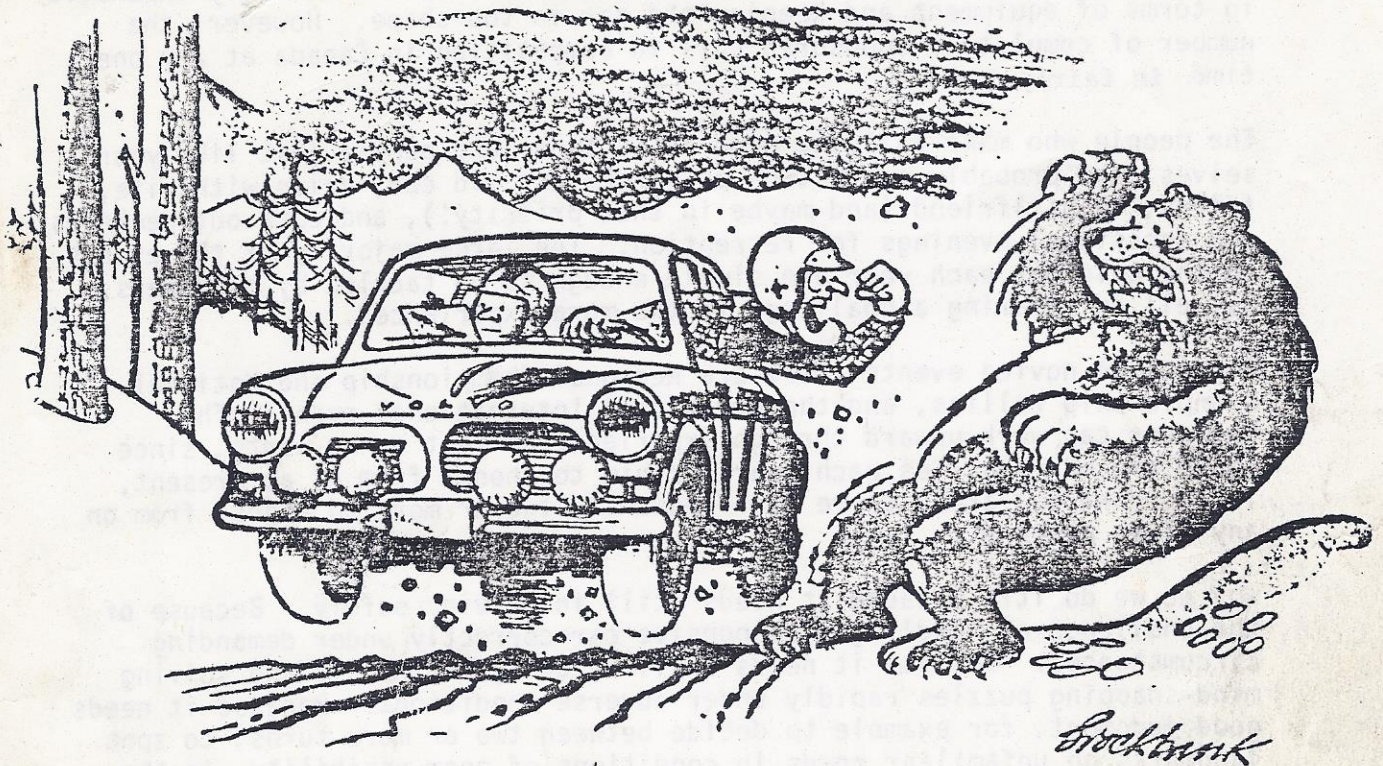


and so to work -----



Definition: RALLY (ral-i) 1. To collect and reduce to order, as troops in confusion. 2. To arouse to action . . . 3. To recover strength after a decline in prices, as stocks. 4. A mass meeting intended to arouse group enthusiasm. 5. A series of strokes interchanged between players, in tennis, rackets, etc. 6. A competitive precision sport taking two people in a highly maneuverable car over public roads and under ordinary traffic rules, along a previously undisclosed route on an exact schedule between checkpoints at undisclosed locations, using instructions which are unambiguous but not always in plain language.



Introduction



WHY RALLY?

Rallying is fun. At expert levels it is highly competitive, demanding of endurance of the crew and durability of the car, and modestly expensive in terms of equipment and keeping the car in top shape. However, the number of completely sponsored cars in competition in Canada at any one time is fairly limited.

The people who make rallying what it is today are people just like yourselves, who probably own a two- or three-year old car, drive with wife, friend, or girlfriend (and maybe in that priority!), and come out weekends and occasional evenings for recreation. The large majority of the events on the calendar each year are simple enough to be tackled by beginners, as well as offering a challenge to the more experienced.

Beyond the novice events there are Regional Championship and National Championship rallies, and the occasional International event. The beginner can work upward through experience as fast as he wants, since there are many rallies each year for him to choose from -- at present, in the Montreal area, there are frequently two or more to choose from on any given weekend.

Why do we do it? Because it needs skill in driving safely. Because of the challenge of handling a responsive car correctly under demanding circumstances. Because it needs skill in doing arithmetic and solving mind-snapping puzzles rapidly under adverse conditions. Because it needs good judgment, for example to decide between two or more turns, to spot landmarks on unfamiliar roads in conditions of poor visibility, in the dark, possibly in the face of confusing instructions. Because it needs cooperation and teamwork. But above all, because all this put together is fun.

WHAT TO RALLY?

What makes a rally fun? For the driver, it is the challenge of handling an agile vehicle over interesting roads, driving skillfully within his abilities over a route chosen by the organizer to test these skills without demanding that the driver over-extend himself and risk the vehicle or the safety of others.

For the navigator, the challenge is that of keeping the car on route and the crew on time while interpreting navigation instructions which are sometimes not obvious or direct, but are never ambiguous.

For the car, the test is mainly one of suitability for back-road driving. Maneuverability, road-holding, steering response, handling should all be enjoyable as well as adequate, or driving on these secondary roads will hold no pleasure.

In the end, all three of these are knit together into a relationship which gives a balanced challenge which intrigues everyone.

The common link which draws rallyists together is their interest in automobiles. So -- what kind of a car do you drive? Does it feel responsive in turns, on loose surfaces, in snow? Is it agile in close quarters? Is it different in appearance? Is its roadholding superb? Does it feel like a part of you when pressed hard? Do you like the command of an intricate, precision machine which acts like an extension of your own abilities?

Then rallying that car is for you. Combine all those skills with the skills needed for navigation to guide the car along a route which you as a beginner have probably never known existed in such interesting form so close to your home town, and you have a successful rallying combination.

One last word about cars -- these secondary roads mentioned above are not always paved, and rallies are run in winter as well as summer, so -- this being Canada -- you may opt for a sporty sedan rather than an open wind-in-the-face convertible sports car, but the choice of car has little to do with the success of the rallyist. As long as you like it and its performance, rally it!

WHO RALLIES?

By the description of the challenge of rallying outlined in the first section, you may expect to find that the typical rallyist possesses a superhuman combination of attributes falling somewhere between Clark Kent and Einstein. Not so. These days, almost everyone has grown up with the automobile, and in many cases they have driven one sort of car or another since minimum licensing age. This familiarity leads everyone, whatever their other interests, to a keen appreciation of the abilities of a car when the time comes that they reach the realization that cars differ from one another in their performance and handling abilities.

Everyone rallies. People from a vast diversity of alternate interests find recreational pleasure in the sport. Our club roster currently includes a banker, students, engineers, secretaries, a lawyer, clerks a chartered accountant, a meteorologist, biologists, a pharmacist, mechanics, and many others

moral from this -- anyone can rally successfully!

So let's draw a

and WHAT ELSE DO THEY DO?

Rallyists are generally a light-hearted bunch who live pretty active lives. Throwing a number of these people together leads to a similarly light-hearted social program. While most of the talk may be about cars, the parties, bull sessions, club meetings, and even a relaxing cup after a rally are fascinating ways to compare experiences with others. This social side of rallying -- its vitality, its friendship, its easy communication about interesting subjects of common interest, leads to

CAR CLUBS

The enjoyment of participating in rallies leads the vast variety of humanity which participate to band together into clusters called Sports

Car Clubs. These organizations meet regularly, usually monthly, and it is their efforts which result in the organization of the rallies which give you the pleasure of participation.

The Clubs have social programs, picnics, plant trips, movies, exhibits, parties, dances, and perhaps annual dinners. Some are interested in other motorsport events -- racing, hillclimbs, flagging, driving skill -- as well as rallying. Today there are motorsport clubs in almost every area in Canada, and major cities have several (yes, even many) clubs.

Consider joining one of the clubs which has interests parallel to yours. Visit various clubs in the area and choose one which suits you best from the point of view of people and activity. Fees are nominal. Club membership brings you into contact with many new friends, some of whom have the same kind of car as you, and as well as offering varied opportunity for competing, in internal club competitions for example, you get into contact with the organizational activities such as checking, officiating, and eventually laying out a rally on your own. Often through the club you can obtain moderate discounts on equipment and accessories for your own car or for navigating in rallies.

The Clubs involved in motorsport in Canada are organized into an association called Canadian Automobile Sport Clubs. This does not have individual memberships, but as member of an affiliated club you will be associated with it automatically. This association will be necessary once you begin to compete in Regional or National Championship rallies.

OBJECTIVES OF RALLY SCHOOL

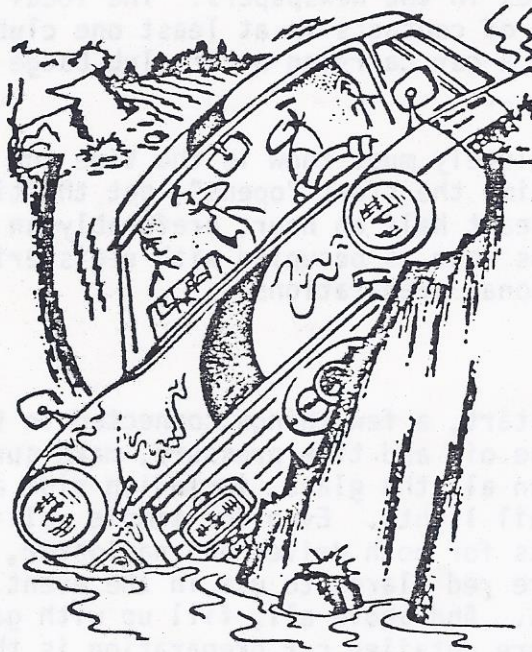
In this course, we in Bluenose are presenting you with a series of lectures and rallies designed to give you the chance to learn from experienced competitors just what techniques they have found work best for them.

The object of holding lecture sessions is to give you the chance to learn by discussion and by asking questions, more rapidly than you could learn by trial and error in actual competition (where one or two big booboos are all you have time for in each event). Still, discussion can teach only the theoretical side of the sport in lectures. This is why we have rallies with the school, to give you "field work" where you can put the learning into actual use.

Beyond the School, you will learn far more by being a steady competitor, entering rallies every few weeks, than by reading all the books in existence on the subject. We are here to give you a start, but this is not a spectator sport. The people who enjoy it are you -- the competitors. These School sessions are designed to give you a head start into that enjoyment.

In Rally School we take the point of view that rally navigation is important for the driver to understand as well as the navigator. So, a good deal of the School is devoted to navigating detail. Cooperation between the crew members is so important that a whole section is devoted to it later in the manual. In the section on Driving and Teamwork you will learn more about how to handle your car, but eventually it is your accumulated experience,

and eventually perhaps Skid School, a Defensive Driving Course, or individual coaching which will give you better driving ability. In passing, we feel that Race Driving Schools are not directly applicable for rally driving, where loose surfaces predominate, although these schools are interesting and may improve your general driving skill by giving you broader variety of driving experiences. In rallying as in racing, lead feet have no place -- skillful control of the toe takes their place.



YOU MIGHT AS WELL KNOW NOW-
WE'RE ALREADY LOST

"In the Beginning . . ." - Your First Rally



So now you have gripped your steering wheel firmly in both hands and decided that you want to try rallying. How do you begin? Well, one good way is to come to Rally School. Here you are. For a first rally, the steps outlined here are needed. You will learn more about each of these steps in later portions of this manual. The brief presentation here is to let you get started more easily.

HOW TO FIND IT

The first step is to find a rally. Maybe you have a friend who is already a member of a car club. Go along with him to one of the Club's meetings. Get on their mailing list for future events. Or look for announcements of car club meetings or rallies in the newspapers. The local dealers of imported cars usually know of contacts in at least one club -- ask them. Or just hail the driver of a car carrying a car-club badge on the street, and ask him.

At this point all you absolutely must know is the time and location of the start. This time is the time the start "opens", not the time the cars leave. You will need at least half an hour, preferably an hour, in advance of car-starting time. This hour is occupied with registering, scrutineering, drivers' meeting, and personal preparations.

IN ADVANCE

Before you arrive at the start, a few things connected to the car should be put in order. Check the oil and tire pressure, make sure the horn and brakes work well, and clean all the glass, including side and back windows and both headlights and tail lights. Even for simple rallies, cars should be equipped with seat belts for both driver and navigator, and it is valuable to carry three or more red flares to use in the event of flat tires or other roadside problems. And above all, fill up with gas as close to the start as possible. More detailed car preparation is the subject of a complete section later in the manual.

EQUIPMENT FOR BEGINNERS

Equipment should be in order. For your first rally, the essential things are:

- a car
- one driver and one navigator
- a working odometer (the part of the speedometer assembly which reads mileage). If it is able to be set back to zero, you have a head start already. If not, don't worry -- you can subtract mileages with pencil work.
- something to write with, preferably at least 3 sharp pencils
- something to write on, such as a clipboard
- lots of paper
- A- gas map of the area you are going to be driving in
- a watch, with a sweep second hand, at least 1½ inches in diameter and preferably with 60 divisions and a second hand that can be set to match a master watch

All that sounds like a lot, but except for the clipboard (and the car) it will all fit into your pockets. It is wise not to overload with gadgets for the first few rallies; learn how to do the important things first, then refine your approach until you can attack the more sophisticated equipment and methods of calculation.

FORMS AND FORMALITIES

So your next step is to go to the start. Once there, look for the registration. As one well-known team says : "Our method is to watch where the other new arrivals go; this can lead only to the registrar or to the rest-rooms". Get a copy of the Supplementary Regulations. Read them completely -- and that means in every detail -- and be sure you understand them. Be prepared to ask questions about points which are unclear.

Fill the registration form and waiver in completely. After the details such as your driver's license and insurance card have been verified by the registrar, pay up and find your starting number. It helps to find out which car is the one immediately before you also.

The next step is usually scrutineering, which has as its aim a safety check of your car for basic soundness and equipment.

In the few hectic minutes which remain between then and the drivers' meeting, fill up with gas, and check your oil and tires again. Also, don't forget to use that r-r you confused with the registration at first contact. Then relax.

DRIVERS' MEETING

Now you have to go to the drivers' meeting. This is wrongly named, since most of the information is of interest mainly to the navigator, but this just means that you should both go. Write down anything that is said concerning corrections in the instructions, of regulations, and make sure you ask any questions left from registration. Get a check of the time with the master clock. It is also oh, so wise to make sure that you know where the finish is going to be, in case you wander far afield like so many lost sheep.

THE START

Then get back to the car, and line up in order as instructed by the starter. Usually, cars will leave at two-minute intervals, and you will be given the route instructions 30 seconds or more before you are to start. So watch the cars ahead of you leave. See if they go left or right, and then where they turn after that.

As you reach the starting line, zero your own odometer, and look quickly through all of the instructions to be sure that all of the pages are there and all are readable.

EN ROUTE

In the car, the best technique, proven by many generations of successful rallyists, is to read all of the instructions out loud. Naturally, the

navigator does the reading. Both crew members should agree on the meaning of each instruction. If there is any doubt, stop and work it out before continuing. It is much easier to make up lost time when you are on route than it is to get back on the right route. Cooperation is the key to success here (like most other human enterprises).

Read the first few instructions (out loud, remember) before you leave the start. You won't embarrass the starter -- he is an experienced rallyist who knows what you are up to.

On the road, anticipate the next instruction. Be ready for an intersection, and know what you want to do before you get there. Do you turn or not? If so, then which direction? Is it acute? Warn the driver ahead of time, so he can be prepared also.

Checkpoints are easily handled, even on your first rally. Stop, past the checkpoint board and car, and pull over until you are clear of traffic. Get out (who gets out? depends on whether it is raining or not) and run back to the checker with your route card. Make sure he initials it and logs in the (correct) time that you passed the board. Then return to your car and leave as promptly as possible.

THE THREE COMMANDMENTS

There are three rules in rallying. Observing them will ensure that you have fun without embarrassment, and observing them all the time will let you climb up the standings until you win more and more. They are:

1. Stay on the road
This is the main business of the driver, and takes precedence over everything, especially screaming navigators.
2. Stay on the route
This takes will power, since stopping to dope out the problem means losing some time, but catching up is easier than driving back on roads you weren't supposed to be on in the first place.
3. Stay on time, if you have time
This takes practice. Sound advice to complete beginners is to ignore time altogether and drive at a comfortable speed about 5 miles per hour faster than the instructions call for until you can find the route without delay. Then (perhaps after several rallies like this) work time calculations in as you can without distracting yourself from route navigation.

