

DARPA Grand Challenge

Rules

The development of revolutionary technologies is a key objective of the Grand Challenge. Entrants are invited to communicate directly with DARPA regarding any rule that restricts their ability to demonstrate technical achievement and innovative solutions to intelligent autonomous ground vehicle behavior.

The Chief Judge has the authority to modify the rules at any time. Reasons for rules modifications include, but are not limited to, the accommodation of promising but unexpected technical approaches that would have been prohibited by the rules and the exclusion of approaches that seek to win without demonstrating the desired technical achievement in autonomous vehicle behavior that is the purpose of the Challenge. DARPA will announce any modifications to the rules with an e-mail to all entrants and a statement on the Grand Challenge website under “Rules”.

The Chief Judge may revise the schedule of the Challenge and provide interpretation of the rules at any time and in any manner that is required. The Chief Judge’s decisions regarding the rules are based on a number of factors, such as safety, legal compliance, fairness, Challenge goals, environmental protection, and efficient operations.

At any time prior to the National Qualification Event (NQE), requests for rules clarifications should be sent to: GrandChallenge@darpa.mil. DARPA will hold confidential any questions that are designated as team proprietary.

Decisions of the Chief Judge are final.

1 Eligibility

1.1 Team Membership

A team is comprised of the individuals identified to DARPA on the team roster. Only these individuals are team members. Each team must designate a single individual to serve as the team leader. The team leader must be at least 21 years of age and must hold US citizenship on the date of application to the Grand Challenge, and must remain a citizen for the duration of the Grand Challenge. Proof of US Citizenship for the team leader must be provided with the application as described in the application instructions. DARPA representatives will verify these documents at the site visit.

For each team, the team leader will serve as the primary point of contact with DARPA. The team leader must sign the application, must provide a notarized signature on the Certification of Team Funding and Support and Site Visit Liability Statement, and must be present at the site visit, the National Qualification Event (NQE), and the Grand Challenge Event. The team leader will specify the team members and will determine the disposition of the prize should the team be successful. An individual may be the leader of only one team but team members may serve on multiple teams.

Team leadership may be transferred from the team leader to another eligible individual; there may be only one team leader at any time. Transfer of team leadership occurs when DARPA receives a notarized Change of Team Leader form. The form is available from DARPA and must be signed by the existing team leader and the new team leader. The new team leader must also submit proof of citizenship, a notarized Part 2B (Certification of Team Funding and Support), and a notarized Part 5B (Site Visit Liability Statement).

Although the number of individuals listed on the team roster is not expressly limited, DARPA will impose a limit on the number of team members allowed into designated areas at the NQE and the Grand Challenge Event. DARPA will communicate the limit to the team leaders upon notification of selection.

1.2 Non-US Participation and Sponsorship

Individuals holding foreign citizenship are eligible to participate in the Challenge on teams with a team leader who is a US citizen. Foreign corporations and non-governmental organizations may participate as team sponsors. Teams receiving funding or any form of support from foreign governments or foreign governmental organizations are not eligible to participate.

1.3 Team Funding and Support

The cost of developing, fielding, and insuring entered vehicles is the sole responsibility of the individual teams. DARPA will not provide funding for the purpose of Grand Challenge entry or participation.

Each team leader must sign and submit a notarized Certification of Team Funding and Support. This document contains the following certifications:

1. No funding used in the design, development, construction, or operation of the vehicle has been or will be charged to a grant, contract, or other transaction from the government, either directly through such work or indirectly through government-reimbursable research and development, government-funded Independent Research and Development (IR&D), overhead, or general and administrative accounts (known as G&A in the US). This restriction includes funding to pay for labor, travel, equipment leases, or other services that are applied directly to the design, development, construction, or operation of the Challenge vehicle.
2. No portion of the software or hardware used on the vehicle, including the vehicle itself, has been or will be paid for, wholly or in part, using government funding. This exclusion does not apply to government-funded software or hardware that is commercially available or openly available to all teams on June 8, 2004, and through the duration of the Grand Challenge.
3. No patented invention that was developed under government funding is part of the vehicle unless the patented invention is commercially available or is openly available to all Grand Challenge teams on June 8, 2004, and through the duration of the Grand Challenge.
4. Government-owned equipment or facilities have not been used and will not be used in the design, development, or operation of the vehicle unless the equipment or facilities are available to all teams.

