Serving the Australian Auto Sport Industry since 2001

Race Management System

Revision: 01/2021

Race Management:

Concepts & Methodology

The RACERS Signalling System for Permanent Circuit Racing

Explanatory Preamble:

The system generally in use for signalling to race PAXs is a continuation of the systems developed for horse racing in the 19th Century. All of the titles (e.g. Clerk of Course, Stewards, etc.), still used in motorsport today, are a direct copy of the roles and responsibilities that existed at the turn of the 20th Century. This was a reasonable strategy when car racing first started as they had to get processes from somewhere and, as cars travelled at about the same speed as horses, it sufficed. The system was never expected to be used for cars travelling at as much as ten times the speed of a race horse. It is also worth noting that those horses were driven by skilled horsemen who had served an apprenticeship in the task.

Fundamentally, a confused PAX is a dangerous PAX. Therefore, the most important thing when dealing with safety during a race is to ensure that the brain of the PAX does not become confused due to inadequate or conflicting information or, as has frequently been the case, not receiving any information at all, in a timely manner. There is merit in the statement, "Safety in the control of a racing car comes from one place, and only one place, the brain of the PAX. Everything else is an attempt to mitigate the damage caused by unsafe decisions or behaviour being delivered by the brain of the PAX."

RACERS made communications with the PAX its first priority for trying to improve the safety of motorsport. Our initial attempt to do this was by supplementing the archaic flag system with traffic lights. Like the QWERTY keyboard was not invented for computers; the existing flag systems were not invented for communicating with racing cars.

In motorsport applications flag systems have three significant disadvantages;

1. Firstly; flags cannot be waved directly in the eye-line of a PAX because of the danger to the person waving the flag. Therefore, to read the flag the PAX must take their attention away from the track then look for and at the flag. This can, and no doubt has, caused unnecessary crashes.

2. Secondly, excessive latency, which is the time between the incident occurring and the PAXs being made aware of the danger(s) they are facing. The time required for a message to go through its channels from a flag point to the race control communicator; to the clerk of course and then back through the race control communicator to the flag marshall at the scene can be lengthy. In a recent fatality the Tasmanian Coroner established this process took 11 seconds which lead to a rider being run over and fatally injured.

3. Thirdly, and not as frequent; there have been cases where the wrong flag has been waved as a result of over excitement on the part of the flag marshall.

All three of these disadvantages are corrected by using traffic lights that are directly controlled by Race Control. The Traffic Manager in the RACERS environment is able to cut the length of time it takes to deliver a message to the field by as much as 90% and the Traffic Manager is able to see immediately that they have displayed the right signal to advise the PAXs of the danger levels they were facing.

Whilst this is a big improvement it still has the big drawback in that it passes no information – it only advises of a condition. Another drawback is that colour blind PAXs (approx 10% of the male population) cannot interpret the display with 100% accuracy.

After looking at how other motorsports worked in other countries it became obvious that the best system is an auditory warning system using a race radio system directly from Race Control to the PAX. The Traffic Manager communicates important information directly to the PAX with no delays or misinterpretations and therefore we have a mechanism that can completely remove confusion and uncertainty from the PAX's brain.

To illustrate:

1) a red flag or a red light can indicate to a PAX that there is a danger ahead and they must cease racing immediately but they have no information as to what the actual danger is; it may be a slow car at the edge of the track or it could be a multi-vehicle pileup – the PAX has no way of knowing what they are driving into.
2) With the radio system PAXs can be told "cancel, race is cancelled, car on fire PAXs left at turn six-all, emergency vehicles on track, all PAXs return to the pits" with this information the PAX knows to stay on the right-hand side of the track, to expect a fire fighting appliance to be on the track and to progress safely back to the pits to await further instructions.

The RACERS manual clearly defines the messages that will be given, the words that will be used, and the way they will be transmitted. This protocol discipline enhances clarity and brevity for PAXs as it does for pilots.