Once these vital rules are learned, a few other hints are:

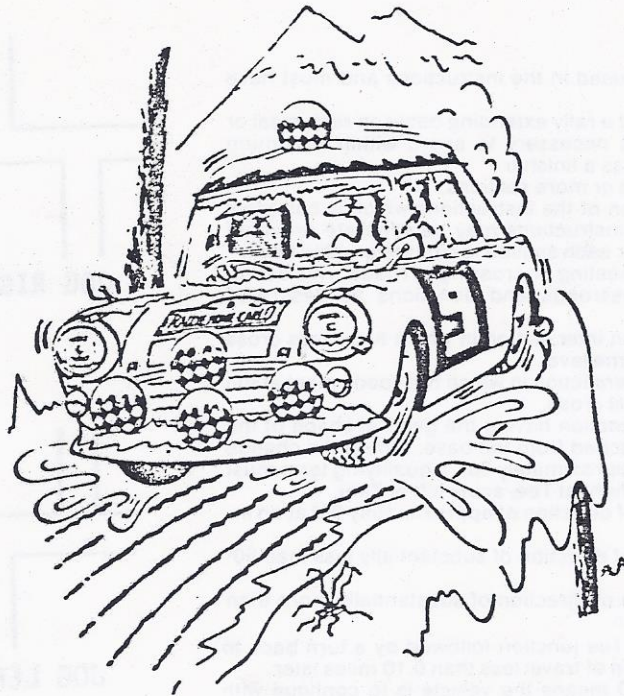
Read all the instructions
Check route book for out of order instructions
Check for out of order mileages

Don't assume anything

Cross off every instruction as you do it (not before, not after)

Don't give up Finish

Following these will keep you out of trouble and in the top ten of the standings in many rallies.



JUST FOLLOW THAT HEAVY
LOGGING TRUCK!

BASIC TERMINOLOGY

Rally navigation is based on route finding using public roads. Road intersections occur in various shapes and patterns, and a standard vocabulary has grown up referring to them. Some of this is based on agreed convention -- terms have meanings more specific than they might appear to warrant at first reading -- so it behooves us to know the lingo before we fire up the engine.

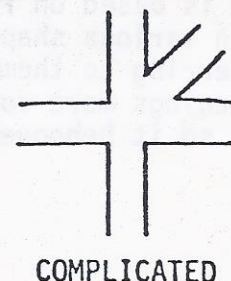
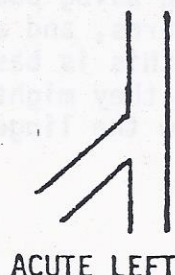
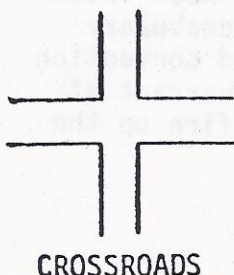
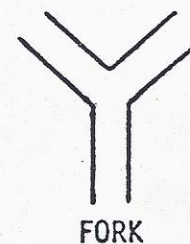
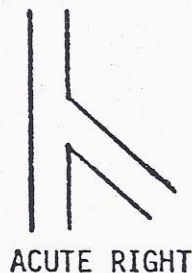
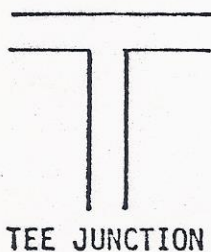
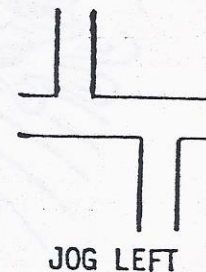
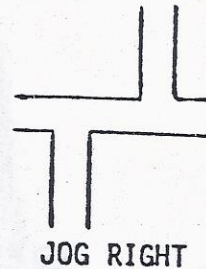
Right, Left, and Straight Ahead seem obvious enough. But we can turn right through 90 degrees at three types of instructions, and go in a right-ward direction at two others. So let's look at the drawings to see what we are talking about when we define our terms.

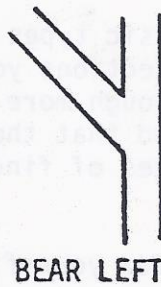
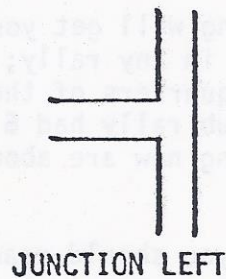
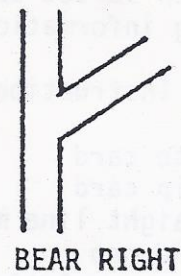
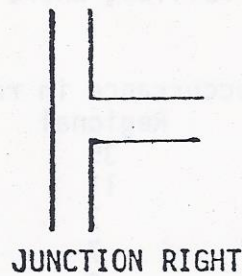
These terms and definitions are drawn directly from the C.A.S.C. Rally Regulations published in 1977 and available from C.A.S.C., 5385 Yonge Street, Willowdale, Ontario.

3.2 TERMS

The following terms may be used in the instructions and must have the following meanings:

- (a) LEG is a major portion of a rally extending between rest, meal or fuel stops at which it is necessary to arrive within maximum lateness to be classified as a finisher.
A leg is composed of one or more sections.
- (b) SECTION is a subdivision of the instructions which is complete within itself. The timing instructions may be separate provided the timing information for each section is complete within itself.
- (c) INTERSECTION is any meeting or crossing of roads. This definition includes both Crossroads and Junctions as described below:
 - (i) CROSSROADS is an intersection in which two roads cross each other at the same level.
 - (ii) JUNCTION is an intersection in which two roads meet at the same level but do not cross.
 - (iii) TEE junction is a junction having the general shape of the letter "T" as approached from the base. Where the change of direction is not approximately 90°, a qualifying term must be used (e.g., bear right at Tee, acute left at Tee).
- (d) (i) TURN is a change of direction of approximately 90° at an intersection.
 - (ii) BEAR is a change of direction of substantially less than 90° at an intersection.
 - (iii) ACUTE is a change of direction of substantially more than 90° at an intersection.
 - (iv) JOG is a turn at a Tee junction followed by a turn back to the original direction of travel less than 0.10 miles later.
 - (v) STRAIGHT AHEAD means the vehicle is to continue with the least possible deviation from its present heading. A mileage or qualifying instruction must be given with this instruction.





NO INSTRUCTION Where no instruction is given, follow the main road, with route number and highway signs taking preference over road surface.

STOP This means exactly what it says.

CHECKPOINT Is a general term for the following:

- (a) Time Control - is located at the beginning and end of a rally section.
- (b) Regularity Control - any control(s) located between time controls where time is recorded.
- (c) Route Control - may be either manned or unmanned, placed to penalize competitors not on route or to ensure the competitor is on course. No time is taken.
- (d) Information Check - same as a route control but is usually unmanned.

NAVIGATING

For purposes of your first few rallies, it is advisable to have a bit more than nodding contact with the most common four or so types of instructions. These are described in complete detail a bit later. The six most common instructions have been sorted out of fifty rallies, where we found the following fascinating information:

Type of Instruction	% occurrence in rallies	
	club	Regional
route card	45	35
tulip card	12	11
straight line map	8	7
blind map	7	7
non-accumulative	6	5
map plotting	4	12
others	18	21

This means that two basic types of navigating will get you through more than half of all the sections you will meet in any rally; and five basic types will get you through more than three-quarters of the sections. At the same time, we found that the average club rally had 6 sections in it, which means your chances of finding something new are about one section per rally.

If you are preparing for your first rally, you should read over the directions and explanation covering the five most common instruction types.

A WORD ABOUT NEXT TIME

In this section we have given you the bare bones of information about the various aspects of rallying needed to get you into your first few rallies. In the rest of this manual we will take you into much more detail on most of these points, and into several more subjects not needed until you get hooked on the sport.

And you will. This sport is a fascinating exercise in self discipline. You will be expected to handle several things at once. Your goofs when you fail to do so properly will be apparent almost immediately; and your feeling will be appropriately good when you get through tricky bits successfully. You will have fights with your partner, which will test your friendship (or your marriage). You will learn more about your automobile. And most important, you will still show up next week to try again.

We all do.

See you there!

Basic Navigation



THE NAVIGATOR

The navigator in a rally has two basic functions:

- (a) To keep the car on the correct route as indicated by the organizers.
- (b) To arrive at assigned places at the elapsed time intended by the organizer, these places being imaginary or definite, but in all cases CHECKPOINTS.

The navigator must:

- (a) Make final decisions in the car and be ready to support them, if necessary. (i.e. if they are wrong)
- (b) Decide who will make the checkpoint run. It is easiest for the driver, as the navigator's knees will often be full of papers, clocks and pencils. The person selected should go all the time. A method of crosschecking information on the route card should be established and followed meticulously.
- (c) Always have his (or her) seatbelt fastened while the car is moving.

ENTERING A RALLY

It is helpful to get your name on car club mailing lists in your area. You will then receive information on rallies to be run. The best way is to join a car club whose specialty is the organization of rallies and related events. Bluenose Autosport Club follows this kind of program and has done so for many years. When you attend the regular meetings held by car clubs, you hear of most current events and are able to obtain a set of rally RULES and REGULATIONS at the same time.

When you decide on an event and receive a set of Rules and Regulations:

- (1) Read them thoroughly and determine:
 - (a) Where the rally begins and at what time.
 - (b) Where it ends. This is important if you and your crew arrive at the start in different cars.
 - (c) Penalties assessed, overall lateness, etc. If the late time allowance is short, you may be classed DNF, even though you finished the rally. This is a precautionary note for the novice.
 - (d) Distance between gas stops. This indicates whether you will have to carry extra gasoline.
 - (e) What special equipment is suggested, either for the car or the navigator.
 - (f) How long the event is. You can then tell your wife, girlfriend, mother-in-law, etc., at what time you should be home.
- (2) Carefully fill out the entry form (PLEASE PRINT) and mail to the organizers. If it is to be a post entry, take the completed form to the rally start, along with whatever documents (insurance, registration, permission to use car, etc.,) requested in the Rules and Regulations.

- (3) Arrive at the start at least 45 minutes before the rally is to begin, in order to:
- (a) Check in at Registration to submit your post entry, or to make certain your mailed form was received.
 - (b) Obtain your car number. Most rallies begin with the first car departing two minutes after the hour (i.e. 8:02 pm), with successive cars leaving at two minute intervals. When this system is used, your car number times 2 will become your departure time in minutes. If car number 1 leaves at 8:02 pm, and your number is 14, you will leave the start at 8:28 pm.
 - (c) Perform a safety check on your car, whether it is mandatory or not.
 - (d) Fill out the route card, completely.
 - (e) Make certain your clock is accurate and corresponds with the organizer's time piece. Short wave time signals are usually used for this purpose and are generally available at the start.
 - (f) Make certain your map reading lights are working properly if you are to compete in an evening event.

STARTING OUT ON THE RALLY

- (1) As the car in front of you is about to start --
ZERO YOUR ODOMETER.
- (2) When you receive your route instructions (about half a minute before you start) READ ALOUD the first four or five directions. This will brief your driver sufficiently to get him started while you work ahead with average speed calculations etc. DO watch the other cars leave the start line and note their initial direction. DO NOT follow the car in front of you. He may have made an error and you might blindly go the same way.
- (3) Read the instructions for the first section through completely, WORD FOR WORD. If anything looks peculiar, check for:
 - Reversed mileages
 - Mileages out of place
 - Non-accumulative mileages
 - Jumbled mileages
 - etc.
- (4) The first section of a rally usually leads to the odometer check and allows generous time. During this run you can work out questions and problems in the second section.
- (5) Do not touch your odometer until you reach the odometer check. Then calculate your error and use it. DO NOT alter your odometer at every turn. If you make changes and do not have an error factor, should the distance between turns be greater than 5 miles, a 10% error might cause you to pass a turn by a half a mile or more.

TYPES OF INSTRUCTIONS

Many types of instructions may be used to define a rally route. The only limitation is the organizer's ingenuity. However, certain types of instructions have become almost standard and we shall devote the rest of this section on basic navigation to discussing these "standard" instructions and

recommend methods of coping with them.

STANDARD ABBREVIATIONS

SA	- Straight Ahead	B	- Bear
R	- Turn Right	K	- Keep
L	- Turn Left	A	- Acute
S	- Stop	J	- Jog
CAS	- Commence or Change <u>A</u> verage <u>S</u> peed		
T	- Tee		

Examples of Use:

TR	Tee Right
BL	Bear Left
JR	Jog Right
SSO	Stop. Straight Ahead
etc.	

Note: Stop cannot be abbreviated in instructions for National or Regional Events, and should not be abbreviated in any event.

1. MILEAGES AND TURNS: ROUTE CARD

Accumulative mileages in order from the start of the section with standard turn instructions and average speed changes or elapsed times given as required.

This is the easiest type of instruction since you simply do what you are told to do at a specific mileage. The first section in most rallies will follow this format.

<u>Example:</u>	0:00	TR out of service station
	0.05	BL (Rtes. 2 and 20)
	0.40	SA- Follow Mercier Bridge Signs
	3.60	BR towards Chateauguay
	4.25	BR towards St. Isidore
	4.40	Tee L
	9.40	SA
	10.00	Stop TL- Odometer Check at Stop Sign. You have 20 minutes to reach this point. CAS-40.5mph
	11.40	AR
	12.15	TR
	15.75	Stop Tee R End of section

Translated, this says:

Turn right out of service station when the starter releases you at your time of departure and start driving at maximum legal speed (traffic conditions permitting). At 0.05 miles bear left. At 0.40 miles go straight ahead, then follow Mercier Bridge signs to mile 3.60 where you bear right. Bear right at 4.25 miles, Tee Left at 4.40 miles then straight ahead to 10:00 miles where you stop beside the stop sign, note YOUR mileage, turn left and (as you are probably early-the 20 minute elapsed time equals 30 mph) park to compute your odometer error factor. You leave this point on time and finish the section at an average speed of 40.5mph. At 11.40 miles, turn acute right, etc.

Common Variations:

- (a) No Mileage Insertions -- organizers frequently insert a turn instruction without a mileage into a mileage and turn section. When this occurs you must make the required turn at the first opportunity after the last indicated mileage and prior to reaching the next indicated mileage.

<u>Example:</u>	10.50	TR
		AR
	11.72	TL

You must make the acute right at the first opportunity between 10.50 and 11.72 miles.

- (b) Misplaced Mileages -- organizers will sometimes "misplace" a mileage to catch the unwary competitor who fails to read through a section completely as early as he can (preferably before starting it).

```

Example:    0.00    SA
            2.72    TL
            5.60    Tee L
            9.25    TR
            14.72   SA
            15.80   Tee R
            21.71   TR
            12.80   AR ----- This one belongs between 9.25
            27.30   TL           and 14.72 miles!
            33.59   TR

```

REMEMBER, there can be more than one misplaced mileage in a section.

- (c) Accumulative Out of Order -- this is when the organizer carries the misplaced mileage theme to its ultimate extreme and can be presented in two ways:

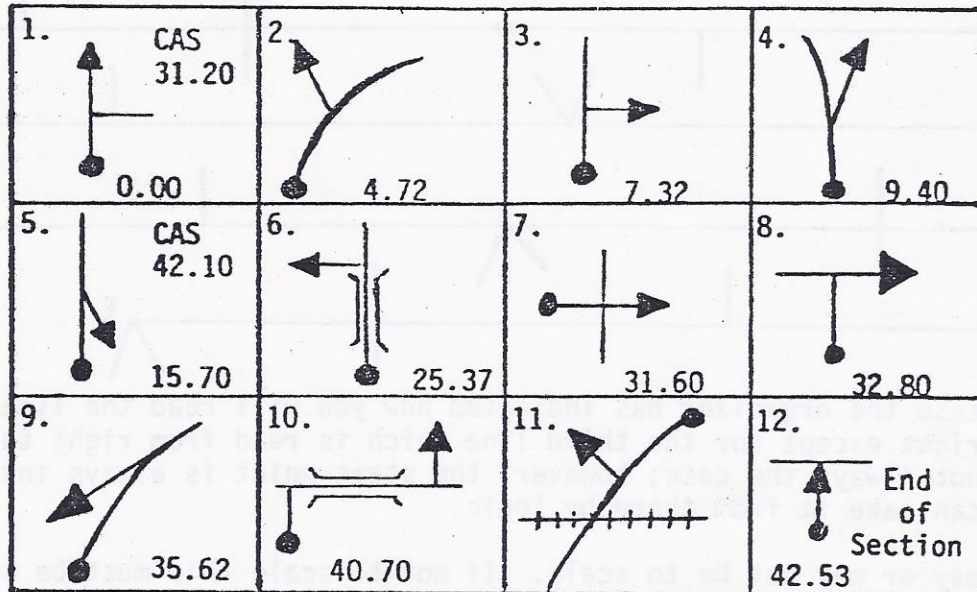
(1)		(2)	<u>TR</u>	<u>TL</u>	<u>SA</u>	<u>BR</u>	<u>AL</u>	<u>Etc.</u>
	0.00	TR						
	1.90	TR						
	2.95	TL	0.00	4.30	5.10	1.50	7.90	0.70
	5.10	SA	0.20	6.40	8.30	10.50		
	1.50	BR	1.90	2.95	9.30			
	4.30	TL						
	8.30	SA						
	7.90	AL						
	10.50	BR						
	00.20	TL						

These are sometimes referred to as Accumulative Mixed Mileage sections and the best way to handle them is to re-arrange the mileages in their correct order on your working papers with the required turn for each.

2. TULIP CARDS

So named because they made their first appearance in the Tulip Rally in Holland, these are simply line diagrams of most of the intersections or junctions on your route with the direction of departure indicated by an arrow and your direction of approach normally indicated by a ball.

Example:



The intersections are at the mileages shown. Note that #11 has no mileage; in this case you simply stay on the main road (more on this later) until you find a junction which fits the diagram. It will, of course, appear before mileage 42.53. Record the mileage when you make the turn; it may prove useful later.

