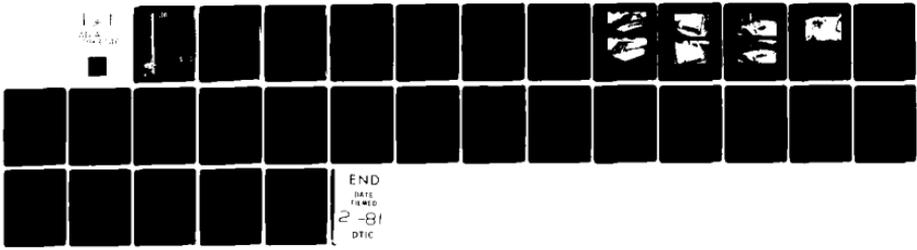


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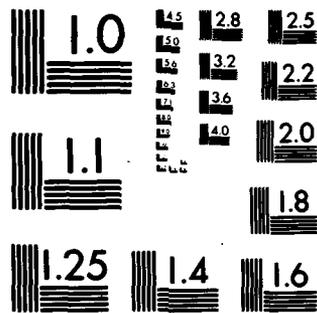
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Report 2312

VERIFICATION TESTS OF THE US ELECTRICAR CORP.

"LECTRIC LEOPARD"

by

Edward J. Dowgiallo, Jr.
Ivan R. Snellings

October 1980

Approved for public release; distribution unlimited.

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U.S. ARMY MOBILITY EQUIPMENT
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VERIFICATION TESTS OF THE US ELECTRICAR CORP.

"LECTRIC LEOPARD"

I. SUMMARY

The Lectric Leopard, manufactured by US Electricar Corporation of Athol, Massachusetts, was tested during the period 15 October to 30 November 1979. Complete test results are contained in Section V. Part of the verification results are summarized below:

Acceleration: 50 km/h in 12 s.

Range: SAE J227a cycle "C" on level (± 1 percent grade), 58 km (36.1 mi) for 106 cycles.

Forward Speed Capability: Forward speed of 80 km/h (49.7 mi/h) was maintained for more than 5 min.

Gradeability at Speed: At 25 km/h (15 mi/h) the vehicle can traverse a 14-percent grade.

Gradeability Limit: 26.2 percent forward gradeability for at least 20 s, and a calculated reverse gradeability limit of 25 percent.

II. INTRODUCTION

The Lectric Leopard was operated to determine conformity to the Department of Energy (DOE), "Performance Standards for Demonstrations," published in the Federal Register, 30 May 1978, Part V. The results of that testing, as performed by the US Army Mobility Equipment Research and Development Command (MERADCOM), as well as other descriptive data concerning the vehicle, are presented in this report.

III. OBJECTIVES

The objectives of the test were to examine the Lectric Leopard for suitability of those aspects of vehicle and component operating characteristics as outlined by DOE's "Performance Standards for Demonstrations."

IV. TEST VEHICLE DESCRIPTION

The Electric Lectric Leopard is a standard Renault Le Car Passenger car which has been converted to an electric vehicle (Figures 1 and 2). The vehicle has a wheelbase of 2.44 m (8 ft) and is 3.66 m (12 ft) long and 1.52 m (5 ft) wide. The Leopard has a curb weight of 1170 kg (2580 lb) and can seat 4 people, including the driver; the Leopard has a gross vehicle weight of 1362 kg (3000 lb). It is powered by sixteen 6-volt lead-acid batteries manufactured by Deka Corporation. The batteries have a capacity of 138 Ah. The batteries are configured as two modules, one under the hood of the vehicle and the other in the rear behind the seat (Figures 3, 4, and 5). The contactor controller manufactured by US Electricar is located under the hood to the right of the battery compartment (Figure 6).

The propulsion motor is a 12-hp, compound-wound d.c. motor manufactured by Prestolite Corporation. The Leopard has the standard Renault Le Car torsion bar suspension, hydraulic shocks, 4-speed synchromesh transmission, and disc brakes in the front with drum in the rear. The tires are Michelin SR-13 steel belted radials inflated to 30 lb/in². The Leopard comes equipped with its own on-board charger manufactured by US Electricar Corporation, rated at 120 VAC and having a peak current of 20 A.

The Lectric Leopard comes equipped with standard equipment such as windshield wipers, heater-defroster, fuel gauge, ammeter, speedometer, and odometer (see Figure 7 and Appendix A). The heater is a resistance-type with a capacity of 4,000 Btu/h.

V. TEST RESULTS

The following are the results of the verification tests performed at MERADCOM during 15 October to 30 November 1979. Paragraphs are referenced to the DOE "Performance Standards for Demonstrations" criteria.