RACERS did not invent or even pioneer the use of radios. They have been in use in Australia for over 15 years at Speedways and in America these radios are mandatory for every category and every race meeting conducted in the USA. The fact that these radios have not previously been used for circuit racing in Australia is hard to fathom.

When deploying C^3 systems best practice is always to have two completely independent systems of communicating the hazard to the endangered parties. RACERS has achieved this by backing the radios up with the second, and totally independent form of communication, that is the traffic lights. Now we can state with high certainty that if a PAX were to miss the auditory message they should still see the light signal to warn them of danger.

The secondary benefits of this signalling strategy are:

1. safety for officials improves by removing the officials and flag marshalls from potentially dangerous areas so they could be seen by the PAXs
2. safety for racing PAXs improves because tracks can remove the concrete protection structures which are no longer required to protect the flag marshalls

Implementation:

To further simplify the system and minimise confusion every situation is reduced to just 3 **Whole of Track** (WoT) conditions which are explained in detail at the PAX's Briefings and below.

The three Whole of Track Conditions are:

CANCEL: On hearing the word "CANCEL" all racing must stop immediately and further instructions will follow shortly afterwards. Expect to see rescue and medical vehicles on the track immediately you hear the call and the lights come on.
Flashing Red Lights are displayed all around the circuit to indicate the race is cancelled.

CLAMPDOWN: On hearing the word "CLAMPDOWN" all PAXs must slow down immediately to 80 KmH and hold station on the car in front of them. PAXs must not attempt to gain any position advantage whilst this condition is active. Expect to see rescue and medical vehicles on the track immediately you hear the call and the lights come on. PAXs do NOT return to the pits unless the CLAMPDOWN converts to a CANCEL. CLAMPDOWN is the equivalent in application of the FIA Mode 60 and F1's "Virtual Safety Car".
Fixed Red Lights are displayed all around the circuit during the period the CLAMPDOWN is in force.

CAUTION: On hearing the word "CAUTION" keep racing – if there is a situation which presents a real and recognisable danger to the PAX it will always have a red light and be called as CANCEL or CLAMPDOWN. The CAUTION call just means there is something Race Control wants the PAX to be aware of e.g. stones on the track. This information will be given at the time of the radio call.
Fixed Yellow lights are displayed all around the track to indicate a CAUTION condition exists.

