

Fire and Rescue Services
United Kingdom Rescue Organisation

advancing professional rescue



Alternative Fuelled Vehicles

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**THE CHIEF
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The professional voice of the
UK fire and rescue service

1. Introduction

The aim of this document is to introduce the subject of vehicle extrication from hybrid vehicles into the arena at future 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. 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 combined with more specific information available for the competing Organisations through their Learning and Development departments.

Further information would be available on hybrid vehicles involved in fire and a hybrid submerged in water within the CD sent to L&D Departments

Rescue tasks for vehicles involved in collision is the main focus of "Rescue on the Clyde.

The information contained within this handout as part of the workshop is a small amount of the information which is being made available through the UKRO and its partnership organisations. Should you wish to receive further information please contact Dick Dawson who is part of the UKRO Education Committee (ddawson@ukro.org)

2. Hybrid Vehicles Generic Risk Procedures

Vehicles in Collision

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 we have identified three likely scenarios

1. Vehicle in a light collision, SRS not activated
2. Vehicle in a medium collision, SRS activated
3. Vehicle in severe collision and heavily traumatised.

As previously mentioned Toyota and Lexus are the predominant car maker to sell Hybrid vehicles within the UK although Honda have recently introduced updated and newer 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 serious 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.

Rescuers should be aware that ..

- Simply pressing the accelerator may cause the engine to come into life!
- May become a hazard if a rescuer enters a vehicle and accidentally depresses the accelerator with the vehicle in "DRIVE" or "Ready" mode!
- Choking the wheels at the earliest opportunity is important to avoid the vehicle moving before we have chance to shut the vehicle down!

3. Hybrid Vehicles in Collision Procedures

1. 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

- a. All crew aware of vehicle possibly in "ready mode"
- b. Chock wheels, stabilise vehicle
- c. Identify SRS not activated
- d. Establish vehicle ignition mode, gear lever position, parking brake mode and location of ignition keys
- e. Can access be gained to vehicle 12v battery for system isolation.

2. 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

- a. Body shape or model recognition
- b. Question driver or occupant
- c. Chock wheels, stabilise vehicle
- d. Identify SRS activated
- e. Ensure vehicle not in "ready" mode
- f. Establish vehicle ignition mode, gear lever position, parking brake mode and location of ignition keys
- g. Can access be gained to vehicle 12v battery for system isolation.

3. 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 hybrids 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.

- a. Consider and identify any High Voltage cables (orange coloured)
- b. Stabilise and secure vehicle
- c. Establish HV battery condition and check for leaks.
- d. Make crews aware
- e. Consider additional PPE (electrical gloves, eye protection)

The Role of the Incident Commander

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.
- Stabilisation and initial immobilisation
- Prioritise Vehicle immobilisation (keys, gearshift position, parking brake, battery disconnection etc)
- Isolation and recognition of any High Voltage Power supplies
- Any environmental issues.

4. The Future of Alternative Fuelled Vehicles

We should not be surprised if when we tackle newer vehicles, existing procedures will become inadequate.

We should 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 change and become more common.

Through engaging with all manufacturers and introducing these scenarios we will ensure our response will be both safer and more effective.

The UKRO's Education Committee is working closely with vehicle manufacturers to ensure that the professional rescuers throughout the UK are better equipped to deal with alternative fuelled vehicles, and this information should be available to every UK Fire Service.