September 27, 2019

Docket Management Facility
U.S. Department of Transportation
Room W12-140
1200 New Jersey Avenue SE
Washington, DC 20590-0001

Re: Docket no. FMCSA-2018-0037; Safe Integration of Automated Driving Systems-Equipped Commercial Motor Vehicles

Background & Introduction – Pronto.ai, Inc. (Pronto) is a safety technology company devoted to developing and promoting the use of the most advanced safe driving software and related technologies in commercial motor vehicles (CMVs). We are therefore keenly interested in regulatory proceedings that might impact this technology, and its integration into the commercial trucking industry.

In addition to developing and commercializing safety technologies, Pronto prioritizes proactive engagement with FMCSA, law enforcement and other government agencies at various levels. This provides invaluable mutual learning opportunities that will improve the safety advanced driver assistance systems (ADAS) and, in the future, automated driving systems (ADS). We sincerely appreciate the Agency's proactive approach to identifying regulatory barriers or impediments to the adoption of ADAS and ADS in CMVs.

Pronto Supports Accelerated Adoption of Critical Safety Technologies

Adoption of ADAS and ADS technologies holds the promise of vastly improving CMV safety. The history of improved road safety is a history of improved vehicle technologies, and most highway safety experts agree that the next big advances in road safety will be driven by so-called "Level 2" ADAS technologies. These technologies integrate already proven features such as:

- adaptive cruise control (at all speeds, including heavy traffic and stop and go);
- automatic emergency braking (including full braking to bring a CMV to a stop);
- lane centering (on a proactive basis rather than reactive lane departure warnings);
- video-based driver monitoring that detects *and reacts* to fatigue and distraction; and
- artificial intelligence software (enabling the transition from the current generation of Level 1 radar-based reactive systems to proactive camera-based driver protections).

Consumers that can afford luxury cars are already improving their daily commutes and errands by enjoying the benefits of Level 2 technologies. But this technology actually holds a lot more promise for professional drivers of CMVs, where its impacts are more meaningful because it enhances people's livelihoods (rather than just increasing convenience). Most importantly, a great Level 2 system can dramatically improve the safety of commercial trucking operations. The benefits of safety features that form the building blocks of Level 2 systems have been known for some time, but they are only now coming to market in the trucking space through products like Pronto's Copilot system. These Level 2 systems will, in turn, be the building blocks for more advanced levels of automation for ADS-equipped CMVs.

There are Currently no ADS-equipped CMVs

The commercialization of ADAS technology in CMVs is still in the early stages. Meanwhile, ADS systems for CMVs do not exist. All statements and proclamations concerning "Level 4 trucks" are strictly aspirational and forward looking. Several ADS technology developers have succeeded in building level 2 system for CMVs that are labeled as "level 4 testing" because it is the developer's hope to one day commercialize Level 4 functionality. But, to date, nobody has actually succeeded in building a Level 4 ADS, not even as a prototype.

A handful of one-off prototype demonstrations have showcased the potential ways in which true ADS might be deployed in the future. (Of these, the Otto "beer delivery" in October 2016 is still by far the most advanced.) However, the realization of safe, repeatable, reliable and commercially viable ADS remains at least several years away. It will likely first require a scientific breakthrough in machine learning that has not yet been demonstrated by any technology developer.

We Must Avoid CMV Automation "Safety Theater"

Even though true ADS will take time to become a reality, Pronto fully supports this request for comments and FMCSA's broader efforts to engage in an intellectually honest dialogue with all stakeholders concerning the eventual deployment and integration of ADS-equipped CMVs. In this respect, the Agency should consider the cautionary tale of the "safety theater" that has plagued the passenger vehicle ADS space for the past several years.

Pronto is a leading voice against the practice of promoting rhetoric and platitudes that create the illusion of safety at the expense of actually delivering improved safety (which is what we define as safety theater)[1]. ADS technology for CMVs is broadly perceived as lagging far behind the automation technologies in passenger vehicles. However, this perception is, in large part, fed by the safety theater prevalent in the autonomous vehicles industry.