This certification does not prohibit:

- a) • the use of government-sponsored information such as Global Positioning System (GPS) signals, cartographic products, or government-developed numerical software routines that are openly available
- b) • the use of any technologies that are commercially available to all teams
- c) • the use of facilities, services, or equipment supplied by DARPA to teams for Grand Challenge
- d) • the use of paid vacation time by US government employees and contract employees to support a Challenge team.

2 Challenge Vehicle Requirements

2.1 Autonomous Vehicle Behavior Requirement

Participating vehicles must demonstrate fully autonomous behavior and operation at all times during the NQE and Grand Challenge Event. Vehicles must be unmanned, and no animals are permitted onboard.

2.2 Vehicle Limitations

The entry must be a ground vehicle that is propelled and steered principally by traction with the ground. The type of ground contact devices (such as tires, treads, and legs) is not restricted. The vehicle must not damage the environment or infrastructure at the NQE or along the Grand Challenge route. Vehicle operation must conform to any regulations or restrictions imposed by the applicable land-use authority.

The vehicle must be able to pass through any underpasses encountered on the route. The clear opening of the smallest underpass will measure no less than 10 feet in width and 9 feet in height. Maximum vehicle weight is 20 tons; any team whose vehicle weighs more than 10 tons must provide its own off-road recovery capability. The vehicle must be able to travel on asphalt pavement without damaging the pavement surface.

2.3 Classified Data and Devices

No classified data or devices may be used by a team in preparation for or during the Grand Challenge.

2.4 Tethered Vehicle Systems

Only individual, independent, untethered ground vehicles are eligible to participate in the Grand Challenge.

A system comprising a single ground vehicle and one or more subsystems (such as sensors) that are physically tethered to that ground vehicle is permitted provided that the tethered subsystems are not propelled or maneuvered independently of the ground vehicle (as would, for example, an aircraft or steerable balloon or kite). Tethered subsystems that are specifically permitted include those that are rigid, telescoping, or on an articulating mast; and move only in response to relative wind and vehicle motion, such as balloons or kites. Tethered subsystems that are designed to extend more than 10 feet above the surface must be painted so as to enhance their visibility to helicopter pilots that may need to land near a Challenge vehicle. Entrants are advised that the Federal Aviation Administration, particularly in 14 CFR 101, regulates the operation of moored (tethered) balloons. Entrants are advised that the route may be adjacent to utility and power structures and high-voltage power lines.

2.5 Vehicle Identification Number

Each *semifinalist* team will be assigned a unique identification number that shall be displayed on its vehicle at least 12 inches in height on its sides, front, back, and top. The number should be either black or white and have a solid background that extends at least 3 inches larger than the number. The colour of the background should contrast with the number such that the number is clearly visible and distinguishable from other signage or symbols on the vehicle. A vehicle that can operate when flipped over shall also display the number on its underside.

Teams are allowed to obtain sponsorships and to display advertising if such advertisements are not considered inappropriate by the *Officials*. The DARPA Grand Challenge 2005 logo may be displayed on each vehicle.

2.6 Vehicle Safety

DARPA makes no representation as to the safety of any vehicle entered in the Grand Challenge notwithstanding any rule or the acceptance by DARPA of any application document, *vehicle specification sheet*, video demonstration, or any inspection or demonstration required as a condition of participating in the Grand Challenge.

2.6.1 Radiated Energy Safety Standards

2.6.1.1 Laser Safety Standards

All parties are directed to OSHA 29 CFR 1926.54 and OSHA Technical Manual (TED 1-0.15A), Section III - Chapter 6 (1999, January 20) for relevant laser safety standards. Challenge vehicles must comply with all applicable local, state, and federal laser safety regulations.

2.6.1.2 RF Radiation Standards

All parties are directed to OSHA 29 CFR 1910.97 (Non-ionizing Radiation) and Department of Defense Instruction 6055.11 (1995, February 21) for relevant RF safety standards. All Challenge vehicles must comply with all applicable local, state, and federal RF safety regulations.

