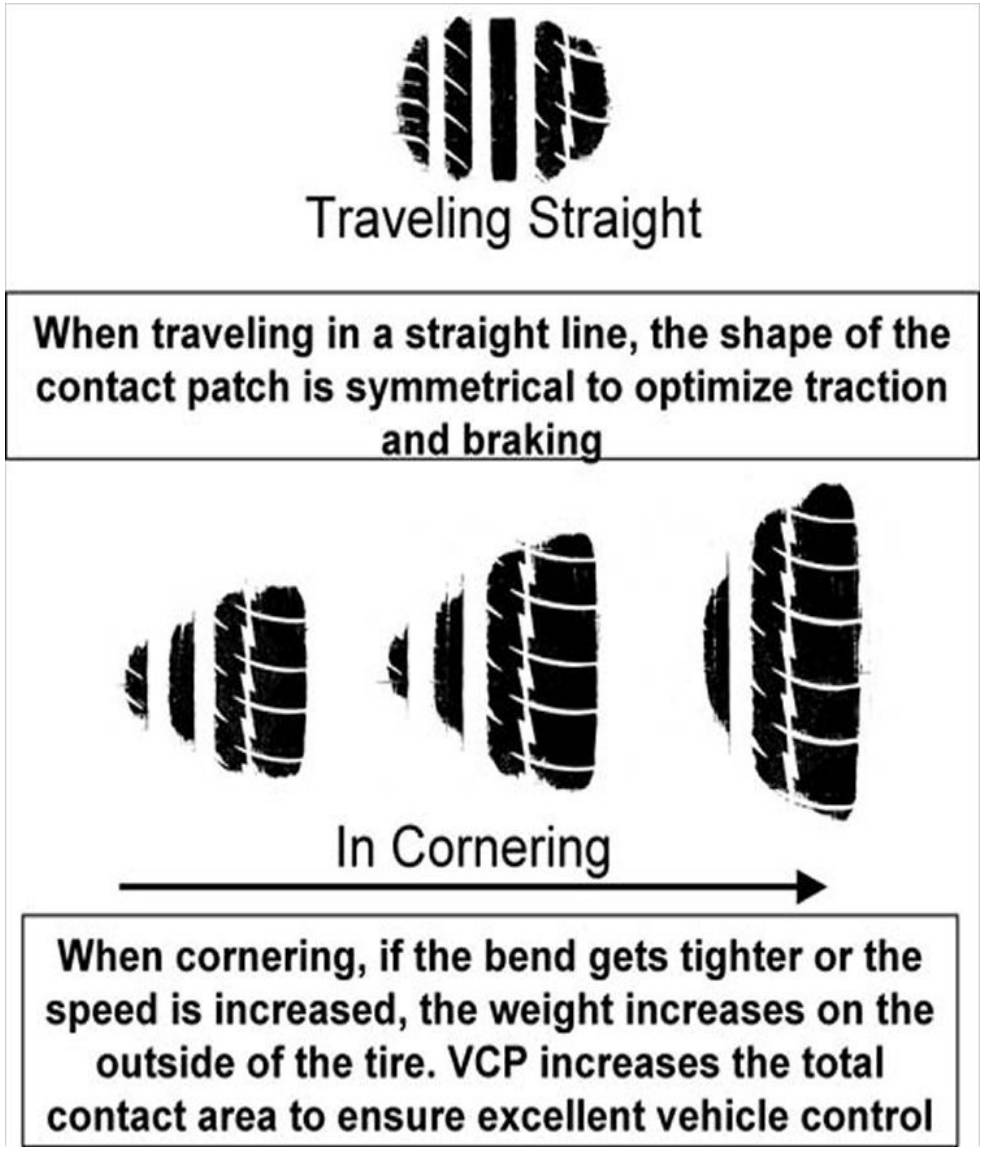
Over/Under Steer & Weight Transfer

(part 5)

- That video we watched had a lot to unpack
- To understand it in detail, we will review
  - the concepts of weight transfer
  - how braking, turning and throttle application shift load around the tires
  - apply the concepts to correcting over and understeer
  - Apply the concepts to increasing cornering speed
- Then we will put it all together by looking at the traction circle

TIRE CONTACT PATCH – weight transfer

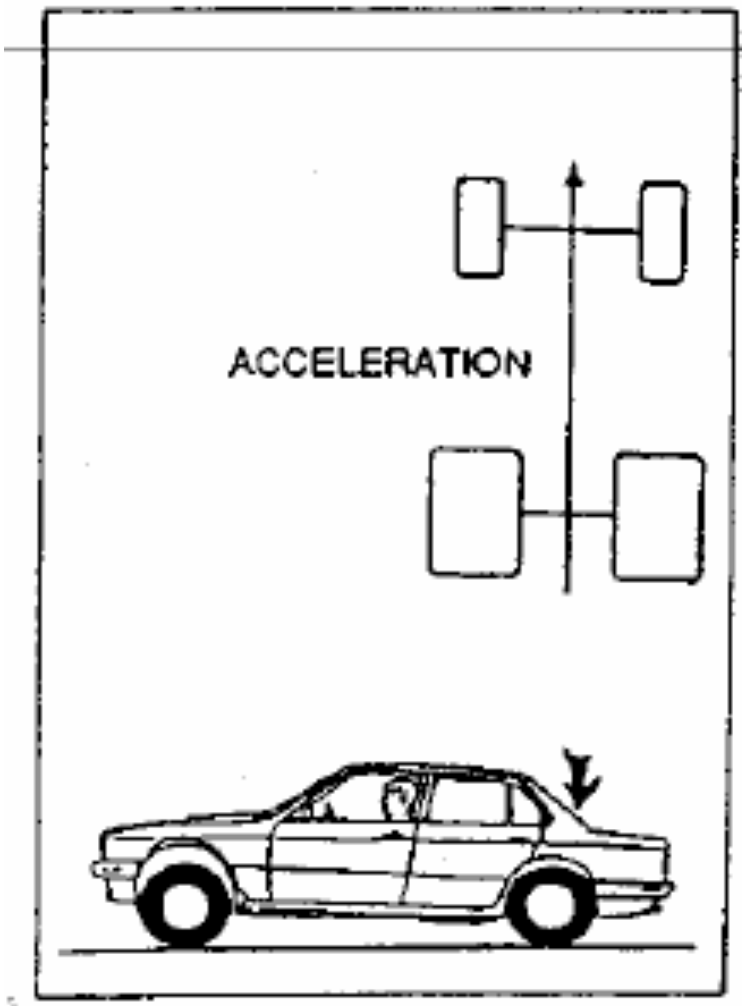
- Responsible for all acceleration, braking and cornering
- Relatively small elliptical shape
- Ever changing with corner weight, camber, temperature & pressure