Interpretation of the above Tulip Card Section:

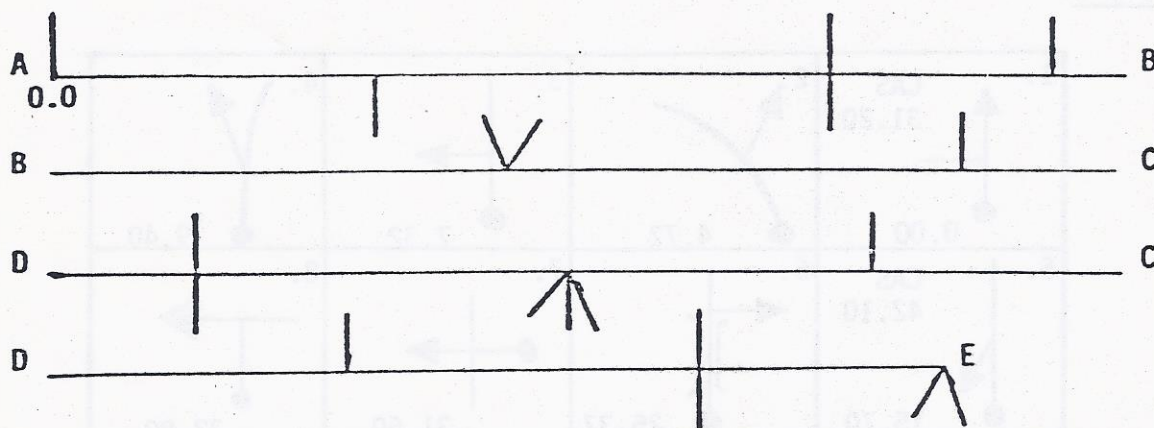
- | | |
|------------------------|-----------------------------|
| 1. SA - CAS 31.20 | 7. SA |
| 2. TL | 8. Tee R |
| 3. TR | 9. AL |
| 4. BR | 10. Jog R across bridge. |
| 5. AR - CAS 42.10 | 11. TR on curve before RRX. |
| 6. Cross bridge and TL | 12. Tee - End of Section. |

Be certain you read your instructions carefully and completely as there are many variations to this type of section. For example: the diagrams may not be numbered, nor in any particular order, in which case you must find the correct sequence from the mileage shown with each diagram.

3. STRAIGHT LINE MAPS

In this type of instruction your route is shown as a horizontal or vertical line (or lines) with "stub" lines projecting on either or both sides of the main line to indicate roads you DO NOT use. At an intersection or junction you go in a direction which will enable you to avoid using (or leave) a road, or roads, on your left or right as indicated.

Exa-ple: NOT TO SCALE



In this case the organizer has indicated how you will read the lines: from left to right except for the third line which is read from right to left. This is not always the case; however, the start point is always indicated and you can take it from there by logic.

The map may or may not be to scale. If not to scale this must be so stated and every junction or intersection must be shown. If to scale and the scale is given there is no problem, you simply measure off the distance to each intersection. If to scale and none is given, you must drive to the first intersection where you can execute the first instruction (in the above example, leave a road on your right) and note the mileage -- you now have a scale.















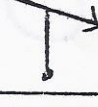

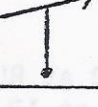
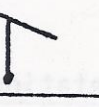
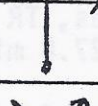


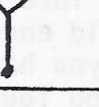



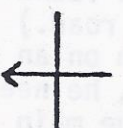


Please see the following page for a complete chart on interpretation of straight line maps.

Interpretation of the above example:

1. Leave a road on the Left (Start, 0.0 miles)
 2. Leave a road on the Right
 3. Leave a road on both sides
 4. Leave a road on the Left
 5. Leave two roads on the Left
 6. Leave a road on the Left
 7. Leave a road on the Right
 8. Leave three roads on the Left
- Etc.

Common Variation: Some organizers will give you a "mirror-image" straight line map. In this case you have to leave the roads on the opposite side to that shown on the map. The first instruction normally tips you off on this one.

Interpretation of Straight Line Maps -- the ball indicates your direction of approach to the intersection.

Straight Line Map Instruction	Your Route Could Be	Straight Line Map Instruction	Your Route Could Be
			
			
			
			
			
			
			
			
			
			
			
		Angular relationships can be indicated but very rarely are as they only serve to confuse both competitor and organizer and create protests and arguments.	

It is obvious from the foregoing that attempting to guess in advance what type of intersection is coming up is a waste of time. The only way to handle this type of instruction is to tell your driver to "Leave 'x' roads on your right (or left)" as the map indicates. ('x' can be one, two, or more.) The driver simply turns, or goes straight ahead, so that he does leave (i.e. does not use) the correct number of roads on the correct side.

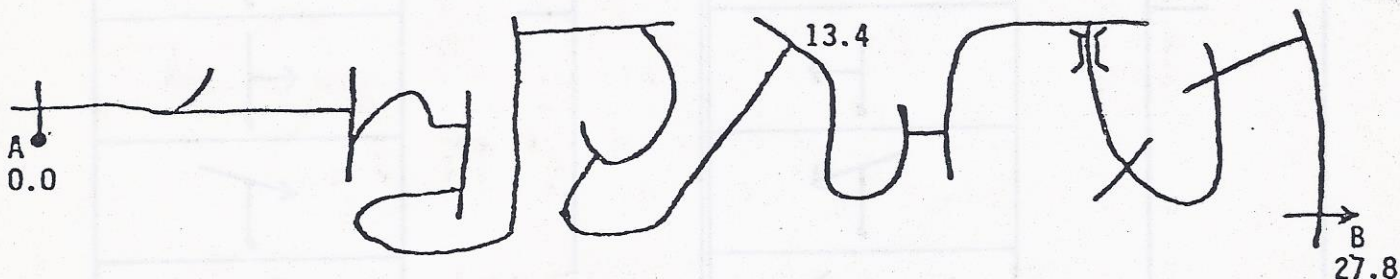
4. BLIND MAPS

When first used in rally navigation, blind maps were single line drawings of the entire route as it actually appeared on a map, sometimes to scale and sometimes not. When to scale, it was comparatively easy to match it to your map of the area and follow the route. When not to scale, it was slightly more difficult.

Today, the blind map has evolved into a horse of a different colour. It is still a single line drawing but seldom has any resemblance to the actual road between the intersections shown. The intersections are drawn as they appear on the road, which may or may not be how they look on your maps. Blind maps today are seldom to scale and so become a real test of your ability to match the intersections on the road with those shown on the map.

A blind map section could look like this:

NOT TO SCALE



Interpretation: 0.0 miles TR at crossroads, SO at BL, Tee R, AL, Tee R, TR, TR, BR, TL off a curve, Tee R at 13.4 miles, TR, Tee L, TR over a bridge, SO at crossroads, TR at crossroads, Tee R, end section at crossroads at 27.8 miles.

Not all intersections are necessarily shown on this type of map. For example, you could encounter a crossroads after the first Tee Right in our sample map before you had come to an Acute Left. In this case you would go straight on until you found the acute left. (Assuming, of course, that you are following the main road.) However, unless the organizer states that not all intersections are shown on an unscaled blind map, he must show all of them. If the map is to scale, he need only show intersections requiring some action other than follow the main road.

5. NON-ACCUMULATIVE MILEAGES

Mileages in this type of instruction are measured from instruction to instruction instead of accumulating throughout the section. You must add them as

you go in order to keep track of your timing.

Non-accumulative mileage instructions can be given in three ways:

(1) <u>In Order:</u>	0.00	SA - CAS 34.5	<u>Your Addition</u>
	1.72	TR	1.72
	0.80	TL	2.52
	1.50	SSA	4.02
	etc.		etc.

This is, of course, the most simple format and is therefore rarely used.

(2) <u>Out of Order:</u>	0.00	SA - CAS 34.5
	1.72	TR
	0.80	TL
	2.72	Tee R
	1.50	SSA
	1.25	TR
	etc.	

In this case, you drive to the first intersection or junction on the road you are on, read the mileage on your odometer, match it to a mileage in your instructions, execute the required action and cross that instruction and mileage off the sheet. You continue in this manner until all mileages (and instructions) have been used. It is helpful, if you can find the time, to re-arrange the instructions in ascending order of mileage prior to starting the section. You must, of course, keep a running total on the mileage for timing purposes.

NOTE: You should note that there is no apparent difference between this format and the preceding one; for this reason it is a favourite trick of many organizers to NOT specify whether the section is in or out of order. To determine this essential fact you drive to the lowest mileage shown and if there is no intersection at that point, continue to the next lowest mileage and so on until an intersection appears at a given mileage. If this mileage is the first one listed in the instructions, you may begin to assume that the instructions are in order. However, do not blindly drive to the second listed mileage, but make sure that no roads appear between the first and second mileages that would fit one of the other, lower, mileages given. If no such roads appear, you may then safely assume the instructions are in order.

(3) <u>Mixed:</u>	TR	TL	SA	BR	AL	ETC.
	0.50	1.32	0.00	0.90	0.30	1.42
	2.10	1.05	1.50	1.26	2.43	0.98

The same procedure is used for this format as (2) above.

6. MAIN ROAD NAVIGATION

Most rally organizers will stipulate that if you come to an intersection or junction during the rally for which you have no instruction you will follow the 'main road'. The main road is normally defined by the following in the order given:

- a. As indicated by Route Number
- b. As indicated by Highway Signs. That is, stop signs and direction arrows.

Examples:

- (1) You approach a junction right () and have no instruction for the mileage. If there is a stop sign on the junction you will go straight on. If, however, there is a stop sign facing the approaching traffic on the road you are on and none on the junction, you must turn right to stay on the main road. YOU NEVER GO THROUGH THE BACK OF A STOP SIGN without an instruction telling you to go that way.
- (2) You approach a junction right and before it there is a road sign saying either or , then you must turn right to stay on the main road.
- (3) There are some Tees in this province where there is no stop sign as you approach them. In these cases, there is a stop sign for traffic approaching on either the left or the right branch of the Tee and the main road follows the branch without the stop sign. Again, you are NOT going through the back of a stop sign.

- c. As indicated by road surface. Pavement takes precedence over gravel, and gravel takes precedence over dirt.
- d. Width of Road. The wider road is the main road.
- e. Straight on. If the main road cannot be determined by any of the above, and there is no clarifying instruction, go straight ahead or as nearly so as possible.

More On Navigation

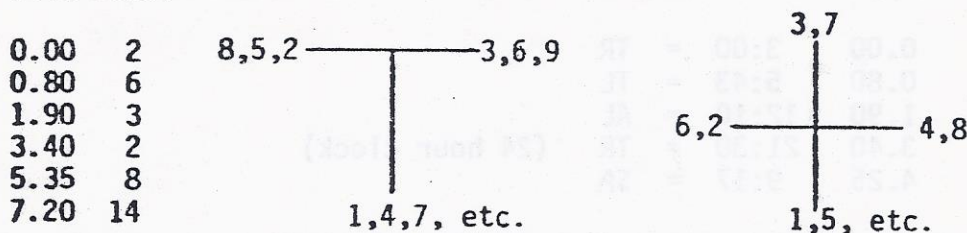


The previous section described the "standard" types of navigation which you will see presented most often in our part of Canada. This section deals with other, more complex types of navigation sections other than maps (which are covered in a section of their own) and with more advanced route-finding hints.

7. DIRECTION BY NUMBERS

The organizer numbers the roads as they appear on the ground at the intersection and gives you your direction of departure by number. He will also stipulate the number given to the road on which you approach the intersection so that you know where to start counting. He will also tell you whether you are to count the roads clockwise or counterclockwise.

Example: The road on which you approach is number one and you will count clockwise.



To cope with this section, you simply count the roads and turn on the appropriate number. Number 6 at 0.80 miles in our example would be TR at a Tee, TL at a crossroads, TR at a junction right and SO at a junction left.

The numbers can go quite high but you just keep on counting. There are methods of factoring the higher numbers but I will leave that to you as an exercise in logic. Also, if you work it out for yourself you are less likely to forget it.

Variations: The number of your approach road can vary and also the methods of counting, e.g. counting by twos, clockwise for even numbers, counterclockwise for odd, etc., etc., etc.

8. DIRECTION BY DEGREES

All turns are indicated by instructions given in degrees relative to the car or as a compass bearing. There are 360 degrees in a circle and the degrees are valued clockwise around the circle from 0 to 360 starting at top dead centre.

a. Compass Bearings

North is always 0 (or 360) degrees; East is 90 degrees; South is 180 degrees and West is 270 degrees. A magnetic compass in the car is most helpful. Compass degrees may be based on magnetic North, true North, or Grid North on a map. Magnetic North is the most common and if either of the other two are used the organizer must give you the declination (or difference) between magnetic north and the north he is using or supply a

map which gives this information. When grid north is used, a map is invariably furnished.

b. Degrees Relative to the Car

Although it can be varied, the normal approach here is to make the direction of the car as you approach the intersection zero degrees. A left turn then becomes 270 degrees; right is 90 degrees; SA is 0 or 360 degrees; BR is 45 degrees, etc.

9. CLOCK FACE DIRECTIONS

Turn instructions are given by time of day. Your direction of approach to an intersection is along one hand of the clock and your direction of departure is along the other hand, as stipulated by the organizer. The centre of the clockface is the intersection.

Example: Approach on the hour hand, leave on the minute hand.

0.00	3:00	=	TR
0.80	5:43	=	TL
1.90	12:10	=	AL
3.40	21:30	=	TR (24 hour clock)
4.25	9:17	=	SA

The organizer may or may not move his hour hand in true relation for this type of instruction. That is to say, he may leave the hour hand on the even hour at all times rather than move it gradually between the hours as the minutes change, thus 2:55 could be BR in the above example if the hour hand moves in true relationship or TR if the hour hand does not move. This is not normally a large problem but it could be in some cases, for example if the mileage for the 2:55 turn was at a 5-way intersection giving you a choice of either BR or TR.

Variation: 12:00 is always SA, then 3:00 becomes TR; 2:00 is BR; 9:00 is TL, etc.

The best way to deal with a clockface section is to draw a clockface on the instruction sheet and work from it rather than visualizing or trying to do it on your wristwatch.

10. NO MILEAGES

Turn instructions are given in order without mileage references. This type requires close attention by both driver and navigator. Each turn instruction is executed, in the order given, at the first opportunity.

Example:

0.00	TR - CAS 37.2
--	L at Tee
--	AL
--	R
--	SA
	etc.

In this example the first turn after the TR at the start of the section is a Tee Left so you would continue on the main road until you reached a tee. After making your left at the Tee, you would then make an Acute Left at the first opportunity (ignoring anything else that shows), then a right turn, and then a SA, etc.

Variation: A no-mileage section in which you must look for specific signs or items on the route to determine your correct turn is called an Observation Section.

Example: 0.00 TR - CAS 37.2
 -- TR at BP Station
 -- SA at stop sign
 -- TL at red barn
 etc.

You follow the main road after executing each instruction until you reach the required "sign" for your next turn.

11. URNS IN TIME RATHER THAN DISTANCE

Fortunately, since it seems to give many people trouble, this type of instruction is not too common today. It requires the navigator to compute the distance between turns by translating the time taken to reach the turn at a specified constant speed into mileage.

Example: This section was driven at a constant speed of 30 MPH.

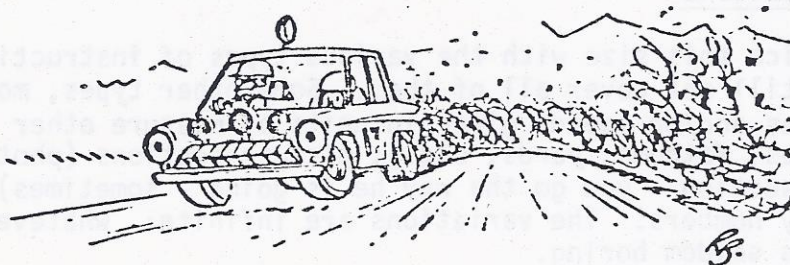
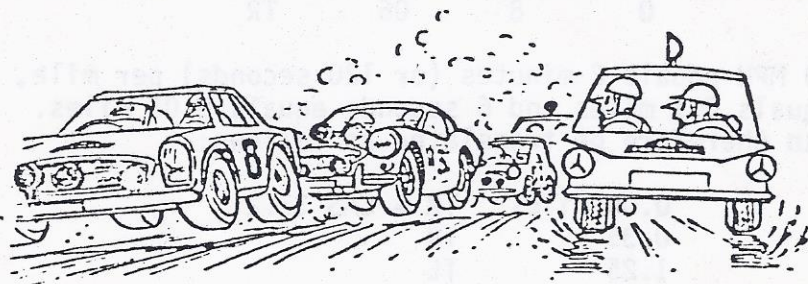
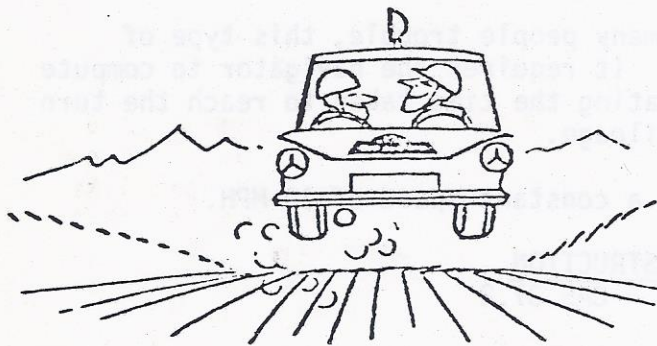
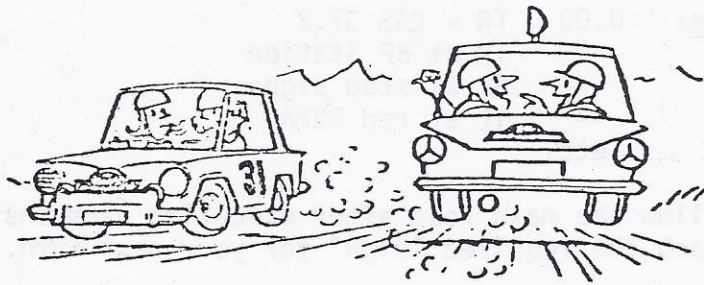
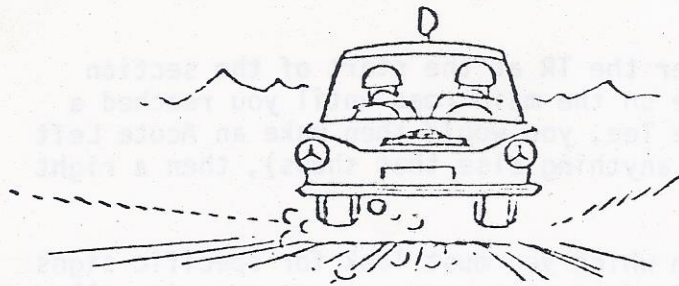
<u>HRS</u>	<u>MINS</u>	<u>SECS</u>	<u>INSTRUCTION</u>
0	0	00	TR - CAS 37.2
0	0	42	TR
0	2	30	TL
0	4	30	TL - CAS 41.0
0	8	06	TR

30 MPH equals 2 minutes (or 120 seconds) per mile, therefore 12 seconds equals 0.1 miles and 6 seconds equals 0.05 miles. The preceding example can therefore be translated as follows:

0.00 miles	TR - CAS 37.2
0.35	TR
1.25	TL
2.25	TL - CAS 41.0
4.05	TR

12. OTHER TYPES OF INSTRUCTIONS

We could fill a manual twice this size with the various types of instructions you could encounter and still not cover all of them. Some other types, more rarely seen, are: distances and/or speeds given in units of measure other than miles (e.g. kilometres, fathoms, yards, etc.); picture sections (photos of a car leaving an intersection - you go the way he is going - sometimes); nomographs and even binary numbers! The variations are infinite: whatever else rallying may be it is seldom boring.