2.6.1.3 Acoustic Safety Standards

All parties are directed to OSHA 29 CFR 1910.95 (Occupational Noise Control) and OSHA Technical Manual (TED 1-0.15A), Section III - Chapter 5 (1999, January 20) for relevant acoustic safety standards. All Challenge vehicles must comply with all applicable local, state, and federal acoustic safety regulations.

2.6.2 *Wireless Emergency Stop (E-stop) Units*

DARPA will supply each semifinalist team one government-owned E-stop system consisting of a controller and a vehicle receiver. It is the sole responsibility of the team to properly install the E-stop system in its vehicle. Detailed specifications for the integration of the E-stop system will be provided on the Grand Challenge website. Limited technical assistance for this installation will be available. DARPA shall not, however, incur any liability from the semifinalist's use of this technical assistance. Use of this technical assistance is solely at the discretion of the team leader.

Semifinalists have 10 calendar days following receipt of the E-stop to notify DARPA that the unit is damaged or otherwise not in working condition. After that period, the semifinalist assumes responsibility for the E-stop, and DARPA will not be responsible for repairs to the E-stop or replacement of damaged units.

DARPA reserves the right, solely within its discretion and assuming equipment availability, to provide the team with a replacement unit. Each E-stop must be fully functional for the semifinalist to be eligible to participate in the NQE and Grand Challenge Event.

Each team shall return its E-stop to DARPA within 24 hours from the date of any of the following events:

- The vehicle is eliminated from participation in the Grand Challenge
- The vehicle is disqualified from the Grand Challenge
- The vehicle is withdrawn from the Grand Challenge
- Completion of the Grand Challenge

If any of these events occur during the NQE or Grand Challenge, the equipment shall be returned to the proper DARPA official on-site.

The E-stop system has three modes: a RUN mode, a PAUSE mode, and a DISABLE mode. Teams must integrate the E-stop equipment so that the vehicle responds to the E-stop outputs as follows:

- E-stop RUN mode enables the vehicle for autonomous movement.
- E-stop PAUSE mode brings the motion of the vehicle to a prompt stop, with brakes applied to hold the vehicle even if it is on a slope. The vehicle should be ready to resume forward motion when the E-stop re-enters RUN mode.
- E-stop DISABLE mode brings the vehicle to a prompt halt and shuts down all propulsion systems while actively applying and maintaining the brakes.

Specifications regarding size, weight, power, output voltage, current, connectors, and other relevant details will be furnished to semifinalists.

The required integration of the E-stop system enables the E-stop PAUSE mode to be cycled on or off so that the vehicle can be stopped and resumed during the Challenge. The E-stop DISABLE mode should be latched so that its state cannot be changed after initiation except by a manual unlatch switch.

The vehicle and its systems must not interfere with the proper functioning of the E-stop device. A demonstration of the wireless E-stop capability is required as part of the NQE. Teams should anticipate that their vehicle may receive the E-stop PAUSE signal numerous times during the Grand Challenge Event, and that the duration of any individual E-stop PAUSE event may be as long as several hours. Teams should ensure that all electrical connections to the E-stop are ruggedized and tested to provide assured electrical connectivity after exposure to adverse (damp or dusty) environmental conditions and a high vibration environment.

2.6.3 *Manual Emergency Stop Unit*

Each vehicle must be additionally equipped with an externally-actuated manual emergency stop capability. Activating the manual emergency stop must promptly bring the vehicle to a complete halt in the E-stop DISABLE mode. At least one actuator and its labeling must be easily visible and accessible from anywhere around the vehicle. The manual emergency stop must be easy to identify and activate safely, even if the vehicle is moving at a walking pace. The operation instructions for manual emergency stop actuators must be clearly labeled in English and Spanish. The instructions must not be interfered with by any other labeling or advertising. A demonstration of the manual emergency stop capability is required as part of the NQE.

2.6.4 *Warning Devices*

Each vehicle shall be equipped with audible and visual alarms that are activated according to the state of the E-stop system. The following is a summary of the required behavior of the alarms.

- E-stop RUN mode: Audible alarm on. Visual alarm on.
- E-stop PAUSE mode: No audible alarm. Visual alarm on.
- E-stop DISABLE mode: No audible alarm. No visual alarm.