The proximity warning is a Flashing YELLOW light

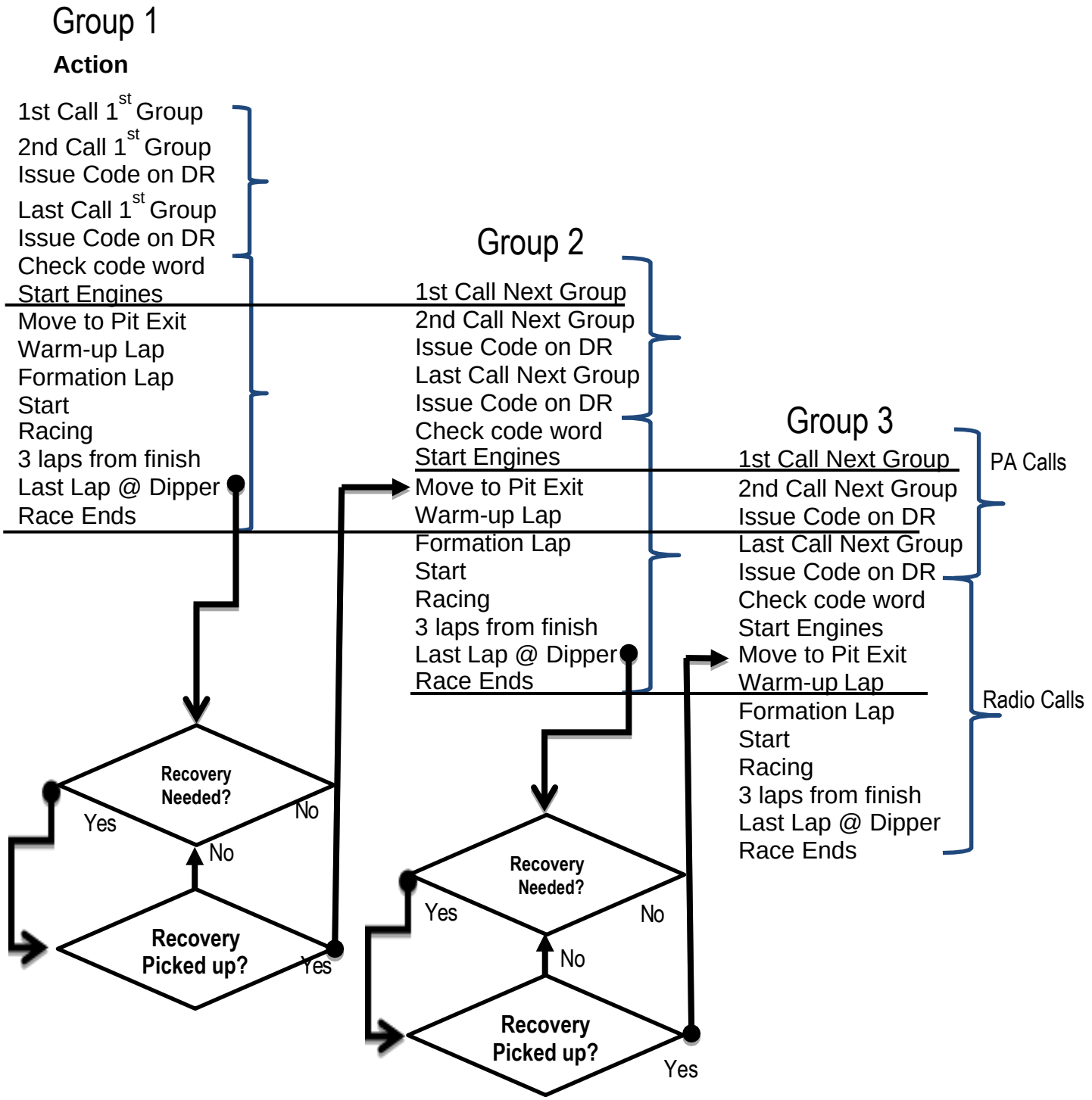
Reminds the PAX they are CLOSE to the incident or problem advised by the radio call.

Actions to be taken by the PAX are:

- When under a WoT CAUTION = Racing continues BUT NO overtaking until the next fixed Yellow light
- Under any WoT RED condition = slow to 40 Km until you are well past the incident.

Flashing Yellow lights are displayed on the approach to the incident or problem causing the WoT Condition will be displayed.

Race Delivery Process



NOTE:

Underlines indicate approx. the same time but in reality it will vary considerably with length of the race(s) and the number of recoveries required.

ETC...

Race Management:

Communication Systems and Protocols

RACE CONTROL ⟺ OBSERVER

COMMUNICATIONS

OBSERVERS

CCTV FEEDS

RACE CONTROL

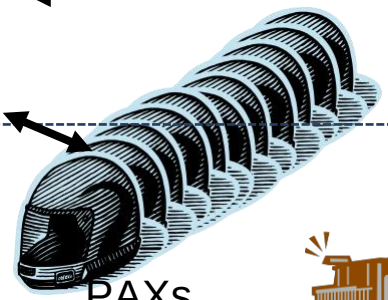
TM

Traffic Manager
(Racing & PAX Conduct)

Driving Standards Observer

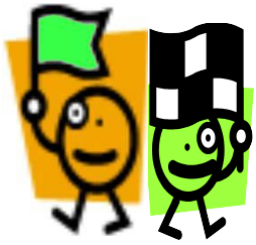
Incident Manager
(FIV management & Reports)