There is almost no data available on the actual performance of the thousands of passenger vehicles and millions of miles they have driven in "autonomous" across many states. Yet an analysis undertaken by Pronto on the limited data that is publicly available suggests that ADS developers crash more often than the average driver, and this despite the presence of safety drivers and engineers in those test vehicles[2]. This has already resulted in hundreds of preventable crashes, many injuries, and at least one death.

We must do better as an industry and we have an important opportunity to avoid repeating the misaligned safety incentives of the robotaxi industry when developing ADS for CMVs. Therefore, Pronto enthusiastically welcomes FMCSA's calls for greater transparency and meaningful dialogue. The Agency should remain vigilant and stamp out attempts to introduce automation safety theater in the CMV realm.

Pronto's Reponses to Some Section XI Questions

Because of the still-nascent stage of ADS technology and the uncertainty surrounding what the missing scientific breakthrough will require, it is difficult to accurately predict how a real ADS for CMVs will ultimately be built. As such, some of FMCSA's questions below are currently difficult to answer. Nevertheless, we provide our thoughts on technical approaches that we

[1] See *Automotive News*, "Exec warns of too much public road AV testing", August 19, 2019.

[2] See "Closing the Curtains on Safety Theater," available at https://medium.com/pronto-ai/closing-the-curtains-on-safety-theater-f442b70645a4

believe may work and which meet FMCSA's stated goal of facilitating the safe, gradual and evolutionary integration of ADS-equipped CMVs into interstate commerce.

1.1 (How) should FMCSA ensure that an ADS-equipped CMV only operates consistent with the ODD for the ADS equipped on the vehicle?

ODD restrictions should primarily be enforced by a combination of technology (with the ADS system itself able to recognize a departure from its ODD) and operations (through detailed training and oversight by motor carriers of their operators of ADS-equipped CMVs to ensure they are properly using the equipment).

FMCSA should be wary of ODD definitions that are extremely narrow, specific and limited, because ADS systems that can only operate within such a niche ODD could present a serious safety hazard when driving conditions change and thereby render the CMV to be outside its ODD. For example, an ODD definition of "I-10 between exits 3 and 19 in lane number two, when temperatures are between 60 and 90 degrees Fahrenheit with no precipitation, winds below 10mph, no road construction, and in light traffic between the hours of 10am to 2pm" presents a much higher safety risk relative to one that is defined as "Any limited access highway, excluding severe weather events."

1.2 What are manufacturers' and motor carriers' plans for when and how Levels 4 and 5 ADS-equipped CMVs will become commercially available?

As mentioned above, Level 4 and 5 ADS-equipped CMVs are still years away and will require scientific breakthroughs to fully realize. All current "Level 4 testing" is actually at Level 1 or 2 functionality. This makes it difficult to forecast when and how such ADS-equipped CMVs will become commercially available.

Overall, Pronto believes that in order for ADS-equipped CMVs to improve safety, they will need to be deployed in a manner that smoothly integrates into the existing truck freight ecosystem (as opposed to reinventing the entire supply chain or requiring new infrastructure). Similarly, it is Pronto's view that safety will be maximized if ADS developers work with and view today's motor carriers as customers rather than as competitors to ADS developers' in-house motor carrier operations.

Pronto believes that it will be safest to gradually introduce Level 4 and 5 technologies and only after a meaningful commercialization of Level 2 ADAS in CMVs. Prior to September 2019, there were no trucks offered for sale in the United States that had any electronic steering capabilities. Similarly, electronic braking for features like automatic emergency braking have been far less functional in CMVs for many years than in passenger vehicles. It is therefore hard to imagine how any CMVs could safely be commercialized at Level 4 without first perfecting the necessary Level 2 ADAS hardware and software foundations.

Finally, the deployment of Level 2 ADAS in trucking should raise the safety threshold for commercializing Level 4 and 5 CMVs. Pronto believes that automation technology should be used to make CMVs operate as safely as possible before it is used to operate CMVs as inexpensively as possible. Therefore, it is not be sufficient for a Level 4 CMV to simply be as safe as a driver operating a CMV without the benefit of any safety technologies. Instead, a Level 4 CMV should be

required to be at least as safe as a Level 2 CMV with a fully engaged driver would be. Anything short of that means that the Level 4 ADS would not operating as safely as it otherwise could if it was simply restricted to Level 2 operations.

