



RALLY TRACKING USAGE GUIDELINES



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INTRODUCTION

This document intends to introduce the reader to modern rally tracking systems, and provide an explanation of what they are, how they work, and how best to choose and use such a system. It also introduces the reader to FIA's most recent efforts in establishing standards for rally tracking systems around the world, at various levels of motorsport. It is intended for readers with a background in rally organisation and management, and some technical knowledge.

RALLY CAR TRACKING SYSTEM

Given its name, it could be assumed that a rally car tracking system does only that – tracks a competitive vehicle's position in a rally. This was true when tracking systems were first introduced, but a modern tracking system is capable of a lot more than simply tracking. Some of the features that can now be found on tracking systems include:

- Tracking competitive vehicles
- Tracking course vehicles
- Crash reporting (SOS/OK)
- Automatic accident detection
- Red flag (with acknowledgement to rally control)
- Car-to-car warnings (accident proximity, overtake request etc)
- Two-way messaging (between car and rally control)

- Speed management
- Logging (Stewards inquiries)
- Timing system integration
- And more

Tracking systems may differ in their feature sets, but they all work in the same way; a system is fitted to each vehicle, which communicates information about the vehicle to rally control. The in-vehicle system contains sensors to record information (i.e. location, speed, battery level etc), a method of communicating with rally control (i.e. radio, cellular or satellite) and a user interface for the crew (i.e. buttons, switches, lights or screens). Computers in Rally Control are used to view the information from the vehicles (most often on a map), send commands (i.e. red flag), and view reports.



LEVELS OF TRACKING SYSTEMS

Tracking systems come in many different form factors and at a range of budget levels, suiting motorsport events from club level through to World Championships. Varied motorsport disciplines such as Rally, Cross-Country, Off-Road, Historics and Hill Climbs can all benefit from the application of a tracking system. FIA has established two specifications of rally tracking systems, and publishes a list of compliant providers. These specifications and lists of compliant providers are intended to support ASN's and event organisers when considering different tracking systems.

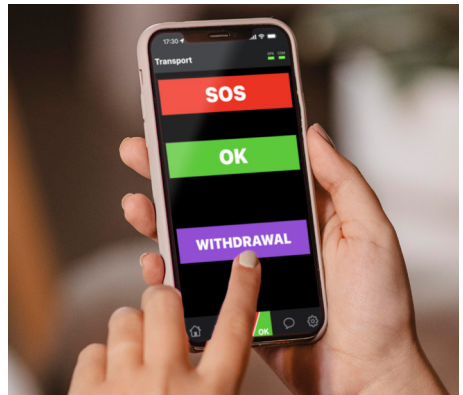
REGIONAL RALLY TRACKING SYSTEM

FIA's Regional Rally Tracking System Specifications, developed in conjunction with industry leading manufacturers, have established a baseline for tracking systems intended for use in FIA Regional Rally Championships. The specifications cover all aspects of tracking systems, from the robustness and performance of in-vehicle units, to the communication methods chosen and rally control software. Although the specifications

are intended to set a high level of functionality and performance, suitable for Regional Rally Championships, compliant systems will work very well for National Rally series, Cross-Country, Off-Road and Historic events. In the future, updates to the specification will ensure a continuously improving standard of tracking systems. FIA publishes a list of approved providers in the [Technical List no. 98](#) on FIA.com

SMART TRACKING

The SMART Tracking project defines a base level of functionality for low-cost tracking provided by a mobile application running on the competitor's smartphone. Although this approach has downsides compared to using a dedicated tracking device (namely, limited to cellular coverage only), it allows for the most cost-effective tracking solutions possible. SMART tracking systems should be considered for use in Club through to National level Rally series, Hill-Climb, and Historics, and it is not intended to replace any dedicated tracking unit already in use. The list of evaluated SMART systems appears later in this document.