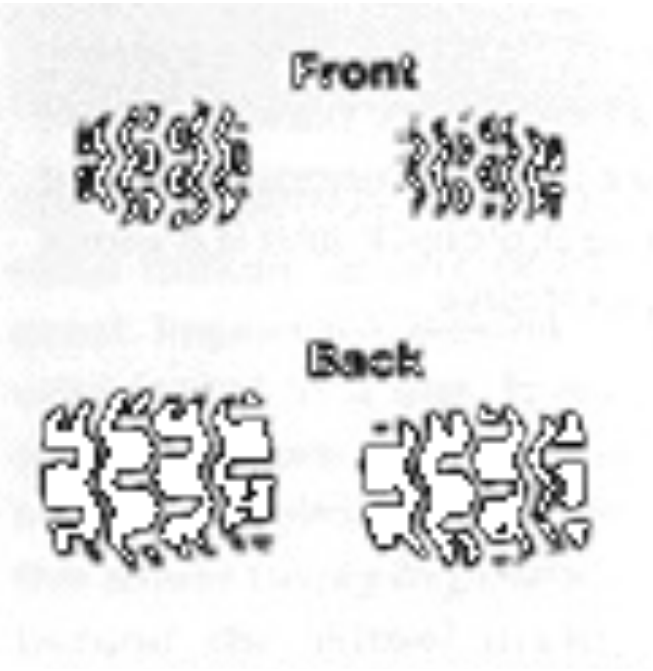
WEIGHT TRANSFER – model for car control

- Is the result of inertia and momentum. It moves:
  - to the rear under acceleration,
  - to the front under braking and
  - to the side under cornering.
- Causes corner weight changes
  - which cause tire contact patch changes
  - Changes the pressure/force tire exerts on surface
  - Result is a change in traction at that corner
- Transition from rolling to sliding friction
  - Causes loss of traction
- Pitching a sliding car can increase sliding friction
  - Getting sideways improves sliding traction somewhat