1.3 Should FMCSA consider amending or augmenting the definition of "driver" and/or "operator" in 49 CFR 390.5 or define a term such as "ADS driver" to reduce the potential for misinterpretation of the requirements?

Yes. Amendments, clarifications, or additions to all of "driver," "operator" and a new term like "ADS driver" could go a long way towards eliminating confusion and clarifying the rules and responsibilities for when technology performs parts or all of the tasks that, at the time 49 CFR 390.5 was promulgated, were done entirely manually by a person.

2.1 Should a CDL endorsement be required of individuals operating an ADS-equipped CMV?

Due to the early stage of technology development and very limited commercialization to date, it would be difficult at this time to establish uniform knowledge and/or skills tests to assess a CDL holder's understanding of a vehicle's ADS, its capabilities and limitations, and the relevant ODD. As such, we believe it's premature for FMCSA to consider a CDL endorsement. However, as ADS technology matures, standardizes, and becomes commonplace in CMVs, there may well come a time when a CDL endorsement would be advisable.

2.2 If so, what should be covered in the knowledge and/or skills test associated with an ADS endorsement?

See answer to 2.1

2.3 What would be the impacts on SDLAs?

See answer to 2.1

2.4 Should a driver be required to have specialized training for ADS-equipped CMVs?

Yes, we believe all drivers operating ADS-equipped CMVs should undergo and be required to complete a specialized driver training program developed by their motor carrier and the ADS technology developer. There is no substitute for an effective training program to help ensure that all drivers operating ADS-equipped CMVs understand how best to use the technology. It is essential that all affected drivers understand not just the capabilities, but also the limitations of all the technologies at their disposal. As trucks become steadily more advanced, this kind of training will be critical. In our view, rigorous training is a critical component of realizing the safety promise of both ADAS and ADS safety technologies.

2.5 In an operational model that has an individual remotely monitoring multiple CMVs, should the Agency impose limitations on the number of vehicles a remote driver monitors?

Yes. Remote monitoring is a difficult and highly sensitive task so limits on remote monitors are essential to ensuring safety. There are two additional factors that Pronto suggests FMCSA should consider, as each of them may prove to be even more safety-critical than a specific maximum number of remotely monitored vehicles. These relate to the wide variation that both of the words "remote" and "monitoring" could take in a remote monitoring operation.

First, the physical location and situational awareness of the remote monitor is highly relevant to that person's ability to effectively monitor one or more ADS-equipped vehicles. For example, a remote monitor could be within line of sight or otherwise able to directly observe the CMV. This could be in the context of yard operations where the remote operator is herself physically in the yard, which is akin to the manner in which autonomous trucks already operate in mines today. That kind of remote monitoring raises different safety concerns than remote monitoring where an operator is sitting in front of a computer screen in an office building hundreds of miles away (or potentially even in another country) while the CMV is driving on a busy stretch of highway. In general, the more "remote" that a remote operator is, the more serious the potential safety risks of supervising one or more vehicles. Thus, different rules and limitations should potentially apply to different levels of remoteness.

Second, the Agency should clearly define what it considers "monitoring." Some remote monitoring simply supervises and helps an ADS-equipped CMV navigate a certain obstacle by suggesting a path for the vehicle to follow or a course of action to take. But, in such a scenario, it is still up to the ADS system to maintain safety and come to a minimal risk condition stop if it is somehow unable to execute the suggestions of the remote supervisor. That type of operation is quite different than direct remote control driving of a CMV. In a remote driving setting, it is not the ADS technology that is making safety-critical driving decisions. Instead, during those periods, the ADS system is inactive and the CMV is simply a drone CMV that is entirely under the control of a distant human. Therefore, Pronto suggests that FMCSA distinguish between remote supervision of ADS technology and remote driving of drone CMVs, as the two scenarios raise very different safety questions and likely require different rules. (We note, also, that it is possible for the same physical vehicle to alternate between being in ADS-mode and in drone-mode in the course of its journey and that potentially very different rules could apply to the same vehicle depending on which mode it happens to be in.)