HELPFUL BITS AND PIECES

Several small items contribute to reaching the elusive checkpoint on time. In heterogeneous fashion they are listed below.

Timing and Checkpoint Placement

Rally timing is dealt with in detail in another section of this manual. It should, however, be stressed that timing between checkpoints is normally in full minutes and is non-accumulative. (i.e. time lost or gained between checks can not be made up or lost after you have taken the check.)

Therefore, once you have the time-out at a checkpoint, forget any lost points and concentrate on the next checkpoint. It will have to be in full minutes. If organizers continue to follow their standard, the checks will come at approximately the same time apart, not the same distance. Therefore, watch the time between checks. You can start figuring when the next check should be near. Another clue - if the road begins to tighten up and the average speed does not drop, watch for a check at the end of the tight part of the road.

Roads Close Together

Often you come to a situation where at a given mileage, there is no road, or you come upon a road about a half a tenth from the given mileage. In either case you or your odometer could be wrong. However it is more likely your driver has followed a slightly different line on the course, to that of the organizer and picked up or lost a half tenth of a mile.

The main thing about such situations is to determine the right road. Examine the terrain about you and that you have passed. Reason whether a road of the character the average speed indicates would be a half a tenth from your position (assuming you haven't passed one). Also once you have made the turn onto the road in question, keep looking left and right to see if another road exists.

The object of this exercise is to avoid rushing up and down a road, merely because a mileage is half a tenth out.

Tire Tracks

If you are a late starter, you have the advantage of seeing where the rest of the rally cars turned, such as if on gravel. Though you may not be lost, keep an eye on the road to see what tracks are left by cars which have already passed your point. If you become lost, this information may be useful. It is also gratifying to know you are on the right road.

Children on the Side of the Road

They love to come out and watch cars go by, especially when they pass with bewildered people in them every couple of minutes. If you are unsure of the route, stop and ask the kids. BUT, be careful, if you are a late running car they may send you the wrong way just for the fun of seeing you come back again!

Following

Generally this is not a good idea. If you happen to follow someone who is experienced, he may lead up the "garden path" and suddenly leave you, completely off route and completely lost.

However this can be done scientifically. The object is not to let anyone know you are following them. Firstly if you are still on route, but have lost your place in the route instructions, allow the car behind to pass. Keep an eye on him from a safe distance, until he makes a turn. It is not advisable to follow for more than one or two turns. He may be lost or could be one of those characters described above, who will purposely get you lost.

Retracing Your Route . . . If Lost

One primary function of the navigator is to know at all times exactly where you are located. In heat of battle this is not always possible, so in anticipation of getting lost you should keep generally oriented - preferably on a topographic map - at all times. Record the names of all towns you pass through. Road signs are valuable and worth noting where possible. Record mileages of turns not shown in the instructions (e.g. main road intersections) which might be needed to retrace the route.

The main thing is to know when you are off route. The first basic rule here is not to force anything to fit. At the first indication that something in the instructions does not work, do not go on with hope that the next instruction will fit. Instead, STOP. Make use of all previous information to recover. If necessary, go BACK. It is better to waste minutes while on route than to waste a half hour trying to re-locate the right route. If you have recorded various items of information as suggested, follow it backwards until you are sure that you are on a known part of the route. Or trace your route as actually taken onto a map.

If you are past your maximum lateness time allowance, look ahead in the instructions to a known point and go there - preferably following a topographic map - to pick up the rally route inside your time limits. You may miss a checkpoint or two, but at least you'll finish the event.

OLD MAPS

After each rally, don't throw used maps into a corner in disgust. Keep them stored in some organized way, ready to take on the next rally. If you have marked your route on the map in one event, chances are that another organizer will make use of some of the same roads. Be careful though - no two rally routes are identical!

CHECKPOINT PROCEDURE

You may lose points unnecessarily through lack of an efficient procedure to follow when a control is sighted. A number of operations must be performed quickly. A proper checkpoint procedure should be developed and adhered to.

The time available at any checkpoint is exactly one minute, extending from the second you arrived until the same second on the next minute. This minute is dead time. If your time in is 5:37, then your time out (whether or not the marshal notes it on your sticker or route card) is 5:38. It is based on 5:38 that you must calculate your time to the next checkpoint in the rally.

It is a matter of personal preference as to who should leave the car to present the route card to the Marshall. Experience favours the driver, as the navigator is loaded down with maps and instruments which can be easily dumped out of the car and not recovered.

The following procedure is recommended. Both members of the crew should be thoroughly familiar with it.

Arrive at the checkpoint between 10-15 seconds after the time you want. Make sure you want to check in at the control. (it may be off route!)

Keep the route card in the same accessible place at all times, so no fumbling takes place at time of need.

Park ahead of and as close to the check car as possible but well off the travelled portion of the road. Make sure the car does not block or impede traffic at the control.

Know your time of arrival, or the time the checker should record if you are early or late, and Tell your driver what time you want him to have recorded.

Have your driver run back to the check car, tell the checker the time that you told him to get. If the checker says it's not that time, but some other, that's your tough luck. Unless his clock is wrong. If it is legitimately wrong, have the checker indicate this fact on the back of your route card.

Be certain the checker records the correct time on his log, and signs your route card in the correct place.

When your driver gets back in the car, have him give you the route card, and you check the time that was marked. If you do not agree with the time he got, have him go back and get it corrected. REMEMBER - you must run on the time marked on your card, like it or not.

Maintain a record of mileage and time of arrival at all Controls and Checkpoints. This information will be invaluable if it becomes necessary to dispute the score of a particular event.

Maps and Map Reading



A map is a representation of the earth's surface.

A good map can tell you a great deal about the area it represents. In general, the larger the scale of a map, the better it will be.

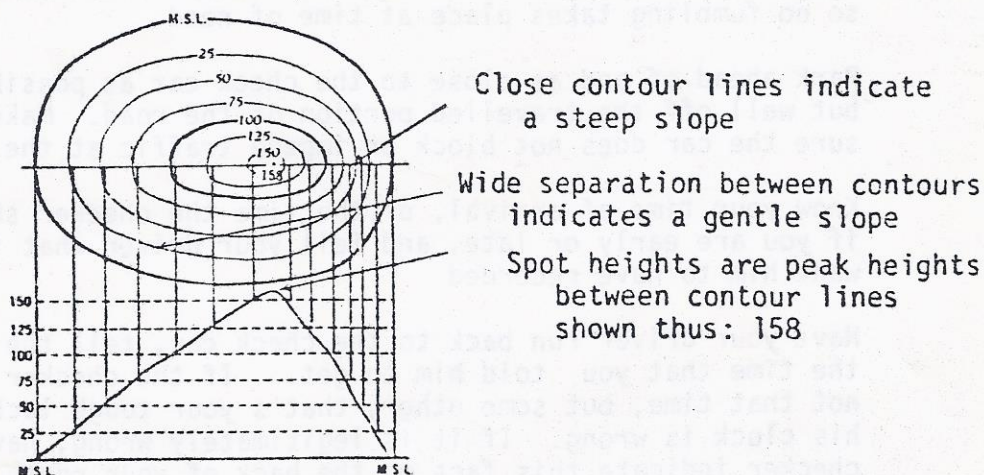
SCALE

The scale of a map is a comparison of a distance on the map with the actual distance on the ground. On a road map, for example, one inch on the map represents about 20 miles. On a large-scale government map, one inch would represent a little over a mile of actual distance.

The government map most used in rallies has a scale of 1:50,000, which means that one inch on the map represents 50,000 inches, or about 1.26 miles. A map of this scale can show a lot of detail.

INTERPRETATION OF TOPOGRAPHIC MAPS

First of all, the map shows whether the area is land (green or white) or water (blue). Second, it shows whether the land is forest (green) or something else (white). Third, it shows the shape of the land by contour lines. Contour lines are generally brown, and might be defined as lines joining points of equal elevation above sea level:



If you can read contour lines you can often locate yourself by reference to nearby hills and valleys.

More important to a rallyist are man-made objects. Roads are represented by lines - the better the road, the wider and redder will be the line:

Trails and cart-tracks are shown as dotted lines.
Small, single-lane roads are shown as a double line.
Lesser gravel roads are shown as a double line with red dots between.
Larger gravel roads have more red.
Paved roads are solid red.

It is important to remember that roads are often changed after the map is drawn. Rally organizers will normally require you to follow the road shown on the map, so you should try to remember to look for places where the road has been changed, but the old road still exists.

Although a map is a representation of the earth's surface, various elements cannot be shown photographically. Symbols are used instead. Therefore, the legend should be consulted before attempting to utilize the map for fine detail. The legend, an example of which is printed below, is an interpretation and explanation of the symbols and marks. On National Topographic Series maps, a lot of information is provided from types of road surface to the location of saw mills and cemeteries. Familiarity with the legend is essential but develops with a bit of practice.

ROADS

	HARD SURFACE, ALL WEATHER, MORE THAN TWO LANES
	HARD SURFACE, ALL WEATHER, TWO LANES
	HARD SURFACE, ALL WEATHER, LESS THAN TWO LANES
	LOOSE SURFACE, ALL WEATHER, TWO LANES OR MORE
	LOOSE SURFACE, ALL WEATHER, LESS THAN TWO LANES
	DRY WEATHER
	CART TRACK, WINTER ROAD
	TRAIL, FOOTPATH, PORTAGE, CUT LINES

























RAILWAYS

	MULTIPLE TRACK
	NARROW SINGLE TRACK
	SINGLE TRACK
	STATION

BRIDGES

	OVERPASS
	FORD (TRAIL)
	FORD (ROAD)
	FERRY

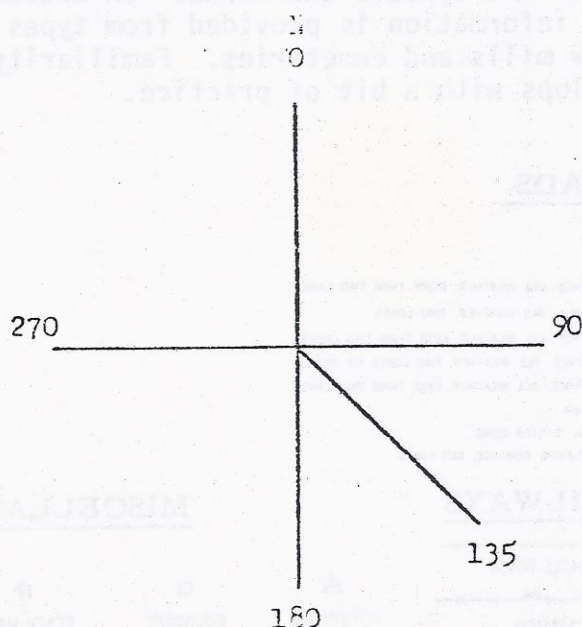
MISCELLANEOUS

					
HORIZONTAL CONTROL POINT	BOUNDARY MARKER	BENCH MARK	SPOT ELEVATION	TOWER	
					
WELL	WINDMILL OR WINDPUMP	LIGHTHOUSE	HISTORICAL SITE	MINE OR PIT	SCHOOL
		 			
CHURCH	CHURCH WITH TOWER OR SPIRE	HOUSE, BUILDING	CEM CEMETERY	AIRFIELD	
					
POWER TRANSMISSION LINE					
			TELEPHONE OR TELEGRAPH LINE		
					
QUARRY	SAND OR GRAVEL PIT	CLIFF	CUTTING	EMBANK	

USE OF MAPS IN RALLYING

In working with a map it is often necessary to give a direction. A direction may be given in the traditional sailor's manner -- for example, north-east; or in degrees -- for example, 45 degrees. The degree notation is almost always used by rallyists.

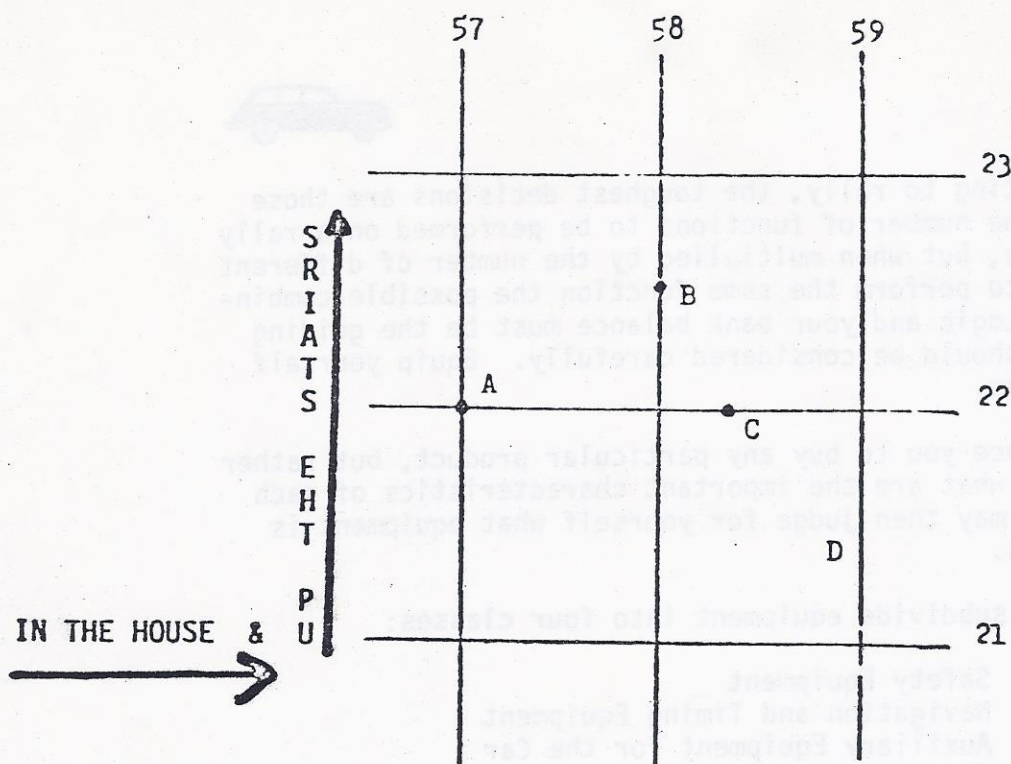
- Remember:
- North is 0 degrees.
 - You count clockwise: East is 90 degrees, South 180 degrees, West is 270 degrees, and North -- if you like -- is 360 degrees.
 - Any intermediate direction can be expressed the same way. South-East is 135 degrees, and 137 degrees is just a bit South, or clockwise, from South-East.
 - Fractions of degrees are expressed as minutes, so that $\frac{1}{2}$ a degree is 30 minutes, or 30'.



A bearing is a direction, expressed in degrees. If point B is exactly South of point A, then point B is said to bear 180 degrees from point A. If B is South-West of A, then B bears 225 degrees from A. This is easy to remember if you look upon a bearing as a direction in which to point. In the second example, if you were standing at A and pointing at B, then you would be pointing from A to B in the direction 225 degrees.

A map reference, or grid reference, is a means of locating a point on the map. The first requirement is that the map must have grid lines, which are a series of numbered North-South and East-West lines dividing the map into squares on a universally coded system. In the example shown on the next page, point A is at the intersection of two lines, and its location can be given as 57-22, or 5722. Most points are not at intersections, but their location can be given by adding another digit to represent the location of the point between lines. Point B is on North-South 58, and is about half-way from 22 to 23. Its grid reference is therefore 58.0-22.5, or 580225 as it is usually written. This is a standard 6-figure grid reference. The number of the North-South line is always given first.

The grid reference of C would be 583220, and that of D would be 588214.



MAP SECTION INSTRUCTIONS

A typical map section in a rally will start by saying something like this:
 "Using only roads shown on the map, visit the following points in order, by the shortest route, without using the same road twice."

Most of this is self-explanatory, but note that using the same road twice usually means driving along the same stretch of road twice. It does not usually refer to crossing a road on which you have already driven, or will later drive.