- (a) Acceleration: 50 km/h in 12 s.
- (b) Gradeability at Speed: At 25 km/h (15 mi/h) the vehicle can traverse a 14-percent grade based on calculations from acceleration tests.
- (c) Gradeability Limit: Calculations based on drawbar pull tests indicate 26.2-percent forward gradeability for at least 20 s. Reverse gradeability was calculated based on the reverse gear ratio of 3.7:1 relative to the forward first gear ratio of 3.545:1 which results in a 25-percent gradeability limit.
- (d) Forward Speed Capability: Forward speed of 80 km/h (49.7 mi/h) was maintained for a minimum of 5 min on the level portion (\pm 1-percent grade) of the MERADCOM test track.



Figure 1. Front oblique view of the Letric Leopard.

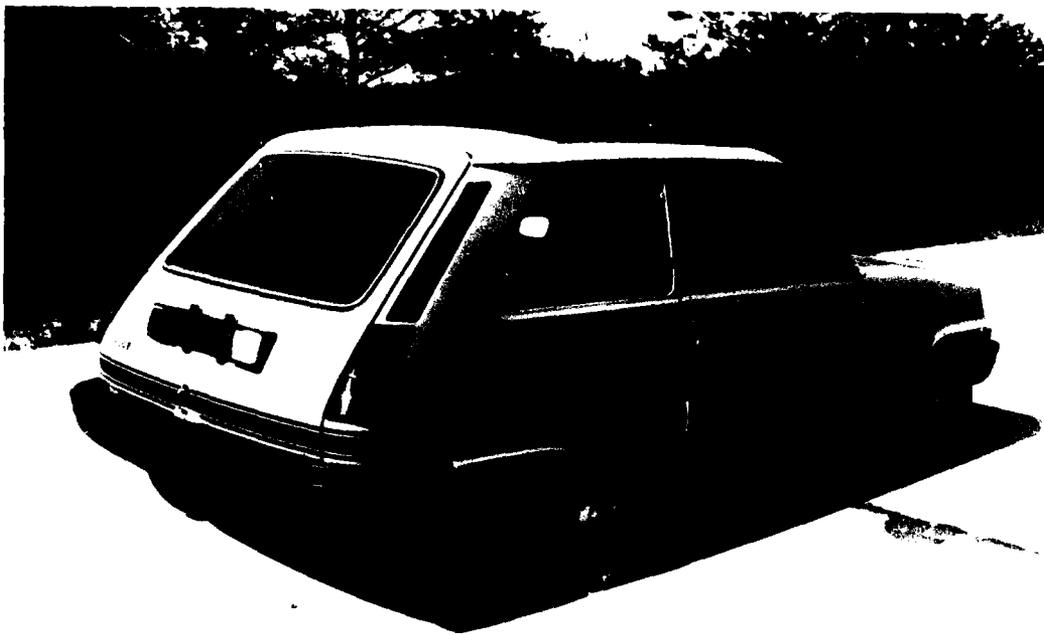


Figure 2. Rear oblique view of the Letric Leopard.

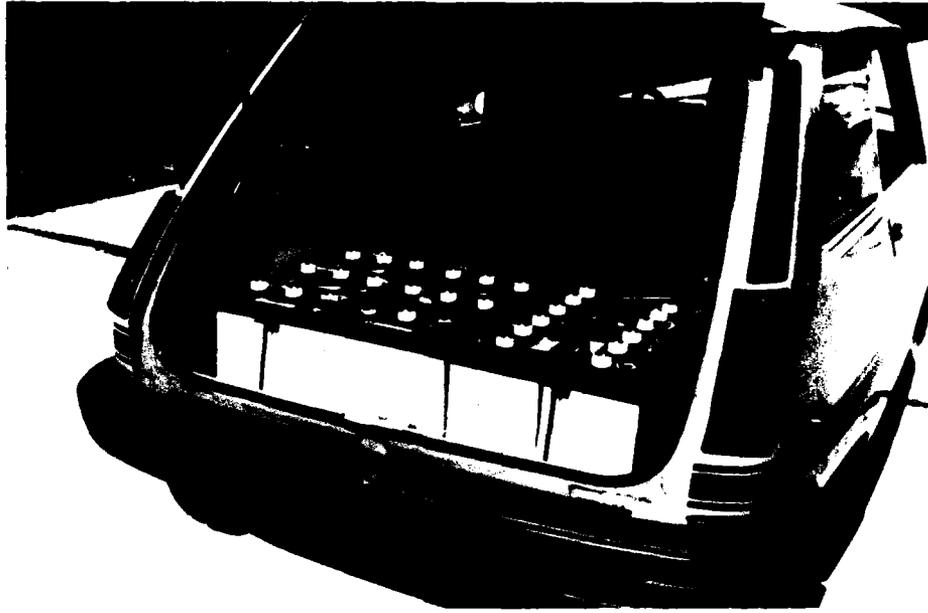


Figure 3. Rear battery module (open).

