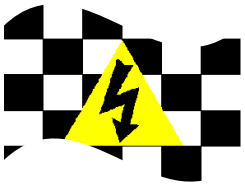


INTRODUCTION:

I have already outlined my general thoughts about the TTXGP, mainly favourable, the following is my 'detailed opinions' only, regarding Electrical Risk Assessment as it refers to the safety of ALL concerned in the event of a Crashed Alternate Fuel Racing Motorcycle, specifically Battery Powered.

CLARIFICATIONS:

The following are my 'detailed opinions' they are not Acts, Standards, and Laws etc. and must not be interpreted as such. I am expressing my 'detailed opinions' for the interest of all associated with the TT and particularly the TTXGP in the hope that they will generate further discussion and hopefully assist in some way to develop the best possible ELECTRICAL SAFETY PROCEDURES, given the time constraints, for the 2009 TTXGP.

Whilst it may appear obvious to most, TTXGP Battery Powered Alternate Fuel Racing Motorcycles will NOT be powered by a typical 12V DC Car Battery, be very aware that the Battery Stacks voltage ratings are allowed to have up to 1,000V between two points and 500V referenced to earth. There is no hiding the fact that following a crash there clearly exists a high possibility of severe electrical shock or worse if appropriate Risk Management and Safety Procedures are NOT in place and adequate training is NOT provided to all 'First Response' personnel, specifically TT Marshall's and TT Medical Teams.

ELECTROCUTION:

There are many factors beyond the scope of this posting that can lead to severe or fatal electrocution. Briefly, electrocution occurs due to sufficient voltage (potential difference) between a person's point of contact with live equipment and earth/ground/frame, which in turn allows current to flow, it is the 'current flow' that electrocutes, hence the need to protect live equipment from contact, (insulation/barriers/enclosures) and where risk assessment deems the increased likelihood of an electrical hazard, suitable protection equipment in the form of approved Insulated Gloves, Insulated Footwear and the like should be worn. Clearly there is a 'voltage' and 'current' mix to understand here.

Voltage of sufficient magnitude to overcome the skin's natural insulating properties is dependant on many factors, including but not limited to skin moisture and significantly greater risk where the skin layer is NOT in place, due to accident, medical procedures etc. My opinion is any Voltage levels greater than 50V AC or DC where skin is in place is hazardous. Where the skin is NOT in place, ANY VOLTAGE is hazardous, including critically, static electricity.

Current, if we accept a sufficient magnitude voltage is present then current will flow, normally through the least resistant path to earth. Again, it is the 'current flow' that electrocutes and the level required is very small. Current flow of around 60mA can invoke fibrillation of the heart when electrocuted through skin tissue with the current flow through the chest cavity to earth, current flow as low as 1mA can invoke heart fibrillation if the skin is not present, for example during Operating Theatre procedures, involving electrically monitored inserted catheters and the like.

To summarise, in my opinion voltages in excess of 50V AC or DC and current in excess of 60mA with 'skin in place' and 1mA with 'no skin barrier' are hazardous.

PUBLISHED EMERGENCY PROCEDURES:

I have no recourse to 'published' Emergency Procedures for Alternative Fuel Racing Motorcycles, no surprises there. However, 'published' Emergency Procedures are available for Hybrid Vehicles Electrical Safety, specifically the Toyota Prius and Honda Civic Hybrid's. These 'cars' power trains are a marriage of ICE and Battery Stacks, the 'Stacks' are well protected, in the boot/rear area.

This 'Car' data cannot be ignored and is an insight to potential risk of human contact with higher voltage levels following a Hybrid Vehicle crash situation. Note that 'published' Emergency Procedures I have reviewed list the Toyota Prius Battery Stack voltage rating at 201V DC, inverted to 500V 3 phase AC and converted back to 500V DC, further the Honda Civic Hybrid voltage rating is 144V DC, these are 'significant' voltages and both Manufacturers have published Emergency Response Guides, which I have downloaded from the Web and reviewed in detail, (Prius: 26 Pages!!) (Honda: 24 Pages!!). It goes without saying the Amperage (current) ratings of the referred Battery Stacks would certainly exceed the #mA values outlined in 'Electrocution' data above.

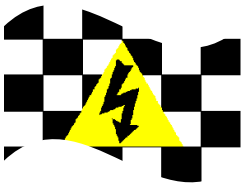
So what can we learn from this, a great deal! Toyota and Honda's Emergency Response Guides are very clear regarding the higher voltage levels in their Hybrid's, the go and no go areas etc. BUT MOST IMPORTANTLY, these 'Cars' obviously offer far superior Battery Stack physical and insulant properties than could ever be achieved with a probably Higher Voltage rated Battery Stack contained between the wheels of a TTXGP Motorcycle. Further, whomever drafted the Emergency Response Guides for the Hybrid's could never have imagined the forces and lack of protection offered to a Battery Stack of a crashing TTXGP Motorcycle.

