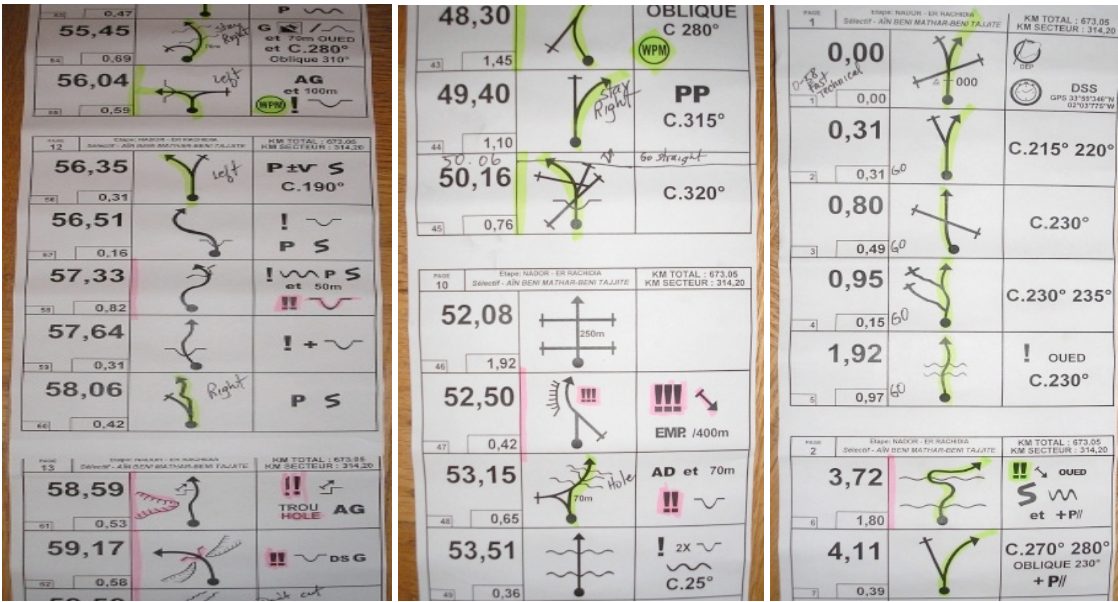


**Excerpt from Dakar Rally Handbook 2007**  
**By Charlie Rauseo**

**Navigation.**

Navigation sets rallying apart from any other kind of racing. You will receive each day's rolled-up roadbook the night before that day's start. Here are some examples of pages of Dakar roadbooks:



On the left, the large number is the total number of kilometers into the section. The smaller number in the left box is the number of kilometers from one item to the next. In the middle is the “Tulip” which is a drawing showing the trail, terrain, and landmarks at that particular kilometer. You enter each tulip drawing from the black dot at the bottom-middle of the drawing. On the right is an observation giving more information about that tulip. The observation often uses lexicon symbols and CAP headings, explained below.

You may have enough time to mark your roadbook with colored markers and review it several times, but you will not have time to memorize much of the route. So, you must learn to decipher the roadbook as you are racing. It takes months of practice to become skilled at navigation.

**The Lexicon.**

Every year, the Dakar organization posts an updated list of symbols it uses in rally roadbooks. There are usually no major changes. Here is the lexicon of symbols for the 2007 Dakar:

LEXIQUE ROAD BOOK LISBOA DAKAR

|  |                               |                           |
|--|-------------------------------|---------------------------|
|  | ROUTE                         | ROAD                      |
|  | ROUTE avec séparateur central | DUAL CARRIAGEWAY          |
|  | PISTE TRACÉE                  | TRACK                     |
|  | HORS PISTE                    | OFF TRACK                 |
|  | ATTENTION                     | 1 DANGER                  |
|  | DANGER                        | 2 DANGER                  |
|  | GROS DANGER                   | 3 DANGER                  |
|  | CUVETTE                       | DIP                       |
|  | BOSSE                         | BUMP                      |
|  | COMPRESSION                   | COMPRESSION               |
|  | SAIGNÉE                       | DITCH                     |
|  | RADER                         | STEP                      |
|  | MARCHE EN DESCENTE            | STEP DOWN                 |
|  | MARCHE EN MONTÉE              | STEP UP                   |
|  | DESCENTE                      | DOWNHILL                  |
|  | VERS                          | TOWARDS                   |
|  | MONTÉE                        | UPHILL                    |
|  | HAUTEUR LIMITÉE               | LIMITED HEIGHT            |
|  | TROU EFFONDRE                 | HOLE COLLAPSE             |
|  | ORNIÈRE                       | RUTS                      |
|  | ONDULATION BOSSE              | BUMPY                     |
|  | SUR PONT SOUS PONT            | ABOVE BRIDGE UNDER BRIDGE |
|  | GUE                           | FORD                      |
|  | TROU                          | HOLE                      |
|  | CAIRN                         | CAIRN                     |
|  | CITERNE                       | WATER TANK                |
|  | FIL BARBELLÉ                  | BARBED WIRE FENCE         |
|  | CLOTURE                       | FENCE                     |
|  | LIGNE ÉLECTRIQUE              | ELECTRIC LINE             |
|  | DUNETTES                      | SMALL DUNES               |
|  | DUNES                         | DUNES                     |
|  | DUNETTE                       | SMALL DUNE                |

|  |   |                                      |
|--|---|--------------------------------------|
|  | OUED                                      | OUED / WADI                          |
|  | LANGUE DE SABLE                           | SAND SPIT                            |
|  | BORNE IGN BORNE                           | IGN MARKER KILOMÈTRE MARKER          |
|  | CIMETIÈRE                                 | CEMETARY                             |
|  | FÛT                                       | BARREL                               |
|  | PANNEAU                                   | SIGNPOST                             |
|  | MAISON HUTTE                              | HOUSE HUT                            |
|  | PORT                                      | PORT                                 |
|  | POTEAU PIQUET                             | POST                                 |
|  | PNEU                                      | TYRE                                 |
|  | PUIT                                      | WELL                                 |
|  | BUNES à dessiner                          | BUNES individual drawing for each    |
|  | MONTAGNE à dessiner                       | MOUNTAIN individual drawing for each |
|  | ANTENNE                                   | ANTENNA / MAST                       |
|  | LIMITE DE VITESSE                         | SPEED LIMIT                          |
|  | STOP                                      | STOP                                 |
|  | DEVERS                                    | CAMBER                               |
|  | DÉPART ARRIVÉE                            | START FINISH                         |
|  | CONTRÔLE HORAIRE                          | TIME CONTROL                         |
|  | ESSENCE                                   | FUEL                                 |
|  | W/POINT MASQUÉ                            | HIDDEN WAIPPOINT                     |
|  | CP  | PC                                   |
|  | DÉBUT ZONE D'ASSISTANCE                   | START OF ASSISTANCE ZONE             |
|  | FIN ZONE D'ASSISTANCE                     | FINISH OF ASSISTANCE ZONE            |
|  | VILLAGE                                   | VILLAGE                              |
|  | DÉBUT de Zone FIN de Zone vitesse limitée | START of Zone of controlled speed    |
|  | A DROITE                                  | ON THE RIGHT                         |
|  | A GAUCHE                                  | ON THE LEFT                          |
|  | DROITE                                    | RIGHT                                |
|  | GAUCHE                                    | LEFT                                 |
|  | MAUVAIS                                   | BAD                                  |
|  | IMPERATIF                                 | IMPERATIVE                           |

