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# **FINAL REPORT ON U.S. ARMY METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION PROGRAM**

**INTERIM REPORT  
BFLRF No. 233**

By

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| FIELD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | GROUP | SUB-GROUP                                        | Fleet Test M85 Engine Conversion                                                                     |                                                      |                                |
| /                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |       |                                                  | Methanol Fuel M85 Engine Oils                                                                        |                                                      |                                |
| /                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |       |                                                  | M85 Engine M85 Refueling Stations                                                                    |                                                      |                                |
| 19. ABSTRACT (Continue on reverse if necessary and identify by block number)<br>A methanol-fueled fleet test demonstration program was conducted using administrative-type vehicles to determine the feasibility of using methanol as an alternative fuel. Over 1,026,000 miles were accumulated using 64 administrative-type vehicles. Approximately 750,000 of these miles were accumulated using M85 methanol fuel. Existing engines engineered for use with gasoline and special methanol engines engineered for use with M85 methanol fuel were included in the demonstration program.<br><br>Fuel economy, in miles per gallon, obtained for vehicles using M85 fuel is shown to be approximately one-half that obtained using regular unleaded gasoline. When the costs of M85 fuel and unleaded gasoline are included in economic calculations, it is shown that using M85 increases the fuel cost by a factor of approximately 3.0.<br><br>No catastrophic engine failure occurred using either fuel. Even though wear rates, indicated from used oil sample analyses, obtained when using M85 fuel appear to be 2 to 4 times those obtained using unleaded gasoline, actual<br>(Continued) |       |                                                  |                                                                                                      |                                                      |                                |
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## 16. SUPPLEMENTARY NOTATION

Color photographs showing wear in the engines of the vehicles are on file at Belvoir RDE Center, STRBE-VF. To conserve project funds, a limited number of reports that include Appendices C and E have been printed. Offices receiving all appendices are noted in the attached distribution list. Complete copies may be obtained from the Defense Technical Information Center.

## 19. ABSTRACT

wear, from inspections and measurements, does not appear to be as severe. No significant increase in individual vehicle maintenance, other than increased oil drains, was noted for the methanol vehicles.

M85 refueling stations were set up at four fleet test sites, and no significant operational problem, safety or otherwise, was encountered during the program. *Keywords: Engine oils; Refueling stations; Engine maintenance; M85 vehicles; Pickup trucks; L&D*



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## EXECUTIVE SUMMARY

**Problems and Objectives:** The U.S. Army Methanol-Fueled Administrative Vehicle Demonstration Program was conducted as the result of a 1984 request by then Vice President Bush to Secretary of Defense Weinberger and legislative directives contained in FY85 Department of Energy Authorization bill, Section 202, PL 98-525. The objective of the demonstration program was to establish the feasibility of using methanol as an alternative fuel for administrative-type vehicles in the instance of a future gasoline shortage due to a natural shortage of petroleum or a shortage due to political idiosyncrasies of the oil-producing nations. Under the provisions of the legislation, the Department of Army was requested to purchase new methanol-compatible vehicles, establish the durability of these vehicles in laboratory and fleet tests, test a percentage in cold weather environments, and resolve related support functions relative to methanol fuel utilization.

**Importance of Project:** It was determined early in the program that no U.S. automobile manufacturer would consider manufacturing the small number of methanol-compatible vehicles required for the demonstration program. Therefore, an alternate approach became necessary, which was the conversion of gasoline-powered vehicles to methanol-compatible vehicles. The conversion technology initially selected was that used by the Bank of America (BoFA) for its methanol-powered vehicle fleet in response to the gasoline shortages of the 1970's.

**Technical Approach:** The demonstration program was initially structured to consist of three phases, each building upon the previous phase in terms of experience gained. Phase I was a small conversion fleet involving five converted 1984 General Motors Chevrolet Citations operating for 4,000 miles to demonstrate the applicability of the BoFA conversion technology and to provide a means for training U.S. Army personnel in the areas of engine conversion and maintenance. Phase II originally involved twenty-five 1985 General Motors Chevrolet S-10 pickup trucks, twenty-two being converted to use methanol fuel while three were operated on unleaded gasoline as baseline vehicles. Later in Phase II, twenty-five 1983 Ford Escort sedans, manufactured for the State of California by Ford Motor Company to use methanol fuel, were purchased from the California Energy Commission and phased into the program. In addition, Chrysler Corporation made four new carbureted engines, engineered to use methanol fuel, available to the program. These engines were obtained, installed in 1985 Chrysler K-cars, and included in Phase II of the demonstration program. Three similar Air Force-owned Chrysler K-cars operating on unleaded gasoline in the same fleet use were also included in the Phase II program as baseline vehicles.

Two Army-owned Chevrolet Citations, operating on unleaded gasoline, were included as baseline vehicles at the Presidio of San Francisco. These two vehicles resulted in a total of 64 vehicles operating at four different geographical sites being included in the overall program.

**Accomplishments:** A total of 1,026,228 miles was accumulated during the program. Seventy-three percent or approximately 750,000 miles were obtained using M85 methanol fuel. Increased wear, as indicated from used oil analyses, was noted for the vehicles using M85 fuel, compared with the vehicles using unleaded gasoline. However, it should be noted that no catastrophic failure occurred using either fuel. Inspection and measurement of selected M85 and gasoline engines at the end of the program did not indicate any real significant wear areas for either fuel when compared with published production specifications.

Also, four Chevrolet vehicles, two each with L-4 engines and two with V-6 engines, were evaluated for cold start performance. One engine from each engine type evaluated was operated using unleaded gasoline and the second engine from each type was operated using M85 fuel. Both gasoline control vehicles were started successfully at temperatures of 0°F (-18°C) using the BofA specified SAE 40 engine oil. Using M85 fuel and SAE 40 engine oil, the minimum unaided starting temperature was approximately 20°F (-7°C) for the V-6 engine and 45°F (7°C) for the L-4 engine. The V-6 engine started much easier and at lower temperatures than the L-4 engine, which was attributed to a heated grid located under the carburetor as standard equipment. The use of M82 fuel, which can be easily blended in the field, lowers the starting temperatures by about 10 degrees for both engines. The L-4 engine was successfully started at temperatures lower than 0°F (-18°C) with the use of an optional electric heater installed in the heater hose in the coolant system of the engine.

Six different formulated engine oils were evaluated to determine which engine oil would provide the best wear and/or corrosion protection for the administrative-type vehicle engines operating on M85 methanol fuel. The six lubricants were first evaluated using a modified ASTM Sequence V-D cyclic test procedure. The three best oils were then evaluated in a second test series using steady-state/cold test conditions. These three oils provided the same order of protection in both test series. As a result, all three lubricants, which were formulated specifically for use in engines operating on M85 fuel, are recommended for use in administrative-type vehicle engines to be operated using M85 methanol fuel.

Additionally, four similar, but different, types of M85 refueling facilities were fabricated and were operated satisfactorily. A 500-gallon steel storage tank, pump, meter, hose, and dispensing nozzle were mounted on a flat-bed truck for dispensing M85 fuel at the Presidio. A 1,000-gallon, above-ground, double-walled steel storage tank, with a modified commercial-type pump and a "California Vapor Return" system for receiving and dispensing fuel, was installed at Fort Ord. Fort Ord also used two of the three specially-modified Army standard 600-gallon aluminum tank-pump units (TPU) as a storage and dispensing unit for M85 fuel. The third modified TPU unit was mounted on a truck and used as the dispensing unit for U.S. Air Force vehicles at Fort Sam Houston. A 6,000-gallon, above-ground, double-walled steel storage tank with a modified commercial-type dispensing pump and a "California Vapor Return" system was installed at Sierra Army Depot for its M85 fuel.

**Military Impact:** In event of a gasoline shortage in the future, an alternative fuel will be required by the military's fleet of spark-ignition engine, which primarily power administrative vehicles. One of the most likely candidates to extend the gasoline supply is a methanol/gasoline blend. M85 fuel (85 percent methanol and 15 percent unleaded gasoline) cannot be consumed directly and may result in increased wear, corrosion, and other maintenance problems if the engines are not modified with care and the materials of construction of the parts exposed to the fuel are not selected properly. However, this demonstration program has shown that existing engines, engineered for use with gasoline, can be successfully modified and operated with no significant deleterious effect when reasonable effort has been taken in the selection of materials and modifications. The engines that were engineered by their respective manufacturers to operate on M85 appeared to show as much wear on parts such as rings, cylinders, and valve guides as the converted gasoline engines using the M85 fuel.

## FOREWORD/ACKNOWLEDGMENTS

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## I. BACKGROUND

During the last few years, increasing interest has been shown in the use of methanol as a possible alternative transportation fuel to gasoline and diesel fuel and as a fuel to improve the environmental quality. Much research and development have been conducted by the Department of Energy (DOE), U.S. Army Belvoir Research, Development and Engineering Center (Belvoir RDE Center), the State of California, the Bank of America (BofA), and others. This research has culminated in a number of modified methanol-fueled vehicle tests fleets being operated for the purpose of demonstrating the acceptability of methanol fuels. A number of vehicle, accessory, and methanol manufacturers has also been involved in this research effort, resulting in the development of methanol-tolerant vehicles and fuel-handling systems. However, several potential problems with the use of methanol fuels have either not been resolved or have not been adequately evaluated in actual field service.

There is an increasing interest at the national level in methanol as a fuel. As a result, efforts are underway to identify and remove any legal or administrative impediments to methanol use. Also, there has been a desire to both identify any problems with incorporating methanol vehicles within the Government's administrative fleet and to stimulate further the production and use of methanol-fueled vehicles.

This program was initiated by the U.S. Army with Belvoir Fuels and Lubricants Research Facility (SwRI) (BFLRF) to initially assist the Jet Propulsion Laboratory (JPL) in planning and conducting the Army Methanol-Fueled Administrative Vehicle Demonstration Program and to provide backup for identifying and resolving any operational problems within the fleet.

The demonstration program was initially structured to consist of three phases, each building upon the previous in terms of experience gained. Phase I was a small conversion fleet involving only five converted 1984 General Motors Chevrolet Citation sedans operating for 4,000 miles to demonstrate the applicability of the BofA conversion technology and to provide a means for training US Army personnel. Phase II, as originally planned, was to be a medium-fleet conversion involving twenty-five converted 1985 General Motors Chevrolet S-10 pickup trucks. These vehicles were to operate for 12,000 to 15,000 miles as a means to establish the durability aspects of methanol-fueled operation. Phase III was to then follow with a large fleet conversion involving up to 1,000 vehicles at several DOD installations.

Phase II was expanded about midway in the program to include 25 Ford Escort sedans with special built 1.6-liter M85 engines, and four Plymouth K-cars with special built 2.2-liter M85 engines. As a result, 64 vehicles, including baseline gasoline vehicles, were included in the Phase II demonstration program.

JPL subsequently removed itself from the demonstration program early in Phase II, at the completion of modifications made on the S-10 pickup trucks assigned to Fort Ord. At that time, BFLRF assumed the management responsibilities of all subsequent operations of the demonstration program.

JPL Report JPL D-4415(1)\* summarizes the portion of the program conducted by JPL and includes the detailed conversion descriptions for converting the 2.5-liter L-4 and the 2.8-liter V-6 General Motors Chevrolet engines to use M85 fuel.

A program plan entitled "U.S. Army's Methanol-Fueled Administrative Vehicle Demonstration Program Plan" was developed to define responsibilities, details of planned activities, projected accomplishments, and milestone schedules. Following extensive coordination, the plan was finalized and promulgated within the Department of Defense (DOD) on November 1986.(2)

## II. INTRODUCTION

In compliance with Section 202 of Public Law 98-525, the Department of Defense conducted a demonstration program involving the operation of administrative vehicles on methanol fuel. Under the provisions of this legislation, the Department of Army was requested to purchase new methanol-compatible automobiles, establish the durability of these cars in laboratory and fleet tests, test a percentage in cold weather environments, and resolve related support functions relative to methanol fuel utilization.

The U.S. Army structured and implemented a demonstration program to develop the necessary data for compliance with those provisions given in Section 202 of Public Law 98-525. It was determined early in the program that no automobile manufacturer in the United States would

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\*Underscored numbers in parentheses refer to the list of references at the end of this report.

consider manufacturing the small number of methanol-compatible vehicles required for this demonstration program. Therefore, it became necessary to consider an alternate approach, which was the conversion of gasoline-powered vehicles to methanol-compatible vehicles. The conversion technology selected for use in this program was identical to that used by the Bank of America (BoFA) in its methanol-powered fleet, which was initiated and developed for its own use in response to the gasoline shortages of the 1970s.

As mentioned earlier, the demonstration program was originally planned to consist of three phases, each building upon the previous phase in terms of experience gained. As it turned out, Phase II was enlarged from 25 vehicles to 64, and it was decided not to recommend continuing with Phase III due to the success and lack of problems encountered during the expanded Phase II of the program.

Three reports (3-5) published and distributed earlier represent specific additional work included in the program, but not included in detail in this report.

### **III. PROGRAM OBJECTIVES**

The objectives of the U.S. Army Methanol-Fueled Administrative Vehicle Demonstration Program were to:

- Determine the feasibility of using methanol as an alternative fuel for administrative-type vehicles.
- Establish the durability of these vehicles in laboratory and fleet tests.
- Test a percentage of the vehicles in cold weather environments.
- Resolve any related support function relative to methanol fuel utilization including handling and storage of the fuel.

### **IV. FLEET DEMONSTRATION PROGRAM**

Phase I of the fleet demonstration program was conducted by JPL, coordinating the work of BoFA in converting four used Chevrolet Citation sedans, purchased from BoFA, to operate using M85 methanol fuel. Two of the vehicles were powered by 2.5-liter L-4, fuel-injected

Chevrolet engines and two were powered by 2.8-liter V-6 carbureted Chevrolet engines. A fifth pre-owned V-6 Citation was purchased by JPL and subjected to engineering evaluation testing at JPL using gasoline, after which it was converted to use methanol by BofA personnel. Following the conversion, the vehicle was returned to JPL for further engineering evaluations using M85 methanol fuel.

The four converted Citation sedans were assigned to Presidio of San Francisco and placed into regular three-shift operation by the military police security force at Presidio. Over 36,000 miles of operation using M85 fuel were accumulated on the four Citation sedans during the first 3 months of operation.

Based upon the satisfactory conversion and operation of the four Citation vehicles at the Presidio of San Francisco, Phase II was initiated by JPL. The initial Phase II consisted of the Army purchasing 25 new S-10 pickup trucks. These pickups were assigned to Fort Ord and were used in normal transportation motor pool service. All 25 pickups were "broken-in" for approximately 5,000 miles using regular unleaded gasoline. After this break-in period, 5 of the 7 pickups powered by 2.5-liter L-4 engines and 16 of the 18 powered by 2.8-liter V-6 engines were converted to use M85 fuel using the same BofA technology as that used with the Presidio vehicles. The only difference in the conversion procedure was that the conversions were made at Fort Ord by Army motor pool maintenance personnel. One L-4 powered pickup was taken to the JPL laboratory after the break-in period and subjected to engineering evaluations using gasoline. The pickup was then converted to use M85 fuel, and further engineering evaluations using M85 fuel were conducted.

The V-6 Citation and L-4 pickup were both assigned to the Fort Ord fleet operation at the completion of the engineering tests performed and reported (1) by JPL.

About midway in Phase II of the fleet demonstration program, an opportunity to include two different manufacturers vehicles with engines engineered to use methanol fuel was made possible. As a result, 25 Ford Escort sedans, manufactured special in 1983 for the State of California by Ford Motor Company to use methanol fuel, were purchased from the California Energy Commission and phased into the fleet demonstration program. These vehicles had been used by California state employees in the Los Angeles area. The odometer readings

from the 25 Ford Escorts ranged from as little as 1,779 miles to 15,342, with the average being approximately 11,300 miles. Five of these vehicles were delivered to Fort Ord and included in its transportation motor pool fleet, and the remaining 20 were shipped to the Sierra Army Depot. Sierra Army Depot was selected for one of the fleet test sites, since it was located at an altitude of approximately 6,500 feet and normally had much colder weather, down to 0°F in the winter, than the other test sites.

About the same time, Chrysler Engineering made four special M85 engines available to the Army at a very reduced price. These four engines were purchased along with modified fuel tanks, fuel lines, and other parts necessary to convert a standard 1985 gasoline K-car to use M85 fuel. Four 1985 Plymouth K-cars were purchased by BFLRF from a local rental car company, and the gasoline engines were removed and replaced with the new 2.2-liter engine engineered to use M85 methanol fuel. Each K-car had approximately 30,000 miles on the odometer when purchased. BFLRF personnel made the engine changes and the fuel tank and fuel line changes, with technical assistance provided by an engineer and senior mechanic from Chrysler Engineering. The four Plymouth K-cars were assigned to an Air Force Group at Randolph Air Force Base, TX, after being converted to M85 methanol fuel. The K-cars were then operated by San Antonio Real Property Maintenance Agency (SARPMA) personnel in their normal transportation motor pool requirements in the San Antonio area. The inclusion of these U.S. Air Force vehicles essentially converted the "Army" program to a DOD Methanol-Fueled Administrative Vehicle Demonstration.

Two 1984 Citation sedans assigned to the military police security force at the Presidio and operated in the same type service assignments, using gasoline, were included in the data collection portion of the program as baseline gasoline vehicles. In addition, SARPMA had three K-cars with 2.2-liter engines being used in similar operational assignments as the four M85 vehicles. The three 1986 K-cars operated by SARPMA were also included in the data collection portion of the program as baseline gasoline vehicles. The only difference in the 1985 M85 K-cars and the 1986 K-cars was that the 1985 K-cars were carbureted engines and the 1986 K-cars were fuel-injected engines.

TABLE 1 summarizes the fleet test sites and the vehicles operated at each site.

**TABLE 1. Fleet Test Sites and Vehicles Operated at Each Site**

| <u>Fleet Site</u>                       | <u>No. of Vehicles</u> |            | <u>Manufacturer</u> | <u>Engine</u>        |           |
|-----------------------------------------|------------------------|------------|---------------------|----------------------|-----------|
|                                         | <u>Gasoline</u>        | <u>M85</u> |                     | <u>Configuration</u> | <u>HP</u> |
| Presidio of San Francisco, CA           | 2                      | 2*         | Chevrolet           | L-4                  | 2.5       |
|                                         |                        | 2**        | Chevrolet           | V-6                  | 2.8       |
| Ford Ord, CA                            | 1                      | 7*         | Chevrolet           | L-4                  | 2.5       |
|                                         | 2                      | 16**       | Chevrolet           | V-6                  | 2.8       |
|                                         |                        | 5*         | Ford                | I-4                  | 1.6       |
| Sierra Army Depot, CA                   |                        | 20**       | Ford                | I-4                  | 1.6       |
| Randolph Air Force Base, TX<br>(SARPMA) | 3*                     | 4**        | Chrysler            | I-4                  | 2.2       |
| *Throttle body injected<br>**Carbureted |                        |            |                     |                      |           |

Photographs of the four different vehicle models are presented in Figs. 1 through 4. The police light bars and radios had been removed from the Presidio Chevrolet Citations when their photograph (Fig. 1) was taken.



Figure 1. 1984 Chevrolet Citation sedans operated at the Presidio of San Francisco

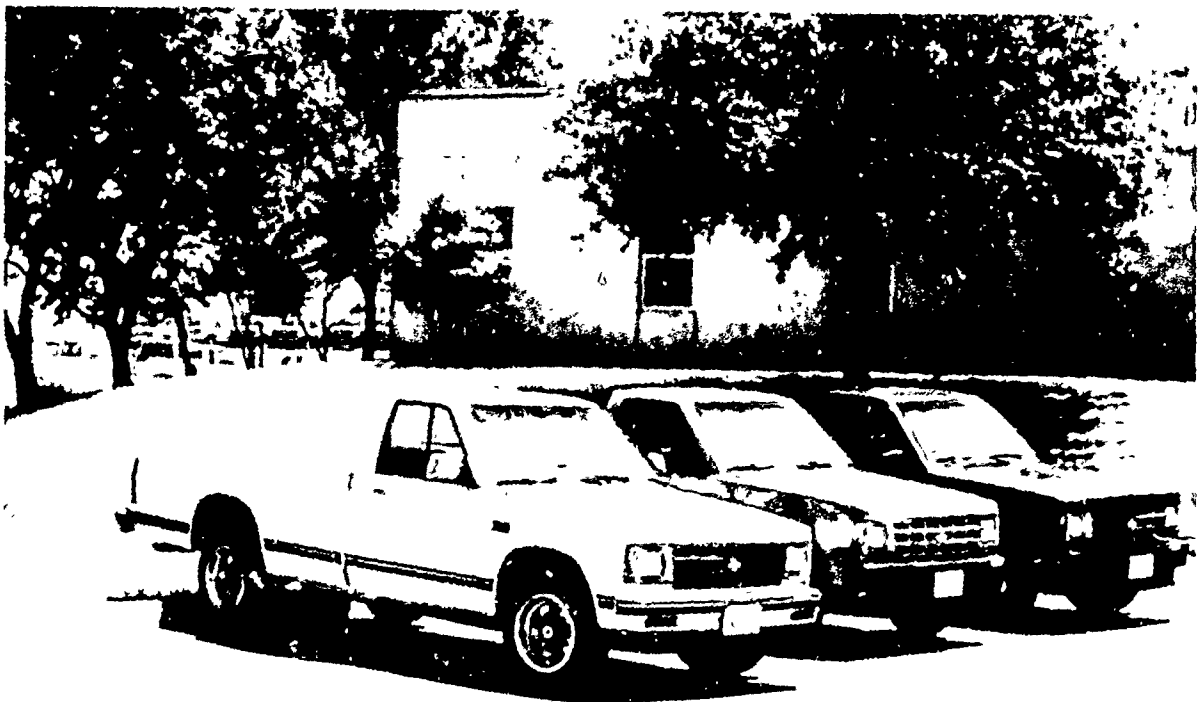


Figure 2. 1985 Chevrolet S-10 pickups operated at Fort Ord



**Figure 3. 1983 Ford Escort sedans operated at the Sierra Army Depot**



**Figure 4. 1985 Plymouth K-Cars operated by SARPMA in the San Antonio Area**

## V. EQUIPMENT AND TEST PROCEDURES

### A. Vehicle/Engine Modifications

Detailed descriptions of the specific changes and modifications made to the various engines and vehicles are reported in detail in other published reports (1,6) for the Chevrolet and Ford engines. TABLES 2 and 3 summarize the modifications made for these engines. Chrysler has not published detailed modifications for its 2.2-liter I-4 engine. However, TABLE 4 denotes those modifications made on the Chrysler engine. As noted in TABLES 2 through 4, in general the same modifications were required for all vehicles modified to operate on M85 fuel.

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**TABLE 2. Bank of America (BoFA) Conversion Technology  
for Chevrolet L-4 and V-6 Engines**

- **CARBURETOR MODIFICATIONS**
    - Enlarged Calibrated Fuel Passages for Increased Flow
    - Electroless Nickel Plating on Carburetor Interior Surfaces
    - Replacement of Elastomer Components (pump cup, float needle, mixture O-ring)
  - **IGNITION MODIFICATIONS**
    - Replacement of Spark Plugs (i.e., lower heat range)
    - Resetting Ignition Timing
  - **FUEL TANK MODIFICATIONS**
    - Substituting 14-Gallon Standard Tank With 21-Gallon Low Carbon Steel Tank
    - Replacement of In-Line Fuel Filter
    - Replacement of Fuel Level Sending Unit
-

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**TABLE 3. Modifications on Ford 1.6-Liter  
Carbureted Methanol-Fueled Escorts**

- Chrome Top Compression Rings
  - Compression-Ratio Increased From 8.8:1 to 11.8:1
  - Carburetor Recalibrated for Increased Volume Requirements
  - Ignition Timing Modified
  - Spark Plugs Changed - Two Heat Ranges Colder
  - Stainless Steel Fuel Tank and Fuel Lines and Electroless Nickel-Plate on Carburetor
  - Engine-Mounted Fuel Pump Nickel-Plated and Elastomers Changed
  - Supplementary Electric Fuel Pump and Fuel Filter Mounted Near Fuel Tank
- 

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**TABLE 4. Modifications on Chrysler's 2.2-Liter  
Carbureted Methanol-Fueled K-Cars**

- Compression Ratio Increased to 11.5:1
  - Chrome Top Compression Rings
  - Nickel-Plated Mechanical Fuel Pump With Internal Material Changes
  - Nickel-Plated Carburetor With Internal Material Changes and Increased Fuel Flow Capability
  - Spark Plugs - Champion N6Y
  - Fuel Tank, Fuel Tank Filler Tube, Fuel Lines, and Fuel Filter - Stainless Steel
  - Fuel Level Sending Unit - Nickel Plated
  - Fluorelastomer Fuel Hoses
  - Revised (New) Electronic Computer Control Board
- 

The general specifications for the engines used in the demonstration program are presented in the following tabulations:

| <u>Component</u>                | <u>Chevrolet</u> |     | <u>Ford</u> | <u>Chrysler</u> |
|---------------------------------|------------------|-----|-------------|-----------------|
| Engine size, liter              | 2.5              | 2.8 | 1.6         | 2.2             |
| Configuration                   | L-4              | V-6 | I-4         | I-4             |
| Compression ratio               | 9.0              | 8.5 | 11.8        | 11.5            |
| Manufactured to use<br>Methanol | No               | No  | Yes         | Yes             |

## **B. Fuels**

### **1. Methanol Fuel**

The methanol fuel used in Phase I of the demonstration program was M85 blended to the BofA specification (85 percent methanol, 15 percent premium unleaded gasoline, plus 2 lb FA5 per 1000 gallons of fuel). FA5 is a proprietary fuel additive for use with methanol and is available from BofA. The M85 fuel used in Phase I was obtained from a BofA refueling facility in downtown San Francisco. Methanol fuel was purchased from Redwood Oil Company to BofA specifications during Phase II of the program for use at the Presidio and Fort Ord. The M85 methanol used at the Sierra Army Depot was also purchased from Redwood Oil Company; however, it was specified to be blended to the State of California specifications, which does not include the proprietary BofA additive. The M85 methanol fuel used in the Chrysler vehicles was blended by BFLRF to the Chrysler Corporation specification (85 percent methanol, 13 percent premium unleaded gasoline, and 2 percent toluene to improve luminescence in case of a fire).

Appendix A presents a copy of the State of California specification for M85 methanol fuel. This specification is the same as that specified by Ford Motor Company, and practically the same as the BofA specification except for the addition of the proprietary BofA additive.

## 2. Gasoline

Regular unleaded gasoline from the normal supply channels was used in all baseline vehicles at all the fleet sites. In addition, regular unleaded gasoline was used to break in the new Chevrolet S-10 pickups at Fort Ord. It is assumed that the five Citation vehicles, purchased from BofA for Phase I of the program, were all operated on regular unleaded gasoline prior to being purchased for the demonstration program.

### C. **Engine Oils**

#### 1. Engine Oils for Methanol Vehicles

Three different engine oils formulated specifically for use in engines using M85 methanol fuel were used during the demonstration program. Since the BofA technology was used to convert the Chevrolet L-4 and V-6 engines to use M85 fuel, an SAE 40 oil recommended by BofA and purchased from BofA was used in all the Chevrolet engines operated on M85 fuel at the Presidio and Fort Ord. An SAE 20W-40, Ford Motorcraft oil was used in all Ford Escort vehicles due to the requirements of the Ford Motor Company warranty, which was obtained with the purchase of the Escorts. The third oil, an SAE 10W-30 oil (OS-59567), was recommended by Chrysler Engineering and supplied by Lubrizol Corporation for use in the Plymouth K-cars. Analyses of new samples of the three oils are presented in TABLE 5.

#### 2. Engine Oils for Gasoline Vehicles

The two baseline vehicles operated on unleaded gasoline at the Presidio and the three gasoline baseline vehicles operated at Fort Ord and SARPMA used MIL-L-46152 specification oils from the regular supply channels. It should be mentioned that all the Chevrolet vehicles operated at Fort Ord used the MIL-L-46152 specification oil during their nominal 5,000-mile break-in period, after the initial factory fill was drained.

**TABLE 5. Analyses of New Lubricant Samples for  
Use in Engines Using M85 Fuel**

| <u>Oil</u>            | <u>Test<br/>Method</u> | <u>Bank of America</u> | <u>Chrysler<br/>Lubrizol</u> | <u>Ford<br/>Motorcraft</u> |
|-----------------------|------------------------|------------------------|------------------------------|----------------------------|
| SAE Viscosity Grade   |                        | 40                     | 10W-30                       | 20W-40                     |
| Viscosity, cSt, at    |                        |                        |                              |                            |
| 40°F                  | D 445                  | 135.6                  | 72.0                         | 118.2                      |
| 100°C                 | D 445                  | 14.0                   | 11.1                         | 14.1                       |
| Viscosity Index       | D 2270                 | 100                    | 145                          | 119                        |
| Total Acid No. (TAN)  | D 664                  | 2.68                   | 3.42                         | 3.49                       |
| Total Base No. (TBN)  | D 664                  | 10.5                   | 7.4                          | 6.6                        |
| Elements, ppm, by ICP |                        |                        |                              |                            |
| Iron (Fe)             |                        | 1                      | 2                            | 3                          |
| Chromium (Cr)         |                        | <1                     | <1                           | 9                          |
| Lead (Pb)             |                        | 3                      | <1                           | 3                          |
| Copper (Cu)           |                        | 3                      | <1                           | 0                          |
| Tin (Sn)              |                        | <1                     | <1                           | 0                          |
| Aluminum (Al)         |                        | <1                     | <1                           | 3                          |
| Nickel (Ni)           |                        | <1                     | <1                           | 0                          |
| Silver (Ag)           |                        | <1                     | <1                           | 0                          |
| Manganese (Mn)        |                        | <1                     | <1                           | 0                          |
| Silicon (Si)          |                        | 16                     | 4                            | 4                          |
| Boron (B)             |                        | 199                    | 97                           | 5                          |
| Magnesium (Mg)        |                        | 2091                   | 9                            | 760                        |
| Calcium (Ca)          |                        | 9                      | *                            | 1550                       |
| Barium (Ba)           |                        | 1                      | 94                           | 0                          |
| Phosphorus (P)        |                        | 1329                   | 1225                         | 1570                       |
| Zinc (Zn)             |                        | 1401                   | 1337                         | 1780                       |

\*Not measured.

### 3. Lubricant Sampling Procedure

It was requested that the engine oil in each vehicle be changed after each 3,000 miles of operation. In addition, in order to obtain data for each vehicle with respect to lubricant degradation, fuel dilution, lubricant additive package depletion, and wear metal content, a lubricant sampling procedure was initiated. A copy of the lubricant sampling procedure is presented in Appendix B. Lubricant samples were requested to be drawn each 1500 miles of operation or each 30 days, whichever occurred first. In addition, samples were to be drawn

just prior to each oil change, and just after the new oil had been added to the engine and the engine operated for approximately 10 minutes.

## **VI. RESULTS OF FLEET TEST DEMONSTRATION**

### **A. Fleet Test Results**

#### **1. General**

A total of 1,026,228 miles were accumulated during the fleet test demonstration program. Approximately 750,00 miles, or 73 percent of the total miles, were accumulated using M85 methanol fuel.

#### **2. Fuel Economy**

A summary of the fuel economy data for each engine type, summarized by fleet test sites, is presented in TABLE 6. Individual monthly mileage and fuel usage summaries for each of the sixty-four vehicles are included as Appendix C. These data are assembled by vehicle number and test site. TABLE 6 shows the fuel economy for vehicles operating on M85 methanol fuel to range from 9.2 miles per gallon for the Chevrolet V-6 engines at Fort Ord to 15.5 miles per gallon for the Plymouth K-cars operated by SARPMA. Where similar gasoline vehicles were operated in the same fleets as the M85 vehicles, it will be noted that the M85 fuel provides approximately 50 percent of the mileage reported for the gasoline vehicles. The Chevrolet L-4 engines operated at the Presidio using M85 fuel gave about 67 percent of the mileage reported for the L-4 gasoline vehicles at the Presidio.

**TABLE 6. Summary Fuel Economy Data for Each Engine Type**

| <u>Engine<br/>Manufacturer</u>    | <u>Engine</u> | <u>Fuel</u> | <u>Number<br/>of<br/>Vehicles</u> | <u>Total<br/>Cumulative<br/>Miles</u> | <u>Cumulative<br/>mpg(a)</u> | <u>Gasoline<br/>Equivalent(b)</u> |
|-----------------------------------|---------------|-------------|-----------------------------------|---------------------------------------|------------------------------|-----------------------------------|
| <b>PRESIDIO OF SAN FRANCISCO</b>  |               |             |                                   |                                       |                              |                                   |
| General Motors                    | L-4           | Gasoline    | 2                                 | 57,892                                | 17.1                         |                                   |
| General Motors                    | L-4           | M85         | 2                                 | 69,386                                | 11.5                         | 20.2                              |
| General Motors                    | V-6           | M85         | 2                                 | 73,942                                | 9.8                          | 17.2                              |
| <b>FORT ORD</b>                   |               |             |                                   |                                       |                              |                                   |
| General Motors                    | L-4           | Gasoline    | 7(c)                              | 58,146                                | 19.9                         |                                   |
| General Motors                    | L-4           | M85         | 6                                 | 63,025                                | 10.1                         | 17.8                              |
| General Motors                    | V-6           | Gasoline    | 18(c)                             | 125,774                               | 19.3                         |                                   |
| General Motors                    | V-6           | M85         | 17                                | 268,450                               | 9.2                          | 16.2                              |
| Ford Motor Co.                    | I-4           | M85         | 5                                 | 49,417                                | 11.2                         | 19.7                              |
| <b>SIERRA ARMY DEPOT</b>          |               |             |                                   |                                       |                              |                                   |
| Ford Motor Co.                    | I-4           | M85         | 20                                | 170,578                               | 12.6                         | 22.2                              |
| <b>RANDOLPH AIR FORCE BASE(d)</b> |               |             |                                   |                                       |                              |                                   |
| Chrysler Corp.                    | I-4           | Gasoline    | 3(e)                              | 35,112                                | 31.0                         |                                   |
| Chrysler Corp.                    | I-4           | M85         | 4                                 | 54,506                                | 15.5                         | 27.3                              |

(a) Total miles divided by total fuel used.

(b) Gasoline Equivalent =  $\frac{\text{Net Btu/gal. for gasoline}}{\text{Net Btu/gal. for M85}} \times \text{actual mpg, or } 1.76 \times \text{mpg.}$

(c) Includes break-in mileage of all S-10 vehicles prior to conversion to M85 fuel.

(d) Vehicles operated by SARPMA personnel.

(e) Gasoline vehicles were throttle body injection engines; M85 vehicles were carbureted engines.

TABLE 7 shows the comparative differences in economy values between similar engines using the same fuel at different operating fleets sites.

**TABLE 7. Comparative Differences in Economy Values of Similar Vehicles**

| <u>Engine</u>      | <u>Fleet Site</u> | <u>Fuel</u> | <u>Cumulative<br/>mpg (a)</u> | <u>Comparative<br/>Economy, % (b)</u> |
|--------------------|-------------------|-------------|-------------------------------|---------------------------------------|
| General Motors L-4 | Presidio          | Gas         | 17.1                          | 85.9                                  |
|                    | Fort Ord          | Gas         | 19.9                          |                                       |
|                    | Presidio          | M85         | 11.5                          | 87.8                                  |
|                    | Fort Ord          | M85         | 10.1                          |                                       |
| General Motors V-6 | Presidio          | M85         | 9.8                           | 93.9                                  |
|                    | Fort Ord          | M85         | 9.2                           |                                       |
| Ford I-4           | Fort Ord          | M85         | 11.2                          | 88.9                                  |
|                    | Sierra            | M85         | 12.6                          |                                       |

(a) From TABLE 6

(b) The smaller mpg divided by the larger mpg

These comparative economy values in TABLE 7 appear to be very reasonable considering they represent mileages accumulated in actual operating dispatch service using drivers with varying degrees of driving proficiencies. It should be mentioned that an error in the dispensing fuel meters cannot be blamed for any of the variations, since calibration of all fuel meters, methanol dispensing and gasoline dispensing, were checked early in the program. Only the dispensing unit used later at SARPMA required adjustment, and this unit was corrected before it was installed at the SARPMA refueling area. The 50-percent values obtained for the fuel economy comparisons between M85 and gasoline compare favorably with results reported from a DOE fleet test program (7), and an M90 fleet test program conducted by the city of Baltimore (8), and the California methanol fleet test program.(9)

### 3. Equipment Problems Related to M85 Fuel

Even though care was taken in the selection of materials used in the methanol fuel systems, it was anticipated at the start of the program that numerous equipment problems would be encountered. No catastrophic failures were encountered during the entire demonstration program. Failures were encountered that were related to the use of M85 fuel, but these failures were limited to components such as fuel pump, flexible fuel lines, and carburetor floats. TABLE 8 summarizes the vehicle and component failures reported during the demonstration program that were believed to be related to the use of M85 fuel.

**TABLE 8. Fuel-Related Vehicle and Component Failures**

| <u>Vehicle/Engine</u> | <u>Fleet Site</u>     | <u>Component Failed</u>                                                               |
|-----------------------|-----------------------|---------------------------------------------------------------------------------------|
| GM/L-4 and V-6        | Presidio and Fort Ord | All fuel level sending units provided during initial conversion by BofA.              |
| GM/L-4                | Presidio and Fort Ord | All flexible fuel lines furnished with L-4 conversion by BofA.                        |
| GM/L-4                | Presidio              | Two fuel pumps after 4,900 and 17,700 miles operation on M85. First BofA conversions. |
| Chrysler/I-4          | SARPMA                | Two fuel level sending units. Initial Chrysler conversion.                            |
| Ford/I-4              | Sierra Army Depot     | Two carburetor floats returned to Ford under warranty.                                |
| Chrysler/I-4          | SARPMA                | All carburetor floats replaced with floats having smaller pivot bearing width.        |
| Chrysler/I-4          | SARPMA                | One carburetor float replaced due to leak in plastic float.                           |

One stock fuel pump failed and was replaced on a Chevrolet Citation V-6 after 64,010 miles (approximately 45,700 miles using M85) at the Presidio of San Francisco. Upon inspection of this pump, it was determined that it was a mechanical failure of a metal rod that operated the diaphragm, and, therefore not considered to be methanol fuel related.

The Chrysler vehicles operated by SARPMA did not have a specific failure in this case, but hot-start problems were encountered when the ambient temperature was above approximately 80°F (27°C). This problem was corrected by replacing the engine-mounted fuel pumps with low-pressure in-tank electric fuel pump assemblies (which also corrected the fuel level sending unit problem encountered earlier), and adding a 10-minute run-on electric radiator fan at the suggestion of the Chrysler project engineer. All the necessary parts needed to correct the problems encountered with the Chrysler vehicles were provided by Chrysler Engineering in an expedient manner and at no cost to the demonstration program.

## **B. Fuel Quality**

Fuel samples were taken at each of the operating sites in accordance with the detailed fuels sampling procedure presented in Appendix D. When M85 fuel was first delivered to Fort Ord early in phase II, the fuel received, which was drawn from the delivery tanker prior to unloading into the Fort Ord storage tank, did not have the appearance of a good M85 fuel sample. A two-phase sample (a light amber fluid in the top 50 percent of the sample and dark brown fluid on the bottom 50 percent) was obtained after setting for a 12-hour period on a laboratory bench. Subsequent analysis and discussions with the M85 supplier indicated that the light amber fluid was primarily methanol, and the dark brown fluid was primarily the oil carrier that the FA5 additive was mixed with prior to blending. It was at this time that the fuel supplier stated that the M85 fuel, whether blended to BofA specification or the State of California specification, was splash blended in the delivery tanker and is assumed to be mixed by the time it is delivered to customer's tank. Based upon this information, no further M85 samples from the tanker delivering the fuel were required. It was requested that when receiving M85 fuel that the fuel be recirculated within the tanker prior to unloading into the storage tank. In this manner, the sample drawn from the refueling pump 8 to 24 hours after the delivery of fuel would provide a more representative sample of the fuel being provided to that respective fleet.

Selected fuel samples from all four fleet test sites were analyzed throughout the program to determine the quality consistency of the M85 fuel used in this demonstration program. TABLE 9 presents a summary of the data obtained from these analyses. A relatively consistent methanol fuel was provided each operating site by the supplier as shown in the following tabulation:

| Fleet Site                | Methanol, vol% |      |         |
|---------------------------|----------------|------|---------|
|                           | High           | Low  | Average |
| Presidio of San Francisco | 90.4           | 84.4 | 87.2    |
| Fort Ord                  | 91.1           | 82.6 | 85.9    |
| Sierra Army Depot*        | 86.4           | 85.8 | 86.1    |
| SARPMA                    | 87.8           | 84.6 | 86.8    |

\* The 71.5 percent methanol shown for sample AL-15483 was the first delivery to a new tank that had been flushed with unleaded gasoline prior to the delivery of methanol fuel. All the gasoline had not been removed from the tank. It was estimated by Sierra personnel that approximately 200 gallons of unleaded gasoline remained in the tank after flushing.

All other values are consistent and within the specification requirement for the State of California. Even the water content, which can be a problem with methanol fuels if the fuel-handling systems are not maintained with care, shows a maximum value of 2500 ppm, well within the California specification limit of 0.5 percent.

### C. Used Oil Samples

As mentioned earlier, used engine oil samples were drawn from the engine and submitted to BFLRF for analysis. The samples were not taken in the exact sequence as requested in the lubricant sampling procedure (Appendix B), but generally in a manner that the data obtained from the samples can be used. It should be mentioned that this program was run at all four fleet sites in a manner that provided the least interference to normal mission requirements. Although the added test vehicles did provide additional transportation capabilities for the motor pool operators, it also added additional maintenance requirements to the respective maintenance

TABLE 9. Analyses of Methanol Fuel Samples From U.S. Army Methanol-Fueled Administrative Vehicle Demonstration Program

| Sample AL No. | Date     | Methanol, vol% | Gasoline, vol% | Additive, ppm | V/L   | RVP (Auto) | Specific Gravity | Saybolt Color | Copper Corrosion | Acidity, mg KOH/g | Gum, mg/100 mL<br>Unwashed Washed | Cl, % | Lead, g/gal | Sulfur, % | Phosphorus, g/gal | Water, ppm | Part. Contam., mg/L |
|---------------|----------|----------------|----------------|---------------|-------|------------|------------------|---------------|------------------|-------------------|-----------------------------------|-------|-------------|-----------|-------------------|------------|---------------------|
| 14385(a)      | 07/10/85 | 86.8           | 13.2           | 175           | 148.0 | 7.66       | 0.7909           | 13            | 1A               | 0.041             | 2.8                               | 0.001 | <0.01       | 0.002     | <0.01             | 340        | 0.2                 |
| 14393(a)      | 07/12/85 | 88.7           | 11.3           | 119           | 146.5 | 7.50       | 0.7901           | 15            | 1A               | 0.048             | 3.0                               | 0.002 | <0.01       | <0.001    | <0.01             | 370        | 0.3                 |
| 14396(a)      | 07/16/85 | 88.2           | 11.8           | 170           | 145.0 | 7.56       | 0.7905           | 13            | 1A               | 0.048             | 2.8                               | 0.001 | <0.01       | 0.002     | <0.01             | 485        | 0.4                 |
| 14433(a)      | 07/25/85 | 84.4           | 15.6           | 96            | 146.0 | 7.66       | 0.7914           | 12            | 1A               | 0.049             | 4.0                               | 0.001 | <0.01       | <0.001    | 0.002             | 441        | 0.0                 |
| 14569(a)      | 08/29/85 | 85.7           | 14.3           | 148           | -     | 5.98       | 0.7914           | 13            | 1A               | 0.045             | 1.6                               | 0.001 | <0.01       | 0.003     | 0.0004            | 247        | 0.3                 |
| 14634(a)      | 09/30/85 | 87.2           | 12.8           | 190           | 145.0 | 6.78       | 0.7909           | 6             | 1A               | 0.051             | 7.1                               | 0.001 | <0.01       | 0.007     | <0.0002           | 575        | 0.3                 |
| 14636(a)      | 09/30/85 | 88.6           | 11.4           | 273           | 148.0 | 6.82       | 0.7905           | 11            | 1A               | 0.050             | 3.0                               | 0.001 | <0.01       | 0.004     | 0.0002            | 468        | 0.1                 |
| 14638(a)      | 10/16/85 | 84.8           | 15.2           | 216           | 146.5 | 6.47       | 0.7936           | 15            | 1A               | 0.049             | 1.3                               | 0.001 | <0.01       | 0.001     | <0.0005           | 365        | 0.1                 |
| 14667(a)      | 10/21/85 | 87.6           | 12.4           | 502           | 145.0 | 6.31       | 0.7905           | 13            | 1A               | 0.048             | 2.3                               | 0.001 | <0.01       | 0.003     | <0.0005           | 354        | 0.4                 |
| 14725(b)      | 11/22/85 | 85.9           | 14.1           | 160           | -     | 8.88       | -                | 19            | 1A               | 0.049             | 4.0                               | 0.001 | <0.01       | 0.003     | <0.0005           | 319        | 0.1                 |
| 14813(a)      | 12/20/85 | 86.4           | 13.6           | 240           | 144.5 | 6.78       | 0.7896           | 12            | 1A               | 0.051             | 3.4                               | 0.001 | <0.01       | 0.003     | <0.0005           | 237        | 0.1                 |
| 14822(a)      | 01/02/86 | 87.8           | 12.2           | 210           | 140.5 | 8.46       | 0.7796           | 12            | -                | 0.042             | -                                 | 0.001 | -           | 0.001     | -                 | -          | -                   |
| 14898(b)      | 02/24/86 | 89.7           | 10.3           | 405           | 139.0 | 7.93       | 0.7887           | 13            | 1A               | 0.057             | 3.0                               | 0.001 | <0.01       | 0.004     | <0.005            | 466        | 0.9                 |
| 14927(b)      | 03/05/86 | 91.1           | 8.9            | 233           | 137.5 | 8.37       | 0.7932           | 10            | 1A               | 0.052             | 3.2                               | 0.001 | <0.01       | 0.002     | <0.005            | 76         | 0.6                 |
| 14971(b)      | 03/24/86 | 85.0           | 15.0           | 174           | 145.0 | 7.35       | 0.7865           | 10            | 1A               | 0.051             | 4.2                               | 0.001 | <0.01       | 0.003     | <0.005            | 301        | 0.8                 |
| 15145(b)      | 05/20/86 | 85.2           | 14.8           | 225           | 145.0 | 7.01       | 0.7905           | 12            | 1A               | 0.045             | 1.9                               | 0.001 | <0.01       | 0.003     | <0.005            | 501        | 0.2                 |
| 15211(a)      | 07/03/86 | 86.6           | 13.4           | 331           | 141.0 | 6.73       | 0.7927           | 6             | 1A               | 0.048             | 2.0                               | 0.001 | <0.01       | 0.002     | <0.005            | 500        | 0.2                 |
| 15481(a)      | 11/03/86 | 85.1           | 14.9           | 475           | 140.5 | 7.86       | 0.7901           | 9             | 1A               | 0.053             | 3.4                               | 0.001 | <0.01       | 0.003     | 0.0002            | 850        | 0.3                 |
| 15484(c)      | 11/06/86 | 71.5           | 28.5           | ND(e)         | 129.0 | 9.37       | 0.7822           | -9            | 1A               | 0.043             | 9.9                               | 0.001 | <0.01       | 0.006     | 0.0004            | 310        | 1.3                 |
| 15484(b)      | 11/06/86 | 84.8           | 15.2           | 64            | 142.0 | 7.31       | 0.7905           | 5             | 1A               | 0.054             | 1.7                               | 0.001 | <0.01       | 0.003     | 0.0003            | 330        | 0.5                 |
| 15619(c)      | 12/11/86 | 86.4           | 13.6           | ND            | 144.5 | 6.56       | 0.7901           | +6            | 1A               | 0.037             | 2.3                               | 0.001 | <0.01       | 0.003     | 0.0001            | 1320       | 0.1                 |
| 15730(a)      | 01/08/87 | 90.4           | 9.6            | 537           | 141.5 | 8.20       | 0.7887           | +2            | 1A               | 0.048             | 4.7                               | 0.001 | <0.01       | 0.003     | <0.0001           | 2320       | 0.1                 |
| 15775(d)      | 01/19/87 | 87.8           | 10.2           | ND            | 140.5 | 8.32       | 0.7828           | -5            | 1A               | 0.058             | 95.0                              | 0.001 | <0.01       | 0.006     | 0.001             | 2500       | 4.8                 |
| 15840(b)      | 02/09/87 | 82.6           | 17.4           | 176           | 142.0 | 7.06       | 0.7887           | +16           | 1A               | 0.041             | 2.1                               | 0.001 | <0.01       | 0.003     | 0.0002            | 396        | 0.2                 |
| 15979(c)      | 04/07/87 | 85.8           | 12.2           | ND            | 147.0 | 6.69       | 0.7918           | +8            | 1A               | 0.048             | 1.6                               | 0.001 | <0.01       | 0.003     | 0.0005            | 2110       | 0.3                 |
| 15994(b)      | 04/13/87 | 84.9           | 15.1           | 171           | 144.0 | 7.47       | 0.7901           | +15           | 1A               | 0.046             | 2.2                               | 0.001 | <0.01       | 0.002     | 0.0003            | 530        | 0.3                 |
| 16055(d)      | 05/11/87 | 87.8           | 10.2           | ND            | 146.0 | 6.66       | 0.7941           | -9            | 1A               | 0.034             | 1.6                               | 0.001 | <0.01       | 0.006     | 0.0003            | 2010       | 0.5                 |
| 16057(b)      | 05/14/87 | 85.2           | 14.8           | 413           | 142.5 | 7.54       | 0.7949           | +2            | 1A               | 0.043             | 2.6                               | 0.001 | <0.01       | 0.003     | 0.0001            | 1970       | 1.6                 |
| 16248(d)      | 07/13/87 | 84.6           | 13.4           | ND            | 147.0 | 7.43       | 0.7954           | -5            | 1A               | 0.014             | -                                 | 0.001 | <0.01       | 0.004     | 0.0001            | 134        | 0.1                 |
| 16261(b)      | 07/20/87 | 85.0           | 15.0           | 291           | 143.0 | 7.76       | 0.7874           | +8            | 1A               | 0.024             | 2.7                               | 0.001 | <0.01       | 0.003     | 0.0001            | 670        | 0.6                 |
| 16465(d)      | 08/11/87 | 87.3           | 10.7           | ND            | 143.5 | 7.36       | 0.7923           | 2             | 1A               | 0.018             | 2.2                               | 0.001 | <0.01       | 0.003     | 0.0003            | 900        | 0.5                 |
| 17709(d)      | 06/01/88 | 86.7           | 11.3           | ND            | 139.5 | 7.29       | 0.7927           | 0             | 1A               | 0.031             | 4.5                               | 0.004 | <0.01       | 0.004     | 0.0002            | 1340       | 0.8                 |

(a) From the Precidio of San Francisco  
 (b) From Fort Ord  
 (c) From Sierra Army Depot  
 (d) From SARPMA, contains 2% toluene  
 (e) ND denotes none detected

units. Therefore, missed oil samples and some extended operating periods between oil changes must be expected with this type program.

