



DARPA Grand Challenge 2005

Grand Challenge Event

August 22, 2005

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Grand Challenge Event (GCE)

This document provides initial instructions for operations at the Grand Challenge Event (GCE), October 6-9, 2005. Teams are required to comply with the guidance in this document.

General GCE will take place within 1-day's driving distance of the California Speedway.

Required participation in GCE operations includes the following:

- Team leaders must attend the Departure Meeting at the Speedway at 8:00 AM on October 6.
- Teams must depart the Speedway before 12:00 PM, transport their vehicles directly to the GCE start area, and check in before 7:00 PM on October 6, 2005.
- Team leaders must attend the Team Leader Orientation Meeting at the GCE start area at 7:00 AM on October 7.
- Grand Challenge vehicles and each team's three-person vehicle-launch crew must participate in GCE practice launches beginning at approximately 10:30 AM on October 7.
- Teams must be ready to move their vehicle into the start queue according to the published start order beginning at 5:30 AM on October 8.
- Teams must be available to assist in recovery of their vehicles should they become disabled on the Grand Challenge route.

Should DARPA modify the schedule for any reason, all teams must participate in these events on the modified schedule.

Vehicle Transport On October 5 at the National Qualification Event (NQE), DARPA will announce the teams selected to participate in the GCE. Selected teams are required to keep their vehicles in the California Speedway garage area overnight on October 5.

The teams whose vehicles are not selected for the GCE must vacate their garage before 10:00 PM on October 5, or between 8:00 AM and 12:00 PM on October 6. These teams are invited to attend the GCE as spectators.

Team leaders of the selected GCE teams will attend the Departure Meeting at 8:00 AM on October 6, in the Drivers Training Room at the Speedway. GCE orientation packets, to include GCE pit area and credentials for the pit areas, will be distributed. Teams should prepare to depart the Speedway immediately following this meeting,

Garage bays must be left in the condition in which they were initially found, including removal of all trash, banners, and equipment.

Area Closure The off-road area closure specified in the Grand Challenge rules remains in effect until the end of GCE. Teams may not conduct any off-road activities in this area during this time without permission from DARPA. Only authorized personnel are allowed on the Grand Challenge route area until the event is complete.

Pits Each team will be assigned a pit at the GCE start area. Teams may not share or trade pit assignments.

Each pit covers approximately 36 feet by 36 feet in an open asphalt surfaced area. Lighting is provided by overhead light poles. Teams may park additional vehicles in their pits, although space is extremely limited and the pits are close together. Additional parking is available nearby, outside the pit area.

The pits are not garages. Amenities such as Internet access, wall-plug electrical power, and RV hookups are not available. No equipment or furniture of any kind is provided.

Teams are permitted to erect canopies or other shelter in their pits, but all structures should be free standing. Teams may not stake into the asphalt.

The following rules apply in the pit area:

- No welding.
- No fueling.
- No vehicles with dripping or leaking fluids.
- No smoking.
- No pets, loud music, horseplay, or other disruptive activity

Access to the pit area is limited to the team members (maximum 25) listed on each team roster. No guest passes for the pit area are available for GCE. Although members of the media are not allowed free access to the pit area, teams may escort members of the media to their pit for interviews.

Beginning at 12:00 PM on October 6, teams may work in the pits 24 hours a day until the conclusion of GCE. Autonomous vehicles must stay in their assigned pits at all times, except as directed by DARPA.

DARPA will provide overnight security patrols of the pit area, but teams should secure their vehicle and all equipment during daylight hours and when the pit is not occupied. DARPA will not provide security in the pits after 5:30 AM on October 8.

Autonomous Vehicle Movement Autonomous vehicle movement at GCE is allowed only during the GCE practice starts on October 7, and during GCE operations on October 8. Teams must obtain DARPA permission to move their autonomous vehicles all other times.

Wireless Device Operation Operation of wireless control devices, remote control devices, and laptops is not allowed in the spectator areas beginning at 6:00 AM on

October 8, or upon launch of the first vehicle from the GCE start chute, whichever is earlier.

Team Leader Orientation Meeting Team leaders are required to attend the orientation meeting at 7:00 AM on October 7 in the start area. Each team may send two representatives to this meeting. Detailed operational procedures and contingencies will be discussed, and teams will receive the RDDF for the practice exercise.

Vehicle Safety Inspection DARPA will inspect each team's autonomous vehicle from 8:00 AM to 10:00 AM on October 7. Teams should wait in their pits for the inspection teams during this time. This inspection team will use the same checklist as that used during the static inspection at NQE.

Fueling A commercial service station is available within 1 mile of the pit area. Autonomous vehicles may be brought to the service station for refueling between 7:00 PM October 7 and 12:00 AM October 8 with prior clearance from DARPA. Teams must obey all local, state, and federal regulations when transporting the vehicle to/from the service station.

On October 8, a temporary fueling area will be available near the GCE start chutes to give teams an opportunity to fill their vehicles' fuel tanks.