2.6.4.1 *Audible Warning–Vehicle Operating*

Each vehicle shall produce an intermittent warning sound when, and only when, the vehicle is in E-stop RUN mode. The vehicle may not commence movement until the warning sound has been in operation for 5 seconds.

The warning sound shall produce at least 85 dBA at 10 feet in front of the vehicle, and shall be loud enough to be clearly heard over the normal vehicle engine noise. The audible warning shall not produce sounds that can be confused with those of public-safety vehicles such as law-enforcement, fire, or ambulance.

2.6.4.2 *Visual Warning–Vehicle Operating*

Each vehicle shall display one or more flashing amber warning lights, the combination of which results in visibility 360 degrees azimuthally around the vehicle. The warning light shall operate when, and only when, the vehicle is in E-stop RUN or E-stop PAUSE mode. The vehicle may not commence movement until the warning light has been in operation for 5 seconds.

The warning light(s) shall comply with SAE Class 1 standards for warning lights and shall not produce light(s) than can be confused with those of public safety vehicles such as law enforcement, fire, or ambulance.

2.6.4.3 *Visual Warning–Vehicle Brake*

Each vehicle shall display two or more steadily illuminated red warning lights on the rear of the vehicle and visible within a 90-degree cone that illuminates when, and only when, the vehicle's dynamic braking system (not the parking brake) is activated. The purpose of this light is to indicate that the vehicle is braking. The placement of this light should be mounted high and sufficiently distant from the flashing amber warning lights to permit rapid recognition.

2.7 Towing Requirements

Each vehicle must be designed to facilitate removal from the route should the vehicle be disabled. The vehicle must have tow points front and rear, or if the vehicle design precludes towing, the vehicle must have hoist points. Wheeled or tracked vehicles must have a free-wheel mechanism that enables the wheels or tracks to spin freely in order to enable towing. The free-wheel mechanism must be readily accessible and clearly marked.

2.8 Position Determination Signals

Challenge vehicles may be equipped to receive and process electronic position-determination signals (such as GPS) that are openly or commercially available to all teams. Position-determination signals that are neither openly available nor commercially available to all teams are prohibited.

2.9 Wireless Signal Restrictions

All computing, intelligence, and sensor processing must be contained onboard the vehicle while on the NQE course or the Challenge route. Apart from the control and tracking signals from DARPA-provided systems and openly or commercially available navigation signals, the emission or reception of communication signals is prohibited.

On-board wireless connections are prohibited. A vehicle may emit and receive signals to sense the environment. Vehicles may record video or other data on-board for review after the conclusion of the event. Any data recorded on the NQE course may not be shared among teams until the conclusion of the NQE. Any data recorded during the Grand Challenge Event may not be shared among teams until all vehicles have finished the route or have been disqualified.

Any wireless system used for vehicle movement or testing must be disconnected prior to the departure signal at the NQE and Grand Challenge Event. The wireless hardware must be easily accessible and capable of being inspected. This includes systems for monitoring, control, or intra-vehicle communication.

2.10 Vehicle Cooperation

Cooperation of any kind among vehicles on the NQE course or the Grand Challenge Event route is prohibited.

2.11 Environmental Impact

Any aspect of vehicle activity or operation that has an unacceptable impact on the environment is prohibited. These activities include destructive vehicle behavior, the use of abnormally hazardous substances or materials, and generally reckless operation. Potentially hazardous equipment or activities must be identified to DARPA for review in the vehicle specification sheet and at the site visit.

2.12 Pre-Challenge Testing

Testing of Challenge vehicles or components is the sole responsibility of each team. The use of public lands for this purpose is at the team's own risk and must be in accordance with applicable local, state, and Federal guidelines.

3 Qualification Process

3.1 Overview

All steps of the qualification process must be completed by teams that wish to compete in the Grand Challenge Event. A team that has submitted parts 1 and 2 of the application by the deadline and has received acknowledgement from DARPA becomes a Grand Challenge entrant. A team must submit parts 3, 4, and 5 of the application by the deadline in order to remain an entrant. A team selected for the NQE become a semifinalist, and a team selected for the Grand Challenge Event is a *finalist*.