Over 700 used oil samples were received and analyzed. The data obtained were added to the used engine oil data base summary presented in the Appendix E. Data in Appendix E are assembled and presented in the order of USA vehicle number. Although some oil deterioration is evident from the viscosity and the total acid and base numbers, no significant oil deterioration was noted except for approximately six samples received from Sierra Army Depot during the first winter of operation with ambient temperatures down to 0°F (-18°C). These used oil samples showed excessive fuel and water dilution, which was not unexpected since short trips and cold weather combine to produce excessive fuel and water dilution even in gasoline-fueled engines. Sierra Army Depot was advised by telephone to change oil in each of these cars immediately before accumulating additional miles, and no other problems were noted.

Engine wear rates were monitored by analyzing each used oil sample for iron, lead, copper, tin, aluminum, and nickel debris using the Inductively Coupled Plasma (ICP) technique. Wear metal data for each individual sample are also presented in Appendix E. A summary of the average wear rates for the six metals, in ppm per 1000 miles, is presented in TABLE 10. Due to the fact that wear is a random occurrence, and unexplained anomalies can occur, it is believed that the overall average wear rates shown in TABLE 10 represent a fair comparison of the wear obtained from similar engines when using gasoline or M85. It will be noted in TABLE 10 that larger average wear rate values were, for the most part, obtained when using M85 fuel. It should be pointed out that the wear rates obtained using gasoline at Fort Ord are probably somewhat higher than would be expected in normal gasoline service since both sets of data (for the General Motors L-4 and V-6 operating on gasoline) include the break-in period. Further, the approximate five times wear factor shown for the Chrysler I-4 when operating on M85 is no doubt due to the fact that the new methanol engines supplied by Chrysler were broken-in on M85 fuel as part of this operating fleet. The relatively high nickel wear rate shown for the V-6 gasoline engines at Fort Ord (27.1 ppm/1,000 miles) is a result of very high wear during the first oil change period during break-in. For example, baseline vehicle CM2884 showed 340-ppm nickel after the first 2,588 miles, while only 20-ppm nickel was generated during the next 13,007 miles.

TABLE 10. Average Wear Rates for Six Wear Metals  
From Used Oil Analyses by ICP

| Manufacturer              | Engine | Fuel    | Average Wear Rate, ppm/1000 miles |      |      |     |      |      | Wear Factor<br>M85/Gas |       |
|---------------------------|--------|---------|-----------------------------------|------|------|-----|------|------|------------------------|-------|
|                           |        |         | Fe                                | Pb   | Cu   | Sn  | Al   | Ni   |                        | Total |
| PRESIDIO OF SAN FRANCISCO |        |         |                                   |      |      |     |      |      |                        |       |
| General Motors            | L-4    | Gas (a) | 12.2                              | 7.3  | 7.0  | 1.0 | 1.4  | 0.2  | <div>29.1</div>        | 3.1   |
| General Motors            | L-4    | M85     | 28.5                              | 31.5 | 19.5 | 5.8 | 2.2  | 2.2  | <div>89.7</div>        |       |
| General Motors            | V-6    | M85     | 32.6                              | 40.4 | 5.1  | 4.4 | 2.2  | 2.0  | 86.7                   |       |
| FORT ORD                  |        |         |                                   |      |      |     |      |      |                        |       |
| General Motors            | L-4    | Gas     | 11.4                              | 35.4 | 15.8 | 6.3 | 1.0  | 9.0  | <div>78.9</div>        | 1.5   |
| General Motors            | L-4    | M85     | 42.0                              | 46.8 | 11.1 | 7.4 | 3.4  | 5.6  | <div>116.3</div>       |       |
| General Motors            | V-6    | Gas     | 25.6                              | 22.7 | 11.3 | 5.8 | 2.2  | 27.1 | <div>94.7</div>        | 1.3   |
| General Motors            | V-6    | M85     | 51.0                              | 52.1 | 7.8  | 7.3 | 3.3  | 2.0  | <div>123.5</div>       |       |
| Ford Motor Co.            | I-4    | M85     | 32.7                              | 16.8 | 1.4  | 0.8 | 5.4  | 0.4  | 57.5                   |       |
| SIERRA ARMY DEPOT         |        |         |                                   |      |      |     |      |      |                        |       |
| Ford Motor Co.            | I-4    | M85     | 47.0                              | 10.0 | 5.8  | 0.4 | 6.1  | 0.2  | 69.5                   |       |
| RANDOLPH AIR FORCE BASE   |        |         |                                   |      |      |     |      |      |                        |       |
| Chrysler Corp.            | I-4    | Gas     | 4.8                               | 3.4  | 3.0  | 1.3 | 2.1  | 0.1  | <div>14.7</div>        | 4.7   |
| Chrysler Corp.            | I-4    | M85     | 23.7                              | 14.0 | 8.3  | 2.9 | 19.7 | 0.4  | <div>69.0</div>        |       |
| Avg. Wear Factor =        |        |         |                                   |      |      |     |      |      | 2.6                    |       |

(a) Unleaded Gasoline

When the total average wear debris, shown in TABLE 10, obtained using M85 fuel is divided by the equivalent engine wear data for unleaded gasoline (boxed-in values in TABLE 10), the overall wear factors for the four sets of data are obtained and are shown in TABLE 10 and summarized below.

|                                         | <u>Wear Factor<br/>M85/Gas</u> |
|-----------------------------------------|--------------------------------|
| The Presidio, L-4 engines (89.7 + 29.1) | 3.1                            |
| Fort Ord, L-4 engines (116 + 78.9)      | 1.5                            |
| Fort Ord, V-6 engines (123.5 + 94.7)    | 1.3                            |
| Air Force, I-4 engines (69.0 + 14.7)    | 4.7                            |
| Average                                 | 2.6                            |

Therefore, from the average used oil wear metals data, methanol fuel appears to increase the overall wear rate by 2.6 times that obtained using unleaded gasoline.

#### D. Inspection and Measurements of Selected Engines

Upon completion of the operational portion of the program, the following vehicles were transported to BFLRF. The engines were removed, inspected, selected parts photographed, and measurements taken of certain wear areas in the engines:

| <u>Vehicle<br/>No.</u> | <u>Fleet<br/>Site</u> | <u>Engine</u> | <u>Operational<br/>Fleet</u> |
|------------------------|-----------------------|---------------|------------------------------|
| CM3613                 | Presidio              | GM L-4        | M85                          |
| CM3614                 | Presidio              | GM V-6        | M85                          |
| CM3616                 | Presidio              | GM V-6        | M85                          |
| CM2879                 | Fort Ord              | GM L-4        | M85                          |
| CM2883                 | Fort Ord              | GM L-4        | M85                          |
| CM2884                 | Fort Ord              | GM V-6        | Gasoline                     |
| CM2885                 | Fort Ord              | GM V-6        | Gasoline                     |
| CM2889                 | Fort Ord              | GM V-6        | M85                          |
| CM2890                 | Fort Ord              | GM L-4        | Gasoline                     |
| CM2895                 | Fort Ord              | GM V-6        | M85                          |
| CN0438                 | Fort Ord              | Ford I-4      | M85                          |
| CN0440                 | Fort Ord              | Ford I-4      | M85                          |
| CN0545                 | Sierra                | Ford I-4      | M85                          |
| CN0547                 | Sierra                | Ford I-4      | M85                          |

The measurements taken from each of the aforementioned engines are presented in Appendix F. The inspections, conducted using the CRC rating procedure, are shown in Appendix G. The color photographs taken of selected engine parts from each engine are on file at Belvoir RDE Center, STRBE-VF.

Vehicle CM3615, assigned to the Presidio of San Francisco, was wrecked after accumulating a total of 41,300 miles (25,120 miles using M85 fuel) and not returned to service. The L-4 engine was removed by Presidio personnel and shipped to BFLRF, where it was inspected and measured. The data from this engine are also included in Appendices F and G. Measurements data, photographs, crankshaft, rod bearings, and the piston rings from this engine were shown to General Motors Research staff members. They commented that the parts were in good condition considering the number of miles accumulated on the engine. They stated that they had seen much more wear, pitting, or corrosion on parts from other engines with much less M85 service history. It was hypothesized that the 16,185-mile break-in period using unleaded gasoline prior to being converted to use M85 fuel significantly reduced subsequent wear in that engine when using M85 fuel from that normally expected using M85 with no break-in on gasoline. It was decided early in the program that selected engines would be inspected for indications of any gross wear areas at the end of the operational portion of the demonstration program. When the engines were torn down, it was decided to attempt to quantify the wear measurements obtained by comparing them with the respective manufacturers published production specifications (included in each manufacturers shop manual for specific engines and vehicles). It is realized that this method is not the best way to indicate actual wear, since wear could occur during operation of the engine, and the final measured dimension could still be below the manufacturer's specification limit, thereby indicating no wear.

Most of the wear noted from the measurements presented in Appendix F appears to be ring wear, as indicated by compression ring gap increases, and valve guide wear, as indicated by increases in valve stem to guide clearances. TABLE 11 was prepared to compare the indications of wear between gasoline engines and M85 engines, and also between the measurements taken at the end of test and the iron content of the used oil samples. Iron content was used since the major wear areas appear to be primarily on iron or steel items.

**TABLE II. Average Ring Gap and Valve Stem to Guide Clearance Measurements Compared With Iron Content of Used Oil Samples Taken**

| Increase Over Specification Limit |                   |         |      |                                |                                         |        |                                                  |         |                                        |
|-----------------------------------|-------------------|---------|------|--------------------------------|-----------------------------------------|--------|--------------------------------------------------|---------|----------------------------------------|
| Engine                            | Fleet Site        | Vehicle | Fuel | Mileage<br>Using<br>Noted Fuel | Average<br>Compression<br>Ring Gap, in. |        | Average Valve<br>Stem to Guide<br>Clearance, in. |         | Iron Content,<br>ppm<br>per/1000 Miles |
|                                   |                   |         |      |                                | Top                                     | Bottom | Intake                                           | Exhaust |                                        |
| GM L-4                            | Presidio          | CM3613  | M85  | 45,151                         | 0.0092                                  | 0.0018 | 0.0002                                           | 0.0000  | 35.6                                   |
|                                   |                   | CM3615  | M85  | 25,120                         | 0.0060                                  | 0.0085 | 0.0000                                           | 0.0000  | 15.7                                   |
| GM V-6                            | Presidio          | CM3614  | M85  | 45,010                         | 0.0103                                  | 0.0053 | 0.0002                                           | 0.0013  | 21.0                                   |
|                                   |                   | CM3616  | M85  | 30,613                         | 0.0068                                  | 0.0020 | 0.0005                                           | 0.0011  | 25.6                                   |
| GM L-4                            | Fort Ord          | CM2879  | M85  | 12,295                         | 0.0000                                  | 0.0000 | 0.0000                                           | 0.0000  | 13.2                                   |
|                                   |                   | CM2883  | M85  | 14,752                         | 0.0000                                  | 0.0000 | 0.0000                                           | 0.0000  | 42.3                                   |
| GM V-6                            | Fort Ord          | CM2890  | Gas  | 18,725                         | 0.0000                                  | 0.0000 | 0.0000                                           | 0.0000  | 13.6                                   |
|                                   |                   | CM2889  | M85  | 10,905                         | 0.0038                                  | 0.0028 | 0.0004                                           | 0.0005  | 116.8                                  |
|                                   |                   | CM2895  | M85  | 17,796                         | 0.0040                                  | 0.0038 | 0.0003                                           | 0.0021  | 52.8                                   |
|                                   |                   | CM2884  | Gas  | 15,595                         | 0.0003                                  | 0.0022 | 0.0005                                           | 0.0029  | 30.1                                   |
| Ford I-4                          | Fort Ord          | CM2885  | Gas  | 18,147                         | 0.0002                                  | 0.0000 | 0.0001                                           | 0.0007  | 23.3                                   |
|                                   |                   | CN0438  | M85  | 23,680                         | 0.0175                                  | 0.0198 | 0.0010                                           | 0.0028  | 25.2                                   |
| Ford I-4                          | Sierra Army Depot | CN0440  | M85  | 23,847                         | 0.0128                                  | 0.0172 | 0.0004                                           | 0.0008  | 44.9                                   |
|                                   |                   | CN0545  | M85  | 24,873                         | 0.0110                                  | 0.0165 | 0.0016                                           | 0.0025  | 49.3                                   |
|                                   |                   | CN0547  | M85  | 26,609                         | 0.0140                                  | 0.0167 | 0.0008                                           | 0.0010  | 32.6                                   |

Wear measurements obtained from engines using gasoline were compared with those using M85, the GM V-6 engines at Fort Ord. TABLE 11 shows a significant increase in ring and valve guide wear when using M85 fuel. In addition, the iron content, in ppm per 1,000 miles, appears to be a reasonable indicator of relative wear between the M85 and gasoline engine figures, but not between the two M85 GM V-6 engines. The same is not true for the GM L-4 engines at Fort Ord. In fact, looking at iron content, vehicle CM2879 indicates slightly less wear using methanol fuel than CM2890 does using gasoline. Although none of the data in TABLE 11 appears to be out of line, considering the relatively small mileage accumulations on most of the vehicles, it is apparent that even a general correlation between the indicated wear (by measurement) and that shown for iron content from used oil samples does not exist.

The inspected engines were rebuilt with new piston rings, connecting rod bearings, and crankshaft main bearings. The GM L-4 and V-6 engines were converted back to gasoline by replacing the throttle body fuel injectors in the L-4 engines and the carburetors on the V-6 engines. New spark plugs, of the correct heat range, were installed in all the converted engines. The engines were replaced in their respective vehicles and returned to their assigned fleet site.

The Chrysler M85 engines were removed from the vehicles and sent to Chrysler Engineering, where they were torn down and measured. The following tabulation identifies the vehicle from which the engines were removed at the mileage accumulation shown:

| <u>Chrysler<br/>Engine No.</u> | <u>Vehicle</u> | <u>Miles<br/>Accumulated<br/>Using Engine</u> |
|--------------------------------|----------------|-----------------------------------------------|
| EX165                          | X79116         | 14,200                                        |
| EX166                          | X79115         | 13,377                                        |
| EX167                          | X79118         | 14,729                                        |
| EX168                          | X79117         | 14,319                                        |

The following comments were received from the Chrysler senior engine development engineer responsible for inspecting the engines. For the most part, the engines appeared to be in good condition following their testing. However, some components did show higher than expected wear for the mileage accumulated. TABLE 12 summarizes the findings.

**TABLE 12. Component Wear for Chrysler M85 Engines**

| Component                | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Piston                   | Negligible wear.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Piston Rings             | The rings all showed a high amount of wear. The special chrome top rings had medium to high wear with engine number EX166 being the worse case with a 0.0087 in. (0.220 mm) gap increase when 0.008 in. (0.203 mm) maximum is the Chrysler standard. The second rings were not out of specification, but did show high wear for the mileage. Engine number EX168 was the worse case with a 0.0075 in. (0.191 mm) gap increase. The oil rings showed the highest amount of wear with engines EX166 and EX168 having radial wall thickness decreases of 0.0047 in. (0.120 mm) and 0.0024 in. (0.060 mm). The Chrysler standard is 0.0015 in. (0.038 mm) maximum. |
| Piston Pin               | The piston pin wear was on the high side of the Chrysler standard for wear with engine EX168 being the highest at 0.0005 in. (0.012 mm) wear.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Piston Pin Bore          | The wear on the pin bore was high for the vehicle mileage, but none of the engines was out of specification.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Crankshaft Main Journal  | No significant wear.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Crankshaft Main Bearings | Medium to low wear. Engine EX166 did exhibit wear equal to Chrysler's standard of 0.0002 in. (0.005 mm).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Connecting Rod Journal   | No significant wear.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Connecting Rod Bearing   | No significant wear.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Camshaft Journal         | High camshaft journal wear. Chrysler's standard for maximum wear is 0.0001 in. (0.003 mm) and both engines EX165, 0.0002 in. (0.005 mm) and EX166, 0.0004 in. (0.009 mm) exceeded that standard.                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Camshaft Bearing Area    | No significant wear.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Exhaust Valve            | All the wear data for the stem were well below the Chrysler standard. The valve face and seat runout data were also acceptable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Intake Valve             | Chrysler's standard for the stem wear is zero wear. All the intake valve stems showed some wear, with the highest on engine EX165 at 0.0003 in. (0.008 mm). The valve face and seat runout data were also acceptable.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Exhaust Valve Guide      | Higher than desired valve guide wear was seen on all the engines, but only engine EX165 was out of the Chrysler standard of 0.0040 in. (0.102 mm) maximum. This engine had 0.0056 in. (0.143 mm) wear.                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Intake Valve Guide       | Average wear for the mileage.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

All other components were in acceptable condition. All the valve seals were in excellent condition as were the rotating shaft seals. All the gasket sealing surfaces were in very good condition and all of the fastener torques were in their acceptable ranges.

## **E. Disposition of Fleet Vehicles and M85 Equipment**

### **1. Fleet Vehicles**

Following the teardown and inspection of the selected vehicles at BFLRF, new carburetors, fuel injectors, and spark plugs were purchased by BFLRF and used to reconvert the GM L-4 and V-6 engines back to use unleaded gasoline. In addition, new carburetors, fuel injectors, spark plugs, and written reconversion instructions were forwarded to Fort Ord to allow its maintenance personnel to reconvert all but one L-4 S-10 pickup and one V-6 Citation back to use unleaded gasoline. These two vehicles were the ones used at JPL for the engineering evaluations and later returned to the CARB Laboratory in El Monte, CA, for an additional emission test. Sierra Army Depot had expressed an interest in continuing to operate the Ford vehicles, which cannot easily be converted to use gasoline, in their regular transportation motor pool assignment. Therefore, the five Ford Escorts, one L-4 S-10 pickup, and one V-6 Citation were transferred to Sierra Army Depot where they will continue operation as M85 vehicles.

The Chrysler K-cars were returned to the Air Force (the SARPMA motor pool) after replacing the special Chrysler M85 engines with the original 2.2-liter gasoline engines removed earlier in the program.

### **2. M85 Equipment**

Since Sierra Army Depot was the only post still using M85 fuel, all the M85 special equipment, pumps, tanks, including the 1200-gallon TPU unit at Fort Ord, hoses, dispensing nozzles, etc., were transferred to Sierra Army Depot for its use and storage.

The four M85 Chrysler engines are currently at Chrysler Engineering in Detroit, MI.

## VII. RELATED EVALUATIONS

### A. Chemical Analysis of Fuel Methanols

Congressional language in Section 202 of Public Law 98-525 also mandated that at least 50 percent of the methanol to be used in the tests should be derived from nonpetroleum sources. Therefore, a sample of methanol produced from coal was obtained for analysis. However, no coal-derived methanol was being commercially produced for use in the program; therefore, it was decided to use natural gas-derived methanol, which was commercially available. As a result, two samples of fuel methanols, one a coal-derived product and the other a natural gas-derived product, were obtained for analysis. Methanol derived from natural gas was assigned sample number AL-14737-F, while the methanol produced from coal was assigned sample number AL-14571-F. The fuel samples were analyzed for trace contaminants considered possible based on the chemical processes involved in production and those contaminants that may be present from shipping and handling. TABLE 13 presents the results of these analyses. The differences between the two samples are not considered to be significant. The higher zinc content sample, AL-14571, was received in a steel can, while sample AL-14337-F was received in glass containers. The container could account for the higher zinc content if the can were slightly zinc coated. The two samples were examined using gas chromatography and gas chromatography/mass selective detection. Both methanol samples were considered to be very pure, with only the coal-derived sample having 15 ppm of ethanol present. No contamination was detected that would affect the use of either methanol as a fuel for automotive engines. Detailed results of this investigation were reported earlier in Reference 3.

### B. Cold-Start Evaluations

#### 1. Laboratory Cold-Start Tests

During this part of the program, four Chevrolet S-10 pickups were transported to BFLRF and tested for cold starting performance. Two pickups were gasoline-fueled baseline vehicles, with one L-4 engine and one V-6 engine; two pickups were M85-fueled test vehicles, also with

TABLE 13. Analysis of Fuel Methanol for Trace Contaminants

| Determination                    | Test Method | Coal-Derived Methanol (AL-14571-F) | Petroleum-Derived Methanol (AL-14737-F) | Limits of Detection |
|----------------------------------|-------------|------------------------------------|-----------------------------------------|---------------------|
| Water, Karl Fischer, wt%         | D 1749      | 0.023                              | 0.049                                   | 0.001               |
| Nitrogen, Chemiluminescence, ppm | D 4629      | <5                                 | <5                                      | 5                   |
| Titrateable Acid, meq/g          | D 664       | 0.0003                             | 0.00004                                 |                     |
| Phosphorus, g/L                  | D 3231      | ND*                                | ND                                      | 0.001               |
| Sulfur, microcoulometric, ppm    | D 3120      | ND                                 | ND                                      | 10                  |
| Chlorine, microcoulometric, ppm  | D 3120      | ND                                 | ND                                      | 10                  |
| Trace Metals, ppb                | AAS**       |                                    |                                         |                     |
| Cr                               |             | ND                                 | ND                                      | 5                   |
| Cu                               |             | 2.5                                | 12                                      | 5                   |
| Zn                               |             | 130                                | 10                                      | 5                   |
| Si                               |             | ND                                 | ND                                      | 10                  |
| Mg                               |             | ND                                 | ND                                      | 5                   |
| Al                               |             | ND                                 | ND                                      | 5                   |
| Na                               |             | ND                                 | ND                                      | 125                 |
| Pb, g/L                          | AAS         | ND                                 | ND                                      | 0.001               |

\*ND = None Detected.

\*\*AAS = Atomic Adsorption Spectroscopy

one L-4 engine and one V-6 engine. Both L-4 engines were 2.5-liter throttle body fuel-injected engines, while the 2.8-liter V-6 engines were both carbureted engines. Details of this laboratory program are reported in Reference 4.

All vehicles were tested in a refrigerated trailer capable of maintaining temperatures of ambient to 0°F (-18°C). Both gasoline vehicles started satisfactorily at temperatures of 0°F. The methanol vehicles were tested using M85 fuel, M82 fuel, SAE 40 engine oil, 10W-30 engine

oil, and, in one case, with a block heater. The V-6 engine started easier at lower temperatures than the L-4 engine. This easier starting was credited to the standard heated grid installed under the carburetor on the V-6, and the ability of the operator to control the initial mixture by using the accelerator pump on the V-6.

As shown in TABLE 14, useful minimum unaided starting temperature for the V-6 engine was approximately 20°F (-7°C) and 45°F (7°C) for the L-4 using M85 fuel and an SAE 40 engine oil. The use of M82 fuel lowers the starting temperatures by about 10 degrees for both engines. The L-4 engine was started successfully at 0°F using an electric heater installed in the cooling system.

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**TABLE 14. Results of Laboratory Cold-Start Tests**  
 [Control Vehicles (Gasoline) Started at 0°F with SAE 40 Viscosity Grade Oil;  
 Possibly Lower (Limit of Refrigeration Equipment)]

| Lubricant                            | Approximate Minimum* Starting Temperatures, °F |            |
|--------------------------------------|------------------------------------------------|------------|
|                                      | L-4                                            | V-6        |
| M85, SAE 40 Lube                     | 48                                             | 18         |
| M85, 10W-30 Lube                     | 37                                             | 19         |
| M82, 10W-30 Lube                     | 25                                             | 10         |
| M85, 10W-30 Lube<br>& Coolant Heater | <0                                             | Not Tested |

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\*Vehicles may start at lower temperatures with cranking times greater than 45 seconds.

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## 2. Field Evaluation of Cold-Starting Capabilities

The cold-start capabilities of M85 engines were monitored from the actual operating histories of twenty Ford Escorts operated at the Sierra Army Depot during December 1986 through February 1987. During that period, seventeen no-starts were reported during days when the low ambient temperature ranges from 4°F (-16°C) to 30°F (-1°C). Twelve of the 17 reported no-starts were recorded for four specific vehicles, which indicates possible engine tune

problems, and/or lack of operator experience in the starting peculiarities of methanol-fueled vehicles. During this same time period, operational data from the remaining Ford Escorts show satisfactory starts and operation for a total of 105 vehicle dispatch days. In addition, 83 satisfactory vehicle dispatch days were recorded for the Ford Escorts when the low ambient temperatures of 0°F (-18°C) to 6°F (-14°C) were recorded. In general, satisfactory cold startability evaluations were more than demonstrated with operation of these vehicles. It should be noted that these vehicles performed satisfactorily even though they were using the special Ford Motorcraft SAE 20W-40 oil, which is not generally intended for use in cold weather environments. An SAE 10W-30 oil would have been the preferred viscosity grade for this environment, but was not available at that time from the Ford Methanol Group.

### **C. Methanol Refueling Stations**

Phase I of the demonstration program was conducted at the Presidio of San Francisco using four M85 vehicles. JPL arranged to borrow a 500-gallon steel tank with a small electric pump and meter mounted on top of the tank from BofA. The tank-and-pump assembly was mounted on a flat bed truck such that the pump could be disconnected from the 120V power source and the truck driven to a BofA refueling station to be refilled with BofA specification fuel. The use of the BofA refueling unit was continued during Phase II of the demonstration program at the Presidio. New M85 refueling stations were installed at Fort Ord, Sierra Army Depot, and SARPMA by BFLRF. It was originally believed that an empty, in-ground steel fuel tank would be made available at Fort Ord for M85 use. In order to get the M85 portion of the demonstration program underway at Fort Ord, a 1000-gallon, double-walled steel tank with a California vapor return system was installed above ground. The double-walled tank was used to satisfy a regulation that requires a secondary retainment system necessary for all new fuel tank installations. A standard Tokheim, model 785-PR, service station-type pump and meter was modified by Shields, Harper Company, the pump supplier, to make all of the fuel-wetted pump parts compatible with M85. (Shields, Harper Company also supplies M85 fuel-dispensing pumps to the California Energy Commission for use in its M85 dispensing stations.) They did not disclose the details of all the modifications required except to say that some parts would require nickel plating and all of the gaskets and elastomers were replaced with Teflon®. M85-compatible dual vapor-return dispensing hose and filling nozzle was also required for the installation. Fig. 5 shows the M85 dispensing station at Fort Ord.

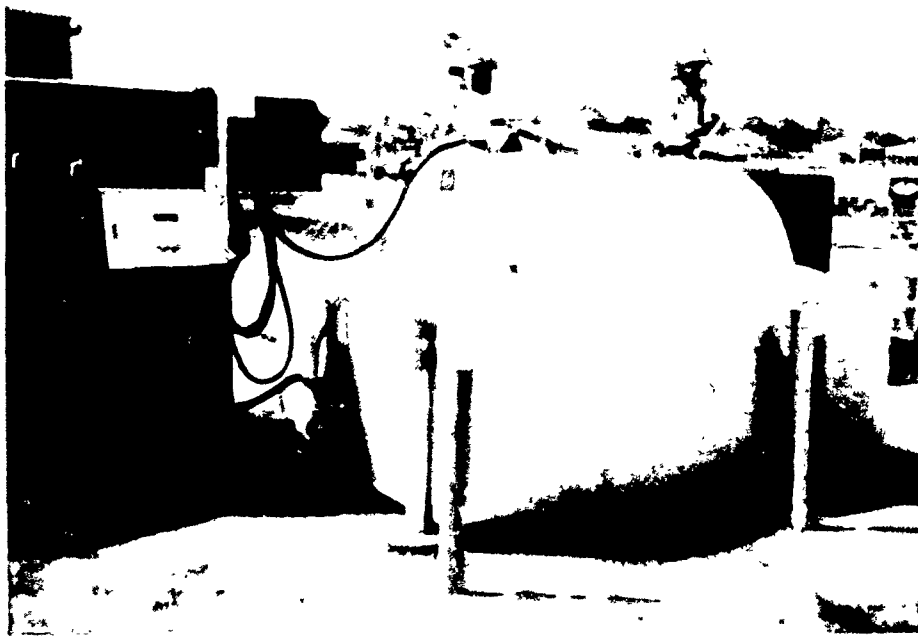


**Figure 5. M85 dispensing station at Fort Ord**

The in-ground tank originally thought to be available to the demonstration program was needed for other Fort Ord requirements and could not be used for the demonstration program. Belvoir Research, Development and Engineering Center formulated two solutions to this refueling deficiency--one short-term and one long-term. Both solutions utilized the standard 600-gallon aluminum fuel pod. A single-pod, gravity-feed fuel dispenser was quickly assembled at Belvoir RDE Center and shipped to Fort Ord. This dispenser used a single Buna-N hose mounted to a conventional service station nozzle. A totalizer and filter were also installed. Designed to mount on the back of a truck or on an elevated platform, the fuel dispenser could deliver fuel at the rate of 6 gpm. This apparatus was used for only a short time until more permanent equipment could be prepared. Belvoir RDE Center obtained three military Tank-and-Pump Units (TPUs)--truck-mounted refueling units intended for aircraft and ground equipment refueling at rates up to 50 gpm. Although TPUs usually contain two 600-gallon pods each, one of these units had only one. The TPUs were modified by a contractor (VSE Corp.) to be fully compatible with M85 and to dispense fuel at service station rates (around 12 gpm). All the elastomers had to be replaced, and new resetable totalizers and filters were installed (the TPU's Military Standard filter/separators proved unsatisfactory due to the deleterious effects of M85 on the coalescer elements). New dual hoses fabricated of Buna-N,

a vapor recovery system, and a California service station nozzle completed the redesign effort. The units were painted white to minimize the effects of solar heating. The total weight of a TPU filled with 1,200 gallons of M85 fuel exceeded the recommended load for a 5-ton truck (the military usually uses 10-ton trucks). As a result, special permission had to be granted from the personnel at Fort Ord to mount the units as shown in Fig. 6.

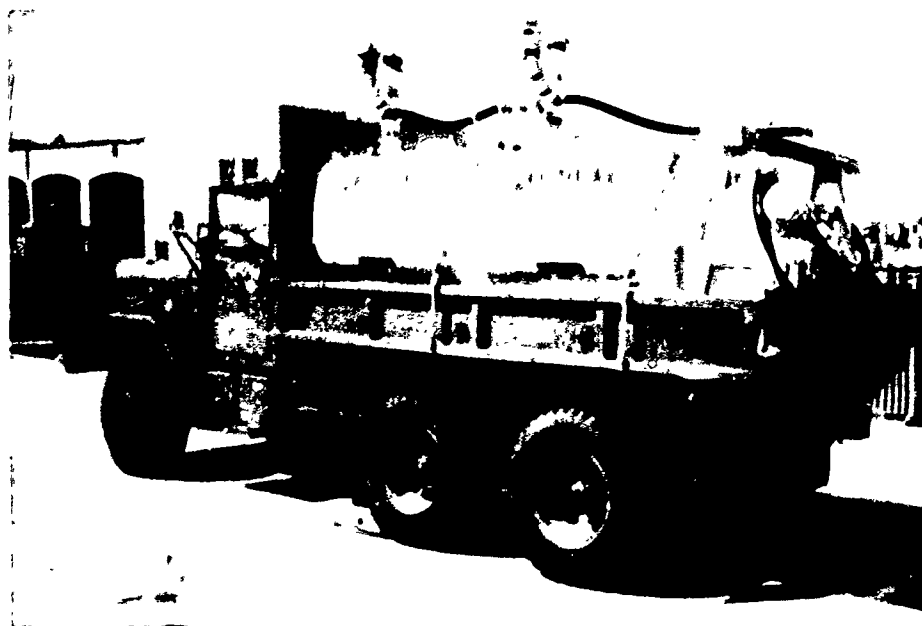


**Figure 6. Tank-and-pump unit utilized at Fort Ord**

The M85 storage and refueling facility installed at the Sierra Army Depot consisted of an above-ground 6,000-gallon, double-walled, steel tank and a modified Tokheim pump with dual, vapor-return dispensing hose and filling nozzle. Fig. 7 shows the M85 storage and refueling facility installed at the Sierra Army Depot by BFLRF. One problem arose during the purchase of the modified pump and dispensing hose and nozzle. The State of California passed a law eliminating the two-hose vapor return dispensing hose on all new fuel pumps purchased for installation in California, just prior to the Sierra Army Depot installation. All new installations were required to have a new dual-concentric hose and nozzle, and no dual-concentric hose compatible with M85 was available. The law was intended for gasoline-dispensing pumps, but no variations were allowed in the wording for the M85 fuel. After discussions with the pump supplier, the California Energy Commission, and the State of California officials, special permission was granted by the State of California to use the two-hose vapor return dispensing hose for the Sierra installation.



**Figure 7. M85 Storage and refueling facility at Sierra Army Depot**

The refueling facility installed at SARPMA was one of the 600-gallon TPU, similar in all respects but size to the unit at Fort Ord (Fig. 6), which was also furnished by Belvoir RDE Center.

#### **D. Army's Tank-and-Pump (TPU) Validation Test**

The TPUs furnished by Belvoir RDE Center for use in the M85 demonstration program were modified by a contractor to be compatible with M85 fuel prior to being shipped to Fort Ord and BFLRF.(10) However, previous work within the California Energy Commission's methanol fleet test program had surfaced an aluminum incompatibility problem with the

methanol fuel. Thus some unprotected aluminum alloys were reportedly not compatible with M85, resulting in aluminum oxide debris that will clog lines, filters, and other small passages such as one found in carburetors. Because of the chloride limitation established as a result of this incompatibility, JPL was reluctant to use the modified TPUs. Because of this concern by JPL, a validation test of a modified TPU was initiated at BFLRF to confirm the compatibility of the unit with M85.

One 600-gallon TPU unit was used in this test. To maximize potential for water condensation, the 12-week test was conducted during the summer months. Two hundred gallons of M85 fuel, blended to BofA specification, were pumped into the unshielded TPU storage tank. This

| <u>Test Weeks</u> | <u>Aluminum Content, ppb</u> |
|-------------------|------------------------------|
|-------------------|------------------------------|

|    |      |
|----|------|
| 2  | 16.6 |
| 4  | 14.6 |
| 6  | 35.0 |
| 8  | 55.0 |
| 10 | 44.0 |
| 12 | 53.0 |

fuel was circulated through the supplied flex lines and filter, using the unit pump, back to the fuel tank filler tube for 1 hour each day, except for weekends. A 1-gallon fuel sample was drawn from the bottom of the unit filter housing and analyzed for aluminum content once each 2 weeks for the 12-week period. The results of the analyses are shown in the listing on the left.

An increase in the aluminum content of the fuel samples is shown, which could possibly be attributed to corrosion of the aluminum by the M85 fuel; however, keeping in mind that the aluminum content is presented in parts per billion and that the 1-gallon sample was taken from the bottom of the filter housing after circulating the fuel for 1 hour, it was not determined to be significant.

Since the primary objection to using the aluminum tank pump unit was the effect of possible corrosion debris on plugging fuel filters, orifices, etc., in the vehicle fuel systems, the iron content of a regular M85 sample received from the Fort Ord steel storage tank and a sample from one of the vehicle fuel tanks were evaluated as a comparison:

| <u>Sample</u>               | <u>Iron Content, ppb</u> |
|-----------------------------|--------------------------|
| Fort Ord Steel Storage Tank | 2,800                    |
| Fuel Tank of CM2890         | 4,000                    |

The iron content of the two fuel samples that have caused no operational problems is considerably higher than that shown for the aluminum. Therefore, on the basis of these results, the 600-gallon TPU unit was deemed satisfactory for M85 storage.

### **E. Evaluation of Potential M85 Engine Oils**

As shown in this report, the use of methanol fuel in current administrative-type vehicles results in increased wear and corrosion to vital engine parts. One method for possibly decreasing this wear and corrosion is the use of an improved lubricant formulation to offset the deleterious actions of the M85 fuel.

In an effort to determine the best lubricant for use in future government programs, a number of organizations were invited to submit oils that they believed would provide the added protection needed for M85-fueled engines. As a result, six oils were received (TABLE 15) and evaluated in an initial test series using modified ASTM Sequence V-D cyclic test conditions. Based upon wear metal debris in the used oil samples (TABLE 16), the three best oils were selected. A second test series was conducted on these three selected oils (AL-15427-L, AL-16155-L, and AL-15610-L) using steady-state/cold test conditions. TABLE 17 presents a summary of the total net used oil wear data obtained for steady-state/cold conditions. Since the results from these three lubricants provided the same order of protection from both cyclic and steady-state/cold conditions and the normalized percent of reference oil was within approximately  $\pm 10$  percent, all three of the better lubricants were recommended for use in future government programs using M85 fuel in administrative vehicles. Details of this portion of the program are reported earlier in Reference 5.

### **F. Emission Tests**

The two GM vehicles subjected to engineering evaluation tests by JPL, one V-6 Citation and one L-4 S-10 pickup, were returned to the California Air Resources Board (CARB) laboratory in El Monte, CA, to be retested for emissions after accumulating approximately 10,000 miles on the V-6 engine using M85 fuel and 12,000 miles on the L-4 engine using M85 fuel. Fig. 8 presents a plot of the results obtained for the L-4 engine where they are compared with

**TABLE 15. Analysis of Test Oils**

| BFLRF<br>Oil Code | Viscosity at<br>40°C, cSt,<br>D 445 | Viscosity at<br>100°C, cSt,<br>D 445 | VI,<br>D 2270 | TAN,<br>D 664 | TBN,<br>D 664 |
|-------------------|-------------------------------------|--------------------------------------|---------------|---------------|---------------|
| AL-14965-L        | 136.6                               | 14.0                                 | 100           | 2.68          | 10.5          |
| AL-14966-L        | 137.8                               | 14.2                                 | 100           | 2.86          | 10.4          |
| AL-15427-L        | 72.0                                | 11.1                                 | 145           | 3.42          | 7.4           |
| AL-15610-L        | 118.2                               | 14.1                                 | 119           | 3.49          | 6.6           |
| AL-16155-L        | 82.7*                               | 10.4                                 | 104           | 2.49          | 15.0          |
| AL-16156-L        | 78.8                                | 10.0                                 | 107           | 2.45          | 14.5          |

\* This candidate oil was used as the baseline "reference" oil in both cyclic and steady-state/cold test conditions to facilitate normalization of the test results. SwRI oil code LO-12119 was used as the flush oil for all tests.

**TABLE 16. Summary of the Total Net Used Oil Wear Metal Data\* for Each Test Conducted Under Cyclic Test Conditions**

| BFLRF<br>Oil Code | Total Net,<br>Wear Metal,<br>ppm | Reference Oil<br>Comparison Data | Normalized Percent<br>of Reference Oil |
|-------------------|----------------------------------|----------------------------------|----------------------------------------|
| AL-16155-L(a)     | 19                               | --                               | --                                     |
| AL-16155-L(b)     | 116                              | 116.0                            | 100.0                                  |
| AL-14965-L        | 134                              | 116.3                            | 115.2                                  |
| AL-15427-L        | 107                              | 116.6                            | 91.8                                   |
| AL-16155-L(b)     | 117                              | 117.0                            | 100.0                                  |
| AL-16156-L        | 150                              | 115.8                            | 129.5                                  |
| AL-15610-L        | 144                              | 114.5                            | 125.8                                  |
| AL-14965-L        | 253                              | 113.2                            | 223.5                                  |
| AL-16155-L(b)     | 112                              | 112.0                            | 100.0                                  |
| AL-15427-L        | 82                               | 100.5                            | 81.6                                   |
| AL-15610-L        | 98                               | 89.0                             | 110.1                                  |
| AL-16156-L        | 104                              | 77.5                             | 134.2                                  |
| AL-16155-L(b)     | 66                               | 66.0                             | 100.0                                  |
| AL-14965-L        | 165                              | 63.0                             | 261.9                                  |
| AL-15610-L        | 82                               | 60.0                             | 136.7                                  |
| AL-14966-L        | 98                               | 57.0                             | 171.9                                  |
| AL-16155-L(b)     | 54                               | 54.0                             | 100.0                                  |
| AL-14966-L        | 63                               | 51.0                             | 123.5                                  |

\*Total net wear metal equals 24-hr sample total data less new sample total data.

(a)Test conducted using Phillips "J" unleaded gasoline. All other tests conducted using M85 methanol fuel.

(b)Reference oil test.

**TABLE 17. Summary of the Total Net Used Oil Wear Metal Data\*  
for Each Test Conducted Under Steady-State/Cold Test Conditions**

| <u>BFLRF<br/>Oil Code</u> | <u>Total Net,<br/>Wear Metal,<br/>ppm</u> | <u>Reference Oil<br/>Comparison Data</u> | <u>Normalized Percent<br/>of Reference Oil</u> |
|---------------------------|-------------------------------------------|------------------------------------------|------------------------------------------------|
| AL-16155-L(a)             | 35                                        | --                                       | --                                             |
| AL-16155-L(b)             | 341                                       | 341.0                                    | 100.0                                          |
| AL-15427-L                | 264                                       | 290.3                                    | 90.9                                           |
| AL-15610-L                | 209                                       | 239.7                                    | 87.2                                           |
| AL-16155-L(b)             | 189                                       | 189.0                                    | 100.0                                          |
| AL-15427-L                | 167                                       | 182.4                                    | 91.6                                           |
| AL-15610-L                | 240                                       | 175.7                                    | 136.6                                          |
| AL-16155-L(b)             | 169                                       | 169.0                                    | 100.0                                          |

\*Total net wear metal equals 24-hr sample total data less new sample total data.

(a) Test conducted using Phillips "J" unleaded gasoline. All other tests conducted using M85 methanol fuel.

(b) Reference oil test.

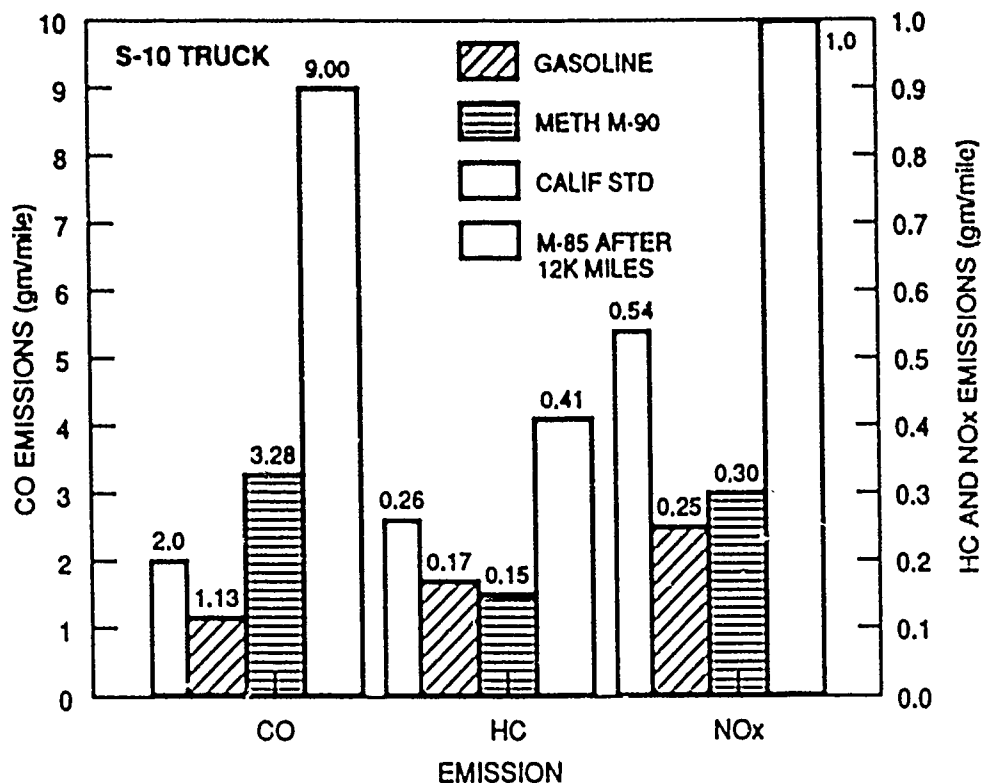


**Figure 8. Exhaust emissions comparison for the L-4 engine**

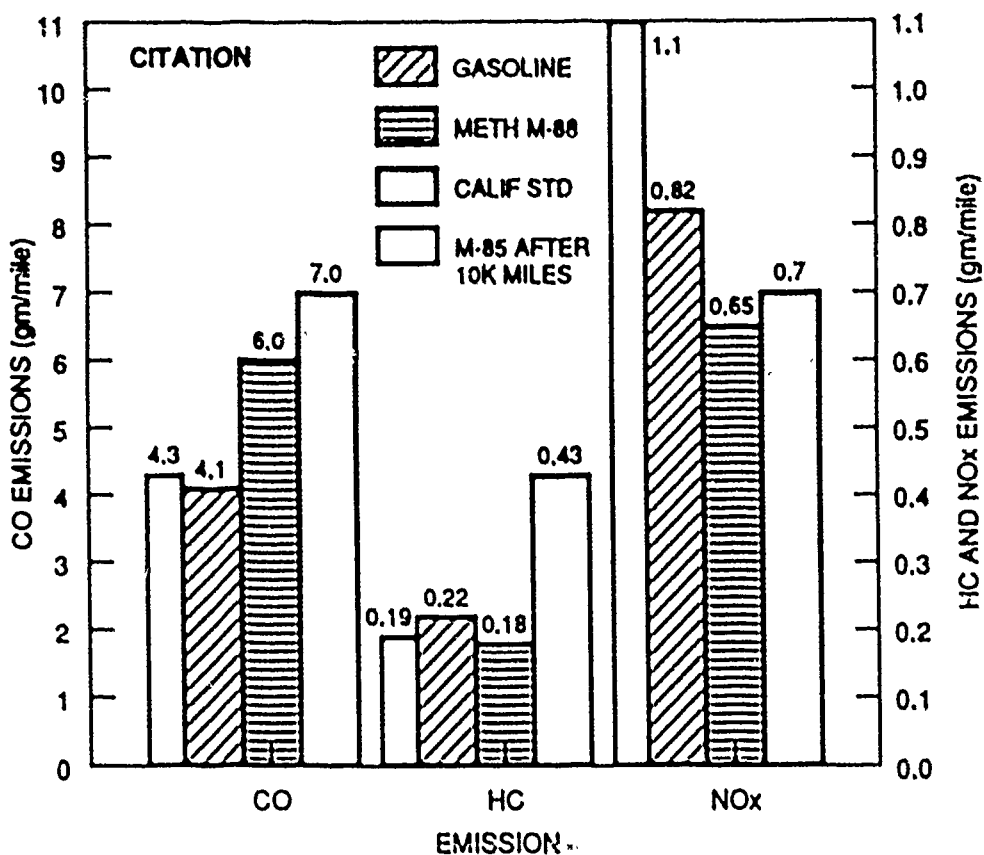


Figure 9. Exhaust emissions comparison for the V-6 engine

data presented earlier(1) by JPL during its initial engineering evaluations. The current values shown for CO, HC, and NO<sub>x</sub> are all higher than those obtained just after the engine was converted to M85, but still well within the standard California requirements. Fig. 9 presents a plot of the results obtained for the V-6 engine where they too are compared with the data presented earlier (1) by JPL. The current results show very little change for the CO and HC values; however, NO<sub>x</sub> increased from 0.82 to 1.1 g/mile. This value for NO<sub>x</sub> was above the California standard of 0.7 g/mile. No additional CARB laboratory time was available at that time, so no effort was made to correct the NO<sub>x</sub> value and return the V-6 Citation for a recheck.