BENEFITS OF USING A TRACKING SYSTEM



Tracking systems bring many benefits to rally management:

- Real-time knowledge of competitor positions, speeds etc
- Real-time knowledge of course vehicle positions (fleet management, running time management)
- Red flag acknowledgement – confirmation of course clear before MIV on course
- Reduced response time to accidents – leading to better medical outcomes
- Speed management features – improving safety & relationships with local governments/insurance
- Logging for Stewards' inquiries – inquiries determined by hard evidence
- New sponsorship opportunities – through publicly available tracking portals

COMMUNICATIONS



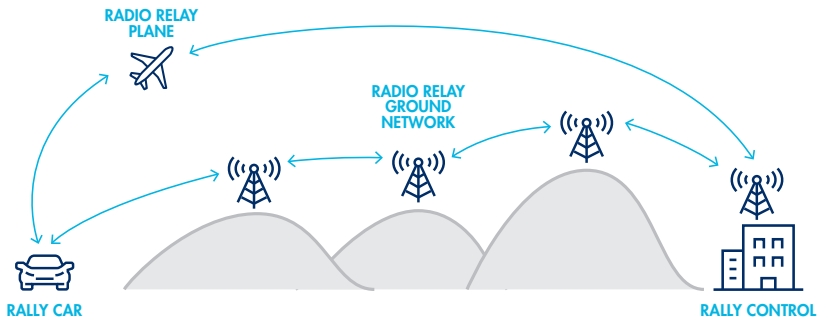
The most important part of a tracking system is its communications. The communication methods define the areas in which the tracking system can be effectively used, the available bandwidth, and the speed and reliability of communications. Some tracking systems combine multiple communication methods for even more coverage and reliability.

Ultimately no one method is inherently better than any other; the right communication method will depend on the rally in question; the terrain, availability of local networks, level of service required, and budget.

DATA RADIO

Data radios use radio waves to transmit data wirelessly between the vehicle and a remote antenna. The vehicle must have line of sight to the antenna for the system to work. Given

the varied terrain of rallies, this can require a dedicated network of antenna repeater stations, or an airborne repeater such as a circling plane.



CELLULAR

Mobile phones are the best example of a cellular device. Over the past three decades, 2/3/4/5G networks have expanded around the world, providing data services to handheld

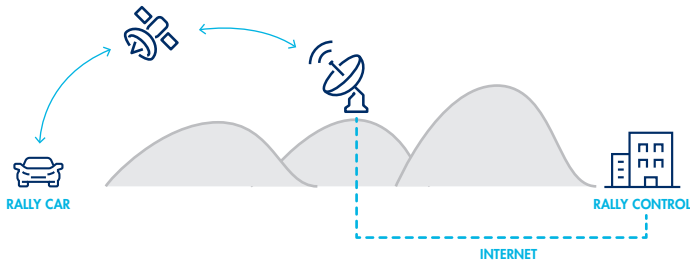
devices. Cellular networks offer high bandwidth, however coverage is limited to populated areas; so often a lot of a rally route will not be covered.



SATELLITE

Vehicle mounted satellite modems can communicate with a satellite in orbit – essentially in the same way a data radio communicates with a local antenna, or a cellular device with a tower –

giving amazing coverage. However the difficulty of communicating with a satellite in space means that, often, bandwidth is extremely limited and messages can take tens of seconds to transmit.



REPEATERS

Short range data radios can be used to transmit information between vehicles (or a roadside antenna), which is then sent to rally control over one of the above methods. This can be

extremely useful when antennas are damaged or otherwise inoperable (e.g. vehicle has rolled onto its roof), or one vehicle is in a reception black spot, but another vehicle has clear reception.



MOUNTING

Care must be taken to ensure the tracking system is installed in a safe and practical manner.

LOCATION

The tracking system should be installed in such a way that both the driver and co-driver can operate the system without taking off their harnesses. This ensures the system can be operated even in the worst of accidents or when competitor movement is limited. This can

be achieved by locating the main system on the tunnel, or in the center of the dash. Some systems also allow for remote button control, allowing the main system to be installed elsewhere but controlled from an accessible location.

MOUNTING ADAPTERS

Mounting must only be achieved by screwing, metal screw clamp, express clamp, or metal inserts. Any type of temporary suction or adhesive based mounting must be avoided, i.e. bonding, double-sided tape, adhesive material, suction devices, etc.

This ensures that the device, whether it is dedicated hardware or a competitor provided smartphone, is secured in the cockpit of the vehicle and will not become a hazard in the event of an accident. Your tracking system provider can assist you with suitable mounting options.