Weight transfer - acceleration

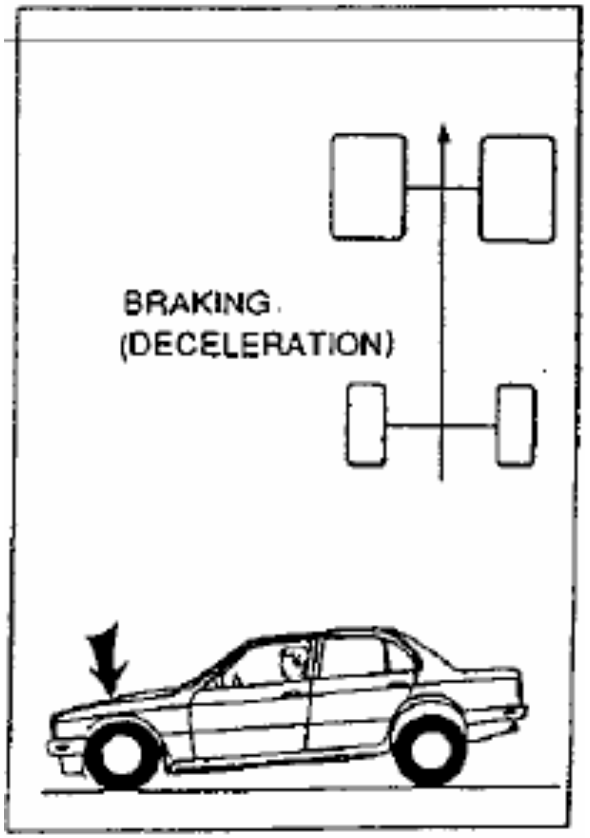


Rear gains, front looses traction

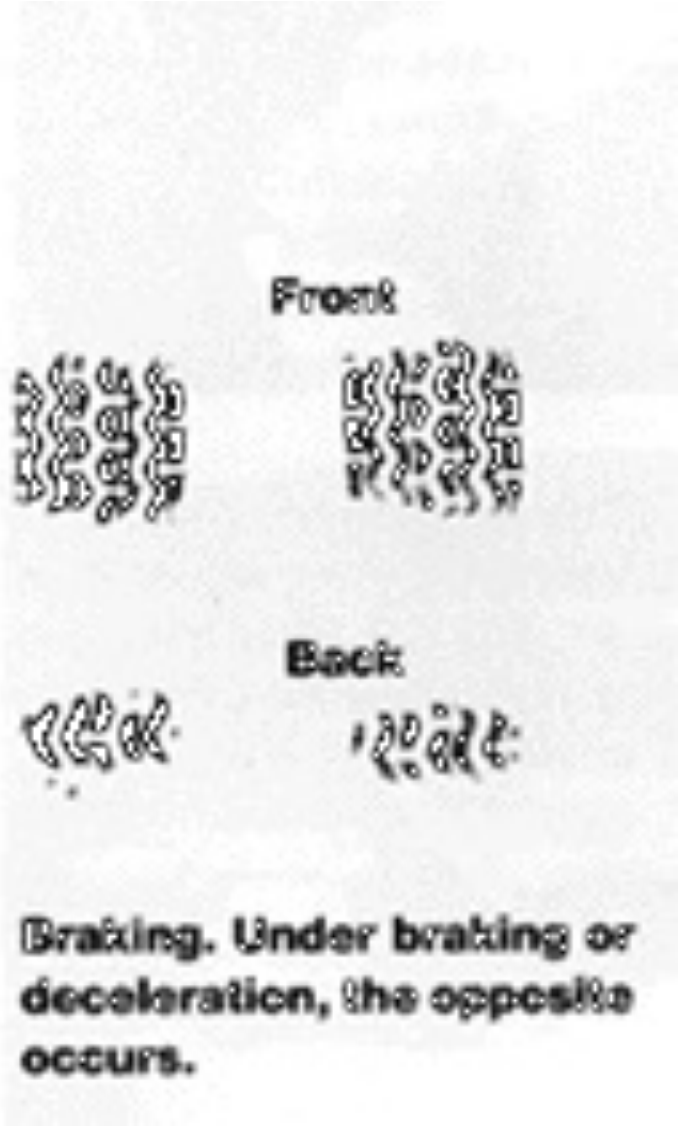


Tire patch size is used to indicate increase or decrease in load (weight) on the corners

Weight transfer - braking

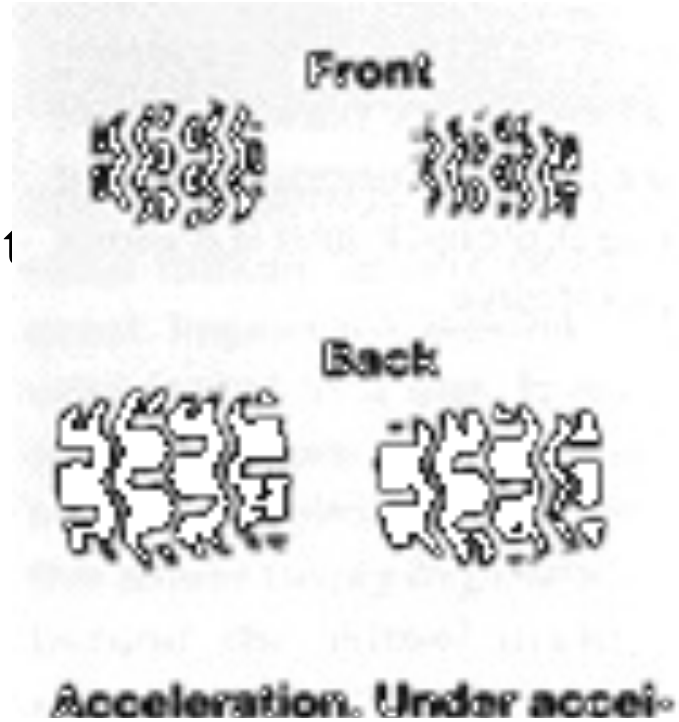


Front gains, rear looses traction



Car Control - oversteer

- Oversteer - do not suddenly lift the throttle
  - Steer into the skid (counter-steer), or
    - Look in direction you want to go
    - Steer the car there
  - Gently add throttle - transfer weight to rear
  - Avoid the tank-slapper
    - Be ready to catch the rebound
    - Release the counter steer as you feel t stabilization
    - Ease off the throttle a touch as well
  - Note this is what the video called the advanced
  - technique



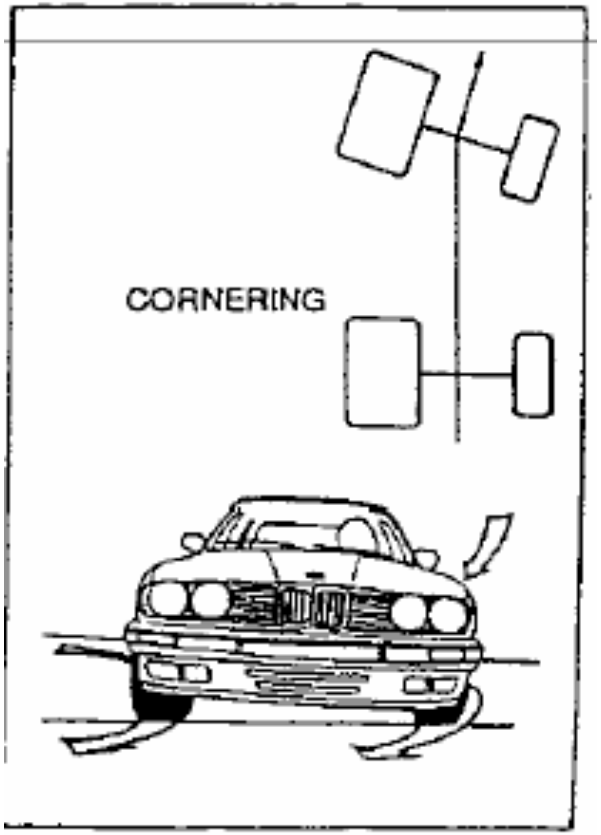
Weight transfer - cornering

Outside - weighted - wheels have more traction

Even ice racing this happens

And it has consequences, helping the outside wheels to bite better

Combine with weight transfer to rear by increasing throttle and pin the outside rear end in place as you corner!



