

INDEX

Index of contents	page 1
Operating a Raynet Station	page 2
Battery Management	page 3
Charging Nickel based batteries Simple guidelines	page 4
Charging Lithium Ion batteries	page 5
Charging Lead Acid batteries	page 6
Lead Acid state of charge table Carrying a hand portable	page 7
On Air Protocol	page 8
Basic principles	page 9
Radio Discipline Radio Security	page 10
Procedure words and phrases	page 11 – 12
Phonic Alphabet	page 13
Outdoor Operations Preparation for deployment	page 14
Weather Precautions/ Conditions	page 14 – 18
The Raynet Operators Casualty Code	page 19

Operating a Raynet Station.

Introduction

The primary role of Raynet Ireland is to provide contingency communications for user services both in Northern Ireland and the Republic of Ireland.

This training programme will deal with both technical issues and the operational protocol required to set up and maintain a Raynet station.

Battery Management

Handportables

To ensure that your communications station is fully operational for the duration of any exercise or emergency situation, it is necessary to keep all hand portables power packs fully charged and prepared. This means conditioning the battery packs, both internal and external, on a regular basis by cycling them where appropriate. All portable radio equipment should be ready for use at a moments notice.

Battery

Changing

1. Make sure that the radio is switched off.
2. Connect the appropriate manufacturer's charger where available.

Charging nickel-based batteries.

New nickel-based batteries should be trickle-charged for 24 hours prior to use. Trickle charge brings all cells to equal charge level because each cell self-discharges at a different rate. Trickle charge also redistributes the electrolyte to remedy dry spots on the separator brought on by gravitation of the electrolyte during long storage.

* The C-rate is a unit by which charge and discharge currents are scaled. A charge current of 1000mAh, or 1C, will charge a 1000mAh battery in slightly more than one hour. A 1C discharge lasts one hour.

Some battery manufacturers do not fully form the cells before shipment. Full performance is reached after the battery has been primed through several charge/discharge cycles, either with a battery analyzer or through normal use. In some cases, 50-100 discharge/charge cycles are needed to obtain full performance. Properly formed cells perform to specification after 5-7 cycles.

Most rechargeable cells are equipped with a safety vent to release excess pressure if over-charged. The safety vent on a nickel-based cell opens between 10-13 Bar (150-200 psi). (The pressure of a car tire is about 2.3 Bar or 35 psi.) With a resealable vent, no damage occurs after venting. Some electrolyte is lost and the seal may leak afterwards. A white powder accumulating at the vent opening indicates venting activities.

Charging nickel-cadmium

The overall charge efficiency of nickel-cadmium is about 90% if

fast charged at 1C. On a 0.1C overnight charge, the efficiency drops to 70% and the charge time is 14 hours or longer.

In the initial 70% of charge, the charge acceptance of a healthy nickel-cadmium battery is close to 100%. The battery remains cool because all energy is absorbed. Currents of several times the C-rating can be applied without heat build up. Ultra-fast chargers use this phenomenon to charge a battery to the 70% level within minutes. Past 70%, the battery gradually loses the ability to accept charge. The pressure and temperature increase. Figure 1 illustrates the relationship of cell voltage, pressure and temperature while nickel-cadmium is being charged.

Ultra-high capacity nickel-cadmium batteries tend to heat up more than the standard version on fast-charge. This is partly due to increased internal cell resistance. To moderate the temperature build up and achieve short charge times, advanced chargers apply a high current at the beginning and then lower the amount to harmonize with the charge acceptance.

After the initial fast charge, some fast-chargers apply a timed topping charged. In an attempt to gain a few extra capacity points, some chargers apply a measured amount of overcharge. The capacity gain is about 6%. The negative is shorter cycle life. The recommended trickle charge for nickel-cadmium is between 0.05C and 0.1C. Because of memory concerns and compatibility with nickel-metal-hydride, the trickle charge is set as low as possible.

Charging nickel-metal-hydride

Nickel-metal-hydride should be rapid charged rather than slow charged. Because of poor overcharge absorption, the trickle charge must be lower than that of nickel-cadmium and is usually around 0.05C. This explains why the original nickel-cadmium charger cannot be used nickel-metal-hydride.

It is difficult, if not impossible, to slow-charge a nickel-metal-hydride. Harmful overcharge can occur if a partially or fully charged battery is charged with a fixed timer. The same occurs if the battery has aged and can only hold 50 instead of 100% charge. Overcharge could occur even though the battery feels cool to the touch.