|  |                                 |                             |
|--|---------------------------------|-----------------------------|
|  | GAUCHE / DROITE                 | LEFT / RIGHT                |
|  | DROITE / GAUCHE                 | RIGHT / LEFT                |
|  | EMPIÈRE                         | STONY OR ROCKY              |
|  | DEFONCE                         | ROUGH                       |
|  | ORNIÈRE                         | RUT                         |
|  | SERRE                           | TIGHT                       |
|  | HORS PISTE                      | OFF PISTE / OFF TRACK       |
|  | HORS PISTE INTERDIT             | OFF TRACK FORBIDDEN         |
|  | OUED                            | OUED / WADI                 |
|  | ÉTROIT                          | NARROW                      |
|  | DANS                            | IN                          |
|  | QUITTER                         | LEAVE                       |
|  | GRAND                           | BIG                         |
|  | NOMBREUX                        | MANY                        |
|  | RALENTIR                        | SLOW DOWN                   |
|  | PLUS OU MOINS VISIBLE           | MORE OR LESS VISIBLE        |
|  | SINUEUX                         | TWISTY                      |
|  | PISTE PRINCIPALE                | MAIN TRACK                  |
|  | TOUT DROIT                      | KEEP STRAIGHT               |
|  | TOUT DROIT SUR PISTE PRINCIPALE | KEEP STRAIGHT ON MAIN TRACK |
|  | TOUT DROIT SUR ROUTE PRINCIPALE | KEEP STRAIGHT ON MAIN ROAD  |
|  | Pistes Parallèles               | PARALLEL TRACKS             |
|  | PISTE                           | TRACK                       |
|  | CAP                             | BEARING                     |
|  | CAP MOYEN                       | AVERAGE BEARING             |
|  | TOUJOURS                        | ALWAYS                      |
|  | PHOTO                           | PHOTO                       |
|  | PALMIER                         | PALM TREE                   |
|  | VEGETATION                      | BUSH                        |
|  | ARBRES                          | TREES                       |
|  | G / SOMMET                      | L OVER BROW                 |
|  | D / SOMMET                      | R OVER BROW                 |

Make up flash cards of the more difficult symbols and abbreviations. Practice with them until you know them perfectly.

**CAP Headings.**

CAP headings are compass directions expressed digitally. East is C.90, South is C.180, West is C.270, North is C.360 or C.0, etc. CAP headings to the right of the direction traveled are higher in number. To the left, they are lower in number. For example, if you are traveling on C.50, and the roadbook tells you to change to C.140, you will turn directly to your right. C.50 to C.320 is a turn directly left. Learn to quickly pick out directions when given a CAP heading.

Learn to know your approximate CAP heading whenever you are riding. These skills will help you immensely when navigating. I practice a drill where I stand pointing straight ahead at an imaginary C.90. Then I ask a friend to call out random numbers between 0 and 360 in quick succession. I try to point at the corresponding CAP headings as rapidly as possible.

### **GPS in the Dakar:**

In the Dakar, the GPS has very limited function. The rules change somewhat each year, so check the rule book. Generally, the GPS will give you only your CAP heading. There is usually no arrow pointing to a waypoint ahead. So, you navigate using three sources of information: ICO for kilometers, GPS for CAP heading, and Roadbook for instructions.

In certain circumstances, the GPS will show an arrow directing you to the next waypoint. For 2006 and 2007, this arrow appeared when you were within a 1.5 km radius of the waypoint. Outside of that radius, there was no arrow. For 2007, the GPS would show an arrow to certain waypoints outside of the 1.5 km radius, usually when traveling for long distances off-piste (“HP” in the roadbook lexicon.)

So, you must learn to navigate using the roadbook, ICO, and compass heading, without a GPS arrow.

### **Navigation Strategy:**

We’ve developed a few methods for approaching navigation over the years. Here are the main points:

Pay attention to the Dangers. Dangerous sections of the trail are marked in the roadbook with exclamation points (“!!!”). These can be holes, cliffs, big rocks, or any other hazard. Usually, a single danger (“!”) is not a problem for motorcycles. But, a double (“!!”) or triple (“!!!”) danger could kill you. Mark the big dangers in your roadbook. It is essential that you prepare and slow down for these dangers, so you must scroll your roadbook and keep your ICO accurate, even when riding in a group or following. I like to mark dangers with a dedicated color, usually red or pink highlighter.