Car control - understeer

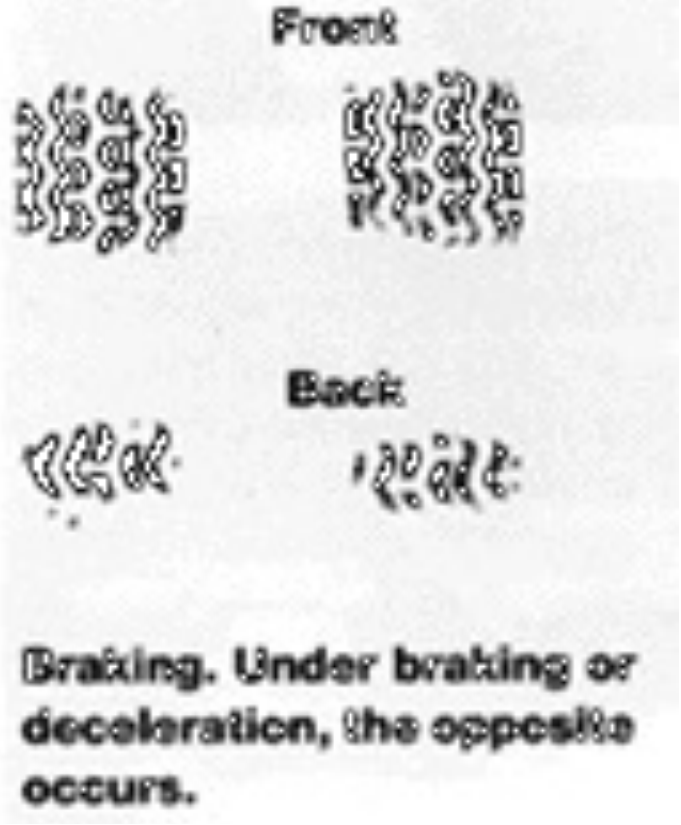
- RWD
- Understeer - do not suddenly lift the throttle
  - Reduce steering input slightly
  - Gently reduce throttle - transfer weight to front

Or deliberately unsettle the rear

Use a heavy lift to transfer a lot of weight to the front wheels, and wait to start to rotate.

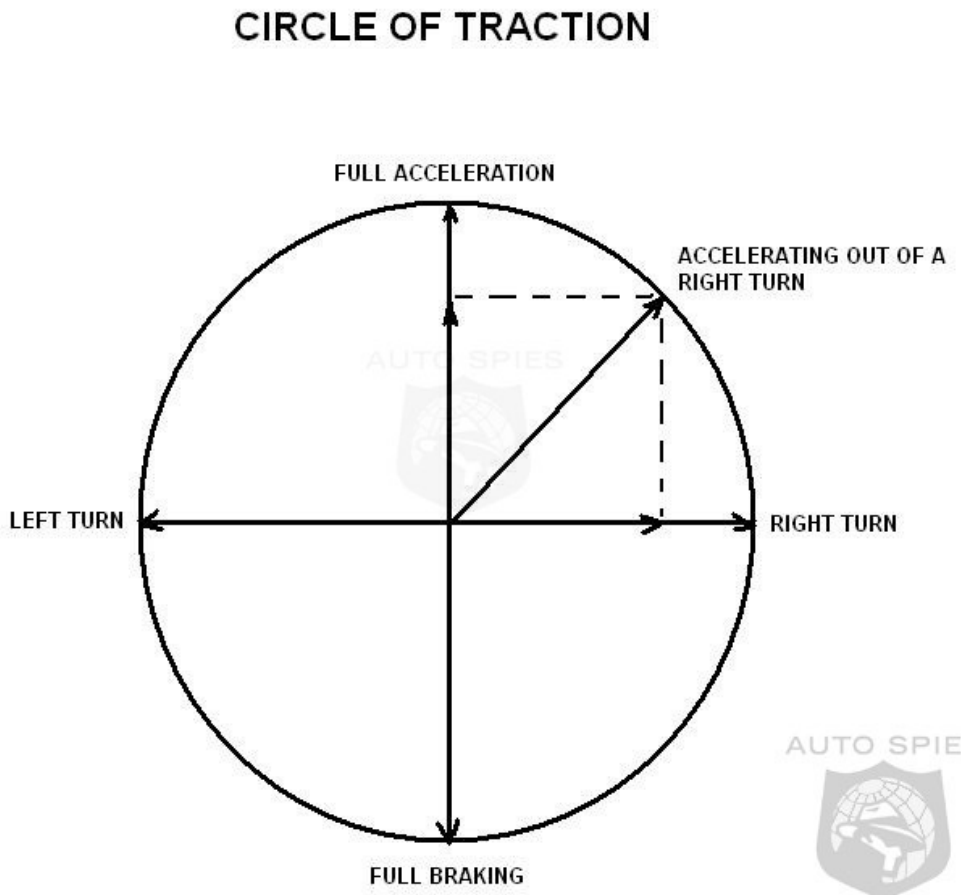
FWD drivers pay attention!