2.6 Is there any reason why a dedicated or stand-by remote operator should not be subject to existing driver qualifications?

No. Dedicated or remote operators should be subject, at the very least, to the existing driver qualifications. It is imperative that a remote operator understand what it physically feels like to drive a CMV. In addition, they should be required hold a valid CDL in the state where the CMV is physically driving, and to have personal experience manually driving a CMV on that exact road. Otherwise, the remote operator would struggle to gather situational awareness and provide the appropriate suggestions or commands to the ADS-equipped CMV. Once again, Pronto strongly suggests that FMCSA distinguish between remote supervision of ADS-equipped CMVs and remote control driving of drone CMVs.

3.1 Should HOS rule changes be considered if ADS technology performs all the driving tasks while a human is on-duty, not driving; off-duty or in the sleeper berth; or physically remote from the CMV?

Yes. HOS rule changes should be considered if the technology performs some or all of the driving tasks while a human driver is in the CMV. If a person is in the driver's seat and is expected to perform some job while the technology is performing some or all of the driving tasks, then the driver could be considered on-duty, not driving, so long as the ADS is advanced enough to guard against driver fatigue or inattentiveness.

The HOS rules are, of course, safety rules, but they also serve as operating rules for the industry. As FMCSA is aware, inflexible or outdated HOS rules can be a source of frustration for many drivers and trucking operations. The deployment of ADS technologies provides FMCSA with a unique opportunity to review and consider HOS-related changes that could provide the industry with incentives to accelerate adoption of safety-improving technology.

3.2 Should the HOS requirements apply to both onboard and remote operators?

Yes. Once again, Pronto suggests that FMCSA distinguish between remote supervision of ADS-equipped CMVs and remote control driving of drone CMVs. Even though both are, in some sense, remote "operators," the job functions and the risks they present differ greatly. Similarly, how "remote" the remote operators are from the CMV in question may also impact decisions concerning HOS requirements.

3.3 If so, how should HOS be recorded when an individual is not physically in control of the vehicle?

If the individual is required to be engaged or perform some work-related task, then an on-duty, not driving status is appropriate. If the individual is not required to be engaged, or if the person is in the sleeper berth, then either the off-duty or sleeper berth status is appropriate.

4.1 Should some of the physical qualification rules be eliminated or made less stringent for humans remotely monitoring or potentially controlling ADS-equipped CMVs?

No. As more fully explained in our answer to 2.6, remote monitors and remote drivers must understand and be able to themselves manually drive a CMV in order to be able to do their jobs safely. If anything, remote drivers of drone CMVs should likely be required to pass <u>more</u> stringent qualifications due to the psychological and other risks associated with driving a heavy vehicle in live traffic without full situational awareness. Moreover, CMV drivers risk their own physical safety whenever they drive their vehicles. In contrast, remote drivers do not bear any physical risks to their well-being, which potentially meaningfully shifts their performance and risk tolerance. FMCSA should therefore be wary of relaxing any driver qualifications

4.2 If so, which of the requirements should be less restrictive for human operators who would take control of an ADS-equipped CMV remotely?

None. See 4.1 above. Pronto suggests that FMCSA investigate cases where more stringent requirements may need to be applied to remote driving.

4.3 Should the Agency consider less restrictive rules for humans who have the benefit of ADS technology to assist them in controlling the vehicle (e.g., technologies that would enable individuals with limb impairments to operate at a level comparable to individuals without such impairments)?

Perhaps. Such scenarios are likely to be highly context and technology specific. As such, they would be better addressed through pilots or exemptions related to existing rules, where a safety equivalence demonstration would need to be made, rather than through the promulgation of broadly-applicable less restrictive rules.

5.1 How should the prohibition against distracted driving (i.e., texting, hand-held cell phone) apply to onboard operators responsible for taking control of the CMV under certain situations, and to remote operators with similar responsibilities?