The points may be defined in many ways. The most obvious way is to give the name of a town, but you could be given a grid reference, a bearing and a distance from another point, a local elevation (spot height) above sea level, landmark, survey marker, public building, and so on.

Example: You are asked to visit the following points:

- Point A The crossroad in Hemmingford
 - Point B Grid reference 216447
 - Point C A point which bears 97 degrees from the crossroad in Hemmingford and is 6.6 miles from it
- and so on.

MAP NAVIGATION

A rally organizer is entitled to assume that you will have with you a ruler, a compass (for drawing circles) and a board to work on. You should therefore carry these with you.

He is not entitled to assume that you carry large-scale maps with you, and he must therefore supply the maps necessary to do his map section. Alternatively he can state in the published regulations that you will need a certain map of a certain edition, which you would then bring.

Rally Equipment



For the novice just starting to rally, the toughest decisions are those concerning equipment. The number of functions to be performed on a rally is not particularly large, but when multiplied by the number of different products each purported to perform the same function the possible combinations are staggering. Logic and your bank balance must be the guiding factors. Each addition should be considered carefully. Equip yourself and the car in easy stages.

We will not try to convince you to buy any particular product, but rather we will try to point out what are the important characteristics of each class of equipment. You may then judge for yourself what equipment is best suited to your needs.

For our purposes we will subdivide equipment into four classes:

- A) Safety Equipment
- B) Navigation and Timing Equipment
- C) Auxiliary Equipment for the Car
- D) Miscellaneous Equipment

SAFETY EQUIPMENT

The minimum standards which automobiles must meet in order to enter Regional and National events are spelled out in the CASC Rally Regulation revised in 1977 as follows:

1.5 VEHICLE

All competing vehicles must be roadworthy and shall be scrutineered to check the function and adequacy of:

- (a) all brakes
- (b) horn
- (c) windshield wipers
- (d) all legally required exterior lights
- (e) exhaust system
- (f) tires, including spares
- (g) mandatory safety equipment (See 1.6, 1.7, 1.8, 1.9)
- (h) all competing vehicles shall be presented at the start of the rally with neat appearance and finished paintwork.
- (i) Four-wheel drive vehicles are permitted in all rallies.
- (j) Two-way radios are not permitted in any vehicles on any rally.

1.6 SAFETY EQUIPMENT

- (a) Vehicles must be equipped with safety belts for each member of the crew. The buckle shall be of a metal-to-metal, quick-release type.

(certain paragraphs of rule 1.6 have been omitted as they should not concern rally school participants)

- (f) The following equipment must be carried in the passenger compartment of competing vehicles on rallies with selectives and/or special stages and is strongly recommended for all rallies. (S)
 - (i) a minimum of six (6) self-igniting warning flares with a total burning time of at least 90 minutes.
 - (ii) a first aid kit which must include:
 - antiseptic (ointment or liquid)
 - gauze pads and rolls
 - adhesive tape
 - arm sling
 - safety pins
 - scissors
 - (iii) a dry chemical fire extinguisher with a minimum Underwriter's rating of 4 BC, securely attached to the vehicle by a quick-release bracket.

1.7 LOOSE ARTICLES

All articles which could be dangerous if left loose must be securely restrained.

1.8 LIGHTS

- (a) It must be possible to run off all lights on the front of the vehicle which could possibly blind the driver of an oncoming car from a single switch which must leave the low beam headlights functioning.
- (b) If the vehicle has a back-up light operated by a manual switch, a warning light inside the passenger compartment must come on whenever the back-up light is turned on.

NAVIGATION AND TIMING EQUIPMENT

There are three fundamental pieces of equipment required by all navigators. An odometer (mileage gauge), a timepiece, and a computational device to link the mileage to the time. These three instruments are the most expensive items you will buy, next to the car itself, and require the most consideration before a choice is made.

1. THE ODOMETER

Most cars are equipped with odometers as part of the speedometer assembly. These, however, are usually less than ideal. Odometers can measure the distance a car travels from two basic sources, an axle hub or a gear driven from the transmission. Most car speedometers operated from a gear in the transmission, but one notable exception is the Volkswagen which operates the speedometer from the front wheel. If an odometer is driven from the transmission (which is connected to the drive wheels) any wheel-spin is entered into the odometer, as an error. To overcome this many rallyists drive their odometers from the hub of a non-driven wheel. Generally speaking, this is an expense you can defer for the first year or two, since wheelspin is seldom a major problem in novice rallies.

To get the information about mileage from the source in the car to the eye of the navigator, two methods are used. The most common method is through a network of cables and gears. The other alternative is through electrical impulses and counters.

What do we want in an odometer?

- a) It must be precise - that is, the mileage reading should be reproducible. It should not slip, skip or add on extra mileage under normal operating conditions. Most car odometers in normal working order meet this requirement.
- b) It should be rezeroable. At the start of each rally, and usually several times throughout the rally, the organizer starts over at zero mileage. If your odometer does not rezero it makes for a pile of work adding and subtracting just to find out what official rally mileage you are at. To navigate efficiently this knowledge is an absolute must.
- c) It should be adjustable. It would be a rare coincidence if your car mileage agreed exactly with the organizer's mileage. Your car odometer can vary as much as plus or minus 5 percent from statute miles depending on the size of your tires, the air pressure in your tires, and the tire temperature. Five percent means that in 20 miles your odometer will be in error by one full mile. This is completely unacceptable and therefore must be corrected. If your odometer is adjustable to the rallymaster's mile you will save a lot of work and many possible errors.
- d) It should be stoppable. If for some reason your mileage reading is higher than the official rally mileage you should be able to turn

your odometer off while the car is moving, in order to bring your mileage reading back into agreement with official mileage.

- e) It should have an add-in feature. If your mileage is lower than rally mileage, you should be able to add on mileage (without driving) to bring the two together.
- f) It should have a subtract feature. This enables you to remove mileage from the counter to correct your mileage.
- g) It should be reversible. That is it should have a negative drive feature that will subtract mileage as you drive, rather than add on mileage. For example, suppose you go one mile down the wrong road. With this feature you merely turn the dial to negative as you turn the car around and presto! you have the proper mileage reading when you return to the route. You then turn the dial to positive again and continue with the rally route.
- h) In the ideal odometer, you should be able to do all of the above functions fast.
- i) It should be easily readable. The larger the numbers the better.
- j) It should read to hundredths of a mile.
- k) The odometer counter should turn continuously, not in starts and stops.
- l) The counter should be fitted with a light so that it can be easily read at night.
- m) It should be strong and reliable enough to take the vibrations and shocks of a long hard rally.

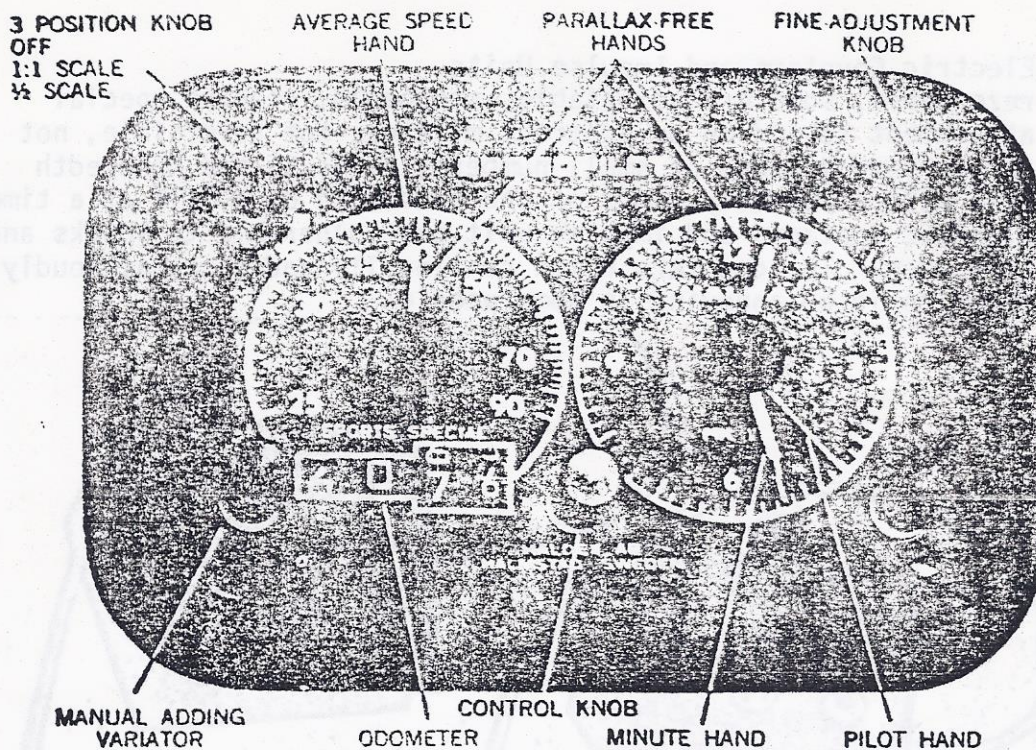
What is available in odometers?

By far the most popular odometers are the cable type. Within this class of instruments, the Swedish manufacturer Haldex AB produces several units which are favorites. In the class of electric odometers, Stevens Engineering Co. in the U.S.A. is foremost.

Comments on specific individual units in popular use follow:

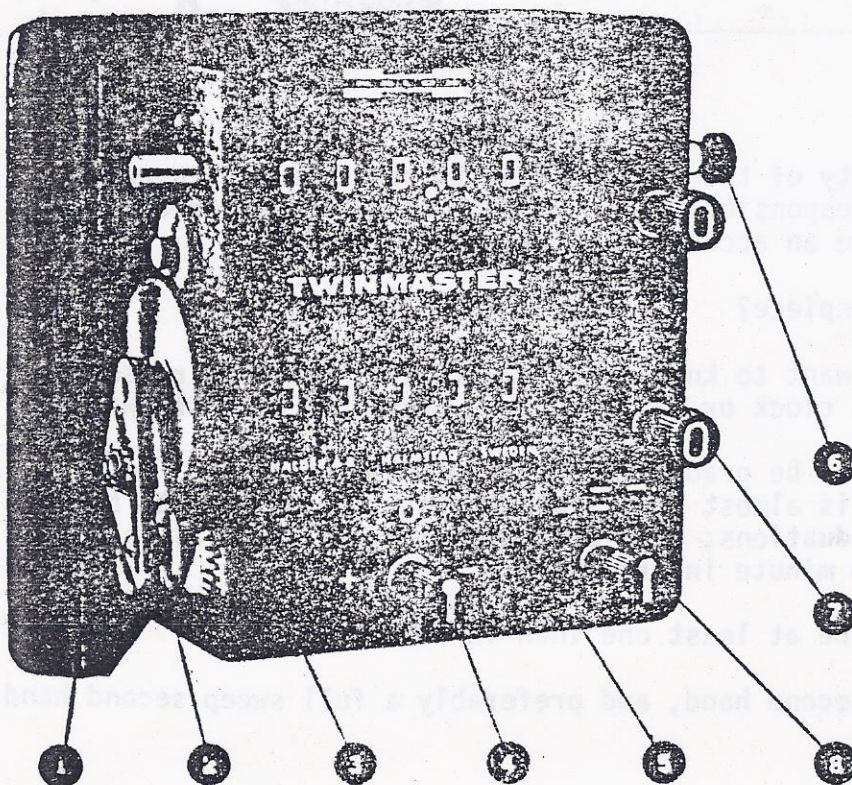
Halda Speedpilot odometer (this unit also has a calculator, described later)-
rezeroable, adjustable, stoppable, can add on mileage, cannot subtract mileage, cannot reverse mileage, readability is fair, does not turn continuously but ratchets 0.02 miles at a time irregularly (not a serious drawback). It has a built-in light and is very sturdy and easily read. Readable to one-half of a tenth of a mile with accuracy. Clicks slightly.

MARK V HALDA SPEEDPILOT



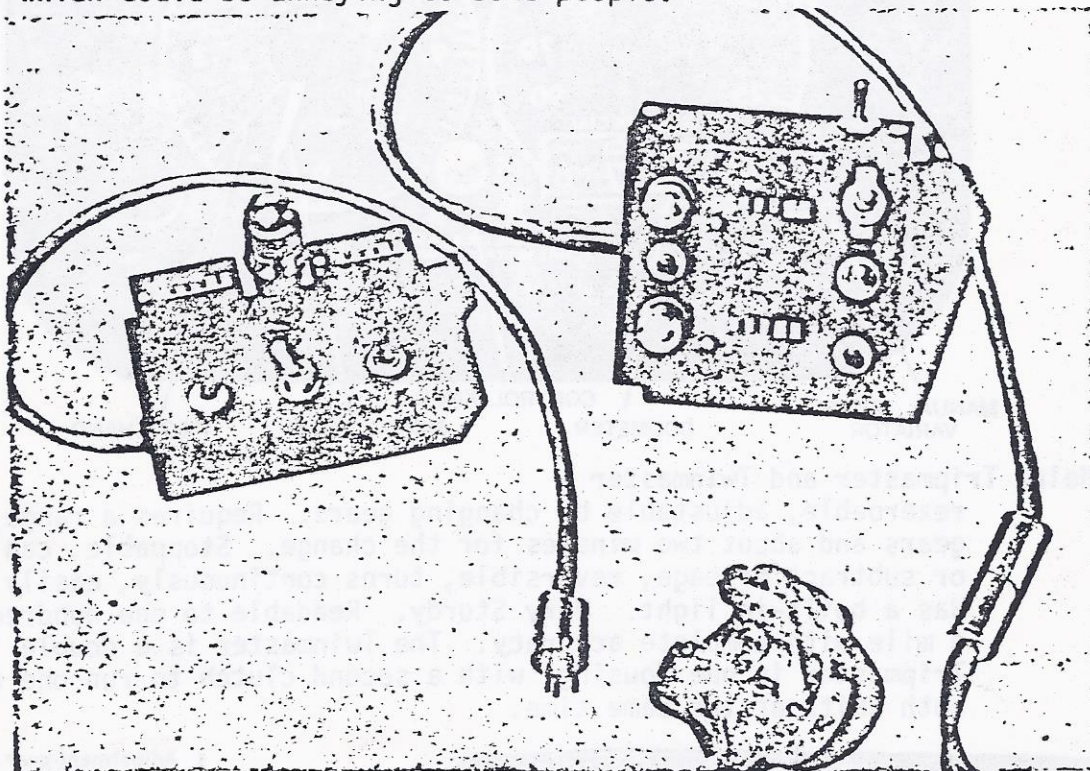
Halda Tripmaster and Twinmaster -

rezeroable, adjustable by changing gears. Requires a range of gears and about two minutes for the change. Stoppable, can add or subtract mileage, reversible, turns continuously, easily read. Has a built-in light. Very Sturdy. Readable to one hundredth of a mile with complete accuracy. The Twinmaster is a double Tripmaster in one housing, with a second clutch to run one or both units at the same time.



- 1 Adjustment-gear holder. Complete adjustment gear allows adjustment to your individual car. Minimum accuracy 99.6%-100%.
- 2 Z-adjustment-gear wheel.
- 3 X-adjustment-gear wheel.
- 4 Three-position odometer control:
+ unit set for adding of mileage
0 unit completely disengaged
- unit set for subtracting of mileage.
- 5 Odometers, calibrated to 1/100th of a mile up to a maximum of 999.99 miles. With large, easy to read figures, 1/4 inch high.
- 6 Correction knob, permits manual adding or subtracting of mileage.
- 7 Zero-setting knobs. Pull out and release for instant resetting.
- 8 Odometer selector:
- lower odometer connected
= both odometers connected
- upper odometer connected

Stevens Electric Counters and Impulse Units -
rezeroable, some are adjustable, stoppable, require special
attachment to add on or subtract mileage, not reversible, not
easily read because of small numbers, reads to one hundredth
of a mile accurately, adds on one hundredth of a mile at a time,
electric contacts and impulse unit are vulnerable to shocks and
vibration. The counters click continually and somewhat loudly,
which could be annoying to some people.



2. THE TIMEPIECE

The primary responsibility of the navigator is to keep the car on route. After that, his second responsibility is to stay on time. In order to stay on time he must have an accurate and reliable timepiece.

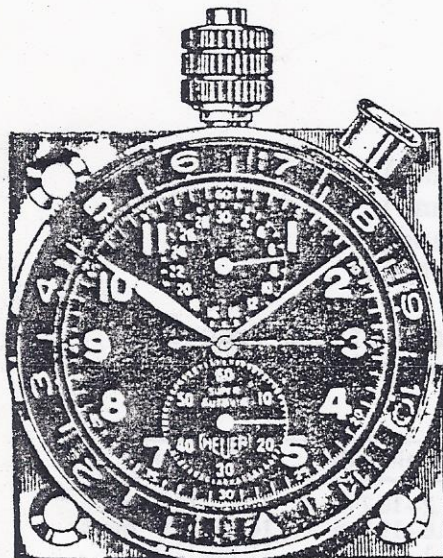
What do we want in a timepiece?

- a) For rallying we want to know the time of day. For this reason an ordinary 12-hour clock or wristwatch is preferred to a stopwatch.
- b) The timepiece must be graduated in one-minute intervals. In a bouncing car it is almost impossible to tell the difference between intermediate graduations, e.g. 6:32 and 6:33, if the dial is marked only at 5 minute intervals.
- c) The face should be at least one inch in diameter.
- d) It must have a second hand, and preferably a full sweep second hand.