## G. Economic Assessment

The extra costs to operate M85 methanol-fueled vehicles, over the costs normally allowed for operating similar vehicles on unleaded gasoline, are generally covered when the following items are considered:

- The extra cost of a vehicle manufactured to operate on M85 fuel. This extra cost can be in the order of \$2,000 per vehicle, and may be more if the vehicle is produced to operate on unleaded gasoline and M100 with no adjustments required by the operator. (\$2,000 was the added cost of each of the 1983 M85 Ford Escorts produced for the State of California.)
- If an existing vehicle/engine is to be converted to use M85, using the BofA type conversion, hardware costs are estimated to be approximately \$500, including plating the carburetor or fuel injectors, if required. In addition, it is estimated that approximately 24 hours of a senior technician's time would be required to make all the necessary changes, including reworking the carburetor fuel injectors. These changes would bring the cost of vehicle/engine conversion to approximately \$1,500 for each vehicle.
- If the M85 fuel distribution infrastructure is not in place, a refueling station system would be required. A similar installation to that used at Sierra Army Depot would be recommended to service a fleet of 20 to 40 vehicles. A 6,000-gallon, double walled, steel saddle-mounted, above-ground tank, including a California vapor recovery system will cost approximately \$9,350. The specially equipped Tokheim No. 785-PR dispensing pump with a meter and register, including all California Air Resources Board required vapor recovery system, pressure regulator valve, dispensing hoses and nozzle, will cost approximately \$1,800 installed. The total cost of the dispensing station would therefore be approximately \$11,100, assuming it was installed similar to the Sierra Army Depot system.
- Fuel Costs - M85 costs vary considerably. For example, M85 fuel cost to Fort Ord was \$0.95 a gallon plus a delivery charge of \$339.00, making a 1200-gallon (normal delivery size to Fort Ord) purchase cost \$1,479, or \$1.23 a gallon. Sierra Army Depot paid the same \$0.95 a gallon plus the delivery charge of \$339.00; however, Sierra purchased 6,000 gallons per delivery making their cost approximately \$1.01 per gallon. The State of California had a contract with the same methanol supplier used by Fort Ord and Sierra Army Depot, and its cost was reported to be approximately 0.50 per gallon plus delivery charges. The

relatively small quantities purchased by the Army compared with that purchased by the State of California was reported as being the reason for the \$0.45 less per gallon difference in the cost to the State of California.

Fort Ord was being charged \$0.84 a gallon for the unleaded gasoline.

As an example, using the cumulative miles and the cumulative miles per gallon shown in TABLE 6 for the GM vehicles operated at Fort Ord on M85 fuel, a total of 35,419 gallons of M85 was used in the 23 M85 vehicles, at a fuel cost of \$43,565. If the same miles had been accumulated using unleaded gasoline, approximately 17,076 gallons would have been required, at a gasoline cost of \$14,344. Using these same data, the fuel cost, on a per mile basis, reduces to 13[cent] per mile using M85 fuel and 4.3 cents per mile using unleaded gasoline. It can be seen that, considering the difference in the cost of the two fuels and the differences in the economies obtained with the two fuels, using M85 increases the fuel costs by a factor of approximately 3.0.

- Engine Oil Costs - The engine oil cost for an M85 engine would be estimated to be about twice that of an engine operating on unleaded gasoline since the oil change interval recommended for M85 engines is about one-half that recommended for gasoline engines.
- When total maintenance costs of an M85 vehicle are compared with those of an equivalent gasoline vehicle, the results from this demonstration program indicate that very little difference, other than increased oil change requirements, are noted after the initial bugs" are eliminated from the methanol vehicle.

#### **H. General Accounting Office (GAO) Evaluation of DOD's Methanol Vehicle Program**

In early 1986, the chairman, Subcommittee on Energy and Power under the Committee on Energy and Commerce, tasked the General Accounting Office (GAO) to evaluate the Army's progress towards achieving the goals of the DOD Methanol-Fueled Administrative Vehicle

Demonstration Program. During subsequent months, GAO representatives interviewed a variety of Army personnel as well as personnel from JPL, BFLRF, California Energy Commission (CEC), and Bank of America. The resulting GAO report (11) was somewhat critical of the DOD program in drawing several inappropriate conclusions. Major points were:

- Objective of the demonstration effort was not to "stimulate" industry to produce methanol-compatible cars, but merely to demonstrate feasibility in utilizing existing technology within a military environment.
- Mileage accumulation of test vehicles proceeded slower than planned because of problems with fuel tank sender units supplied by BofA (i.e., drivers were hesitant to operate vehicles), the cooperative nature of this demonstration (i.e., using nondedicated drivers and vehicles), and unrealistic mileage accumulation goals initially established at the program's onset.
- Procurement of 1000 cars was never identified in DOD Authorization Bill as a goal.

The GAO report also questioned the ability to assess engine durability. The GAO criticism was based upon the sampling of vehicles and the anticipated accumulated mileage. It should be clearly understood that the DOD program was always intended to be a demonstration and not a designed test experiment. Further, the DOD program was initiated using essentially a conversion technology developed and "fielded" by BofA, which had accrued considerable mileage and experience in its methanol fuel fleet operation. The expansion of the DOD program to include the Ford Escorts again utilized a proven technology as these same vehicle types have accumulated more than 2,400,000 methanol fuel miles as part of CEC's fleet tests. The experience gained within both the BofA and CEC fleet programs was subsequently used in augmenting the engine durability assessments for the DOD program. Since no major problem has occurred at any of the four test sites, the DOD program did answer the engine durability request given in the 1985 DOD Appropriations Bill.

## VIII. CONCLUSIONS AND RECOMMENDATIONS

### A. Conclusions

The Army Methanol-Fueled Administrative Vehicle Demonstration Program was a complete success in that it showed:

- Methanol fuel (M85) can be utilized to extend short gasoline supplies. However, it requires that modifications be made to existing engine/vehicle fuel systems.
- Methanol fuel (M85) can successfully be utilized in modified existing engines, and/or engines designed to use methanol with very few problems as long as care is taken in the selection of fuel-wetted parts to ensure their compatibility with the methanol fuel.
- No significant increase in individual vehicle maintenance requirements, other than increased oil drains, was noted by any of the four groups responsible for the operational maintenance of the methanol vehicles.
- Even though indicated wear rates, from used oil samples analyses, obtained when using M85 fuel appear to be two to four times those obtained with similar engines using unleaded gasoline, actual wear, as evidenced by inspections and measurements, does not appear to be as severe as that indicated by the oil sample analyses.
- Fuel economy, in miles per gallon, obtained for vehicles using M85 fuel is shown to be approximately one-half that obtained in similar vehicles using regular unleaded gasoline.
- M85 refueling stations were set up and operated at each fleet site at just a slight increase in cost, due to the cost of pump modifications and hose requirements to ensure compatibility with M85, from that which would have been expended to set up new gasoline refueling stations.

- No operational problems, safety or otherwise, were encountered with any of the four M85 refueling stations.
- Methanol fuel (M85) costs, in larger quantities, can be as low as \$0.50 per gallon. In the quantities purchased for this fleet program, the costs ranged from \$0.86 to \$0.95 per gallon plus transportation costs, which added approximately \$340 to each delivery to Fort Ord and Sierra Army Depot.
- The extremely satisfactory results obtained during Phases I and II of the Army Methanol-Fueled Administrative Vehicle Demonstration Program precludes the necessity of continuing the program into the large Phase III originally planned.

## **B. Recommendations**

Based upon the results obtained in Phases I and II of the Army Methanol-Fueled Administrative Vehicle Demonstration Program, the following items are recommended:

- Due to the successful completion of Phase I and II, it is recommended that the program be terminated and that Phase III of the originally planned program not be initiated.
- When it becomes necessary for the Army to have a fuel specification for M85 methanol fuel, it is recommended that the current State of California specification for M85 fuel be used as a model since no problems were encountered with its use in this program, and no proprietary materials are used in its formulation.
- Three lubricants, found to indicate decreased engine wear when using M85 fuel in one portion of the present program, are recommended for use in any future program using M85 as a motor fuel.

## X. LIST OF REFERENCES

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**APPENDIX A**  
**STATE OF CALIFORNIA FUEL SPECIFICATION**  
**FOR M85 METHANOL FUEL**

## APPENDIX A

### STATE OF CALIFORNIA FUEL SPECIFICATION FOR M85 METHANOL FUEL

12/12/84

- |                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                               |             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------|
| 1.                                                                                                                                                                                                                                                                                                                                                                                                                                     | METHANOL, By Volume, Min<br>ASTM D 1152, 99.85% grade)                                                                        | 85.0%*      |
| <p>* The following test method shall be used when determining methanol-gasoline content.</p> <p>ASTM D 3545 is to be modified for the determination of methanol, utilizing the gas chromatograph described therein. Acidity and water content results determined in 4 and 11 are to be used to normalize values obtained by gas chromatography. Note that the remaining portion of the fuel mixture is to be reported as gasoline.</p> |                                                                                                                               |             |
| 2.                                                                                                                                                                                                                                                                                                                                                                                                                                     | GASOLINE, PREMIUM UNLEADED, By Volume<br>(ASTM D 439), 9-11 psi RVP<br>Aromatics in Gasoline, 40% min. by volume, ASTM D 1319 | 14.5 ± 0.5% |
| 3.                                                                                                                                                                                                                                                                                                                                                                                                                                     | VAPOR PRESSURE, dry<br>(ASTM D 323)                                                                                           | 40-65 kPa   |
| 4.                                                                                                                                                                                                                                                                                                                                                                                                                                     | ACIDITY, wt%, max<br>(ASTM D 1613)                                                                                            | 0.003%      |
| 5.                                                                                                                                                                                                                                                                                                                                                                                                                                     | DISTILLATION RESIDUE, max<br>(ASTM D 86)                                                                                      | 0.5%        |
| 6.                                                                                                                                                                                                                                                                                                                                                                                                                                     | TOTAL CHLORIDE CONTENT, ORGANIC AND INORGANIC, max<br>(ASTM D 3120, Modified & ASTM D 2988)                                   | 0.0002%     |
| <p>ASTM D 3120 is modified for the determination of organic chlorides</p>                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                               |             |
| 7.                                                                                                                                                                                                                                                                                                                                                                                                                                     | LEAD CONTENT, MAX<br>(ASTM D 3237)                                                                                            | 0.003 g/L   |
| 8.                                                                                                                                                                                                                                                                                                                                                                                                                                     | PHOSPHORUS CONTENT, max<br>(ASTM D 3231)                                                                                      | 0.001 g/L   |
| 9.                                                                                                                                                                                                                                                                                                                                                                                                                                     | SULFUR CONTENT, max<br>(ASTM D 3120)                                                                                          | 0.015%      |
| 10.                                                                                                                                                                                                                                                                                                                                                                                                                                    | PARTICULATE CONTAMINANTS, max<br>(ASTM D 2276)                                                                                | 0.1 g/L     |
| 11.                                                                                                                                                                                                                                                                                                                                                                                                                                    | WATER, wt%, max<br>(ASTM D 1744)                                                                                              | 0.5%        |

**APPENDIX B**

**LUBRICANT SAMPLING PROCEDURE FOR USE IN THE ARMY  
METHANOL-FUELED ADMINISTRATIVE VEHICLE  
DEMONSTRATION PROGRAM**

## APPENDIX B

### LUBRICANT SAMPLING PROCEDURE FOR USE IN THE ARMY METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION PROGRAM

#### Lubricant Samples

Purpose. Lubricant samples will be taken from each vehicle and evaluated to provide data with respect to lubricant quality, degradation, fuel dilution, lubricant additive depletion, and wear metal content.

Sampling Schedule. A new, unused oil sample will be obtained from the initial lubricant supply received for use in the methanol vehicles. Additional new, unused oil samples will be required if it is determined that a different batch or batches of the selected lubricant formulation is supplied later in the program.

A used engine oil sample will be drawn from each vehicle operating in Phase I and Phase II of the program once each 30 days or after each 1500 miles driven, whichever occurs first. A used engine oil sample will also be drawn just prior to each recommended oil change.

Sampling Procedure. The used engine oil sampling procedure will be the AOAP procedure using the Oil Sampling Pump Method, subparagraph 14d., page 3 of Technical Bulletin 43-0210. The equipment/supplies required for drawing the samples are given in Table 1, page 3 or TB 43-0210, dated 10 December 1984.

Shipping. BFLRF will provide the following items to each sampling activity in order to facilitate the rapid shipment of oil samples to BFLRF for analysis:

- Stick on labels for application to individual sample bottles with the required data documentation preprinted on the labels.
- Appropriate addressed shipping containers.

Analyses. Lubricant analyses by BFLRF will include, but not be limited to the following evaluations:

| Evaluation                                                                                                   | Method         |
|--------------------------------------------------------------------------------------------------------------|----------------|
| Kinematic Viscosity, 40°C and 100°C                                                                          | D 445          |
| Total Acid No.                                                                                               | D-664          |
| Total Base No.                                                                                               | D 2896         |
| Fuel Dilution                                                                                                | by G.C.        |
| Wear Metals Determination by<br>ICP (Pb, Cu, Sn, Ai, Ni, Sb,<br>Ag, Mn, Si, B, Mg, Ca, Ba, P,<br>Zn, Fe, Cr) | Emission Spec. |
| Infrared Spectra                                                                                             | --             |

Reporting. The data obtained from the submitted samples will be reported by letter to JPL and the sampling activity, as a minimum, every 30 days if no significant changes in data are noted. In the event a significant change, for example a large increase in one or more wear metals, is noted, these data will be reported immediately by telephone to the sampling activity. In addition, it is planned that BFLRF personnel will visit each sampling activity on a regular basis, approximately once each month, to review the data generated, discuss any problems encountered in the program, and assist in solving any problems that may arise.

**APPENDIX C**  
**MONTHLY CUMULATIVE FUEL REPORTS FOR EACH VEHICLE**

**Monthly Cumulative Fuel Reports for Each Vehicle  
at Presidio of San Francisco**

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: PSFC  
VEHICLE USA #: CK2364

'93 CHEV CITATION, 4 DOOR SEDAN  
ENGINE TYPE: L-4

PRESIDIO BASELINE VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 388              | 11.3               | 34.3           | 388            | 11.3             | 34.3         |
| JUNE      | 1838             | 41.8               | 44.0           | 2226           | 53.1             | 41.9         |
| JULY      | 1540             | 142.3              | 10.8           | 3766           | 195.4            | 19.3         |
| AUGUST    | 1167             | 71.8               | 16.3           | 4933           | 267.2            | 18.5         |
| SEPTEMBER | 1207             | 59.2               | 20.4           | 6140           | 326.4            | 18.8         |
| OCTOBER   | 1483             | 58.0               | 25.4           | 7623           | 384.4            | 19.8         |
| NOVEMBER  | 2218             | 167.8              | 13.2           | 9841           | 552.2            | 17.6         |
| DECEMBER  | 1298             | 117.3              | 11.1           | 11139          | 669.5            | 16.6         |
| JANUARY   | 3079             | 196.5              | 15.7           | 14218          | 866.0            | 16.4         |
| FEBRUARY  | 1154             | 51.7               | 22.3           | 15372          | 917.7            | 16.8         |
| MARCH     | 2386             | 148.7              | 16.0           | 17758          | 1066.4           | 16.7         |
| APRIL     | 2387             | 201.5              | 11.8           | 20145          | 1267.9           | 15.9         |
| JUNE      | 368              | 0.0                | 0.0            | 20513          | 1267.9           | 16.2         |
| JULY      | 749              | 43.9               | 17.1           | 21262          | 1311.8           | 16.2         |
| AUGUST    | 1154             | 76.7               | 15.0           | 22416          | 1388.5           | 16.1         |
| SEPTEMBER | 2129             | 113.0              | 18.8           | 24545          | 1501.5           | 16.3         |
| OCTOBER   | 1393             | 70.9               | 19.6           | 25938          | 1572.4           | 16.5         |
| NOVEMBER  | 830              | 13.1               | 48.1           | 26568          | 1585.5           | 16.8         |
| DECEMBER  | 569              | 43.4               | 13.1           | 27237          | 1628.9           | 16.7         |
| JANUARY   | 2629             | 101.7              | 25.9           | 29866          | 1730.6           | 17.3         |
| FEBRUARY  | 1404             | 91.5               | 15.3           | 31270          | 1822.1           | 17.2         |
| MARCH     | 392              | 22.2               | 17.7           | 31662          | 1844.3           | 17.2         |
| APRIL     | 754              | 58.1               | 13.0           | 32416          | 1902.4           | 17.0         |
| MAY       | 573              | 21.7               | 26.4           | 32989          | 1924.1           | 17.1         |
| JUNE      | 128              | 12.8               | 10.0           | 33117          | 1936.9           | 17.1         |
| JULY      | 581              | 0.0                | 0.0            | 33698          | 1936.9           | 17.4         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST ACTIVITY: PSFC  
VEHICLE USA #: CK2366

'83 CHEV CITATION, 4 DOOR SEDAN  
ENGINE TYPE: L-4 PRESIDIO BASELINE VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| SEPTEMBER | 255              | 32.8               | 7.8            | 255            | 72.8             | 7.8          |
| OCTOBER   | 183              | 3.2                | 22.3           | 438            | 40.8             | 10.7         |
| NOVEMBER  | 215              | 64.8               | 12.3           | 653            | 267.3            | 12.3         |
| DECEMBER  | 689              | 57.2               | 11.9           | 3233           | 265.2            | 12.4         |
| JANUARY   | 7083             | 238.3              | 12.4           | 6366           | 503.5            | 12.6         |
| FEBRUARY  | 788              | 64.8               | 11.2           | 7154           | 558.1            | 12.6         |
| MARCH     | 1014             | 65.7               | 15.1           | 8168           | 633.8            | 12.9         |
| APRIL     | 215              | 0.0                | 0.0            | 8383           | 633.8            | 13.2         |
| MAY       | 457              | 37.2               | 12.3           | 8840           | 671.0            | 13.1         |
| JUNE      | 388              | 29.2               | 30.4           | 9228           | 700.2            | 13.9         |
| JULY      | 2405             | 121.8              | 19.8           | 12113          | 821.8            | 14.7         |
| AUGUST    | 3339             | 161.8              | 20.7           | 15452          | 983.4            | 15.7         |
| SEPTEMBER | 2874             | 128.4              | 22.4           | 18326          | 1111.8           | 16.5         |
| NOVEMBER  | 530              | 14.5               | 36.8           | 18856          | 1126.3           | 16.7         |
| DECEMBER  | 1131             | 72.0               | 15.7           | 19987          | 1198.3           | 16.7         |
| JANUARY   | 1685             | 110.4              | 15.3           | 21672          | 1308.7           | 15.6         |
| MARCH     | 887              | 32.8               | 20.3           | 22339          | 1341.5           | 16.7         |
| APRIL     | 1243             | 73.8               | 16.8           | 23582          | 1415.3           | 16.7         |
| MAY       | 612              | 39.7               | 15.4           | 24194          | 1455.0           | 16.6         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: PSFC  
VEHICLE USA #: CM3613

'84 CHEV CITATION, 4 DOOR SEDAN  
ENGINE TYPE: L-4

PRESIDIO METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| JUNE      | 3329             | 275.3              | 12.1           | 3329           | 275.3            | 12.1         |
| JULY      | 3981             | 275.0              | 14.1           | 7210           | 550.3            | 13.1         |
| AUGUST    | 4542             | 350.8              | 12.9           | 11752          | 901.1            | 13.0         |
| SEPTEMBER | 4703             | 326.5              | 14.1           | 16455          | 1227.6           | 13.4         |
| OCTOBER   | 1511             | 140.3              | 10.8           | 17966          | 1367.9           | 13.1         |
| NOVEMBER  | 732              | 87.5               | 8.4            | 18698          | 1455.4           | 12.8         |
| MARCH     | 1736             | 129.5              | 13.4           | 20434          | 1584.9           | 12.9         |
| APRIL     | 1117             | 167.8              | 6.7            | 21551          | 1752.7           | 12.3         |
| MAY       | 1398             | 170.8              | 8.2            | 22949          | 1923.5           | 11.9         |
| JUNE      | 693              | 11.7               | 59.2           | 23642          | 1935.2           | 12.2         |
| JULY      | 2706             | 273.9              | 9.9            | 26348          | 2209.0           | 11.9         |
| AUGUST    | 3571             | 312.7              | 11.4           | 29919          | 2521.7           | 11.9         |
| SEPTEMBER | 1139             | 65.6               | 17.4           | 31058          | 2587.3           | 12.0         |
| NOVEMBER  | 1291             | 77.6               | 16.6           | 32349          | 2664.9           | 12.1         |
| DECEMBER  | 1081             | 113.4              | 9.5            | 33430          | 2778.3           | 12.0         |
| JANUARY   | 234              | 17.5               | 13.4           | 33664          | 2795.8           | 12.0         |
| FEBRUARY  | 3134             | 219.7              | 14.3           | 36798          | 3015.5           | 12.2         |
| MARCH     | 3071             | 306.0              | 10.0           | 39869          | 3321.5           | 12.0         |
| APRIL     | 1931             | 193.1              | 10.0           | 41800          | 3514.6           | 11.9         |
| MAY       | 1609             | 153.1              | 10.5           | 43409          | 3667.7           | 11.8         |
| JUNE      | 1232             | 98.4               | 12.5           | 44641          | 3766.1           | 11.9         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: PSFC  
VEHICLE USA #: CM3614

'34 CHEV CITATION, 4 DOOR SEDAN  
ENGINE TYPE: V-6

PRESIDIO METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| JUNE      | 1915             | 230.5              | 8.3            | 1915           | 230.5            | 8.3          |
| JULY      | 3042             | 307.5              | 9.9            | 4957           | 538.0            | 9.2          |
| AUGUST    | 2548             | 323.1              | 7.9            | 7505           | 861.1            | 8.7          |
| SEPTEMBER | 1810             | 196.5              | 9.2            | 9315           | 1057.6           | 8.8          |
| OCTOBER   | 2116             | 212.6              | 10.0           | 11431          | 1270.2           | 9.0          |
| NOVEMBER  | 726              | 112.5              | 6.5            | 12157          | 1382.7           | 8.8          |
| DECEMBER  | 2950             | 344.6              | 8.6            | 15107          | 1727.3           | 8.7          |
| JANUARY   | 3210             | 408.4              | 7.9            | 18317          | 2135.7           | 8.6          |
| FEBRUARY  | 2812             | 313.6              | 9.0            | 21129          | 2449.3           | 8.6          |
| MARCH     | 4022             | 444.6              | 9.0            | 25151          | 2893.9           | 8.7          |
| APRIL     | 872              | 44.7               | 17.3           | 25923          | 2938.6           | 8.8          |
| JUNE      | 1766             | 158.2              | 11.2           | 27689          | 3096.8           | 8.9          |
| JULY      | 628              | 53.1               | 11.8           | 28317          | 3149.9           | 9.0          |
| OCTOBER   | 2627             | 229.5              | 11.4           | 30944          | 3379.4           | 9.2          |
| NOVEMBER  | 3269             | 310.5              | 10.5           | 34213          | 3689.9           | 9.3          |
| DECEMBER  | 1869             | 180.8              | 10.3           | 36082          | 3870.7           | 9.3          |
| JANUARY   | 1459             | 165.5              | 8.8            | 37541          | 4036.2           | 9.3          |
| FEBRUARY  | 858              | 95.0               | 9.0            | 38399          | 4131.2           | 9.3          |
| MARCH     | 1987             | 251.8              | 7.9            | 40386          | 4383.0           | 9.2          |
| APRIL     | 2418             | 294.1              | 8.2            | 42804          | 4677.1           | 9.2          |
| MAY       | 2067             | 223.8              | 9.2            | 44871          | 4900.9           | 9.2          |
| JUNE      | 239              | 28.7               | 8.3            | 45110          | 4929.6           | 9.2          |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: PSFC      '84 CHEV CITATION, 4 DOOR SEDAN  
VEHICLE USA #: CM3615      ENGINE TYPE: L-4      PRESIDIO METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 71               | 6.0                | 11.8           | 71             | 6.0              | 11.8         |
| JUNE      | 3684             | 295.7              | 12.5           | 3755           | 301.7            | 12.4         |
| JULY      | 3053             | 254.5              | 12.0           | 6808           | 556.2            | 12.2         |
| AUGUST    | 4108             | 329.9              | 12.5           | 10916          | 885.1            | 12.3         |
| SEPTEMBER | 3850             | 256.1              | 15.0           | 14766          | 1141.2           | 12.9         |
| OCTOBER   | 2566             | 214.9              | 11.9           | 17332          | 1356.1           | 12.8         |
| NOVEMBER  | 690              | 95.8               | 7.2            | 18022          | 1451.9           | 12.4         |
| DECEMBER  | 2003             | 261.8              | 7.7            | 20025          | 1713.7           | 11.7         |
| FEBRUARY  | 2608             | 316.3              | 8.2            | 22633          | 2030.0           | 11.1         |
| MARCH     | 2112             | 259.9              | 8.1            | 24745          | 2289.9           | 10.8         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: PSFC  
VEHICLE USA #: CM3616

'83 CHEV CITATION, 4 DOOR SEDAN  
ENGINE TYPE: V-6      PRESIDIO METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| JUNE      | 2700             | 245.1              | 11.0           | 2700           | 245.1            | 11.0         |
| JULY      | 2215             | 229.9              | 9.6            | 4915           | 475.0            | 10.3         |
| AUGUST    | 1254             | 122.0              | 10.3           | 6169           | 597.0            | 10.3         |
| SEPTEMBER | 982              | 129.4              | 7.6            | 7151           | 726.4            | 9.8          |
| OCTOBER   | 1424             | 114.7              | 12.4           | 8575           | 841.1            | 10.2         |
| NOVEMBER  | 1265             | 165.2              | 7.7            | 9840           | 1006.3           | 9.8          |
| DECEMBER  | 696              | 79.4               | 8.8            | 10536          | 1085.7           | 9.7          |
| JANUARY   | 1333             | 178.3              | 7.5            | 11869          | 1264.0           | 9.4          |
| FEBRUARY  | 990              | 110.6              | 9.0            | 12859          | 1374.6           | 9.4          |
| MARCH     | 1508             | 145.8              | 10.3           | 14367          | 1520.4           | 9.4          |
| APRIL     | 1329             | 143.5              | 9.3            | 15696          | 1663.9           | 9.4          |
| MAY       | 995              | 142.1              | 7.0            | 16691          | 1806.0           | 9.2          |
| JUNE      | 1504             | 156.1              | 9.6            | 18195          | 1962.1           | 9.3          |
| JULY      | 1233             | 99.0               | 12.5           | 19428          | 2061.1           | 9.4          |
| AUGUST    | 695              | 44.3               | 15.7           | 20123          | 2105.4           | 9.6          |
| SEPTEMBER | 1114             | 70.9               | 15.7           | 21237          | 2176.3           | 9.8          |
| OCTOBER   | 1227             | 117.9              | 10.4           | 22464          | 2294.2           | 9.8          |
| NOVEMBER  | 1413             | 96.2               | 14.7           | 23877          | 2390.4           | 10.0         |
| DECEMBER  | 561              | 19.1               | 34.6           | 24538          | 2409.5           | 10.2         |
| JANUARY   | 670              | 18.7               | 35.8           | 25208          | 2428.2           | 10.4         |
| MARCH     | 57               | 0.0                | 0.0            | 25265          | 2428.2           | 10.4         |
| APRIL     | 746              | 49.6               | 15.0           | 26011          | 2477.8           | 10.5         |
| MAY       | 964              | 57.4               | 16.8           | 26975          | 2535.2           | 10.6         |
| JUNE      | 857              | 43.8               | 19.6           | 27832          | 2579.0           | 10.8         |
| JULY      | 1000             | 38.3               | 26.1           | 28832          | 2617.3           | 11.0         |

**Monthly Cumulative Fuel Reports for Each Vehicle  
at Fort Ord**

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2884

'85 CHEV S-10 PICKUP  
ENGINE TYPE: V-6

FT. ORD BASELINE VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 277              | 0.0                | 0.0            | 277            | 0.0              | 0.0          |
| JUNE      | 348              | 27.0               | 12.9           | 625            | 27.0             | 23.1         |
| JULY      | 485              | 31.1               | 15.6           | 1110           | 58.1             | 19.1         |
| AUGUST    | 1105             | 65.2               | 16.9           | 2215           | 123.3            | 18.0         |
| SEPTEMBER | 779              | 44.6               | 17.5           | 2994           | 167.9            | 17.8         |
| OCTOBER   | 493              | 26.2               | 18.4           | 3477           | 194.1            | 17.9         |
| NOVEMBER  | 255              | 19.1               | 13.4           | 3732           | 213.2            | 17.5         |
| DECEMBER  | 750              | 20.2               | 37.1           | 4482           | 233.4            | 19.2         |
| JANUARY   | 984              | 30.7               | 32.1           | 5466           | 264.1            | 20.7         |
| FEBRUARY  | 335              | 14.0               | 23.9           | 5801           | 278.1            | 20.9         |
| MARCH     | 279              | 13.1               | 21.3           | 6080           | 291.2            | 20.9         |
| OCTOBER   | 665              | 38.4               | 17.3           | 6745           | 329.6            | 20.5         |
| NOVEMBER  | 235              | 14.7               | 16.0           | 6980           | 344.3            | 20.3         |
| DECEMBER  | 320              | 14.5               | 22.1           | 7300           | 358.8            | 20.3         |
| JANUARY   | 255              | 7.5                | 34.0           | 7555           | 366.3            | 20.6         |
| FEBRUARY  | 205              | 20.0               | 10.3           | 7760           | 386.3            | 20.1         |
| MARCH     | 327              | 17.3               | 18.9           | 8087           | 403.6            | 20.0         |
| APRIL     | 442              | 23.1               | 19.1           | 8529           | 426.7            | 20.0         |
| MAY       | 383              | 31.0               | 12.4           | 8912           | 457.7            | 19.5         |
| JUNE      | 402              | 25.4               | 15.8           | 9314           | 483.1            | 19.3         |
| JULY      | 817              | 59.4               | 13.8           | 10131          | 542.5            | 18.7         |
| AUGUST    | 1244             | 58.7               | 21.2           | 11375          | 601.2            | 18.9         |
| SEPTEMBER | 1358             | 75.2               | 18.1           | 12733          | 676.4            | 18.8         |
| OCTOBER   | 1234             | 51.3               | 24.1           | 13967          | 727.7            | 19.2         |
| NOVEMBER  | 1162             | 49.9               | 23.3           | 15129          | 777.6            | 19.5         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA / , CM2985

'85 CHEV S-10 PICKUP  
ENGINE TYPE: V-6

FT. ORD BASELINE VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 247              | 19.0               | 13.0           | 247            | 19.0             | 13.0         |
| JUNE      | 748              | 37.8               | 19.8           | 995            | 56.8             | 17.5         |
| JULY      | 546              | 39.5               | 13.8           | 1541           | 96.3             | 16.0         |
| AUGUST    | 615              | 36.9               | 22.1           | 2356           | 133.2            | 17.7         |
| SEPTEMBER | 753              | 45.7               | 16.5           | 3109           | 178.9            | 17.4         |
| OCTOBER   | 599              | 38.5               | 18.2           | 3908           | 217.4            | 17.5         |
| NOVEMBER  | 533              | 34.5               | 15.4           | 4341           | 251.9            | 17.2         |
| DECEMBER  | 605              | 38.0               | 21.2           | 5146           | 299.9            | 17.8         |
| JANUARY   | 540              | 38.0               | 14.2           | 5686           | 327.9            | 17.3         |
| FEBRUARY  | 569              | 38.6               | 14.7           | 6255           | 366.5            | 17.1         |
| MARCH     | 433              | 23.7               | 18.3           | 6688           | 390.2            | 17.1         |
| APRIL     | 540              | 36.2               | 14.9           | 7228           | 426.4            | 17.0         |
| MAY       | 516              | 32.1               | 16.1           | 7744           | 458.5            | 16.9         |
| JUNE      | 632              | 33.0               | 19.2           | 8376           | 491.5            | 17.0         |
| JULY      | 906              | 47.9               | 18.9           | 9282           | 539.4            | 17.2         |
| AUGUST    | 734              | 42.5               | 17.3           | 10016          | 581.9            | 17.2         |
| SEPTEMBER | 687              | 38.0               | 18.1           | 10703          | 619.9            | 17.3         |
| OCTOBER   | 616              | 25.3               | 24.3           | 11319          | 645.2            | 17.5         |
| NOVEMBER  | 431              | 23.0               | 18.7           | 11750          | 668.2            | 17.6         |
| DECEMBER  | 319              | 28.9               | 11.0           | 12069          | 697.1            | 17.3         |
| JANUARY   | 564              | 29.0               | 19.4           | 12633          | 726.1            | 17.4         |
| FEBRUARY  | 516              | 38.4               | 13.4           | 13149          | 764.5            | 17.2         |
| MARCH     | 566              | 38.9               | 14.6           | 13715          | 803.4            | 17.1         |
| APRIL     | 701              | 46.1               | 15.2           | 14416          | 849.5            | 17.0         |
| MAY       | 526              | 28.9               | 18.2           | 14942          | 878.4            | 17.0         |
| JUNE      | 411              | 20.2               | 20.3           | 15353          | 898.6            | 17.1         |
| JULY      | 485              | 27.5               | 17.6           | 15838          | 926.1            | 17.1         |
| AUGUST    | 385              | 31.0               | 12.4           | 16223          | 957.1            | 17.0         |
| SEPTEMBER | 558              | 29.7               | 18.8           | 16781          | 986.8            | 17.0         |
| OCTOBER   | 494              | 31.3               | 15.8           | 17275          | 1018.1           | 17.0         |
| NOVEMBER  | 529              | 39.2               | 13.5           | 17804          | 1057.3           | 16.8         |
| DECEMBER  | 95               | 14.3               | 6.6            | 17899          | 1071.6           | 16.7         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2890

'85 CHEV S-10 PICKUP  
ENGINE TYPE: L-4

FT. ORD BASELINE VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 27               | 0.0                | 0.0            | 27             | 0.0              | 0.0          |
| JUNE      | 1116             | 64.0               | 17.4           | 1143           | 64.0             | 17.9         |
| JULY      | 1183             | 60.6               | 19.5           | 2326           | 124.6            | 18.7         |
| AUGUST    | 1806             | 47.0               | 21.4           | 3332           | 171.6            | 19.4         |
| SEPTEMBER | 1046             | 66.0               | 15.8           | 4378           | 237.6            | 18.4         |
| OCTOBER   | 1230             | 61.0               | 20.2           | 5608           | 298.6            | 18.8         |
| NOVEMBER  | 912              | 60.0               | 15.2           | 6520           | 358.6            | 18.2         |
| DECEMBER  | 708              | 48.2               | 14.7           | 7228           | 406.8            | 17.8         |
| JANUARY   | 610              | 29.3               | 20.8           | 7838           | 436.1            | 18.0         |
| FEBRUARY  | 338              | 21.8               | 15.5           | 8176           | 457.9            | 17.9         |
| MARCH     | 115              | 9.4                | 12.2           | 8291           | 467.3            | 17.7         |
| OCTOBER   | 471              | 35.7               | 13.2           | 8762           | 503.0            | 17.4         |
| NOVEMBER  | 418              | 26.5               | 15.8           | 9180           | 529.5            | 17.3         |
| DECEMBER  | 401              | 17.3               | 23.2           | 9581           | 546.8            | 17.5         |
| JANUARY   | 234              | 8.0                | 29.3           | 9815           | 554.8            | 17.7         |
| FEBRUARY  | 647              | 47.1               | 13.7           | 10462          | 601.9            | 17.4         |
| MARCH     | 658              | 44.1               | 14.9           | 11120          | 646.0            | 17.2         |
| APRIL     | 359              | 37.6               | 14.9           | 11679          | 683.6            | 17.1         |
| MAY       | 491              | 32.5               | 14.8           | 12160          | 716.1            | 17.0         |
| JUNE      | 1358             | 97.4               | 13.9           | 13518          | 813.5            | 16.6         |
| JULY      | 1091             | 58.2               | 18.7           | 14609          | 871.7            | 16.8         |
| AUGUST    | 895              | 40.3               | 22.2           | 15504          | 912.0            | 17.0         |
| SEPTEMBER | 944              | 50.2               | 18.8           | 16448          | 962.2            | 17.1         |
| OCTOBER   | 1265             | 63.3               | 20.0           | 17713          | 1025.5           | 17.3         |
| NOVEMBER  | 509              | 44.5               | 20.4           | 18622          | 1070.0           | 17.4         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2878

'85 CHEV S-10 PICKUP  
ENGINE TYPE: L-4

FT. ORD METHANOL VEHICLE

| MONTH                 | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------------------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY                   | 344              | 13.0               | 26.5           | 344            | 13.0             | 26.5         |
| JUNE                  | 850              | 30.8               | 27.6           | 1194           | 43.8             | 27.3         |
| JULY                  | 351              | 34.9               | 18.7           | 1845           | 78.7             | 23.4         |
| AUGUST                | 807              | 43.8               | 18.4           | 2652           | 122.5            | 21.6         |
| SEPTEMBER             | 745              | 38.9               | 19.2           | 3397           | 161.4            | 21.0         |
| OCTOBER               | 377              | 14.7               | 25.6           | 3774           | 176.1            | 21.4         |
| NOVEMBER              | 483              | 25.9               | 18.6           | 4257           | 202.0            | 21.1         |
| DECEMBER              | 428              | 24.1               | 17.8           | 4685           | 226.1            | 20.7         |
| JANUARY               | 523              | 8.8                | 59.4           | 5208           | 234.9            | 22.2         |
| FEBRUARY              | 171              | 0.0                | 0.0            | 5379           | 234.9            | 22.9         |
| CONVERTED TO METHANOL |                  |                    |                |                |                  |              |
| MARCH                 | 467              | 49.3               | 9.5            | 467            | 49.3             | 9.5          |
| APRIL                 | 864              | 79.0               | 8.4            | 1131           | 128.3            | 8.8          |
| MAY                   | 408              | 29.9               | 13.6           | 1539           | 158.2            | 9.7          |
| JUNE                  | 453              | 43.4               | 10.4           | 1992           | 201.6            | 9.9          |
| JULY                  | 566              | 59.7               | 9.5            | 2558           | 261.7            | 9.8          |
| AUGUST                | 545              | 65.0               | 8.4            | 3103           | 326.3            | 9.5          |
| SEPTEMBER             | 506              | 31.0               | 16.3           | 3609           | 357.3            | 10.1         |
| OCTOBER               | 438              | 45.4               | 9.6            | 4047           | 402.7            | 10.0         |
| NOVEMBER              | 484              | 45.8               | 10.6           | 4531           | 448.5            | 10.1         |
| DECEMBER              | 553              | 43.5               | 12.7           | 5084           | 492.0            | 10.3         |
| JANUARY               | 403              | 0.0                | 0.0            | 5487           | 492.0            | 11.2         |
| FEBRUARY              | 423              | 44.9               | 9.4            | 5910           | 536.9            | 11.0         |
| MARCH                 | 365              | 69.5               | 8.1            | 6475           | 606.4            | 10.7         |
| APRIL                 | 647              | 43.9               | 12.5           | 7022           | 650.3            | 10.8         |
| MAY                   | 749              | 38.0               | 19.7           | 7771           | 688.3            | 11.3         |
| JUNE                  | 593              | 71.2               | 8.3            | 8364           | 759.5            | 11.0         |
| JULY                  | 472              | 43.5               | 10.9           | 8836           | 803.0            | 11.0         |
| AUGUST                | 561              | 65.5               | 8.6            | 9397           | 868.5            | 10.8         |
| SEPTEMBER             | 512              | 43.5               | 11.8           | 9909           | 912.0            | 10.9         |
| OCTOBER               | 315              | 15.4               | 20.5           | 10224          | 927.4            | 11.0         |
| NOVEMBER              | 403              | 42.6               | 9.5            | 10627          | 970.0            | 11.0         |
| DECEMBER              | 655              | 55.0               | 11.9           | 11282          | 1025.0           | 11.0         |
| JANUARY               | 681              | 78.4               | 8.7            | 11963          | 1103.4           | 10.8         |
| FEBRUARY              | 631              | 68.4               | 9.2            | 12594          | 1171.8           | 10.7         |
| MARCH                 | 508              | 52.4               | 9.7            | 13102          | 1224.2           | 10.7         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2879

'85 CHEV S-10 PICKUP  
ENGINE TYPE: L-4

FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 3                | 0.0                | 0.0            | 3              | 0.0              | 0.0          |
| JUNE      | 710              | 39.3               | 18.1           | 713            | 39.3             | 18.1         |
| JULY      | 203              | 32.9               | 24.4           | 1516           | 72.2             | 21.0         |
| AUGUST    | 545              | 34.5               | 15.8           | 2061           | 106.7            | 19.3         |
| SEPTEMBER | 538              | 37.9               | 14.2           | 2599           | 144.6            | 18.0         |
| OCTOBER   | 526              | 23.7               | 22.2           | 3125           | 168.3            | 18.6         |
| NOVEMBER  | 400              | 22.6               | 17.7           | 3525           | 190.9            | 18.5         |
| DECEMBER  | 365              | 27.6               | 13.2           | 3890           | 218.5            | 17.8         |
| JANUARY   | 432              | 26.7               | 16.2           | 4322           | 245.2            | 17.6         |
| FEBRUARY  | 431              | 27.3               | 15.8           | 4753           | 272.5            | 17.4         |
| MARCH     | 83               | 0.0                | 0.0            | 4836           | 272.5            | 17.7         |

CONVERTED TO METHANOL

Mid-Month

|           |      |       |      |       |        |      |
|-----------|------|-------|------|-------|--------|------|
| MARCH     | 16   | 10.0  | 1.6  | 16    | 10.0   | 1.6  |
| APRIL     | 235  | 36.5  | 6.4  | 251   | 46.5   | 5.4  |
| MAY       | 364  | 33.6  | 10.8 | 615   | 30.1   | 7.7  |
| JUNE      | 288  | 38.5  | 7.5  | 903   | 118.6  | 7.6  |
| JULY      | 593  | 64.6  | 9.0  | 1496  | 183.2  | 8.1  |
| AUGUST    | 388  | 45.9  | 12.8 | 2074  | 229.1  | 9.1  |
| SEPTEMBER | 558  | 63.3  | 8.8  | 2632  | 292.4  | 9.0  |
| OCTOBER   | 640  | 55.9  | 11.4 | 3272  | 348.3  | 9.4  |
| NOVEMBER  | 849  | 80.4  | 10.6 | 4121  | 428.7  | 9.6  |
| DECEMBER  | 687  | 53.1  | 12.9 | 4808  | 481.8  | 10.0 |
| JANUARY   | 1128 | 59.3  | 19.0 | 5936  | 541.1  | 11.0 |
| FEBRUARY  | 609  | 50.3  | 12.1 | 6545  | 591.4  | 11.1 |
| MARCH     | 1163 | 109.3 | 10.6 | 7708  | 700.7  | 11.0 |
| APRIL     | 549  | 53.6  | 10.2 | 8257  | 754.3  | 10.9 |
| MAY       | 591  | 66.4  | 8.9  | 8848  | 820.7  | 10.8 |
| JUNE      | 597  | 63.6  | 9.4  | 9445  | 884.3  | 10.7 |
| JULY      | 697  | 78.0  | 8.9  | 10142 | 962.3  | 10.5 |
| AUGUST    | 543  | 34.0  | 16.0 | 10685 | 996.3  | 10.7 |
| SEPTEMBER | 545  | 58.2  | 9.4  | 11230 | 1054.5 | 10.6 |
| OCTOBER   | 433  | 43.4  | 10.0 | 11663 | 1097.9 | 10.6 |
| NOVEMBER  | 368  | 36.9  | 10.0 | 12031 | 1134.8 | 10.6 |
| DECEMBER  | 106  | 7.0   | 15.1 | 12137 | 1141.8 | 10.6 |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2980

'85 CHEV S-10 PICKUP  
ENGINE TYPE: V-6

FT. ORD METHANOL VEHICLE

| MONTH                 | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------------------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY                   | 230              | 9.5                | 29.5           | 230            | 9.5              | 29.5         |
| JUNE                  | 398              | 32.5               | 18.4           | 978            | 42.0             | 20.9         |
| JULY                  | 914              | 54.6               | 16.7           | 1792           | 96.6             | 18.6         |
| AUGUST                | 1264             | 59.0               | 21.3           | 3056           | 154.6            | 19.8         |
| SEPTEMBER             | 1056             | 36.2               | 29.2           | 4112           | 190.8            | 21.6         |
| OCTOBER               | 575              | 35.2               | 16.3           | 4687           | 226.0            | 20.7         |
| NOVEMBER              | 542              | 25.5               | 21.3           | 5229           | 251.5            | 20.8         |
| DECEMBER              | 1308             | 74.3               | 17.6           | 6537           | 325.8            | 20.1         |
| JANUARY               | 48               | 0.0                | 0.0            | 6585           | 325.8            | 20.2         |
| CONVERTED TO METHANOL |                  |                    |                |                |                  |              |
| FEBRUARY              | 519              | 69.6               | 7.5            | 519            | 69.6             | 7.5          |
| MARCH                 | 1430             | 147.7              | 9.7            | 1949           | 217.3            | 9.0          |
| APRIL                 | 993              | 123.3              | 8.1            | 2942           | 340.6            | 8.6          |
| MAY                   | 670              | 65.0               | 10.3           | 3612           | 405.6            | 8.9          |
| JUNE                  | 820              | 94.3               | 8.7            | 4432           | 499.9            | 8.9          |
| JULY                  | 920              | 101.8              | 9.0            | 5352           | 601.7            | 8.9          |
| AUGUST                | 613              | 70.0               | 8.8            | 5965           | 671.7            | 8.9          |
| SEPTEMBER             | 904              | 114.2              | 7.9            | 6869           | 785.9            | 8.7          |
| OCTOBER               | 559              | 62.6               | 8.9            | 7428           | 948.5            | 8.8          |
| NOVEMBER              | 1284             | 114.7              | 11.2           | 8712           | 963.2            | 9.0          |
| DECEMBER              | 967              | 86.5               | 10.0           | 9579           | 1049.7           | 9.1          |
| JANUARY               | 618              | 74.5               | 8.3            | 10197          | 1124.2           | 9.1          |
| FEBRUARY              | 673              | 60.5               | 11.2           | 10875          | 1184.7           | 9.2          |
| MARCH                 | 598              | 88.7               | 6.7            | 11473          | 1273.4           | 9.0          |
| APRIL                 | 1535             | 129.9              | 11.8           | 13008          | 1403.3           | 9.3          |
| MAY                   | 1117             | 102.9              | 10.9           | 14125          | 1506.2           | 9.4          |
| JUNE                  | 872              | 77.8               | 11.2           | 14997          | 1584.0           | 9.5          |
| JULY                  | 503              | 78.8               | 7.7            | 15500          | 1662.8           | 9.4          |
| AUGUST                | 905              | 90.7               | 10.0           | 16505          | 1753.5           | 9.4          |
| SEPTEMBER             | 463              | 49.9               | 9.3            | 16968          | 1803.4           | 9.4          |
| OCTOBER               | 634              | 66.0               | 9.6            | 17602          | 1869.4           | 9.4          |
| NOVEMBER              | 445              | 41.0               | 10.9           | 18047          | 1910.4           | 9.4          |
| DECEMBER              | 399              | 59.0               | 6.6            | 18436          | 1969.4           | 9.4          |
| JANUARY               | 599              | 56.6               | 10.6           | 19035          | 2026.0           | 9.4          |
| FEBRUARY              | 527              | 49.1               | 10.7           | 19562          | 2075.1           | 9.4          |
| MARCH                 | 349              | 60.6               | 5.8            | 19911          | 2135.7           | 9.3          |
| FEBRUARY              | 43               | 0.0                | 0.0            | 19954          | 2135.7           | 9.3          |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2991