IM



PAXs

Starter



Pit Lane Controller

Fire & Rescue

Recovery & Clean Up Crews

Ambulance & Medic Crews

Field Staff:	Admin & FIV staff:
Start/Finish x 1	Race Control x 2
Pit Lane x 2	Paramedic x 3(4)
Scrut x 2	Fire & Resc. x 2(3)
Observers:	Recovery x 1 (+1)
QR 1,2,3,5,6	Event Secretary
LP 1,2,3,4,5	Sign-in Staff (3)

INCIDENT MANAGER (IM) ⇔ OBSERVER

Radio Protocols

Structured Communications (like Pilots use)

OBSERVER - TO - INCIDENT MGR (IM) - TO - OBSERVER

Observer to IM "Point No." IM to Observer "Point No."
Ob1: Calls in Severity and Condition Code(s) and Location
IM1: "Repeat Severity, Code and Location"
Ob2: Repeats Severity Code(s) and location
IM2: Reads Back the Information to the Observer
Ob3: Affirm

SEVERITY:

Red (number): there must be a clear & present DANGER**- RESPOND NOW**

Yellow: (number): the race can continue – **RESPOND SOON**

PAN PAN (number) – information only; response (if any) at end of race

CONDITION CODE NUMBERS:

1. Fire, multiple or major car damage – PAX(s) still in car
2. PAX appears injured inside the car
3. Fire AND PAX is Out of the car
4. Fire or heavy smoke from car or grass near car – PAX Out
5. PAX out of car
6. Collision – Car(s) Stopped
7. Car Stopped due to roll over or wall
8. Stones, oil or coolant on Track
9. Car stationary
10. Slow moving vehicle or faulty vehicle (provide car number)

AUTHORISED WORDS (use of codes is preferred):

"Say Again " Formal request for confirmation or if trans. not heard or understood
"Fire" Prefer Call Code number 1, 3 or 4 unless it is grass fire
"Crash at (position)"
"PAX (condition)"
"Request (position)"
"Confirm (message)"
"Contact (Car number & Car number)"

POSITION:

Turn # (e.g. 1,2,3, Dipper, etc)
Distance or Feature (e.g. T3~100 metres / beside start tower ~ etc)

TRAFFIC LIGHTS:

Used as back up to the verbal PAX directions:
Cancel – Flashing Red
Clampdown – Solid Red
Caution – Solid Yellow
Close to incident – Flashing Yellow

Sample Conversations 1

INCIDENT – Example 1:
car runs off at turn 3 & stops 12 metres from the track in the trap in a safe position:

OBSERVER to IM: “Point 3”
IM to OBSERVER: “Send 3” (or “wait 3” if dealing with another incident then “Send 3”)
OBSERVER to IM: “Yellow 9 – PAXs Left Turn 3 Gravel Trap –Yellow 9”
IM to OBSERVER: “Say again”
OBSERVER to IM: “Yellow 9 – PAXs Left Turn 3 Gravel Trap –Yellow 9”
IM to OBSERVER: “Yellow 9 – PAXs Left Turn 3 Gravel Trap –Yellow 9”
OBSERVER to IM: “AFFIRM”
IM to TM “Yellow 9 – PAXs Left Turn 3 Gravel trap”
TM – PAXS: “Caution; Car Stopped - PAXs Left T3 Gravel Trap (x 2)”

IM to Recovery 1: “Recovery 1 – stand by for T3 gravel trap recovery”
RECOVERY 1 > IM; “Recovery 1 Standing by for T3 recovery”

INCIDENT – Example 2:
car runs off, crashes and stops against the wall at exit T6; PAX is in the car

