

Old Dominion Region – SCCA Learn to Rally School

1. Purpose: This school will provide you with the basic skills and tools to participate in a Time-Speed-Distance or TSD road rally. It will provide some insight into the world of precision navigation, precision driving, and the precise mathematics needed to ensure the first two items. Moreover, this school should open another avenue of fun and recreation for automotive enthusiasts.

Rule #1: Have fun! Don't make a rally more work than fun.

2. Background: It takes two to tango and two to rally. There must be a driver and a navigator team to participate in any type of a road rally. Both the driver and the navigator must work together in order to place well in the standings. A driver is no more effective than his/her navigator; and conversely, a navigator is no more effective than his/her driver. The more effective the two of you become as a team, the more fun you'll have. All rallies have some type of sequential navigational instructions that must be executed in their proper order to navigate the rally's course. In TSD rallies, these navigational instructions are called **Number Route Instructions (NRIs)** that provide information such as turns, times, mileages, speed, and other essential tidbits that the rallymaster deems necessary for the competing driver/navigator teams. The theme of the TSD rally is "Stay on course and stay on time." Sounds simple, but of course that's part of the lure for the unwary. Penalty points are awarded for being either early or late to a checkpoint. It's just like golf. The lowest score wins!

Rule #2: Always stay on course even if you cannot stay on time!!

3. Classes: Each sanctioning body has its own rules for classes based upon the amount of equipment carried by each individual driver/navigator team. If possible, always try to compete in the class with the least amount of expensive equipment until you have several rallies under your belt as a team. Typically, the lowest classes are Stock, Seat-of-(the)-Pants (SOP), and Novice. Stock is just that, a stock vehicle with no on board computer hooked up to a driven wheel with restrictions on what types of calculators may be used. SOP is more rudimentary and usually allows little more than a timepiece, odometer, and (hopefully) rally tables. Novice is a catch all category usually reserved for those teams with less than a preset number of TSD rallies between the driver and navigator. In ODR, our lowest level of car preparation is Stock, and our least experienced teams may participate in the Novice class.

4. Generals: Each sanctioning body will normally issue General Instructions (known as "Generals") that contain information about their rally series that pertains to all their rallies. You need to read and understand this information before you participate in one of their rallies. Some clubs even issue rally-specific general instructions. You need to read and understand these instructions also. Typically, these instructions will deal with the management of the rally itself while giving directions to the teams for such things as "bought time", course following, terms definitions, etc. You also may find that you are to turn right at all Tees unless an NRI may be executed at the Tee.

Rule #3: Be sure to read the Generals and all rally-specific supplements before the rally.

5. Equipment: Starting out, you just want the basics: a four-function calculator (with memory); a clipboard; rally tables; and plenty of paper & pencils. Some teams use different color highlighters as well as different colored inks to mark important information or distinguish between the rallymaster's mileage and their car's uncorrected odometer. Whatever you decide to take, make sure that it doesn't end up hindering more than helping you. You should be comfortable as possible - that means don't overdress or underdress for the event's prevailing weather and ignoring the fact you will be closed inside

an automobile for several hours. You should have plenty of room for yourself and whatever you need. Don't forget to bring along some liquid refreshment (non-alcoholic please) as well as something to snack on if you tend to be hypoglycemic. One other word of caution, car sickness!! If you think that you might become queasy after several miles of twisty roads when your head down punching in numbers, be sure to take some type of non-drowsy medicine far enough ahead to time to be effective during the rally. Remember Rule #1.

6. TSD Math: This is the part most of you wanted to avoid. Mathematics!! (Just what you didn't want to hear.) Let's talk about the relationships between time, speed, and distance.

$$\frac{\text{Distance}}{\text{Time}} = \text{Speed, or another way to express it: } \frac{\text{Distance (in miles)} \times 60}{\text{Time (in minutes)}} = \text{Speed (mph)}$$

For example, if you travel fifteen miles in twenty-five minutes, what is your speed? Answer: 36 mph

We can use the above relationship to solve for the unknown if we have two of the three values:

$$\frac{\text{Speed (in mph)} \times \text{Time (in minutes)}}{60} = \text{Distance (in miles)}$$

$$\frac{\text{Distance (in miles)} \times 60}{\text{Speed (in mph)}} = \text{Time (in minutes)}$$

If the next NRI stated "Right at Tee CAS 32 Left in 2.12 minutes", how far would you travel before the left turn after turning right at the Tee? You must solve for distance. Answer: 1.13 miles

If the next NRI stated "Left at Stop CAS 30" and the delta mileage to the next NRI is 1.05 miles, how long will it take you (in minutes) before your reach the next NRI? Answer: 2.10 minutes

Now that you have mastered the TSD equation, let's derive some useful information for rallying. We're talking about rate or how fast things are happening. For most TSD rallies, you want to know rate in unit of minutes-per-mile since time is such a fleeting thing. There are two different ways to calculate your rate in minutes per mile.