'85 CHEV S-10 PICKUP  
ENGINE TYPE: V-6

FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| JUNE      | 1345             | 57.9               | 23.2           | 1345           | 57.9             | 23.2         |
| JULY      | 725              | 27.0               | 26.5           | 2070           | 84.9             | 24.4         |
| AUGUST    | 911              | 41.6               | 19.5           | 2981           | 126.5            | 22.8         |
| SEPTEMBER | 199              | 30.4               | 19.2           | 3770           | 156.9            | 24.0         |
| OCTOBER   | 369              | 39.8               | 9.3            | 4139           | 196.7            | 21.0         |
| NOVEMBER  | 309              | 18.8               | 16.4           | 4448           | 215.5            | 20.6         |
| DECEMBER  | 191              | 17.7               | 10.8           | 4639           | 233.2            | 19.9         |
| JANUARY   | 41               | 0.0                | 0.0            | 4680           | 233.2            | 20.1         |

CONVERTED TO METHANOL

|           |     |       |      |       |        |     |
|-----------|-----|-------|------|-------|--------|-----|
| FEBRUARY  | 253 | 39.8  | 6.5  | 253   | 39.8   | 6.5 |
| MARCH     | 551 | 70.1  | 7.9  | 809   | 109.9  | 7.4 |
| APRIL     | 638 | 82.7  | 7.7  | 1447  | 192.6  | 7.5 |
| MAY       | 620 | 67.3  | 9.2  | 2067  | 259.9  | 8.0 |
| JUNE      | 253 | 36.8  | 6.9  | 2320  | 296.7  | 7.8 |
| JULY      | 417 | 58.8  | 7.1  | 2737  | 355.5  | 7.7 |
| AUGUST    | 335 | 42.6  | 7.9  | 3072  | 398.1  | 7.7 |
| SEPTEMBER | 467 | 70.5  | 6.6  | 3539  | 468.6  | 7.6 |
| OCTOBER   | 458 | 65.2  | 7.0  | 3997  | 533.8  | 7.5 |
| NOVEMBER  | 450 | 52.8  | 8.5  | 4447  | 586.6  | 7.6 |
| DECEMBER  | 407 | 57.6  | 7.1  | 4854  | 644.2  | 7.5 |
| JANUARY   | 443 | 73.8  | 6.0  | 5297  | 718.0  | 7.4 |
| FEBRUARY  | 458 | 138.0 | 3.3  | 5755  | 856.0  | 6.7 |
| MARCH     | 622 | 91.3  | 6.8  | 6377  | 947.3  | 6.7 |
| APRIL     | 524 | 58.0  | 9.0  | 6901  | 1005.3 | 6.9 |
| MAY       | 506 | 77.2  | 6.6  | 7407  | 1082.5 | 6.8 |
| JUNE      | 416 | 50.7  | 8.2  | 7823  | 1133.2 | 6.9 |
| JULY      | 688 | 96.7  | 7.1  | 8511  | 1229.9 | 6.9 |
| AUGUST    | 771 | 82.2  | 9.4  | 9282  | 1312.1 | 7.1 |
| SEPTEMBER | 959 | 63.8  | 13.5 | 10141 | 1375.9 | 7.4 |
| OCTOBER   | 122 | 32.2  | 3.8  | 10263 | 1408.1 | 7.3 |
| NOVEMBER  | 316 | 87.3  | 3.6  | 10579 | 1495.4 | 7.1 |
| DECEMBER  | 612 | 90.3  | 6.8  | 11191 | 1585.7 | 7.1 |
| JANUARY   | 679 | 118.6 | 5.7  | 11870 | 1704.3 | 7.0 |
| FEBRUARY  | 733 | 83.9  | 8.7  | 12603 | 1788.2 | 7.0 |
| MARCH     | 564 | 85.5  | 6.6  | 13167 | 1873.7 | 7.0 |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2982

'85 CHEV S-10 PICKUP  
ENGINE TYPE: V-6

FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 369              | 6.3                | 54.3           | 369            | 6.3              | 54.3         |
| JUNE      | 349              | 53.5               | 15.9           | 1218           | 60.3             | 20.2         |
| JULY      | 1078             | 53.4               | 20.2           | 2296           | 113.7            | 20.2         |
| AUGUST    | 484              | 51.7               | 19.0           | 3280           | 165.4            | 19.8         |
| SEPTEMBER | 695              | 33.5               | 20.4           | 3965           | 198.9            | 19.9         |
| OCTOBER   | 776              | 48.7               | 15.9           | 4741           | 247.6            | 19.1         |
| NOVEMBER  | 513              | 25.9               | 19.8           | 5254           | 273.5            | 19.2         |
| DECEMBER  | 1207             | 62.0               | 19.5           | 6461           | 335.5            | 19.3         |
| JANUARY   | 131              | 11.0               | 11.9           | 6592           | 346.5            | 19.0         |

CONVERTED TO METHANOL

|           |      |       |      |       |        |      |
|-----------|------|-------|------|-------|--------|------|
| FEBRUARY  | 446  | 39.0  | 11.7 | 446   | 39.0   | 11.7 |
| MARCH     | 1186 | 129.7 | 9.1  | 1632  | 167.7  | 9.7  |
| APRIL     | 896  | 103.0 | 8.7  | 2528  | 270.7  | 9.3  |
| MAY       | 340  | 36.8  | 9.2  | 2968  | 307.5  | 9.3  |
| JUNE      | 456  | 57.5  | 7.9  | 3324  | 365.0  | 9.1  |
| JULY      | 563  | 67.4  | 8.4  | 3987  | 432.4  | 9.0  |
| AUGUST    | 551  | 63.7  | 8.6  | 4438  | 496.1  | 8.9  |
| SEPTEMBER | 678  | 64.4  | 10.5 | 5116  | 560.5  | 9.1  |
| OCTOBER   | 534  | 59.9  | 8.9  | 5650  | 620.4  | 9.1  |
| NOVEMBER  | 729  | 77.3  | 9.4  | 6379  | 697.7  | 9.1  |
| DECEMBER  | 397  | 51.4  | 7.7  | 6776  | 749.1  | 9.0  |
| JANUARY   | 539  | 56.2  | 9.6  | 7315  | 805.3  | 9.1  |
| FEBRUARY  | 506  | 42.0  | 12.0 | 7821  | 847.3  | 9.2  |
| MARCH     | 638  | 91.6  | 7.0  | 8459  | 938.9  | 9.0  |
| APRIL     | 690  | 77.9  | 8.9  | 9149  | 1016.8 | 9.0  |
| MAY       | 419  | 62.3  | 6.7  | 9568  | 1079.1 | 8.9  |
| JUNE      | 641  | 60.0  | 10.7 | 10209 | 1139.1 | 9.0  |
| JULY      | 766  | 95.7  | 8.0  | 10975 | 1234.8 | 8.9  |
| AUGUST    | 636  | 81.8  | 7.8  | 11611 | 1316.6 | 8.8  |
| SEPTEMBER | 606  | 72.5  | 8.4  | 12217 | 1389.1 | 8.8  |
| OCTOBER   | 5    | 0.0   | 0.0  | 12222 | 1389.1 | 8.8  |
| NOVEMBER  | 128  | 17.8  | 7.2  | 12350 | 1406.9 | 8.8  |
| DECEMBER  | 483  | 62.1  | 7.8  | 12833 | 1469.0 | 8.7  |
| JANUARY   | 636  | 95.1  | 6.7  | 13469 | 1564.1 | 8.6  |
| FEBRUARY  | 694  | 104.4 | 6.6  | 14163 | 1668.5 | 8.5  |
| MARCH     | 707  | 68.9  | 10.3 | 14870 | 1737.4 | 8.6  |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2993

'85 CHEV S-10 PICKUP  
ENGINE TYPE: L-4

FT. ORD METHANOL VEHICLE

| MONTH                 | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------------------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY                   | 235              | 9.3                | 25.3           | 235            | 9.3              | 25.3         |
| JUNE                  | 1334             | 53.0               | 25.2           | 1569           | 62.3             | 25.2         |
| JULY                  | 819              | 40.1               | 20.4           | 2388           | 102.4            | 23.3         |
| AUGUST                | 958              | 47.1               | 20.3           | 3346           | 149.5            | 22.4         |
| SEPTEMBER             | 690              | 34.5               | 19.7           | 4026           | 184.0            | 21.9         |
| OCTOBER               | 436              | 27.7               | 15.7           | 4462           | 211.7            | 21.1         |
| NOVEMBER              | 198              | 16.6               | 17.3           | 4750           | 228.3            | 20.9         |
| DECEMBER              | 141              | 11.8               | 11.9           | 4891           | 240.1            | 20.4         |
| JANUARY               | 794              | 34.1               | 23.3           | 5685           | 274.2            | 20.7         |
| FEBRUARY              | 272              | 4.0                | 68.0           | 5957           | 278.2            | 21.4         |
| CONVERTED TO METHANOL |                  |                    |                |                |                  |              |
| MARCH                 | 257              | 38.3               | 6.7            | 257            | 38.3             | 6.7          |
| APRIL                 | 98               | 0.0                | 0.0            | 355            | 38.3             | 9.3          |
| MAY                   | 351              | 55.0               | 6.4            | 706            | 93.3             | 7.6          |
| JUNE                  | 546              | 60.0               | 9.1            | 1252           | 153.3            | 8.2          |
| JULY                  | 500              | 57.8               | 8.7            | 1752           | 211.1            | 8.3          |
| AUGUST                | 409              | 31.4               | 13.0           | 2161           | 242.5            | 8.9          |
| SEPTEMBER             | 681              | 99.5               | 6.8            | 2842           | 342.0            | 8.3          |
| OCTOBER               | 530              | 55.3               | 9.6            | 3372           | 397.3            | 8.5          |
| NOVEMBER              | 485              | 50.3               | 9.6            | 3857           | 447.6            | 8.6          |
| DECEMBER              | 390              | 41.8               | 9.3            | 4247           | 489.4            | 8.7          |
| JANUARY               | 7                | 0.0                | 0.0            | 4254           | 489.4            | 8.7          |
| MARCH                 | 183              | 25.0               | 7.3            | 4437           | 514.4            | 8.6          |
| APRIL                 | 698              | 102.7              | 6.8            | 5135           | 617.1            | 8.3          |
| MAY                   | 969              | 109.0              | 8.9            | 6104           | 726.1            | 8.4          |
| JUNE                  | 517              | 59.7               | 8.7            | 6621           | 785.8            | 8.4          |
| JULY                  | 510              | 57.0               | 8.9            | 7131           | 842.8            | 8.5          |
| AUGUST                | 461              | 44.3               | 10.4           | 7592           | 887.1            | 8.6          |
| SEPTEMBER             | 320              | 23.5               | 9.4            | 7912           | 910.6            | 8.6          |
| OCTOBER               | 412              | 47.2               | 8.7            | 8224           | 957.8            | 8.6          |
| NOVEMBER              | 322              | 40.0               | 8.0            | 8546           | 997.8            | 8.6          |
| DECEMBER              | 94               | 0.0                | 0.0            | 8640           | 997.8            | 8.7          |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2986

'85 CHEV S-10 PICKUP  
ENGINE TYPE: V-6

FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 74               | 0.0                | 0.0            | 74             | 0.0              | 0.0          |
| JUNE      | 767              | 52.0               | 14.8           | 841            | 52.0             | 16.2         |
| JULY      | 1353             | 73.5               | 21.1           | 2394           | 125.5            | 19.1         |
| AUGUST    | 1390             | 71.0               | 26.5           | 4274           | 196.5            | 21.8         |
| SEPTEMBER | 477              | 14.0               | 34.1           | 4751           | 210.5            | 22.6         |

CONVERTED TO METHANOL

|           |      |       |      |       |        |      |
|-----------|------|-------|------|-------|--------|------|
| JANUARY   | 564  | 25.8  | 21.9 | 564   | 25.8   | 21.9 |
| FEBRUARY  | 375  | 33.4  | 11.2 | 939   | 59.2   | 15.9 |
| MARCH     | 1052 | 104.0 | 10.1 | 1991  | 163.2  | 12.2 |
| APRIL     | 893  | 109.4 | 8.2  | 2884  | 272.6  | 10.6 |
| MAY       | 708  | 81.7  | 8.7  | 3592  | 354.3  | 10.1 |
| JUNE      | 649  | 58.3  | 11.1 | 4241  | 412.6  | 10.3 |
| JULY      | 533  | 35.1  | 6.3  | 4774  | 497.7  | 9.6  |
| AUGUST    | 1041 | 142.9 | 7.3  | 5815  | 640.6  | 9.1  |
| SEPTEMBER | 674  | 75.8  | 8.9  | 6489  | 716.4  | 9.1  |
| OCTOBER   | 854  | 99.3  | 8.6  | 7343  | 815.7  | 9.0  |
| NOVEMBER  | 357  | 26.2  | 13.6 | 7700  | 841.9  | 9.1  |
| DECEMBER  | 440  | 66.5  | 6.6  | 8140  | 908.4  | 9.0  |
| JANUARY   | 428  | 37.4  | 11.4 | 8568  | 945.8  | 9.1  |
| FEBRUARY  | 413  | 47.0  | 8.8  | 8981  | 992.8  | 9.0  |
| MARCH     | 503  | 58.1  | 8.7  | 9484  | 1050.9 | 9.0  |
| APRIL     | 377  | 30.3  | 12.4 | 9861  | 1081.2 | 9.1  |
| MAY       | 349  | 30.5  | 4.3  | 10210 | 1161.7 | 8.8  |
| JUNE      | 505  | 54.0  | 9.4  | 10715 | 1215.7 | 8.8  |
| JULY      | 368  | 68.6  | 5.4  | 11083 | 1284.3 | 8.6  |
| AUGUST    | 497  | 56.6  | 8.8  | 11580 | 1340.9 | 8.6  |
| SEPTEMBER | 382  | 67.4  | 5.7  | 11962 | 1408.3 | 8.5  |
| OCTOBER   | 441  | 50.8  | 8.7  | 12403 | 1459.1 | 8.5  |
| NOVEMBER  | 382  | 37.3  | 10.2 | 12785 | 1496.4 | 8.5  |
| DECEMBER  | 394  | 62.1  | 6.3  | 13179 | 1558.5 | 8.5  |
| JANUARY   | 696  | 65.7  | 10.6 | 13875 | 1624.2 | 8.5  |
| FEBRUARY  | 485  | 75.4  | 6.4  | 14360 | 1699.6 | 8.4  |
| MARCH     | 220  | 31.6  | 7.0  | 14580 | 1731.2 | 8.4  |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2887

'95 CHEV S-10 PICKUP  
ENGINE TYPE: V-6

FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 17               | 0.0                | 0.0            | 17             | 0.0              | 0.0          |
| JUNE      | 1038             | 52.9               | 19.6           | 1055           | 52.9             | 19.9         |
| JULY      | 932              | 42.9               | 21.7           | 1987           | 95.8             | 20.7         |
| AUGUST    | 1020             | 53.7               | 17.4           | 3007           | 154.5            | 19.5         |
| SEPTEMBER | 947              | 49.5               | 19.1           | 3954           | 204.0            | 19.4         |
| OCTOBER   | 542              | 35.1               | 15.4           | 4496           | 239.1            | 18.8         |
| NOVEMBER  | 514              | 32.8               | 15.7           | 5010           | 271.9            | 18.4         |
| DECEMBER  | 407              | 22.9               | 17.8           | 5417           | 294.8            | 18.4         |
| JANUARY   | 29               | 0.0                | 0.0            | 5446           | 294.8            | 18.5         |

CONVERTED TO METHANOL

|           |      |       |      |       |        |     |
|-----------|------|-------|------|-------|--------|-----|
| FEBRUARY  | 106  | 11.0  | 9.6  | 106   | 11.0   | 9.6 |
| MARCH     | 477  | 71.9  | 6.6  | 583   | 82.9   | 7.0 |
| APRIL     | 305  | 35.3  | 8.6  | 888   | 118.2  | 7.5 |
| MAY       | 417  | 63.7  | 6.5  | 1305  | 181.9  | 7.2 |
| JUNE      | 273  | 43.0  | 6.3  | 1578  | 224.9  | 7.0 |
| JULY      | 365  | 49.9  | 7.3  | 1943  | 274.8  | 7.1 |
| AUGUST    | 309  | 46.1  | 6.7  | 2252  | 320.9  | 7.0 |
| SEPTEMBER | 414  | 60.9  | 6.8  | 2666  | 381.8  | 7.0 |
| OCTOBER   | 790  | 115.0 | 6.9  | 3446  | 496.8  | 6.9 |
| NOVEMBER  | 796  | 92.2  | 8.6  | 4242  | 589.0  | 7.2 |
| DECEMBER  | 793  | 81.5  | 9.7  | 5035  | 670.5  | 7.5 |
| JANUARY   | 1408 | 115.7 | 12.2 | 6443  | 786.2  | 8.2 |
| FEBRUARY  | 1067 | 103.7 | 10.3 | 7510  | 899.9  | 8.4 |
| MARCH     | 1067 | 118.1 | 9.0  | 8577  | 1008.0 | 8.5 |
| APRIL     | 805  | 73.6  | 10.9 | 9382  | 1081.6 | 8.7 |
| MAY       | 1108 | 85.8  | 12.9 | 10490 | 1167.4 | 9.0 |
| JUNE      | 1206 | 106.2 | 11.4 | 11696 | 1273.6 | 9.2 |
| JULY      | 657  | 86.4  | 7.6  | 12353 | 1360.0 | 9.1 |
| AUGUST    | 825  | 81.7  | 10.1 | 13178 | 1441.7 | 9.1 |
| SEPTEMBER | 1358 | 112.5 | 12.1 | 14536 | 1554.2 | 9.4 |
| OCTOBER   | 793  | 89.2  | 8.9  | 15329 | 1643.4 | 9.3 |
| NOVEMBER  | 446  | 51.2  | 8.7  | 15775 | 1694.6 | 9.3 |
| DECEMBER  | 438  | 48.9  | 9.0  | 16213 | 1743.5 | 9.3 |
| JANUARY   | 401  | 50.4  | 8.0  | 16614 | 1793.9 | 9.3 |
| FEBRUARY  | 1040 | 123.0 | 8.5  | 17654 | 1916.9 | 9.2 |
| MARCH     | 1070 | 92.6  | 11.6 | 18724 | 2009.5 | 9.3 |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2998

'85 CHEV S-10 PICKUP  
ENGINE TYPE: V-6

FT. ORD METHANOL VEHICLE

| MONTH  | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|--------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY    | 12               | 0.0                | 0.0            | 12             | 0.0              | 0.0          |
| JUNE   | 1233             | 59.4               | 21.1           | 1245           | 59.4             | 21.3         |
| JULY   | 2120             | 66.8               | 21.7           | 3365           | 125.2            | 26.9         |
| AUGUST | 368              | 31.8               | 21.0           | 4033           | 157.0            | 25.7         |

CONVERTED TO METHANOL

|           |      |       |      |       |        |      |
|-----------|------|-------|------|-------|--------|------|
| DECEMBER  | 125  | 49.2  | 2.5  | 125   | 49.2   | 2.5  |
| JANUARY   | 1001 | 76.6  | 13.1 | 1126  | 125.8  | 9.0  |
| FEBRUARY  | 232  | 38.6  | 6.0  | 1358  | 164.4  | 8.3  |
| MARCH     | 549  | 61.5  | 8.9  | 1907  | 225.9  | 8.4  |
| APRIL     | 606  | 32.7  | 9.7  | 2713  | 308.6  | 8.8  |
| MAY       | 921  | 31.6  | 11.3 | 3634  | 390.2  | 9.3  |
| JUNE      | 1241 | 97.1  | 12.8 | 4875  | 487.3  | 10.0 |
| JULY      | 1243 | 110.3 | 11.3 | 6118  | 597.6  | 10.2 |
| AUGUST    | 1062 | 93.0  | 11.4 | 7180  | 690.6  | 10.4 |
| SEPTEMBER | 984  | 99.1  | 11.0 | 8164  | 779.7  | 10.5 |
| OCTOBER   | 1027 | 73.8  | 13.9 | 9191  | 853.5  | 10.8 |
| NOVEMBER  | 849  | 96.5  | 8.8  | 10040 | 940.0  | 10.7 |
| DECEMBER  | 404  | 44.0  | 9.2  | 10444 | 984.0  | 10.6 |
| JANUARY   | 588  | 49.6  | 11.9 | 11032 | 1033.6 | 10.7 |
| FEBRUARY  | 1146 | 78.2  | 14.7 | 12178 | 1111.8 | 11.0 |
| MARCH     | 650  | 63.2  | 10.3 | 12828 | 1175.0 | 10.9 |
| APRIL     | 457  | 62.0  | 7.4  | 13285 | 1237.0 | 10.7 |
| MAY       | 507  | 56.7  | 8.9  | 13792 | 1293.7 | 10.7 |
| JUNE      | 587  | 79.5  | 7.4  | 14379 | 1373.2 | 10.5 |
| JULY      | 697  | 70.8  | 9.8  | 15076 | 1444.0 | 10.4 |
| AUGUST    | 1522 | 140.4 | 10.8 | 16598 | 1584.4 | 10.5 |
| SEPTEMBER | 1206 | 115.7 | 10.4 | 17804 | 1700.1 | 10.5 |
| OCTOBER   | 1093 | 115.6 | 9.5  | 18897 | 1815.7 | 10.4 |
| NOVEMBER  | 1474 | 124.3 | 11.9 | 20371 | 1940.0 | 10.5 |
| DECEMBER  | 892  | 88.6  | 10.1 | 21263 | 2028.6 | 10.5 |
| JANUARY   | 1294 | 109.9 | 11.8 | 22557 | 2138.5 | 10.5 |
| FEBRUARY  | 837  | 101.0 | 8.3  | 23394 | 2239.5 | 10.4 |
| MARCH     | 964  | 87.8  | 11.0 | 24358 | 2327.3 | 10.5 |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2889

'85 CHEV S-10 PICKUP  
ENGINE TYPE: V-6

FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 28               | 0.0                | 0.0            | 28             | 0.0              | 0.0          |
| JUNE      | 1117             | 60.6               | 18.4           | 1145           | 60.6             | 18.9         |
| JULY      | 1243             | 71.1               | 17.5           | 2388           | 131.7            | 18.1         |
| AUGUST    | 1050             | 55.0               | 19.1           | 3438           | 186.7            | 18.4         |
| SEPTEMBER | 1356             | 69.4               | 19.5           | 4794           | 256.1            | 18.7         |
| OCTOBER   | 1201             | 61.0               | 19.7           | 5995           | 317.1            | 18.9         |
| NOVEMBER  | 399              | 11.0               | 36.3           | 6394           | 328.1            | 19.5         |

CONVERTED TO METHANOL

|           |     |       |      |       |        |     |
|-----------|-----|-------|------|-------|--------|-----|
| JANUARY   | 949 | 118.2 | 8.0  | 949   | 118.2  | 8.0 |
| FEBRUARY  | 437 | 56.6  | 7.7  | 1386  | 174.8  | 7.9 |
| MARCH     | 972 | 98.7  | 9.8  | 2358  | 273.5  | 8.6 |
| APRIL     | 644 | 64.3  | 10.0 | 3002  | 337.8  | 8.9 |
| JUNE      | 555 | 64.3  | 8.6  | 3557  | 402.1  | 8.8 |
| JULY      | 483 | 60.7  | 8.0  | 4040  | 462.8  | 8.7 |
| AUGUST    | 479 | 51.5  | 9.3  | 4519  | 514.3  | 8.8 |
| SEPTEMBER | 519 | 67.8  | 7.7  | 5038  | 582.1  | 8.7 |
| OCTOBER   | 399 | 67.0  | 8.9  | 5637  | 649.1  | 8.7 |
| NOVEMBER  | 530 | 45.7  | 11.6 | 6167  | 694.8  | 8.9 |
| DECEMBER  | 209 | 27.1  | 7.7  | 6376  | 721.9  | 8.8 |
| JANUARY   | 436 | 63.9  | 6.8  | 6812  | 785.8  | 8.7 |
| FEBRUARY  | 482 | 57.2  | 8.4  | 7294  | 843.0  | 8.7 |
| MARCH     | 594 | 68.7  | 8.6  | 7888  | 911.7  | 8.7 |
| APRIL     | 507 | 60.4  | 8.4  | 8395  | 972.1  | 8.6 |
| MAY       | 345 | 42.8  | 8.1  | 8740  | 1014.9 | 8.6 |
| JUNE      | 600 | 58.2  | 10.3 | 9340  | 1073.1 | 8.7 |
| JULY      | 511 | 67.2  | 7.6  | 9851  | 1140.3 | 8.6 |
| AUGUST    | 541 | 59.8  | 9.0  | 10392 | 1200.1 | 8.7 |
| SEPTEMBER | 416 | 41.1  | 10.1 | 10808 | 1241.2 | 8.7 |
| NOVEMBER  | 156 | 15.0  | 10.4 | 10964 | 1256.2 | 8.7 |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2891

'85 CHEV 3-10 PICKUP  
ENGINE TYPE: V-6

FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 62               | 4.2                | 14.8           | 62             | 4.2              | 14.8         |
| JUNE      | 1060             | 54.7               | 19.4           | 1122           | 58.9             | 19.0         |
| JULY      | 1026             | 63.4               | 16.2           | 2148           | 122.3            | 17.6         |
| AUGUST    | 1134             | 59.2               | 19.2           | 3282           | 181.5            | 18.1         |
| SEPTEMBER | 1573             | 82.3               | 19.1           | 4855           | 263.8            | 18.4         |

CONVERTED TO METHANOL

|           |      |       |      |       |        |      |
|-----------|------|-------|------|-------|--------|------|
| FEBRUARY  | 377  | 77.7  | 11.3 | 377   | 77.7   | 11.3 |
| MARCH     | 1123 | 109.3 | 10.3 | 2000  | 187.0  | 10.7 |
| APRIL     | 165  | 14.0  | 11.8 | 2165  | 201.0  | 10.8 |
| MAY       | 393  | 40.6  | 9.7  | 2558  | 241.6  | 10.6 |
| JUNE      | 920  | 96.7  | 9.5  | 3478  | 338.3  | 10.3 |
| JULY      | 989  | 113.6 | 8.7  | 4467  | 451.9  | 9.9  |
| AUGUST    | 1142 | 117.2 | 9.7  | 5609  | 569.1  | 9.9  |
| SEPTEMBER | 1137 | 98.0  | 11.6 | 6746  | 667.1  | 10.1 |
| OCTOBER   | 1159 | 98.1  | 11.8 | 7905  | 765.2  | 10.3 |
| NOVEMBER  | 942  | 89.2  | 10.6 | 8847  | 854.4  | 10.4 |
| DECEMBER  | 1059 | 91.9  | 11.5 | 9906  | 946.3  | 10.5 |
| JANUARY   | 956  | 77.5  | 12.3 | 10862 | 1023.8 | 10.6 |
| FEBRUARY  | 1313 | 104.4 | 12.6 | 12175 | 1128.2 | 10.8 |
| MARCH     | 994  | 103.3 | 9.6  | 13169 | 1231.5 | 10.7 |
| APRIL     | 780  | 83.5  | 9.3  | 13949 | 1315.0 | 10.6 |
| MAY       | 1302 | 115.3 | 11.3 | 15251 | 1430.3 | 10.7 |
| JUNE      | 1000 | 89.3  | 11.2 | 16251 | 1519.6 | 10.7 |
| JULY      | 971  | 87.1  | 11.1 | 17222 | 1606.7 | 10.7 |
| AUGUST    | 671  | 94.1  | 7.1  | 17893 | 1700.8 | 10.5 |
| SEPTEMBER | 1291 | 93.1  | 13.9 | 19184 | 1793.9 | 10.7 |
| OCTOBER   | 1362 | 150.6 | 9.0  | 20546 | 1944.5 | 10.6 |
| NOVEMBER  | 938  | 112.8 | 8.3  | 21484 | 2057.3 | 10.4 |
| DECEMBER  | 1022 | 97.3  | 10.5 | 22506 | 2154.6 | 10.4 |
| JANUARY   | 1084 | 112.4 | 9.6  | 23590 | 2267.0 | 10.4 |
| FEBRUARY  | 635  | 91.0  | 7.0  | 24225 | 2358.0 | 10.3 |
| MARCH     | 305  | 55.0  | 5.5  | 24530 | 2413.0 | 10.2 |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2892

'95 CHEV S-10 PICKUP  
ENGINE TYPE: V-6

FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 42               | 0.0                | 0.0            | 42             | 0.0              | 0.0          |
| JUNE      | 1274             | 64.4               | 19.8           | 1316           | 64.4             | 20.4         |
| JULY      | 1398             | 73.3               | 18.9           | 2714           | 138.2            | 19.6         |
| AUGUST    | 880              | 48.1               | 18.3           | 3594           | 186.3            | 19.3         |
| SEPTEMBER | 793              | 44.5               | 17.8           | 4387           | 230.8            | 19.0         |
| OCTOBER   | 1436             | 67.1               | 21.4           | 5823           | 297.9            | 19.5         |
| NOVEMBER  | 733              | 38.4               | 19.1           | 6556           | 336.3            | 19.5         |

CONVERTED TO METHANOL

|           |      |       |      |       |        |      |
|-----------|------|-------|------|-------|--------|------|
| JANUARY   | 911  | 84.0  | 10.8 | 911   | 84.0   | 10.8 |
| FEBRUARY  | 320  | 46.4  | 6.9  | 1231  | 130.4  | 9.4  |
| MARCH     | 237  | 19.2  | 12.0 | 1468  | 149.6  | 9.9  |
| OCTOBER   | 419  | 67.5  | 6.2  | 1887  | 216.1  | 8.7  |
| NOVEMBER  | 769  | 49.1  | 15.7 | 2656  | 265.2  | 10.0 |
| DECEMBER  | 607  | 63.3  | 9.5  | 3263  | 329.0  | 9.9  |
| JANUARY   | 816  | 93.1  | 8.8  | 4079  | 422.1  | 9.7  |
| FEBRUARY  | 885  | 84.4  | 10.5 | 4964  | 506.5  | 9.8  |
| MARCH     | 896  | 82.1  | 10.9 | 5860  | 588.6  | 10.0 |
| APRIL     | 857  | 98.7  | 8.7  | 6717  | 687.3  | 9.8  |
| MAY       | 770  | 92.9  | 8.3  | 7487  | 780.2  | 9.6  |
| JUNE      | 889  | 99.7  | 8.9  | 8376  | 879.9  | 9.6  |
| JULY      | 772  | 94.0  | 8.2  | 9248  | 973.9  | 9.5  |
| AUGUST    | 927  | 84.1  | 11.0 | 10175 | 1058.0 | 9.6  |
| SEPTEMBER | 751  | 89.6  | 8.4  | 10926 | 1147.6 | 9.5  |
| OCTOBER   | 840  | 95.8  | 8.8  | 11766 | 1243.4 | 9.5  |
| NOVEMBER  | 413  | 17.5  | 23.6 | 12179 | 1260.9 | 9.7  |
| DECEMBER  | 552  | 64.4  | 8.6  | 12731 | 1325.3 | 9.6  |
| JANUARY   | 640  | 74.0  | 8.6  | 13371 | 1399.3 | 9.6  |
| FEBRUARY  | 1133 | 112.0 | 10.1 | 14504 | 1511.3 | 9.6  |
| MARCH     | 771  | 78.3  | 9.8  | 15275 | 1589.6 | 9.6  |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2893

'85 CHEV 3-10 PICKUP  
ENGINE TYPE: V-6

FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 80               | 4.9                | 16.3           | 80             | 4.9              | 16.3         |
| JUNE      | 1023             | 58.2               | 17.6           | 1103           | 63.1             | 17.5         |
| JULY      | 1358             | 71.4               | 19.0           | 2461           | 134.5            | 18.3         |
| AUGUST    | 596              | 30.0               | 19.9           | 3057           | 164.5            | 18.6         |
| SEPTEMBER | 329              | 9.7                | 33.9           | 3386           | 174.2            | 19.4         |

CONVERTED TO METHANOL

|           |     |      |      |       |        |     |
|-----------|-----|------|------|-------|--------|-----|
| DECEMBER  | 231 | 57.9 | 4.0  | 231   | 57.9   | 4.0 |
| JANUARY   | 326 | 75.8 | 10.9 | 1057  | 133.7  | 7.9 |
| FEBRUARY  | 236 | 26.0 | 9.1  | 1293  | 159.7  | 8.1 |
| MARCH     | 614 | 73.4 | 8.4  | 1907  | 233.1  | 8.2 |
| APRIL     | 607 | 67.0 | 9.1  | 2514  | 300.1  | 8.4 |
| MAY       | 551 | 63.4 | 8.7  | 3065  | 363.5  | 8.4 |
| JUNE      | 581 | 68.0 | 8.5  | 3646  | 431.5  | 8.4 |
| JULY      | 507 | 58.7 | 8.6  | 4153  | 490.2  | 8.5 |
| AUGUST    | 365 | 42.8 | 8.5  | 4518  | 533.0  | 8.5 |
| SEPTEMBER | 653 | 66.7 | 9.3  | 5171  | 599.7  | 8.6 |
| OCTOBER   | 743 | 70.3 | 10.6 | 5914  | 670.0  | 8.8 |
| NOVEMBER  | 931 | 94.0 | 11.1 | 6845  | 754.0  | 9.1 |
| DECEMBER  | 723 | 65.9 | 11.0 | 7568  | 819.9  | 9.2 |
| JANUARY   | 530 | 57.7 | 9.2  | 8098  | 877.6  | 9.2 |
| FEBRUARY  | 525 | 62.5 | 8.4  | 8623  | 940.1  | 9.2 |
| MARCH     | 348 | 37.3 | 9.3  | 8971  | 977.4  | 9.2 |
| APRIL     | 599 | 72.0 | 8.3  | 9570  | 1049.4 | 9.1 |
| MAY       | 533 | 53.7 | 9.9  | 10103 | 1103.1 | 9.2 |
| JUNE      | 500 | 54.0 | 9.3  | 10603 | 1157.1 | 9.2 |
| JULY      | 602 | 59.6 | 10.1 | 11205 | 1216.7 | 9.2 |
| AUGUST    | 626 | 87.9 | 7.1  | 11831 | 1304.6 | 9.1 |
| SEPTEMBER | 160 | 16.3 | 9.8  | 11991 | 1320.9 | 9.1 |
| NOVEMBER  | 55  | 4.1  | 13.4 | 12046 | 1325.0 | 9.1 |
| DECEMBER  | 436 | 52.5 | 8.3  | 12482 | 1377.5 | 9.1 |
| JANUARY   | 412 | 42.4 | 9.7  | 12894 | 1419.9 | 9.1 |
| FEBRUARY  | 449 | 29.0 | 15.5 | 13343 | 1448.9 | 9.2 |
| MARCH     | 364 | 43.7 | 8.3  | 13707 | 1492.6 | 9.2 |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2894

'85 CHEV S-10 PICKUP  
ENGINE TYPE: L-4

FT. ORD METHANOL VEHICLE

| MONTH                 | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------------------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY                   | 282              | 19.5               | 14.5           | 232            | 19.5             | 14.5         |
| JUNE                  | 1081             | 38.6               | 28.0           | 1363           | 58.1             | 23.5         |
| JULY                  | 878              | 35.4               | 24.8           | 2241           | 93.5             | 24.0         |
| AUGUST                | 366              | 43.9               | 19.7           | 3107           | 137.4            | 22.6         |
| SEPTEMBER             | 1169             | 50.1               | 23.3           | 4275           | 187.5            | 22.8         |
| OCTOBER               | 1342             | 72.6               | 18.5           | 5617           | 260.1            | 21.6         |
| NOVEMBER              | 1047             | 54.1               | 19.4           | 6664           | 314.2            | 21.2         |
| DECEMBER              | 857              | 43.1               | 19.9           | 7521           | 357.3            | 21.0         |
| JANUARY               | 1273             | 50.3               | 25.3           | 8794           | 407.6            | 21.6         |
| FEBRUARY              | 542              | 29.0               | 18.7           | 9336           | 436.6            | 21.4         |
| CONVERTED TO METHANOL |                  |                    |                |                |                  |              |
| MARCH                 | 93               | 10.0               | 9.3            | 93             | 10.0             | 9.3          |
| OCTOBER               | 128              | 6.5                | 19.7           | 221            | 16.5             | 13.4         |
| NOVEMBER              | 748              | 63.5               | 11.8           | 969            | 80.0             | 12.1         |
| DECEMBER              | 988              | 95.5               | 10.3           | 1957           | 175.5            | 11.2         |
| JANUARY               | 840              | 9.2                | 47.8           | 2397           | 184.7            | 13.0         |
| FEBRUARY              | 515              | 38.3               | 13.4           | 2912           | 223.0            | 13.1         |
| MARCH                 | 662              | 62.1               | 10.7           | 3574           | 285.1            | 12.5         |
| APRIL                 | 602              | 55.3               | 10.9           | 4176           | 340.4            | 12.3         |
| MAY                   | 337              | 42.8               | 9.0            | 4563           | 383.2            | 11.9         |
| JUNE                  | 828              | 77.7               | 10.7           | 5391           | 460.9            | 11.7         |
| JULY                  | 473              | 36.0               | 13.1           | 5864           | 496.9            | 11.8         |
| AUGUST                | 639              | 60.2               | 10.6           | 6503           | 557.1            | 11.7         |
| SEPTEMBER             | 120              | 21.0               | 5.7            | 6623           | 578.1            | 11.5         |
| DECEMBER              | 523              | 0.0                | 0.0            | 7146           | 578.1            | 12.4         |
| JANUARY               | 403              | 60.5               | 6.7            | 7549           | 638.6            | 11.8         |
| FEBRUARY              | 297              | 34.2               | 8.7            | 7846           | 672.8            | 11.7         |
| MARCH                 | 346              | 22.3               | 15.5           | 8192           | 695.1            | 11.8         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2895

'95 CHEV S-10 PICKUP  
ENGINE TYPE: V-6

FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 106              | 13.0               | 8.2            | 106            | 13.0             | 8.2          |
| JUNE      | 567              | 39.0               | 14.5           | 673            | 52.0             | 12.9         |
| JULY      | 595              | 30.4               | 19.6           | 1268           | 82.4             | 15.4         |
| AUGUST    | 593              | 29.5               | 13.3           | 1661           | 111.9            | 14.8         |
| SEPTEMBER | 1159             | 66.3               | 17.3           | 2820           | 178.3            | 15.8         |
| OCTOBER   | 712              | 44.9               | 15.9           | 3532           | 223.7            | 15.8         |
| NOVEMBER  | 598              | 27.3               | 21.5           | 4130           | 251.5            | 16.4         |
| DECEMBER  | 844              | 53.0               | 15.9           | 4974           | 304.5            | 16.3         |
| JANUARY   | 761              | 38.5               | 19.8           | 5735           | 343.0            | 16.7         |
| FEBRUARY  | 496              | 31.3               | 15.8           | 6231           | 374.9            | 16.6         |
| MARCH     | 121              | 9.0                | 13.4           | 6352           | 383.9            | 16.5         |

CONVERTED TO METHANOL

Mid-Month

|           |      |       |      |       |        |      |
|-----------|------|-------|------|-------|--------|------|
| MARCH     | 75   | 25.0  | 3.0  | 75    | 25.0   | 3.0  |
| APRIL     | 338  | 18.1  | 18.7 | 413   | 43.1   | 9.6  |
| MAY       | 597  | 77.7  | 7.7  | 1010  | 120.8  | 8.4  |
| JUNE      | 1006 | 83.2  | 12.1 | 2016  | 204.0  | 9.9  |
| JULY      | 850  | 85.5  | 9.9  | 2866  | 289.5  | 9.9  |
| AUGUST    | 1129 | 91.5  | 12.3 | 3995  | 381.0  | 10.5 |
| SEPTEMBER | 1118 | 102.5 | 10.9 | 5113  | 483.5  | 10.6 |
| OCTOBER   | 842  | 91.7  | 10.3 | 5955  | 565.2  | 10.5 |
| NOVEMBER  | 834  | 100.2 | 8.3  | 6789  | 663.4  | 10.2 |
| DECEMBER  | 859  | 89.7  | 9.6  | 7648  | 755.1  | 10.1 |
| JANUARY   | 776  | 52.2  | 14.9 | 8424  | 807.3  | 10.4 |
| FEBRUARY  | 1053 | 98.3  | 12.0 | 9482  | 895.6  | 10.6 |
| MARCH     | 1545 | 118.0 | 13.1 | 11027 | 1013.6 | 10.9 |
| APRIL     | 1195 | 123.8 | 9.7  | 12222 | 1137.4 | 10.7 |
| MAY       | 1288 | 138.0 | 9.3  | 13510 | 1275.4 | 10.6 |
| JUNE      | 1621 | 153.7 | 10.5 | 15131 | 1429.1 | 10.6 |
| JULY      | 973  | 92.8  | 10.5 | 16104 | 1521.9 | 10.6 |
| AUGUST    | 303  | 30.8  | 9.8  | 16407 | 1552.7 | 10.6 |
| SEPTEMBER | 401  | 48.0  | 8.3  | 16808 | 1601.3 | 10.5 |
| OCTOBER   | 597  | 58.0  | 10.3 | 17405 | 1659.3 | 10.5 |
| NOVEMBER  | 122  | 20.7  | 10.7 | 17627 | 1680.0 | 10.5 |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2896

'85 CHEV S-10 PICKUP  
ENGINE TYPE: L-4

FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 77               | 5.4                | 14.3           | 77             | 5.4              | 14.3         |
| JUNE      | 1159             | 44.4               | 26.1           | 1236           | 49.8             | 24.8         |
| JULY      | 1170             | 24.4               | 48.0           | 2406           | 74.2             | 32.4         |
| AUGUST    | 473              | 31.8               | 14.9           | 2879           | 106.0            | 27.2         |
| SEPTEMBER | 1454             | 64.1               | 22.7           | 4333           | 170.1            | 25.5         |
| OCTOBER   | 1452             | 66.9               | 21.7           | 5785           | 237.0            | 24.4         |
| NOVEMBER  | 1032             | 47.4               | 21.8           | 6817           | 284.4            | 24.0         |
| DECEMBER  | 902              | 47.8               | 18.9           | 7719           | 332.2            | 23.2         |
| JANUARY   | 702              | 43.0               | 16.3           | 8421           | 375.2            | 22.4         |
| FEBRUARY  | 182              | 9.0                | 20.2           | 8603           | 384.2            | 22.4         |

CONVERTED TO METHANOL

|           |     |      |      |      |        |     |
|-----------|-----|------|------|------|--------|-----|
| MARCH     | 670 | 97.8 | 7.6  | 670  | 87.8   | 7.6 |
| APRIL     | 528 | 63.3 | 8.3  | 1198 | 151.1  | 7.9 |
| MAY       | 392 | 40.5 | 9.7  | 1590 | 191.6  | 8.3 |
| JUNE      | 248 | 38.8 | 6.4  | 1838 | 230.4  | 8.0 |
| JULY      | 341 | 44.0 | 7.8  | 2179 | 274.4  | 7.9 |
| AUGUST    | 595 | 60.9 | 9.8  | 2774 | 335.3  | 8.3 |
| SEPTEMBER | 595 | 73.4 | 8.1  | 3369 | 408.7  | 8.2 |
| OCTOBER   | 435 | 42.1 | 10.3 | 3804 | 450.8  | 8.4 |
| NOVEMBER  | 210 | 26.8 | 7.8  | 4014 | 477.6  | 8.4 |
| DECEMBER  | 219 | 25.6 | 8.6  | 4233 | 503.2  | 8.4 |
| JANUARY   | 143 | 6.1  | 23.4 | 4376 | 509.3  | 8.6 |
| FEBRUARY  | 343 | 41.0 | 8.4  | 4719 | 550.3  | 8.6 |
| MARCH     | 296 | 52.4 | 5.6  | 5015 | 602.7  | 8.3 |
| APRIL     | 257 | 37.0 | 6.9  | 5272 | 639.7  | 8.2 |
| MAY       | 343 | 27.0 | 12.7 | 5615 | 666.7  | 8.4 |
| JUNE      | 327 | 57.9 | 5.6  | 5942 | 724.6  | 8.2 |
| JULY      | 205 | 27.6 | 7.4  | 6147 | 752.2  | 8.2 |
| AUGUST    | 621 | 55.0 | 11.3 | 6768 | 807.2  | 8.4 |
| SEPTEMBER | 363 | 44.0 | 8.3  | 7131 | 851.2  | 8.4 |
| OCTOBER   | 367 | 43.1 | 8.5  | 7498 | 894.3  | 8.4 |
| NOVEMBER  | 203 | 0.0  | 0.0  | 7701 | 894.3  | 8.6 |
| DECEMBER  | 527 | 66.3 | 7.9  | 8228 | 960.6  | 8.6 |
| JANUARY   | 199 | 19.8 | 10.1 | 8427 | 980.4  | 8.6 |
| FEBRUARY  | 303 | 53.7 | 5.6  | 8730 | 1034.1 | 8.4 |
| MARCH     | 123 | 19.1 | 6.4  | 8853 | 1053.2 | 8.4 |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CN2897

'85 CHEV S-10 PICKUP  
ENGINE TYPE: V-6

FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 112              | 3.3                | 12.7           | 112            | 3.3              | 12.7         |
| JUNE      | 789              | 42.2               | 13.7           | 901            | 51.0             | 17.7         |
| JULY      | 548              | 31.4               | 10.4           | 1749           | 132.4            | 13.2         |
| AUGUST    | 549              | 36.3               | 13.0           | 2298           | 168.7            | 13.6         |
| SEPTEMBER | 516              | 35.0               | 14.7           | 2814           | 203.9            | 13.8         |
| OCTOBER   | 530              | 53.6               | 11.4           | 3494           | 267.5            | 13.3         |
| NOVEMBER  | 491              | 32.5               | 14.3           | 3975           | 296.0            | 13.4         |
| DECEMBER  | 535              | 35.1               | 16.7           | 4560           | 331.1            | 15.8         |
| JANUARY   | 1200             | 53.4               | 20.5           | 5760           | 389.5            | 14.8         |
| FEBRUARY  | 1328             | 66.6               | 19.9           | 7088           | 456.1            | 15.5         |
| MARCH     | 452              | 27.0               | 16.7           | 7540           | 483.1            | 15.6         |

CONVERTED TO METHANOL

Mid-Month

|           |      |       |      |       |        |      |
|-----------|------|-------|------|-------|--------|------|
| MARCH     | 43   | 10.0  | 4.3  | 43    | 10.0   | 4.3  |
| APRIL     | 352  | 43.0  | 9.2  | 395   | 53.0   | 7.5  |
| MAY       | 555  | 61.3  | 10.6 | 1050  | 114.3  | 9.1  |
| JUNE      | 959  | 94.1  | 10.2 | 2009  | 208.9  | 9.6  |
| JULY      | 1336 | 116.3 | 11.4 | 3345  | 325.7  | 10.3 |
| AUGUST    | 904  | 90.7  | 10.0 | 4249  | 416.4  | 10.2 |
| SEPTEMBER | 1194 | 123.9 | 9.6  | 5443  | 540.3  | 10.1 |
| OCTOBER   | 1025 | 101.3 | 10.1 | 6468  | 641.6  | 10.1 |
| NOVEMBER  | 1108 | 103.0 | 10.3 | 7576  | 744.6  | 10.2 |
| DECEMBER  | 341  | 33.0  | 9.0  | 7917  | 782.6  | 10.1 |
| JANUARY   | 756  | 62.9  | 12.1 | 8673  | 845.5  | 10.3 |
| FEBRUARY  | 592  | 44.0  | 13.5 | 9265  | 889.5  | 10.4 |
| MARCH     | 1243 | 121.5 | 10.2 | 10508 | 1011.0 | 10.4 |
| APRIL     | 1133 | 104.1 | 10.9 | 11641 | 1115.1 | 10.4 |
| MAY       | 533  | 60.4  | 9.7  | 12229 | 1175.5 | 10.4 |
| JUNE      | 1421 | 120.7 | 11.3 | 13650 | 1296.2 | 10.5 |
| JULY      | 963  | 100.5 | 9.6  | 14513 | 1396.7 | 10.4 |
| AUGUST    | 628  | 34.0  | 7.4  | 15135 | 1480.7 | 10.2 |
| SEPTEMBER | 537  | 60.0  | 10.6 | 15772 | 1540.7 | 10.2 |
| OCTOBER   | 613  | 38.7  | 6.9  | 16385 | 1629.4 | 10.1 |
| NOVEMBER  | 491  | 74.7  | 6.6  | 16876 | 1704.1 | 9.9  |
| DECEMBER  | 294  | 17.5  | 16.8 | 17170 | 1721.6 | 10.0 |
| JANUARY   | 464  | 75.7  | 6.1  | 17634 | 1797.3 | 9.8  |
| FEBRUARY  | 676  | 31.9  | 3.3  | 18310 | 1879.2 | 9.7  |
| MARCH     | 369  | 60.2  | 6.1  | 18679 | 1939.4 | 9.6  |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2898