Then get hard on the throttle, and correct the direction with the front wheels



TRACTION CIRCLE (part 6)

- Represents the maximum force that the tire is able to endure in any direction
- Requires smooth steering input, transition to acceleration or braking to not exceed the limit
- Fast requires as close as possible to limit
- Steering input should be constant during a corner
- Imagine a glass of water on the dash



ADHESION IN THE RAIN

Racing in the rain separates drivers - eg Lance Stroll's best moments

All the same concepts apply, except for finding grip that may not be on the standard racing line

Traction on wet tracks reduces approximately:

- Acceleration – 30% less
- Braking – 50% less
- Cornering – 80% less

Rain tires can help, but the percentages stay the same.

Racing in the rain is not all bad, Jay Pringle puts it well, you can:

- Highly rewarded for being smooth (jerky inputs = off track)
- You can play with car control at slower speeds
- Enjoy less stress on brakes, tires, fuel and temps
- Have a lot of fun!

BRAKING TECHNIQUE (PART 7)

- Slowing the car properly is the ticket to racing fast

- Threshold braking
  - Maximum braking without locking up
  - With ABS equipped vehicles, will feel brake pedal pulsing
- Trail braking – some braking while turning
- Left Foot braking – combined brake, throttle, turning

Racing Basics: Braking

- Straight line braking – 3 parts:
  - Throttle to brake transition
  - Straight line braking - threshold
  - Brake to neutral throttle transition

  - Advanced technique:
    - Threshold braking in straight line
    - Continue braking while turning (trail braking)
    - Practice this in Corner 6 later in the day

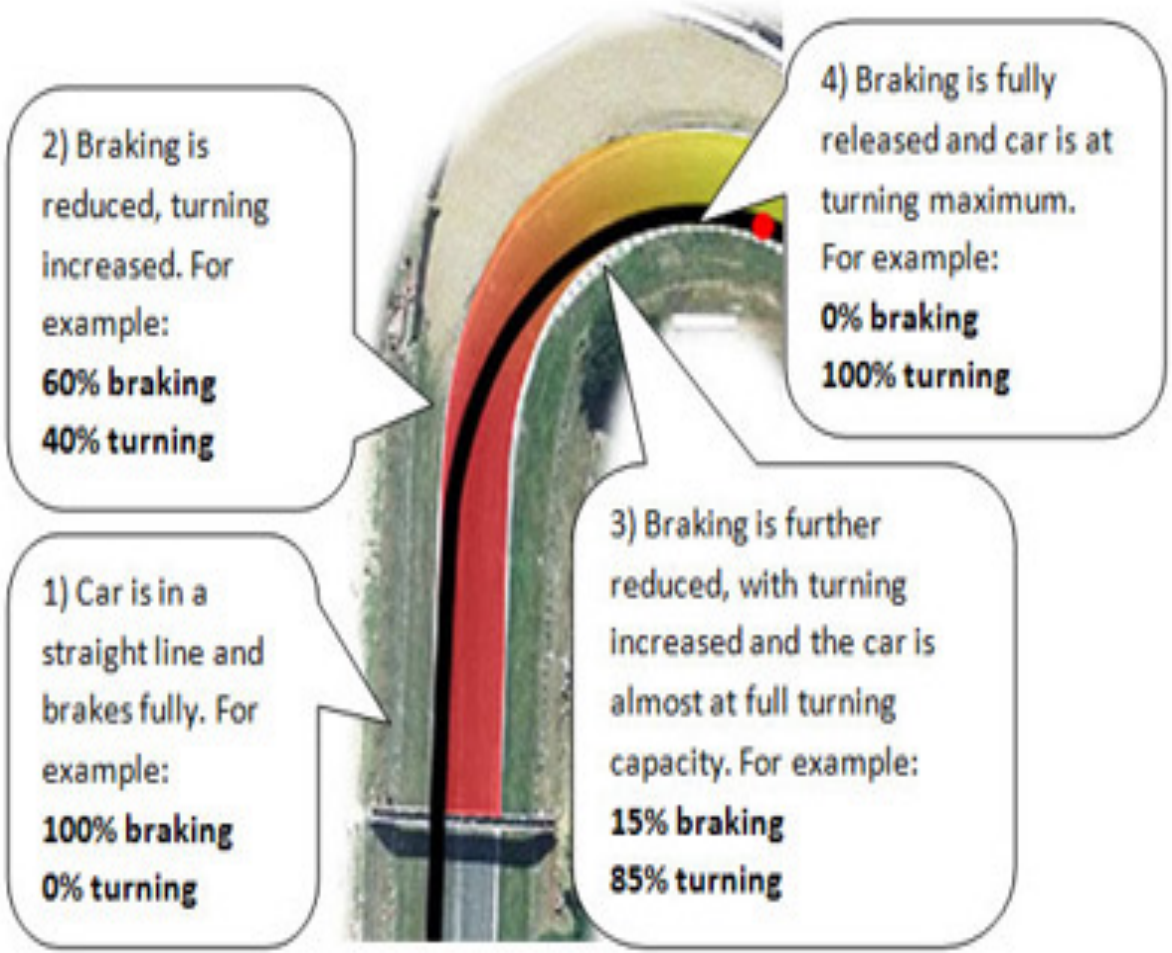
Threshold Braking

- 'The procedure'
  - Find the braking point
  - Find the threshold – no lockup (ABS activation)
- Throttle - brake transition
  - Rapid transition from throttle to brake
  - No hard impact on pedal, squeeze the brake on
- Brake - throttle
  - Come smoothly off brake
  - Transition to an even throttle
  - Squeeze on acceleration as the line allows
- Mistakes – Difficult to do really well
  - Jump on or off too abruptly
  - Too early, too late

TRAIL-BRAKING

- Technique that combines braking and turning during corner entry. Allows for later braking thereby increasing corner turn-in speed.