First, you can calculate your rate if you know the time it will take and the distance you will cover:

$$\frac{\text{Time (in minutes)}}{\text{Distance (in miles)}} = \text{Rate (in minutes-per-mile)}$$

If you cover four miles in six minutes, your rate is equal to 0.667 minutes-per-mile.

Second, you can calculate your rate for any given speed: $\frac{60}{\text{Speed (in mph)}} = \text{Rate (in minutes-per-mile)}$.

So, if you're assigned CAS 30, you can now calculate what rate you will cover ground. Answer: 2 minutes-per-mile.

Knowing your rate in minutes-per-mile is useful in determining how long (in minutes) it will take to cover the mileage on any given leg using the following formula:

Distance (in miles) x Rate (in minutes-per-mile) = Time (in minutes).

For example, if you know that the next leg's delta mileage is 2.25 and that your CAS is 36 mph, you can determine how much time it will take to complete that leg on time. Answer: 3.75 minutes.

Well, that's it. You're now got all the basic TSD mathematics you'll need for rallying. Let's try figuring out what all those esoteric abbreviations and strange terms mean.

7. It All Makes Cents to Me: Here are some rally terms and abbreviations you need to know.

AFTER – Any distance past the referenced landmark.

BOUGHT TIME – A mystical concept in which a rally team may request a specific amount of time be deducted from their score ranging from 30 seconds to 19.50 minutes. Usually used to regroup time lost to railroad crossings, funerals, or a really bad off-course excursion.

BTZ – Begin transit zone. (See TRANSIT ZONE below.)

CAS – Change Average Speed. This instruction assumes that you can instantaneously accelerate or de-accelerate to the new speed while time marches on. You will maintain this average speed until directed otherwise.

CENTS - First of all, all time in TSD rallies is measured in “cents” or hundredths of a minute. After seeing all the TSD calculations above, it really does make sense to do it that way. However, most of us normal people don't have timepieces that measure in cents. We use minutes and seconds. One method of converting time to cents is to take the time, separate the minutes from the seconds, and then divide the seconds by 60. Not much fun in a moving vehicle, but don't despair, that's what conversion tables are for! Just remember that all references to time are in minutes and cents.

CLOSED CHECKPOINT – This is a manned checkpoint where you don't have to stop or even get out of your car. The checkpoint workers will note your time of passing which will be compared to a perfect time since the last checkpoint. Very sneaky and devastating to those who run late all the time hoping to make it up with a burst of speed just before the checkpoint sign!

CORRECTED MILEAGE FACTOR– This is end result of the odometer correction leg. It is the factor used to correct your odometer readings to those of the rallymaster. At the end of odometer correction leg, divide your mileage by that claimed by the rallymaster. The end result is the corrected mileage factor that must be included in your calculations to match your mileage to that of the rallymaster.

CUMULATIVE MILEAGE – Overall mileage since the start of this leg of the rally.

DELTA MILEAGE – Difference in mileage between the execution of the current NRI and the previous NRI.

DIY – Do-it-yourself as in DIY checkpoint. There is not checkpoint and you must calculate the perfect time to complete the next portion of the rally using the information provided by the rallymaster. This can give you a leg up on the competition if you pay attention to the course and NRIs. You should always aim for a zero score on a DIY leg.

ETZ – End transit zone. (See TRANSIT ZONE below.)

GAIN – This decreases your time on your current leg. It is measured in cents and is usually given in the format “GAIN 40 over the next 2.00 miles”. To solve this puzzle, you need to know what your rate is in minutes-per-mile. Take that time and subtract .20 (40/2) for the new rate. Then solve for the new speed (in mph) by dividing the new rate into 60.

OPEN CHECKPOINT – This is a manned checkpoint where one of you will get out and turn in your scorecard to a checkpoint worker who will write down your arrival time, your departure time, and give you a checkpoint slip with instructions on how to continue on the next leg of the rally. Be sure to read these instructions carefully because the rallymaster may have slipped in a CAS for the next leg!

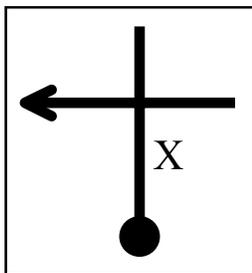
OVERALL MILEAGE – Cumulative mileage since the start of this leg of the rally.

PAUSE – Adds dead time to your current leg. Remember, time is in cents so a “PAUSE 10” would only add six seconds to the perfect time for that leg.

SI – Signalled intersection, i.e., an intersection controlled by a traffic light.

TEE – A street or road that ends at a perpendicular angle into another street. You cannot go straight at a tee. You must go either left or right.