Mountings must be able to withstand a minimum deceleration of 25g. It must also be installed before the scrutineering, so that scrutineers can check the complete system.



CHOOSING A TRACKING SYSTEM

When choosing a tracking system, a range of factors must be considered to make sure that the tracking system chosen will work effectively.

PRICE

Suppliers can offer very different price levels depending on the technology and level of support required. Tracking system costs may also be mitigated in several ways; dedicated

ASN tracking personnel, bulk pricing deals, corporate sponsorships, insurance premium reductions, and government sporting safety initiatives.

FEATURES

Although most tracking systems offer similar features, some features might be more necessary for a particular rally than others. As an example, proximity warnings of stopped vehicles might be highly desirable in a desert Baja, whilst

speed management features might be a top priority for a rally around dense urban areas. It is also important to fully understand the tracking system's feature set, in order to maximise the usefulness of the system.

COMMUNICATIONS

Similar to the tracking system's feature set, the communication methods must be chosen according to the terrain and available networks. A rally held

away from populated areas might require satellite communications, whilst a rally held near an urban centre might be fine utilising cellular technology.

SUPPORT

Tracking system suppliers can offer varying levels of support to event organisers; it may be possible to have staff attend the rally to assist with system installation/retrieval and to run the system in rally control, or it may be possible to have equipment freighted and for an event to do a lot of the work themselves.

this approach can take time for officials to be trained correctly.

Training ASN or event officials in the proper installation/use/maintenance of the tracking system can be economically feasible, however

Having onsite support from the tracking provider can be useful as a lot of the work involved in running the tracking system can be delegated to the tracking provider, such as scrutineering checks, maintenance, and monitoring in rally control; however there is a direct financial cost associated with the travel and accommodation of support staff.

LANGUAGE

The language(s) used by the tracking supplier, both spoken and written, will also need to be taken into account. Beyond the obvious needs for smooth communication, providing user/

installation guides and other training materials in the common languages of competitors and officials greatly increases the ease of adoption and understanding of the system.

COURSE LOGGING

Tracking system suppliers require a digital version of the course in order to prepare their system for use in a rally.

COURSE LOGGING TIPS

Usually, this data is gathered by using a piece of GPS logging hardware and driving the entire course, from start to finish, adding points and logging the stages & liaisons as appropriate. When driving the course, try to drive the entire roadbook from start to finish, with no deviations. Drive at a consistent speed, do not take any short

cuts, drive stages in reverse, or take alternative routes. Try and mark course points as accurately as possible; remember that the GPS device takes its reference from the antenna location. If you do make mistakes, note them down and tell your tracking system provider; this will make it a lot easier for them to correct the mistakes.

HARDWARE/SOFTWARE

The hardware used can be an off-the-shelf GPS logging device, custom hardware provided by the tracking supplier, or even just a mobile phone with a dedicated GPS logging application. After gathering the raw data, it's normal to import the data into software to further refine it; renaming

points appropriately, moving them slightly, or editing mistakes. Software such as Google Earth Pro can be used for this purpose, and is capable of exporting KML/KMZ files, an industry standard for geodata.

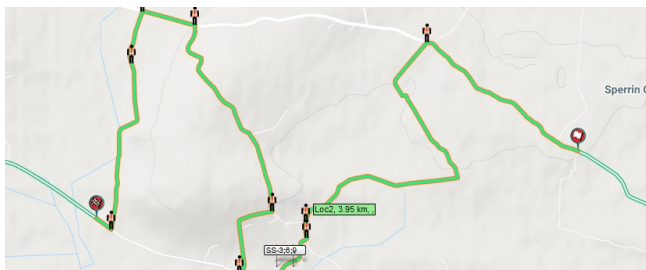
REQUIRED DATA

As a guide, the tracking system supplier will expect the following data:

- All Special Stages
- All Liaison stages
- All Course Points
 - Time Controls
 - Starts
 - Intermediates/SOS/Radio Points
 - Finishes
 - Stop Controls

Any other points of interest you may wish to add to the map e.g. spectator zones, marshal locations, service park location, remote refuel locations - may be able to be supported by the tracking system supplier. Your tracking system supplier will be able to help with any of the above points, advising on the best way to log the course to suit their system.

