Actual word target: 7000, Current target at least 6000

Things to mention:

- Main focus on speed, redundancy and reliability,
- Rated torque vs max
- Emphasis on how the car handles, ipg might have most optimal solution, but if car has a small 'sweet spot' then very hard for driver to actually drive that fast, if unable to deal with the understeer/oversteer characteristics of the car

General start stuff:

- Why choose what we chose, what effect does it have on me and what 'variables' are most important for me or my responsibility or i have the biggest effect on?
- What rules are directly explicit to me from the regulations from FSG
- Abbreviations?

KPIs:

- Mention how better handling will not show explicit results in sim, but will result in quicker results on track
- Show that target is based on development of the last few years, and to beat the potential for the following year

Current setup for future development: Emphasis on how model has made future development easier:

- Model has been fully explained (if possible) proof shown in model screenshots in appendix
- Model built in clear subsections (bit of a weak point imo, maybe as an add on to the next point) (or make point that previous model, not easy development or justification for everything) **Can I crap on last year?**
- Model made in both MATLAB co-sim with IPG AND as a plug in with IPG standalone·
- IPG standalone model means easier development for other team members in TBRE like aero and chasis·
- Co-sim IPG very important as standalone plug in has to be complied each time and plugged into model (so slow/bad development), co-sim means model adaptations are quicker and easier·
- Co-sim more importantly (once adapted) allows MATLAB command terminal to run ipg sims, allowing scripts to be built to look at a range of thousands of inputs and easily determine what affect they have (mention why you cannot run ipg from.exe, without visual) file which means its more efficientt
- Start of devopment, certain issue occurred with development, PDF created to explain how to run models, and solutions to common problems that I faced, along with resources used· GitHub folder created with scripts, models and explain pdf

Torque vectoring: 2 types: rear biased torque vectoring and left/right TV

- Explain theory of torque vectoring here
- Perhaps ‘hard limits’ explained here, along with how power is limited to 80Kw
- Perhaps explain parts of model to do with TV
- Perhaps all theory explained here (yaw error vs sideslip perhaps mentioned here, but explained in results)

Rear Biased Results:

- Ideally can be set to different levels, should in theory change oversteer/understeer.
- Perhaps explain difference between between yaw error and actual oversteer/understeer (advanatge of ipg allowing us to look at all sensor data including wheel sideslip).
- Do simulation showing oversteer/understeer levels, and the difference between different torque biases, including one with hard limit, one with ‘extra biasing’ (where if 4 x 21 Nm of Trq is available, but throttle is high, then when front/rear reaches limit, spare trq will be given to opposing axle so car can go faster (more important than the bias?) perhaps show if it makes much of a difference (perhaps theres more total slip, or just lateral.
- Make point that even though IPG runs everything at same speed, the driver is not max Verstappen and will not be able to drive peak performance of a car that is hard to handle.

Left/Right TV Results:

- Is d in pid affective/needed?
- Show results of affects of PID on average error, perhaps look at peak error as well, does that correlate to steering as well?
- Should there be 2 different options for traction ctrl llvl? One for low peak error, the other for low error average? Does wheel longitudinal slip correlate with high errorr peak? Could good slip cntrl help with lower peak?
- Perhaps explain why time isn’t affected as much, but perhaps will affect more in real world
- Show results of testing means there is a linear response to driver input of lvl of trq vectoring from zero to 1, shows in reduction in average yaw error from max to min
- Show how you can now have ‘personalised PID’ and also new subsection showing PID based on TV lvl
- If it makes sense show graph of actual axle side slip if it supposts data/driver handling
- Can show impact of trq to wheels left right as ‘proof’ or visual aide

Redundancy Results

- Investigate reason for 4 motors was redundancy, mention how this falls under motor control
-

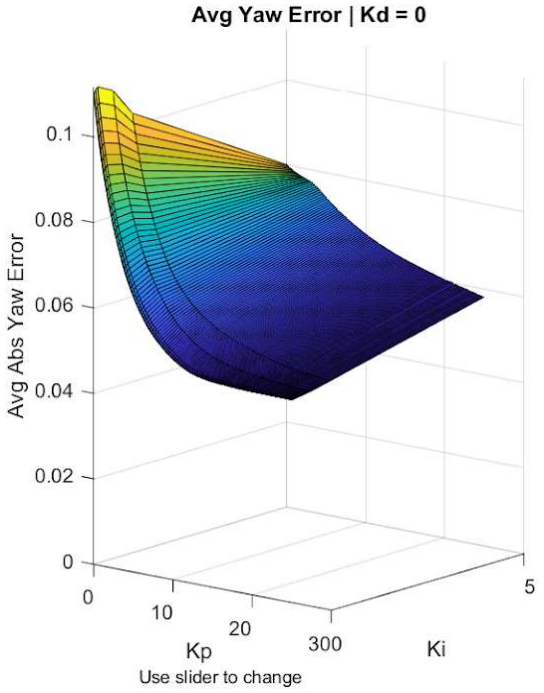
Max power Results:

- Maybe explained at the start before TV, show total power consumed, how its limited to 80, explain how safety factor is calculated, maybe show how when simulating TV, total power delivery is the same regardless of constants

Traction control:

- Explain the traction control and graphs and how they work, then show results
- Investigate different affects of calculating wheel slip (e.g if using gps, is that valid or accurate enough, how quickly does ipg update (maybe 20ms) and how quick and accurate is actual gps, would gnss be worth looking into, or perhaps true speed ground sensor, maybe a place for future development to see how much more affective gnss would be as apposed to gps
- LEADING OFF LAST point, to simulate real gps, could perhaps have a random number generator, which puts the actual vehicle speed within 2-3% of what it actually is and see how effective gps is. SO either make this or idea for future development
- Compare looking at taking rear wheel speed as the 'base' perhaps since we are power limited to 4 wheels there is less trq per wheel, less slip?
- Does calculating a different theoretical radius per wheel make a difference in accuracy?
- Do tests to show linear response to traction control level from 0 to 1, and perhaps different method can be taken in subsystem. Should this be a switch that driver can choose from, if gps fails or rear wheels fail for redundancy purposes. How accurate are different wheels at 'base slip'

Regen

- Calculate what endurance score we can get
- 

Figures and links

FSG rules and skidtrack (2 right turns then 2 left)- https://www.formulastudent.de/fileadmin/user_upload/all/2020/rules/FS-Rules_2020_V1.0.pdf