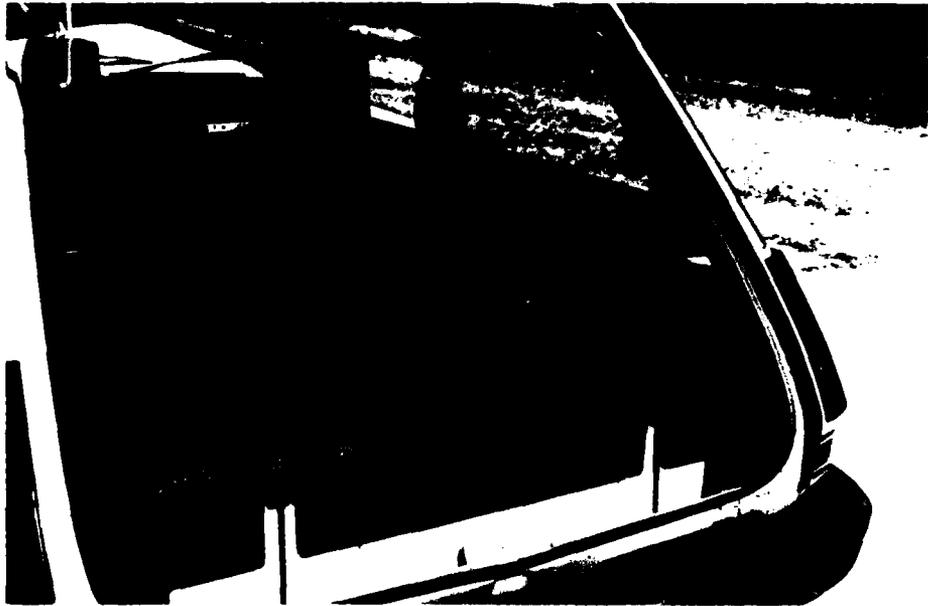


Figure 4. Rear battery module (covered).

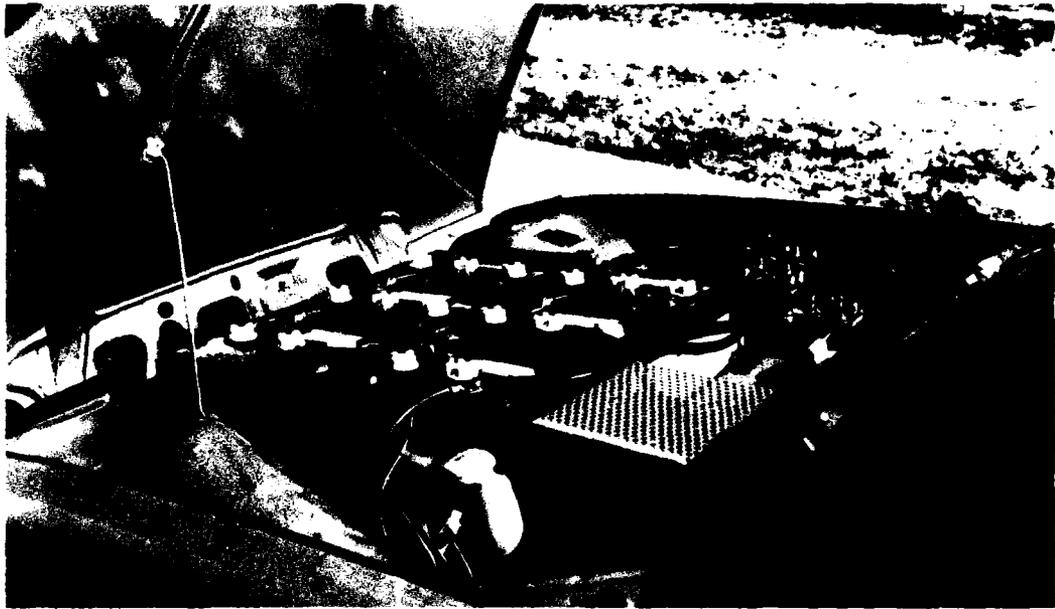


Figure 5. Front battery module (open).