Simple Guidelines:

Avoid high temperature during charging. Discontinue the use of chargers that cook batteries.

A charger for nickel-metal-hydride can also accommodate nickel-cadmium, but not the other way around. A charger designed for nickel-cadmium would overcharge the nickel-metal-hydride battery.

nickel-based batteries prefer fast-charge. Lingering slow charges cause crystalline formation (memory).

nickel- and lithium-based batteries require different charge algorithms. The two chemistries can normally not be interchanged in the same charger.

If not used immediately, remove the battery from the charger and apply a topping-charge before use. Do not leave nickel-based battery in the charger for more than a few days, even if on trickle charge.

A well-designed charger is a reasonably complex device. Taking short cuts will cost the user in the long run. Choosing a well-engineered charger will return the investment in longer lasting and better performing batteries.

Charging lithium-ion batteries (BU12)

There is only one way to charge lithium-based batteries. The so-called 'miracle chargers', which claim to restore and prolong batteries, do not exist for lithium chemistries. Neither does super-fast charging apply. Manufacturers of lithium-ion cells have very strict guidelines in charge procedures and the pack should be charged as per the manufacturers "typical" charge technique.

Lithium-ion is a very clean system and does not need priming as nickel-based batteries do. The 1st charge is no different to the 5th or the 50th charge. Stickers instructing to charge the battery for 8 hours or more for the first time may be a leftover from the nickel battery days.

Most cells are charged to 4.20 volts with a tolerance of $\pm 0.05\text{V}/\text{cell}$. Charging only to 4.10V reduced the capacity by 10% but provides a longer service life. Newer cell are capable of delivering a good cycle count with a charge to 4.20 volts per cell. Figure 1 shows the voltage and current signature as the lithium-ion cell passes through the charge stages.

No trickle charge is applied because lithium-ion is unable to absorb overcharge. Depending on the battery, a topping charge may be repeated once every 20 days.

What happens if a battery is inadvertently overcharged? Overcharging causes the cell to heat up. If left unattended, the cell could vent with flame.

Extreme low voltage must also be prevented. There are several safeguards to prevent excessive discharge. The equipment protects the battery by cutting off when the cell reaches 2.7 to 3.0V/cell.

Charging the lead-acid battery (BU13)

Car batteries and valve-regulated-lead-acid batteries (VRLA) are typically charged to between 2.26 and 2.36V/cell. At 2.37V, most lead-acid batteries start to gas, causing loss of electrolyte and possible temperature increases. The exceptions are small sealed lead acid batteries (SLA), which can be charged to 2.50V/cell without adverse side effect.

Lead-acid batteries must always be stored in a charged state. A topping charge should be applied every six months to avoid the voltage from dropping below 2.10V/cell on an SLA. Prolonged storage below the critical voltage causes sulfation, a condition that is difficult to reverse. (See also: ["How to restore and prolong lead-acid batteries"](#))

Charging lead-acid batteries with a power supply

Lead-acid batteries can be charged manually with a commercial power supply featuring voltage regulation and current limiting. Calculate the charge voltage according to the number of cells and desired voltage limit. Charging a 12-volt battery (6 cells) at a cell voltage limit of 2.40V, for example, would require a voltage setting of 14.40V.

The charge current for small lead-acid batteries should be set between 10% and 30% of the rated capacity (30% of a 2Ah battery would be 600mA). Larger batteries, such as those used in the automotive industry, are generally charged at lower current ratings. Cells constructed of a non-antimonial lead grid material allow higher charge currents but have a lower capacity. The cylindrical Cyclone is sealed and can sustain a pressure of up to 3.5 Bar (50 psi). A pressurized cell assists in the recombination of gases.

After full charge, remove the battery from the charger. If float charge is needed for operational readiness, lower the charge voltage to about 13.50V (2.25V/cell). Most chargers perform this function automatically. The float charge can be applied for an unlimited time.

State-of-charge reading based on terminal voltage

The state-of-charge of a lead-acid battery can, to a certain extent, be estimated by measuring the open terminal voltage. Prior to measuring, the battery must have rested for 4-8 hours after charge or discharge and reside at room temperature. A cold battery would show slightly higher voltages and a hot battery would be lower. Plate additions of calcium and antimony will also vary the open terminal voltage. Furthermore, AGM has a higher voltage plateau than the flooded lead acid and the readings on Figure 3 may not apply.