TRANSIT ZONE – Any portion of the rally wherein the rally car may transit at a speed appropriate to local traffic conditions. Usually given at the start of a rally for the odometer calibration/correction leg and at the end of rally to return to a common meeting point. May or may not have a transit time specified.



TULIP – A graphic representation for an NRI. First used in Holland during the 50’s hence the name “tulip”. The graphic representation represents an overhead view of the rally car. The round bulb is the rally car and the stem represents the current direction in which the car is traveling. Leaves (representing roads encountered along that section of the rally) will be drawn intersecting the stem. One of ends of the leaves or the stem will have an arrow drawn on the end to indicate the direction the rally car must take. Usually has a landmark or sign indicated by the letter “X” with the sign or landmark quoted in the margin.

8. A Little Strategy: Lets try using all this knowledge for a desktop rally. Let’s say that you’ve completed the odometer correction leg in plenty of time. What’s next? First the navigator needs to calculate the odometer correction factor. Say that your trip odometer reads 11.5 miles and that the .5 is half way up and the .6 is showing on the bottom. You could guesstimate that your mileage was 11.55. If the rallymaster said that you should have traveled 12.06 miles, what is your correction factor? Write the answer here _____.

Now the navigator knows how to correct the rallymaster’s mileage to a mileage that the driver can monitor, but first, look at the rally NRIs and try to fill in the blanks using the given delta mileages and overall mileage figures. You really want to know how far you will be traveling between NRIs.

Once you’ve filled in as many of the missing mileages as possible, don’t forget to convert them to your corrected mileage. Plug your mileage correction factor into your calculator’s memory and multiply it times all the rallymaster’s mileages. (Try writing these mileages in parenthesis or in different color ink so you won’t mistake them for the actual course mileage.)

Everywhere you see a CAS, calculate the rate and add it next to the CAS. Likewise, if you have the delta mileages for most NRIs, calculate the perfect time between NRIs given the CAS in effect. BE sure to use the tables whenever possible. (Don't write down the cumulative time, just the time between NRIs. You might get lost on one NRI and that would blow your cumulative times for the rest of the NRIs.)

Note your out time and circle or highlight any CAS changes, pauses, or gains along the route so you won't miss them.

Try to finish up with a few minutes to spare in order to relax a little before your out time. Talk about the upcoming NRIs so each of you knows whats up ahead.

As the driver, you should always know the direction of the next turn plus any landmarks or signs quoted in the NRI. It would be nice to know the distance in corrected odometer miles if possible.

Navigators watch the time between NRIs. If your mileage was less than the rallymasters on the odometer correction leg, it's highly likely that your driver's indicated speed will be less than his/her speed over ground. (You can also use the mileage correction factor for speed if there is a significant difference. If your mileage correction factor is less than 1.00, subtract it from 2.00 and use the result as a multiplication factor times CAS for your corrected speed. If it's more than 1.00, discard the 1 and subtract the decimal portion from 1.00 and use the result as your multiplication factor for speed. If the difference is two point something or more, get another car for the rally.)

Driver, please note the amount of time you are under the posted CAS. You and your navigator will have to devise some system for making up this lost time along the route. Sometimes you can compensate for this dead time by accelerating past the CAS by one or two miles and hold this speed for a set period of time, e.g., the same amount of time you were under the CAS, before coasting back to the CAS. Work with your navigator to find the sweet spot for your car and driving pattern.

Rule #4: It's easier to lose time than make it up!

Let's try using these tips on the following rally:

Mileage	Delta	NRI
0.00	-----	1. Begin Rally at "Lynnhaven Mall" (at exit from parking lot). Leave at 11:30.0 plus your car number in minutes. Zero your odometer. Begin odometer check. BTZ of 30.00 minutes. <u>Left.</u>
1.83		2. <u>Right</u> onto Potters Road.
3.43		3. Straight at SI.
	2.14	4. <u>Left</u> onto First Colonial Road.
8.10		5. End odometer check at "McDonalds". ETZ. Pause 300. CAS 30.
	0.85	6. <u>Right</u> at "Hilltop North". CAS 36.

7. Right after “Sugar Plum Fairy Bakery”. **Pause 50 (30 Seconds)**.
- 12.82 2.60 8. Right at Tee. **CAS 32**.
9. Left at Tee. **CAS 36**.
- 14.96 1.86 10. “Caution School Zone”
- 2.11 11. “Speed Limit 45” **CAS 42**.
- 19.20 12. Right at Stop. **Pause 10 (6 seconds)**.
- 1.47 13. “Speed Limit 35” **CAS 32**.
14. Straight at SI. **Pause 30 (18 seconds)**.
- 25.16 2.29 15. Right at “Blue Hawaii”
Turn into parking lot. End Rally.