- Weight transfer to front reduces understeer
- Imagine a string from the bottom of the steering wheel tied to the brake pedal
- Mistakes will be punished immediately



Advanced skills - Heel and Toe

- Smoothness in Shifting - as in gear selection
  - heel and toe
- matching the engine revs to wheel speed
  - Prevents wheel hop, lockup, sliding or spinning
- Makes for smooth downshifts at speed
- Not a method to learn for the first time at the track - practice on a country road first

Advanced skills - Heel and Toe

- Foot and pedal placement is important
- 1) Apply brake, with half of foot
- 2) disengage clutch
- 3) roll foot over, or twist heel over to apply throttle "blip" with foot still on brake
- 4) Re-engage clutch before rev's drop back too much

Watch the 7 sec Heel Toe video 3 or 4 times in a row, then return to Zoom

DRIVING TECHNIQUE (PART 8 LIVE)

Smoothness - Analog vs. Digital, Dimmer vs. Light Switch

- Technique of achieving maximum acceleration, braking and cornering
- Smooth building to max over a short time period
- Tires are calling to you, you can't hear them if you're shouting with the controls

Throttle steer

- Use of throttle to control the understeer/oversteer characteristics
- Changes rear tire slip angle to induce oversteer
- Most effective when cornering near the limit

Left Foot Braking

- Shift weight to front wheels

Race Driving - the Secret Sauce (part 8a)

- Race Car driving is simply more precise
  - Qualifying laps, consistent and daring
  - Same principles as HPDE
  - "The rules dictate some things, but in terms of driving you just try to go as fast as you can." - Kimi Raikkonen
  - "All of us drivers take our car, fast or slow, to the limit. And when you're at the limit, it's like wrestling a bull." – Lewis Hamilton
- F1 has started posting good vs great lap analyses
  - It starts with analysis of the data
  - And visualization of car attitude on track