This depends on the specific capabilities of a particular ADS system and its proper use. If an onboard or remote operator is required to be attentive and monitor the CMV at all times, then the same prohibitions should apply. If the operator does not need to be attentive at all times, then the rules could be relaxed during those times.

6.1 Should FMCSA consider revising its rules to ensure that (1) any human exercising control of an ADS-equipped vehicle must continue to comply with all the rules under Part 392, and (2) a CMV under the control of a Level 4 or Level 5 ADS must satisfy the operational rules?

Yes. But we suggest building in some flexibility for technology-based solutions to achieve the same ends, even if through slightly different means than a person would.

6.2 For example, should FMCSA require that the ADS be capable of identifying highway- rail grade crossings and stopping the CMV prior to crossing railroad tracks to avoid collisions with trains, or going onto a highway-rail grade crossing without having sufficient space to travel completely through the crossing without stopping?

Yes, but only for ADS where a road with a rail grade crossing is within the ODD for the ADS.

6.3 For scenarios in which the control of the ADS-equipped CMV alternates, or may alternate between a human and the technology, should FMCSA require that both the human operator and ADS comply with the applicable operational rules?

In general, there should never be confusion about who is in full control of an ADS-equipped CMV. It should either be 100% the responsibility of the human operator (even if, at times, some of the driving tasks might be automated, the control remains fully the person's) or 100% the responsibility of the ADS technology. All applicable operational rules should be followed by both the technology and the person at the times when each of them is in full control.

7.1 What qualifications should be required of the individual performing the pre-trip inspection?

This will be context-specific depending on the type of ADS and the business model that will support its commercialization. Pronto is committed to working with FMCSA, law enforcement and other stakeholders to ensure proper pre-trip inspection guidelines be developed for the commercialization of ADS technologies.

7.2 What kind of routine or scheduled inspections should be performed and what types of ADS-related maintenance records should be required?

This depends on the specific capabilities of a particular ADS system. In general, however, we expect that many ADS systems will be able to self-calibrate and self-diagnose for potential failures, thereby catching many potential problems long before a routine or scheduled inspection would. Pronto expects that maintenance records for ADS technology would not be meaningfully different than those of other technologies already found on CMVs such as dashcams, ELDs, or "Level 1" collision mitigation systems.

7.3 Should the inspection period be more or less frequent than annual for an ADS-equipped CMV?

Once again, this depends on the specific capabilities of a particular ADS system. In general, we expect that the existing annual inspections will suffice, especially because there will be more proactive maintenance of ADS-equipped CMVs due to the technology's ability to proactively self-calibrate and diagnose problems without first needing a human inspection.

7.4 Should inspections be mileage-based or time-based (e.g., 1,000 miles, 3 months or 1,000 hours of operation)?

Either could be appropriate and there could be a standard that blends both such as "50,000 thousand miles or 1,000 hours of operation, whichever comes first."

7.5 Should FMCSA impose general requirements for motor carrier personnel responsible for ADS-related inspection, repair, and maintenance tasks similar to the Agency's brake inspector qualification requirements?

Due to the early stage of technology development and very limited commercialization to date, it would be difficult at this time to establish uniform knowledge and/or skills to impose these types of requirements. However, as ADS technology matures, standardizes, and becomes commonplace

in CMVs, there may well come a time when such requirements could be needed. We note, however, that Pronto expects many ADS-related maintenance tasks to be automated and built into the technology itself.

7.6 How could FMCSA ensure that motor carriers apply safety-critical software updates?

FMCSA should consider following procedures similar for those that are already in place for safety-critical recalls of CMV equipment.

8.1 Should motor carriers be required to notify FMCSA that they are operating Level 4 or 5 ADS-equipped CMVs?

During the initial stages of ADS deployment and commercialization, yes.

8.2 If so, how should the carrier notify FMCSA?

Ideally, an existing reporting mechanism like an online MCS-150 report should be considered.

8.3 Should FMCSA require markings identifying the ADS Level of a vehicle?

No. Markings are likely to serve only as a distraction to other motorists, and would likely serve little safety purpose (and could potentially even risk inviting other motorists to "challenge" or "test" the ADS system). However, Pronto does recognize the need to effectively communicate this information to FMCSA and law enforcement through means other than markings.