OBSERVER to IM: “Point 6”
IM to OBSERVER: “Send 6” (or “wait 6” if dealing with another incident then “Send 6”)
OBSERVER to IM: “Red 6 – PAXs Left, Turn 6 – car in wall PAXs left”
IM to OBSERVER: “Say again”
OBSERVER to IM: “Red 6 – PAXs Left, Turn 6 – car in wall PAXs left”
IM to OBSERVER: “Red 6 – PAXs Left, Turn 6 – car in wall PAXs left”
OBSERVER to IM: “AFFIRM”
IM to TRAFFIC MANAGER “Red 6 – PAXs Left, Turn 6 – car in wall PAXs left”
TM – PAXS: “CLAMPDOWN; Car Stopped in wall - PAXs Left T6; PAXs Left Turn 6; CLAMPDOWN”

When IM sees compliance with CLAMPDOWN
IM TO MEDICAL: “Medical proceed immediately to Turn 6 via -----.”
MEDICAL TO IM: “Medical proceeding to Turn 6 via -----.”
IM TO RECOVERY: “Recovery proceed immediately to Turn 6 via --- “
RECOVERY to IM; “Recovery 1 proceeding to Turn 6”

NOTES:
Traffic manager radios race end as Incident Manager is likely to be busy as they have the responsibility for expediting restitution of the track for the next event.
Traffic Manager controls Pit lane officials, track entry & the Starter
NO FLAGS will at the observation points but 2 x F500 extinguishers
Binoculars will be issued to the Observers where appropriate
Traffic lights are under the control of the Traffic Manager; they should only to be used to reinforce voice communications.

Sample Conversations 2

INCIDENT – Example 3:

Gravel on track – possible oil in T2

OBSERVER to IM: “Point 3”
IM to OBSERVER: “Send 3” (or “wait 3” if dealing with another incident then “Send 3”)
OBSERVER to IM: “Pan Pan 8 – PAXs Left Turn 2”
IM to OBSERVER: “Say again”
OBSERVER to IM: ““Pan Pan 8 – PAXs Left Turn 2”
IM to OBSERVER: ““Pan Pan 8 – PAXs Left Turn 2”
OBSERVER to IM: “AFFIRM”
IM to TRAFFIC MANAGER “Pan Pan 8 – PAXs Left Turn 2”
TM – PAXS: “Caution; Caution; gravel - possible oil outside T2 (x 2)”

IM to Recovery 1: “Recovery 1 – stand by for T2 clean up”
RECOVERY 1 > IM; “Recovery 1 Standing by for T2 clean up”

INCIDENT – Example 4 – MAJOR INCIDENT

Track completely blocked by multi car crash in Turn 5 – lots of smoke likelihood of serious injuries; possible fire(s)

