

## **Team TJA3**

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### **1.) What should occur if there is no time to stop before a collision?**

What lead us to that position? How could you have avoided it? If we're using adaptive cruise control, it maintains a distance. It's going to be very unlikely to get into that situation. If you're about to hit something the car will just brake. The TJA system will always maintain a set distance based on what the driver selected.

### **2.) What is the relationship between the Adaptive Cruise Control and the TJA system?**

TJA is a higher level of ACC. TJA is limited to certain limited access highways. The vehicle needs to know it's position because the system can only be used in certain situations. If you are not on a limited access highway the driver should be alerted that the TJA system will be off.

### **3.) What do you mean by autonomous? What parts of the system are autonomous?**

The system is not autonomous. It is an assistant system. It contains elements of an autonomous system but is not a completely autonomous system. The autonomous parts are position and lane keeping. The driver still needs to steer and be engaged.

### **4.) In which conditions should the TJA system not be activated?**

It should only be activated on limited access highways. The system must analyze all roads in the U.S. and select out highways that would be optimal for the system. The collected data is used to decide where the system should be activated. This requires the system to acquire petabytes of data to decide which roads can be approved. Also, cities like Pittsburgh that have lots of hills and tunnels are tough for the system to work in.

### **5.) How should the system handle hazardous weather conditions?**

The TJA system does not discriminate between weather unless there is a slip condition. Slip control determines if the wheels are all going the same speed. If the wheels are not going the same speed, the TJA system will disengage. If we start seeing slip conditions, the TJA system will notify the driver and deactivate. Additionally, if the radar signals are blocked due to heavy rain/snow the TJA system will notify the driver and deactivate.

### **6.) What is the expected behavior of the car if it enters construction zones?**

The TJA system will maintain the set distance (about a car length), even if the speed limit is reduced. If traffic resumes, the vehicle will gain its speed once more. The driver must take care

of merging into another lane. The TJA system should maintain speed during lane change and be re-calculated after the merge is complete.

**7.) How does the system know if the driver is paying attention to the road?**

Tactile feedback on the steering wheel determines whether the driver is paying attention to the road. Additionally, internal cameras will be used in models after 2022.

**7.1.) Do the internal cameras have any impact on privacy law?**

The data is not recorded but rather analyzed in the moment (real time responsive). It is analogous to a black box in a plane.

**8.) What would be an appropriate maximum speed for the TJA system?**

80 mph is the max speed of the TJA system. It should still work beyond that if it can maintain the set distance. The brake lights should still activate when braking.

**9.) How should we alert the driver when a sensor is blocked, damaged, or broken?**

It should come up as a sign on the text display, such as “Forward looking sensor blocked”, on the dashboard.

**10.) What would be the parameters that the driver is able to control?**

The big two are speed and following distance. The levels are likely split into 1 car length, 2 cars length, or 3 cars length (decided by the user). Additionally, tapping the brakes will cancel the TJA system. There will be a resume button to reset to the previous settings.

**11.) How will the driver always be able to take control of the system?**

Tapping the brakes will disable the ACC system, and as such, the TJA system. There is a cancel and resume button on the steering wheel. There is an on/off button that shuts the TJA system off, including the ability to resume.

**12.) What are the limitations of current TJA systems?**

Lane keeping can be hard because of bad lane marking or weather conditions. Also, cities with lots of hills and tunnels, like Pittsburgh, will hinder the usefulness of the TJA system.

**13.) How will the car know what highways are going to be used? What if these things change?**

There should be a database that knows which highways are considered limited access highways. The vehicle's database can update if changes are made to the data. There needs to be a cloud and security system to store and protect that information.

**14.) What would be the expected behavior of the car if the car ahead of us is reversing?**

There is no expected behavior since this doesn't fall under the TJA system. It becomes the driver's duty to make the appropriate decision. The TJA system is strictly a forward moving system.

**15.) What is expected behavior if there is a broken sensor?**

The TJA system should alert the driver, and the system will deactivate. The TJ system should not be active even if one component is not working as intended.

**16.) Is there a failsafe measure if the TJA system must stop too quickly?**

This is handled by automatic emergency braking. If something unusual happens it is up to the driver to resume the system. The system will not resume itself.

**17.) How should the system handle pedestrians and bikers?**

This should not come up because pedestrians and bikers should not be on highways. The system cannot detect pedestrians. The system will not be able to discriminate between pedestrians.

**18.) What would be the optimal way for the driver to interface with the system?**

The most optimal way is the typical driver controls: buttons on the wheel, the standard accelerator, and the standard brakes. Additionally, the driver can set the speed as required.

**19.) What should the system do during lane changing?**

This is indicated by the driver using a turn signal. It should know which lane we are in and when we are in the middle of a lane change. Lane changing systems will try to steer you back into the other lane if there is no turn signal. The turn signal disables this feature, and the driver can now change lanes. The vehicle will look for a target after lane changing and begin to accelerate/decelerate based on what is needed to maintain a set distance. To emphasis, the target can only be what is in front of the vehicle.

**20.) What should be expected behavior when the driver uses the accelerator?**

If they accelerate, the system allows them to, but after they take their foot off the accelerator, the system returns to the set speed.

**21.) How should the system handle different stages of brake life, hardware, etc.?**

These issues should not be handled by the TJA system. There are other parts in the vehicle that handle this.

**22.) What is the problem that the system is trying to solve? What is the end goal of the system?**

The system fixes driver error/fatigue. The driver does not have to go between the accelerator and brakes in traffic anymore. The more often drivers do this, the more often they will make a mistake.

**23.) What are the minimum power requirements for the system?**

There is no definitive minimum power requirement. There is a lot of effort going into limit power consumption. The system will do its best to optimize power.