



UKRO

HYBRID VEHICLES

Challenge Hampshire
2010

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HYBRID VEHICLES

1. INTRODUCTION

The aim of this information is to develop the subject of vehicle extrication from hybrid vehicles into the arena at UKRO events both nationally and locally.

Although there are many manufacturers of Hybrid vehicles worldwide and no two manufacturer's vehicles are the same, we will be concentrating on the Toyota Prius and Lexus Hybrids which are the predominant hybrids sold in the UK. There are other available alternative fuels such as CNG/LNG but unlike the rest of Europe the UK has a minimal amount of these vehicles at this time.

The focus on hybrids is to raise awareness at this early stage due to the commitment Toyota and other manufacturers are making to hybrid technologies. Worldwide Toyota has produced more than 1 Million Prius Hybrids!

In our efforts to raise the awareness of the hazards at an incident, the intention is to make the practical element in a scenario as generic as possible.

Rescue tasks for a hybrid vehicle involved in a medium collision is the scenario that will be used during "Challenge Hampshire 2010".

As previously mentioned Toyota are the predominant car maker to sell Hybrid vehicles within the UK with the Toyota and Lexus marques, although Honda have recently introduced updated and newer hybrid models onto the UK market

Toyota and Lexus hybrids use a conventional petrol engine along with a high voltage electric motor to power the vehicle both forwards and when reversing. Toyota hybrid systems combine the best of series and parallel technology to create a more efficient power train.

Except for the precautions listed in this document, hybrid vehicles may be approached using standard vehicle extrication principles and techniques.

Toyota hybrid vehicles have G force sensors in the engine compartment that will automatically isolate the high voltage supply from the rear battery compartment to the front electric motors in the event of a medium and severe frontal collision (similar criteria to that of air bag deployment).

This High Voltage link will also shut down if there is any interruption to the power supply i.e. severing off the high voltage cable, water submersion or any damage to the vehicle causing a "short circuit" within any of the HV components.

The vehicle can be powered by the electric motor alone and the engine can be stopped whilst the vehicle is in motion **so it is important to note that a vehicle may seem inactive such as at a traffic light or minor collision and there may be no**

noise from the engine compartment. Early identification and immobilisation of a hybrid vehicle is the priority for Incident Commanders.

2. HYBRID VEHICLES IN COLLISION GENERIC RISK PROCEDURES

The main objective for participants at events would be to focus on the recognition by crews of a hybrid and their actions in response to a given situation.

Although there could be many different situations there are three likely scenarios that have been identified.

- i. Vehicle in a light collision, SRS not activated.
- ii. Vehicle in a medium collision, SRS activated.**
- iii. Vehicle in severe collision and heavily traumatised.

Rescuers should be aware that..

- **Simply pressing the accelerator may cause the engine to come into life!**
- **Choking the wheels at the earliest opportunity is important to avoid the vehicle moving before we attempt to shut the vehicle down!**
- **It may become a hazard if a rescuer enters a vehicle and accidentally depresses the accelerator with the vehicle in “DRIVE” or “READY” mode!**

3. HYBRID VEHICLES IN COLLISION PROCEDURES

i. Vehicle in a light collision, SRS not activated

- Information gathering prior to attendance (control operator questioning?)
- Vehicle markings on scene survey (Hybrid synergy drive or “h “ designation on Lexus range)
- Body shape or model recognition
- Question driver or occupants
- All crew aware of vehicle possibly in “ready mode”
- **Chock wheels**, stabilise vehicle
- **Identify SRS not activated**
- Establish vehicle ignition mode, gear lever position, parking brake mode and location of ignition keys
- Can access be gained to vehicle 12v battery for system isolation.

ii. Vehicle in a medium collision, SRS activated

- Information gathering prior to attendance (control operator questioning?)
- Vehicle markings on scene survey (Hybrid synergy drive or “h “ designation on Lexus range)
- Body shape or model recognition
- Question driver or occupant
- **Chock wheels**, stabilise vehicle
- **Identify SRS activated**
- Ensure vehicle not in “ready“ mode
- Establish vehicle ignition mode, gear lever position, parking brake mode and location of ignition keys
- Can access be gained to vehicle 12v battery for system isolation.

iii. Vehicle in severe collision or heavily traumatised

In a severe collision there is a potential risk from High Voltage systems. These systems operate between 201-288 Volts. All of the positive and negative supplies on the hybrid electrical system are isolated from the vehicle chassis.

The HV battery packs are located either behind or under the second row seat on the Toyota /Lexus range.

These cables are orange to distinguish them as HV and are routed centrally, outside and underneath the vehicle.