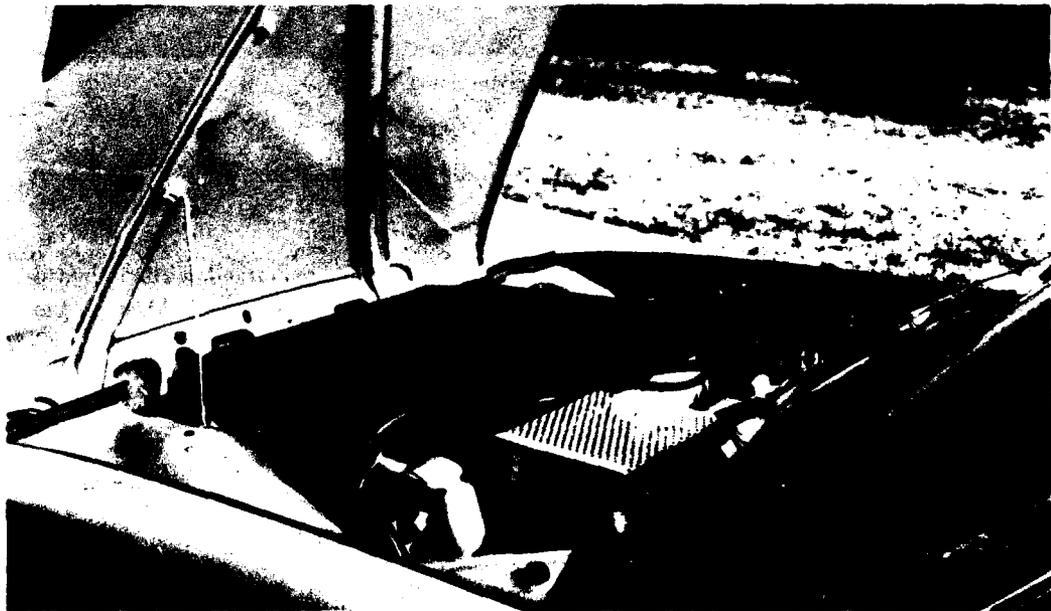


Figure 6. Controller and charger with front battery module (covered).



Figure 7. Instrument panel.

(e) Range: SAE J227a cycle "C" on level (\pm 1-percent grade 58 km (36.1 mi)) for 106 cycles.

(f) Battery Recharge Time: After an 80-percent discharge, recharged with on-board charger (20 A, 120 VAC) for 10 h; after recharge, vehicle operated for at least 50 km (31.1 mi) to SAE J227a cycle "C" regime.

(g) Recharge Control: Timer, maximum setting of 16 h.

(h) Energy Consumption: All components of the vehicle used electrical energy.

(i) Battery:

(1) Warranty: 30 days unconditional, then on prorated basis up to 12 m.

(2) Type: Deka.

(3) Capacity: 138-Ah (75 A for 110 min).

(4) Voltage: The sixteen 6-volt battery modules are connected in series/parallel configurations to produce either a manually switched 48 volts for charge or a two-step accelerator switched 24 or 48 volts for discharge through the motor.

(j) State-of-Charge Meter: Voltmeter, three-color band, manufactured by US Electricar, showing percent of charge.

(k) Odometer: Yes.

(l) Passenger Comfort Heater: Yes; electrical-resistance type.

(m) Documentation: Maintenance manual, operator's manual, and owner's manual were submitted. No parts lists were submitted.

(n) Safety: The Department of Transportation (DOT) is performing these evaluations; however, MERADCOM performed the following limited checks for design intent:

(1) Electrical Isolation: The electrical propulsion system is isolated by design.

(2) Safety Standards 208 and 301: DOT will check compliance.

(3) Battery Caps: Standard golf-cart industry type. Flame-barrier characteristics were not tested.

(4) Ventilation of Battery Compartment: The battery compartments have no forced-air ventilation and are not completely sealed from the driver or passengers.

(5) Battery Emergency Disconnection: None. However, the vehicle has a clutch for disconnection of the drive train from the electric propulsion system.

(6) Parked Temperature Effect: Parked vehicle for an 8-h period at each of the temperatures: -25°C and 50°C. Subsequent operation revealed no apparent damage to vehicle or hazard to persons.

VI. CHRONOLOGY OF VEHICLE FAILURES AND CORRECTIVE ACTIONS

No significant failures occurred.