3.2 Visit

DARPA will review each team's *video demonstration* and vehicle specification sheet submitted as part of the application. Applications will be evaluated on the basis of:

- Conformance with the rules
- Possession of a vehicle
- Possession of sensor equipment
- Possession of navigation equipment
- Capability of vehicle to complete the Grand Challenge Event route
- Demonstration of navigation and sensor capabilities necessary for completion of the Grand Challenge.

Instructions for the Video and the vehicle specification sheet are provided on the application form available on the Grand Challenge website.

On April 4, 2005 DARPA will notify all teams of the results of the review process based on the vehicle specification sheet and video demonstration. Selected entrants will be notified of DARPA's intent to conduct a site visit. Only teams selected for a site visit will continue as Grand Challenge entrants.

3.3 Site Visit Procedure

Site visits will take place at an appropriate testing location in the United States specified by the entrant. The Site Visit Liability Statement (Part 5B of application) must be on file with DARPA before a site visit can be scheduled. Because of scheduling limitations, mandatory schedule dates and times will be set by DARPA. If rescheduling is necessary due to DARPA's inability to keep the primary scheduled meeting, DARPA will work with the team to find a mutually agreeable new date. Inability to find a mutually agreeable new date may result in removal from further participation. Site visits are scheduled to take place May 2–15, 2005, with backup days May 16–21, 2005.

The team leader and vehicle must be present at the site visit. The inspection team will verify the proof of US citizenship of the team leader. Site visit guidelines will be available on the Grand Challenge website.

Based on the results of the site visits, DARPA will select and invite teams to participate in the NQE. Teams that accept this invitation must submit a technical paper describing their vehicle. Teams that are not selected are no longer eligible for participation in DARPA Grand Challenge 2005.

3.4 Papers

A technical paper describing the vehicle of each semifinalist must be received at DARPA by August 15, 2005. A description of the subjects that must be addressed in the technical paper will be available on the Grand Challenge website. DARPA will withhold the technical papers until the conclusion of Grand Challenge 2005, at which time the papers will be made available to the public.

Other than the required technical paper and information already in the public domain, DARPA will not publicly release information regarding a team's technical approach without permission from the team leader.

DARPA claims no intellectual property (IP) rights from entrants, semifinalists, finalists, or the winner. All trade secrets, copyrights, patent rights, and software rights will remain with each respective team.

3.5 Qualification Event (NQE)

The NQE will be held September 27, 2005 to October 6, 2005 at the California Speedway in Fontana, California. A detailed schedule will be published on the Grand Challenge website and instructions for semifinalists will be distributed.

Semifinalist teams will transport their vehicles to the California Speedway on September 27, 2005 for team check-in and the NQE start.

3.5.1 Inspection

The first phase of the NQE is a static technical and safety inspection of all vehicles to ensure compliance with all rules, to verify the details of vehicle operation described in the vehicle specification sheet, and to ensure safe vehicle operation. Any deviations will be identified to the team leader for immediate action to bring the vehicle into compliance. If a vehicle cannot be brought into compliance it may be disqualified.

3.5.2 Demonstration

The NQE is used to select finalists to compete in the Grand Challenge Event. Teams are given two opportunities on the NQE course. Additional opportunities are at the discretion of DARPA. A team's final score is derived from its best two attempts.

Vehicle control procedures, autonomous vehicle requirements, and the route definition will be based upon those of the Grand Challenge Event. Details are provided in section 6.

3.5.3 Restrictions on Vehicle Operation

Operation of semifinalist vehicles is limited to DARPA-specified events and operation within DARPA-specified practice areas from the first day of the NQE until the vehicle is returned to the team.

Vehicles that may be selected as Grand Challenge finalists must remain at the NQE until October 6, 2005. Teams that choose not to participate in the Grand Challenge Event may remove their vehicles at any time. Teams may petition DARPA if major repairs are needed that require expertise that is only available offsite.

3.5.4 Security

3.5.4.1 Access Control

Grand Challenge semifinalist teams and DARPA-accredited media representatives will be issued access-control passes that are required for entry into controlled areas at the NQE.

3.5.4.2 Team Security

DARPA will control access to the garage area at the NQE but DARPA assumes no responsibility for the security of team equipment or supplies.