Open circuit voltage	State-of-Charge in %
12.65V	100%
12.45V	75%
12.24V	50%
12.06V	25%
11.89V or less	Discharged

Carrying of Handportables

There are two approved ways of carrying personal radios by uniformed personnel.

- ❑ **CARRYING WITH STRAP**
- ❑ **CARRYING ON BELT**

It is recommended that if manning a post whilst carrying a hand portable that you use a remote speaker microphone with an earpiece.

On Air protocol

Most nets will consist of a number of stations, one of which is designated the **CONTROL STATION**. The control station should be sited so that it is in radio contact with all other stations, which are known as **POSTS**. Each Post will be in direct contact with the User Services, and at locations required by them. The control station is responsible for the control of radio traffic over the air. The principle behind directed net operation is that no station may use the net frequency without permission from control.

The efficient use of amateur radio equipment depends to a great extent on the method of speaking and on the articulation of the operator. The normal distinctive sounds of consonants are liable to become blurred during speech transmission and, as words of a similar length, containing the same vowels, are apt to sound alike, special care is required in the pronunciation. All words should be spoken plainly and each word ended clearly. Any tendency to shout or talk rapidly should be avoided. The following points should be observed:

- **Speed**
Slow and deliberate speech is better suited to secure radio
- **Pitch**
High pitched voices transmit better than low pitched.
- **Rhythm.**
The natural rhythm of ordinary conversation should be preserved by transmitting each sentence phrase by phrase
- **Microphone**
A constant distance between mouth and microphone should be maintained at all times. This should be approximately 75 millimetres.

It is important to follow the above instructions as clarity often decreases owing to natural and man made interference on the net. All personnel should be aware that transmissions should not be made in close proximity to other electronic equipment such as computers, electric typewriters etc. Such equipment is likely to be found in hospitals, offices and police stations. This applies especially to hand portable equipment. The receipt of messages will not have any effect on such equipment.

Basic Principles

The following, basic principles should be observed by all radio users.

- Unnecessary phrases (e.g. please, thank you) should not be used.
- Prior to commencing a transmission the user should ensure that the network is clear and their transmission will not cut out another station. In this respect the transmitting switch should not be 'flicked' on and off by personnel wishing to make contact with their controller as this has a disconcerting effect on the entire network and may cut out a call sign wishing to make an urgent transmission. The switch should be depressed only during transmissions and released at the termination of same.
- Users should not transmit until all voice traffic stops. Failure to adhere to this results in first part of the message not being received by control properly.
- When an emergency is being dealt with by the controller, all other stations or call signs will not engage in non-urgent transmissions without the authority of the control room from which the emergency originated.
- When changing channels during an event, the controller involved should be informed. When mobiles are unattended the radio should be switched off.
- When personnel leave their vehicle they should maintain contact by use of a hand portable. Hand portables should not be used inside vehicles.
- In no circumstances should operators resort to the use of forenames when making transmissions. The designated call sign is appropriate and should be used in all cases. Casual conversation should be avoided.
- Where lengthy transmissions are necessary, and this should only be in exceptional circumstances like passing of a long string of numbers, one or two 'breaks' should be incorporated to facilitate other call signs having urgent information to pass.
- All call signs will report to their controller by radio when going:
 - **ON THE AIR**
At the commencement of duty
 - **TEMPORARILY OFF THE AIR**
During a turn of duty – report back on at the end of a break.
 - **OFF AIR**
At the termination of a turn of duty.

- It is also good practice for call signs to report to their controllers when:

CHANGING STATUS

Updating status during the duty turn.

ARRIVING AT AN INCIDENT

When arriving at an incident if asked to accompany a person or vehicle to a specific location.

- **RESULTING CALLS**

The details and outcome of any incident should be passed to the controller before recommencing a static point.

Radio Discipline

Committee members have expressed a personal concern regarding lapses in discipline on our channels and have directed that misconduct and indiscipline be stamped out.

- It is the responsibility of supervisory personnel at stations and controllers to maintain and enforce net discipline.
- Misconduct and indiscipline on radio channels, eg cat calling, animal impersonations, derogatory or insulting comments etc is totally unacceptable and will not be tolerated.

Radio Security

Particular attention should be paid to the content of a message being passed to a controller in reference to a casualty. Remember our net can be monitored by outsiders and press, so any personal information being passed should be avoided or details of casualties should be sent using the appropriate codes.