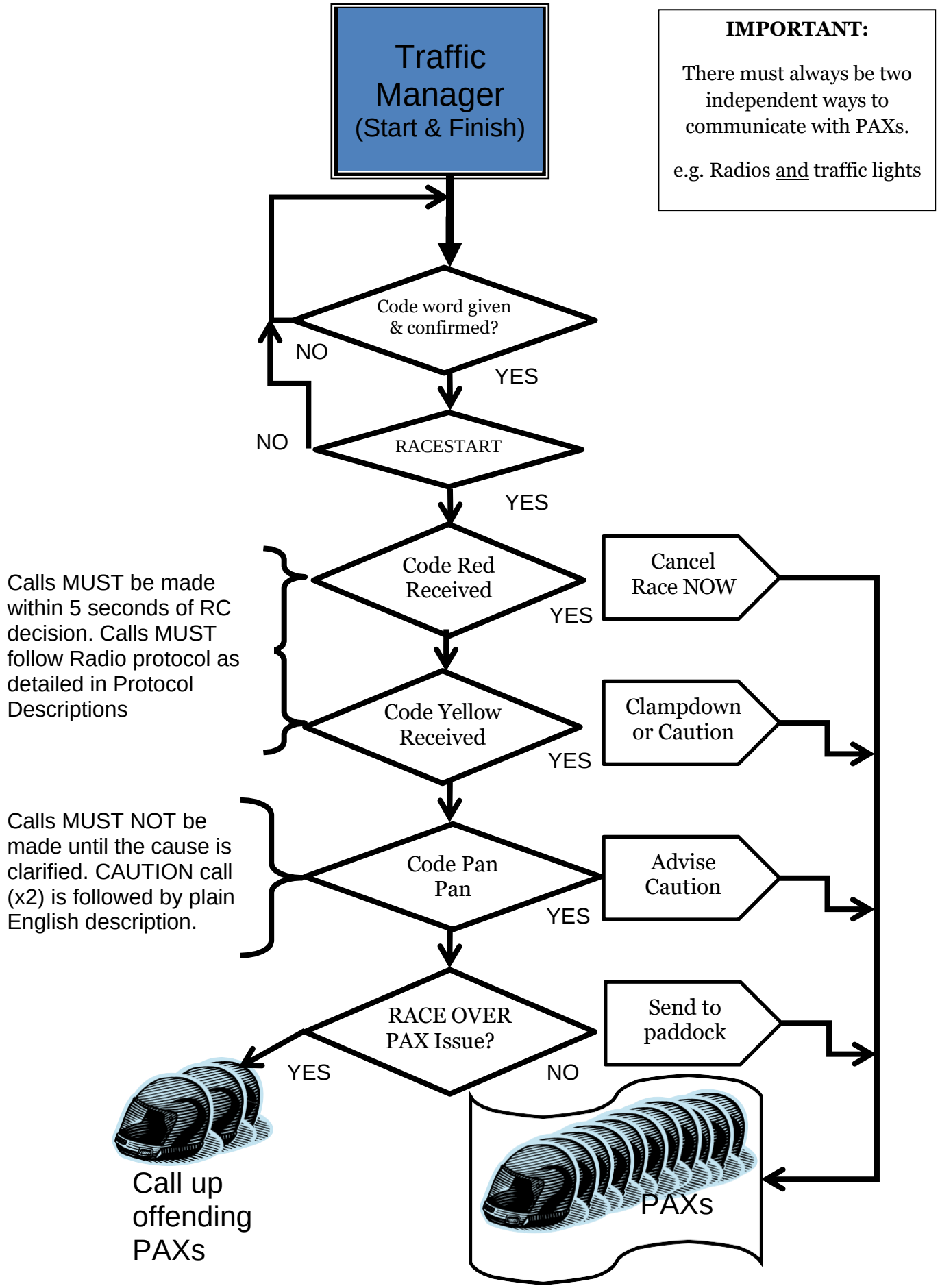
OBSERVER to IM: “Point 5”
IM to OBSERVER: “Send 5” (or “wait 5” if dealing with another incident then “Send 5”)
OBSERVER to IM: “Red 1 – PAXs Right, Turn 5 – Track Blocked multi car crash”
IM to OBSERVER: “Repeat Situation”
OBSERVER to IM: “Red 1 – PAXs Right, Turn 5 – Track Blocked multi car crash”
IM to OBSERVER: “Red 1 – PAXs Right, Turn 5 – Track Blocked multi car crash””
OBSERVER to IM: “AFFIRM”

IM to TM “Red 1 – PAXs Right, Turn 5 – Track Blocked multi car crash”

TM – PAXS: “CANCEL CANCEL CANCEL; track blocked Turn 5; multi car crash – stay clear of emergency traffic; park in the crossover and await further instructions”