3.5.5 General Safety

A Safety Standard Operating Procedures (SOP) Manual will be distributed to each semifinalist team prior to the NQE. The SOP will provide specific instructions for the administration of activities as well as emergency procedures and instructions for handling other contingencies. Compliance with the SOP is mandatory whenever the team or its vehicle is within DARPA-controlled areas. Failure to comply with the SOP may result in disqualification.

4 Grand Challenge Event

On October 6, 2005, each finalist team will transport its vehicle to the Grand Challenge *departure area* to make final preparations for the Grand Challenge Event. On October 7, 2005, DARPA will host a meeting with teams to make final preparations for the start. The time and place for this meeting will be provided to the finalists at the NQE. Each team will receive a compact disc (CD) containing the RDDF at least 2 hours prior to the start of the event.

The first vehicle starts the route after first light on October 8, 2005.

DARPA maintains control of all vehicles for safety and operational purposes using the E-stop system. While vehicles are on the route, DARPA officials follow each vehicle in a dedicated *control vehicle* equipped with an E-stop transmitter.

4.1 Departure Area

When instructed to do so, each team must move its vehicle promptly to the *start chute*. Challenge vehicles start in sequential order at specified time intervals. Start order is announced at the end of NQE.

Each vehicle must be enabled for autonomous operation within 5 minutes after entering the start chute. Vehicles must be prepared to wait in E-stop PAUSE mode in the start chute for up to 1 hour without manual intervention.

Before each start, an official places the vehicle in E-stop PAUSE mode. At the designated start time an official switches the E-stop from PAUSE to RUN and the vehicle must depart the start area promptly after the mandatory 5 second delay for the audible alarm.

4.2 Vehicle Control

An official may place any vehicle in E-stop PAUSE mode for safety or operational reasons. The official later returns the vehicle to E-stop RUN mode so that it may continue. Time spent in E-stop PAUSE mode does not contribute to a team's corrected time. If a vehicle does not progress within 10 minutes of resuming E-stop RUN mode, it may be disqualified.

If dangerous or destructive behavior by a vehicle is imminent, an official places the vehicle in E-stop PAUSE mode and the vehicle may be disqualified. If necessary to stop it, the official places the vehicle in E-stop DISABLE mode.

DARPA will take measures to stop a vehicle that does not respond to an E-stop command, even if these measures may result in damage to the vehicle.

4.3 Challenge Route

A team may not intervene in any aspect of vehicle operation or participate in vehicle tracking from the time the vehicle clears the start chute until it is returned to the team. A vehicle is returned to the team after it is disqualified from the event or after it clears the *arrival line* and is inspected. Refueling of vehicles is not permitted.

Teams may not operate any ground vehicles or position any team members along or near the route during the Grand Challenge Event except at designated viewing areas.

Each vehicle must remain within the route boundary from its departure from the start chute to its arrival at the last *waypoint*.

If a vehicle is in E-stop RUN mode and the vehicle does not progress for longer than 10 minutes, it may be disqualified.

If DARPA officials determine that it is not possible for a vehicle on the route to finish in less than 10 hours while traveling at the maximum speed limit over the remaining segments of the route and allowing the vehicle to continue would hinder Grand Challenge operations, the vehicle may be disqualified.

4.3.1 Route Definition

The route definition data file (RDDF) is the official definition of the route and defines the corridor through which all vehicles are required to travel. The RDDF contains waypoints, *lateral boundary offsets* (LBO), and maximum speed limits. Vehicles may traverse any area within the route boundary but must detect and avoid obstacles therein. Navigability directly along the track line connecting successive waypoints is not guaranteed; vehicles must determine for themselves the best way to travel from one waypoint to the next while staying within the lateral boundaries.

Vehicles encounter the first waypoint after departing the start chute. The last waypoint is beyond the arrival line.

The LBO is specified from any point on a *track line* and applies to the route segment defined by the associated waypoint to the next sequential waypoint. Boundaries may be marked with concrete barriers, plastic snow fencing, or by other similar means along limited portions of the route. Any vehicle that leaves the route may be disqualified.

A maximum speed limit is specified for each segment of the route. Any vehicle that exceeds the speed limit may be disqualified. A specified speed limit does not imply that it is a safe or achievable speed. Speed limits are specified in the RDDF and apply to the route segment defined by the associated waypoint to the next sequential waypoint. Between the start chutes and the first waypoint, vehicles may not exceed the speed limit of the first route segment. In the area where two route segments overlap, the least restrictive (i.e., higher) speed limit applies.