8.4 Should the Agency require motor carriers to utilize ADS-equipped CMVs that have a malfunction indicator?

Yes, some basic malfunction lights or indicators seem both appropriate and necessary.

8.5 Should the Agency require that motor carriers deploying ADS-equipped CMVs ensure the vehicle can pull over in response to Federal and State officials or move out of the way of first-responders?

Yes.

8.6 How might that be achieved, and at what cost?

There are a number of cost-effective ways this could be achieved through the adoption of uniform vehicle-to-vehicle communication technologies. The ADS industry should help fund and roll out these solutions.

8.7 How would roadside enforcement personnel know that a vehicle can no longer operate safely?

We anticipate that it will be difficult for roadside enforcement personnel to be able to independently ascertain that a vehicle can no longer operate safely. Much of the responsibility for taking unsafe vehicles off the road will instead lie with motor carriers and ADS developers.

8.8 Absent an FMVSS, how could standard indications be provided to enforcement personnel?

Due to the early stage of technology development and very limited commercialization to date, it would be difficult at this time to establish standard indications to be provided to enforcement personnel. Nevertheless, the ADS industry should work towards this goal in cooperation with organizations like CVSA.

9.1 What types of safety and cargo security risks may be introduced with the integration of ADS-equipped CMVs?

The biggest risks are likely to be ones related to remotely accessing a vehicle's controls. Other risks relate to compromising the large amounts of data that ADS-equipped CMVs will collect.

9.2 What types of rules should FMCSA consider to ensure that motor carriers safety management practices adequately address cybersecurity?

There are many cybersecurity standards and best practices from a wide range of industries that FMCSA could look to in order to promote the highest standards of cybersecurity. These include enterprise software, financial services, the electric grid (and the nuclear power industry), aviation, and others. There are also a number of cybersecurity standards and initiatives from government, the computer industry, and the trucking industry itself that would lend themselves to this effort.

10.1 As the development of ADS technology continues, the Agency believes there is a need to learn about the performance limitations of these systems. FMCSA draws a distinction between information about performance limitations (e.g., how well does the ADS keep the vehicle in its lane and under what environmental conditions, etc.) and details about the system design (e.g., the specific types of sensors, or the arrays of sensors and cameras used for input to the central processing unit for the ADS). To what extent do ADS developers believe performance data should be considered proprietary and withheld from the public?

Pronto welcomes transparency and public discourse around ADS performance, especially in the current environment when performance and the current state of the technology is not well understood by the general public.

10.2 Are the Agency's current processes under 49 CFR 389.9 for submission and protection of confidential business information in the context of a rulemaking sufficient to allow ADS developers and motor carriers to communicate essential information to the Agency regarding the operation of ADS?

The processes are likely sufficient but it depends on what the Agency will ultimately define as falling with the scope of "essential information" that it may seek.

10.3 If not, how should those processes be modified?

See 10.2 above.

Summary

We are still in the very early stages of the development of ADS technologies for CMVs. In fact, there are no ADS-equipped CMVs operating on any public roads today and there likely won't be any for several years more. Nevertheless, now is the time to begin addressing many of the important and reasonable questions the Agency has posed so that we can properly align safety incentives when developing ADS-equipped CMVs.

Pronto fully supports FMCSA's proactive approach to the safe integration of ADS technologies. It is especially important to clarify the current state of the technology, the various business models and associated risks for commercialization of Level 4 and 5 systems, the anticipated responsibilities of human operators, and the definitions of ODD. Other topics such as maintenance requirements and roadside inspections will become clearer only after ADS deployments are closer to becoming reality.

Ponto believes that those of us developing ADS systems can and must do better as an industry than we have to date when it comes to engaging with regulators and the public. A transparent and straightforward dialogue on the capabilities, limitations, and safety of the technologies we are building is imperative.

Thank you for the opportunity to comment on this important topic.

Robbie Miller
CEO, Pronto.ai, Inc.

Ognen Stojanovski
COO, Pronto.ai, Inc.