APPENDIX A

VEHICLE SUMMARY DATA SHEET

1. Vehicle Manufacturer:

US Electricar Corp.
2342 Main St.
Athol, Massachusetts 01331

2. Vehicle Description:

Name: Lectric Leopard
Model: 953
Availability: 30 days
Price: \$7995.00

3. Vehicle Weight:

Curb Wt: 1171 kg (2580 lb)
Payload Wt: 190.68 kg (420 lb) includes 4 passengers
Gross Wt: 1362 kg (3000 lb)

4. Vehicle Size:

Wheelbase: 2.43 m (8 ft)
Length: 3.65 m (12 ft)
Width: 1.52 m (5 ft)
Headroom: 0.91 m (3 ft)
Legroom: 0.61 m (2 ft)

5. Auxiliaries & Options:

No. Lights: 11
a. Headlights, Parking, Signal, Dome, Taillight
b. License Tag, Backup, Stop, Emergency, Dashboard
c. Running Lights

Windshield Wipers: Yes
Windshield Washers: No
Defroster: Yes
Heater: Yes
Radio: No
Fuel Gauge: Yes
Ammeter: Yes
Tachometer: No
Speedometer: Yes
Odometer: Yes
No. Mirrors: 2
Power Steering: No
Power Brakes: No
Transmission Type: 4-speed manual (synchromesh)

6. Propulsion Batteries:

Type: lead-acid
Manufacturer: Deka
No. of Modules: 16
No. Cells: 48
Battery Voltage: 48 volts
AH Capacity: 138
Battery Size: 181 mm x 257 mm x 279 mm (7-1/8 in. x 10-1/8 in. x 11 in.)
Battery Wt: 27.2 kg (60 lb)
Battery Age: New
Battery Rate: 75 A for 110 min
Battery Cycles: 400

7. Auxiliary Battery:

Type: lead-acid
Manufacturer: Deka
No. Cells: 6
Battery Voltage: 12
AH Capacity: 35
Battery Size: 241 mm x 181 mm x 165 mm (9½ in. x 7 in. x 6½ in.)
Battery Rate: 20 h
Battery Wt: 16.8 kg (37 lb)

8. Controller:

Type: contactor
Manufacturer: US Electricar
Voltage Rating: 48 V
Current Rating: 500 A
Size: 181 mm x 228 mm x 127 mm (7 in. x 9 in. x 5 in.)
Wt: 11.3 kg (25 lb)

9. Propulsion Motor:

Type: compound
Manufacturer: Prestolite
Insulation Class: H
Voltage Rating: 48 V
Current Rating: 300 A
HP Rating: 12 hp
Size: 180.97 dia. (7-1/8 in.) 431.8 mm long (17 in.)
Wt: 45.3 kg (100 lb)
Rated Speed: 3000 r/min

10. Body:

Type: sedan
Manufacturer: Renault
No. Doors: 3
Type: side, hatch
No. Windows: 6
Type: glass
No. Seats: 4
Type: bucket (front) bench (retractable rear)
Cargo Volume: 0.72 m³ (25.5 ft³)

11. Chassis:

Type Frame: std (Le Car)
Manufacturer: Renault
Type Material: steel
Modifications: none
Type Springs: torsion bar
Type Shocks: hydraulic
Axle Type Front: transaxle

Axle Type Rear: std Renault
Axle Manufacturer: Renault
Drive Line Ratio: 20:1
Type Brakes Front: disc
Type Brakes Rear: drum
Regenerative Brakes: No
Tire Type: radial
Manufacturer: Michelin
Size: SR-13
Pressure: 206.84 kPa (30 lb/in.²)

12. Battery Charger:

Type: transformer
Manufacturer: US Electricar
On or Off Board: on
Input Voltage: 120 V
Peak Current: 20 A
Recharger Timer: 16 h
Wt: 27.2 kg (60 lb)
Automatic Turn Off: Yes

APPENDIX B

PERFORMANCE STANDARDS FOR DEMONSTRATIONS

FEDERAL REGISTER

TUESDAY MAY 30, 1978

PART V, SUBPART B, PARA: 475.10

475.10 MINIMUM LEVELS OF PERFORMANCE FOR PERSONAL-USE VEHICLES.

The following minimum levels of performance are required with respect to any personal-use vehicles purchased or leased pursuant to section 7 (c) of the Act.

(a) Acceleration. The time required to accelerate from rest to 50 km/h shall not exceed 15 s.

(b) Gradeability at speed. The grade which can be traversed up at 25 km/h shall be at least 10 percent.

(c) Gradeability limit. The grade on which the vehicle can start and climb for 20 s either backward or forward shall be no less than 20 percent.

(d) Forward speed capability. The speed which can be maintained for 5 minutes will be 80 km/h.

(e) Range. The distance which the vehicle can be operated with vital accessories on or equivalent shall be:

(1) For an electric vehicle, at least 50 km on the SAE J227a/C cycle.

(2) For a hybrid vehicle, at least 200 km on the SAE J227a/C cycle.