Navigation. I think of the roadbook as having two parts, Dangers and Navigation. As described above, the Dangers are very important for survival. Navigation can be tricky, but missing a turn is usually not as bad as missing a Danger point. Here are some tips on navigating efficiently at speed:

Know your CAP headings. Great navigators will use only the CAP headings and ICO to navigate most of the time. If you are traveling at CAP 100 and know that the next turn is to CAP 190 in 1.0 km, you do not need any more information. Just before 1.0 km, you will prepare for and look for a right turn. If you can memorize a few turns, you can navigate this way at a very quick pace.

Use all your clues: When navigation becomes tricky, you will need more information than just the CAP heading and kilometer. At any time, you have 5 or more bits of information to use: CAP heading, roadbook drawing, ICO, tracks of earlier riders, tracks of the opening car, the

rider in front of you, the organization helicopter overhead, the general description of the daily route from the beginning of the roadbook, spectators, photographers, cars, trucks, etc. Take all of this information into account. Sometimes not all bits of information will agree, so weigh the evidence and use your best guess.

You are not lost: People ask whether I was often lost in the Dakar. This is hard to answer. Often you will be fairly certain that you are going the right way, but not absolutely certain. For example, 3 of 5 bits of information may indicate a turn onto a certain track. If you take that track, you may be unsure that it is the correct track until the next roadbook item. You are not lost, but you are also not 100% sure you are going the right way.

Waypoints: Throughout the day, you must pass through several waypoints. Some will be marked in the roadbook, some will actually be checkpoints where the organization will stop you and stamp your card, and some are hidden. You can switch your GPS to the “waypoints” screen to see whether you have missed any waypoints. The “waypoints” GPS screen shows a series of boxes indicating the day’s waypoints. When you pass through a waypoint, it is grayed out on that screen. So, you should see a series of grayed out boxes. If any of the boxes is not grayed out, you have missed that waypoint. Check the rules to decide whether it is better to go back and get any missed waypoint or to continue and take the resulting penalty.

Use “Certain” points to set your ICO. Sometimes the roadbook will show a point that is very certain. For example, there may be a particular intersection with road sign, or a distinctive terrain item drawn in the roadbook such as a cliff, a well, or a uniquely shaped building. When you pass this “Certain” point, adjust your ICO if your mileage does not match that in the roadbook. If your ICO regularly reads too high or low at these certain points, you should adjust your wheel circumference at the end of the day.

Safety trumps navigation. Look down at your roadbook only when it is safe to do so. Sometimes the track is too rocky, twisty or otherwise dangerous to look down at your roadbook. Glance down quickly to make sure there are no upcoming Dangers (marked in red or pink), but keep your eyes on the trail if it is tricky. Memorize a few items in the roadbook to carry you through tricky sections, or simply ride through the tricky sections and check later to see if you missed a navigation item. You can always turn back to catch a missed turn, but you must avoid crashing at all costs.

Mark your roadbook. The night before each day’s stage, you will have a chance to read and mark your roadbook. Each rider develops his own method, but here are my tips: Use a dedicated color for Dangers (red or pink.) Mark all the double and triple dangers. Navigation: Make sure you can read the CAP headings. Write them larger or highlight them if this helps. Use a dedicated color for turns (I use blue.) Mark only turns, and ignore items that simply tell you to go straight. I mark the side of the roadbook with a blue stripe for particularly tricky navigation items, telling myself to slow down and pay attention. You can also write notes to yourself in English on the roadbook. Each night, the organization will post several changes to the roadbook, which you must read and write into your roadbook. (The roadbook page examples above are not very well marked. Can you see why?) Lastly, mark the side of the roadbook with

a third color (I use green) for long sections with no Dangers and no significant navigation. Green tells me to twist the throttle and head for the horizon.

**A Final Word about Navigation:** It is possible to finish the Dakar with very little navigation experience. Once you understand the general concept, and if you go slow enough, you will not get lost. Navigation training and practice can make you more efficient at navigating while riding fast. If you run out of time preparing for the Dakar, sacrifice navigation training before you cut your physical and riding training short. You will not make it to the finish if you are unfit, but you can muddle your way through the navigation.