Teams wanting to fuel their vehicles before they are placed in the start chute must deliver the fuel in a UL-approved fuel container (maximum capacity of 5 gallons) to a DARPA staff member in the temporary fuel area on October 7 between 3:00 PM and 5:00 PM. All containers must have a pouring spout and be sealed with threaded closures to ensure safe handling. The container must be clearly labeled with the team's name and number.

This container will be available to the team for fueling at the marked fuel area shortly before the team enters the start chute on October 8. All fueling operations will take place under DARPA supervision. The team must shut down the vehicle's engine during refueling, and the team is responsible for re-starting the vehicle in time to enter the start chute.

Practice Start Exercise The practice start exercise is a required activity for all GCE entrants.

On Oct 7, beginning at approximately 11:00 AM, DARPA will conduct practice starts at the GCE start line. This exercise will use the GCE start chutes and practice launching vehicles at 5-minute intervals.

Each team will identify a 3-person launch crew that will move the vehicle to the start chutes for the practice exercise, and for the Grand Challenge event.

The first vehicle will enter the start queue from the pits at approximately 10:30 AM. Vehicles will be maneuvered into the start chutes by each team's vehicle-launch crew. At DARPA's direction, the team's vehicle launch crew will place the vehicle in autonomous mode and clear the start area. (Note: DARPA may add refueling operations to the practice exercise. Updated information will be provided at the Oct 6 Departure meeting.)

After launch, the vehicle will follow an RDDF that will traverse a short route near the start area to a termination point. Teams will then be escorted to their vehicle, place the vehicle in manual mode, and proceed directly to their pits, or to an area as directed by DARPA.

The E-stop PAUSE and DISABLE functions will be tested during the practice start exercise.

DARPA may repeat the exercise, as necessary.

Evening Barbecue The evening barbecue social event will be held on October 7 from 4:00 – 7:00 PM. Ticket sales will begin October 1 at the Registration and Information Booth at the Speedway and will continue until all tickets are sold. Because space is limited and this event is expected to sell out early, teams are strongly encouraged to purchase tickets before leaving the Speedway.

Start Procedure The RDDF for the Grand Challenge route will be distributed to each team exactly 2 hours before their assigned start time. Teams should send a representative to the Resource Operations Center to receive their RDDF CD.

The opening ceremony will begin at 6:20 AM, and the first vehicle will be released from the start chutes at 6:30 AM on October 8. Vehicles will be released at 5-minute intervals, according to the start order announced at NQE.

Team launch crews should remain in their pits with their vehicles until summoned by DARPA personnel. Only the 3-person team launch crew will be allowed to move the vehicle through the start queue to the start chute.

The launch crew will be given the opportunity to top off their fuel tank at the temporary fueling area as described above.

DARPA officials will require access to the vehicle E-stop in the start queue to ensure correct timing operation.

After the vehicle is secured in the start chute and placed in autonomous mode by the launch crew, the crew will be directed to depart the start chute area via a prescribed path.

Monitoring Vehicle Progress Teams are not allowed to operate or ride in any aerial platforms, such as planes, helicopters, or balloons anywhere within the route area.

Instructions for teams wishing to monitor the progress of their vehicle will be provided at the Team Leader Orientation Meeting.

Vehicle Recovery Each team is required to assist DARPA in the recovery of its vehicles anywhere in the route area, should it be disabled before completing the route. DARPA will notify the team leader that the vehicle is disabled and discuss recovery options. GCE operations take precedence and teams may have to wait some time before vehicle recovery can occur.

Recovered vehicles will be placed in a display area that will be located near the start area.

Upon return of the disabled vehicle to the display area, teams will return the E-stop system equipment to DARPA officials.

Note: It may be some time before vehicle recovery can occur if the vehicle was seriously damaged during the event. Recovery of the vehicle by DARPA is not guaranteed and teams are ultimately responsible for removal of their vehicle from the route area.

Overnight Operations The GCE will be conducted only during daylight hours. Delays during GCE, for any reason, could mean there is not enough daylight hours available to complete the event.

Should a delay occur, DARPA will determine whether the vehicles on the course could complete the remaining route segments in less than 10 hours without exceeding the course speeds.

If any vehicle has a chance to finish the route segments in less than 10 hours without exceeding speed limits, DARPA will announce a pause to the event just before sunset and stop the remaining vehicles on the route. DARPA will shut down the vehicles and they will remain in place overnight.

Team members will not be allowed on the route, and the vehicles will not be refueled.

At approximately 8:00 AM on October 9, the vehicles remaining on the route will be restarted by DARPA and the route will be resumed.

Teams should ensure their vehicles are capable of being shut down overnight and restarted. Vehicle design should require simple procedures for vehicle shutdown and restart. During NQE and again on October 7, teams will be asked to train identified DARPA staff to execute vehicle shutdown and startup procedures. Teams should list the restart procedures in a checklist format and give the document to the identified DARPA staff.

The Finish DARPA will inspect each vehicle that finishes the route before returning the vehicle to the team. DARPA will remove the E-stop system to obtain the data log and analyze the timing data.

DARPA will announce the results of the Grand Challenge once all data is analyzed and verified.

Please direct questions or comments to grandchallenge@darpa.mil