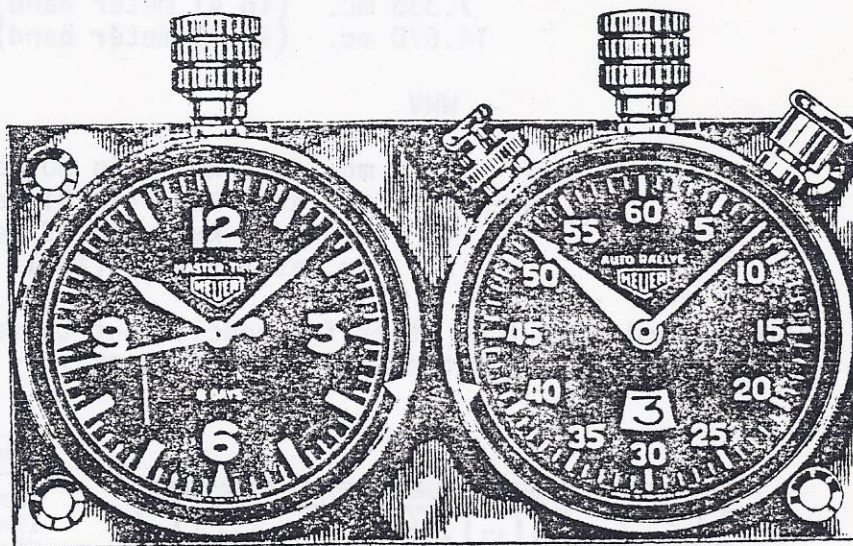
- e) The second hand should be stoppable so that it can be synchronized with the minute hand.
- f) It should be accurate to within several seconds in 24 hours.
- g) It is an advantage if the dial is luminous.
- h) It should not be affected by temperature.
- i) It should be shockproof, antimagnetic, and waterproof.
- j) It should have a simple, clear, uncluttered face; preferably with each hour numbered.
- k) The hour and minute hands should be positionable to any time setting, for synchronization with official time. A stopwatch usually does not have this feature, and can at best be set only on the even hour.
- l) The second hand should make only one revolution per minute, to avoid confusion.

What is available in timepieces?

Both wrist watches and clocks are suitable if they meet the requirements mentioned.



Super Autavia



Master Time

Monte Carlo

The most popular choice among rallyists are Heuer clocks. These Swiss-made clocks are extremely accurate and reliable and sell at relatively modest prices.

Checking the Time

Most rallies use a short wave time signal to determine official time for organizer and entrant. Invariably, a short wave set will be available at the start to set your clock by. Many rallyists have a short wave adapter such as the one shown below installed with their car radio. The Blaupunkt (as shown) or similar units will adapt to most conventional auto radios quite easily. The Blaupunkt "buttons" fit beneath a car radio and connect directly to the set and antenna.

Minute by minute, 24 hour time signals are broadcast by the Dominion Observatory on CHU.

WWV in Washington, D.C. broadcasts a 5 minute signal, 24 hours per day, with a changing tone each 5 minutes (to relieve the monotony on a long rally!)

The "time mark" at the beginning of the minute on the CHU signal is the long dash after the announcer has called the time.

Frequencies at which these signals can be found are:

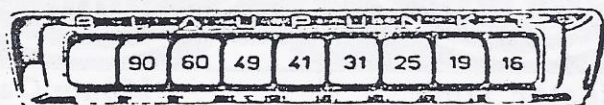
CHU

3.330 mc. (in 90 meter band)
7.335 mc. (in 41 meter band)
14.670 mc. (in 19 meter band)

WWV

5 mc. at 8 kw. (in 60 meter band)
10 mc. at 9 kw. (in 31 meter band)
15 mc. at 9 kw. (in 19 meter band)
20 mc. at 8.5 kw. (in 13 meter band)

WWV transmits at four other frequencies but these are out of the frequency range of the Blaupunkt adapter, and also at very low power levels.



Band	Wavelength	Frequency
16 m	17.2-16.2 m	17.4 -18.5 mc
19 m	20.6-19.2 m	14.55-15.6 mc
25 m	26.1-24.5 m	11.15-12.25 mc
31 m	33.7-30.0 m	8.9 -10.0 mc
41 m	44.8-38.5 m	6.7 - 7.8 mc
49 m	53.6-44.8 m	5.7 - 6.7 mc
60 m	72.3-56.5 m	4.15- 5.3 mc
90 m	100.0-73.2 m	3.0 - 4.1 mc

3. COMPUTATION DEVICES

The first and most common computational device is the brain. Either alone or with the help of Time - Distance - Speed tables the brain is very efficient. One of the best navigators in Canada, John Bird, uses nothing but tables, pencil and paper to keep his timing. However, many of us who are less endowed use mechanical or electrical devices for reliability, speed and mainly because we are just lazy.

To calculate whether you are on time or not is done in the same manner no matter what kind of device is used. You multiply the distance travelled by the appropriate factor for the average speed at which you are supposed to travel. The product of these two gives you a theoretical time. You compare the theoretical time with the actual time to determine whether you are early, late, or on time.

What do we want in a computational device?

- a) It must be accurate to the half minute at the very least and preferably to the second.
- b) It must be fast.
- c) It must require a minimum of time and effort to operate.
- d) It should be able to back-track or start over again if an error is made.
- e) It should be compact, rugged and easily carried or installed.
- f) The computational device must be able to give cumulative results, that is overall performance not instantaneous performance.

What is available in computational devices?

There are many devices, mechanical and electric, manually operated or automatic.

Speedometer - this is the original computational device to integrate mileage and time. Its most serious drawback is that it gives instantaneous results, not overall results. If one stops or otherwise varies from the average speed all track is lost of your performance.

Halda Speedpilot - this instrument takes the output from the odometer and through gears multiplies it by a factor (inserted by an average speed dial) and gives a mechanical output which turns a pilot hand on a clock. If you travel too fast the pilot hand moves ahead of the minute hand on the clock. If you travel too slowly it falls behind the minute hand.

The Speedpilot can be accurate to at least plus or minus one minute if operated carefully. This is usually unacceptable in serious competition but is satisfactory for novice and intermediate events.

The other serious drawback to the Speedpilot is that an error cannot be corrected. If an error is made in the average speed put in or the time that it was supposed to be changed, the only way to correct is to figure your timing by another method.

The hand held pocket calculator is an asset. But, be sure you carry extra batteries and select a unit which is readable in sunlight on day-time rallies.

4. OTHER NAVIGATION EQUIPMENT

Maps - maps are discussed in detail in their own section of this manual.

The average gas map is completely useless for finding typical rally roads, which just aren't marked. However they can be handy for finding towns when you are lost.

Magnetic Compass - should be mounted in car and adjusted to magnetic north. Usually best results are obtained if the compass is on the center-line of the car. Organizers seldom use magnetic compass bearing navigation and therefore a compass is usually not required. Usually suitable ones may be bought from automotive supply stores for about \$10.00.

Clipboard - should not be too large (or it will always be in the driver's way). It should be firm but still flexible enough so that it will break rather than cut you in half if you have an accident. Most navigators mount their clocks and Curtas on their clipboard.

Map Light - any suitable light (even a flashlight) will do but should be a gooseneck type with a cowl over the bulb to minimize stray light that will bother the driver. Should of course be mounted on the car out of the way as much as possible.

T.S.D. Tables - books of conversion factors for Time - Distance - Speed such as Larry Reid's Rally Tables

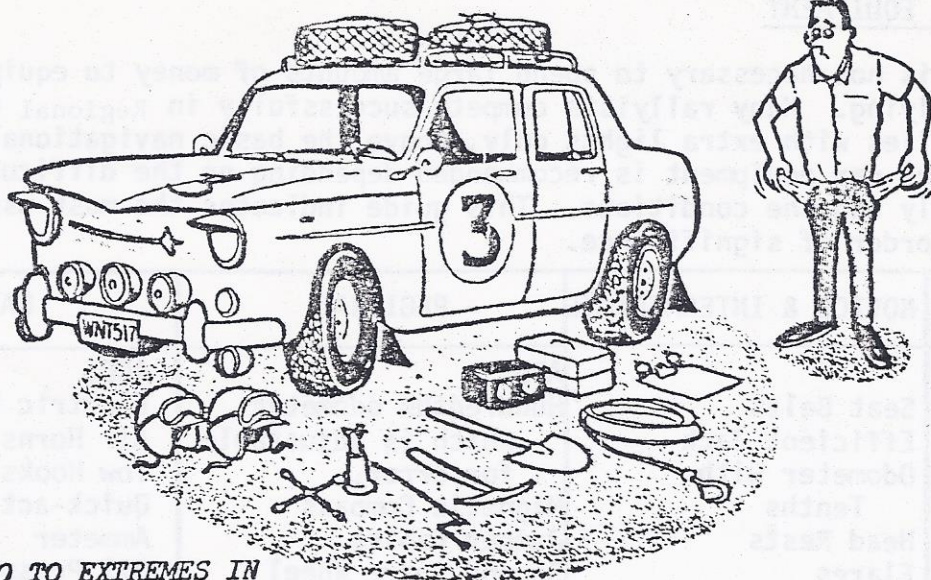
Miscellaneous - pencils; erasers; pads of paper; flashlight; pocket knife; draughting set or at least compass, dividers and a protractor; a long flexible straight edge; rulers with graduations in tenths of inches, centimeters, etc.; rulers graduated in map scales such as 1:250,000 and 1:50,000; felt point pens; roamers (a grid reference finder); etc.

Remember also to bring sunglasses, rags for wiping dirty hands and lights, specific rag for windshield, masking tape, rubber boots and some waterproof clothing.

CAR EQUIPMENT

It is not necessary to spend large amounts of money to equip a car for rallying. Many rallyists compete successfully in Regional Championship rallies with extra lights only, above the basic navigational equipment. Other car equipment is recommended depending on the difficulty of the rally and the conditions. This guide indicates the most useful additions, in order of significance.

	NOVICE & INTERMEDIATE	REGIONAL	NATIONAL
D A Y	Seat Belts Efficient Jack Odometer with Tenths Head Rests Flares Good Spare Tire First Aid Kit Fire Extinguisher Tow Rope Spare Oil	ADD: Hundredths odometer which is adjustable for error. Magnetic Compass Jumper Cables Second Spare Wheel Comprehensive First- Aid Kit Sump Guard (belly pan) Can of Radiator Stop- Leak Spare: Oil (3-4 qts.) Gas (enough for 200 miles) Wiper Blades Fan Belt Bulbs & Fuses	ADD: Electric Windshield Washer Air Horns Tow Hooks Quick-acting Jack Ammeter Oil Pressure Gauge Non-driven wheel Odometer Chain on Radiator & Gas Caps Auto-tractor or Winch Spare Speedo Cable taped in place Flat black paint on all shiny objects seen by driver, including hood Heavy Duty: Alternator Radiator Brake Pads Battery Wiper Motor Shocks Spare: Distributor Cap and Leads Shock Absorber
N I G H T	Map Light Flashlight	Wide beam Reversing Light Two additional long- range driving lights (quartz-iodine bulbs are superior) Protective padded or mesh covers for lights Plug-in Trouble Light	Two Fog Lights Light in Trunk Light under Hood
W I N T E R	Snow tires (studs on drive wheels advised) Shovels (two!) Winter Wiper Blades Gas Line Antifreeze Windshield Washer Solvent	Studded Tires on all four wheels and spares	Two spare studded snow tires Battery warmer Block or oil pan heater



**YOU CAN GO TO EXTREMES IN
PREPARING A RALLY CAR!**

Tires and Wheels

- | | | |
|---|------|--|
| Install tubes in all tires | WHY? | Rough roads damage wheel rims - tubes will hold air where tubeless tires would leak. |
| Carry two spare wheels mounted with tires and tubes | WHY? | If the road is bad enough to cause one flat, chances are you will get a second. |
| Use radial ply tires | WHY? | Long lasting, durable. Cord construction prevents expansion, which creates odometer errors. Low pressure gives better ride on rough roads and more rubber on pavement. WARNING: Do not install radial ply tires with other tires in the same set. |
| Use studs in winter | WHY? | Safety on ice. Efficient braking. Control may be maintained at high speeds in winter ice conditions. Check local rules for number of studs allowed. Have studs (and snow tread) on all four wheels. |

Lights

When it comes to purchasing additional lights one must use common sense. A driver's speed at night is limited by the distance he can see. Conversely he needs only enough light to see far enough ahead so that he can stop or take evasive action. If the driver does not intend to go over 30 miles per hour, he doesn't need extra light. If he expects to travel fast, he

will need about a tenth of a mile to stop. For this reason it is not logical to use a pencil-beam light that will reach to half a mile, but which has a beam only about 5 feet wide at a tenth of a mile distance. It is much more advantageous to have a beam 40 feet wide at one tenth mile than a beam 5 feet wide at one tenth but which reaches half a mile. In addition, on winding, hilly roads the narrower beams will rarely be on the road - they will more often be pointing into the trees and fields.

Fog lights should have a lens with gratings (to scatter the light) and should cut off the top half of the beam completely to keep the light flat and low. Yellow fog lights may help visibility because the blue light which is filtered out is the light which reflects back most in fog or snow; however some drivers do not like the colored beams - the choice is an individual one.

Driving lights should have a clear lens. Having a yellow filter on driving lights is just wasting candlepower, because they are not intended for use in fog or snow, and the filter removes part of the light. The best driving lights have a carefully balanced reflector and lens combination which spreads the light to give a slightly-expanding beam with the best combination of width and reach.

Besides scatter and colour, the next most important factor is size. This combines candlepower and physical dimensions. The first cannot be large without the second also being large. Driving lights range from about 80,000 to 350,000 candlepower. Diameters are usually 5 or 7 inches, with a few models at fractional intermediate sizes. The most powerful lights are deeper front-to-back (unfortunately a drawback when you come to mount some of them on your front bumper), but other lights have been designed with slimmest of profile in mind and still produce over 200,000 candlepower.

For about three years the best lights have offered quartz-iodine bulbs, which give a more concentrated source with higher power yet less drain on the car battery. The light is also more blue, giving better shadow relief. All in all, quartz iodine lights offer better performance for the investment, although they are somewhat more expensive than incandescent bulbs.

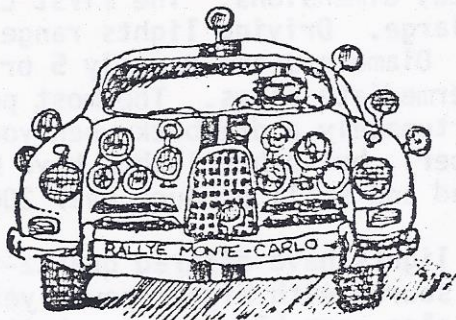
No particular pattern exists by which the overall properties of auxiliary lights can be classified. They are made in many countries - notably France, Italy, England and the U.S.A. Your best move is probably to look at a number of models in actual use on friends' cars before you choose your own.

Headlights themselves can be converted to stronger beams. On 4-headlight cars, the high beams can be made driving lights. On any car, lights like the Marchal or Lucas sharp-cutoff asymmetric beam dipping units can be installed. These throw further without interfering with normal oncoming traffic. Quartz-iodine bulbs for such installations are just coming on the market,

Any auxiliary light should be wired with its own switch, and preferably with a pilot light so you don't leave it on in daytime driving. Driving lights are required to be wired so the normal dimmer switch turns them off while leaving the normal low-beam headlights operating, in CASC rallies.

In summary . . .

- | | |
|---|--|
| Replace standard headlights with Lucas or Cibie headlight conversions | WHY? Provides roughly 2-1/2 times the power of normal sealed-beam units. When dipped, cutoff is such that very little light is reflected back |
| Fog lights | WHY? Best penetration in fog or snow conditions. When properly set up, can be used for spotting side roads and seeing around corners. |
| Long range driving lights with quartz iodine bulbs | WHY? Properly angled, will give light well beyond the range of normal headlights, enabling you to drive faster and more safely over changing road conditions. |
| Wide-beam reversing light | WHY? When it is necessary to back up, you need efficient lighting since your vision is impeded. Remember a pilot light. Some standard back-up lights are not suitable. |
| Protective pads for lights | WHY? Flying stones from passing cars break lenses, cost money and points. |
| Avoid switch panels | WHY? To avoid confusion. Space switches on dash to be easily accessible and un-mistakeable. |



*IF YOUR CAR LOOKS LIKE THIS
YOU SHOULD CARRY AN EXTRA FUSE.*

MISCELLANEOUS EQUIPMENT

There are many little items of equipment that most rallyists carry to provide for emergencies, temporary repairs, and comfort of the crew. Develop your own list. Try carrying some items. If you eventually use one, replace it. If not, consider its value against the possible need. A few suggestions are given here, but tastes are universally different in this area. The choices are yours.

The first on the list would be a re-sealable jug of water. It can be pretty dry and dusty on some rallies. Many wise rallyists carry a lunch and a thermos of coffee (hot). If you are late at the lunch stop you may not have time to wait for something to eat. Snacks like candies, chewing

gun and fresh fruit are always refreshing.

On bad weather rallies take a raincoat, rubber boots, and extra dry warm clothing. You never know what will happen out in the wilderness 25 miles from nowhere which will require you to climb under your car.

For minor repairs it is handy to have masking tape, electric tape, rubber tubing, as assortment of rubber stoppers, baling wire, and electric wire. Of course bring your usual tool kit, stocked in proportion to your ability to make repairs.

Always remember that there is always something you don't have, but that doesn't mean that you need it. Plan your requirements and build up your stock over a period of time.

On Carrying Spare Parts

Your car may have been faultless before entering a rally. During rugged road driving, latent weaknesses will soon become apparent. Selecting spare parts should be done carefully so as not to load up with parts that never need replacement. Discuss the matter with a few rallyists who drive the same make of car as yours. Their interest will be as sincere as your own. A suggested minimal kit includes a spare speedometer cable, fan belt, bulbs and fuses, windshield wiper blades, spark plugs, a set of good tools including "weirdies" to fit your car's special requirements, radiator hoses and clamps, a roll of vinyl tape and two coat hangers.