Accurate geodata can also be used for printed maps in roadbooks, safety plans, map handouts and spectator information.



RUNNING AN EVENT WITH A TRACKING SYSTEM



Adding a tracking system to the normal event management workflow can be made easier by a strong relationship with the tracking system provider, and a solid understanding of the requirements that they may have. The most important point is to keep the provider updated with any changes to the event.

6 MONTHS BEFORE EVENT

- Liaise with the tracking system supplier to ensure both parties have knowledge about requirements, dates, number of competitors, expectations etc.
- Send any available information to supplier (rally guides etc)
- Utilise tracking system data to influence course selection/plotting (e.g. previous years avg. speed data)

2 MONTHS BEFORE EVENT

- Log the course; provide the supplier with a digital file of the rally coordinates (KML etc)
- Ideally record data about the strength of communication networks across the course simultaneously
- Insert supplier provided information about tracking system into the supp. regs
- Update supplier with available information (supp. regs, itinerary, rally guides etc)

1 MONTH BEFORE EVENT

- Ensure competitors notified of tracking system use; distribute supplier provided user and installation guides
- Update supplier with available information (supp. regs, itinerary, rally guides etc)
- Prepare manual tracking backup, plan for any black holes identified by logging the course

PRE-EVENT (SCRUTINEERING, DOCUMENTATION ETC)

- Ensure every vehicle's tracking system has been checked as part of the scrutineering process
- Organise a competitor briefing on the tracking system, focussing on safety matters (pressing OK/SOS etc)
- Organise an officials training session on the rally control system, focussing on safety matters (SOS / red flag process etc)

LIVE

- Check all tracking systems turned on and working at the start of every day (Parc Ferme out/Service out)
- Identify and repair any issues with installed systems during service windows
- Plan for any communication black spots (identified whilst logging the course)
- Utilise tracking system for maximum value
 - Logged data for Steward's inquiries
 - Two-way messaging for increased situational awareness
 - Reports of stopped cars for sweep/ stage clearance

POST-EVENT

- Implement a clear plan for removal and return of tracking systems from competitive and course vehicles
- Ensure any retired competitors return systems before departure
- Gather useful reports from supplier (e.g. avg. speed)



IMPLICATIONS OF A TRACKING SYSTEM

Although the introduction of a tracking system brings many benefits, it also brings some challenges and impacts the way rallies are run.

CREW

The rally competitors (driver/co-driver) must learn about the operation of the tracking system, so that they can swiftly and accurately use it to call for assistance in the event of an emergency, and understand the information provided to them (red flag etc). The mechanics or other crew must learn how to accurately install the system and integrate it into the vehicle in a safe manner (for example, running any antenna leads on the inside of the roll cage, to avoid damage).

The crew must also understand and achieve any logistical challenges associated with the system; such as picking up the system, paying any deposits, and returning it after the event or retirement.

All of these tasks can be made easier by providing the crew with succinct and accurate instructions.

RALLY OFFICIALS

Introducing a tracking system can change the workflow of many rally officials. Course cars may have a tracking system installed into them. Some systems are capable of notifying the sweep vehicle where stopped vehicles are, aiding in locating all vehicles. Radio point officials may not be required to report passing car numbers over radio anymore, instead keeping a physical log and only reporting over radio when required (i.e. in a black spot for coverage or when a particular car's tracking system is not working).

Rally organisers need to choose and implement the tracking system's requirements, adjusting course plotting, scrutineering and administrative checks. And rally control must adapt to the new information and features they have access to, such as utilising the red flag feature to stop a stage quickly and confirm vehicles have acknowledged the red flag and are travelling at non-competitive speeds before sending in intervention vehicles.

FIA SMART TRACKING SYSTEMS

The list of evaluated SMART tracking systems is updated on www.fia.com/rally-safety, ordered by the first date of evaluation. For the purposes of clarity, there is no commercial agreement in place between FIA and each supplier. This list will be kept up-to-date as more suppliers submit SMART systems for evaluation.



[FIA.COM/RALLY-SAFETY](https://www.fia.com/rally-safety)