(f) Battery recharge time. The vehicle shall be capable of satisfying the range requirement of 475.10 (e) above, after being recharged for no more than 10 hours by use of an onboard charger. At the start of this recharge the vehicle shall have 80 percent

discharged batteries as specified by the vehicle test conditions and procedures of 475.3. The onboard charger shall be compatible with an electric power outlet of 110 V or 220 V a.c., as specified by the vehicle manufacturer.

(g) Recharge control. The vehicle shall have a recharge control which is adequate to meet the requirements of energy, life, and safety as such requirements are stated by these performance standards.

(h) Energy consumption.

(1) For an electric vehicle, the maximum amount of nonelectrical energy consumed shall be that used for operation of the accessories only.

(2) For a hybrid vehicle, nonelectrical energy consumed shall not exceed 1.3 MJ/km and shall also not exceed 75 percent of total energy consumed for propulsion and vital accessories, based on being fully loaded on a driving schedule of 33 km on SAE J227a/C cycle plus 33 km at 75 km/h (higher heating value of gasoline taken as 32.7 MJ/L) with vital accessories on.

(i) Battery life.

(1) The vehicle shall be capable of at least 75 percent of the range specified in 475.10 (e) after 12 months or 15,000 km of normal use, whichever occurs first.

(2) The vehicle shall be capable of 100 percent of the acceleration and gradeability specified in 475.10 (a), (b), and (c), for all test conditions and procedures specified by 475.3, for 12 months or 15,000 km of normal use, whichever occurs first.

(3) The batteries shall, if necessary, be repaired or replaced by the vehicle manufacturer at no cost to the user of the vehicle in order to meet requirements of (1) and (2) of 475.10 (i).

(j) State-of-charge meter. The vehicle shall have a state-of-charge meter for the propulsion battery system or other means of providing an indication of remaining range.

(k) Odometer. The vehicle shall have an odometer.

(l) Passenger comfort heater. The vehicle shall have a passenger comfort heater available as an option.

(m) Documentation. Adequate user manuals, maintenance (service) manuals, and parts lists shall be provided.

(n) Emissions. The vehicle shall comply with all applicable Federal emissions regulations for motor vehicles.

(o) Safety, crashworthiness, damageability, crash avoidance, and hazards.

(1) The vehicle shall comply with all applicable Federal regulations for motor vehicles concerning safety, crashworthiness, damageability, crash avoidance, and hazards, unless a waiver or modification is obtained from the Department of Transportation.

(2) Until the Department of Transportation issues regulations which cover the same subjects, the vehicle shall also have the following performance characteristics:

(i) The electric propulsion circuit shall be electrically isolated from other conductive portions of the vehicle.

(ii) The vehicle shall be capable of undergoing the test procedure of Federal Motor Safety Standards 208 and 301 with all battery materials remaining outside the passenger compartment.

(iii) Vehicles with battery caps or battery vents shall have flame barrier provisions to inhibit battery explosions.

(iv) Ventilation shall be adequate within the battery compartment to maintain the concentration of hydrogen below 4 percent by volume during vehicle operation (including charging and maintenance).

(v) The vehicle shall have a device which provides for the positive disconnection of the battery and which is operable from the normal operator position.

(vi) The vehicle shall be capable of being parked for up to 8 hours in temperatures of -25°C to 50°C and subsequently operated at any temperature within this temperature range without damage to the vehicle or hazard to persons.

APPENDIX C

ELECTRIC AND HYBRID VEHICLE VERIFICATION PROCEDURES

Background

DOE is required by Public Law 94-413 to issue performance standards for vehicles used in the Electric and Hybrid Vehicle (EHV) Market Demonstration. On May 30, 1978, DOE published a final rule in the Federal Register (Vol. 43, No. 104) promulgating the first Performance Standards. This rule was effective on 3 July 1978 and prescribed minimum performance standards for electric and hybrid vehicles to be purchased or leased for the first phase of a demonstration program under the Electric and Hybrid Research, and Development Act of 1976. Performance Standards are updated from time to time and the current rule was published in the Federal Register on February 12, 1980 (Vol. 45, No. 30).

Manufacturers who certify that their vehicles meet the latest requirements of the DOE Performance Standards may offer those vehicles for the DOE Market Demonstration Program. DOE reserves the right to verify, by independent test, the manufacturer's self-certification. The test procedures used for DOE performance tests are based on SAE Test Procedures J227a. Safety inspection and testing services are provided by the Department of Transportation/National Highway and Traffic Safety Administration (DOT/NHTSA) through an interagency agreement. Performance testing is performed by the US Army Mobility Equipment Research and Development Command (MERADCOM) through an interagency agreement. During verification testing vehicle component or subsystem failures will be immediately brought to the attention of the manufacturer. Repeated or multiple component or subsystem failures experienced during test are grounds for invalidating the self-certification of the vehicle for purpose of the DOE Market Demonstration Program.