IM to all FIV “ALL FIV, ALL FIV, SCRAMBLE; SCRAMBLE; DEPLOY NOW; DEPLOY NOW” (Sends FIV to their deployment holding position)
When IM sees compliance with CANCEL and race cars parking up:
IM TO MEDICAL: “Medical proceed immediately to Turn 5 via Pit Entry.”
MEDICAL TO IM: “Medical proceeding to Turn 5 via Pit Entry”
IM to RESCUE: “Rescue proceed immediately to Turn 5 via Pit Exit and Grass”
RESCUE to IM: “Rescue proceed immediately to Turn 5 via Pit Exit and Grass”
IM TO RECOVERY1: “Recovery 1 proceed immediately to Turn 5 via pit Exit and Grass’
RECOVERY1 to IM; “Recovery 1 proceeding to Turn 5 via Pit Exit and grass”
IM TO RECOVERY2: “Recovery 2 proceed immediately to Turn 5 via dipper
RECOVERY2 to IM; “Recovery 2 proceeding to Turn 5 via dipper”
NOTE:: Always deploy FIVs in the order – MEDCAL, RESCUE, RECOVERY
TM to PAXS: All PAXs, All PAXs – return to your paddock or garage – race has been cancelled. Event management will advise if there will be a re-start time.

RACE CONTROL ⇨ PAX COMMUNICATIONS 1



RACE CONTROL ⇨ PAX COMMUNICATIONS - 2

ENUNCIATIONS:	
Cancel said as:	**KAN** sell
Clampdown said as:	clamp – **DOWN**
Caution said as:	**KORR** shun

(Words in BOLD are said louder than the words in plain.)

Sample Instructions:

Situation 1:

Red Code 1 established in T3 – track blocked - late in race – RC decides to end the race at that point.

TM Broadcast is:

1. "All PAXs KAN sell - KAN sell - KAN sell - All PAXs - All PAXs – Crash turn 3; Crash turn 3 - 50 Kmh **now** please - stand by for further instructions"
2. "All PAXs– emergency vehicles on track – All PAXs keep clear, keep clear"
3. "All PAXs - Park up in Turn 2 – Park up in Turn 2"
4. "All PAXs - All PAXs – return to paddock (or Pit Lane) via Dipper – Turn 4 & Turn 5 – return to paddock (or Pit Lane."

Situation 2:

Red Code 6 established in T4 PAX right – in RED zone10 metres off track only a few laps done so RC calls it as "Recover & Resume"

TM Broadcast is:

1. "All PAXs - clamp DOWN- clamp DOWN - clamp DOWN- All PAXs - Crash turn 4; Crash turn 4 - stand by for further instructions – 80 Kmh and hold station **now** please"
2. As soon as FIVs are in a safe position "GO GO GO"
3. NOTE: If after ~10 minutes situation has not been rectified go to appropriate CANCEL procedure for Pit Lane or Paddock

RACE CONTROL ⇨ PAX COMMUNICATIONS - 3

Situation 3:
Car stopped beside exit T3 in a red zone:
Red Code 9 established, RC calls it as “Recover & Resume”

TM Broadcasts:

1. “All PAXs - clamp DOWN- clamp DOWN - clamp DOWN - All PAXs - Car stopped T3 exit; Car stopped T3 exit – SLOW Vehicles on track – RESCUE vehicles on track – 80 Kmh **now** please”
2. “All PAXs – All PAXs - Recovery in progress – 40 Kmh near the scene please” until track clears then:
3. “ GO GO GO All PAXs - GO GO GO - All PAXs.”

Situation 4:
Car stopped deep in T1 Gravel Trap. Yellow Code 9 established RC calls it as “Leave 4 Later” (IM asserts full course & flashing yellow)

TM Broadcasts:

1. “KORR shun KORR shun - All PAXs - All PAXs – Car stopped T1 gravel trap; Car stopped T1 gravel trap – keep racing but be careful please”
2. (At end of race) “All PAXs – All PAXs - Recovery in progress”

Situation 5:
Stones reported on track RC calls it as “Leave 4 Later”

TM Broadcasts:

1. “KORR shun KORR shun -All PAXs - All PAXs – stones on track reported exit T6 – keep racing please”

Situation 6:
On-track situations

TM Broadcasts:

1. “Car 54 redress on car 35 – Car 54 redress on car 35”
2. “Car 17 Pit Lane drive through next lap – 17 drive through pits.”
3. “Car 18 Black Flag – Black Flag – come to tower on next lap”
4. “Car 29 be aware - you are about to be lapped