'95 CHEV S-10 PICKUP  
ENGINE TYPE: V-6

FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 870              | 47.3               | 18.2           | 870            | 47.3             | 18.2         |
| JUNE      | 2982             | 109.2              | 27.3           | 3852           | 157.0            | 24.5         |
| JULY      | 617              | 41.4               | 14.9           | 4469           | 198.4            | 22.5         |
| AUGUST    | 957              | 53.4               | 17.9           | 5426           | 251.8            | 21.5         |
| SEPTEMBER | 152              | 8.0                | 19.0           | 5578           | 259.8            | 21.5         |

CONVERTED TO METHANOL

|           |     |       |      |       |        |      |
|-----------|-----|-------|------|-------|--------|------|
| DECEMBER  | 416 | 41.2  | 10.1 | 416   | 41.2   | 10.1 |
| JANUARY   | 521 | 53.3  | 9.9  | 937   | 94.5   | 9.9  |
| FEBRUARY  | 294 | 41.7  | 7.1  | 1231  | 136.2  | 9.0  |
| MARCH     | 695 | 63.2  | 11.0 | 1926  | 199.4  | 9.7  |
| APRIL     | 896 | 105.7 | 8.4  | 2812  | 305.1  | 9.2  |
| MAY       | 667 | 75.7  | 8.9  | 3479  | 380.9  | 9.1  |
| JUNE      | 738 | 76.4  | 9.7  | 4217  | 457.2  | 9.2  |
| JULY      | 895 | 92.7  | 9.7  | 5112  | 549.9  | 9.3  |
| AUGUST    | 448 | 57.5  | 7.8  | 5560  | 607.4  | 9.2  |
| SEPTEMBER | 555 | 63.3  | 8.8  | 6115  | 670.7  | 9.1  |
| OCTOBER   | 695 | 73.6  | 9.4  | 6810  | 744.3  | 9.1  |
| NOVEMBER  | 479 | 51.4  | 9.3  | 7289  | 795.7  | 9.2  |
| DECEMBER  | 494 | 63.6  | 7.8  | 7783  | 859.3  | 9.1  |
| JANUARY   | 544 | 77.6  | 7.0  | 8327  | 936.9  | 8.9  |
| FEBRUARY  | 354 | 38.7  | 9.1  | 8681  | 975.6  | 8.9  |
| MARCH     | 469 | 68.5  | 6.8  | 9150  | 1044.1 | 8.8  |
| APRIL     | 455 | 54.4  | 8.4  | 9605  | 1098.5 | 8.7  |
| MAY       | 523 | 55.9  | 9.4  | 10128 | 1154.4 | 8.8  |
| JUNE      | 656 | 67.1  | 9.8  | 10784 | 1221.5 | 8.8  |
| JULY      | 561 | 60.4  | 9.3  | 11345 | 1281.9 | 8.9  |
| AUGUST    | 466 | 58.5  | 8.0  | 11811 | 1340.4 | 8.8  |
| SEPTEMBER | 464 | 52.0  | 8.9  | 12275 | 1392.4 | 8.8  |
| OCTOBER   | 445 | 52.9  | 8.4  | 12720 | 1445.3 | 8.8  |
| NOVEMBER  | 321 | 32.9  | 9.8  | 13041 | 1478.2 | 8.8  |
| DECEMBER  | 446 | 49.5  | 9.0  | 13487 | 1527.7 | 8.8  |
| JANUARY   | 309 | 35.7  | 8.7  | 13796 | 1563.4 | 8.8  |
| FEBRUARY  | 303 | 44.0  | 6.9  | 14099 | 1607.4 | 8.8  |
| MARCH     | 272 | 42.8  | 6.4  | 14371 | 1650.2 | 8.7  |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2899

'85 CHEV S-10 PICKUP  
ENGINE TYPE: L-4

FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 614              | 28.1               | 21.9           | 614            | 28.1             | 21.9         |
| JUNE      | 3332             | 140.6              | 23.7           | 3946           | 168.7            | 23.4         |
| JULY      | 1134             | 49.7               | 22.8           | 5080           | 218.4            | 23.3         |
| AUGUST    | 271              | 16.6               | 16.3           | 5351           | 235.0            | 22.8         |
| SEPTEMBER | 62               | 3.2                | 12.4           | 5413           | 240.0            | 22.6         |

TRANSFERRED TO JPL

Mid-Month

CONVERTED TO METHANOL

|           |      |      |      |       |        |      |
|-----------|------|------|------|-------|--------|------|
| SEPTEMBER | 452  | 53.2 | 7.3  | 452   | 53.2   | 7.8  |
| OCTOBER   | 442  | 30.6 | 14.4 | 894   | 88.8   | 10.1 |
| NOVEMBER  | 861  | 77.0 | 9.6  | 1555  | 165.8  | 9.4  |
| DECEMBER  | 556  | 38.8 | 14.3 | 2111  | 204.6  | 10.3 |
| JANUARY   | 513  | 98.6 | 5.2  | 2624  | 303.2  | 8.7  |
| FEBRUARY  | 442  | 23.8 | 15.3 | 3066  | 332.0  | 9.2  |
| MARCH     | 471  | 48.2 | 9.8  | 3537  | 380.2  | 9.3  |
| APRIL     | 425  | 66.8 | 6.4  | 3962  | 447.0  | 8.9  |
| MAY       | 466  | 63.9 | 7.3  | 4428  | 510.9  | 8.7  |
| JUNE      | 645  | 67.3 | 9.6  | 5073  | 578.2  | 8.8  |
| JULY      | 680  | 68.4 | 9.9  | 5753  | 646.6  | 8.9  |
| AUGUST    | 591  | 42.5 | 13.9 | 6344  | 689.1  | 9.2  |
| SEPTEMBER | 863  | 78.7 | 11.0 | 7207  | 767.8  | 9.4  |
| OCTOBER   | 990  | 99.6 | 11.0 | 8197  | 857.4  | 9.6  |
| NOVEMBER  | 864  | 58.6 | 14.7 | 9061  | 916.0  | 9.9  |
| DECEMBER  | 566  | 35.8 | 10.1 | 9627  | 971.8  | 9.9  |
| JANUARY   | 585  | 35.5 | 16.5 | 10212 | 1007.3 | 10.1 |
| FEBRUARY  | 1232 | 83.4 | 14.8 | 11444 | 1090.7 | 10.5 |
| MARCH     | 469  | 40.4 | 11.6 | 11913 | 1131.1 | 10.5 |

TRANSFERRED TO SIDP @

|      |    |      |     |       |        |      |
|------|----|------|-----|-------|--------|------|
| MAY  | 38 | 18.1 | 2.1 | 11951 | 1149.2 | 10.4 |
| JUNE | 78 | 0.0  | 0.0 | 12029 | 1149.2 | 10.5 |
| JULY | 72 | 0.0  | 0.0 | 12101 | 1149.2 | 10.5 |

**OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II**

**MONTHLY CUMULATIVE VEHICLE REPORT**

POST ACTIVITY: FOGA  
VEHICLE USA #: CM2900

'85 CHEV S-10 PICKUP  
ENGINE TYPE: V-6

FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 604              | 32.4               | 18.6           | 604            | 32.4             | 18.6         |
| JUNE      | 1075             | 48.6               | 22.1           | 1679           | 81.0             | 20.7         |
| AUGUST    | 862              | 42.5               | 20.3           | 2541           | 123.5            | 20.6         |
| SEPTEMBER | 755              | 43.8               | 17.2           | 3296           | 167.3            | 19.7         |
| OCTOBER   | 1085             | 50.5               | 21.5           | 4381           | 217.8            | 20.1         |
| NOVEMBER  | 441              | 17.0               | 25.9           | 4822           | 234.8            | 20.5         |
| DECEMBER  | 1470             | 70.2               | 20.9           | 6292           | 305.0            | 20.6         |
| JANUARY   | 892              | 10.5               | 85.0           | 7184           | 315.5            | 22.8         |

**CONVERTED TO METHANOL**

|           |     |      |      |      |        |     |
|-----------|-----|------|------|------|--------|-----|
| FEBRUARY  | 139 | 30.1 | 4.6  | 139  | 30.1   | 4.6 |
| MARCH     | 554 | 72.9 | 7.6  | 693  | 103.0  | 6.7 |
| APRIL     | 555 | 68.0 | 8.2  | 1248 | 171.0  | 7.3 |
| MAY       | 413 | 49.7 | 8.3  | 1661 | 220.7  | 7.5 |
| JUNE      | 566 | 70.2 | 8.1  | 2227 | 290.9  | 7.7 |
| JULY      | 424 | 39.9 | 10.6 | 2651 | 330.8  | 8.0 |
| AUGUST    | 540 | 83.0 | 6.5  | 3191 | 413.8  | 7.7 |
| SEPTEMBER | 270 | 25.3 | 10.7 | 3461 | 439.1  | 7.9 |
| OCTOBER   | 308 | 47.0 | 6.6  | 3769 | 486.1  | 7.8 |
| NOVEMBER  | 372 | 42.8 | 8.7  | 4141 | 528.9  | 7.8 |
| DECEMBER  | 353 | 45.4 | 7.8  | 4494 | 574.3  | 7.8 |
| JANUARY   | 463 | 50.0 | 9.3  | 4957 | 624.3  | 7.9 |
| FEBRUARY  | 482 | 90.3 | 5.3  | 5439 | 715.1  | 7.6 |
| MARCH     | 567 | 86.0 | 6.6  | 6006 | 801.1  | 7.5 |
| APRIL     | 408 | 55.1 | 7.4  | 6414 | 856.2  | 7.5 |
| MAY       | 578 | 41.5 | 9.1  | 6792 | 897.7  | 7.6 |
| JUNE      | 479 | 52.0 | 9.2  | 7271 | 949.7  | 7.7 |
| JULY      | 323 | 39.4 | 8.2  | 7594 | 989.1  | 7.7 |
| AUGUST    | 209 | 23.7 | 8.8  | 7803 | 1012.8 | 7.7 |
| SEPTEMBER | 418 | 45.7 | 9.1  | 8221 | 1058.5 | 7.8 |
| OCTOBER   | 322 | 41.8 | 7.7  | 8543 | 1100.3 | 7.8 |
| NOVEMBER  | 296 | 23.7 | 12.5 | 8839 | 1124.0 | 7.9 |
| DECEMBER  | 284 | 61.9 | 4.6  | 9123 | 1185.9 | 7.7 |
| JANUARY   | 230 | 0.0  | 0.0  | 9353 | 1185.9 | 7.9 |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2901

'85 CHEV 'S-10 PICKUP  
ENGINE TYPE: V-6

FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 969              | 37.6               | 25.7           | 969            | 37.6             | 25.7         |
| JUNE      | 1966             | 89.5               | 22.0           | 2934           | 127.1            | 23.1         |
| JULY      | 1680             | 74.8               | 22.5           | 4614           | 201.9            | 22.9         |
| AUGUST    | 495              | 35.9               | 13.8           | 5109           | 237.8            | 21.5         |
| SEPTEMBER | 32               | 0.0                | 0.0            | 5191           | 237.8            | 21.8         |

CONVERTED TO METHANOL

|           |      |       |      |       |        |      |
|-----------|------|-------|------|-------|--------|------|
| DECEMBER  | 379  | 62.9  | 6.0  | 379   | 62.9   | 6.0  |
| JANUARY   | 146  | 23.0  | 6.3  | 525   | 85.9   | 6.1  |
| MARCH     | 1250 | 144.1 | 8.7  | 1775  | 230.0  | 7.7  |
| APRIL     | 1133 | 141.1 | 8.0  | 2908  | 371.1  | 7.8  |
| MAY       | 1029 | 114.2 | 9.0  | 3936  | 485.3  | 8.1  |
| JUNE      | 1446 | 117.6 | 12.3 | 5382  | 602.9  | 8.9  |
| JULY      | 1011 | 97.2  | 10.4 | 6393  | 700.1  | 9.1  |
| AUGUST    | 532  | 46.3  | 11.5 | 6925  | 746.4  | 9.3  |
| SEPTEMBER | 731  | 78.4  | 9.3  | 7656  | 824.8  | 9.3  |
| OCTOBER   | 898  | 102.1 | 8.8  | 8554  | 926.9  | 9.2  |
| NOVEMBER  | 693  | 68.7  | 10.1 | 9247  | 995.6  | 9.3  |
| DECEMBER  | 399  | 29.0  | 13.8 | 9646  | 1024.6 | 9.4  |
| JANUARY   | 963  | 59.1  | 16.3 | 10609 | 1083.7 | 9.8  |
| FEBRUARY  | 720  | 71.9  | 10.0 | 11329 | 1155.6 | 9.8  |
| MARCH     | 490  | 49.2  | 10.0 | 11819 | 1204.8 | 9.8  |
| APRIL     | 753  | 79.2  | 9.5  | 12572 | 1284.0 | 9.8  |
| MAY       | 750  | 62.2  | 12.1 | 13322 | 1346.2 | 9.9  |
| JUNE      | 1023 | 97.0  | 10.5 | 14345 | 1443.2 | 9.9  |
| JULY      | 815  | 78.5  | 10.4 | 15160 | 1521.7 | 10.0 |
| AUGUST    | 448  | 66.2  | 6.8  | 15608 | 1587.9 | 9.8  |
| SEPTEMBER | 579  | 76.8  | 7.5  | 16187 | 1664.7 | 9.7  |
| OCTOBER   | 498  | 68.6  | 7.1  | 16675 | 1733.3 | 9.6  |
| NOVEMBER  | 459  | 59.2  | 7.9  | 17134 | 1791.5 | 9.6  |
| DECEMBER  | 449  | 76.8  | 5.8  | 17583 | 1868.3 | 9.4  |
| JANUARY   | 452  | 61.4  | 7.4  | 18035 | 1929.7 | 9.3  |
| FEBRUARY  | 259  | 37.4  | 6.9  | 18294 | 1967.1 | 9.3  |
| MARCH     | 410  | 45.4  | 9.0  | 18704 | 2012.5 | 9.3  |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CM2902

'85 CHEV S-10 PICKUP  
ENGINE TYPE: V-6

FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| MAY       | 657              | 28.3               | 23.2           | 657            | 28.3             | 23.2         |
| JUNE      | 853              | 35.9               | 26.5           | 1610           | 64.2             | 25.1         |
| JULY      | 206              | 11.5               | 17.9           | 1816           | 75.7             | 24.0         |
| AUGUST    | 1170             | 53.2               | 22.0           | 2986           | 128.9            | 23.2         |
| SEPTEMBER | 1521             | 65.2               | 23.3           | 4507           | 194.1            | 23.2         |
| OCTOBER   | 1727             | 78.4               | 22.0           | 6234           | 272.5            | 22.9         |
| NOVEMBER  | 1389             | 57.4               | 24.2           | 7623           | 329.9            | 23.1         |

CONVERTED TO METHANOL

|           |      |       |      |       |        |      |
|-----------|------|-------|------|-------|--------|------|
| JANUARY   | 1356 | 123.6 | 11.0 | 1356  | 123.6  | 11.0 |
| FEBRUARY  | 401  | 55.6  | 7.2  | 1757  | 179.2  | 9.8  |
| MARCH     | 495  | 56.2  | 8.8  | 2252  | 235.4  | 9.6  |
| APRIL     | 606  | 81.5  | 7.4  | 2858  | 316.9  | 9.0  |
| MAY       | 215  | 30.4  | 7.1  | 3073  | 347.3  | 8.8  |
| JUNE      | 556  | 22.7  | 24.5 | 3629  | 370.0  | 9.8  |
| JULY      | 977  | 93.1  | 10.0 | 4606  | 468.1  | 9.8  |
| AUGUST    | 537  | 54.9  | 9.8  | 5143  | 523.0  | 9.8  |
| SEPTEMBER | 539  | 56.5  | 9.5  | 5682  | 579.5  | 9.8  |
| OCTOBER   | 399  | 33.6  | 11.9 | 6081  | 613.1  | 9.9  |
| NOVEMBER  | 360  | 36.1  | 10.0 | 6441  | 649.2  | 9.9  |
| DECEMBER  | 318  | 50.0  | 6.4  | 6759  | 699.2  | 9.7  |
| JANUARY   | 304  | 20.0  | 15.2 | 7063  | 719.2  | 9.8  |
| FEBRUARY  | 383  | 51.7  | 7.4  | 7446  | 770.9  | 9.7  |
| MARCH     | 383  | 56.8  | 6.7  | 7829  | 827.7  | 9.5  |
| APRIL     | 601  | 71.6  | 8.4  | 8430  | 899.3  | 9.4  |
| MAY       | 496  | 57.0  | 8.7  | 8926  | 956.3  | 9.3  |
| JUNE      | 524  | 56.4  | 9.3  | 9450  | 1012.7 | 9.3  |
| JULY      | 502  | 44.0  | 11.4 | 9952  | 1056.7 | 9.4  |
| AUGUST    | 302  | 56.9  | 5.3  | 10254 | 1113.6 | 9.2  |
| SEPTEMBER | 645  | 53.7  | 12.0 | 10899 | 1167.3 | 9.3  |
| OCTOBER   | 606  | 76.8  | 7.9  | 11505 | 1244.1 | 9.2  |
| NOVEMBER  | 291  | 48.9  | 6.0  | 11796 | 1293.0 | 9.1  |
| DECEMBER  | 235  | 22.0  | 10.7 | 12031 | 1315.0 | 9.1  |
| JANUARY   | 488  | 55.8  | 8.7  | 12519 | 1370.8 | 9.1  |
| FEBRUARY  | 368  | 32.5  | 11.3 | 12887 | 1403.3 | 9.2  |
| MARCH     | 195  | 31.6  | 6.2  | 13082 | 1434.9 | 9.1  |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CN0436

'83 FORD ESCORT, 4 DOOR SEDAN  
ENGINE TYPE: I-4 FT. ORD METHANOL VEHICLE

| MONTH                 | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------------------|------------------|--------------------|----------------|----------------|------------------|--------------|
| AUGUST                | 381              | 37.1               | 10.3           | 381            | 37.1             | 10.3         |
| SEPTEMBER             | 191              | 26.3               | 7.3            | 572            | 63.4             | 9.0          |
| OCTOBER               | 292              | 35.8               | 8.2            | 864            | 99.2             | 8.7          |
| NOVEMBER              | 429              | 43.0               | 10.0           | 1293           | 142.2            | 9.1          |
| DECEMBER              | 37               | 0.0                | 0.0            | 1330           | 142.2            | 9.4          |
| FEBRUARY              | 130              | 9.1                | 14.3           | 1460           | 151.3            | 9.6          |
| MARCH                 | 67               | 9.5                | 7.1            | 1527           | 160.8            | 9.5          |
| JULY                  | 11               | 0.0                | 0.0            | 1538           | 160.8            | 9.6          |
| MARCH                 | 278              | 24.0               | 11.6           | 1816           | 184.8            | 9.8          |
| APRIL                 | 734              | 63.5               | 11.6           | 2550           | 248.3            | 10.3         |
| MAY                   | 144              | 7.2                | 20.0           | 2694           | 255.5            | 10.5         |
| JUNE                  | 779              | 75.7               | 10.3           | 3473           | 331.2            | 10.5         |
| JULY                  | 506              | 50.4               | 10.0           | 3979           | 381.6            | 10.4         |
| AUGUST                | 422              | 33.8               | 12.5           | 4401           | 415.4            | 10.6         |
| SEPTEMBER             | 551              | 51.9               | 10.6           | 4952           | 467.3            | 10.6         |
| OCTOBER               | 343              | 32.2               | 10.7           | 5295           | 499.5            | 10.6         |
| NOVEMBER              | 795              | 68.5               | 11.6           | 6090           | 568.0            | 10.7         |
| DECEMBER              | 543              | 38.5               | 14.1           | 6633           | 606.5            | 10.9         |
| JANUARY               | 635              | 52.8               | 12.0           | 7268           | 659.3            | 11.0         |
| FEBRUARY              | 743              | 66.1               | 11.2           | 8011           | 725.4            | 11.0         |
| MARCH                 | 821              | 64.5               | 12.7           | 8832           | 789.9            | 11.2         |
| MAY                   | 1                | 5.7                | .2             | 8833           | 795.6            | 11.1         |
| TRANSFERRED TO SIDP @ |                  |                    |                |                |                  | Mid-Month    |
| MAY                   | 128              | 19.1               | 6.7            | 3961           | 814.7            | 11.0         |
| JUNE                  | 218              | 16.0               | 13.6           | 9179           | 830.7            | 11.0         |
| JULY                  | 140              | 9.6                | 14.6           | 9319           | 840.3            | 11.1         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CN0437

'83 FORD ESCORT, 4 DOOR SEDAN  
ENGINE TYPE: I-4 FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| JULY      | 2                | 0.0                | 0.0            | 2              | 0.0              | 0.0          |
| AUGUST    | 325              | 28.2               | 11.5           | 327            | 28.2             | 11.6         |
| SEPTEMBER | 355              | 33.2               | 10.7           | 682            | 61.4             | 11.1         |
| OCTOBER   | 543              | 53.7               | 12.0           | 1325           | 115.1            | 11.5         |
| NOVEMBER  | 422              | 42.4               | 10.0           | 1747           | 157.5            | 11.1         |
| DECEMBER  | 192              | 19.3               | 9.9            | 1939           | 176.8            | 11.0         |
| JANUARY   | 293              | 29.4               | 10.3           | 2232           | 205.2            | 10.9         |
| FEBRUARY  | 249              | 18.4               | 13.5           | 2481           | 223.6            | 11.1         |
| MARCH     | 797              | 61.4               | 13.0           | 3278           | 285.0            | 11.5         |
| APRIL     | 497              | 48.2               | 10.1           | 3765           | 333.2            | 11.3         |
| MAY       | 374              | 24.7               | 15.1           | 4139           | 357.9            | 11.6         |
| JUNE      | 377              | 47.0               | 8.0            | 4516           | 404.9            | 11.2         |
| JULY      | 499              | 35.6               | 14.0           | 5015           | 440.5            | 11.4         |
| AUGUST    | 535              | 40.8               | 13.1           | 5550           | 481.3            | 11.5         |
| SEPTEMBER | 441              | 52.0               | 8.5            | 5991           | 533.3            | 11.2         |
| OCTOBER   | 597              | 62.8               | 9.5            | 6588           | 596.1            | 11.1         |
| NOVEMBER  | 314              | 29.6               | 10.6           | 6902           | 625.7            | 11.0         |
| DECEMBER  | 998              | 70.3               | 14.2           | 7900           | 696.0            | 11.4         |
| JANUARY   | 890              | 61.3               | 14.5           | 8790           | 757.3            | 11.6         |
| FEBRUARY  | 1266             | 102.6              | 12.3           | 10056          | 859.9            | 11.7         |
| MARCH     | 708              | 59.5               | 11.9           | 10764          | 919.4            | 11.7         |

TRANSFERRED TO SIDP 0

|      |     |      |      |       |       |      |
|------|-----|------|------|-------|-------|------|
| MAY  | 78  | 8.6  | 9.1  | 10842 | 928.0 | 11.7 |
| JUNE | 145 | 8.6  | 16.9 | 10987 | 936.6 | 11.7 |
| JULY | 216 | 25.4 | 8.5  | 11203 | 962.0 | 11.6 |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CN0438

'83 FORD ESCORT, 4 DOOR SEDAN  
ENGINE TYPE: I-4 FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| AUGUST    | 320              | 25.2               | 12.7           | 320            | 25.2             | 12.7         |
| SEPTEMBER | 662              | 50.6               | 13.1           | 982            | 75.8             | 13.0         |
| OCTOBER   | 500              | 43.4               | 11.5           | 1482           | 119.2            | 12.4         |
| NOVEMBER  | 439              | 40.5               | 10.8           | 1921           | 159.7            | 12.0         |
| DECEMBER  | 683              | 57.6               | 11.9           | 2604           | 217.3            | 12.0         |
| JANUARY   | 499              | 54.2               | 9.2            | 3103           | 271.5            | 11.4         |
| FEBRUARY  | 662              | 53.9               | 12.3           | 3765           | 325.4            | 11.6         |
| MARCH     | 248              | 26.9               | 9.2            | 4013           | 352.3            | 11.4         |
| APRIL     | 503              | 41.1               | 12.1           | 4516           | 394.0            | 11.5         |
| MAY       | 337              | 28.9               | 11.7           | 4853           | 422.9            | 11.5         |
| JUNE      | 307              | 33.1               | 9.3            | 5160           | 456.0            | 11.3         |
| JULY      | 372              | 32.7               | 11.4           | 5532           | 488.7            | 11.3         |
| AUGUST    | 620              | 54.5               | 11.4           | 6152           | 543.2            | 11.3         |
| SEPTEMBER | 675              | 45.0               | 15.0           | 6827           | 588.2            | 11.6         |
| OCTOBER   | 632              | 60.0               | 11.4           | 7509           | 648.2            | 11.6         |
| NOVEMBER  | 474              | 43.6               | 10.9           | 7983           | 691.8            | 11.5         |
| DECEMBER  | 632              | 47.6               | 13.3           | 8615           | 739.4            | 11.7         |
| JANUARY   | 498              | 48.2               | 10.3           | 9113           | 787.6            | 11.6         |
| FEBRUARY  | 587              | 47.3               | 12.4           | 9700           | 834.9            | 11.6         |
| MARCH     | 413              | 41.3               | 10.0           | 10113          | 876.2            | 11.5         |
| MAY       | 71               | 9.5                | 7.5            | 10184          | 885.7            | 11.5         |
| JUNE      | 296              | 31.3               | 13.9           | 10480          | 907.0            | 11.6         |
| JULY      | 303              | 23.5               | 12.9           | 10783          | 930.5            | 11.6         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CN0439

'83 FORD ESCORT, 4 DOOR SEDAN  
ENGINE TYPE: I-4

FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| AUGUST    | 789              | 64.6               | 12.2           | 789            | 64.6             | 12.2         |
| SEPTEMBER | 400              | 36.3               | 11.0           | 1189           | 100.9            | 11.8         |
| OCTOBER   | 410              | 39.6               | 10.4           | 1599           | 140.5            | 11.4         |
| NOVEMBER  | 321              | 30.7               | 10.5           | 1920           | 171.2            | 11.2         |
| DECEMBER  | 272              | 26.8               | 10.1           | 2192           | 198.0            | 11.1         |
| JANUARY   | 225              | 20.1               | 11.2           | 2417           | 218.1            | 11.1         |
| FEBRUARY  | 311              | 18.7               | 16.6           | 2728           | 236.8            | 11.5         |
| MARCH     | 494              | 51.2               | 9.6            | 3222           | 288.0            | 11.2         |
| APRIL     | 556              | 44.5               | 12.5           | 3778           | 332.5            | 11.4         |
| MAY       | 316              | 27.2               | 11.6           | 4094           | 359.7            | 11.4         |
| JUNE      | 376              | 40.6               | 9.3            | 4470           | 400.3            | 11.2         |
| JULY      | 430              | 44.1               | 9.8            | 4900           | 444.4            | 11.0         |
| AUGUST    | 404              | 41.7               | 9.7            | 5304           | 486.1            | 10.9         |
| SEPTEMBER | 205              | 20.1               | 10.2           | 5509           | 506.2            | 10.9         |
| OCTOBER   | 336              | 35.5               | 9.5            | 5845           | 541.7            | 10.8         |
| NOVEMBER  | 315              | 24.6               | 12.8           | 6160           | 566.3            | 10.9         |
| DECEMBER  | 217              | 27.3               | 7.9            | 6377           | 593.6            | 10.7         |
| JANUARY   | 269              | 28.9               | 9.3            | 6646           | 622.5            | 10.7         |
| FEBRUARY  | 253              | 25.2               | 10.0           | 6899           | 647.7            | 10.7         |
| MARCH     | 177              | 12.8               | 13.8           | 7076           | 660.5            | 10.7         |

TRANSFERRED TO SIDP 0

|      |     |      |      |      |       |      |
|------|-----|------|------|------|-------|------|
| MAY  | 59  | 9.0  | 6.6  | 7135 | 669.5 | 10.7 |
| JUNE | 246 | 19.0 | 12.9 | 7381 | 688.5 | 10.7 |
| JULY | 184 | 10.0 | 18.4 | 7565 | 698.5 | 10.8 |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA  
VEHICLE USA #: CN0440

'83 FORD ESCORT, 4 DOOR SEDAN  
ENGINE TYPE: I-4

FT. ORD METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| JULY      | 47               | 6.2                | 7.6            | 47             | 6.2              | 7.6          |
| AUGUST    | 929              | 70.4               | 13.2           | 976            | 76.6             | 12.7         |
| SEPTEMBER | 413              | 37.9               | 10.9           | 1389           | 114.5            | 12.1         |
| OCTOBER   | 563              | 57.1               | 9.9            | 1952           | 171.6            | 11.4         |
| NOVEMBER  | 127              | 9.0                | 14.1           | 2079           | 180.6            | 11.5         |
| DECEMBER  | 231              | 25.0               | 11.2           | 2360           | 205.6            | 11.5         |
| JANUARY   | 435              | 40.1               | 10.8           | 2795           | 245.7            | 11.4         |
| FEBRUARY  | 438              | 39.0               | 11.2           | 3233           | 284.7            | 11.4         |
| MARCH     | 488              | 32.2               | 15.2           | 3721           | 316.9            | 11.7         |
| APRIL     | 624              | 59.1               | 10.6           | 4345           | 376.0            | 11.6         |
| MAY       | 504              | 50.3               | 10.0           | 4849           | 426.3            | 11.4         |
| JUNE      | 547              | 47.4               | 11.5           | 5396           | 473.7            | 11.4         |
| JULY      | 504              | 52.6               | 9.6            | 5900           | 526.3            | 11.2         |
| AUGUST    | 553              | 45.3               | 12.2           | 6453           | 571.6            | 11.3         |
| SEPTEMBER | 615              | 51.9               | 11.8           | 7068           | 623.5            | 11.3         |
| OCTOBER   | 549              | 65.7               | 8.4            | 7617           | 689.2            | 11.1         |
| NOVEMBER  | 567              | 71.4               | 7.9            | 8184           | 760.6            | 10.8         |
| DECEMBER  | 484              | 50.0               | 9.7            | 8668           | 810.6            | 10.7         |
| JANUARY   | 658              | 67.3               | 9.8            | 9326           | 877.9            | 10.6         |
| FEBRUARY  | 509              | 42.2               | 12.1           | 9835           | 920.1            | 10.7         |
| MARCH     | 378              | 36.9               | 10.2           | 10213          | 957.0            | 10.7         |

TRANSFERRED TO SIDP @

|      |     |      |      |       |       |      |
|------|-----|------|------|-------|-------|------|
| MAY  | 47  | 0.0  | 0.0  | 10260 | 957.0 | 10.7 |
| JUNE | 255 | 17.0 | 15.0 | 10515 | 974.0 | 10.8 |
| JULY | 32  | 10.0 | 3.2  | 10547 | 984.0 | 10.7 |

**OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II**

**MONTHLY CUMULATIVE VEHICLE REPORT**

POST/ACTIVITY: FOCA  
VEHICLE USA #: CN0491

'83 CHEV CITATION, 4 DOOR SEDAN  
ENGINE TYPE: V-6

FT. ORD METHANOL VEHICLE

| MONTH                 | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------------------|------------------|--------------------|----------------|----------------|------------------|--------------|
| NOVEMBER              | 224              | 18.4               | 12.2           | 224            | 18.4             | 12.2         |
| DECEMBER              | 109              | 12.5               | 8.7            | 333            | 30.9             | 10.8         |
| JANUARY               | 294              | 24.2               | 12.1           | 627            | 55.1             | 11.4         |
| FEBRUARY              | 361              | 34.2               | 10.6           | 988            | 89.3             | 11.1         |
| MARCH                 | 341              | 50.8               | 6.7            | 1329           | 140.1            | 9.5          |
| APRIL                 | 352              | 33.5               | 10.5           | 1681           | 173.6            | 9.7          |
| MAY                   | 353              | 46.2               | 7.6            | 2034           | 219.8            | 9.3          |
| JUNE                  | 362              | 46.8               | 7.7            | 2396           | 266.6            | 9.0          |
| JULY                  | 263              | 16.3               | 16.1           | 2659           | 282.9            | 9.4          |
| AUGUST                | 323              | 35.0               | 9.2            | 2982           | 317.9            | 9.4          |
| SEPTEMBER             | 344              | 25.0               | 13.8           | 3326           | 342.9            | 9.7          |
| OCTOBER               | 475              | 50.4               | 9.4            | 3801           | 393.3            | 9.7          |
| NOVEMBER              | 429              | 41.3               | 10.4           | 4230           | 434.6            | 9.7          |
| DECEMBER              | 415              | 53.8               | 7.7            | 4645           | 488.4            | 9.5          |
| JANUARY               | 613              | 36.7               | 16.7           | 5258           | 525.1            | 10.0         |
| FEBRUARY              | 744              | 42.4               | 17.5           | 6002           | 567.5            | 10.6         |
| MARCH                 | 297              | 36.6               | 8.1            | 6299           | 604.1            | 10.4         |
| TRANSFERRED TO SIDP 0 |                  |                    |                |                |                  |              |
| MAY                   | 14               | 0.0                | 0.0            | 6313           | 604.1            | 10.5         |
| JUNE                  | 152              | 16.5               | 9.2            | 6465           | 620.6            | 10.4         |
| JULY                  | 40               | 8.1                | 4.9            | 6505           | 628.7            | 10.3         |

**Monthly Cumulative Fuel Reports for Each Vehicle  
at Sierra Army Depot**

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP  
VEHICLE USA #: CN0445

FORD ESCORT  
ENGINE TYPE: I-4

S.A.O.P. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| NOVEMBER  | 32               | 0.0                | 0.0            | 32             | 0.0              | 0.0          |
| DECEMBER  | 217              | 26.4               | 8.2            | 249            | 26.4             | 9.4          |
| JANUARY   | 91               | 9.0                | 9.0            | 330            | 35.4             | 9.3          |
| APRIL     | 161              | 9.0                | 17.9           | 491            | 44.4             | 11.1         |
| MAY       | 1003             | 84.9               | 11.9           | 1494           | 129.3            | 11.6         |
| JUNE      | 1984             | 127.2              | 15.6           | 3478           | 256.5            | 13.6         |
| JULY      | 277              | 14.1               | 19.6           | 3755           | 270.6            | 13.9         |
| AUGUST    | 353              | 25.7               | 13.7           | 4108           | 296.3            | 13.9         |
| SEPTEMBER | 298              | 25.5               | 11.7           | 4406           | 321.9            | 13.7         |
| OCTOBER   | 166              | 10.0               | 16.6           | 4572           | 331.9            | 13.8         |
| NOVEMBER  | 297              | 26.6               | 11.2           | 4869           | 358.4            | 13.6         |
| DECEMBER  | 144              | 15.0               | 9.6            | 5013           | 373.4            | 13.4         |
| JANUARY   | 170              | 27.9               | 6.1            | 5183           | 401.3            | 12.9         |
| FEBRUARY  | 278              | 23.5               | 11.8           | 5461           | 424.8            | 12.9         |
| MARCH     | 236              | 18.5               | 12.8           | 5697           | 443.3            | 12.9         |
| APRIL     | 316              | 17.7               | 17.9           | 6013           | 461.0            | 13.0         |
| MAY       | 219              | 7.9                | 27.7           | 6232           | 468.9            | 13.3         |
| JUNE      | 228              | 18.3               | 12.5           | 6460           | 487.2            | 13.3         |
| JULY      | 287              | 18.5               | 15.5           | 6747           | 505.7            | 13.3         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP  
VEHICLE USA #: CH0539

FORD ESCORT  
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| DECEMBER  | 103              | 15.0               | 6.9            | 103            | 15.0             | 6.9          |
| JANUARY   | 116              | 9.0                | 14.5           | 219            | 23.0             | 9.5          |
| FEBRUARY  | 190              | 23.1               | 8.2            | 409            | 46.1             | 8.9          |
| MARCH     | 1493             | 92.0               | 16.2           | 1902           | 128.1            | 14.8         |
| APRIL     | 2262             | 130.5              | 17.3           | 4164           | 258.6            | 16.1         |
| MAY       | 768              | 41.3               | 18.6           | 4932           | 299.9            | 16.4         |
| JUNE      | 437              | 39.1               | 11.5           | 5369           | 338.0            | 15.9         |
| JULY      | 350              | 14.0               | 25.0           | 5719           | 352.0            | 16.2         |
| AUGUST    | 145              | 9.0                | 16.1           | 5864           | 361.0            | 16.2         |
| SEPTEMBER | 356              | 29.8               | 12.4           | 6220           | 389.8            | 16.0         |
| OCTOBER   | 376              | 32.5               | 11.6           | 6596           | 422.3            | 15.6         |
| NOVEMBER  | 155              | 15.6               | 9.9            | 6751           | 437.9            | 15.4         |
| DECEMBER  | 309              | 26.4               | 11.7           | 7060           | 464.3            | 15.2         |
| JANUARY   | 833              | 74.5               | 11.2           | 7893           | 538.8            | 14.6         |
| FEBRUARY  | 43               | 7.0                | 6.1            | 7936           | 545.8            | 14.5         |
| MARCH     | 88               | 6.0                | 14.7           | 8024           | 551.8            | 14.5         |
| APRIL     | 405              | 21.4               | 18.9           | 8429           | 573.2            | 14.7         |
| MAY       | 613              | 39.0               | 15.7           | 9042           | 612.2            | 14.8         |
| JUNE      | 293              | 28.7               | 10.2           | 9335           | 640.9            | 14.6         |
| JULY      | 118              | 15.5               | 7.6            | 9453           | 656.4            | 14.4         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP  
VEHICLE USA #: CN0540

FORD ESCORT  
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

| MONTH    | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| NOVEMBER | 35               | 0.0                | 0.0            | 35             | 0.0              | 0.0          |
| DECEMBER | 330              | 34.1               | 9.7            | 365            | 34.1             | 10.7         |
| JANUARY  | 302              | 16.4               | 18.4           | 667            | 50.5             | 13.2         |
| FEBRUARY | 293              | 24.9               | 11.8           | 960            | 75.4             | 12.7         |
| MARCH    | 352              | 33.5               | 10.5           | 1312           | 108.9            | 12.0         |
| APRIL    | 371              | 23.6               | 15.7           | 1683           | 132.5            | 12.7         |
| MAY      | 434              | 30.4               | 14.3           | 2117           | 162.9            | 13.0         |
| JUNE     | 361              | 25.0               | 14.4           | 2478           | 187.9            | 13.2         |
| JULY     | 2219             | 141.9              | 15.6           | 4697           | 329.8            | 14.2         |
| AUGUST   | 60               | 7.5                | 8.0            | 4757           | 337.3            | 14.1         |
| OCTOBER  | 447              | 29.8               | 15.0           | 5204           | 367.1            | 14.2         |
| NOVEMBER | 138              | 15.1               | 9.1            | 5342           | 382.2            | 14.0         |
| DECEMBER | 306              | 19.5               | 15.7           | 5648           | 401.7            | 14.1         |
| JANUARY  | 242              | 29.0               | 8.3            | 5890           | 430.7            | 13.7         |
| FEBRUARY | 280              | 27.7               | 10.1           | 6170           | 458.4            | 13.5         |
| MARCH    | 220              | 18.9               | 11.6           | 6390           | 477.3            | 13.4         |
| APRIL    | 367              | 43.8               | 8.4            | 6757           | 521.1            | 13.0         |
| MAY      | 631              | 43.7               | 14.4           | 7388           | 564.8            | 13.1         |
| JUNE     | 493              | 37.9               | 13.0           | 7881           | 602.7            | 13.1         |
| JULY     | 727              | 59.1               | 12.3           | 8608           | 661.8            | 13.0         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SACP  
VEHICLE USA #: CN0541

FORD ESCORT  
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| NOVEMBER  | 125              | 9.0                | 13.6           | 125            | 9.0              | 13.6         |
| DECEMBER  | 562              | 57.0               | 11.6           | 797            | 65.0             | 12.1         |
| JANUARY   | 364              | 49.5               | 13.4           | 1451           | 114.5            | 12.7         |
| FEBRUARY  | 422              | 33.5               | 12.6           | 1873           | 148.0            | 12.7         |
| MARCH     | 317              | 69.4               | 11.3           | 2690           | 217.4            | 12.4         |
| APRIL     | 744              | 44.3               | 16.6           | 3434           | 262.2            | 13.1         |
| MAY       | 454              | 36.8               | 12.3           | 3998           | 299.0            | 13.0         |
| JUNE      | 540              | 31.3               | 17.0           | 4428           | 330.3            | 13.4         |
| JULY      | 304              | 63.3               | 11.7           | 5232           | 399.6            | 13.1         |
| AUGUST    | 475              | 32.2               | 14.3           | 5707           | 431.3            | 13.2         |
| SEPTEMBER | 740              | 59.2               | 12.7           | 6447           | 490.0            | 13.2         |
| OCTOBER   | 473              | 30.3               | 15.5           | 6925           | 520.3            | 13.3         |
| NOVEMBER  | 1168             | 81.4               | 14.3           | 8093           | 602.2            | 13.4         |
| DECEMBER  | 517              | 42.1               | 12.3           | 8610           | 644.3            | 13.4         |
| JANUARY   | 642              | 52.2               | 12.3           | 9252           | 696.5            | 13.3         |
| FEBRUARY  | 129              | 5.0                | 25.8           | 9381           | 701.5            | 13.4         |
| MARCH     | 547              | 45.6               | 12.0           | 9928           | 747.1            | 13.3         |
| APRIL     | 561              | 43.8               | 12.8           | 10489          | 790.9            | 13.3         |
| MAY       | 704              | 49.2               | 14.3           | 11193          | 840.1            | 13.3         |
| JUNE      | 706              | 58.0               | 12.2           | 11899          | 898.1            | 13.2         |
| JULY      | 562              | 37.2               | 15.1           | 12461          | 935.3            | 13.3         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP  
VEHICLE USA #: CH0542

FORD ESCORT  
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| NOVEMBER  | 9                | 0.0                | 0.0            | 9              | 0.0              | 0.0          |
| DECEMBER  | 911              | 85.0               | 10.7           | 920            | 85.0             | 10.8         |
| FEBRUARY  | 98               | 6.0                | 16.3           | 1018           | 91.0             | 11.2         |
| MARCH     | 141              | 13.4               | 7.7            | 1159           | 109.4            | 10.6         |
| APRIL     | 214              | 22.6               | 9.5            | 1373           | 132.0            | 10.4         |
| MAY       | 285              | 16.3               | 17.5           | 1658           | 148.3            | 11.2         |
| JUNE      | 65               | 9.0                | 7.2            | 1723           | 157.3            | 11.0         |
| JULY      | 134              | 19.0               | 7.1            | 1857           | 176.3            | 10.5         |
| AUGUST    | 202              | 14.9               | 13.6           | 2059           | 191.2            | 10.8         |
| SEPTEMBER | 122              | 9.9                | 12.3           | 2181           | 201.1            | 10.8         |
| OCTOBER   | 834              | 57.7               | 14.5           | 3015           | 258.9            | 11.6         |
| NOVEMBER  | 1167             | 76.5               | 15.3           | 4182           | 335.3            | 12.5         |
| JANUARY   | 101              | 5.8                | 17.4           | 4283           | 341.1            | 12.6         |
| FEBRUARY  | 305              | 24.8               | 12.3           | 4588           | 365.9            | 12.5         |
| MARCH     | 177              | 23.3               | 7.4            | 4765           | 389.7            | 12.2         |
| APRIL     | 161              | 17.0               | 9.5            | 4926           | 406.7            | 12.1         |
| MAY       | 195              | 15.5               | 12.6           | 5121           | 422.2            | 12.1         |
| JUNE      | 178              | 6.0                | 29.7           | 5299           | 428.2            | 12.4         |
| JULY      | 136              | 19.0               | 7.2            | 5435           | 447.2            | 12.2         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP  
VEHICLE USA #: CN0543

FORD ESCORT  
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| NOVEMBER  | 19               | 0.0                | 0.0            | 19             | 0.0              | 0.0          |
| DECEMBER  | 626              | 92.2               | 7.6            | 645            | 92.2             | 7.9          |
| FEBRUARY  | 596              | 79.9               | 7.4            | 1231           | 161.1            | 7.6          |
| MARCH     | 753              | 59.2               | 12.9           | 1984           | 219.3            | 9.0          |
| APRIL     | 567              | 37.9               | 15.0           | 2551           | 257.2            | 9.9          |
| MAY       | 267              | 20.0               | 13.4           | 2818           | 277.2            | 10.2         |
| JUNE      | 38               | 9.9                | 4.3            | 2856           | 286.1            | 10.0         |
| JULY      | 273              | 14.4               | 19.0           | 3129           | 300.5            | 10.4         |
| AUGUST    | 286              | 30.4               | 9.4            | 3415           | 330.9            | 10.3         |
| SEPTEMBER | 1559             | 96.0               | 18.1           | 4974           | 416.9            | 11.9         |
| OCTOBER   | 211              | 17.2               | 12.3           | 5185           | 434.1            | 11.9         |
| NOVEMBER  | 3                | 23.5               | .1             | 5188           | 457.6            | 11.3         |
| DECEMBER  | 1                | 8.4                | .1             | 5189           | 466.0            | 11.1         |
| JANUARY   | 992              | 39.4               | 25.2           | 6181           | 505.4            | 12.2         |
| FEBRUARY  | 491              | 51.5               | 9.5            | 6672           | 556.9            | 12.0         |
| MARCH     | 575              | 49.7               | 11.6           | 7247           | 606.6            | 11.9         |
| APRIL     | 240              | 20.9               | 11.5           | 7487           | 627.5            | 11.9         |
| MAY       | 170              | 21.6               | 7.9            | 7657           | 649.1            | 11.8         |
| JULY      | 76               | 10.9               | 7.0            | 7733           | 660.0            | 11.7         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP  
VEHICLE USA #: CN0544

FORD ESCORT  
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| NOVEMBER  | 79               | 9.0                | 8.8            | 79             | 9.0              | 8.8          |
| DECEMBER  | 334              | 25.7               | 13.0           | 413            | 34.7             | 11.9         |
| JANUARY   | 1043             | 45.5               | 22.9           | 1456           | 80.2             | 18.2         |
| FEBRUARY  | 341              | 28.2               | 12.1           | 1797           | 108.4            | 16.6         |
| MARCH     | 393              | 38.9               | 10.1           | 2190           | 147.3            | 14.9         |
| APRIL     | 177              | 20.7               | 8.6            | 2367           | 168.0            | 14.1         |
| MAY       | 121              | 15.1               | 8.0            | 2488           | 183.1            | 13.6         |
| JUNE      | 1905             | 121.6              | 15.7           | 4393           | 304.7            | 14.4         |
| JULY      | 2588             | 161.2              | 16.1           | 6981           | 465.9            | 15.0         |
| AUGUST    | 2185             | 138.5              | 15.8           | 9166           | 604.4            | 15.2         |
| SEPTEMBER | 1428             | 96.0               | 14.9           | 10594          | 700.4            | 15.1         |
| DECEMBER  | 2                | 15.0               | .1             | 10596          | 715.4            | 14.8         |
| JANUARY   | 645              | 50.3               | 12.8           | 11241          | 765.7            | 14.7         |
| FEBRUARY  | 752              | 84.7               | 8.9            | 11993          | 850.4            | 14.1         |
| MARCH     | 523              | 53.5               | 9.8            | 12516          | 903.9            | 13.8         |
| APRIL     | 250              | 24.5               | 10.2           | 12766          | 928.4            | 13.8         |
| MAY       | 784              | 52.0               | 15.1           | 13550          | 980.4            | 13.8         |
| JUNE      | 760              | 58.3               | 13.0           | 14310          | 1038.7           | 13.8         |
| JULY      | 568              | 41.8               | 13.6           | 14878          | 1080.5           | 13.8         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP  
VEHICLE USA #: CN0545