Certification Process

A manufacturer can certify an existing vehicle as meeting the DOE Standards (which include applicable NHTSA safety standards by reference) at any time by submitting a letter of certification and providing the required data on the vehicle to the Department of Energy Director of Electric and Hybrid Vehicles Division or his designee.

Verification Process

Should DOE elect to verify the certification, arrangements will be made with the manufacturer for delivery of the vehicle to a DOE-specified site for testing. (Details of scheduling priorities are described in the following section.) Several basic types of tests may be involved:

- DOE-Sponsored Performance Tests by the US Army MERADCOM.
- DOE-Sponsored Safety Inspection by DOT/NHTSA.
- DOE-Sponsored Safety Compliance Testing by the Research Division of DOT/NHTSA.
- DOT/NHTSA Safety Compliance Test (Independent of DOE).

One important principle followed by DOE during testing is to allow the Facility Manager to work with manufacturers to overcome the normal problems that occur during inspection and testing. To ensure impartial treatment of manufacturers during the test sequence, limits have been set for the Test Facility Manager concerning how many vehicle component or subsystem failures can be allowed before certification is invalidated. DOE will objectively evaluate the impact of all failures during the testing phase so that vehicles are not unfairly penalized for minor and easily correctable failures. The Test Facility Manager, however, has an obligation to conduct the testing thoroughly and to adhere to a tight schedule.

Manufacturers may be notified from time to time by the Test Facility Manager of potential and actual problems. When these problems do not involve components of subsystem failures, where failure is defined as a vehicle being below the required standard, such notification would not necessarily invalidate the certification.

Test Facility Scheduling Guidelines

Vehicles will be scheduled for testing by the Test Facility Manager on a first-come, first-served basis, with certain exceptions as noted below. Scheduling is dependent upon the ability of the manufacturer to provide a vehicle for testing. The Test Facility Manager will request the manufacturer to provide a certified vehicle for testing within 60 days from the date of the request. If a vehicle is not received at the Test Facility within the 60-day period, the self-certification will be returned and the vehicle will be removed from the self-certification list.

The primary function of certification testing is to ensure that vehicles available to the Market Demonstration Program fully satisfy the applicable DOE Performance Standards. For this reason, it is necessary to establish a set of priority testing categories for vehicles selected or being considered for selection by demonstration site operators. The categories are listed below in decreasing order of priority for testing:

1. Certified vehicles which have not been verified but have been purchased by and delivered to site operators.
2. Certified vehicles purchased by but not delivered to site operators for demonstration.
3. Certified vehicles that have been modified subsequent to verification testing and have been delivered to site operators.* On request by DOE, the manufacturer will furnish DOE with technical information about each modification in sufficient detail to determine if reverification tests are needed.
4. Certified vehicles that are being considered for purchase by a site operator.
5. Certified vehicles that are available for test but are not under consideration by a site operator.

Vehicle test schedules are sensitive to the requirements of the Market Demonstration Program, and rescheduling by the Test Facility Manager may be required to meet changing needs. Vehicles delivered late or taken out of test because of operational failures may be rescheduled on a lower priority basis by the Test Facility Manager with approval of the DOE Test Manager. On-site rectification of a vehicle problem by the manufacturer within a 5-working-day period described below may avoid the necessity for rescheduling.

Vehicle Modification/Repair Guidelines

The guidelines provided in this section are for use by the Test Facility Manager. Exceptions to these guidelines require the approval of the Director of the DOE Electric and Hybrid Vehicle Division or his designee. The intent of these guidelines is to facilitate the establishment of a clear basis for validating or invalidating a manufacturer self-certification. Subsystem failures may raise questions as to the relevance of the results of the validation testing. It is also important that the test facilities not be used for development and test engineering. Vehicles that experience repeated failures of the same component of subsystems must be upgraded before verification testing can be rescheduled. Rescheduling will be contingent on the submission and acceptance of evidence, obtained

* The manufacturer is responsible for notifying the DOE Director of the Electric and Hybrid Vehicle Division or his designee of all modifications to the verified production configuration.

by the manufacturer through testing, that the cause of failure has been corrected. The Test Facility Manager will determine when significant repairs should be and have been made.

Vehicle Modifications/Repairs On or Near the Test Facility

A. Only those modifications or repairs that can be completed within 5 working days by the manufacturer or his designee will be allowed. If the repairs cannot be completed within this period, the vehicle must be removed from the test facility unless DOE programmatic requirements dictate that it is in the best interest of the Government that a waiver be granted by the Director of the Electric and Hybrid Vehicles Division or his designee.