SAFETY STANDARDS:

Thankyou Team TTXGP for your prompt response to my initial posting regarding the TTXGP, with respect, I am responding here exclusively to your response: Paragraph 6) Safety Standards.

Firstly, I note the welcome involvement of Leading Experts, a Senior Academic Chair from CIT and the IET as an Advisory Panel. Again with respect, there is no specific mention of the Advisory Panel including 'at all times' TT Marshall, TT Medical and critically current leading TT Rider Representatives, the aforementioned TT groups are the ONLY people that have first hand knowledge of the unique safety procedures and risks of the TT and must in my opinion be directly involved in formulating and finalising the 2009 TTXGP Safety Standards. Possibly they are included in the aforementioned 'Leading Experts' group?

Secondly, I cannot agree with the response, in part I quote: 'Some might argue that tanks of petroleum are on balance more dangerous than a bank of batteries under a wider range of conditions. In any event the TTXGP is unlikely to add to the risk that is already attached to racing in the TT'. I am amazed at that comment. TT Marshall's and TT Medical Personnel are clearly going to be the 'First Response' to any crash (hopefully none) that could occur throughout the practice and race days of the TTXGP, the aforementioned are well versed in actions to take with conventional racing machinery, petrol, oil etc. TTXGP Motorcycles will be totally new to most if not all First Respondents, regardless of their initial training. Clearly there are unknowns, there are greater, or if you will, DIFFERENT sets of circumstances to consider for the Rider, Spectators and the safety of said Personnel. Petrol is a known issue, response is if you will almost second nature, conversely Battery and possibly Hydrogen Fuel Cell technologies are not. BTW this is the main reason I have against running the TTXGP on Senior TT Day, the differences in technologies and risks on the Main Race Day. Allied to my view here, there are numerous www postings, mainly from the USA and Canada regarding Professional Emergency Response Personnel concerns even approaching a crashed Hybrid 'Car'. At least some of the 'Advisory Panel' delegates should at least review some of these publicly available insights of crash scenes involving new vehicle technologies.



ELECTRICAL SAFETY PROCEDURES:
Hopefully the above highlights that there are unique risks involved with TTXGP Battery Powered Motorcycles. There are easily implemented procedures to deal with, or significantly minimise the risk, to acceptable levels, including:

KNOWLEDGE PART 1: Participating TTXGP Riders, TT Marshall's and TT Medical Personnel need to be made fully aware of the risks they face, the types of motorcycle power plants involved, how to interpret the warning signage to be displayed on TTXGP Motorcycles, Emergency Cut Off functions etc. I acknowledge this is an ongoing procedure.....

KNOWLEDGE - PART 2: The Race Controllers/ACU need to have at their disposal MSDS (Material Safety Data Sheets), from each Team outlining detailed risk assessments and actions to take in 'any eventuality' with their TTXGP Motorcycle, as a minimum, directions could then be onforwarded to Marshall's posts, as required, by radio.

ELECTRICAL SAFETY EQUIPMENT: In accepting the fact that the TTXGP Rules allow 1000V DC as an upper voltage limit, in my opinion the risk of electrocution from a crashed motorcycle is highly possible. With respect, I am NOT hiding anything here or glossing over the facts. I personally would feel much safer approaching a faulty Electrical Switchboard with a known voltage gradient between 415V 3 Phase and 240V single phase than approaching a unique Battery Stack (damaged to an unknown extent by a crash) with a voltage in the vicinity of 1000V. Further there is only one way to approach either scenario, that is with proper risk management in place and wearing appropriate insulated gloves and insulated footwear, by that I DO NOT mean basic leather gloves and basic Motorcycle boots.

RESCUE OF ELECTROCUTED PERSON: In a 'worst case scenario' of a crashed Rider being entangled with their TTXGP Motorcycle and there exists even the slightest possibility that the Rider may be electrocuted, TT Marshall's and TT Medical Personnel should be provided with heavily insulated hooks, (at least that is what is used in Australia for 'in contact' electrocution victims), to not only extricate the Rider but also to clear the TTXGP Motorcycle from the track, again I repeat this is a 'worst case scenario', but it must be addressed for TTXGP.

THE WEATHER: Under no circumstances would I even contemplate running practice or the actual race in wet weather, there is a need to learn a great deal more about safety procedures in hopefully future events/years than time constraints will allow for the '09 TTXGP. Suffice to say wet weather will escalate Electrical risk issues.

ELECTRICAL TERMINOLOGY:
I accept some may not understand some of the Electrical terminology used here, hopefully the following assists all to read the posting.

V=Volt or 'Potential Difference' between two points.
A= Ampere, the measurement of electrical current.
mA= milliAmpere, one thousandth of one ampere.

DC= Direct Current, generally as sourced from a Battery or Rectified AC.
AC= Alternating Current, generally as sourced from the Electrical Grid or Inverted from a DC supply.

INVERTOR=A device to invert DC current to AC
CONVERTOR= A device to convert AC to DC

MSDS= Material Safety Data Sheet