FORD ESCORT  
ENGINE TYPE: I-4

S.A.O.P. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| NOVEMBER  | 6                | 0.0                | 0.0            | 6              | 0.0              | 0.0          |
| DECEMBER  | 1199             | 107.1              | 11.2           | 1204           | 107.1            | 11.2         |
| FEBRUARY  | 2121             | 167.2              | 12.6           | 3325           | 275.0            | 12.1         |
| MARCH     | 2595             | 243.2              | 10.7           | 5920           | 518.2            | 11.4         |
| APRIL     | 742              | 68.6               | 10.8           | 6662           | 586.8            | 11.4         |
| MAY       | 1143             | 93.6               | 13.7           | 7805           | 670.4            | 11.6         |
| JUNE      | 354              | 66.5               | 9.3            | 8359           | 736.9            | 11.3         |
| JULY      | 514              | 54.5               | 9.4            | 9873           | 791.4            | 11.2         |
| AUGUST    | 630              | 61.4               | 10.3           | 9503           | 852.8            | 11.1         |
| SEPTEMBER | 642              | 45.9               | 14.0           | 10145          | 898.7            | 11.3         |
| JANUARY   | 360              | 24.0               | 15.0           | 10505          | 922.7            | 11.4         |
| FEBRUARY  | 110              | 9.7                | 11.3           | 10615          | 932.4            | 11.4         |
| MARCH     | 28               | 6.0                | 4.7            | 10643          | 938.4            | 11.3         |
| APRIL     | 243              | 16.0               | 15.2           | 10886          | 954.4            | 11.4         |
| MAY       | 454              | 28.7               | 15.8           | 11340          | 983.1            | 11.5         |
| JUNE      | 584              | 43.7               | 13.4           | 11924          | 1026.8           | 11.6         |
| JULY      | 227              | 16.0               | 14.2           | 12151          | 1042.8           | 11.7         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SAMP  
VEHICLE USA #: CH0546

FORD ESCORT  
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| NOVEMBER  | 2                | 0.0                | 0.0            | 2              | 0.0              | 0.0          |
| DECEMBER  | 902              | 100.2              | 9.0            | 904            | 100.2            | 9.0          |
| JANUARY   | 415              | 45.3               | 9.2            | 1319           | 145.5            | 9.1          |
| FEBRUARY  | 1630             | 148.0              | 11.0           | 2949           | 293.5            | 10.0         |
| MARCH     | 527              | 53.8               | 9.8            | 3476           | 347.3            | 10.0         |
| APRIL     | 1951             | 171.2              | 11.4           | 5427           | 518.5            | 10.5         |
| MAY       | 327              | 62.6               | 5.2            | 5754           | 581.1            | 9.9          |
| JUNE      | 1162             | 114.7              | 10.1           | 6916           | 695.8            | 9.9          |
| JULY      | 1451             | 133.3              | 10.9           | 8367           | 829.1            | 10.1         |
| AUGUST    | 332              | 32.1               | 10.3           | 8699           | 861.2            | 10.1         |
| SEPTEMBER | 664              | 51.4               | 12.9           | 9363           | 912.6            | 10.3         |
| OCTOBER   | 295              | 26.3               | 11.0           | 9658           | 939.4            | 10.3         |
| NOVEMBER  | 278              | 21.6               | 12.9           | 9936           | 961.0            | 10.3         |
| DECEMBER  | 1298             | 98.8               | 13.1           | 11234          | 1059.8           | 10.6         |
| JANUARY   | 696              | 62.2               | 11.2           | 11930          | 1122.0           | 10.6         |
| FEBRUARY  | 133              | 18.5               | 7.2            | 12063          | 1140.5           | 10.6         |
| MARCH     | 501              | 56.4               | 8.9            | 12564          | 1196.9           | 10.5         |
| APRIL     | 435              | 31.0               | 14.0           | 12999          | 1227.9           | 10.6         |
| MAY       | 405              | 37.1               | 10.9           | 13404          | 1265.0           | 10.6         |
| JUNE      | 276              | 51.0               | 5.4            | 13680          | 1316.0           | 10.4         |
| JULY      | 252              | 25.7               | 9.8            | 13932          | 1341.7           | 10.4         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

| POST/ACTIVITY: SADP   | FORD ESCORT      |                    |                | S.A.D.P. METHANOL VEHICLE |                  |              |
|-----------------------|------------------|--------------------|----------------|---------------------------|------------------|--------------|
| VEHICLE USA #: CN0547 | ENGINE TYPE: I-4 |                    |                |                           |                  |              |
| MONTH                 | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES            | CUMUL<br>GALLONS | CUMUL<br>MPG |
| DECEMBER              | 1                | 0.0                | 0.0            | 1                         | 0.0              | 0.0          |
| JANUARY               | 55               | 10.6               | 5.2            | 56                        | 10.6             | 5.3          |
| FEBRUARY              | 99               | 10.0               | 9.9            | 145                       | 20.6             | 7.0          |
| MARCH                 | 1563             | 109.5              | 14.3           | 1703                      | 130.1            | 13.1         |
| APRIL                 | 2748             | 158.2              | 17.4           | 4456                      | 288.3            | 15.5         |
| MAY                   | 451              | 35.3               | 12.8           | 4907                      | 323.6            | 15.2         |
| JUNE                  | 1444             | 72.2               | 20.0           | 6351                      | 395.8            | 16.0         |
| JULY                  | 190              | 18.2               | 10.4           | 6541                      | 414.0            | 15.8         |
| AUGUST                | 704              | 40.8               | 17.3           | 7245                      | 454.8            | 15.9         |
| SEPTEMBER             | 334              | 24.2               | 13.8           | 7579                      | 479.0            | 15.8         |
| OCTOBER               | 1341             | 88.1               | 15.2           | 8920                      | 567.1            | 15.7         |
| NOVEMBER              | 2683             | 145.2              | 18.5           | 11603                     | 712.3            | 16.3         |
| DECEMBER              | 142              | 13.8               | 10.3           | 11745                     | 726.1            | 16.2         |
| JANUARY               | 342              | 30.9               | 11.1           | 12087                     | 757.0            | 16.0         |
| FEBRUARY              | 261              | 17.8               | 14.7           | 12348                     | 774.8            | 15.9         |
| MARCH                 | 454              | 38.4               | 11.8           | 12802                     | 813.2            | 15.7         |
| APRIL                 | 223              | 16.9               | 13.2           | 13025                     | 830.1            | 15.7         |
| MAY                   | 252              | 20.5               | 12.3           | 13277                     | 850.6            | 15.6         |
| JUNE                  | 91               | 10.0               | 9.1            | 13358                     | 860.6            | 15.5         |
| JULY                  | 193              | 18.0               | 10.2           | 13541                     | 878.6            | 15.4         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP  
VEHICLE USA #: CH0548

FORD ESCORT  
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| DECEMBER  | 92               | 9.0                | 10.2           | 92             | 9.0              | 10.2         |
| JANUARY   | 120              | 13.0               | 9.2            | 212            | 22.0             | 9.6          |
| FEBRUARY  | 178              | 11.5               | 15.5           | 390            | 33.5             | 11.6         |
| MARCH     | 95               | 12.1               | 7.9            | 485            | 45.6             | 10.6         |
| APRIL     | 284              | 28.9               | 9.8            | 769            | 74.5             | 10.3         |
| MAY       | 1145             | 67.7               | 16.9           | 1914           | 142.2            | 13.5         |
| JUNE      | 199              | 18.0               | 11.1           | 2113           | 160.2            | 13.2         |
| JULY      | 135              | 8.0                | 16.9           | 2248           | 168.2            | 13.4         |
| AUGUST    | 337              | 24.6               | 13.7           | 2585           | 192.8            | 13.4         |
| SEPTEMBER | 260              | 26.5               | 9.8            | 2845           | 219.3            | 13.0         |
| OCTOBER   | 238              | 14.8               | 16.1           | 3083           | 234.1            | 13.2         |
| NOVEMBER  | 3                | 30.2               | .1             | 3086           | 264.3            | 11.7         |
| DECEMBER  | 3                | 30.0               | .1             | 3089           | 294.3            | 10.5         |
| JANUARY   | 1164             | 21.7               | 53.6           | 4253           | 316.0            | 13.5         |
| MARCH     | 54               | 8.5                | 6.4            | 4307           | 324.5            | 13.3         |
| APRIL     | 56               | 0.0                | 0.0            | 4363           | 324.5            | 13.4         |
| MAY       | 104              | 9.0                | 11.6           | 4467           | 333.5            | 13.4         |
| JUNE      | 134              | 15.4               | 8.7            | 4601           | 348.9            | 13.2         |
| JULY      | 91               | 0.0                | 0.0            | 4682           | 348.9            | 13.4         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP  
VEHICLE USA #: CN6549

FORD ESCORT  
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| DECEMBER  | 117              | 7.0                | 16.7           | 117            | 7.0              | 16.7         |
| JANUARY   | 639              | 65.3               | 9.8            | 756            | 72.3             | 10.5         |
| FEBRUARY  | 751              | 64.9               | 11.6           | 1507           | 137.2            | 11.0         |
| MARCH     | 724              | 60.0               | 12.1           | 2231           | 197.2            | 11.3         |
| APRIL     | 448              | 37.0               | 12.1           | 2679           | 234.2            | 11.4         |
| MAY       | 444              | 29.7               | 14.9           | 3123           | 263.9            | 11.8         |
| JUNE      | 219              | 12.0               | 18.3           | 3342           | 275.9            | 12.1         |
| JULY      | 103              | 7.0                | 14.7           | 3445           | 282.9            | 12.2         |
| AUGUST    | 36               | 9.0                | 9.6            | 3531           | 291.9            | 12.1         |
| SEPTEMBER | 433              | 13.3               | 32.6           | 3964           | 305.2            | 13.0         |
| OCTOBER   | 1                | 7.5                | .1             | 3965           | 312.7            | 12.7         |
| NOVEMBER  | 4                | 31.5               | .1             | 3969           | 344.2            | 11.5         |
| DECEMBER  | 347              | 0.0                | 0.0            | 4316           | 344.2            | 12.5         |
| JANUARY   | 81               | 7.6                | 10.7           | 4397           | 351.8            | 12.5         |
| FEBRUARY  | 80               | 11.9               | 6.7            | 4477           | 363.7            | 12.3         |
| MARCH     | 210              | 18.8               | 11.2           | 4687           | 382.5            | 12.3         |
| APRIL     | 199              | 14.4               | 13.8           | 4886           | 396.9            | 12.3         |
| MAY       | 141              | 15.0               | 9.4            | 5027           | 411.9            | 12.2         |
| JUNE      | 133              | 6.8                | 19.6           | 5160           | 418.7            | 12.3         |
| JULY      | 40               | 5.9                | 6.8            | 5200           | 424.6            | 12.2         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP  
VEHICLE USA #: CN0550

FORD ESCORT  
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| JANUARY   | 690              | 62.2               | 10.9           | 690            | 62.2             | 10.9         |
| FEBRUARY  | 439              | 44.0               | 10.0           | 1119           | 106.2            | 10.5         |
| MARCH     | 577              | 40.2               | 14.4           | 1696           | 146.4            | 11.6         |
| APRIL     | 391              | 34.0               | 11.5           | 2087           | 180.4            | 11.6         |
| MAY       | 293              | 10.0               | 29.3           | 2380           | 190.4            | 12.5         |
| JUNE      | 312              | 33.0               | 9.5            | 2692           | 223.4            | 12.1         |
| JULY      | 130              | 31.5               | 4.1            | 2822           | 254.9            | 11.1         |
| AUGUST    | 899              | 74.3               | 12.0           | 3711           | 329.2            | 11.3         |
| SEPTEMBER | 877              | 50.2               | 17.5           | 4588           | 379.4            | 12.1         |
| OCTOBER   | 134              | 9.3                | 14.4           | 4722           | 398.7            | 12.1         |
| NOVEMBER  | 95               | 8.0                | 10.6           | 4807           | 396.7            | 12.1         |
| DECEMBER  | 19               | 7.0                | 2.7            | 4826           | 403.7            | 12.0         |
| JANUARY   | 15               | 10.0               | 1.5            | 4841           | 413.7            | 11.7         |
| FEBRUARY  | 70               | 7.4                | 9.5            | 4911           | 421.1            | 11.7         |
| MARCH     | 54               | 7.0                | 7.7            | 4965           | 428.1            | 11.6         |
| APRIL     | 57               | 8.0                | 7.1            | 5022           | 436.1            | 11.5         |
| MAY       | 45               | 0.0                | 0.0            | 5067           | 436.1            | 11.6         |
| JUNE      | 436              | 34.3               | 12.5           | 5503           | 470.9            | 11.7         |
| JULY      | 361              | 29.0               | 12.9           | 5864           | 498.9            | 11.8         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP  
VEHICLE USA #: CH0551

FORD ESCORT  
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| NOVEMBER  | 99               | 9.0                | 11.0           | 99             | 9.0              | 11.0         |
| DECEMBER  | 323              | 25.1               | 12.9           | 422            | 34.1             | 12.4         |
| JANUARY   | 578              | 36.3               | 15.9           | 1000           | 70.4             | 14.2         |
| FEBRUARY  | 450              | 33.0               | 13.6           | 1450           | 103.4            | 14.0         |
| MARCH     | 30               | 10.0               | 3.0            | 1480           | 113.4            | 13.1         |
| APRIL     | 184              | 19.0               | 10.2           | 1664           | 131.4            | 12.7         |
| MAY       | 466              | 28.1               | 16.6           | 2130           | 159.5            | 13.4         |
| JUNE      | 499              | 42.5               | 11.7           | 2629           | 202.0            | 13.0         |
| JULY      | 300              | 27.7               | 10.8           | 2929           | 229.7            | 12.8         |
| AUGUST    | 424              | 32.0               | 13.3           | 3353           | 261.7            | 12.8         |
| SEPTEMBER | 399              | 25.5               | 15.6           | 3752           | 287.2            | 13.1         |
| OCTOBER   | 253              | 25.0               | 10.1           | 4005           | 312.2            | 12.8         |
| NOVEMBER  | 345              | 23.6               | 14.6           | 4350           | 335.8            | 13.0         |
| DECEMBER  | 151              | 27.9               | 5.4            | 4501           | 363.7            | 12.4         |
| JANUARY   | 243              | 16.0               | 15.2           | 4744           | 379.7            | 12.5         |
| FEBRUARY  | 101              | 8.0                | 12.6           | 4845           | 387.7            | 12.5         |
| MARCH     | 389              | 26.3               | 14.5           | 5234           | 414.5            | 12.6         |
| APRIL     | 274              | 16.0               | 17.1           | 5508           | 430.5            | 12.8         |
| MAY       | 268              | 16.0               | 16.8           | 5776           | 446.5            | 12.9         |
| JUNE      | 433              | 29.5               | 14.7           | 6209           | 476.0            | 13.0         |
| JULY      | 365              | 25.1               | 14.5           | 6574           | 501.1            | 13.1         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP  
VEHICLE USA #: CN0552

FORD ESCORT  
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| NOVEMBER  | 3                | 0.0                | 0.0            | 3              | 0.0              | 0.0          |
| DECEMBER  | 189              | 17.4               | 10.9           | 192            | 17.4             | 11.0         |
| JANUARY   | 363              | 43.3               | 8.3            | 555            | 61.2             | 9.1          |
| FEBRUARY  | 361              | 23.5               | 15.4           | 916            | 34.7             | 10.8         |
| MARCH     | 78               | 9.0                | 8.7            | 994            | 93.7             | 10.6         |
| APRIL     | 215              | 10.0               | 21.5           | 1209           | 103.7            | 11.7         |
| MAY       | 109              | 11.0               | 9.9            | 1318           | 114.7            | 11.5         |
| JUNE      | 149              | 10.0               | 14.9           | 1467           | 124.7            | 11.8         |
| JULY      | 192              | 11.0               | 17.5           | 1659           | 135.7            | 12.2         |
| AUGUST    | 177              | 10.0               | 17.7           | 1836           | 145.7            | 12.6         |
| SEPTEMBER | 115              | 9.0                | 12.8           | 1951           | 154.7            | 12.6         |
| OCTOBER   | 68               | 11.0               | 6.2            | 2019           | 165.7            | 12.2         |
| NOVEMBER  | 95               | 11.0               | 8.6            | 2114           | 176.7            | 12.0         |
| DECEMBER  | 69               | 8.0                | 8.6            | 2183           | 184.7            | 11.8         |
| JANUARY   | 111              | 10.7               | 10.4           | 2294           | 195.4            | 11.7         |
| FEBRUARY  | 112              | 9.0                | 12.4           | 2406           | 204.4            | 11.8         |
| MARCH     | 148              | 0.0                | 0.0            | 2554           | 204.4            | 12.5         |
| APRIL     | 101              | 10.0               | 10.1           | 2655           | 214.4            | 12.4         |
| MAY       | 119              | 9.7                | 12.3           | 2774           | 224.1            | 12.4         |
| JUNE      | 162              | 19.0               | 8.5            | 2936           | 243.1            | 12.1         |
| JULY      | 156              | 7.2                | 21.7           | 3092           | 250.3            | 12.4         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP  
VEHICLE USA #: CN0553

FORD ESCORT  
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| NOVEMBER  | 26               | 0.0                | 0.0            | 26             | 0.0              | 0.0          |
| DECEMBER  | 550              | 42.9               | 12.8           | 576            | 42.9             | 13.4         |
| JANUARY   | 325              | 30.3               | 10.7           | 901            | 73.2             | 12.3         |
| FEBRUARY  | 237              | 22.3               | 10.6           | 1138           | 95.5             | 11.9         |
| MARCH     | 295              | 30.3               | 9.7            | 1433           | 125.8            | 11.4         |
| APRIL     | 348              | 22.7               | 15.3           | 1781           | 148.5            | 12.0         |
| MAY       | 243              | 22.6               | 10.8           | 2024           | 171.1            | 11.8         |
| JUNE      | 351              | 30.9               | 11.4           | 2375           | 202.0            | 11.8         |
| JULY      | 469              | 29.0               | 16.2           | 2844           | 231.0            | 12.3         |
| AUGUST    | 1350             | 95.9               | 14.1           | 4194           | 326.9            | 12.8         |
| SEPTEMBER | 807              | 57.4               | 14.1           | 5001           | 384.3            | 13.0         |
| OCTOBER   | 297              | 15.8               | 18.8           | 5298           | 400.1            | 13.2         |
| NOVEMBER  | 362              | 30.7               | 11.8           | 5660           | 430.9            | 13.1         |
| DECEMBER  | 359              | 41.8               | 8.6            | 6019           | 472.6            | 12.7         |
| JANUARY   | 696              | 56.5               | 12.3           | 6715           | 529.1            | 12.7         |
| FEBRUARY  | 225              | 19.5               | 11.5           | 6940           | 548.6            | 12.7         |
| MARCH     | 253              | 33.5               | 7.6            | 7193           | 582.1            | 12.4         |
| APRIL     | 129              | 11.6               | 11.1           | 7322           | 593.7            | 12.3         |
| MAY       | 153              | 17.5               | 8.7            | 7475           | 611.2            | 12.2         |
| JUNE      | 207              | 19.4               | 10.7           | 7682           | 630.6            | 12.2         |
| JULY      | 29               | 8.9                | 3.3            | 7711           | 639.5            | 12.1         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP  
VEHICLE USA #: CN0554

FORD ESCORT  
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| DECEMBER  | 148              | 16.6               | 8.9            | 148            | 16.6             | 8.9          |
| JANUARY   | 669              | 52.3               | 12.8           | 817            | 68.9             | 11.9         |
| FEBRUARY  | 114              | 10.4               | 11.0           | 931            | 79.3             | 11.7         |
| MARCH     | 798              | 47.6               | 16.6           | 1719           | 126.9            | 13.5         |
| APRIL     | 1630             | 115.8              | 14.1           | 3349           | 242.7            | 13.8         |
| MAY       | 768              | 41.5               | 18.5           | 4117           | 284.2            | 14.5         |
| JUNE      | 704              | 59.0               | 11.9           | 4821           | 343.2            | 14.0         |
| JULY      | 536              | 40.0               | 13.4           | 5357           | 383.2            | 14.0         |
| AUGUST    | 701              | 65.0               | 10.8           | 6058           | 448.2            | 13.5         |
| SEPTEMBER | 476              | 38.4               | 12.4           | 6534           | 486.6            | 13.4         |
| OCTOBER   | 401              | 28.4               | 14.1           | 6935           | 515.0            | 13.5         |
| NOVEMBER  | 776              | 59.0               | 13.2           | 7711           | 574.0            | 13.4         |
| DECEMBER  | 498              | 40.1               | 12.4           | 8209           | 614.1            | 13.4         |
| JANUARY   | 478              | 73.0               | 6.5            | 8687           | 687.1            | 12.6         |
| FEBRUARY  | 534              | 52.2               | 10.2           | 9221           | 739.3            | 12.5         |
| MARCH     | 432              | 38.7               | 11.2           | 9653           | 778.0            | 12.4         |
| APRIL     | 199              | 12.5               | 15.9           | 9852           | 790.5            | 12.5         |
| MAY       | 251              | 21.0               | 12.0           | 10103          | 811.5            | 12.4         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP  
VEHICLE USA #: CH0555

FORD ESCORT  
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| NOVEMBER  | 64               | 6.5                | 9.8            | 64             | 6.5              | 9.8          |
| DECEMBER  | 353              | 43.9               | 8.2            | 417            | 49.5             | 8.4          |
| JANUARY   | 283              | 27.1               | 10.4           | 700            | 76.6             | 9.1          |
| FEBRUARY  | 194              | 26.6               | 7.3            | 894            | 103.2            | 8.7          |
| MARCH     | 139              | 11.0               | 12.6           | 1033           | 114.2            | 9.0          |
| APRIL     | 64               | 10.0               | 6.4            | 1097           | 124.2            | 8.8          |
| MAY       | 218              | 28.0               | 7.8            | 1315           | 152.2            | 8.6          |
| JUNE      | 254              | 27.3               | 9.3            | 1569           | 179.5            | 8.7          |
| JULY      | 53               | 9.5                | 5.6            | 1622           | 189.0            | 8.6          |
| AUGUST    | 413              | 40.5               | 10.2           | 2035           | 229.5            | 8.9          |
| SEPTEMBER | 164              | 14.7               | 11.2           | 2199           | 244.2            | 9.0          |
| OCTOBER   | 108              | 26.3               | 4.1            | 2307           | 270.5            | 8.5          |
| NOVEMBER  | 340              | 29.7               | 11.4           | 2647           | 300.2            | 8.8          |
| DECEMBER  | 348              | 31.8               | 10.9           | 2995           | 332.0            | 9.0          |
| JANUARY   | 276              | 41.0               | 6.7            | 3271           | 373.0            | 8.8          |
| FEBRUARY  | 177              | 25.5               | 6.9            | 3448           | 398.5            | 8.7          |
| MARCH     | 260              | 34.3               | 7.6            | 3708           | 432.8            | 8.6          |
| APRIL     | 263              | 32.9               | 8.0            | 3971           | 465.7            | 8.5          |
| MAY       | 433              | 42.5               | 10.2           | 4404           | 508.2            | 8.7          |
| JUNE      | 429              | 30.8               | 13.9           | 4833           | 539.0            | 9.0          |
| JULY      | 373              | 37.4               | 10.0           | 5206           | 576.4            | 9.0          |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP  
VEHICLE USA #: CN0556

FORD ESCORT  
ENGINE TYPE: I-4

S.A.O.P. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| DECEMBER  | 221              | 10.9               | 20.3           | 221            | 10.9             | 20.3         |
| JANUARY   | 193              | 16.0               | 12.1           | 414            | 26.9             | 15.4         |
| FEBRUARY  | 285              | 24.2               | 11.8           | 699            | 51.1             | 13.7         |
| MARCH     | 391              | 26.4               | 14.8           | 1090           | 77.5             | 14.1         |
| APRIL     | 143              | 19.0               | 7.5            | 1233           | 96.5             | 12.8         |
| MAY       | 283              | 19.2               | 14.7           | 1516           | 115.7            | 13.1         |
| JUNE      | 225              | 20.5               | 11.0           | 1741           | 136.2            | 12.8         |
| JULY      | 2267             | 129.6              | 17.5           | 4008           | 265.8            | 15.1         |
| AUGUST    | 1403             | 74.8               | 18.8           | 5411           | 340.6            | 15.9         |
| SEPTEMBER | 510              | 36.1               | 14.1           | 5921           | 376.7            | 15.7         |
| OCTOBER   | 284              | 19.5               | 14.6           | 6205           | 396.2            | 15.7         |
| NOVEMBER  | 70               | 10.0               | 7.0            | 6275           | 406.2            | 15.4         |
| FEBRUARY  | 636              | 45.9               | 13.9           | 6911           | 452.1            | 15.3         |
| MARCH     | 78               | 6.0                | 13.0           | 6989           | 458.1            | 15.3         |
| APRIL     | 238              | 10.0               | 23.8           | 7227           | 468.1            | 15.4         |
| MAY       | 199              | 19.1               | 9.9            | 7416           | 487.2            | 15.2         |
| JUNE      | 157              | 10.2               | 15.4           | 7573           | 497.4            | 15.2         |
| JULY      | 129              | 10.0               | 12.9           | 7702           | 507.4            | 15.2         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP  
VEHICLE USA #: CN0557

FORD ESCORT  
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| NOVEMBER  | 24               | 7.0                | 3.4            | 24             | 7.0              | 3.4          |
| DECEMBER  | 370              | 69.7               | 12.5           | 394            | 76.7             | 11.7         |
| JANUARY   | 725              | 68.1               | 10.6           | 1519           | 144.8            | 11.2         |
| FEBRUARY  | 594              | 46.5               | 12.6           | 2203           | 191.3            | 11.5         |
| MARCH     | 489              | 41.8               | 11.7           | 2692           | 233.1            | 11.5         |
| APRIL     | 434              | 35.0               | 12.4           | 3126           | 268.1            | 11.7         |
| MAY       | 654              | 53.6               | 12.2           | 3780           | 321.7            | 11.8         |
| JUNE      | 768              | 56.8               | 13.5           | 4548           | 378.5            | 12.0         |
| JULY      | 375              | 31.1               | 12.1           | 4923           | 409.6            | 12.0         |
| AUGUST    | 326              | 24.5               | 13.3           | 5249           | 434.1            | 12.1         |
| SEPTEMBER | 95               | 8.5                | 11.2           | 5344           | 442.6            | 12.1         |
| OCTOBER   | 224              | 18.0               | 12.4           | 5568           | 460.6            | 12.1         |
| NOVEMBER  | 202              | 15.5               | 13.0           | 5770           | 476.1            | 12.1         |
| DECEMBER  | 215              | 26.4               | 8.1            | 5985           | 502.5            | 11.9         |
| JANUARY   | 436              | 27.5               | 15.9           | 6421           | 530.0            | 12.1         |
| FEBRUARY  | 530              | 54.3               | 9.8            | 6951           | 594.3            | 11.9         |
| MARCH     | 785              | 49.8               | 15.8           | 7736           | 634.1            | 12.2         |
| APRIL     | 482              | 28.0               | 17.2           | 8218           | 662.1            | 12.4         |
| MAY       | 523              | 40.7               | 12.9           | 8741           | 702.8            | 12.4         |
| JUNE      | 503              | 28.8               | 17.5           | 9244           | 731.6            | 12.6         |
| JULY      | 261              | 26.5               | 9.8            | 9505           | 758.1            | 12.5         |

**Monthly Cumulative Fuel Reports for Each Vehicle  
at San Antonio Real Property Maintenance Agency**

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST ACTIVITY: USAF  
VEHICLE USA #: CB9917

PLYMOUTH RELIANT  
ENGINE TYPE: I-4

U.S.A.F. BASELINE VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| JANUARY   | 574              | 20.0               | 28.7           | 574            | 20.0             | 28.7         |
| FEBRUARY  | 214              | 7.0                | 30.6           | 788            | 27.0             | 29.2         |
| MARCH     | 487              | 0.0                | 0.0            | 1275           | 27.0             | 47.2         |
| APRIL     | 617              | 33.2               | 18.6           | 1892           | 60.2             | 31.4         |
| MAY       | 592              | 7.3                | 81.1           | 2484           | 67.5             | 36.8         |
| JUNE      | 511              | 13.6               | 37.6           | 2995           | 81.1             | 36.9         |
| JULY      | 860              | 17.0               | 50.6           | 3855           | 98.1             | 39.3         |
| AUGUST    | 1319             | 38.3               | 34.4           | 5174           | 136.4            | 37.9         |
| SEPTEMBER | 860              | 38.5               | 24.9           | 6134           | 174.9            | 35.1         |
| OCTOBER   | 826              | 29.0               | 28.5           | 6960           | 203.9            | 34.1         |
| NOVEMBER  | 600              | 18.0               | 33.3           | 7560           | 221.9            | 34.1         |
| DECEMBER  | 1024             | 34.6               | 29.6           | 8584           | 256.5            | 33.5         |
| JANUARY   | 709              | 16.0               | 44.3           | 9293           | 272.5            | 34.1         |
| FEBRUARY  | 735              | 0.0                | 0.0            | 10028          | 272.5            | 36.8         |
| MARCH     | 962              | 49.2               | 19.6           | 10990          | 321.7            | 34.2         |
| APRIL     | 764              | 38.6               | 19.8           | 11754          | 360.3            | 32.6         |
| MAY       | 1017             | 31.0               | 32.8           | 12771          | 391.3            | 32.6         |
| JUNE      | 928              | 37.0               | 25.1           | 13699          | 428.3            | 32.0         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: USAF  
VEHICLE USA #: CB9918

PLYMOUTH RELIANT  
ENGINE TYPE: I-4

U.S.A.F. BASELINE VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| JANUARY   | 1064             | 39.0               | 27.3           | 1064           | 39.0             | 27.3         |
| FEBRUARY  | 898              | 30.0               | 29.9           | 1962           | 69.0             | 28.4         |
| MARCH     | 836              | 33.0               | 25.3           | 2798           | 102.0            | 27.4         |
| APRIL     | 822              | 37.0               | 24.9           | 3720           | 139.0            | 26.8         |
| MAY       | 1015             | 21.2               | 47.4           | 4735           | 160.2            | 29.6         |
| JUNE      | 1336             | 40.0               | 33.4           | 6071           | 200.2            | 30.3         |
| JULY      | 931              | 31.7               | 29.4           | 7002           | 231.9            | 30.2         |
| AUGUST    | 178              | 10.5               | 17.0           | 7180           | 242.4            | 29.6         |
| SEPTEMBER | 664              | 22.0               | 30.2           | 7844           | 264.4            | 29.7         |
| OCTOBER   | 451              | 15.9               | 28.4           | 8295           | 280.3            | 29.6         |
| NOVEMBER  | 575              | 18.0               | 31.9           | 8870           | 298.3            | 29.7         |
| DECEMBER  | 389              | 16.7               | 23.3           | 9259           | 315.0            | 29.4         |
| JANUARY   | 329              | 14.4               | 36.7           | 9788           | 329.4            | 29.7         |
| FEBRUARY  | 266              | 7.0                | 38.0           | 10054          | 336.4            | 29.9         |
| MARCH     | 318              | 17.2               | 18.5           | 10372          | 353.6            | 29.3         |
| APRIL     | 294              | 9.5                | 30.9           | 10666          | 363.1            | 29.4         |
| MAY       | 716              | 21.5               | 33.3           | 11382          | 384.6            | 29.6         |
| JUNE      | 558              | 8.0                | 69.8           | 11940          | 392.6            | 30.4         |
| JULY      | 65               | 0.0                | 0.0            | 12005          | 392.6            | 30.6         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: USAF  
VEHICLE USA #: CB9922

PLYMOUTH RELIANT  
ENGINE TYPE: I-4

U.S.A.F. BASELINE VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| JANUARY   | 330              | 38.0               | 10.0           | 330            | 38.0             | 10.0         |
| FEBRUARY  | 575              | 8.0                | 71.9           | 955            | 46.0             | 20.8         |
| MARCH     | 455              | 17.0               | 26.3           | 1410           | 63.0             | 22.4         |
| APRIL     | 946              | 31.0               | 30.5           | 2356           | 94.0             | 25.1         |
| MAY       | 692              | 15.7               | 43.4           | 3038           | 109.7            | 27.7         |
| JUNE      | 630              | 18.0               | 35.0           | 3668           | 127.7            | 28.7         |
| JULY      | 466              | 13.0               | 35.8           | 4134           | 140.7            | 29.4         |
| AUGUST    | 342              | 14.4               | 23.7           | 4476           | 155.1            | 28.9         |
| SEPTEMBER | 986              | 29.0               | 30.6           | 5362           | 184.1            | 29.1         |
| OCTOBER   | 512              | 13.0               | 39.4           | 5874           | 197.1            | 29.8         |
| NOVEMBER  | 332              | 12.0               | 27.7           | 6206           | 209.1            | 29.7         |
| DECEMBER  | 430              | 24.8               | 17.3           | 6636           | 233.9            | 28.4         |
| JANUARY   | 420              | 18.0               | 23.3           | 7056           | 251.9            | 28.0         |
| FEBRUARY  | 270              | 0.0                | 0.0            | 7326           | 251.9            | 29.1         |
| MARCH     | 409              | 8.0                | 51.1           | 7735           | 259.9            | 29.8         |
| APRIL     | 352              | 12.9               | 27.3           | 8087           | 272.8            | 29.6         |
| MAY       | 1013             | 37.2               | 27.2           | 9100           | 310.0            | 29.4         |
| JUNE      | 139              | 0.0                | 0.0            | 9239           | 310.0            | 29.8         |
| JULY      | 169              | 0.0                | 0.0            | 9408           | 310.0            | 30.3         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

| POST/ACTIVITY: USAF   | PLYMOUTH RELIANT |                    |                | U.S.A.F. METHANOL VEHICLE |                  |              |
|-----------------------|------------------|--------------------|----------------|---------------------------|------------------|--------------|
| VEHICLE USA #: X79115 | ENGINE TYPE: I-4 |                    |                |                           |                  |              |
| MONTH                 | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES            | CUMUL<br>GALLONS | CUMUL<br>MPG |
| JANUARY               | 173              | 9.0                | 19.2           | 173                       | 9.0              | 19.2         |
| FEBRUARY              | 629              | 36.2               | 17.4           | 802                       | 45.2             | 17.7         |
| MARCH                 | 834              | 45.0               | 18.5           | 1636                      | 90.2             | 18.1         |
| APRIL                 | 867              | 58.1               | 14.9           | 2503                      | 148.3            | 16.9         |
| MAY                   | 984              | 67.3               | 14.6           | 3487                      | 215.6            | 16.2         |
| JUNE                  | 899              | 54.6               | 16.3           | 4376                      | 270.2            | 16.2         |
| JULY                  | 707              | 54.6               | 12.9           | 5083                      | 324.9            | 15.6         |
| AUGUST                | 1227             | 94.4               | 14.5           | 6310                      | 409.2            | 15.4         |
| SEPTEMBER             | 128              | 16.0               | 8.0            | 6438                      | 425.2            | 15.1         |
| OCTOBER               | 662              | 32.3               | 20.5           | 7100                      | 457.5            | 15.5         |
| NOVEMBER              | 896              | 50.1               | 13.9           | 7796                      | 507.6            | 15.4         |
| DECEMBER              | 521              | 28.7               | 18.2           | 8317                      | 536.3            | 15.5         |
| JANUARY               | 450              | 36.9               | 12.2           | 8767                      | 573.2            | 15.3         |
| FEBRUARY              | 856              | 52.3               | 16.4           | 9623                      | 625.5            | 15.4         |
| MARCH                 | 904              | 64.0               | 14.1           | 10527                     | 689.5            | 15.3         |
| APRIL                 | 1057             | 75.2               | 14.1           | 11584                     | 764.7            | 15.1         |
| MAY                   | 904              | 54.8               | 16.5           | 12488                     | 819.5            | 15.2         |
| JUNE                  | 695              | 56.5               | 12.1           | 13173                     | 876.0            | 15.0         |
| JULY                  | 110              | 12.0               | 9.2            | 13283                     | 988.0            | 15.0         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: USAF  
VEHICLE USA #: X79116

PLYMOUTH RELIANT  
ENGINE TYPE: I-4

U.S.A.F. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| JANUARY   | 215              | 12.4               | 17.3           | 215            | 12.4             | 17.3         |
| FEBRUARY  | 275              | 16.6               | 16.6           | 490            | 29.0             | 16.9         |
| MARCH     | 753              | 17.0               | 44.3           | 1243           | 46.0             | 27.0         |
| APRIL     | 773              | 45.2               | 17.1           | 2016           | 91.2             | 22.1         |
| MAY       | 370              | 34.5               | 10.7           | 2386           | 125.7            | 19.0         |
| JUNE      | 853              | 54.6               | 15.6           | 3239           | 180.3            | 18.0         |
| JULY      | 722              | 55.5               | 13.0           | 3961           | 235.8            | 16.8         |
| AUGUST    | 747              | 54.6               | 13.7           | 4708           | 290.4            | 16.2         |
| SEPTEMBER | 1149             | 71.3               | 16.0           | 5857           | 362.2            | 16.2         |
| OCTOBER   | 917              | 62.5               | 14.7           | 6774           | 424.7            | 16.0         |
| NOVEMBER  | 784              | 55.0               | 14.3           | 7558           | 479.7            | 15.8         |
| DECEMBER  | 936              | 65.1               | 14.4           | 8494           | 544.8            | 15.6         |
| JANUARY   | 971              | 61.8               | 15.7           | 9465           | 606.6            | 15.6         |
| FEBRUARY  | 500              | 35.0               | 14.3           | 9965           | 641.6            | 15.5         |
| MARCH     | 1127             | 69.3               | 16.1           | 11092          | 711.4            | 15.6         |
| APRIL     | 403              | 34.3               | 11.6           | 11495          | 746.2            | 15.4         |
| MAY       | 483              | 33.5               | 14.4           | 11978          | 779.7            | 15.4         |
| JUNE      | 1074             | 75.1               | 14.3           | 13052          | 854.8            | 15.3         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST ACTIVITY: USAF  
VEHICLE USA #: X79117

PLYMOUTH RELIANT  
ENGINE TYPE: I-4

U.S.A.F. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| JANUARY   | 400              | 19.9               | 20.1           | 400            | 19.9             | 20.1         |
| FEBRUARY  | 628              | 25.1               | 25.0           | 1028           | 45.0             | 22.8         |
| MARCH     | 1120             | 51.5               | 21.7           | 2148           | 96.5             | 22.3         |
| APRIL     | 656              | 43.3               | 15.2           | 2804           | 139.3            | 20.1         |
| MAY       | 370              | 59.7               | 14.6           | 3674           | 199.5            | 18.4         |
| JUNE      | 636              | 43.1               | 14.8           | 4310           | 242.6            | 17.9         |
| JULY      | 696              | 56.0               | 12.2           | 4996           | 298.6            | 16.7         |
| AUGUST    | 916              | 54.8               | 16.7           | 5912           | 353.4            | 16.7         |
| SEPTEMBER | 648              | 46.1               | 14.1           | 6560           | 399.5            | 16.4         |
| OCTOBER   | 956              | 66.8               | 14.3           | 7516           | 466.3            | 16.1         |
| NOVEMBER  | 752              | 52.3               | 14.4           | 8268           | 518.6            | 15.9         |
| DECEMBER  | 946              | 65.9               | 14.4           | 9214           | 584.5            | 15.8         |
| JANUARY   | 1162             | 60.8               | 19.1           | 10376          | 645.3            | 16.1         |
| FEBRUARY  | 541              | 39.9               | 13.6           | 10917          | 685.2            | 15.9         |
| MARCH     | 1119             | 67.2               | 16.6           | 12035          | 752.4            | 16.0         |
| APRIL     | 314              | 15.4               | 20.4           | 12349          | 767.8            | 16.1         |
| MAY       | 489              | 25.7               | 19.0           | 12838          | 793.5            | 16.2         |
| JUNE      | 812              | 59.0               | 13.8           | 13650          | 852.5            | 16.0         |

OPERATIONAL DATA FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: USAF  
VEHICLE USA #: X79118

PLYMOUTH RELIANT  
ENGINE TYPE: I-4

U.S.A.F. METHANOL VEHICLE

| MONTH     | MONTHLY<br>MILES | MONTHLY<br>GALLONS | MONTHLY<br>MPG | CUMUL<br>MILES | CUMUL<br>GALLONS | CUMUL<br>MPG |
|-----------|------------------|--------------------|----------------|----------------|------------------|--------------|
| JANUARY   | 213              | 15.9               | 13.4           | 213            | 15.9             | 13.4         |
| FEBRUARY  | 1134             | 65.3               | 17.4           | 1347           | 81.2             | 16.6         |
| MARCH     | 1166             | 39.9               | 29.2           | 2513           | 121.1            | 20.8         |
| APRIL     | 904              | 77.9               | 11.6           | 3417           | 199.0            | 17.2         |
| MAY       | 468              | 26.2               | 17.9           | 3885           | 225.2            | 17.3         |
| JUNE      | 893              | 55.0               | 16.2           | 4778           | 280.2            | 17.1         |
| JULY      | 833              | 59.7               | 14.0           | 5611           | 339.9            | 16.5         |
| AUGUST    | 561              | 26.8               | 20.9           | 6172           | 366.7            | 16.8         |
| SEPTEMBER | 501              | 47.3               | 10.6           | 6673           | 414.0            | 16.1         |
| OCTOBER   | 1095             | 64.3               | 17.0           | 7768           | 478.3            | 16.2         |
| NOVEMBER  | 857              | 44.3               | 19.3           | 8625           | 522.6            | 16.5         |
| DECEMBER  | 1068             | 67.4               | 15.8           | 9693           | 590.0            | 16.4         |
| JANUARY   | 677              | 38.0               | 17.9           | 10370          | 628.0            | 16.5         |
| FEBRUARY  | 622              | 40.0               | 15.5           | 10992          | 668.0            | 16.5         |
| MARCH     | 933              | 65.0               | 14.4           | 11925          | 733.0            | 16.3         |
| APRIL     | 688              | 66.0               | 10.4           | 12613          | 799.0            | 15.8         |
| MAY       | 976              | 64.8               | 15.1           | 13589          | 863.8            | 15.7         |
| JUNE      | 932              | 66.3               | 14.1           | 14521          | 930.1            | 15.6         |

## **APPENDIX D**

### **FUEL SAMPLING PROCEDURE FOR USE IN THE ARMY METHANOL- FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION PROGRAM**

## APPENDIX D

### FUEL SAMPLING PROCEDURE FOR USE IN THE ARMY METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION PROGRAM

#### Fuel Samples

Purpose. Fuel samples will be taken and evaluated to determine the quality consistency of the methanol fuel delivered for use in the Army Methanol-Fueled Administrative Vehicle Demonstration Program.

Sampling Schedule. Presidio of San Francisco - a fuel sample will be taken by Army personnel from the new 550-gal refueling tank, supplied by JPL, each time the refueling tank is refilled with more than 200 gal from a BofA fuel dispensing station.

Fort Ord and Sierra Army Depot - a fuel sample will be taken by Army personnel from the bulk fuel tanker delivering methanol fuel to the refueling facilities each time a fuel delivery is made. In addition, a sample will be drawn from the refueling pump approximately 8 to 24 hrs after receipt of each bulk fuel delivery.

Sample Containers. One gallon, ICC approved, unlined, steel cans (to be supplied by BFLRF with shipping labels) will be used to take and ship the methanol fuel samples. These cans meet Government Specification DOT 17E and can be shipped without being enclosed in another container if necessary. Before introducing the sample, visually inspect the sample cans to ensure they are free of rust and do not contain any extraneous materials such as oil, dirt, dust, etc. If cans are rusty, do not use for samples. If foreign material cannot be removed by rinsing as described under sampling procedure, do not use for samples. Do not permit cans to get hot from being in direct sunlight for a long period of time before introducing the sample. Also, it is very important that filled sample cans not be allowed to sit in direct sunlight or placed in rooms with very warm temperatures since exposure to such heat degrades the sample.

Sampling Procedure. The following sampling procedure will be used for the methanol fuel:

- a. Purge filler hose and valve by discharging at least 3 times the hose volume through the hose and valve. If a methanol vehicle is at the pump storage tank for refueling, 2 to 5 gallons could be pumped into the vehicle before the sample is taken. Otherwise, a "slop" can must be provided. Disposition of the "slop" can will be in accordance with local SOP.
- b. After purging, partially fill the sample container with fuel (about one-third full). Cap, shake vigorously, and discard this rinse fuel. Repeat for a total of three rinses.
- c. Fill each rinsed container with the sampled fuel to within not less than one and one-half inches from the top. This space is for expansion of fuel if exposed to heat for any length of time.
- d. For the metal sample containers, a metal shipping insert is to be rinsed with fuel immediately before inserting into the can opening. Make sure the insert is clean. This insert is vital to the sealing of the sample containers and must fit flat in the opening and be level with or slightly below the rim of the opening. If the insert does not go in easily, use a round, flat object (such as a 1-inch socket) slightly smaller than the insert to gently force it into place. Take care, for if the insert is bent, it will not seal. Make sure you can read "PRY OUT" printed on the insert.
- e. Place the screw cap on the can and tighten as tight as possible by hand.
- f. Place all filled, capped containers on their side for about 30 minutes to check for leaks. If further tightening is necessary to stop leakage, channel-lock or water pump pliers may be used on the metal cap, taking care to avoid damaging the cap.

Shipping. All fuel samples are to be shipped to BFLRF as follows:

- a. All samples will be airshipped to BFLRF by Federal Express or other comparable air shipping service for next day arrival.

b. Each 1-gallon sample can will be placed in a carton provided for shipping purposes.

c. The carton will be marked as follows:

1. "FLAMMABLE LIQUID" label (Red w/White lettering)

2. "DANGER-PELIGRO" label (Orange w/Black lettering)

3. A label bearing the following information:

"The container in this box meets the Federal  
Specification for the fuel being shipped therein."

4. A label bearing the following information:

Fuel-Methanol Alcohol  
FLAMMABLE LIQUID  
UN-1230  
Flash point: 54°F (12°C)

d. Cartons, with appropriate shipping labels, will be provided by BFLRF.

e. Samples will be shipped to:

Southwest Research Institute  
Belvoir Fuels and Lubricants Research Facility  
Attn: B.B. Baber, Bldg. 99  
6220 Culebra Road  
San Antonio, TX 78228-0510

Analyses. Upon receipt of the samples, fuel analyses conducted by BFLRF will include, but not limited to, the following evaluations:

| Evaluation                                 | Method          |
|--------------------------------------------|-----------------|
| GC analysis of hydrocarbons and oxygenates | BFLRF           |
| Specific Gravity                           | D 1217          |
| Color                                      | D 156           |
| Copper Corrosion                           | D 130           |
| Reid Vapor Pressure (auto)                 | SwRI            |
| Sulfur                                     | D 3120 & ICP    |
| Gum                                        | D 381           |
| Lead                                       | D 3237          |
| Distillation                               | D 86            |
| Chloride Content, Organic & Inorganic      | D 3120 modified |
| Phosphorus Content                         | D 3231          |
| Water                                      | D 1744          |
| Particulate Contaminants                   | D 2276 & HIAC   |
| Acidity                                    | D 1613          |

Reporting. The results obtained from the fuel analyses will be reported by letter to JPL and the supplying activity, along with any pertinent comments relative to the results obtained.