- Start with a Charles Leclerc Lap comparison

The minimum data

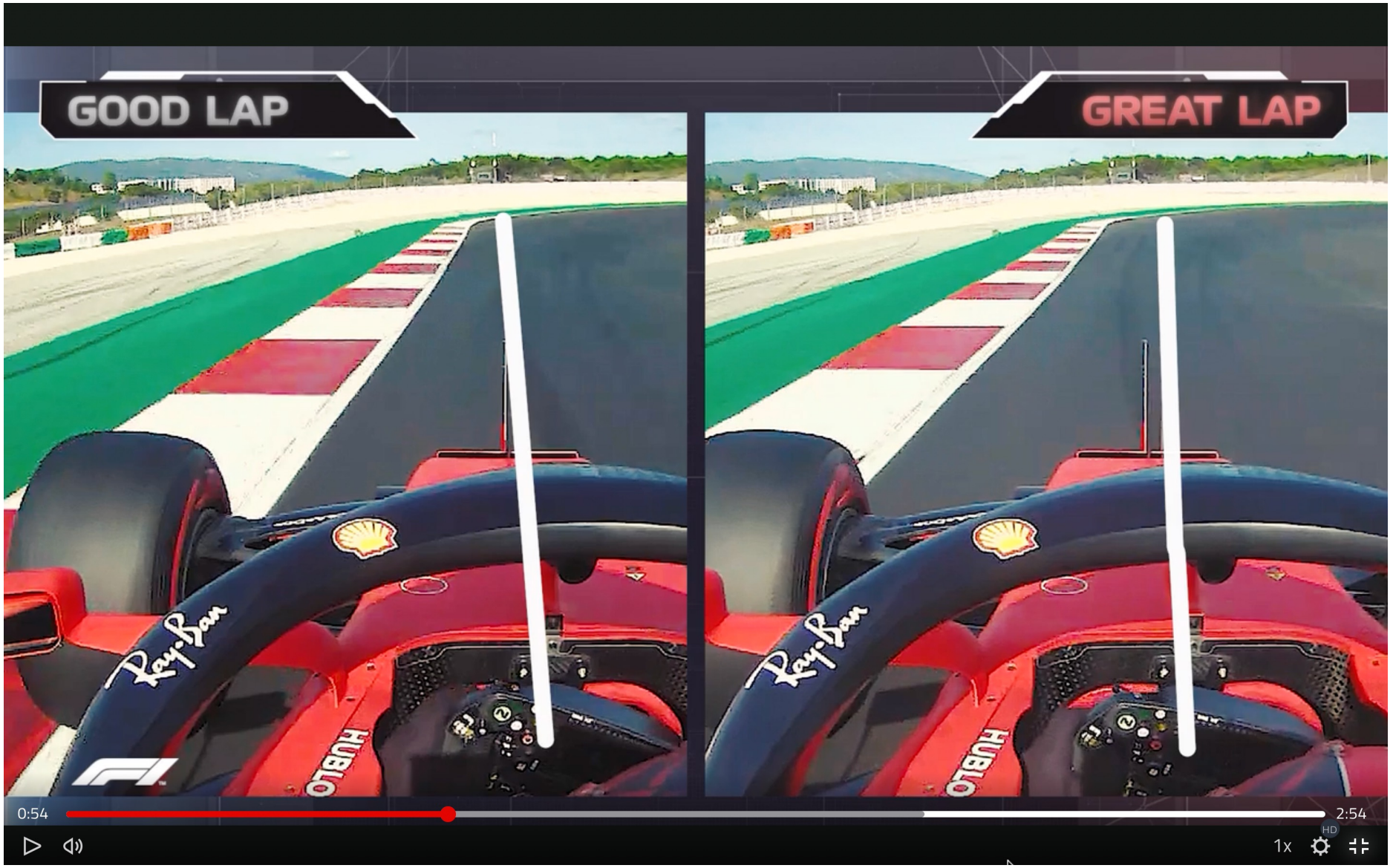
Red – great lap
Grey – good lap

Lines – throttle
Blocks - brake duration

Leclerc Lap – Car attitude

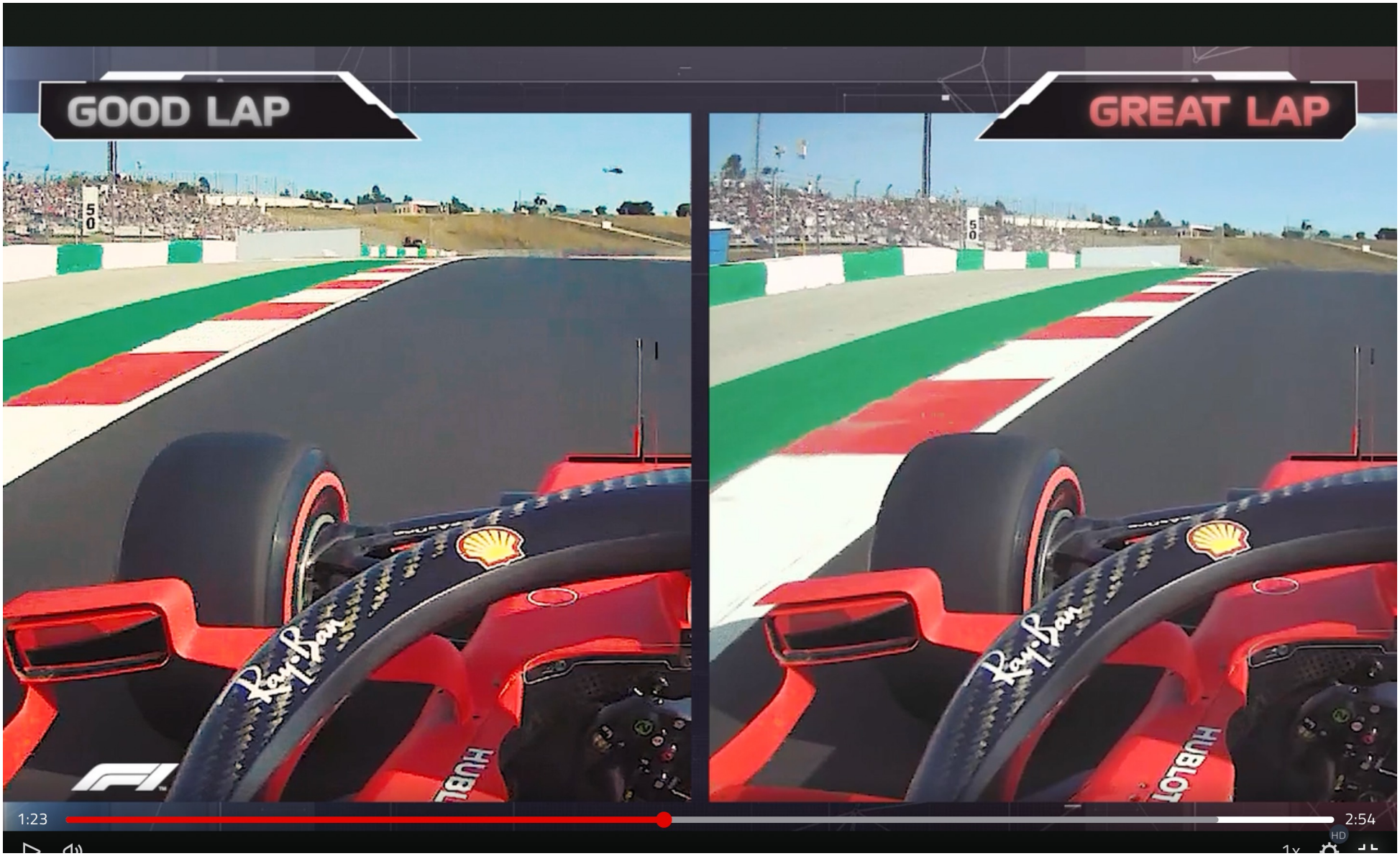
Improved angle of attack at corner entrance