- Consider and identify any High Voltage cables (orange coloured)
- Establish HV battery condition and check for leaks
- Chock wheels, stabilise vehicle where possible
- Make crews aware
- Consider additional PPE (electrical gloves, eye protection)

4. INCIDENT COMMANDER ROLE IN SCENARIOS

Incident Commanders will identify an Alternative Fuelled Vehicle in a medium impact, SRS activated, two vehicle scenario where:

Considerations for crews of the initial attendance would be:-

- Vehicle identification and make crews aware
- **Chock wheels**, stabilise vehicle
- Prioritise Vehicle immobilisation (keys, gearshift position, parking brake, battery disconnection etc)
- Isolation and recognition of any High Voltage Power supplies
- Any environmental issues (leaks / spills recognised and contained)

5. THE FUTURE FOR HYBRIDS?

We should be aware that existing procedures are becoming inadequate as we are confronted with newer and more diverse vehicle power systems.

We should also recognise the investments that vehicle manufacturers are making in reducing emissions and be aware that it will affect our response in the future as these technologies improve and become more common.

Through engaging with all manufacturers and developing these scenarios we will ensure our response will become safer and more effective.

The UKRO's Education Committee is working with vehicle manufacturers to ensure that the professional rescuers throughout the UK are better equipped to deal with alternative fuelled vehicles.

TOYOTA /LEXUS HYBRID VEHICLE IDENTIFICATION

TOYOTA PRIUS 2





Isolation from “**READY**” is quickly achieved by pressing the “**POWER**” button.



LEXUS RX400h



Where a Lexus model number has the suffix “h” it indicates a hybrid vehicle





All hybrid Lexus models have the “POWER ” button located in the centre console area so access past casualties may be difficult when “READY” indicator is illuminated within the instrument cluster.

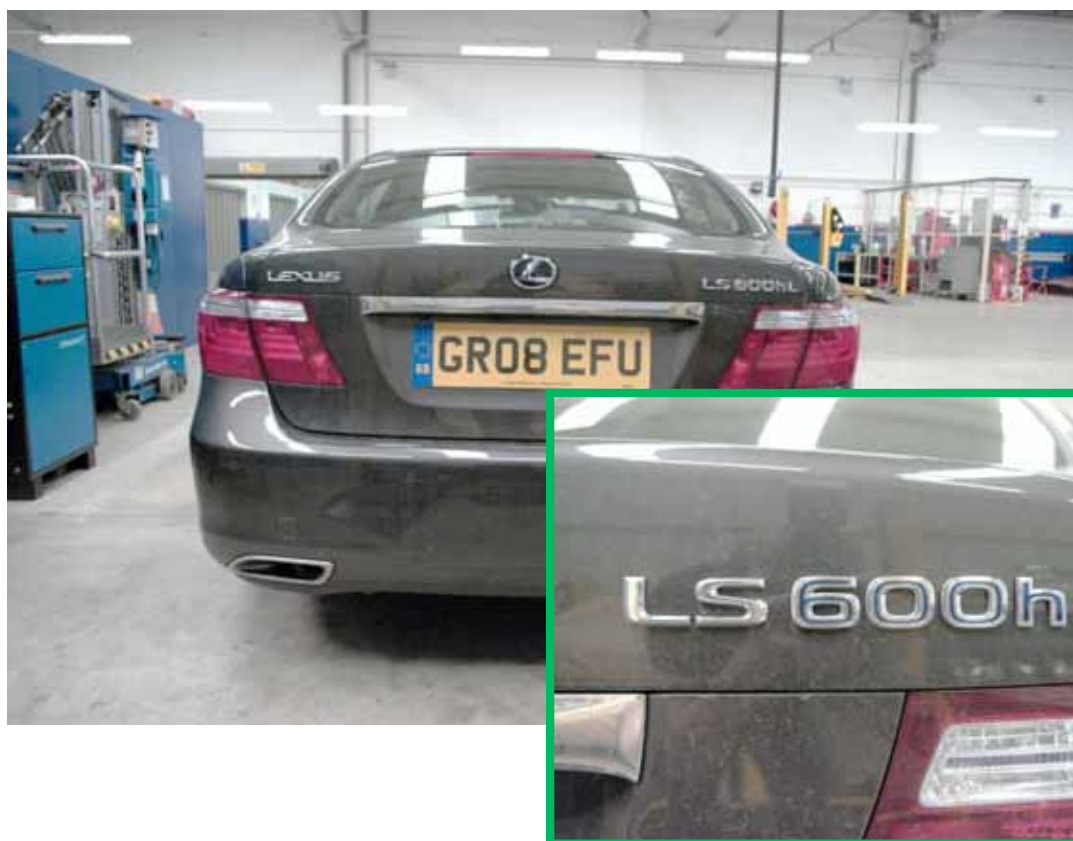


LEXUS GS 450h





LEXUS LS 600h L





Keyless entry identifiable by sensors on door handles.





12v Batteries are located in the boot of all hybrid models. The isolation plug will also be in the boot except for the RX 400h where it is located below the seat in the nearside rear passenger door.