- Ear pieces for hand portables should be used whenever possible to prevent bystanders overhearing messages being passed.
- Information of a confidential nature should not normally be the subject of a radio transmission. If in doubt contact the controller first to seek clarification.
- Personnel should be aware that unauthorised persons may be in position to overhear the transmissions, eg at a post where there is a crowd of spectators at an event.
- Where information of an important nature is required to be transmitted, all call signs should be informed to ensure that unauthorised persons are not in a position to overhear, prior to commencement of transmission, e.g.:

All call signs stand by, secure message to follow**Procedure Words
& Phrases**

The following pages explain phraseology and the phonetic alphabet. It is essential that all operators know this before taking their communications examination. Whilst it is not practicable to lay down practise phraseology for all radio transmissions, the following abbreviations are frequently used:

Acknowledge

Let me know that you have received and understood the message.

Affirmative

“Yes” or permission granted.

Break

Indicates a break in a lengthy transmission.

Correction

Error has been made, correct version to follow.

How do you read

Self-explanatory.

I say again

Self-explanatory.

Negative

“No” or permission not granted.

Over

Transmission ended, response expected.

Out

Transmission ended, no response expected.

Read back

Repeat message as received.

Roger

Received your last transmission.

Say again

Self-explanatory.

Send

Proceed with your message.

Verify

Check previous transmission and send correct version.

Wait

Self-explanatory.

Wilco

Message received, understood and will be complied with.

Speak slower

Self-explanatory.

That is correct

Self-explanatory.

Sit-rep

Situation report at scene.

Secure message

Information to be transmitted, which should not be overheard by, unauthorised persons.

RV

Rendezvous

ETA

Estimated time of arrival

Phonetic Alphabet

Phonetic 'of or relating to vocal sounds.'

Raynet Ireland members use the Phonetic Alphabet when transmitting individual letters or numbers on the radio. The syllables to be emphasised are underlined:

<u>LETTER</u>	<u>WORD</u>	<u>PRONUNCIATION</u>
A	ALPHA	<u>AL</u> fah
B	BRAVO	<u>BRAH</u> voh
C	CHARLIE	<u>CHAR</u> lee
D	DELTA	<u>DELL</u> tah
E	ECHO	<u>ECK</u> oh
F	FOXTROT	<u>FOKS</u> trot
G	GOLF	<u>GOLF</u>
H	HOTEL	hoh <u>TEL</u>
I	INDIA	<u>IN</u> dee ah
J	JULIET	jew lee <u>ETT</u>
K	KILO	<u>KEY</u> loh
L	LIMA	<u>LEE</u> mah
M	MIKE	<u>MIKE</u>
N	NOVEMBER	<u>NOVEM</u> bar
O	OSCAR	<u>OSS</u> car
P	PAPA	<u>PAH</u> pah
Q	QUEBEC	<u>QUEE</u> back
R	ROMEO	<u>ROH</u> me oh
S	SIERRA	<u>SEE</u> errah
T	TANGO	<u>TANG</u> go
U	UNIFORM	<u>YOU</u> nee form
V	VICTOR	<u>VIC</u> tah
W	WHISKEY	<u>WISS</u> key
X	X-RAY	<u>ECKS</u> ray
Y	YANKEE	<u>YANK</u> key
Z	ZULU	<u>ZOO</u> loo

Numerals

When transmitting by Radio the following pronunciation should be used:

0	<u>ZERO</u>
1	<u>WUN</u>
2	<u>TOO</u>
3	<u>TREE</u>
4	<u>FOW</u> er
5	<u>FIFE</u>
6	<u>SIX</u>
7	<u>SE</u> Ven
8	<u>AIT</u>
9	<u>NIN</u> e

Outdoor operation of a station

Preparation for deployment as a mobile station

It is advisable to check all your equipment prior to being deployed as a fixed/mobile station. Power packs should be fully charged, antennas checked for SWR and in proper working condition, and that you have all necessary connections to set up your transceiver.