Pay attention to detail. Never assume a worn part will last one more event. Repair or replace it before the next rally.

Car Troubles en Route

Before a rally, get together and practice:

- Changing a tire
- Changing both front and back bulbs
- Knowledge of changing a speedometer cable.
- For winter driving - Deditching procedure.

The less time you take with any contingency on route, the greater your advantage over a slower competitor in the same situation. This is summed up best in Bland's law for drivers: Carry Two Shovels - so your navigator can work too.

Conclusion - Comfort and Convenience

Make your car as comfortable as possible. This alone will increase your enjoyment of rallying. Any fool can be uncomfortable, but it is harder to win that way!

Plenty of pockets and planned storage space will keep the car tidy and efficient. Shoe bags clipped to the inside of doors or to the back of the rear seat make ideal hold-alls for small equipment.

Spare bulbs and fuses taped to the dashboard will avoid a frantic scramble

and search for small, easily misplaced replacements. Find a handy location location to store a small kit of tools for minor running repairs - pliers, screwdriver, adjustable wrench and wire. Locate tire-changing tools in a particularly handy place.

Eliminate noise and rattles wherever possible. A deep throaty exhaust may sound sporty, but for the last half of a 24-hour rally the sound will fray your nerves.

When packing the trunk place items you are most likely to need on top. Avoid rattles by using rubber tie-downs and hooks to hold parts in place. Make certain any container for spare gas does not leak. Carry a funnel, particularly if the can does not have its own spout. Always store spare fuel in the trunk - NEVER inside the car. In winter, mix gas-line anti-freeze in the spare fuel before starting on a rally.

When all is done and you are catching your breath before picking your navigator up for the next event, you may rest assured that your car is more comfortable, safer and more roadworthy than a shocking number of "other cars". If nothing more, this is an important difference of which the sincere rallyist may be well and truly proud.

Timing and Speed Calculations



Success in rallying requires you to be in the right place at the right time. Now that you have learned how to stay ON ROUTE during the entire course of the rally, we can think about how to stay ON TIME.

CHECKING THE TIME

At the start of a rally it is essential to verify that the time you are carrying agrees with that of the organizer, known as the "Official Time". Usually the "Official Time" is that broadcast by the Dominion Observatory on CHU. If so, a short wave set will be available at the start by which to set your timepiece. Otherwise be sure to set your timepiece to correspond to the organizer's watch; a time check should be given at the competitors' briefing, particularly if it varies from that broadcast by CHU.

ODOMETER CHECK

The first section of a rally usually leads to the odometer check and allows generous time. The odometer check covers a distance of not less than ten miles from the start. No time control can be located within five miles of the finish of the odometer check leg.

Do not touch your odometer until you reach the odometer check. Then calculate your error and use it. Note the elapsed mileage on your odometer with the greatest possible accuracy. Express the difference between your mileage and the official rally mileage as a function of the official mileage.

Example: Suppose your odometer reads 10.2 miles at an official odometer check mileage of 10.0 miles. Then your error is:

$$\frac{10.2 - 10.0}{10.0} = \frac{+0.2}{10.0} = +.02 = +2\%$$

and your odometer is reading 2% high. This means that all mileages in the rally must be raised by 2% (multiply by 1.02) when looking for turns, etc.

If your measured mileage reads 9.8, the error is:

$$\frac{9.8 - 10.0}{10.0} = \frac{-0.2}{10.0} = -2\% \text{ and your odometer is}$$

reading 2% low. In this case all mileages in the rally must be lowered by 2% (multiply by 0.980).

Always keep in mind that timing calculations are done with reference to the official rally mileages. Of course, having an adjustable odometer as described in the preceding chapter will save a lot of work here.

CALCULATING THE TIME

There are two basic methods by which you may be required to measure your progress along a rally route, relative to time. These are:

1. ELAPSED TIME
2. AVERAGE SPEED

Elapsed Time

When instructions require you to travel from point "A" to point "B" within a fixed time interval, this is known as an Elapsed Time section.

Example:

	0.00	L
↑	1.35	TR
5 min.	2.75	TL
↑	4.90	R
11 min.	6.35	SSA
↓	9.50	L

5 minutes is the Elapsed Time for the trip from 0.00 to 2.75 miles; 11 minutes is the Elapsed Time for the trip from 2.75 to 9.50 miles. So if you leave the beginning of this section at say 9:32 o'clock, you must reach 2.75 miles at $9:32 + :05 = 9:37$ and 9.50 miles at $9:37 + :11 = 9:48$ o'clock.

Time controls may only be placed at the beginning and end of an Elapsed Time section, i.e. at 0.00, 2.75, and 9.50 miles in the above example.

Normally, unless otherwise specified by the organizer, you will be allowed to arrive early at the end of an Elapsed Time section; however, you must present your route card to the checker at the correct time.

One way to negotiate an Elapsed Time section is to proceed quickly (while always staying within posted speed limits) to the end of the section and then waiting out the allotted time if you are early. This procedure may allow some badly needed time for occurrences such as a flat tire or a wrong turn.

Especially in the case of a longer Elapsed Time section, the driver should be told what the average speed works out to be. This may avoid going unnecessarily fast over a particularly rough road; or if the average seems hard to maintain, the driver will be alerted to the fact that he has to take advantage of an easy stretch of road to pick up some time. In any case it is a good idea to travel a little faster than the worked-out average speed indicates toward the beginning of an Elapsed Time section; the road will very often become worse towards the end and any time previously gained will be appreciated.

Average Speed

The Average Speed section is the heart of the rally, from a timing point of

view. When the instructions say to proceed from point 'A' to point 'B' at a specific speed, it is known as an Average speed section.

Example:	0.00	SA	CAS 30.0 MPH
	2.00	L	
	5.50	SA	
	6.00	TR	CAS 36.0 MPH
	7.65	L	
	10.30	SA	
	12.55	TL	
	15.00	R	

It is easily seen that you should take 12 minutes to travel from 0.00 to 6.00 TR. However, unlike the elapsed time section, you cannot be early and must be at mile 1 at 2 minutes, mile 2 at 4 minutes, and so on, travelling at exactly 30 miles per hour throughout the distance. Changing your average speed to 36.0 MPH at miles 6.00, it should then take you an additional 15 minutes to reach mile 15.00. By referring to the time-speed-distance tables, you can easily see that at 36.0 MPH it should take you 1 minute 40 seconds to travel each mile.

In an Average Speed Section time controls may be located anywhere along the route. Generally they will be placed so your calculated time of arrival will be exactly on the 00 seconds point of the minute, which is your ideal time. It is advisable to maintain a margin of 10 to 15 seconds after 'ideal time' when driving an Average Speed section. This will allow you time to park, check in, and drive off again without being more than half a minute or so behind time.

METHODS OF CALCULATION

1. With Pencil and Paper

The Basic Time-Speed-Distance relationship may be expressed by the formula:

$$D \text{ equals } \frac{RT}{60} \quad \text{where} \quad \begin{array}{l} D \text{ equals Distance in miles} \\ R \text{ equals Speed in miles per hour} \\ T \text{ equals Time in minutes} \end{array}$$

Knowledge of any two of these factors will enable you to determine the third quickly. For any average speed R, the number of miles D to be covered in one minute can be determined. Substituting figures from the Average Speed example, we have the following:

$$D \text{ equals } \frac{30 \times 1}{60} \text{ equals } .50 \text{ equal half a mile to be covered each minute driving at 30 MPH.}$$

Therefore it must take 12 minutes to drive 6 miles.

And for the second part, D equals $\frac{36 \times 1}{60}$ equals .60 equals .6 of a mile to be covered each minute driving at 36.0 MPH.

After 2 minutes you should have covered	1.2 miles;
3 minutes	1.8 miles;
4 minutes	2.4 miles;
5 minutes	3.0 miles;

and so on until you see that it will take exactly 15 minutes to cover the 9 miles at 36.0 MPH.

Solving for T in the above formula, to find out how long it should take you to cover a certain distance with a given average speed, is equally straightforward. Again using figures from the Average Speed example, to find out how long it should take to travel one mile we have:

$$T = \frac{60 D}{R} = \frac{60 \times 1}{30} = 2.0 \text{ minutes, for a speed of 30.0 MPH.}$$

Again we see that we must use 12 minutes to cover 6 miles. And the second example:

$$T = \frac{60 \times 1}{36} = 1.6667 \text{ minutes, for a speed of 36.0 MPH.}$$

Carrying this further we see that 2 miles should take 3.3333 minutes;
 3 miles 5.0000 minutes;
 4 miles 6.6667 minutes;
 5 miles 8.3333 minutes;
 6 miles 10.0000 minutes;

and so on, and again we see that we must use 15 minutes to cover 9 miles.

For 36.0 miles per hour, the "Miles per Minute" factor is .6000; the "Minutes per Mile" factor is 1.6667.

Either of these methods of calculation can be used as you travel along the rally route. The additions can be done by hand, using only pencil and paper, and can also be done very quickly and easily using an electronic calculator.

The actual manipulation of a calculator is quickly learned if and when you acquire one. In the meantime, understanding how the system works and being able to do it with pencil and paper is sufficient. In table form, either of the two methods -- miles per minute, or minutes per mile -- can be worked as follows:

Miles per Minute -- for 36.0 MPH the factor is .6000.

TIME	MILEAGE	
10:00	0.00	(supposing you start the section at 10:00 A.M.)
10:01	0.60	
10:02	1.20	(adding .6000 mile for every minute)
10:03	1.80	
.	.	
.	.	
.	.	
10:10	6.00	
10:11	6.60	
etc.		

This can be carried to greater detail when necessary, such as when an average speed must be changed at some point other than on an even minute. This is shown in the following table:

At 36.0 MPH, if one minute = 0.60 mile, then 0.1 minute = 0.06 mile.
Continuing from the above table:

TIME	MILEAGE
10:11.0	6.60
10:11.1	6.66 (adding 0.06 mile for every 0.1 minute)
10:11.2	6.72
10:11.3	6.78
10:11.4	6.84
10:11.5	6.90

Suppose the average speed is to be changed at 6.90 miles; then you could work it out as above and see that you should be at mile 6.90 at 10:11.5 minutes, and start calculating the new speed from there.

Working in a similar manner with Minutes per Mile, we have the following:

Minutes per Mile -- for 36.0 MPH the factor is 1.6667.

MILEAGE	TIME
0.00	10:00.00 (again, starting the section at 10:00 A.M.)
1.00	10:01.6667 (= 10:01:40)
2.00	10:03.3333 (= 10:03:20)
3.00	10:05.0000
.	.
.	(adding 1.6667 minutes for every mile)
6.00	10:10.0000

When greater detail is necessary, such as when an average speed must be changed at some point other than on an even mile, the method used is the same as above in the Miles per Minute example.

At 36.0, if one mile = 1.6667 minutes, then 0.1 mile = 0.1667 min.
Continuing from mile 6.00 above:

MILEAGE	TIME
6.00	10:10.0000
6.10	10:10.1667
6.20	10:10.3333 (adding 0.1667 minute for every 0.1 mile)
6.30	10:10.5000

Suppose the average speed is to be changed at 6.30 miles; then you can see that you should reach that mileage at 10:10.5, and start calculating the new speed from there.

These calculations could be carried to greater accuracy by considering hundredths of minutes or miles, but that increased accuracy is unnecessary.

This type of calculation done by hand is time-consuming, but offers the best return for the effort invested.

2. Time - Speed - Distance Tables

Tables are available which indicate the amount of DISTANCE which should be covered in set TIME intervals, according to average SPEED.

Example: At 40.0 MPH --

TIME	DISTANCE
1 min.	0.67 miles
2 min.	1.33 miles
3 min.	2.00 miles
4 min.	2.67 miles
.	.
10 min.	6.67 miles
.	.
30 min.	20.00 miles

This table uses the Miles per Minute factor of 0.67 for 40.0 MPH, as described above.

Other tables express TIME relative to DISTANCE, showing you how much time in minutes and seconds you should use to cover a certain distance at a given speed. This type of table appears at the back of this book.

Example: At an average speed of 34.2 MPH:

3 miles takes 5 minutes, 16 seconds;

3.6 miles takes 6 minutes, 19 seconds (5 minutes, 16 seconds plus 1 minute, 3 seconds)

GETTING LOST

We offer one word of counsel and advice with respect to getting lost on a rally DON'T. However if misfortune should come your way one dark night on a rally and you find there is no doubt a wrong turn was made some time back, do not panic. Turn around, carefully noting your mileage.

Retrace your route to the last point where you are certain you were on course. Note the indicated mileage at this point.

Subtract the reading taken at the turnabout from the mileage noted when the true route was reached. Deduct twice the difference from the latter mileage. This provides a fix on correct mileage and permits a lateness calculation to be made.

<u>Example:</u>	Turnabout mileage	26.4
	Back on route	30.5
	Difference	4.1
	Route mileage (30.5 - 8.2)	22.3

In so far as timing is concerned, our advice is to forget about it until you are sure you are back on the rally route. If you continue to be off route, it makes no difference if you are three minutes late or 17 minutes late; you won't find a checkpoint until you are back on route. In the above example you drove an extra 8.2 miles; this would take you about 12 to 20 minutes extra, and it is unlikely that that much time would be made up before reaching the next control. When you do find the control, and are sure of the route you are to follow from that point, then start timing again from that control. As mentioned earlier in this book, time lost between checks can not be made up after you have taken the check. So you start again from each check.

MAXIMUM LATENESS

The only time you have to worry about any kind of timing when you are lost is if you think you might be approaching your maximum lateness. The Maximum Lateness for any rally is stipulated in the regulations or at the start by the organizer. Very often it is one hour; it may vary from 30 minutes on short rallies to 90 minutes or more on the longer events. If you check in to a control beyond your maximum lateness, you will usually be scored as having missed that control. Therefore -- if the maximum lateness is 60 minutes and you find it has taken you longer than that to find your way back onto the rally route, try to cut out part of the rally; find some identifiable place in the instructions, proceed to that point and carry on from there. You may miss a few controls, but at least you'll finish the event. IN ANY CASE -- if you get hopelessly lost and can't get back on route, COME IN TO THE FINISH. There you will be able to find out where and why you went wrong, and also meet other rallyists with similar problems and adventures to tell about. You may be surprised at how well you've done compared to others, in spite of perhaps feeling you have probably done rather badly.

To find out how much "maximum lateness" you have used up at any point in the rally, simply add up your "late" times and subtract any "early" times at controls. The check points will usually be able to give you the following information: their official mileage on the rally route; the time the first car was due in to that control as calculated from the start. From this latter piece of information you can easily see whether or not you are within your own maximum lateness.

CONCLUSION

In conclusion, the following advice is offered. First: make absolutely sure that you are ON ROUTE. Then, and only then, try to stay ON TIME. The first rule for a good navigator is to determine the correct road and to direct the driver along it. Only then should he concern himself with time. No rally was ever won Off course; but you stand a good chance of winning even if some time is lost, if you can manage to stay ON ROUTE.

Rally Driving and Teamwork



FOR DRIVERS ONLY

Presumably you know how to drive a car and enjoy doing so or you wouldn't be reading this. Therefore, it is not our purpose to teach you how to drive, but rather to suggest ways to improve your technique and ways of making your driving an easier job.

Everyone drives a car differently and most good drivers have secrets of their own.

You have all developed certain reflex actions and they will differ from some of mine. Remember to make allowances for them in any other driving habits you may develop.

FOR NON-DRIVERS

Go to a commercial (public) driving school.

FOR DRIVERS

BASIC PRINCIPLES

- | | |
|-----------------------|---|
| 1. Stay on the road) |) FEEL SAFE! ALWAYS APPLY THESE PRINCIPLES IN THIS ORDER. |
| 2. Stay on route) | |
| 3. Stay on time) | |

Rallying is fun. Do not jeopardize this idea with foolish driving antics. You may feel certain actions are justified at times but most often they are not. Your navigator cannot work efficiently when he is scared -- and they all scare easily! Those "nerves of steel" that top navigators have only develop after they have complete trust in their driver's ability. You must nurture this trust slowly. The three principles mentioned above must be followed in given order to do this.

STAY ON THE ROAD

Car must be safe:

- Brakes in top condition
- Tires in good condition with proper road pressures (higher than normal)
- Springs and shock absorbers working well
- Wipers and washers working well
- Horn working
- Steering tight
- Seats well secured

Everything within easy reach:

- Be able to locate and operate every driving aid easily and without taking your eyes off the road.

Ample lighting:

- The amount of lighting available directly governs the speed you may safely maintain at night.
- Lights to see far ahead down the road are not the same lights necessary for you to see around corners.

Good seat belt:

- The "across the shoulder" belt without a lap strap is not sufficient.
- In order of preference, recommended types are:
 - EXCELLENT 1. Full harness.
 - 2. Combined lap and across the shoulder belt.
- SATISFACTORY -- Lap belt.
- POOR -- Across the shoulder belt only.
- WORSE -- No belt at all.

Good driving position:

- Be comfortable.
- Have no restrictions for quick reflex action.

Comfortable clothing:

- Wear clothes which do not bind or need adjusting.
- Wear a good pair of gloves with leather palms for maximum grip and comfort, or install a steering wheel cover.
- Wear comfortable shoes or sneakers. Do not wear heavy boots in the winter - they are too wide for accurate pedal action. The lighter your shoes, the more suited they are for rally driving. But carry rubber boots in the car.

Stay awake:

- There are many ways of doing this. Find one that suits you and use it.
- If you feel drowsy, let your navigator drive for a spell, provided he's awake! This is a stipulation in major Canadian rallies.

Never change your line when committed:

- Brake, stop and turn around if you've made a mistake.
- Many mishaps in rallies happen because the driver tries to make a last-minute turn into a side road.
- Do not let a screaming navigator make this decision for you.