**APPENDIX E**  
**LUBRICANT AND TRACE METAL DATA**

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

REVISION DATE: AUG 11, 1980

VEHICLE USA 01 C80917 ENGINE TYPE: I-4 CHRYSLER K-CR USAF BASELINE VEHICLE

| DATE | OIL | VISCOSITY<br>40 C 100 C | TAN | FUEL<br>D664 OIL % | PPM (PARTS PER MILLION) |    |    |    |    |    |   |    |    |  | P | Zn | SFLR<br>CODE |
|------|-----|-------------------------|-----|--------------------|-------------------------|----|----|----|----|----|---|----|----|--|---|----|--------------|
|      |     |                         |     |                    | Fe                      | Pb | Cu | Sn | Mn | Si | B | Mg | Ca |  |   |    |              |

## CHRYSLER "K" CAR U/TBI ENGINE

|          |       |      |      |     |      |      |     |    |   |    |   |   |   |    |    |      |     |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|---|----|---|---|---|----|----|------|-----|------|------|-------|
| 12-31-86 | 8897  | 74.7 | 11.4 | 145 | 1.23 | 3.49 | 0.0 | 11 | 4 | 4  | 0 | 0 | 0 | 15 | 43 | 1950 | 310 | 900  | 1270 | 15703 |
| 01-30-87 | 9574  | 62.6 | 10.2 | 150 | 1.85 | 4.83 | 0.0 | 20 | 7 | 10 | 0 | 0 | 0 | 24 | 38 | 970  | 310 | 1270 | 1000 | 15034 |
| 05-12-87 | 11145 | 90.3 | 10.6 | 100 | 1.91 | 5.82 | 0.0 | 11 | 6 | 6  | 0 | 0 | 0 | 11 | 7  | 630  | 000 | 1190 | 1430 | 16066 |
| 06-23-87 | 11851 | 78.5 | 10.4 | 116 | 1.60 | 4.49 | 0.0 | 13 | 7 | 7  | 0 | 0 | 0 | 12 | 5  | 620  | 000 | 1210 | 1550 | 16233 |

## OIL CHANGE AT 11851 MILES

|          |       |      |      |     |      |      |     |    |    |   |   |   |   |    |   |     |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|----|---|---|---|---|----|---|-----|------|------|------|-------|
| 07-23-87 | 12486 | 71.5 | 10.9 | 140 | 1.69 | 7.03 | 0.0 | 6  | 11 | 3 | 0 | 0 | 0 | 8  | 2 | 620 | 1310 | 000  | 1220 | 16460 |
| 09-15-87 | 14024 | 81.6 | 11.0 | 130 | 2.59 | 5.01 | 0.0 | 12 | 5  | 7 | 0 | 0 | 0 | 14 | 2 | 500 | 1260 | 1000 | 1100 | 16665 |

## OIL CHANGE AT 14824 MILES

|          |       |      |      |     |      |      |     |    |    |   |   |   |   |     |    |      |     |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|----|---|---|---|---|-----|----|------|-----|------|------|-------|
| 10-15-87 | 15764 | 68.4 | 10.4 | 139 | 2.91 | 4.60 | 0.0 | 12 | 9  | 3 | 0 | 0 | 0 | 10  | 31 | 1230 | 360 | 1190 | 1460 | 16000 |
| 01-05-88 | 17848 | 70.5 | 10.4 | 133 | 1.11 | 3.14 | 0.0 | 13 | 11 | 6 | 0 | 0 | 0 | 120 | 12 | 790  | 290 | 060  | 1100 | 17096 |

## OIL CHANGE AT 17848 MILES

|          |       |      |      |     |      |      |     |    |    |   |   |   |   |    |   |      |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|----|---|---|---|---|----|---|------|------|------|------|-------|
| 02-05-88 | 18791 | 67.5 | 10.8 | 150 | 2.69 | 5.27 | 0.0 | 13 | 13 | 4 | 0 | 0 | 0 | 10 | 3 | 690  | 1490 | 1070 | 1400 | 17221 |
| 04-22-88 | 20931 | 69.5 | 11.1 | 152 | 3.59 | 4.71 | 0.0 | 21 | 14 | 7 | 0 | 2 | 0 | 18 | 3 | 1000 | 2370 | 1130 | 1050 | 17555 |

## OIL CHANGE AT 20931 MILES

|          |       |      |      |     |      |      |     |    |   |   |   |   |   |    |   |     |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|---|---|---|---|---|----|---|-----|------|------|------|-------|
| 05-23-88 | 21595 | 67.5 | 10.6 | 146 | 1.80 | 6.96 | 0.0 | 10 | 9 | 3 | 0 | 0 | 0 | 14 | 2 | 840 | 1740 | 1210 | 1570 | 17639 |
| 07-01-88 | 22754 | 67.3 | 10.9 | 153 | 2.75 | 5.16 | 0.0 | 11 | 7 | 5 | 0 | 0 | 0 | 16 | 6 | 620 | 1540 | 940  | 1300 | 17049 |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #: C08910         |       | ENGINE TYPE: 1-4 |            | CHRYSLER K-CAR          |      | USAF BASELINE VEHICLE |     |    |    |    |    |    |    |   |    | REVISION DATE: AUG 11, 1988 |      |     |      |      |       |       |  |  |  | BFL/PF |  |
|-------------------------------|-------|------------------|------------|-------------------------|------|-----------------------|-----|----|----|----|----|----|----|---|----|-----------------------------|------|-----|------|------|-------|-------|--|--|--|--------|--|
| VISCOSITY                     |       | TBI FUEL         |            | PPH (PARTS PER MILLION) |      |                       |     |    |    |    |    |    |    |   |    |                             |      |     |      |      |       |       |  |  |  |        |  |
| 40 C 100 C                    | VI    | TAN              | D664 CIL % | Fe                      | Pb   | Cu                    | Sn  | Al | Ni | Mn | Si | Mo | Ca | P | Zn | CODE                        |      |     |      |      |       |       |  |  |  |        |  |
| CHRYSLER "K" CAR W/TBI ENGINE |       |                  |            |                         |      |                       |     |    |    |    |    |    |    |   |    |                             |      |     |      |      |       |       |  |  |  |        |  |
| 12-30-86                      | 14950 | 69.5             | 10.5       | 130                     | 2.52 | 4.50                  | 0.0 | 5  | 3  | 0  | 0  | 2  | 0  | 0 | 0  | 48                          | 1230 | 270 | 1040 | 1300 | 15702 |       |  |  |  |        |  |
| 01-30-87                      | 16036 | 63.3             | 9.3        | 126                     | 2.50 | 4.30                  | 0.0 | 11 | 4  | 3  | 0  | 5  | 0  | 0 | 0  | 24                          | 36   | 900 | 250  | 1220 | 1020  | 15035 |  |  |  |        |  |
| 04-02-87                      | 17906 | 60.4             | 10.5       | 142                     | 3.59 | 4.15                  | 0.0 | 12 | 4  | 4  | 0  | 5  | 0  | 0 | 0  | 19                          | 19   | 920 | 250  | 910  | 1140  | 15904 |  |  |  |        |  |
| OIL CHANGE AT 17907 MILES     |       |                  |            |                         |      |                       |     |    |    |    |    |    |    |   |    |                             |      |     |      |      |       |       |  |  |  |        |  |
| 05-12-87                      | 19146 | 73.2             | 11.7       | 152                     | 1.80 | 5.39                  | 0.0 | 9  | 7  | 3  | 0  | 4  | 0  | 0 | 0  | 15                          | 4    | 800 | 1500 | 1000 | 1420  | 16065 |  |  |  |        |  |
| 07-15-87                      | 21664 | 82.2             | 11.4       | 129                     | 2.50 | 6.28                  | 0.0 | 13 | 7  | 4  | 0  | 5  | 0  | 0 | 0  | 10                          | 12   | 870 | 1460 | 1230 | 1400  | 16425 |  |  |  |        |  |
| OIL CHANGE AT 21664 MILES     |       |                  |            |                         |      |                       |     |    |    |    |    |    |    |   |    |                             |      |     |      |      |       |       |  |  |  |        |  |
| 01-21-88                      | 24660 | 72.1             | 10.7       | 136                     | 4.15 | 3.14                  | 0.0 | 10 | 6  | 3  | 0  | 4  | 0  | 0 | 0  | 10                          | 15   | 600 | 260  | 760  | 1050  | 17191 |  |  |  |        |  |
| OIL CHANGE AT 24660 MILES     |       |                  |            |                         |      |                       |     |    |    |    |    |    |    |   |    |                             |      |     |      |      |       |       |  |  |  |        |  |
| 07-06-88                      | 27199 | 68.3             | 10.6       | 144                     | 1.96 | 5.02                  | 0.0 | 10 | 7  | 6  | 0  | 7  | 0  | 1 | 0  | 54                          | 24   | 520 | 2250 | 1060 | 1550  | 17050 |  |  |  |        |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

REVISION DATE: AUG 11, 1989

VEHICLE USA 0: CB8922 ENGINE TYPE: I-4 CHRYSLER K-CAR USAF BASELINE VEHICLE

| DATE | ODOM | VISCOSITY<br>40 C 100 C | VI | TAN | TBN | FUEL<br>0664 OIL % | Fe | Pb | Cu | Sn | Mn | PPM PARTS PER MILLION |    |    |   | Ca | P | Zn | BFLRF<br>CODE |
|------|------|-------------------------|----|-----|-----|--------------------|----|----|----|----|----|-----------------------|----|----|---|----|---|----|---------------|
|      |      |                         |    |     |     |                    |    |    |    |    |    | Si                    | Mo | Bi | B |    |   |    |               |

## CHRYSLER "K" CAR W/TBI ENGINE

|          |       |      |      |     |      |      |     |    |   |    |   |   |   |   |    |    |      |     |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|---|----|---|---|---|---|----|----|------|-----|------|------|-------|
| 12-31-86 | 12400 | 68.0 | 11.0 | 151 | 2.52 | 4.49 | .5  | 5  | 0 | 0  | 0 | 0 | 0 | 0 | 12 | 45 | 1250 | 310 | 1060 | 1320 | 15784 |
| 01-30-87 | 13044 | 53.5 | 9.0  | 149 | 2.36 | 4.71 | 0.0 | 12 | 6 | 3  | 0 | 0 | 0 | 0 | 26 | 39 | 1010 | 300 | 1220 | 1000 | 15833 |
| 05-28-87 | 15765 | 69.3 | 10.6 | 141 | 3.65 | 3.14 | 0.0 | 17 | 6 | 27 | 3 | 0 | 0 | 0 | 32 | 25 | 1240 | 240 | 1260 | 1160 | 16103 |

OIL CHANGE AT 15705 MILES

OIL CHANGE AT 18789 MILES

|          |       |      |      |     |      |      |     |    |    |   |   |   |   |   |    |   |     |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|----|---|---|---|---|---|----|---|-----|------|------|------|-------|
| 12-10-87 | 19154 | 67.2 | 10.9 | 153 | 2.02 | 5.22 | 0.0 | 9  | 0  | 0 | 0 | 0 | 0 | 0 | 0  | 3 | 750 | 1640 | 1150 | 1300 | 17041 |
| 05-18-88 | 21759 | 76.6 | 11.6 | 145 | 2.69 | 5.72 | 0.0 | 13 | 14 | 8 | 0 | 1 | 0 | 0 | 24 | 1 | 630 | 1740 | 890  | 1390 | 17637 |

OIL CHANGE AT 21759 MILES

|          |       |      |      |     |      |      |     |    |   |   |   |   |   |   |    |    |     |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|---|---|---|---|---|---|----|----|-----|------|------|------|-------|
| 06-21-88 | 21901 | 75.9 | 12.0 | 154 | 2.81 | 7.41 | 0.0 | 7  | 4 | 1 | 0 | 0 | 0 | 0 | 12 | 62 | 970 | 1100 | 1190 | 1330 | 17003 |
| 07-06-88 | 22114 | 81.6 | 12.4 | 149 | 1.96 | 6.22 | 0.0 | 10 | 6 | 2 | 0 | 0 | 0 | 0 | 15 | 64 | 740 | 1170 | 1000 | 1370 | 17040 |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA 01 CK2364 |            |            |            | ENGINE TYPE: L-4 |            |            |            | CHEV CITATION |            |            |            | PRESIDIO BASELINE VEHICLE |            |            |            |            |            |            |            |            |            | REVISION DATE: AUG 11, 1900 |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            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|-----------------------|------------|------------|------------|------------------|------------|------------|------------|---------------|------------|------------|------------|---------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-----------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------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| VISCOSITY             |            | ODOM       |            | VI               |            | TAN        |            | IBH FUEL      |            | Fe         |            | Pb                        |            | Cu         |            | Sn         |            | Al         |            | Ni         |            | Mo                          |            | Si         |            | B          |            | Mg         |            | Ca         |            | P          |            | Zn         |            | BFLRF CODE |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            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|        |
| DATE                  | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C       | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C    | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C                | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C                  | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 100 C | 40 C 1 |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA 01 CK2366     |       |           |       | ENGINE TYPE: L-4 |      | CHEV CITATION |      | PRESIDIO BASELINE VEHICLE |    |     |    |                         |    |    |    |     |      | REVISION DATE: AUG 11, 1980 |      |      |            |  |
|---------------------------|-------|-----------|-------|------------------|------|---------------|------|---------------------------|----|-----|----|-------------------------|----|----|----|-----|------|-----------------------------|------|------|------------|--|
| DATE                      | ODOM  | VISCOSITY |       | VI               | TAN  | TBN           | FUEL | Fe                        | Pb | Cu  | Zn | PPM (PARTS PER MILLION) |    |    |    |     |      | Ca                          | P    | Zn   | BFLRF CODE |  |
|                           |       | 40 C      | 100 C |                  |      |               |      |                           |    |     |    | Al                      | Mn | Si | S  | Mg  |      |                             |      |      |            |  |
| OIL CHANGE AT 28500 MILES |       |           |       |                  |      |               |      |                           |    |     |    |                         |    |    |    |     |      |                             |      |      |            |  |
| 11-25-85                  | 30593 | 73.1      | 11.1  | 142              | 4.32 | 1.92          | 1.9  | 93                        | 49 | 97  | 5  | 9                       | 4  | 1  | 39 | 35  | 1064 | 44                          | 946  | 993  | 14732      |  |
| 12-12-85                  | 31728 | 85.0      | 12.5  | 144              | 5.58 | 1.56          | 1.9  | 112                       | 61 | 102 | 5  | 10                      | 4  | 2  | 39 | 26  | 1045 | 44                          | 807  | 962  | 14803      |  |
| OIL CHANGE AT 31728 MILES |       |           |       |                  |      |               |      |                           |    |     |    |                         |    |    |    |     |      |                             |      |      |            |  |
| 01-07-86                  | 31969 | 120.8     | 12.9  | 100              | 2.66 | 5.01          | 1.4  | 28                        | 10 | 21  | 2  | 3                       | 1  | 1  | 32 | 150 | 1217 | 22                          | 1145 | 1133 | 14826      |  |
| OIL CHANGE AT 31969 MILES |       |           |       |                  |      |               |      |                           |    |     |    |                         |    |    |    |     |      |                             |      |      |            |  |
| 01-07-86                  | 31970 | 146.4     | 14.2  | 94               | 2.79 | 7.36          | .3   | 3                         | 2  | 5   | 1  | 1                       | 1  | 1  | 26 | 173 | 1245 | 17                          | 1168 | 1097 | 14827      |  |
| 02-04-86                  | 34093 | 94.9      | 11.8  | 114              | 3.61 | 2.74          | 2.3  | 31                        | 21 | 12  | 5  | 3                       | 4  | 1  | 19 | 43  | 851  | 362                         | 1124 | 1113 | 14873      |  |
| 02-12-86                  | 35005 | 85.0      | 11.2  | 120              | 2.94 | 2.76          | 2.7  | 52                        | 17 | 20  | 2  | 3                       | 1  | 1  | 16 | 3   | 801  | 310                         | 1043 | 905  | 14880      |  |
| OIL CHANGE AT 35005 MILES |       |           |       |                  |      |               |      |                           |    |     |    |                         |    |    |    |     |      |                             |      |      |            |  |
| 02-12-86                  | 35006 | 143.7     | 14.1  | 95               | 2.78 | 8.13          | .4   | 4                         | 1  | 3   | 1  | 1                       | 5  | 1  | 27 | 4   | 1181 | 36                          | 1194 | 1101 | 14889      |  |
| 03-18-86                  | 36241 | 140.5     | 14.1  | 97               | 3.79 | 3.10          | .9   | 22                        | 13 | 7   | 2  | 1                       | 1  | 1  | 17 | 74  | 1172 | 51                          | 1170 | 1132 | 14967      |  |
| 08-15-86                  | 41540 | 138.8     | 14.4  | 103              | 4.94 | 2.13          | .5   | 82                        | 35 | 17  | 2  | 9                       | 0  | 0  | 23 | 23  | 920  | 356                         | 1220 | 1320 | 15308      |  |
| OIL CHANGE AT 41543 MILES |       |           |       |                  |      |               |      |                           |    |     |    |                         |    |    |    |     |      |                             |      |      |            |  |
| 08-15-86                  | 41544 | 150.6     | 14.4  | 93               | 2.41 | 7.69          | .5   | 3                         | 1  | 4   | 3  | 0                       | 0  | 0  | 18 | 195 | 1440 | 38                          | 1340 | 1320 | 15389      |  |
| 09-05-86                  | 44344 | 158.7     | 15.6  | 108              | 5.22 | 3.48          | 1.5  | 52                        | 13 | 13  | 4  | 5                       | 0  | 0  | 15 | 37  | 1890 | 50                          | 1150 | 1100 | 15396      |  |
| 09-22-86                  | 45998 | 156.3     | 16.7  | 114              | 5.39 | 1.68          | .5   | 59                        | 18 | 14  | 7  | 5                       | 0  | 0  | 22 | 29  | 550  | 170                         | 1260 | 1090 | 15456      |  |
| OIL CHANGE AT 45998 MILES |       |           |       |                  |      |               |      |                           |    |     |    |                         |    |    |    |     |      |                             |      |      |            |  |
| 09-22-86                  | 45999 | 134.8     | 14.5  | 107              | 2.92 | 9.43          | .5   | 0                         | 4  | 3   | 4  | 0                       | 0  | 0  | 8  | 161 | 1258 | 30                          | 1360 | 1250 | 15460      |  |
| 11-18-86                  | 46722 | 115.9     | 13.8  | 106              | 2.69 | 7.86          | 0.0  | 32                        | 9  | 8   | 0  | 5                       | 0  | 0  | 10 | 103 | 1790 | 40                          | 1150 | 1070 | 15562      |  |
| 12-09-86                  | 47501 | 140.4     | 14.6  | 103              | 3.09 | 6.51          | 0.0  | 53                        | 15 | 15  | 7  | 0                       | 0  | 0  | 14 | 91  | 1430 | 50                          | 1300 | 1160 | 15659      |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

|                       |                  |                         |                           |                             |      |                    |     |    |    |    |    |    |    |    |                         |    |      |       |      |      |       |
|-----------------------|------------------|-------------------------|---------------------------|-----------------------------|------|--------------------|-----|----|----|----|----|----|----|----|-------------------------|----|------|-------|------|------|-------|
| VEHICLE USA #: CK2366 | ENGINE TYPE: L-4 | CHEV CITATION           | PRESIDIO BASELINE VEHICLE | REVISION DATE: AUG 11, 1988 |      |                    |     |    |    |    |    |    |    |    |                         |    |      |       |      |      |       |
| DATE                  | ODOM             | VISCOSITY<br>40 C 100 C | VI                        | TAN                         | TBN  | FUEL<br>D664 DIL % | Fe  | Pb | Cu | Sn | Al | Hi | Mn | Si | PPM (PARTS PER MILLION) |    |      | BFLBF |      |      |       |
| 01-20-87              | 49357            | 135.0                   | 15.6                      | 120                         | 4.71 | 4.49               | 0.0 | 59 | 19 | 19 | 3  | 7  | 0  | 0  | 19                      | 27 | 1420 | 200   | 1390 | 1310 | 16229 |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA 01 CM2070                                    |  |       |  | ENGINE TYPE: L-4        |  |                 |  | CHEV S-10     |  |     |  | FT. ORD METHANOL VEHICLE |  |     |  |    |  |    |  |                                                  |  | REVISION DATE: AUG 11, 1980 |  |                           |  |       |  |
|----------------------------------------------------------|--|-------|--|-------------------------|--|-----------------|--|---------------|--|-----|--|--------------------------|--|-----|--|----|--|----|--|--------------------------------------------------|--|-----------------------------|--|---------------------------|--|-------|--|
| DATE                                                     |  | ODOM  |  | VISCOSITY<br>40 C 100 C |  | TBN<br>TAN D664 |  | FUEL<br>OIL % |  | Fe  |  | Pb                       |  | Cu  |  | Sn |  | Al |  | PPM (PARTS PER MILLION)<br>Hf Mn Si B Mg Ca P Zn |  |                             |  | BFLRF<br>CODE             |  |       |  |
| 06-06-85                                                 |  | 569   |  | 51.3 8.9                |  | 1.75 4.94       |  | 1.5           |  | 60  |  | 56                       |  | 108 |  | 22 |  | 1  |  | 14                                               |  | 4                           |  | 332 107 987 130 952 1000  |  | 14264 |  |
| 08-29-85                                                 |  | 2627  |  | 54.1 9.2                |  | 3.85 2.00       |  | 1.7           |  | 90  |  | 123                      |  | 97  |  | 38 |  | 2  |  | 140                                              |  | 7                           |  | 428 62 977 80 926 1069    |  | 14391 |  |
| OIL CHANGE AT 2627 MILES                                 |  |       |  |                         |  |                 |  |               |  |     |  |                          |  |     |  |    |  |    |  |                                                  |  |                             |  |                           |  |       |  |
| 10-30-85                                                 |  | 3782  |  | 71.0 10.0               |  | 2.08 3.26       |  | 2.0           |  | 22  |  | 29                       |  | 23  |  | 10 |  | 1  |  | 3                                                |  | 1                           |  | 68 60 409 1360 1005 1169  |  | 14709 |  |
| 01-06-86                                                 |  | 4775  |  | 81.0 11.4               |  | 3.84 3.53       |  | 2.1           |  | 45  |  | 81                       |  | 34  |  | 20 |  | 3  |  | 5                                                |  | 2                           |  | 103 58 596 1378 1230 1395 |  | 14844 |  |
| OIL CHANGE AT 4775 MILES                                 |  |       |  |                         |  |                 |  |               |  |     |  |                          |  |     |  |    |  |    |  |                                                  |  |                             |  |                           |  |       |  |
| 02-19-86                                                 |  | 5390  |  | 78.3 11.1               |  | 2.02 4.48       |  | 2.2           |  | 12  |  | 19                       |  | 86  |  | 4  |  | 0  |  | 1                                                |  | 1                           |  | 26 113 916 160 945 1041   |  | 14900 |  |
| CONVERTED TO METHANOL AT 5390 MILES and 8 of A Oil Added |  |       |  |                         |  |                 |  |               |  |     |  |                          |  |     |  |    |  |    |  |                                                  |  |                             |  |                           |  |       |  |
| New Unused 8 of A Oil                                    |  |       |  |                         |  |                 |  |               |  |     |  |                          |  |     |  |    |  |    |  |                                                  |  |                             |  |                           |  |       |  |
|                                                          |  | 137.4 |  | 14.4 103                |  | 3.01 10.61      |  |               |  | 1   |  | 1                        |  | 1   |  | 1  |  | 1  |  | 1                                                |  | 1                           |  | 20 282 1903 6 1345 1263   |  | 14740 |  |
| 05-01-86                                                 |  | 6535  |  | 122.6 13.5              |  | 2.93 4.96       |  | .5            |  | 103 |  | 148                      |  | 39  |  | 27 |  | 3  |  | 0                                                |  | 3                           |  | 8 38 1640 81 1371 1332    |  | 15130 |  |
| 07-18-86                                                 |  | 7674  |  | 133.5 19.7              |  | 3.59 5.33       |  | 0.0           |  | 241 |  | 149                      |  | 46  |  | 39 |  | 12 |  | 19                                               |  | 0                           |  | 50 6 1160 60 1230 1170    |  | 15310 |  |
| 09-19-86                                                 |  | 8798  |  | 136.4 14.7              |  | 7.85 5.16       |  | 0.0           |  | 289 |  | 195                      |  | 51  |  | 48 |  | 13 |  | 23                                               |  | 0                           |  | 51 4 1450 100 1120 1430   |  | 15426 |  |
| 12-03-86                                                 |  | 10000 |  | 144.5 14.0              |  | 7.07 4.83       |  | 0.0           |  | 381 |  | 309                      |  | 49  |  | 35 |  | 17 |  | 31                                               |  | 0                           |  | 55 2 1030 80 1290 1320    |  | 15689 |  |
| OIL CHANGE AT 10000 MILES                                |  |       |  |                         |  |                 |  |               |  |     |  |                          |  |     |  |    |  |    |  |                                                  |  |                             |  |                           |  |       |  |
| 02-17-87                                                 |  | 11130 |  | 125.4 13.9              |  | 5.61 6.62       |  | 0.0           |  | 124 |  | 03                       |  | 38  |  | 21 |  | 2  |  | 12                                               |  | 0                           |  | 36 14 1400 60 1340 1090   |  | 15862 |  |
| 04-20-87                                                 |  | 12153 |  | 126.0 17.0              |  | 7.18 3.70       |  | 0.0           |  | 163 |  | 108                      |  | 38  |  | 18 |  | 9  |  | 15                                               |  | 0                           |  | 39 2 1378 60 1510 1140    |  | 16034 |  |
| 06-15-87                                                 |  | 13505 |  | 135.5 14.1              |  | 6.06 3.70       |  | 0.0           |  | 177 |  | 126                      |  | 52  |  | 16 |  | 13 |  | 14                                               |  | 0                           |  | 30 15 1340 1240 1200 1260 |  | 16219 |  |
| OIL CHANGE AT 13505 MILES                                |  |       |  |                         |  |                 |  |               |  |     |  |                          |  |     |  |    |  |    |  |                                                  |  |                             |  |                           |  |       |  |
| 08-30-87                                                 |  | 14088 |  | 126.6 13.7              |  | 5.95 6.28       |  | 0.0           |  | 83  |  | 63                       |  | 28  |  | 14 |  | 5  |  | 0                                                |  | 0                           |  | 20 11 1450 20 1230 1060   |  | 16667 |  |
| 10-14-87                                                 |  | 15449 |  | 135.9 15.4              |  | 6.96 5.27       |  | 0.0           |  | 94  |  | 79                       |  | 31  |  | 23 |  | 6  |  | 10                                               |  | 0                           |  | 23 3 1760 30 1350 1190    |  | 16801 |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA 01 CM2879                                    |       |          |     | ENGINE TYPE: L-4        |       |    |    | CHIEV S-10 |    |    |    | FT. ORD METHANOL VEHICLE |    |       |    |    |   |    |      |       |       | REVISION DATE: AUG 11, 1988 |      |       |      |     |     |     |    |    |    |     |    |     |     |      |      |      |      |       |
|----------------------------------------------------------|-------|----------|-----|-------------------------|-------|----|----|------------|----|----|----|--------------------------|----|-------|----|----|---|----|------|-------|-------|-----------------------------|------|-------|------|-----|-----|-----|----|----|----|-----|----|-----|-----|------|------|------|------|-------|
| VISCOSITY                                                |       | TBM FUEL |     | PPM (PARTS PER MILLION) |       |    |    |            |    |    |    |                          |    | BFLRF |    |    |   |    |      |       |       |                             |      |       |      |     |     |     |    |    |    |     |    |     |     |      |      |      |      |       |
| 40 C                                                     | 100 C | VI       | TAN | D664                    | DIL % | Fe | Pb | Cu         | Sn | Al | Ni | Mn                       | Si | B     | Mg | Ca | P | Zn | CODE |       |       |                             |      |       |      |     |     |     |    |    |    |     |    |     |     |      |      |      |      |       |
| DATE                                                     |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      | ODOM  |       |                             |      |       |      |     |     |     |    |    |    |     |    |     |     |      |      |      |      |       |
| 06-05-85                                                 |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      | 360   | 45.9  | 0.3                         | 156  | 1.02  | 4.25 | 2.6 | 41  | 50  | 12 | 16 | 1  | 10  | 4  | 239 | 0   | 56   | 1116 | 966  | 1099 | 14269 |
| 08-30-85                                                 |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      | 2135  | 46.7  | 0.0                         | 144  | 2.33  | 1.60 | 1.4 | 80  | 163 | 22 | 33 | 1  | 120 | 7  | 350 | 4   | 63   | 1438 | 1031 | 1134 | 14592 |
| OIL CHANGE AT 2135 MILES                                 |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      |       |       |                             |      |       |      |     |     |     |    |    |    |     |    |     |     |      |      |      |      |       |
| 12-05-85                                                 |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      | 3663  | 79.0  | 11.3                        | 132  | 1.90  | 4.44 | 1.7 | 7   | 26  | 02 | 3  | <1 | <1  | <1 | 22  | 112 | 037  | 201  | 062  | 990  | 14605 |
| OIL CHANGE AT 3665 MILES                                 |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      |       |       |                             |      |       |      |     |     |     |    |    |    |     |    |     |     |      |      |      |      |       |
| 02-28-86                                                 |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      | 4810  | 80.2  | 11.0                        | 126  | 3.39  | 2.52 | 1.6 | 13  | 45  | 07 | 0  | <1 | 2   | <1 | 29  | 97  | 962  | 40   | 097  | 900  | 14909 |
| 03-07-86                                                 |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      | 4908  | 79.0  | 10.9                        | 126  | 2.99  | 1.90 | 1.8 | 12  | 47  | 07 | 7  | <1 | 1   | <1 | 27  | 09  | 962  | 49   | 045  | 956  | 14957 |
| CONVERTED TO METHANOL AT 4908 MILES and 8 of A Oil Added |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      |       |       |                             |      |       |      |     |     |     |    |    |    |     |    |     |     |      |      |      |      |       |
| New Unused B of A Oil                                    |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      | 137.4 | 14.4  | 103                         | 3.01 | 10.61 |      | 1   | <1  | <1  | 1  | <1 | <1 | <1  | <1 | 20  | 202 | 1903 | 6    | 1345 | 1263 | 14740 |
| 05-27-86                                                 |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      | 5544  | 117.8 | 10.5                        | 100  | 3.42  | 7.57 | .5  | 76  | 214 | 41 | 35 | 7  | 13  | 0  | 33  | 46  | 1520 | 00   | 1250 | 1110 | 15162 |
| 10-10-86                                                 |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      | 7223  | 129.4 | 15.0                        | 129  | 4.94  | 4.71 | 0.0 | 90  | 202 | 57 | 47 | 11 | 32  | 0  | 39  | 1   | 1050 | 140  | 900  | 1200 | 15509 |
| 12-05-86                                                 |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      | 9070  | 130.9 | 16.3                        | 125  | 7.01  | 3.93 | 0.0 | 170 | 376 | 61 | 55 | 15 | 37  | 0  | 44  | 1   | 1150 | 150  | 1240 | 1250 | 15650 |
| OIL CHANGE AT 9070 MILES                                 |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      |       |       |                             |      |       |      |     |     |     |    |    |    |     |    |     |     |      |      |      |      |       |
| 03-02-87                                                 |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      | 11511 | 134.9 | 13.4                        | 93   | 4.60  | 5.39 | 0.0 | 91  | 133 | 53 | 31 | 6  | 16  | 0  | 34  | 3   | 1740 | 50   | 1510 | 1200 | 15096 |
| 04-13-87                                                 |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      | 12097 | 135.1 | 15.0                        | 113  | 6.05  | 4.15 | 0.0 | 101 | 161 | 50 | 30 | 7  | 19  | 0  | 27  | 1   | 1410 | 50   | 1200 | 1320 | 16010 |
| OIL CHANGE AT 12090 MILES                                |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      |       |       |                             |      |       |      |     |     |     |    |    |    |     |    |     |     |      |      |      |      |       |
| OIL CHANGE AT 14139 MILES                                |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      |       |       |                             |      |       |      |     |     |     |    |    |    |     |    |     |     |      |      |      |      |       |
| 06-15-87                                                 |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      | 14141 | 133.3 | 14.2                        | 105  | 5.44  | 7.63 | 0.0 | 41  | 43  | 33 | 9  | 3  | 6   | 0  | 20  | 14  | 1690 | 20   | 1240 | 1200 | 16220 |
| 03-29-88                                                 |       |          |     |                         |       |    |    |            |    |    |    |                          |    |       |    |    |   |    |      | 17203 | 121.0 | 13.0                        | 112  | 7.07  | 4.03 | 0.0 | 163 | 172 | 0  | 64 | 0  | 19  | 0  | 30  | 1   | 1340 | 40   | 1290 | 1370 | 17506 |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA 01 CM2000                                    |       |          |      | ENGINE TYPE: V-6        |       |       |     | CHEV S-10 |     |    |    | FT. ORD METHANOL VEHICLE |     |       |     |     |      |      |      |      |  | REVISION DATE: AUG 11, 1980 |  |  |  |
|----------------------------------------------------------|-------|----------|------|-------------------------|-------|-------|-----|-----------|-----|----|----|--------------------------|-----|-------|-----|-----|------|------|------|------|--|-----------------------------|--|--|--|
| VISCOSITY                                                |       | TBH FUEL |      | PPM (PARTS PER MILLION) |       |       |     |           |     |    |    |                          |     | BFLNF |     |     |      |      |      |      |  |                             |  |  |  |
| 40 C                                                     | 100 C | VI       | TAN  | D664                    | OIL X | Fe    | Pb  | Cu        | Sn  | Al | Mi | Mn                       | Si  | S     | Mg  | Ca  | P    | Zn   | CODE |      |  |                             |  |  |  |
| DATE                                                     | OOM   |          |      |                         |       |       |     |           |     |    |    |                          |     |       |     |     |      |      |      |      |  |                             |  |  |  |
| 05-15-85                                                 | 20    | 44.0     | 0.5  | 175                     | 2.15  | 3.25  | 3.1 | 55        | <1  | 13 | 13 | 2                        | <1  | 3     | 400 | <1  | 7    | 1179 | 824  | 909  |  |                             |  |  |  |
| 08-28-85                                                 | 3080  | 48.3     | 0.3  | 145                     | 2.58  | .70   | 1.1 | 169       | 153 | 23 | 51 | 17                       | 300 | 10    | 860 | <1  | 13   | 1470 | 1143 | 1216 |  |                             |  |  |  |
| OIL CHANGE AT 3000 MILES                                 |       |          |      |                         |       |       |     |           |     |    |    |                          |     |       |     |     |      |      |      |      |  |                             |  |  |  |
| 10-02-85                                                 | 4202  | 87.3     | 12.3 | 133                     | 2.93  | 3.59  | .7  | 10        | 21  | 7  | 6  | 1                        | 12  | 1     | 63  | 69  | 567  | 1620 | 1300 | 1495 |  |                             |  |  |  |
| 12-06-85                                                 | 5515  | 85.4     | 11.0 | 130                     | 3.14  | 2.92  | 1.3 | 40        | 31  | 9  | 11 | 5                        | 6   | 1     | 142 | 43  | 400  | 1540 | 1177 | 1359 |  |                             |  |  |  |
| OIL CHANGE AT 5515 MILES                                 |       |          |      |                         |       |       |     |           |     |    |    |                          |     |       |     |     |      |      |      |      |  |                             |  |  |  |
| 01-08-86                                                 | 6622  | 89.0     | 11.9 | 126                     | 3.19  | 3.10  | 1.2 | 22        | 12  | 84 | 7  | 4                        | 1   | 1     | 46  | 89  | 931  | 203  | 930  | 1090 |  |                             |  |  |  |
| CONVERTED TO METHANOL AT 6622 MILES and B of A Oil Added |       |          |      |                         |       |       |     |           |     |    |    |                          |     |       |     |     |      |      |      |      |  |                             |  |  |  |
| New Unused B of A Oil                                    |       | 137.4    | 14.4 | 103                     | 3.01  | 10.61 |     | 1         | <1  | <1 | <1 | 1                        | <1  | <1    | 20  | 202 | 1903 | 6    | 1345 | 1263 |  |                             |  |  |  |
| 03-20-86                                                 | 8129  | 124.1    | 13.2 | 100                     | 3.22  | 2.75  | 1.0 | 65        | 51  | 23 | 14 | 7                        | 5   | 1     | 37  | 30  | 1464 | 140  | 1130 | 1161 |  |                             |  |  |  |
| 07-03-86                                                 | 11152 | 149.5    | 19.0 | 153                     | 4.82  | 4.50  | 0.0 | 151       | 375 | 33 | 55 | 17                       | 9   | 0     | 45  | 1   | 1120 | 520  | 1300 | 1150 |  |                             |  |  |  |
| 08-28-86                                                 | 12503 | 134.0    | 14.0 | 101                     | 5.09  | 3.81  | 0.0 | 246       | 322 | 37 | 56 | 20                       | 10  | 0     | 49  | 1   | 1310 | 550  | 1090 | 1540 |  |                             |  |  |  |
| 10-01-86                                                 | 13529 | 115.5    | 13.2 | 109                     | 5.67  | 4.04  | 0.0 | 353       | 333 | 42 | 57 | 20                       | 12  | 0     | 55  | 4   | 1390 | 650  | 1370 | 1600 |  |                             |  |  |  |
| OIL CHANGE AT 13530 MILES                                |       |          |      |                         |       |       |     |           |     |    |    |                          |     |       |     |     |      |      |      |      |  |                             |  |  |  |
| 11-21-86                                                 | 15226 | 136.5    | 14.0 | 109                     | 4.60  | 6.40  | 0.0 | 70        | 82  | 19 | 11 | 11                       | 2   | 0     | 14  | 3   | 1690 | 90   | 1110 | 1150 |  |                             |  |  |  |
| 12-02-86                                                 | 15409 | 129.3    | 12.9 | 92                      | 2.36  | 8.42  | 0.0 | 74        | 96  | 16 | 0  | 10                       | 1   | 0     | 16  | 2   | 1670 | 010  | 1240 | 1360 |  |                             |  |  |  |
| 01-15-87                                                 | 16500 | 133.0    | 15.4 | 119                     | 4.15  | 8.87  | 0.0 | 70        | 125 | 45 | 27 | 4                        | 11  | 0     | 23  | 36  | 1620 | 50   | 1540 | 1130 |  |                             |  |  |  |
| OIL CHANGE AT 16509 MILES                                |       |          |      |                         |       |       |     |           |     |    |    |                          |     |       |     |     |      |      |      |      |  |                             |  |  |  |
| 03-06-87                                                 | 17630 | 121.0    | 12.7 | 97                      | 2.58  | 6.73  | 0.0 | 57        | 30  | 10 | 3  | 5                        | 0   | 0     | 14  | 5   | 1360 | 330  | 1230 | 1190 |  |                             |  |  |  |
| 04-17-87                                                 | 18682 | 110.1    | 13.5 | 111                     | 2.86  | 3.37  | 0.0 | 112       | 23  | 14 | 6  | 9                        | 1   | 0     | 13  | 1   | 1040 | 100  | 1570 | 1170 |  |                             |  |  |  |
| 05-05-87                                                 | 19734 | 136.4    | 14.7 | 100                     | 3.37  | 3.59  | 0.0 | 143       | 23  | 14 | 5  | 11                       | 3   | 0     | 20  | 0   | 1070 | 60   | 1250 | 1100 |  |                             |  |  |  |
| OIL CHANGE AT 19735 MILES                                |       |          |      |                         |       |       |     |           |     |    |    |                          |     |       |     |     |      |      |      |      |  |                             |  |  |  |
| 05-08-87                                                 | 20917 | 120.4    | 13.6 | 101                     | 4.15  | 7.07  | 0.0 | 67        | 14  | 9  | 7  | 7                        | 1   | 0     | 12  | 0   | 1060 | 20   | 1310 | 1140 |  |                             |  |  |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM -- PHASE I & II

VEHICLE USA #: CM2000 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1980

| DATE                      | ODOM  | VISCOSITY<br>40 C 100 C | VI   | TAN  | TBN  | FUEL<br>D664 DIL % | Fe  | Pb | Cu | Sn | Al | Ni | Mn | Si | Mo | Cd   | P  | Zn   | BFLRF<br>CODE |       |
|---------------------------|-------|-------------------------|------|------|------|--------------------|-----|----|----|----|----|----|----|----|----|------|----|------|---------------|-------|
| OIL CHANGE AT 20917 MILES |       |                         |      |      |      |                    |     |    |    |    |    |    |    |    |    |      |    |      |               |       |
| 07-17-87                  | 21938 | 120.4                   | 15.7 | 4.04 | 7.86 | 0.0                | 67  | 12 | 9  | 0  | 6  | 1  | 0  | 12 | 0  | 1560 | 20 | 1020 | 1110          | 16452 |
| 09-08-87                  | 23275 | 156.1                   | 14.1 | 3.70 | 5.50 | 0.0                | 227 | 10 | 11 | 5  | 9  | 3  | 0  | 17 | 22 | 1290 | 30 | 1220 | 1050          | 16673 |
| 10-16-87                  | 23680 | 130.1                   | 14.4 | 4.94 | 4.49 | 0.0                | 322 | 24 | 17 | 7  | 13 | 5  | 0  | 29 | 3  | 1560 | 30 | 1390 | 1260          | 16009 |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA 01 CM2001                                    |       |       |      | ENGINE TYPE: V-6        |       |       |     | CHEV S-10 |     |    |    | FT. ORD METHANOL VEHICLE |     |    |     | REVISION DATE: AUG 11, 1988 |      |      |       |       |       |
|----------------------------------------------------------|-------|-------|------|-------------------------|-------|-------|-----|-----------|-----|----|----|--------------------------|-----|----|-----|-----------------------------|------|------|-------|-------|-------|
| VISCOSITY                                                |       | FUEL  |      | PPH (PARTS PER MILLION) |       |       |     |           |     |    |    |                          |     |    |     | BFLRF                       |      |      |       |       |       |
| 40 C                                                     | 100 C | VI    | TAM  | D664                    | OIL % | Fe    | Pb  | Cu        | Sn  | Al | Mn | Si                       | Mo  | Ca | P   | Zn                          | CODE |      |       |       |       |
| DATE                                                     | ODOM  |       |      |                         |       |       |     |           |     |    |    |                          |     |    |     |                             |      |      |       |       |       |
| 05-15-85                                                 | 61    | 47.1  | 8.9  | 168                     | 2.00  | 2.59  | 2.2 | 60        | 38  | 17 | 11 | 2                        | 36  | 4  | 466 | 6                           | 907  | 1012 | 14100 |       |       |
| 08-24-85                                                 | 2932  | 49.4  | 8.6  | 152                     | 2.22  | 1.57  | 1.2 | 102       | 120 | 26 | 38 | 8                        | 340 | 12 | 980 | 15                          | 1390 | 1121 | 14501 |       |       |
| OIL CHANGE AT 2932 MILES                                 |       |       |      |                         |       |       |     |           |     |    |    |                          |     |    |     |                             |      |      |       |       |       |
| 10-02-85                                                 | 3070  | 04.2  | 11.8 | 132                     | 2.70  | 4.49  | .9  | 53        | 25  | 19 | 6  | 3                        | 9   | 1  | 110 | 70                          | 524  | 1600 | 14643 |       |       |
| 10-21-85                                                 | 4045  | 72.2  | 10.8 | 138                     | 2.21  | 3.91  | 2.0 | 30        | 23  | 7  | 11 | 2                        | 30  | 1  | 162 | 66                          | 460  | 1550 | 14700 |       |       |
| 01-07-86                                                 | 4743  | 74.2  | 10.7 | 124                     | 3.51  | 3.45  | 2.0 | 44        | 35  | 8  | 14 | 5                        | 7   | 2  | 212 | 50                          | 490  | 1520 | 14846 |       |       |
| CONVERTED TO METHANOL AT 4743 MILES and B of A Oil Added |       |       |      |                         |       |       |     |           |     |    |    |                          |     |    |     |                             |      |      |       |       |       |
| New Unused B of A Oil                                    |       |       |      |                         |       |       |     |           |     |    |    |                          |     |    |     |                             |      |      |       |       |       |
|                                                          |       | 137.4 | 14.4 | 103                     | 3.01  | 10.51 |     | 1         | 41  | 41 | 1  | 41                       | 41  | 20 | 202 | 1903                        | 6    | 1345 | 1263  | 14740 |       |
| 03-20-86                                                 | 5202  | 120.6 | 13.0 | 101                     | 2.31  | 6.53  | .3  | 47        | 24  | 21 | 11 | 3                        | 4   | 1  | 44  | 75                          | 1196 | 143  | 1004  | 1131  | 14970 |
| 04-24-86                                                 | 6067  | 130.3 | 13.6 | 99                      | 3.10  | 4.65  | 0.0 | 61        | 31  | 19 | 8  | 3                        | 2   | 2  | 40  | 50                          | 1414 | 760  | 1195  | 1170  | 15060 |
| 07-10-86                                                 | 7163  | 130.1 | 13.9 | 103                     | 5.20  | 4.70  | 0.0 | 96        | 79  | 24 | 21 | 12                       | 4   | 0  | 50  | 3                           | 1150 | 120  | 1150  | 1120  | 15290 |
| 09-24-86                                                 | 8100  | 126.6 | 14.0 | 100                     | 5.61  | 3.82  | 0.0 | 147       | 135 | 31 | 30 | 15                       | 5   | 0  | 66  | 2                           | 1370 | 350  | 1350  | 1400  | 15464 |
| OIL CHANGE AT 8100 MILES                                 |       |       |      |                         |       |       |     |           |     |    |    |                          |     |    |     |                             |      |      |       |       |       |
| 12-04-86                                                 | 9209  | 91.5  | 10.9 | 104                     | 3.65  | 6.06  | 0.0 | 74        | 45  | 15 | 15 | 10                       | 2   | 0  | 30  | 6                           | 1270 | 250  | 1320  | 1140  | 15657 |
| 02-24-87                                                 | 10460 | 76.5  | 10.1 | 114                     | 3.40  | 2.92  | 0.0 | 302       | 100 | 12 | 13 | 11                       | 5   | 0  | 32  | 0                           | 390  | 20   | 1920  | 890   | 15905 |
| 03-02-87                                                 | 10506 | 84.6  | 10.5 | 107                     | 3.70  | 2.81  | 0.0 | 393       | 136 | 15 | 17 | 14                       | 7   | 0  | 46  | 0                           | 690  | 50   | 1100  | 1050  | 15906 |
| 04-17-87                                                 | 11466 | 94.1  | 11.7 | 114                     | 3.87  | 1.80  | 0.0 | 460       | 155 | 24 | 21 | 18                       | 7   | 0  | 47  | 0                           | 370  | 30   | 1260  | 1040  | 16031 |
| OIL CHANGE AT 11467 MILES                                |       |       |      |                         |       |       |     |           |     |    |    |                          |     |    |     |                             |      |      |       |       |       |
| 07-07-87                                                 | 12626 | 120.3 | 14.1 | 100                     | 4.94  | 6.20  | 0.0 | 120       | 79  | 24 | 8  | 9                        | 3   | 0  | 18  | 4                           | 1590 | 40   | 1310  | 1210  | 16420 |
| OIL CHANGE AT 12627 MILES                                |       |       |      |                         |       |       |     |           |     |    |    |                          |     |    |     |                             |      |      |       |       |       |
| 08-25-87                                                 | 13934 | 140.3 | 15.2 | 103                     | 4.04  | 8.42  | 0.0 | 74        | 44  | 14 | 11 | 8                        | 2   | 0  | 19  | 16                          | 2110 | 30   | 1260  | 1200  | 16574 |
| 10-16-87                                                 | 14080 | 161.0 | 15.9 | 101                     | 5.78  | 6.62  | 0.0 | 133       | 50  | 26 | 12 | 16                       | 2   | 0  | 30  | 11                          | 1760 | 40   | 1240  | 1090  | 16706 |
| OIL CHANGE AT 16039 MILES                                |       |       |      |                         |       |       |     |           |     |    |    |                          |     |    |     |                             |      |      |       |       |       |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2802 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1980