It may also be a good idea to have a pack ready for emergencies which could sustain you for several hours at short notice. Such a pack could contain for example:

2m Radio / remote speaker mic, spare batteries, 1/4 wave antenna, headphones / ear piece, notebook / pens, watch, map / compass, tabard, hat and gloves, waterproofs, quick energy food, food for meals, a flask of hot drink, sun block & hat, a torch & batteries and a copy of the Casualty Code (*provided to members*)

- Operation of a station may be required at any time day or night and also at any location. Outdoor operation will require preparation for any weather conditions that may prevail.
- **Dense Fog:**
 - Drive very slowly with dipped headlights, full-beam lights reflect off the fog causing a 'white wall' effect. Keep an eye on your speed, fog can give the illusion of moving in slow motion. Use fog lights, but remember to turn them off when the visibility improves. Don't hang on the tail lights of the car in front, rear lights can give a false sense of security. Watch out for freezing fog which is made of water droplets that freeze on contact with objects such as the pavement, road, car, etc. It can quickly form a layer of ice.
- **Heavy Rain:**
- **Before the flood**
 - Ensure appropriate waterproof clothing is worn. Raynet Hi-Vis should be worn on top to show identity.
 - Ensure you have bottles of drinking water in case the water supply becomes contaminated.

- **During the flood**

- Never try to drive through flood water — 80% of flood deaths occur in vehicles.
- Avoid walking through flood water, streams or rivers in full flow — just six inches of rapidly moving water can knock a person over.
- Keep to shelter as much as possible and keep radio equipment dry. Use of a waterproof pouch is preferable.

- **Thunderstorms & Lightning:**

- **Before the thunderstorm**

- Be aware of location of antennas and feeders. Try to lower operating height or downsize to a portable antenna.
- Seek shelter if possible. When you hear thunder you are already within range of where the next ground flash may occur, lightning can strike as far as 10 miles away from the centre of a storm.

- **During the thunderstorm**

- Keep transmissions to a minimum. Avoid metal objects which can conduct electricity.
- If outside on foot, avoid water and find a low-lying open place that is a safe distance from trees, poles or metal objects.
- If you find yourself in an exposed location, close down the station immediately. It may be advisable to squat close to the ground, with hands on knees and with head tucked between them. Try to touch as little of the ground with your body as possible, do not lie down on the ground.
- If you feel your hair stand on end, drop to the above position immediately.

- **After the thunderstorm**

- Avoid downed power lines or broken cables.
- If someone is struck by lightning they often suffer severe burns. The strike also affects the heart, so check if they have a pulse.

- **Heavy Snow & Icy Roads:**

- **Before snow or ice**

- If you have to make a journey when snow is forecast, make sure you have warm clothes, food, water, boots, a torch and spade, and let the control station know when you expect to arrive and your route.

- **During snow or ice**

- If you must drive check the [Highway Code](#) for advice on driving in ice and snowy weather. A summary of the advice is: Take care around gritters. Don't be tempted to overtake. Slow down — it can take 10 times longer to stop in snowy or icy conditions, so allow extra room. Use the highest gear possible to avoid wheel spin. Manoeuvre gently and avoid harsh braking and acceleration. If you start to skid, gently ease off the accelerator and avoid braking. If braking is necessary, pump the brakes don't slam them on. If you get stuck, stay with your car and tie something brightly coloured to your antenna.

- If you go outside wear several layers of clothing and keep dry to prevent loss of body heat. Watch out for signs of hypothermia — uncontrollable shivering, slow/slurred speech, memory lapse and drowsiness and frostbite — loss of feeling in and pale appearance of fingers, toes, nose and ear lobes. Keep moving your arms and legs to help the blood circulate

- **After snow and ice**

- Be careful when walking or driving on compacted snow — it may have turned to ice
- Take care when shovelling snow. Cold air makes it harder to work and breathe, which adds some extra strain on the body and can be the cause of heart attacks in the vulnerable

- **Severe Gales:**

- **Before the storm**

- Park vehicles in a garage, if available; otherwise keep them clear of buildings, trees, walls and fences.

- **During the storm**

- Stay indoors as much as possible.
- If you do go out, try not to walk or shelter close to buildings and trees.
- Keep away from the sheltered side of boundary walls and fences — if these structures fail, they will collapse on this side.
- Do not go outside to repair damaged antennas while the storm is in progress.

- If possible, enter and leave the building through doors in the sheltered side, closing them behind you.
- Open internal doors only as needed, and close them behind you.
- Take care when driving on exposed routes such as bridges, or high open roads, delay your journey or find alternative routes if possible.
- Slow down and be aware of side winds, particular care should be taken if you are towing or are a high sided vehicle.