Always use your brakes:

- At the top of a hill - keep well to the right side of the road.
- On a blind corner.

Drive the straight -- motor the corner:

- This applies to most conditions in rallying and general driving.

Test the surface:

- When road conditions change, test for adhesion in braking and cornering situations.
- Before entering a corner, test the road surface for turning adhesion, with a quick flick of the steering wheel.

Do not trust anyone:

- Always make allowance for the other fellow's mistake -- or be well aware of the consequences.

Do not trust landmarks:

- Do not use telephone lines, power lines or lines of trees to indicate road direction on the other side of blind hills. Often power

lines will cross the road in these situations.

Pump the brakes:

- To stop quickly, use a pumping action when braking. This will also keep the brakes cool and more efficient. Always use this technique when braking on snow and ice without studs.

STAY ON ROUTE

In order to rally successfully, it is essential to have a navigator in whom you have implicit trust. Practice often with the man of your choice. This discussion shows you some ways to gain his confidence, but never exceed your limit. Your limit will change, but never in the middle of the tight section of a rally.

Respect one another's judgment. If the navigator tells you to slow down because you are over your limit, he is probably right. The fact that he is afraid is sufficient evidence of the fact, assuming you have gained the mutual respect and understanding of each other.

You are then in the position to give greater assistance to your navigator. If he is not nervous in company with you, he has no need to check your driving. He can spend his time navigating and computing the next part of the rally. The rest of "stay on route" is up to your navigator. However, there are some ways you can help him. His job is as important as yours.

Be certain to:

- a) Call out all turns and route signs.
- b) Repeat all instructions back to him.
- c) Have him repeat complicated instructions.
- d) Get instructions "two-ahead", i.e., ask him "What's the next instruction?" then "and what's after that?" In this way a quick instruction is never missed.
- e) On the odometer check leg ask him to look for:
 - i. Mixed mileages.
 - ii. Reversed instructions.
 - iii. Sections out of order.
 - iv. Instructions close together (have him circle these with red pencil).
- f) Perform difficult section interpretation with your navigator. It is more important to get it right the first time and lose a little time than to be forced to back-track and lose a lot of time.

STAY ON TIME

This is easy to do on small rallies. Do not go off the road and do not go off the route. You will find you have to drive somewhat slower than expected.

Things are not that easy, however. All navigators make mistakes. Mistakes cost time. If you are lucky, you may be able to make the time up. Here are some hints on avoiding the lost time problem:

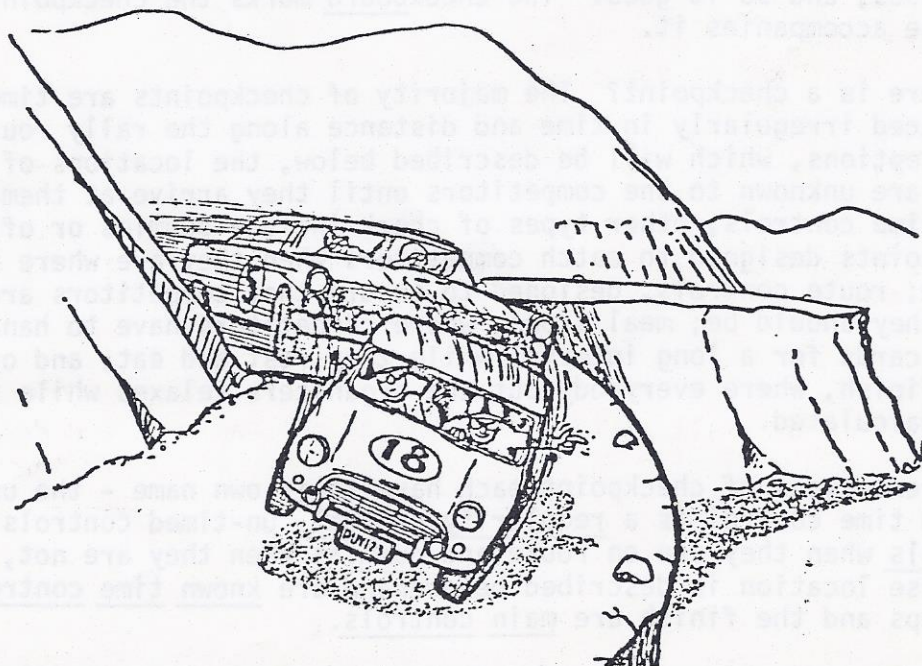
- a) Always get in and out of checkpoints in a hurry. If you get out at controls, have the navigator hold your seat belt for you to save time when re-fastening. Organizers are sneaky and sometimes put

checkpoints close together to catch those competitors who dilly-dally.

- b) If you must drive fast, remember your greatest speed is obtained only when you are accelerating or braking to maximum at all times.
- c) Drive with your engine in the maximum power range as much as possible with careful use of the gears.
- d) Use the "heel-toe" or "toe-heel" technique to change gears quickly while braking. This is not used because the engine must be revved to change gears, but rather to prevent sudden change in drag on the drive wheels. (The sudden drag is particularly hazardous on snow/ice when entering a corner.)
- e) Assume a relaxed position for driving. Keep your back firmly planted against the seat back and leave ample room to maneuver your arms before you. This is the secret of the "straight arm technique". A quick way of determining whether you have assumed the correct position in your car is to put the car in third gear (4-speed floor shift) and extend your right arm fully. Your palm should just reach the shift knob.
- f) Know your car well. Have you ever had the back end "break-away" on the corner? You have? -- okay. Can you break it to the same amount on every corner no matter what road conditions? No? -- Go out and practice on a back road, gradually increasing speeds on the same corner. Ride with someone who can do this to get the feeling first.
- g) Follow the hints given under "Stay on Road".

SUMMARY

Rally driving is fun. You have a lot to learn. Some will learn more quickly than others, but above all heed the warning -- **DRIVE SAFELY**. Do not expect to win all the time. Do not get mad because you lose points. Stay calm, cool and collected. Do the best job you can without exceeding your limit. Practice makes perfect. Drive often. Eventually you will be able to compete and win against the best opposition.



*IF ANOTHER COMPETITOR WISHES TO PASS, BE SPORTSMANLIKE,
PULL OVER AND ALLOW HIM BY.*

Checking, Checkpoints, and Checkers



BEHIND THE BOARD

In the second section on navigation you learned what to do when you came upon a checkpoint at the side of the road while you were competing in a rally. In this section checkpoint procedure is seen from the other side - the viewpoint of the lonely, beset-upon, maligned, self-sacrificing individual whose help is essential to the success of any rally - the checkpoint marshall!

If you have ever been a checkpoint marshall, most of what follows will be familiar already. Some people volunteer for checking regularly, and most clubs have a few people who enjoy checking as much or more than competing themselves. Most experienced rallyists have checked at some time, perhaps on a novice rally, and so have learned what goes on on the other side of the checkboard. If you want to learn also - this section is for you.

WHAT IS CHECKING ALL ABOUT

First of all, what is a checkpoint? It is a location, marked by a distinctive board which usually carries the name or badge of the organizing club, and which may also carry markings like "✓", "control", or "CP". This board is usually propped up at the right-hand side of the road. It is interesting and important to note that while most checkers get to their checkpoint location by car, and sit in it while checking, with the checkboard propped against its bumper, the car is not the checkpoint. The board is. Checkpoints have been run with people sitting on camp cots next to the board, by people standing in the ditch on narrow winding 2-rut mud tracks, by people sitting high on rocks next to the road on mountain passes, and so it goes. The checkboard marks the checkpoint, whatever else accompanies it.

So next, where is a checkpoint? The majority of checkpoints are time controls spaced irregularly in time and distance along the rally route. With few exceptions, which will be described below, the locations of the checkpoints are unknown to the competitors until they arrive at them. As well as time controls, other types of check include dummies or off-route checkpoints designed to catch competitors when they are where they shouldn't be; route controls, designed to ensure that competitors are on route when they should be; meal stops, where competitors have to hand in their route cards for a long interval while they rest and eat; and of course the finish, where everybody but the organizers relaxes while the scores are calculated.

These different types of checkpoint each have their own name - the usual un-announced time control is a regularity control, un-timed controls are route controls when they are on route and dummies when they are not, time controls whose location is described beforehand are known time controls, and meal stops and the finish are main controls.

Continuing with our probing then, why is a checkpoint? First and foremost, a checkpoint marshall, usually called a checker, is needed to

confirm the time at which each competitor passes his location. This is done by timing each rally car as it passes - and incidentally timing all the local traffic too, since you don't know right away which are rally cars - then keeping two sets of records of these times. The first and most important record is on the route card carried by the competitor. On this the time and the checkers initials are logged, and these times are used later by the organizers to score the results. The other record is the Checkers Log Sheet, which provides a duplicate for reference in case of doubt about the route card. The details of keeping track of the times of arrival are so important that they are given a separate detailed description below.

But before that, two other questions remain:

When is a checkpoint? Usually the organizers provide a guarantee that controls will be manned from 15 minutes before the first car is theoretically due until 60 minutes after the last car in the rally is due to arrive.

And who is a checkpoint? Well, since you volunteered, it's YOU!

EQUIPMENT

Two items of equipment are essential for checking. In addition, while you don't need to be as elaborately equipped as a rally car in order to function efficiently at a checkpoint, several items of the same sort of equipment are useful.

- checkboard - the first essential. You may have one from a previous rally, or pick one up from the organizer beforehand. Less desirable, the course opening car may bring one to you, but he will be in a hurry and if you can set up completely before he reaches you, his job will be easier.
- an accurate watch - the second essential. Your watch should be as good as those carried by the rallyists, which means as good as you can afford. It should be adjustable to synchronize it with official time, rapidly, and preferably this should be done before the course car reaches you.
- clipboard or other stiff flat surface to write on.
- map light, for evening or all-night rallies. Your interior car light may be useful, but courtesy lights aren't always ideally located for reading and writing while you are seated behind the wheel. A flashlight will serve if it has good batteries.
- a supply of log sheets, for recording the arrival of the rally cars in order.
- and of course one or more sharp pencils. Preferably your pencil should be distinctive in colour or appearance to help the

organizer in scoring. Ball point pens are favorites among skillful checkers, but they can dry up!

This list of equipment will carry you through any day or evening rally in warm weather. As for winter rallying, in winter checking you should be prepared for the worst and carry blankets or sleeping bags, coffee, food, a shovel or two (often the best place for a Rallye des Neiges checkpoint is in a car dug into the plowed snowbank at the side of the road) and spare gas to enable you to keep the car warm over a period of several hours. Remember to keep the windows open for ventilation.

GETTING READY

Once you have volunteered or had your arm twisted into serving as a checker, you should make yourself familiar with the rally you are checking for. Read the regulations. What kind of controls will there be, for other checkers as well as yourself? Will they all be regularity, or will there be elapsed time controls at which competitors can arrive early? When should you officially open and close? Are there any special provisions such as timed-to-the-second controls?

Next, go to the checkers meeting. This will be called by the organizer, at a time and place convenient to all concerned. At this session you will be able to pick up your supplies - checkboard, log sheets, etc. - and get detailed instructions on where your checkpoint location will be. These may be sketched, may be a map reference, or on a map marked up by the organizer. Be sure you understand these instructions before you leave the checkers meeting, because from then on getting to the proper location is your responsibility.

If possible, go to the start. This is interesting at any rally, and it will give you a chance to see who is entered, how many cars are entered, and to learn of any last-minute changes.

Then, get into position in plenty of time. Set up your board, always on the right hand side of the road and preferably fastened to your car or something else to eliminate the possibility of it blowing over or being knocked down by running competitors or passing cars.

The importance of being in the exact location described by the organizer



THE COMPLETE CHECKER

will be obvious if you have competed in rallies. It can be illustrated by an example in which the average speed of the rally is 30 miles/hour. Assuming the checkpoint is to be located within 5 seconds of the even minute, your board must be placed accurately within 220 feet, or about 15 car lengths. This distance is shorter when the speeds are slower- 110 feet at 15 miles /hour- but with practice, you can easily get into position within 1 second (about 44 feet) by using landmarks and your odometer.

Your next job is to greet the course opening car. Be cheerful, but don't delay him, even if you have already been sitting in place at a desolate crossroads 15 miles from any civilization for two hours at three o'clock in the morning. At that point you yearn for any sort of companionship, but the course car will want to move on in order to stay ahead of the rally.

Your loneliness will not last long, since the competitors soon start to arrive, and your job is then to check them through efficiently with as little time consumed as possible. They don't usually have any time allowance for checking in, so they won't want to delay to talk or answer questions.

Stay in position until your maximum lateness time has passed. In most rallies, there are one or two stragglers running nearly on their maximum lateness and you have to wait for them all. The maximum time may be provided by the organizer, or possibly there will be a course closing car following the rally at the maximum lateness time. The one, usually early, exception, is in the case where you are 110% certain that all rally cars have checked through your control. This happens only in the first few checkpoints of a rally or possibly after a major meal stop.

Finally, turn in your log sheets and checkboard to the organizers at the finish-if not to the course closing car. The organizers need the log information to answer questions about the rally.

TIMING

Logging the cars past your control should be no problem if your watch is accurately set up and you are set up to read it as the cars arrive. Your log will show the cars in order of arrival, and usually they will be timed as they pass the checkpoint, so you can write the times in as the cars pass, and add the car numbers to the log after the competitors appear with their route cards. Sometimes car numbers will be visible on the car windows as they pass, which makes your job easier. Experienced checkers often use a scratch sheet to note times and numbers when things are happening rapidly and fill in the log from it. The important steps are:

- set and read your watch accurately

 - The minute extends from 00 seconds to 59 seconds.

 - There should therefore be no doubt as to the correct minute, however, make sure when the course car verifies your second hand accuracy that he also verifies your minute hand, and then try to avoid the 'full 5 minute' reading error which can trap you when you are in a hurry.

- make sure that you get the proper time for each car. This is a problem only when two or more cars pass you at the same time, when the later car may park behind the others and reach you first to be logged in.
- log the time and your initials on the competitor's route card in the proper spaces - and on the correct line!

When two or more cars have arrived at your checkpoint on the same minute, you can (unless the regulations prohibit it) separate them by giving one of them a different time out of your checkpoint. This will mean that the cars don't have to drive closely packed after they leave you. When a time out is given, it will be logged in the appropriate column of the route card and also on the log sheet, and you should hang on to the competitor's route card until the time has run on and you are inside the minute given him as his 'out' time.

On elapsed time checkpoints or when competitors' sealed watches are used, the procedures are only slightly changed. In elapsed time sections, there are usually no provisions for penalty when cars arrive early at a control. Some record should be kept (use your scratch sheet) to establish 'earliness' in case a competitor does run over a specified allowance. With sealed watches, which are rarely used at present, the time recorded is read from the competitor's watch, and it is read when it is presented to the checker, not as the car passes the checkboard.

For route controls and dummy checkpoints, the procedures are basically the same, simplified of course by the absence of any need to record a time of arrival.

PROBLEMS

In an ideal rally, everyone's equipment and watches would be perfect and there would be no inaccuracy in measuring mileages. Strangely enough, in most normal rallies competitors achieve a state of mind in which they think that only their odometer, watch, and calculations are correct. As a checker, you have a responsibility for accuracy, especially in timing, but having assured this, you are in charge at a checkpoint. The time logged is the time you have read. Competitors may complain, but you have no authority to change time, or watches, or to interpret rules. You can however make a note of any questions for use later by the organizer in adjusting the scores if there is any legitimate ground on which to do so.

Problems sometimes do occur. The primary rule to follow is to treat every competitor equally. If this is done, equitable adjustment can be made in the scoring, and no-one will get either benefit or penalty as a result, because all competitors will face the same problems equally. In one recent

rally, for example, the course opening car had a watch - used to set the checkers watches - which was 1 minute earlier than the watch worn by the starter - used to set the competitors watches. As a result, an ideal competitor was logged in one minute early at every checkpoint. However, the checkers were mostly experienced (and thick-skinned) and stuck to this rule of consistent treatment. As a result the scores could be adjusted by the organizer at the finish with no upset.

Usually a problem of car location or watch accuracy will become apparent only after a few competitors have checked through. This makes it doubly important to treat all competitors consistently, since to do anything else would penalize the early cars. This means that even should you decide part way through a rally that your watch may be off, under no circumstances should you correct it once the rally has started checking through.

In bad weather, problems may arise in reaching the checkpoint location. If you are not in place on time, the course opening car cannot wait, and you may miss him. If you suspect that this is the case from the opening time given on your log sheet, and more important if there is any chance that some competitors have started to pass before you arrived, the best move is to act as though you were a route control, even if you were intended to be a time control. This will give no problems to the scorer. The opposite can occur - weather or blockages may delay all competitors, and you may wait in place (having reached the checkpoint by main roads) for an hour or more beyond the official time before anyone appears. In this case again your own judgement should be used to estimate the situation. It is generally best not to depart too soon, but checkers have been known to be on the wrong road!

AND FINALLY

A good checker is one who understands both sides of rallying - organizing and competing - since he is the link between the two. He may be a source of information for the competitors if the organizer wants to provide official checkpoint mileages and time of arrival of the first car under ideal conditions. He may be a source of conversation about how things are going, and who else has checked in, or he may not if he or the organizer are so inclined. This is a sport we are all involved in, and sportsmanship can be expressed in many ways. A cheerful hello to any familiar face is appreciated in both directions. Giving a hand to a beginner who is on the verge of becoming completely lost would never be criticised. Checkers have dug competitors out of snowbanks, handed out coffee, loaned tools, and warmed occupants of ditched cars many times with their efforts going all but unsung. And a recognition that everyone involved is doing the best that they can can lead to nothing but improvement in the sport in the future.

