Preparations for IMS

Objectives for IMS operations on 08/23:

- Single vehicle driving with 75-100mph.
- Data collection with autonomous driving sensors. This will be used to prepare the autonomous driving algorithms for multi-vehicle racing (e.g. opponent vehicle detection).
- Verification of vehicle’s capabilities at IMS (Powertrain, suspension, electronics).
- Verification of autonomous driving systems at IMS (CURWB Network, GPS coverage, sensor capabilities).
- Refinement of operational procedures from LOR to prepare for the three-day testing at September.

Thresholds for Teams to meet in preparation for achieving the 8/23 objectives:

- Demonstrate autonomous driving capabilities at LOR at speeds of approx. 75mph. This includes fully autonomous throttle, brake, gear shifting and steering control.
- Demonstrate autonomous safe stop capabilities at LOR at speeds of approx. 75mph. This translates into triggering a safe stop from the chase vehicle and coming to a controlled stop without locking the wheels or the vehicle showing erratic behavior.
- Undertake the steps to achieve this, including: Configuration of the vehicle in general, working GPS sensors, working Drive-by-Wire system and interface, extension of the base vehicle software to run faster than 40mph, verification of the safe stop capabilities.
- Demonstrate that safety is their top priority and that they are capable of establishing the procedures required to achieve the targets for the IMS test.
- Demonstrate autonomous driving passing capabilities at LOR at speeds of approx. 60mph. if they want to run at IMS with other race teams’ vehicles on the track at the same time. This includes fully autonomous throttle, brake, gear shifting and steering control of all autonomous-capable vehicle on the track.
Schedule for the test at IMS on 08/23

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
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<tbody>
<tr>
<td>07:00 – 07:30</td>
<td>Pit built up and vehicle unloading</td>
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<tr>
<td>07:30 – 08:00</td>
<td>Preparation of vehicles for running (pre-cranking and systems check by Juncos)</td>
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<tr>
<td>08:00 – 08:30</td>
<td>Engine warmup and verification of autonomous driving systems on short-stands</td>
</tr>
<tr>
<td>08:30 – Dusk</td>
<td>Testing session with 30 min slots</td>
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Teams can take optional break(s) as they choose in between scheduled operating windows or by choosing to sit out their next operating window. Additional details on this schedule and its associated procedures will be provided by Juncos Racing in advance of the 23rd.

Vehicle operation

- Teams will operate their vehicles in autonomous mode. Manual control is only used for moving the vehicles in and out of the pitlane.
- Only one vehicle will run at a time on the track. The vehicle which will be running at the upcoming slot will be prepared as soon as the current slot starts. The vehicle has to sit at the pitlane exit with engine running towards the end of the session. As soon as the vehicle of the current session enters the pitlane, the next vehicle is given green flag.
- The AV-21 is followed by a chase vehicle for supervision only. This allows to monitor engine vitals as well as the performance of the autonomous system.

Importance of Teams’ vehicle operations at IMS

- The collected data will enable teams to verify that the vehicle as well as the algorithms are capable of running at speeds above 100mph. These steps will be taken incrementally to ensure safety and minimize the risk of having an incident on track. Refinements of the used control algorithms are an essential part of responsible development processes.
- The results from these tests will allow Juncos Racing to make necessary changes to the setup of the vehicle and understand potential areas of improvement.
- The collected sensor data will enable teams to verify that their algorithms to perceive the IMS track. This data is affected by track characteristics, such as materials used for the track and the barriers, the fences, the buildings around the Brickyard and the banking. This verification is a prerequisite to establishing a baseline for multi-vehicle racing at IMS.

Accomplishment of objectives and operations at IMS on 8/23 will position Teams for the resulting objectives for operations at IMS on 09/04 – 09/06:

- Target speeds of approx. 130-150mph.
- Each Teams’ demonstration of autonomous driving software compliance to the race procedures at the race day. This includes: pit exit, pit entry, yellow flags, formation lap as well as red and black flags.
- Teams supervision of their vehicle’s operations from the pitlane without a chase vehicle. This includes a sound set of safety measures implemented in each vehicle’s autonomous driving algorithm as well as communication of all essential data (engine vitals, autonomous driving system data) from the vehicle to the pit.