B. All failures requiring repair, whether significant or insignificant, will be recorded by the Test Facility Manager or his designee. For all repairs the manufacturer must submit (to the Test Facility Manager) written explanation of the failure modes and the corrective action taken within 15 days after completion of corrective action. Failed components or subsystems must be replaced by an identical part except in those cases where the component or subsystem design is inadequate. In the latter case, the manufacturer may substitute a readily available component or system when the manufacturer can provide assurance of improved reliability and performance.

C. Three on-site repairs to correct a significant powertrain failure are allowed. A fourth failure will invalidate the vehicle certification, and the Facility Manager will order the vehicle to be returned to the manufacturer unless DOE programmatic requirements dictate that a waiver be granted by the Director of the Electric and Hybrid Vehicles Division or his designee.

D. Subject to overriding priority considerations, testing will be resumed as soon as repairs are completed.

Vehicles Returned to the Manufacturer Because of Failure in Test

A. A letter invalidating the certification will be issued to the manufacturer and DOE will notify site operators of the invalidation. A report including the vehicle failures will be provided by DOE to members of the public requesting such a report. Vehicles that are part of the Market Demonstration Program (based on the manufacturer's self-certification) which fail the verification tests will have their certification invalidated until successful correction of the defects is completed. Future funding to site operators for the invalidated vehicle model will be suspended until corrections are completed.

B. A one-time voluntary withdrawal of a vehicle from test by a manufacturer to correct problems is allowed for a period not to exceed 60 days. The vehicle will be rescheduled for testing based on priorities at the time of resubmittal. No action will be taken to invalidate the certification during the voluntary withdrawal period unless there is a clear case of user safety involved or the manufacturer fails to offer the vehicle for test after 60 days.

C. Before a vehicle can be resubmitted for testing, the manufacturer must provide to the Director of the Electric and Hybrid Vehicles Division, or his designee, appropriate evidence that modifications and/or repairs have been made. The manufacturer must also provide substantiating test data to show that the vehicle can meet all DOE Performance Standards.

D. Repaired vehicles returned by the manufacturer may be required to undergo the complete series of verification tests regardless of the portion of testing completed prior to invalidation of certification. The Test Facility Manager with the approval of DOE, will determine the necessity for such retesting.

Grounds for Invalidating Certification

1. A vehicle will be returned to the manufacturer after four significant powertrain failures or a single powertrain failure that cannot be corrected, and its certification will be invalidated.

2. A vehicle that fails to meet applicable DOE Performance Standards will have its certification invalidated. (The standards include documentation and warranty provisions.)

3. A vehicle that fails to comply with applicable DOT/NHTSA Safety Regulations will have its certification invalidated.

4. If a manufacturer fails to commit to and follow a reasonable schedule (defined in the following section) to provide a vehicle for testing when requested by DOE, the vehicle will have its certification invalidated.

Summary of Responsibility of Manufacturers

Manufacturers must self-certify their production vehicles to participate in the DOE Market Demonstration Program. They must also commit to a reasonable schedule to provide a vehicle for verification testing upon request from the DOE designated Test Facility Manager. If this delivery cannot be made within 60 days after receipt of such a request, the self-certification letter will be returned and the vehicle will be removed from the self-certified list.

Manufacturers must provide required and necessary information to document the vehicle configuration:

- Vehicle Summary Data Sheets,
- Operator's Manual, and
- Service and Maintenance Manual including a parts list.

This information may be in draft form, but it must be complete enough to be useful should any mechanical or electrical difficulty develop in the vehicle.

The manufacturer will notify the Director of the Electric and Hybrid Vehicles Division or his designee of all modifications to previously verified production configurations within 30 days of the sale of such modified vehicles to DOE site operators. If it is requested, the manufacturer shall furnish the DOE Test Manager with technical information about each modification in sufficient detail to determine if reverification tests are needed.

For vehicles receiving an invalidation of certification, the manufacturer must provide to the Director of the Electric and Hybrid Vehicles Division appropriate evidence that modifications and/or repairs have been made and must also provide substantiating test data to show that the vehicle can meet all DOE Performance Standards prior to resubmittal of the vehicle for test. Following successful verification testing, vehicles already in DOE site operator fleets must be modified and/or repaired in the same manner as the vehicle successfully tested. A modification and/or repair schedule acceptable to the Director of the Electric and Hybrid Vehicles Division must be developed and followed by the manufacturer as a condition for validation of the manufacturers certification.

DOE Notification Documentation

DOE will notify manufacturers of actions taken during the verification testing process, including but not limited to:

- Receipt of self-certification.
- Notification of vehicle failure.
- Validation or invalidation of certification.
- Final Test Report.

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