- **After the storm**
- Be careful not to touch any electrical/telephone cables that have been blown down or are still hanging.
- Do not walk too close to walls, buildings and trees as they could have been weakened.

- **Severe Heat & Sun:**

- **Before a heatwave**
- Ensure you have plenty of cold fluids available.
- **During a heatwave**
- Try to keep your station location cool, closing blinds or curtains can help
- Try to stay cool by sprinkling yourself several times a day with cold water.
- Avoid too much exercise, which can cause heat exhaustion or heat stroke, and can even be fatal. Watch for signs of heat stress — an early sign is fatigue.
- Drink plenty of fluids, but not alcohol, which dehydrates the body.
- Try to eat as you normally would. Not eating properly may exacerbate health related problems.
- If driving keep your vehicle well ventilated to avoid drowsiness. Take plenty of water with you and have regular rest breaks.
- If you do go out, try and avoid the hottest part of the day (11 a.m. to 3 p.m.) and seek shade where possible. Avoid being in the sun for long stretches.
- **Before going out in the sun**

- Check you have appropriate sun cream for your particular type of skin.
- **During sunny weather**
- The UV index (the strength of the sun) can be high at many times of the year — it doesn't have to be hot. The UV index can be strong through cloud even when the sun isn't directly shining.
- If you go out, wear lightweight, light-coloured clothing, high factor sunscreen and a wide-brimmed hat.
- Avoid being in the sun for long stretches.
- Reapply an appropriate factor sun cream at regular intervals during the day.

The Raynet Casualty Code

CONFIDENTIAL

CASUALTY SITUATION CODE

Casualty Condition

RETIRED / STOPPED	Romeo
UNHURT	Alpha
MINOR INJURIES	Bravo
INTERMEDIATE INJURIES	Charlie
MAJOR INJURIES / SERIOUSLY ILL	Delta
CONDITION UNKNOWN	Echo
DEAD (PRESUMED)	Lima
DEAD (CONFIRMED BY A DOCTOR)	Mike
DEAD (CONFIRMED BY A DOCTOR & IDENTIFICATION POSITIVELY MADE)	November

Casualty Disposal

TO HOSPITAL IMMEDIATELY	Foxtrot
TO HOSPITAL (NO IMMEDIATE URGENCY)	Golf
TO MEDICAL AID UNIT	Hotel
TO BE PICKED UP LATER	India

Requirements

REQUEST TO STOP RACE (FROM MEDICAL OFFICER)	Sierra
STOP RACE (ORDERED BY CLERK OF COURSE)	Tango
AMBULANCE REPLACEMENT REQUIRED	Juliet
AMBULANCE URGENTLY REQUIRED	Kilo
<i>Prefix code with Number of RIDER</i>	
<i>Suffix code with Number of First Aid Post</i>	
<i>e.g. Rider 18 Alpha Post 4</i>	
<i>Rider 22 Delta Foxtrot Post 5</i>	
<i>Rider 70 Post 1 Kilo</i>	

ALTERNATIVE FREQUENCY CODE **NEW **12.5kHz****

STANDBY TO CHANGE FREQUENCY			Yankee
144.800	Yankee 0	144.650	Yankee 5
144.775	Yankee 1	144.675	Yankee 6
144.625	Yankee 2	433.700	Yankee 7
145.225	Yankee 3	433.725	Yankee 8
145.200	Yankee 4	433.750	Yankee 9

CONFIDENTIAL**A GUIDE TO CASUALTY CONDITION****UNHURT****ALPHA**

Completely uninjured
(Must have been examined by First Aiders)

MINOR**BRAVO**

Bruises
Abrasions
Minor lacerations
Bleeding - easily controlled by pressure / dressings
No loss of function
Stable - no sign of clinical shock

INTERMEDIATE**CHARLIE**

To medical clearing / seen by Doctor AFTER race

Simple fractures - not femur / spine / pelvis
Transient loss of consciousness
Chest injuries - no respiratory difficulty
Loss of function

MAJOR (All Others)**DELTA**

Medical assistance DURING race

Multiple Injuries:

Fractures of more than one limb
Fractures of limb plus trunk trauma

Uncontrolled bleeding

Moderate - major blood loss

Facial injuries

Chest injuries with respiratory difficulty

Fractures

- open (compound)

- pelvis spine femur

SHOCK

Unconsciousness - other than transient

Severe burns

Gi8SKR

DR S. TANNER 1987

JUNE 1995