4.3.2 RDDF Format

The RDDF is a comma-delimited text file distributed on a PC-formatted CD and contains the following data fields: the number of each waypoint, the latitude of each waypoint, the longitude of each waypoint, the lateral boundary offset of each segment (feet), and the maximum speed of each segment (mph).

Each waypoint marks the start of a segment. The first waypoint is number 1 and subsequent waypoints follow in sequence. Latitude and longitude are specified in decimal degrees with seven decimal places. The applicable datum is WGS 84. The accuracy of the waypoint locations is +/- 15 cm. The 7th decimal figure does not connote an additional degree of accuracy. Segments with unspecified maximum speed are indicated by 999.

4.4 Obstacles

The vehicle must avoid collisions with any obstacle, moving or static, on the route. DARPA will place obstacles along the route to test obstacle avoidance capabilities. Vehicles that collide with any other vehicle or obstacle along the route may be disqualified. Incidental or non-damaging contact with obstacles may not result in disqualification.

4.5 Intentional Interference and Damage

Intentional interference with other vehicles is prohibited. Intentional interference is any activity that, in the opinion of the Chief Judge, is intended to degrade another vehicle's ability to compete.

Any team responsible for the intentional damage of property that does not belong to that team may be disqualified. Intentional damage includes damage that occurs as a result of failure to prevent damage that could have been foreseen and includes damage that adversely and materially affects the performance of another team. The Chief Judge will have the final say in all matters involving damage.

4.6 Improper Vehicle Contact

A team may not make or cause physical contact with its vehicle after it has departed the start chute and before it is returned to the team. Contact with the vehicle may be permitted if the vehicle has been disqualified or overnight procedures have been enacted as determined by the officials. Physical contact includes indirect contact with tools and human-initiated contact using remotely controlled or electronic equipment.

4.7 Jettisoning Material on the Route

Except for normal by products of power generation, the intentional jettison of any material from a vehicle is prohibited and may result in disqualification. If a portion of a vehicle unintentionally falls from the vehicle while on the route, DARPA will notify that team, and the team is responsible to recover such debris once all qualified vehicles have cleared the affected area.

A smokescreen or any other obscurant intentionally discharged from a vehicle is specifically prohibited.

4.8 Passing

DARPA officials determine when and where vehicles pass.

No vehicle may intentionally operate to hinder another vehicle that is trying to pass it. The overtaking vehicle has the burden of responsibility for collision avoidance and must remain within the route boundary.

If the width of a route segment is sufficient for passing, DARPA officials may place a slow moving (impeding) vehicle in E-stop PAUSE mode to allow a faster (overtaking) vehicle to pass with its associated control vehicle. The overtaking vehicle must sense all stopped vehicles and navigate around them.

If the width of a route segment is insufficient for passing, and the impeding vehicle is moving, a DARPA official places the overtaking vehicle in E-stop PAUSE mode until there is sufficient room to pass.

If the width of a route segment is insufficient for passing and a vehicle is immobile and blocking the route such that no other vehicles can pass, DARPA officials place any approaching vehicles in E-stop PAUSE mode until the route is clear.

4.9 Overnight Operations

If necessary, the event will continue beyond October 8, 2005. DARPA will distribute procedures for overnight operations that address corrected time computation, vehicle shut down and restart, security, and safety.

4.10 Arrival Area

After a vehicle crosses the arrival line it is impounded for an inspection. Teams may not interact with their vehicle until it is released by a DARPA official.

4.11 Corrected Time

Elapsed time for each vehicle begins at the departure signal and ends when the entire vehicle clears the arrival line from the direction of the previous waypoint. Elapsed time will not be maintained for disqualified vehicles.

Corrected time is computed by subtracting corrections for time spent in E-stop PAUSE mode from the elapsed time.

A vehicle must have a corrected time of 10 hours or less to be eligible for the prize.

4.12 Disqualification

A disqualified vehicle may not continue on the route. DARPA will coordinate with the team to recover the vehicle from the route. Teams will enter the route area only when so directed by DARPA officials.