F1 Leclerc Portimao



Leclerc Lap – larger radius

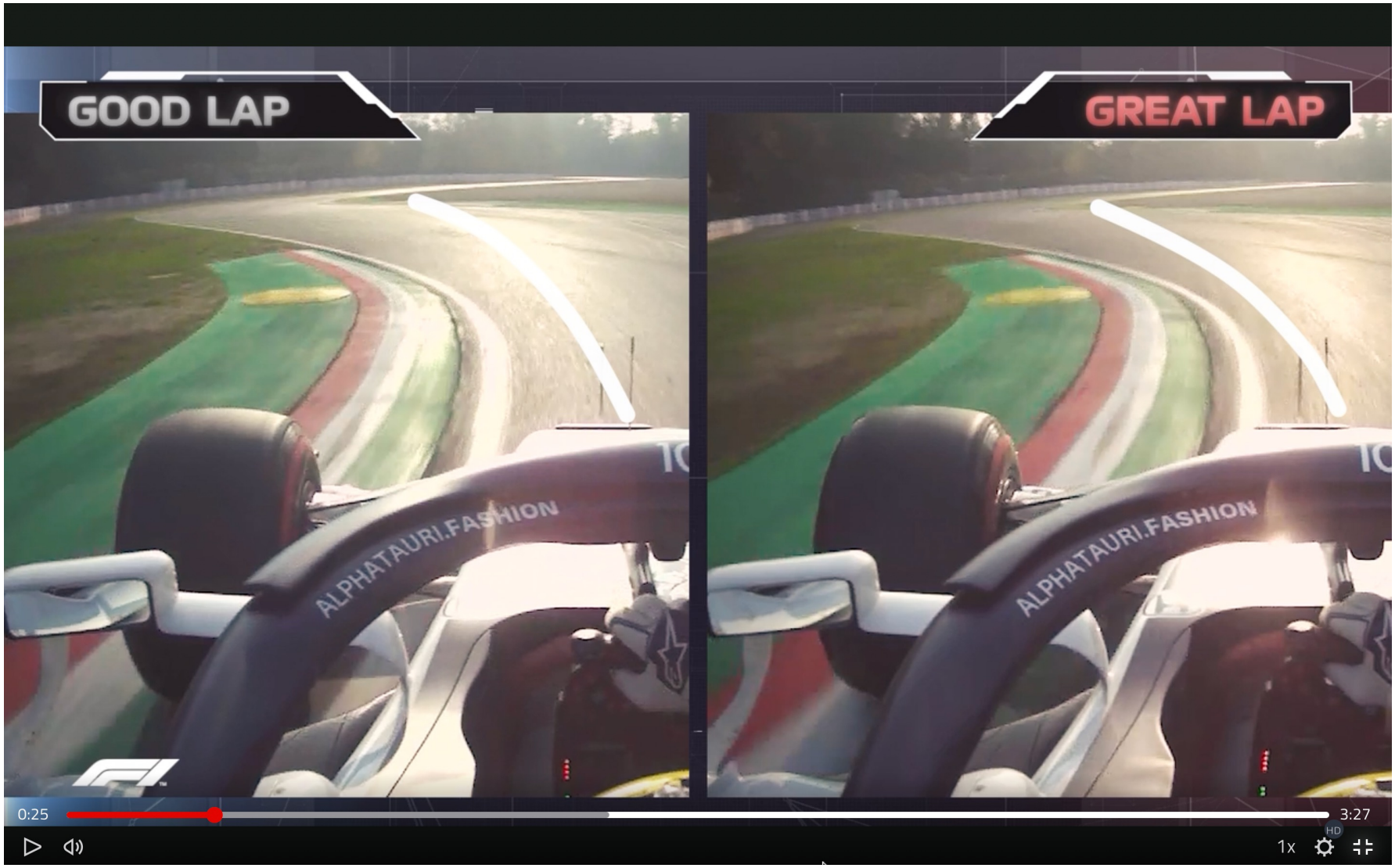
Use all the track, increase the radius of the corner, higher cornering speed



Pierre Gasly – use the brakes to go faster

Control Car balance at corner entrance, and before throttle input, using the brakes
And improved angle of attack (car attitude)

F1 Pierre Gasly at Imola



Session 1 – Learn the Line (part 9 live)

- Optimum path called "the line"
  - maximize radius of corner
    - general rule, some corners are special
  - Primary focus is on allowing early acceleration
  - Secondary focus is on carrying maximum corner speed
- Importance of braking points
- In-car instructors may ask to drive student's car to demonstrate for the first 3 laps or so

Session 2 – Focus on braking

Importance of braking points

- the braking points
- the acceleration points

- Reinforce and refine “the line”
  - Consider car attitude
    - – angle of attack to corners

Session 3 – Emphasis on Vision

- Importance of **VISION**
  - Car goes where you are looking
  - Look further down the track, look ahead
  - Look **past** the turn-in to apex when turning in
  - Look **past** the apex to track out, before the apex
  - Look **past** track out toward the next corner once at the apex.
- Awareness – towards situational awareness
  - Green flags thrown students expected to call out when they see them – feedback on how quick they are
  - Towards end, ask students what car is behind, what is front

Session 4 – weight transfer

- Importance of balancing the car
  - Applying brakes, throttle or steering shifts weight (load) around the tires
  - Smooth application of inputs helps keep the car balanced
  - Abrupt inputs unsettle the car, reducing grip
  - Braking loads the front, enhancing turning grip
  - Throttle loads the rear, keeping the back end pinned to the track and reducing sliding
  - Turning reduces grip for throttle or break

Session 5 – Rolling Starts

- Student Side-by-Side & Rolling Starts
  - Instructors in car or observe from corners
- Sub-groups of 5 or 6 cars within the colour run group, organized in paddock
- Pace car for every sub-group of cars (so 3 Pace cars)

- Rolling start practice,
  - Follow pace car, maintain speed when it jack rabbits away before the start line.
  - Continue side by side run until green is thrown, then race to the checker flag
  - Regather behind the pace car side by side, and follow pace around track maintaining side by side and keeping up with pace.
  - Repeat, and run the side by side faster each time.
- After about ten minutes
  - Black Flag All will bring you through the hot pit lane,
  - and then back on track for a regular session
  - Lead/follow students proceed to paddock to collect instructor car

Session 6 – Smooth is Consistent

- Student Solos
  - Instructors observe from corners
- Build speed up over the session
- Students use the feedback they have been given
  - VISION is still the key – look further ahead
  - Smooth application of brakes, squeeze on, release gently
  - Smooth application of throttle, squeeze on, release gently
  - Get to the apex, use all the track