### **Navigation/Safety Equipment:**



Cockpit: from top, left to right: ICO, Cap and Speed Repeater, Roadbook reader (second ICO underneath), GPS-Iritrack. Left handlebar has roadbook toggle below, first ICO switch near grip, and red second ICO switch.

1. Roadbook reader: This must have an electric motor, handlebar switch, and back-lighting. The best and most common on the Dakar is the MD Roadbook reader. Roadbook problems are probably the most frequent mechanical failures during the Dakar, so use a quality item and learn how to fix it.
2. ICO: This is a re-settable digital odometer and speedometer. The most suitable version for the Dakar is the ICO Rally Light which has back-lighting and a handlebar switch. It will run on its own batteries for some time, but should be powered by the bike's electrical system. Many riders run two of these, with the second as a spare in case of failure, or as a backup in case they make an error resetting mileage. Since the most common failure by far of the ICO is damage to the pickup cable to the magnetic sensor on the front disc, it is possible to run only one ICO unit, but run two parallel pickup cables with the second as a quick-change spare. The ICO cables and pickup must be carefully routed out of harm's way.
3. GPS-Iritrack: The Dakar organization will issue you an ERTF GPS-Iritrack unit at Scrutineering just before the start. Your bike must arrive at Scrutineering with the necessary bracket and wiring to accept their GPS. The GPS-Iritrack unit is a single box incorporating two separate sections, each with its own power and antennas. Before the rally, you must purchase the

GPS bracket and GPS wiring harness and antenna from ERTF. You must also purchase the Iritrack wiring harness and two Iritrack antennas from TDCOM. The Dakar organization will forward specific ordering forms in the early fall, and the parts will come with detailed instructions.



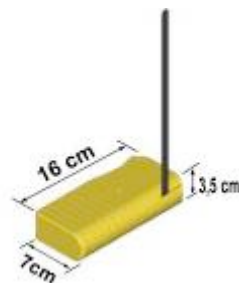
Dakar ERTF GPS unit

4. Sentinel: Similar to the GPS-Iritrack, your bike must arrive at Scrutineering with the bracket and wiring harness and signal horn of the Sentinel system, which you must purchase ahead of time from Protech Engineering. The organization will give you the Sentinel unit at Scrutineering. When a car or truck is near you, it may send a signal to your Sentinel which will sound the signal horn. You are supposed to get out of the way. Remember that many cars do this a few hundred yards behind you, so you generally have plenty of time. Some cars don't sound the horn at all, which can be dangerous if they raise lots of dust passing you. The fastest cars will catch most of the motorcycles. The optional Sentinel light is unnecessary. The buzzer is loud enough, and there is not enough space on most rally bikes for optional equipment.



Sentinel

5. Balise: This is a marine-type location beacon, completely separate from the other safety systems. The organizers will hand you one of these at Scrutineering. You must attach this somewhere accessible on your bike, and it is best to fabricate a small bracket and strap when preparing your bike.





Dimensions of the balise unit and example of mounting position.

6. Safety Equipment. The Dakar rules require you to carry certain safety items on your person or on the bike. Generally you can get these at a camping or marine supply store. Check the rule book for specific items, as they may change, but usually you'll need: A lighter, a strobe light, a flashlight, 3 flares, a compass, a mirror, a foil survival blanket. Space on you and the bike is scarce, so get the smallest version of each of these that you can find.

7. Repeater. This is a small unit that connects to the GPS via a cable. Repeaters have a screen which displays your CAP heading (compass heading) or Speed, or both. There are various versions available and vary in price from just over \$200 to almost \$600. Repeaters are not absolutely necessary because the same information can be seen on the GPS screen. However, they can make navigation easier and safer because they show important information up high, closer to your line of sight when riding. This lets you keep your eyes on the terrain more, looking down less.

8. Water capacity: The rules require that you carry 3 liters of water fixed on your bike and 2 liters of water on your person. Most rally bikes use a water tank built into the skid plate. However, our 2006 bikes used water bladders mounted between the front tanks, with camelback-style hoses so the riders could drink the water during the day.