| DATE                                                     | ODOM  | VISCOSITY |       | TBN  |       | FUEL | PPM (PARTS PER MILLION) |       |     |    |    |    |     |    |     |     |      |      | BFLRF CODE |      |       |
|----------------------------------------------------------|-------|-----------|-------|------|-------|------|-------------------------|-------|-----|----|----|----|-----|----|-----|-----|------|------|------------|------|-------|
|                                                          |       | 40 C      | 100 C | VI   | TAH   |      | D664                    | DIL % | Fe  | Pb | Cu | Sn | Al  | Ni | Mn  | Si  | S    | Mg   |            | Ca   | P     |
| 05-15-85                                                 | 30    | 47.7      | 8.9   | 168  | 2.13  | 4.26 | 2.4                     | 48    | 27  | 16 | 14 | 2  | 26  | 5  | 396 | 11  | 9    | 954  | 837        | 992  | 14204 |
| 08-28-85                                                 | 3067  | 53.9      | 8.4   | 130  | 2.57  | 2.11 | 1.2                     | 136   | 107 | 22 | 37 | 6  | 250 | 11 | 730 | 11  | 403  | 1190 | 1174       | 1257 | 14500 |
| OIL CHANGE AT 3068 MILES                                 |       |           |       |      |       |      |                         |       |     |    |    |    |     |    |     |     |      |      |            |      |       |
| 10-15-85                                                 | 4245  | 79.0      | 11.4  | 134  | 2.29  | 3.41 | 1.4                     | 27    | 24  | 9  | 10 | 2  | 9   | 2  | 124 | 60  | 495  | 1460 | 1242       | 1340 | 14701 |
| 12-06-85                                                 | 5544  | 84.2      | 11.6  | 129  | 3.05  | 2.90 | 1.0                     | 40    | 30  | 7  | 11 | 5  | 6   | 2  | 165 | 30  | 501  | 1400 | 1153       | 1356 | 14604 |
| OIL CHANGE AT 5544 MILES                                 |       |           |       |      |       |      |                         |       |     |    |    |    |     |    |     |     |      |      |            |      |       |
| 01-08-86                                                 | 6627  | 85.7      | 11.5  | 125  | 2.80  | 3.11 | 1.2                     | 23    | 16  | 88 | 0  | 3  | 1   | 1  | 54  | 87  | 965  | 243  | 950        | 1001 | 14047 |
| CONVERTED TO METHANOL AT 6627 MILES and B of A Oil Added |       |           |       |      |       |      |                         |       |     |    |    |    |     |    |     |     |      |      |            |      |       |
| New Unused B of A Oil                                    |       |           |       |      |       |      |                         |       |     |    |    |    |     |    |     |     |      |      |            |      |       |
|                                                          | 137.4 | 14.4      | 103   | 3.01 | 10.61 |      |                         | 1     | 1   | 1  | 1  | 1  | 1   | 1  | 20  | 202 | 1903 | 6    | 1345       | 1263 | 14748 |
| 03-26-86                                                 | 8071  | 125.2     | 13.1  | 97   | 1.98  | 3.85 | 0.0                     | 44    | 106 | 17 | 11 | 4  | 2   | 2  | 37  | 13  | 1170 | 310  | 1230       | 1250 | 15015 |
| 07-02-86                                                 | 9987  | 130.4     | 13.5  | 98   | 6.79  | 4.04 | .1                      | 86    | 211 | 21 | 27 | 9  | 5   | 0  | 42  | 3   | 860  | 360  | 1090       | 1130 | 15215 |
| 08-29-86                                                 | 11074 | 127.0     | 13.9  | 107  | 4.62  | 3.53 | 0.0                     | 113   | 232 | 25 | 35 | 12 | 5   | 0  | 50  | 2   | 1070 | 510  | 1130       | 1450 | 15404 |
| OIL CHANGE AT 11094 MILES                                |       |           |       |      |       |      |                         |       |     |    |    |    |     |    |     |     |      |      |            |      |       |
| 10-31-86                                                 | 12275 | 130.7     | 14.3  | 108  | 4.60  | 7.63 | 0.0                     | 35    | 43  | 9  | 9  | 5  | 1   | 0  | 20  | 0   | 1360 | 50   | 980        | 1090 | 15526 |
| 12-12-86                                                 | 13225 | 133.5     | 14.7  | 111  | 4.71  | 5.61 | 0.0                     | 100   | 88  | 15 | 19 | 11 | 3   | 0  | 33  | 4   | 1680 | 90   | 1540       | 1330 | 15702 |
| 02-27-87                                                 | 14449 | 128.0     | 22.2  | 200  | 4.94  | 4.38 | 0.0                     | 133   | 100 | 13 | 11 | 9  | 3   | 0  | 23  | 2   | 1210 | 300  | 1250       | 1200 | 15907 |
| OIL CHANGE AT 14452 MILES                                |       |           |       |      |       |      |                         |       |     |    |    |    |     |    |     |     |      |      |            |      |       |
| 04-28-87                                                 | 15701 | 139.2     | 4.4   | 102  | 3.14  | 7.41 | 0.0                     | 89    | 36  | 12 | 3  | 7  | 1   | 0  | 20  | 6   | 1770 | 80   | 1330       | 1200 | 16069 |
| 07-14-87                                                 | 17269 | 140.4     | 15.5  | 107  | 5.84  | 4.38 | 0.0                     | 215   | 60  | 14 | 10 | 13 | 4   | 0  | 29  | 2   | 1320 | 60   | 1480       | 1170 | 16441 |
| OIL CHANGE AT 17270 MILES                                |       |           |       |      |       |      |                         |       |     |    |    |    |     |    |     |     |      |      |            |      |       |
| 10-04-87                                                 | 18298 | 142.1     | 15.7  | 115  | 4.83  | 7.52 | 0.0                     | 74    | 26  | 11 | 7  | 5  | 1   | 0  | 15  | 14  | 2330 | 50   | 1430       | 1150 | 16752 |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA #: CM2003                                    |       |           |       | ENGINE TYPE: L-4 |      |          |       | CHEV 5-10 |     |    |    | FT. ORD METHANOL VEHICLE |                         |     |    |     |      |      |      |       |            | REVISION DATE: AUG 11, 1988 |  |  |  |
|----------------------------------------------------------|-------|-----------|-------|------------------|------|----------|-------|-----------|-----|----|----|--------------------------|-------------------------|-----|----|-----|------|------|------|-------|------------|-----------------------------|--|--|--|
| DATE                                                     | ODOM  | VISCOSITY |       | VI               | TAN  | TBH FUEL |       | Fe        | Pb  | Cu | Sn | Al                       | PPM (PARTS PER MILLION) |     |    |     |      | Ca   | P    | Zn    | BFLRF CODE |                             |  |  |  |
|                                                          |       | 40 C      | 100 C |                  |      | 0624     | OIL % |           |     |    |    |                          | Si                      | B   | Mg |     |      |      |      |       |            |                             |  |  |  |
| 06-04-85                                                 | 900   | 49.5      | 8.6   | 152              | 1.99 | 5.50     | 1.6   | 44        | 37  | 22 | 17 | 2                        | 10                      | 227 | 15 | 136 | 1375 | 1053 | 907  | 1230  | 14265      |                             |  |  |  |
| 09-12-85                                                 | 3221  | 53.2      | 9.0   | 148              | 2.64 | 3.18     | 1.2   | 49        | 67  | 41 | 18 | 1                        | 20                      | 4   | 31 | 356 | 1195 | 907  | 1077 | 14560 |            |                             |  |  |  |
| OIL CHANGE AT 3221 MILES                                 |       |           |       |                  |      |          |       |           |     |    |    |                          |                         |     |    |     |      |      |      |       |            |                             |  |  |  |
| 09-18-85                                                 | 3763  | 80.9      | 11.6  | 136              | 2.34 | 4.33     | 1.2   | 15        | 9   | 10 | 5  | 1                        | 7                       | 1   | 47 | 93  | 557  | 2000 | 1178 | 1390  | 14625      |                             |  |  |  |
| 11-13-85                                                 | 4712  | 79.0      | 11.2  | 131              | 1.38 | 3.25     | 1.6   | 21        | 34  | 14 | 6  | 1                        | 2                       | 1   | 63 | 68  | 517  | 1570 | 1202 | 1491  | 14727      |                             |  |  |  |
| 12-05-85                                                 | 4904  | 73.9      | 10.8  | 133              | 3.00 | 3.53     | 2.2   | 22        | 44  | 13 | 8  | 3                        | 3                       | 1   | 71 | 50  | 561  | 1450 | 1140 | 1346  | 14000      |                             |  |  |  |
| OIL CHANGE AT 4904 MILES                                 |       |           |       |                  |      |          |       |           |     |    |    |                          |                         |     |    |     |      |      |      |       |            |                             |  |  |  |
| 01-06-86                                                 | 5032  | 79.9      | 11.4  | 133              | 2.08 | 5.90     | 2.0   | 6         | 16  | 92 | 4  | 1                        | 1                       | 1   | 19 | 111 | 890  | 200  | 805  | 903   | 14040      |                             |  |  |  |
| 02-19-86                                                 | 6090  | 83.3      | 11.7  | 132              | 3.28 | 3.25     | 1.6   | 15        | 42  | 83 | 7  | 1                        | 2                       | 1   | 29 | 106 | 937  | 200  | 979  | 1087  | 14910      |                             |  |  |  |
| CONVERTED TO METHANOL AT 6090 MILES and 8 of A Oil Added |       |           |       |                  |      |          |       |           |     |    |    |                          |                         |     |    |     |      |      |      |       |            |                             |  |  |  |
| New Unused 8 of A Oil                                    |       | 137.4     | 14.4  | 103              | 3.01 | 10.61    |       | 1         | 1   | 1  | 1  | 1                        | 1                       | 1   | 20 | 202 | 1903 | 6    | 1345 | 1263  | 14740      |                             |  |  |  |
| 06-11-86                                                 | 7012  | 124.2     | 14.7  | 116              | 5.50 | 6.90     | 0.0   | 53        | 356 | 39 | 47 | 5                        | 6                       | 7   | 29 | 40  | 1360 | 60   | 1220 | 1110  | 15192      |                             |  |  |  |
| 08-22-86                                                 | 8153  | 125.3     | 14.5  | 120              | 8.13 | 5.16     | 0.0   | 79        | 309 | 40 | 43 | 7                        | 9                       | 0   | 31 | 5   | 1270 | 70   | 1080 | 1250  | 15397      |                             |  |  |  |
| 10-21-86                                                 | 9200  | 130.1     | 13.7  | 101              | 5.27 | 6.17     | 0.0   | 108       | 360 | 53 | 50 | 9                        | 16                      | 0   | 36 | 2   | 1090 | 650  | 910  | 1500  | 15512      |                             |  |  |  |
| 12-16-86                                                 | 10313 | 133.5     | 14.1  | 103              | 6.12 | 4.60     | 0.0   | 143       | 381 | 50 | 46 | 11                       | 16                      | 0   | 38 | 2   | 1200 | 630  | 1290 | 1310  | 15705      |                             |  |  |  |
| OIL CHANGE AT 10313 MILES                                |       |           |       |                  |      |          |       |           |     |    |    |                          |                         |     |    |     |      |      |      |       |            |                             |  |  |  |
| 06-29-87                                                 | 12700 | 133.6     | 15.4  | 119              | 7.52 | 5.16     | 0.0   | 129       | 149 | 41 | 20 | 10                       | 12                      | 0   | 28 | 2   | 1670 | 80   | 1330 | 1200  | 16427      |                             |  |  |  |
| 10-11-87                                                 | 13796 | 132.0     | 14.2  | 105              | 5.27 | 7.63     | 0.0   | 164       | 61  | 30 | 14 | 12                       | 9                       | 0   | 37 | 30  | 1950 | 60   | 1390 | 1070  | 16753      |                             |  |  |  |
| 04-06-88                                                 | 14752 | 136.0     | 13.4  | 92               | 7.29 | 5.50     | 0.0   | 465       | 168 | 46 | 29 | 22                       | 21                      | 0   | 65 | 4   | 1470 | 60   | 1150 | 1200  | 17507      |                             |  |  |  |

REVISION DATE: AUG 11, 1988

| DATE                     | ODOM  | VISCOSITY |       | TBM FUEL |      | PPM (PARTS PER MILLION) |       |     |     |    |    |    |     |    |     | BFLRF CODE |      |      |      |      |       |
|--------------------------|-------|-----------|-------|----------|------|-------------------------|-------|-----|-----|----|----|----|-----|----|-----|------------|------|------|------|------|-------|
|                          |       | 40 C      | 100 C | VI       | TAM  | D664                    | OIL % | Fe  | Pb  | Cu | Sn | Al | Mi  | Mn | Si  | B          | Mg   | Ca   | P    | Zn   |       |
| 05-15-85                 | 460   | 35.4      | 7.0   | 200      | 1.39 | 5.95                    | 4.9   | 111 | 89  | 20 | 24 | 10 | 62  | 9  | 761 | 1          | 29   | 2276 | 976  | 1126 | 14189 |
| 08-29-85                 | 2588  | 50.6      | 9.4   | 173      | 3.19 | 1.99                    | 1.1   | 188 | 186 | 25 | 42 | 17 | 340 | 13 | 970 | <1         | 20   | 2378 | 1865 | 1144 | 14580 |
| OIL CHANGE AT 2589 MILES |       |           |       |          |      |                         |       |     |     |    |    |    |     |    |     |            |      |      |      |      |       |
| 12-14-85                 | 4640  | 81.6      | 11.4  | 130      | 4.41 | 2.75                    | 2.4   | 61  | 95  | 11 | 17 | 8  | 5   | 3  | 185 | 33         | 479  | 1790 | 1275 | 1420 | 14949 |
| OIL CHANGE AT 4641 MILES |       |           |       |          |      |                         |       |     |     |    |    |    |     |    |     |            |      |      |      |      |       |
| 01-31-86                 | 5928  | 88.8      | 12.0  | 128      | 3.20 | 1.41                    | 1.3   | 33  | 47  | 88 | 6  | 4  | 3   | <1 | 43  | 75         | 1084 | 234  | 948  | 1090 | 14874 |
| OIL CHANGE AT 6648 MILES |       |           |       |          |      |                         |       |     |     |    |    |    |     |    |     |            |      |      |      |      |       |
| 03-24-86                 | 6547  | 85.6      | 11.7  | 128      | 3.51 | 2.35                    | 2.4   | 53  | 74  | 86 | 7  | 6  | 12  | 1  | 48  | 40         | 956  | 218  | 885  | 1027 | 15832 |
| OIL CHANGE AT 9487 MILES |       |           |       |          |      |                         |       |     |     |    |    |    |     |    |     |            |      |      |      |      |       |
| 10-06-86                 | 6673  | 112.9     | 12.6  | 104      | 2.64 | 9.76                    | <.5   | 26  | 15  | 8  | 5  | 3  | 0   | 0  | 14  | 176        | 1830 | 30   | 1310 | 1328 | 15470 |
| 12-11-86                 | 7659  | 117.5     | 13.4  | 110      | 3.37 | 7.63                    | 0.0   | 52  | 31  | 13 | 7  | 7  | 0   | 0  | 16  | 137        | 1610 | 40   | 1330 | 1160 | 15694 |
| 03-05-87                 | 8256  | 122.7     | 13.1  | 100      | 4.15 | 6.40                    | 0.0   | 65  | 35  | 11 | 5  | 6  | 0   | 0  | 21  | 110        | 1670 | 20   | 1220 | 1118 | 15989 |
| 06-08-87                 | 9486  | 116.6     | 13.9  | 118      | 5.67 | 4.60                    | 0.0   | 90  | 61  | 12 | 7  | 9  | 0   | 0  | 22  | 41         | 1530 | 190  | 1280 | 1198 | 16218 |
| OIL CHANGE AT 9487 MILES |       |           |       |          |      |                         |       |     |     |    |    |    |     |    |     |            |      |      |      |      |       |
| 08-06-87                 | 10776 | 136.6     | 13.8  | 97       | 4.26 | 7.18                    | 0.0   | 35  | 37  | 7  | 0  | 7  | 0   | 0  | 14  | 114        | 1730 | 40   | 1330 | 1280 | 16529 |
| 09-04-87                 | 12010 | 152.6     | 15.9  | 108      | 4.49 | 5.27                    | 0.0   | 59  | 72  | 8  | 7  | 8  | 0   | 0  | 16  | 79         | 1730 | 30   | 1310 | 1250 | 16668 |
| 01-22-88                 | 15595 | 159.6     | 16.3  | 107      | 7.63 | 3.14                    | 0.0   | 141 | 163 | 13 | 14 | 13 | 0   | 0  | 21  | 34         | 1640 | 60   | 1280 | 1328 | 17588 |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA #: CM2005     |  |           |       | ENGINE TYPE: V-6 |     |      |       | CHEV S-10 |     |    |    | FT. ORD BASELINE VEHICLE |    |     |    |     |     |                         |      |      |      | REVISION DATE: AUG 11, 1980 |    |  |  |  |  |            |  |
|---------------------------|--|-----------|-------|------------------|-----|------|-------|-----------|-----|----|----|--------------------------|----|-----|----|-----|-----|-------------------------|------|------|------|-----------------------------|----|--|--|--|--|------------|--|
| DATE                      |  | VISCOSITY |       | TBN              |     | FUEL |       | Fe        |     | Pb |    | Cu                       |    | Sn  |    | Al  |     | PPM (PARTS PER MILLION) |      |      |      |                             |    |  |  |  |  | BFLRF CODE |  |
|                           |  | 40 C      | 100 C | VI               | TAN | D664 | OIL % |           |     |    |    |                          |    |     |    |     |     | Si                      | B    | Mg   | Ca   | P                           | Zn |  |  |  |  |            |  |
| 05-15-85                  |  | 158       | 40.6  | 8.7              | 159 | 2.20 | 5.50  | 2.2       | 56  | 28 | 23 | 16                       | 2  | 29  | 4  | 379 | <1  | 13                      | 1350 | 945  | 1101 | 14190                       |    |  |  |  |  |            |  |
| 08-29-85                  |  | 2428      | 51.5  | 8.5              | 141 | 2.84 | 1.96  | 1.8       | 139 | 92 | 34 | 37                       | 6  | 210 | 7  | 610 | <1  | 20                      | 1640 | 1169 | 1256 | 14502                       |    |  |  |  |  |            |  |
| OIL CHANGE AT 2428 MILES  |  |           |       |                  |     |      |       |           |     |    |    |                          |    |     |    |     |     |                         |      |      |      |                             |    |  |  |  |  |            |  |
| 10-21-85                  |  | 3664      | 78.5  | 11.4             | 136 | 2.56 | 3.84  | 1.4       | 34  | 22 | 12 | 11                       | 2  | 9   | 1  | 120 | 50  | 436                     | 1570 | 1220 | 1353 | 14702                       |    |  |  |  |  |            |  |
| 12-16-85                  |  | 4793      | 77.2  | 11.1             | 133 | 3.38 | 2.75  | 1.6       | 52  | 35 | 14 | 15                       | 7  | 8   | 1  | 158 | 32  | 462                     | 1490 | 1200 | 1474 | 14014                       |    |  |  |  |  |            |  |
| OIL CHANGE AT 4793 MILES  |  |           |       |                  |     |      |       |           |     |    |    |                          |    |     |    |     |     |                         |      |      |      |                             |    |  |  |  |  |            |  |
| 02-14-86                  |  | 6203      | 84.5  | 11.5             | 126 | 3.45 | 2.71  | 1.4       | 23  | 13 | 73 | 6                        | 2  | 2   | <1 | 52  | 64  | 873                     | 200  | 944  | 1054 | 14911                       |    |  |  |  |  |            |  |
| 05-05-86                  |  | 7435      | 83.1  | 11.5             | 130 | 3.86 | 2.14  | 0.0       | 74  | 44 | 82 | 13                       | 6  | <1  | 1  | <1  | 20  | 923                     | 349  | 1037 | 1160 | 15132                       |    |  |  |  |  |            |  |
| OIL CHANGE AT 7435 MILES  |  |           |       |                  |     |      |       |           |     |    |    |                          |    |     |    |     |     |                         |      |      |      |                             |    |  |  |  |  |            |  |
| 07-01-86                  |  | 8572      | 111.8 | 13.3             | 115 | 4.38 | 8.08  | 1.0       | 23  | 16 | 21 | 5                        | 5  | 0   | 0  | 25  | 96  | 1250                    | 40   | 910  | 1070 | 15213                       |    |  |  |  |  |            |  |
| 09-23-86                  |  | 10693     | 122.0 | 13.5             | 106 | 7.24 | 5.16  | .5        | 52  | 31 | 24 | 13                       | 9  | 0   | 0  | 40  | 47  | 1740                    | 50   | 1140 | 1230 | 15465                       |    |  |  |  |  |            |  |
| OIL CHANGE AT 10693 MILES |  |           |       |                  |     |      |       |           |     |    |    |                          |    |     |    |     |     |                         |      |      |      |                             |    |  |  |  |  |            |  |
| 10-17-86                  |  | 11719     | 91.1  | 12.0             | 123 | 4.04 | 5.16  | 0.0       | 24  | 15 | 73 | 7                        | 5  | 0   | 0  | 23  | 62  | 1430                    | 30   | 900  | 950  | 15555                       |    |  |  |  |  |            |  |
| 02-09-87                  |  | 12972     | 102.6 | 12.9             | 121 | 5.78 | 2.69  | 0.0       | 48  | 33 | 72 | 7                        | 9  | 0   | 0  | 33  | 30  | 1090                    | 30   | 960  | 864  | 15050                       |    |  |  |  |  |            |  |
| 04-13-87                  |  | 14143     | 112.1 | 14.5             | 132 | 7.07 | 2.02  | 0.0       | 85  | 52 | 77 | 10                       | 10 | 0   | 0  | 43  | 27  | 1300                    | 40   | 930  | 1140 | 16011                       |    |  |  |  |  |            |  |
| OIL CHANGE AT 14144 MILES |  |           |       |                  |     |      |       |           |     |    |    |                          |    |     |    |     |     |                         |      |      |      |                             |    |  |  |  |  |            |  |
| OIL CHANGE AT 15345 MILES |  |           |       |                  |     |      |       |           |     |    |    |                          |    |     |    |     |     |                         |      |      |      |                             |    |  |  |  |  |            |  |
| 09-04-87                  |  | 16474     | 119.3 | 13.3             | 107 | 2.81 | 8.42  | 0.0       | 18  | 8  | 5  | 2                        | 2  | 0   | 0  | 13  | 104 | 1520                    | 20   | 1100 | 1160 | 16669                       |    |  |  |  |  |            |  |
| 02-19-88                  |  | 18147     | 121.2 | 10.6             | 58  | 6.85 | 5.16  | 0.0       | 45  | 21 | 8  | 7                        | 5  | 0   | 0  | 22  | 44  | 1630                    | 30   | 1010 | 1300 | 17509                       |    |  |  |  |  |            |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA #: CM2006                                    |       |          |       | ENGINE TYPE: V-6        |       |      |      | CHEV S-10 |     |     |    | FT. ORD METHANOL VEHICLE |    |       |    |     |    |      |      |      |      | REVISION DATE: AUG 11, 1980 |  |  |  |
|----------------------------------------------------------|-------|----------|-------|-------------------------|-------|------|------|-----------|-----|-----|----|--------------------------|----|-------|----|-----|----|------|------|------|------|-----------------------------|--|--|--|
| VISCOSITY                                                |       | TBN FUEL |       | PPM (PARTS PER MILLION) |       |      |      |           |     |     |    |                          |    | BFLRF |    |     |    |      |      |      |      |                             |  |  |  |
| 40 C                                                     | 100 C | VI       | TAN   | D664                    | DIL % | Fe   | Pb   | Cu        | Sn  | Al  | Ni | Mn                       | Si | B     | Mg | P   | Zn | CODE |      |      |      |                             |  |  |  |
| DATE                                                     |       |          |       |                         |       |      |      |           |     |     |    |                          |    |       |    |     |    |      | ODOM |      |      |                             |  |  |  |
| 05-15-85                                                 |       | 44       | 34.6  | 8.0                     | 214   | 1.79 | 5.72 | 4.7       | 74  | 58  | 16 | 11                       | 3  | 43    | 6  | 488 | 1  | 19   | 1982 | 917  | 1065 | 14191                       |  |  |  |
| 08-13-85                                                 |       | 3359     | 61.4  | 9.5                     | 136   | 2.38 | 2.24 | 1.7       | 122 | 129 | 19 | 27                       | 6  | 49    | 8  | 485 | 16 | 357  | 1476 | 1110 | 1194 | 14561                       |  |  |  |
| OIL CHANGE AT 3359 MILES                                 |       |          |       |                         |       |      |      |           |     |     |    |                          |    |       |    |     |    |      |      |      |      |                             |  |  |  |
| 09-09-85                                                 |       | 4801     | 86.6  | 11.8                    | 135   | 2.35 | 3.81 | 1.2       | 48  | 55  | 8  | 8                        | 6  | 10    | 2  | 116 | 64 | 531  | 1590 | 1308 | 1498 | 14603                       |  |  |  |
| CONVERTED TO METHANOL AT 4801 MILES and B of A Oil Added |       |          |       |                         |       |      |      |           |     |     |    |                          |    |       |    |     |    |      |      |      |      |                             |  |  |  |
| New Unused B of A Oil                                    |       |          |       |                         |       |      |      |           |     |     |    |                          |    |       |    |     |    |      |      |      |      |                             |  |  |  |
| 11-27-85                                                 |       | 4828     | 124.8 | 13.4                    | 102   | 2.52 | 6.74 | .5        | 25  | 13  | 13 | 3                        | 4  | 2     | 1  | 37  | 2  | 1124 | 108  | 1214 | 1176 | 14740                       |  |  |  |
| 03-17-86                                                 |       | 6096     | 126.5 | 13.2                    | 99    | 2.64 | 3.45 | 0.0       | 133 | 534 | 25 | 55                       | 8  | 9     | 4  | 51  | 3  | 998  | 231  | 1145 | 1006 | 14979                       |  |  |  |
| OIL CHANGE AT 6415 MILES                                 |       |          |       |                         |       |      |      |           |     |     |    |                          |    |       |    |     |    |      |      |      |      |                             |  |  |  |
| 05-02-86                                                 |       | 7698     | 132.6 | 14.2                    | 105   | 2.82 | 7.03 | 0.0       | 65  | 90  | 11 | 13                       | 4  | 2     | 1  | 2   | 22 | 1021 | 62   | 1415 | 1358 | 15131                       |  |  |  |
| 06-11-86                                                 |       | 8705     | 136.1 | 14.5                    | 106   | 6.00 | 6.68 | .1        | 73  | 102 | 14 | 14                       | 9  | 3     | 13 | 42  | 4  | 1430 | 48   | 1160 | 1140 | 15191                       |  |  |  |
| 08-07-86                                                 |       | 9770     | 138.6 | 14.4                    | 102   | 7.52 | 5.50 | 0.0       | 122 | 187 | 17 | 16                       | 13 | 7     | 0  | 45  | 1  | 1098 | 50   | 1360 | 1300 | 15343                       |  |  |  |
| OIL CHANGE AT 9770 MILES                                 |       |          |       |                         |       |      |      |           |     |     |    |                          |    |       |    |     |    |      |      |      |      |                             |  |  |  |
| 09-23-86                                                 |       | 11049    | 129.7 | 14.2                    | 108   | 3.93 | 7.86 | 0.0       | 57  | 68  | 20 | 13                       | 7  | 3     | 0  | 24  | 12 | 1620 | 38   | 1290 | 1300 | 15461                       |  |  |  |
| 11-14-86                                                 |       | 12316    | 139.8 | 14.6                    | 104   | 4.60 | 5.61 | 0.0       | 103 | 108 | 19 | 12                       | 12 | 5     | 0  | 27  | 3  | 1860 | 38   | 1370 | 1190 | 15556                       |  |  |  |
| 01-29-87                                                 |       | 13380    | 142.9 | 15.7                    | 114   | 7.46 | 4.26 | 0.0       | 192 | 253 | 25 | 17                       | 15 | 10    | 0  | 33  | 2  | 1620 | 58   | 1540 | 1198 | 15831                       |  |  |  |
| OIL CHANGE AT 13381 MILES                                |       |          |       |                         |       |      |      |           |     |     |    |                          |    |       |    |     |    |      |      |      |      |                             |  |  |  |
| 04-17-87                                                 |       | 14462    | 128.2 | 13.4                    | 99    | 3.09 | 8.87 | 0.0       | 56  | 53  | 14 | 3                        | 6  | 2     | 0  | 18  | 14 | 1790 | 38   | 1550 | 1230 | 16032                       |  |  |  |
| 07-13-87                                                 |       | 15514    | 127.2 | 13.2                    | 97    | 6.40 | 5.95 | 0.0       | 111 | 70  | 16 | 5                        | 13 | 5     | 0  | 20  | 2  | 1800 | 0    | 1410 | 1160 | 16432                       |  |  |  |
| OIL CHANGE AT 15515 MILES                                |       |          |       |                         |       |      |      |           |     |     |    |                          |    |       |    |     |    |      |      |      |      |                             |  |  |  |
| 10-24-87                                                 |       | 16581    | 136.2 | 15.0                    | 112   | 3.93 | 8.75 | 0.0       | 46  | 26  | 11 | 3                        | 6  | 1     | 0  | 13  | 16 | 2190 | 58   | 1410 | 1160 | 16759                       |  |  |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA #: CM2007                                    |       |          |            | ENGINE TYPE: V-6        |      |       |     | CHEV S-10 |     |    |    | FT. ORD METHANOL VEHICLE |    |    |      |     |      |      |      |      |       | REVISION DATE: AUG 11, 1988 |  |  |  |
|----------------------------------------------------------|-------|----------|------------|-------------------------|------|-------|-----|-----------|-----|----|----|--------------------------|----|----|------|-----|------|------|------|------|-------|-----------------------------|--|--|--|
| VISCOSITY                                                |       | TBH FUEL |            | PPH (PARTS PER MILLION) |      | BFLRF |     |           |     |    |    |                          |    |    |      |     |      |      |      |      |       |                             |  |  |  |
| 40 C                                                     | 100 C | TAN      | D664 OIL % | VI                      | Fe   | Pb    | Cu  | Sn        | Al  | Hi | Mn | Si                       | B  | Mg | Ca   | P   | Zn   | CODE |      |      |       |                             |  |  |  |
| DATE                                                     | ODOM  |          |            |                         |      |       |     |           |     |    |    |                          |    |    |      |     |      |      |      |      |       |                             |  |  |  |
| 05-15-85                                                 | 41    | 46.4     | 8.8        | 172                     | 2.10 | 2.58  | 2.4 | 55        | 31  | 22 | 14 | 3                        | 28 | 5  | 351  | <1  | 11   | 596  | 910  | 986  | 14197 |                             |  |  |  |
| 09-09-85                                                 | 2329  | 48.5     | 8.3        | 145                     | 2.82 | .35   | .8  | 157       | 125 | 36 | 41 | 8                        | 93 | 14 | 1060 | <1  | 16   | 1400 | 1090 | 1103 | 14606 |                             |  |  |  |
| OIL CHANGE AT 2329 MILES                                 |       |          |            |                         |      |       |     |           |     |    |    |                          |    |    |      |     |      |      |      |      |       |                             |  |  |  |
| 10-03-85                                                 | 4063  | 80.6     | 11.2       | 128                     | 2.18 | 4.15  | 1.0 | 27        | 19  | <1 | 4  | 1                        | 9  | 1  | 131  | 68  | 968  | 317  | 1032 | 1244 | 14640 |                             |  |  |  |
| 12-13-85                                                 | 5293  | 78.0     | 10.9       | 127                     | 3.53 | 3.05  | 1.5 | 34        | 29  | 89 | 9  | 3                        | 9  | 1  | 155  | 43  | 933  | 261  | 976  | 1125 | 14815 |                             |  |  |  |
| CONVERTED TO METHANOL AT 5490 MILES and B of A Oil Added |       |          |            |                         |      |       |     |           |     |    |    |                          |    |    |      |     |      |      |      |      |       |                             |  |  |  |
| New Unused B of A Oil                                    |       |          |            |                         |      |       |     |           |     |    |    |                          |    |    |      |     |      |      |      |      |       |                             |  |  |  |
|                                                          |       | 137.4    | 14.4       | 103                     | 3.01 | 10.61 |     | 1         | <1  | <1 | 1  | 1                        | <1 | <1 | 20   | 282 | 1903 | 6    | 1345 | 1263 | 14740 |                             |  |  |  |
| 01-08-86                                                 | 5491  | 85.1     | 11.8       | 131                     | 2.34 | 5.58  | 1.5 | 8         | 3   | 93 | 2  | 1                        | 1  | <1 | 25   | 116 | 930  | 23   | 852  | 933  | 14058 |                             |  |  |  |
| 05-22-86                                                 | 6737  | 124.1    | 14.1       | 112                     | 3.76 | 6.73  | 0.0 | 75        | 196 | 25 | 30 | 7                        | 2  | 0  | 45   | 7   | 1570 | 220  | 1290 | 1160 | 15163 |                             |  |  |  |
| 07-01-86                                                 | 7082  | 125.6    | 13.5       | 103                     | 7.29 | 5.05  | 0.0 | 88        | 192 | 26 | 34 | 10                       | 3  | 0  | 50   | 5   | 1070 | 280  | 1070 | 1110 | 15214 |                             |  |  |  |
| 08-28-86                                                 | 7740  | 113.1    | 13.1       | 111                     | 6.11 | 5.11  | 0.0 | 117       | 229 | 27 | 35 | 11                       | 3  | 0  | 53   | 2   | 1180 | 360  | 1090 | 1350 | 15482 |                             |  |  |  |
| 11-06-86                                                 | 9050  | 126.9    | 14.2       | 111                     | 4.94 | 3.82  | 0.0 | 298       | 311 | 30 | 41 | 17                       | 5  | 0  | 60   | 1   | 1180 | 360  | 1340 | 1250 | 15520 |                             |  |  |  |
| 12-18-86                                                 | 10462 | 144.6    | 15.9       | 115                     | 7.52 | 2.24  | 0.0 | 298       | 311 | 30 | 41 | 17                       | 5  | 0  | 60   | 1   | 1180 | 360  | 1340 | 1250 | 15710 |                             |  |  |  |
| 01-23-87                                                 | 11604 | 158.5    | 17.1       | 116                     | 8.02 | 4.04  | 0.0 | 331       | 339 | 32 | 42 | 17                       | 6  | 0  | 60   | 5   | 1250 | 310  | 1300 | 1210 | 15829 |                             |  |  |  |
| OIL CHANGE AT 11605 MILES                                |       |          |            |                         |      |       |     |           |     |    |    |                          |    |    |      |     |      |      |      |      |       |                             |  |  |  |
| 03-13-87                                                 | 13618 | 127.0    | 13.0       | 95                      | 4.66 | 6.40  | 0.0 | 54        | 53  | 12 | 8  | 7                        | 2  | 0  | 18   | 5   | 1310 | 280  | 1090 | 1150 | 15985 |                             |  |  |  |
| 05-05-87                                                 | 14789 | 131.4    | 19.2       | 166                     | 3.14 | 5.50  | 0.0 | 134       | 83  | 17 | 39 | 12                       | 3  | 0  | 27   | 3   | 1620 | 220  | 1370 | 1180 | 16071 |                             |  |  |  |
| OIL CHANGE AT 14790 MILES                                |       |          |            |                         |      |       |     |           |     |    |    |                          |    |    |      |     |      |      |      |      |       |                             |  |  |  |
| 06-01-87                                                 | 15796 | 131.0    | 14.5       | 109                     | 4.71 | 7.74  | 0.0 | 53        | 53  | 9  | 12 | 6                        | 1  | 0  | 17   | 32  | 2160 | 50   | 1460 | 1270 | 16210 |                             |  |  |  |
| OIL CHANGE AT 17000 MILES                                |       |          |            |                         |      |       |     |           |     |    |    |                          |    |    |      |     |      |      |      |      |       |                             |  |  |  |
| 07-07-87                                                 | 17020 | 130.6    | 13.9       | 103                     | 4.49 | 5.84  | 0.0 | 73        | 34  | 12 | 8  | 9                        | 3  | 0  | 21   | 4   | 1420 | 170  | 1230 | 1230 | 16414 |                             |  |  |  |
| 07-08-87                                                 | 17035 | 126.0    | 14.2       | 112                     | 4.71 | 6.21  | 0.0 | 67        | 31  | 10 | 7  | 8                        | 2  | 0  | 17   | 3   | 1350 | 150  | 1150 | 1120 | 16416 |                             |  |  |  |
| 08-26-87                                                 | 19389 | 123.2    | 15.0       | 125                     | 5.84 | 5.16  | 0.0 | 95        | 42  | 12 | 9  | 11                       | 3  | 0  | 22   | 2   | 1290 | 310  | 1240 | 1240 | 16577 |                             |  |  |  |
| OIL CHANGE AT 18389 MILES                                |       |          |            |                         |      |       |     |           |     |    |    |                          |    |    |      |     |      |      |      |      |       |                             |  |  |  |
| 10-24-87                                                 | 19608 | 146.2    | 14.3       | 95                      | 4.15 | 8.03  | 0.0 | 42        | 21  | 9  | 5  | 5                        | 0  | 0  | 15   | 15  | 2130 | 80   | 1420 | 1160 | 16760 |                             |  |  |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA 01 CM2080 ENGINE TYPE: V-6 CHEV 5-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1980

| DATE     | ODOM | VISCOSITY<br>40 C 100 C | VI  | TAN  | TBN  | FUEL<br>D664 OIL % | Fe  | Pb  | Cu | Sn | Al | Si  | Mn | Ni  | PPH (PARTS PER MILLION) | Mg  | Ca   | P    | Zn   | BFLRF<br>CODE |
|----------|------|-------------------------|-----|------|------|--------------------|-----|-----|----|----|----|-----|----|-----|-------------------------|-----|------|------|------|---------------|
| 05-15-85 | 29   | 47.4                    | 8.8 | 1.97 | 3.70 | 2.6                | 60  | 35  | 18 | 11 | 1  | 32  | 3  | 385 | 4                       | 371 | 1050 | 1102 | 1001 | 14190         |
| 07-29-85 | 3395 | 55.6                    | 8.6 | 3.10 | 1.83 | 1.4                | 143 | 115 | 30 | 24 | 7  | 153 | 10 | 756 | 4                       | 371 | 1050 | 1102 | 1240 | 14457         |

HAD ACCIDENT AT 3395 MILES

|          |      |       |      |     |     |      |    |    |    |    |    |   |   |   |    |   |     |     |     |      |       |
|----------|------|-------|------|-----|-----|------|----|----|----|----|----|---|---|---|----|---|-----|-----|-----|------|-------|
| 09-30-85 | 4786 | 110.6 | 14.2 | 129 | .99 | 3.29 | .8 | 20 | 19 | 14 | 10 | 1 | 5 | 1 | 84 | 6 | 426 | 690 | 953 | 1000 | 14630 |
|----------|------|-------|------|-----|-----|------|----|----|----|----|----|---|---|---|----|---|-----|-----|-----|------|-------|

CONVERTED TO METHANOL AT 4786 MILES and B of A Oil Added

|                       |       |       |      |      |       |      |     |     |     |    |    |    |    |    |    |     |      |     |      |      |       |
|-----------------------|-------|-------|------|------|-------|------|-----|-----|-----|----|----|----|----|----|----|-----|------|-----|------|------|-------|
| New Unused B of A Oil | 137.4 | 14.4  | 103  | 3.01 | 10.51 |      | 1   | <1  | <1  | <1 | <1 | <1 | <1 | <1 | 20 | 282 | 1903 | 6   | 1345 | 1263 | 14740 |
| 11-27-85              | 4788  | 133.2 | 13.9 | 101  | 2.34  | 6.63 | .3  | 13  | <1  | 12 | <1 | 2  | 1  | <1 | 33 | 215 | 1025 | 86  | 1127 | 1055 | 14744 |
| 01-28-86              | 5808  | 136.0 | 12.8 | 84   | 2.34  | 3.51 | 0.0 | 61  | 701 | 20 | 73 | 5  | 9  | 2  | 92 | 9   | 1122 | 123 | 1223 | 1196 | 14875 |
| 04-24-86              | 7240  | 138.3 | 13.9 | 96   | 3.30  | 2.94 | .1  | 84  | 594 | 18 | 69 | 5  | 5  | 4  | 92 | 9   | 1210 | 90  | 1189 | 1192 | 15058 |
| 05-29-86              | 8272  | 125.1 | 15.2 | 126  | 5.33  | 5.11 | .1  | 104 | 531 | 24 | 81 | 13 | 9  | 0  | 97 | 4   | 1260 | 150 | 1300 | 1230 | 15164 |
| 07-02-86              | 9701  | 148.6 | 14.8 | 99   | 5.61  | 3.14 | .1  | 92  | 406 | 22 | 72 | 15 | 9  | 0  | 82 | 4   | 900  | 120 | 1010 | 1090 | 15216 |
| 07-31-86              | 10905 | 112.7 | 16.7 | 161  | 5.72  | 3.48 | 0.0 | 116 | 481 | 23 | 73 | 15 | 9  | 0  | 90 | 15  | 1220 | 330 | 1230 | 1430 | 15327 |

OIL CHANGE AT 10906 MILES

|          |       |       |      |     |      |      |     |    |     |    |    |   |   |   |    |    |      |    |      |      |       |
|----------|-------|-------|------|-----|------|------|-----|----|-----|----|----|---|---|---|----|----|------|----|------|------|-------|
| 09-03-86 | 11968 | 131.1 | 14.2 | 167 | 3.31 | 7.57 | 0.0 | 42 | 109 | 15 | 15 | 8 | 2 | 0 | 33 | 12 | 1770 | 60 | 1290 | 1430 | 15406 |
| 10-09-86 | 13269 | 132.2 | 15.5 | 122 | 4.38 | 6.17 | 0.0 | 39 | 84  | 13 | 15 | 5 | 3 | 0 | 32 | 3  | 1120 | 50 | 920  | 1230 | 15507 |
| 11-17-86 | 14307 | 128.6 | 13.2 | 96  | 3.93 | 7.52 | 0.0 | 65 | 111 | 24 | 16 | 8 | 9 | 0 | 35 | 38 | 2010 | 80 | 1460 | 1230 | 15557 |

OIL CHANGE AT 15488 MILES

|          |       |       |      |     |      |      |     |     |    |    |    |    |   |   |    |    |      |    |      |      |       |
|----------|-------|-------|------|-----|------|------|-----|-----|----|----|----|----|---|---|----|----|------|----|------|------|-------|
| 03-05-87 | 16659 | 136.1 | 16.4 | 129 | 3.48 | 7.41 | 0.0 | 52  | 34 | 10 | 4  | 6  | 1 | 0 | 23 | 14 | 1450 | 80 | 1200 | 1140 | 15910 |
| 05-14-87 | 17970 | 142.8 | 14.6 | 103 | 5.50 | 6.17 | 0.0 | 131 | 50 | 13 | 15 | 11 | 3 | 0 | 29 | 17 | 2130 | 90 | 1690 | 1460 | 16102 |

OIL CHANGE AT 17970 MILES

|          |       |       |      |     |      |      |     |     |    |    |   |    |   |   |    |    |      |    |      |      |       |
|----------|-------|-------|------|-----|------|------|-----|-----|----|----|---|----|---|---|----|----|------|----|------|------|-------|
| 07-13-87 | 18957 | 125.3 | 17.3 | 152 | 3.82 | 6.96 | 0.0 | 62  | 17 | 8  | 3 | 6  | 2 | 0 | 17 | 7  | 1690 | 20 | 1370 | 1100 | 16433 |
| 07-20-87 | 19084 | 128.3 | 14.2 | 109 | 5.72 | 7.29 | 0.0 | 67  | 18 | 9  | 0 | 7  | 3 | 0 | 22 | 6  | 1660 | 20 | 1070 | 1200 | 16454 |
| 08-25-87 | 20647 | 130.6 | 15.1 | 111 | 6.51 | 4.04 | 0.0 | 162 | 49 | 12 | 7 | 11 | 6 | 0 | 28 | 4  | 1760 | 40 | 1390 | 1370 | 16572 |
| 10-24-87 | 22064 | 154.8 | 16.0 | 107 | 6.06 | 6.62 | 0.0 | 172 | 61 | 12 | 8 | 10 | 5 | 0 | 23 | 13 | 2030 | 50 | 1570 | 1310 | 16757 |

OIL CHANGE AT 22111 MILES

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA #1 CM2809 |  |      |  | ENGINE TYPE: V-6 |  |          |  | CHEV S-10               |  |                         |  | FT. ORD METHANOL VEHICLE |  |                         |  |                         |  |                         |  |                         |  | REVISION DATE: AUG 11, 1988 |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |               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                        |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |                         |  |  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| DATE                  |  | ODOM |  | VISCOSITY        |  | TBH FUEL |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION)  |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION)     |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER MILLION) |  | PPM (PARTS PER 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LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA 0: CM2090                  |  |           |       | ENGINE TYPE: L-4 |      |       |      | CHEV S-10 |      |     |                         | FT. ORD BASELINE VEHICLE |    |     |    |     |     |      |      |      |            | REVISION DATE: AUG 11, 1980 |  |  |  |
|----------------------------------------|--|-----------|-------|------------------|------|-------|------|-----------|------|-----|-------------------------|--------------------------|----|-----|----|-----|-----|------|------|------|------------|-----------------------------|--|--|--|
| DATE                                   |  | VISCOSITY |       | VI               | TAN  |       | TBN  |           | FUEL |     | PPM (PARTS PER MILLION) |                          |    |     |    |     |     |      |      |      | BFLRF CODE |                             |  |  |  |
|                                        |  | 40 C      | 100 C |                  | D664 | DIL % | Fe   | Pb        | Cu   | Sn  | Al                      | Mn                       | Si | B   | Hg | Ca  | P   | Zn   |      |      |            |                             |  |  |  |
| 06-06-85                               |  | 262       | 49.5  | 8.7              | 154  | 1.63  | 4.15 | 1.6       | 62   | 54  | 17                      | 20                       | 2  | 11  | 5  | 276 | 6   | 53   | 1030 | 1036 | 1106       | 14267                       |  |  |  |
| 08-30-85                               |  | 3425      | 63.7  | 9.9              | 140  | 2.70  | 2.00 | 1.3       | 115  | 150 | 26                      | 39                       | 5  | 100 | 9  | 290 | 21  | 191  | 1540 | 1171 | 1316       | 14509                       |  |  |  |
| OIL CHANGE AT 3425 MILES               |  |           |       |                  |      |       |      |           |      |     |                         |                          |    |     |    |     |     |      |      |      |            |                             |  |  |  |
| 10-03-85                               |  | 4711      | 89.6  | 12.4             | 134  | 2.81  | 4.04 | 1.0       | 37   | 42  | 88                      | 9                        | 3  | 6   | 1  | 65  | 62  | 496  | 1640 | 1276 | 1153       | 14641                       |  |  |  |
| 11-15-85                               |  | 6189      | 95.2  | 12.6             | 127  | 3.79  | 2.55 | 1.1       | 61   | 85  | 21                      | 17                       | 6  | 5   | 3  | 92  | 33  | 529  | 1800 | 1249 | 1493       | 14730                       |  |  |  |
| 12-09-85                               |  | 6930      | 100.0 | 13.1             | 120  | 4.31  | 2.48 | 1.2       | 81   | 120 | 25                      | 24                       | 21 | 7   | 3  | 103 | 25  | 511  | 1600 | 1247 | 1491       | 14889                       |  |  |  |
| 12-17-85                               |  | 7130      | 96.6  | 12.6             | 125  | 4.72  | 2.80 | 1.3       | 87   | 135 | 28                      | 27                       | 10 | 9   | 3  | 113 | 26  | 532  | 1730 | 1304 | 1622       | 14610                       |  |  |  |
| 8384-8417 MILES, 8FLRF COLD START TEST |  |           |       |                  |      |       |      |           |      |     |                         |                          |    |     |    |     |     |      |      |      |            |                             |  |  |  |
| 03-24-86                               |  | 8385      | 83.3  | 11.4             | 127  | 3.21  | 2.62 | 2.4       | 25   | 46  | 88                      | 6                        | 1  | 11  | 1  | 44  | 77  | 953  | 228  | 885  | 1031       | 15031                       |  |  |  |
| 07-31-86                               |  | 8386      | 80.9  | 11.0             | 124  | 2.02  | 5.72 | 5.0       | 38   | 47  | 21                      | 9                        | 2  | 1   | 0  | 25  | 71  | 1410 | 60   | 990  | 1290       | 15353                       |  |  |  |
| OIL CHANGE AT 8418 MILES               |  |           |       |                  |      |       |      |           |      |     |                         |                          |    |     |    |     |     |      |      |      |            |                             |  |  |  |
| 12-11-86                               |  | 9543      | 118.9 | 13.9             | 115  | 3.31  | 7.97 | 0.0       | 19   | 33  | 16                      | 10                       | 3  | 0   | 0  | 25  | 141 | 1450 | 50   | 1350 | 1210       | 15695                       |  |  |  |
| OIL CHANGE AT 11035 MILES              |  |           |       |                  |      |       |      |           |      |     |                         |                          |    |     |    |     |     |      |      |      |            |                             |  |  |  |
| 05-07-87                               |  | 11836     | 124.2 | 14.3             | 115  | 4.04  | 5.50 | 0.0       | 27   | 323 | 22                      | 47                       | 3  | 1   | 0  | 37  | 39  | 1610 | 270  | 1240 | 1250       | 16072                       |  |  |  |
| 07-21-87                               |  | 14236     | 148.5 | 15.2             | 103  | 7.07  | 6.96 | 0.0       | 28   | 128 | 10                      | 16                       | 5  | 3   | 0  | 26  | 69  | 2040 | 40   | 980  | 1290       | 16455                       |  |  |  |
| 08-25-87                               |  | 15438     | 156.4 | 16.3             | 109  | 6.51  | 6.51 | 0.0       | 30   | 142 | 12                      | 20                       | 5  | 3   | 0  | 30  | 72  | 1900 | 40   | 1200 | 1350       | 16573                       |  |  |  |
| OIL CHANGE AT 15439 MILES              |  |           |       |                  |      |       |      |           |      |     |                         |                          |    |     |    |     |     |      |      |      |            |                             |  |  |  |
| 03-22-88                               |  | 18725     | 141.3 | 15.5             | 113  | 6.06  | 6.40 | 0.0       | 24   | 550 | 10                      | 83                       | 2  | 2   | 0  | 23  | 59  | 1860 | 30   | 1100 | 1390       | 17511                       |  |  |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA #: CM2891                                    |       |          |      | ENGINE TYPE: V-6        |       |       |     | CHEV S-10 |     |    |    | FT. ORD METHANOL VEHICLE |    |       |     |      |      |      |      |       |  | REVISION DATE: AUG 11, 1988 |  |  |  |
|----------------------------------------------------------|-------|----------|------|-------------------------|-------|-------|-----|-----------|-----|----|----|--------------------------|----|-------|-----|------|------|------|------|-------|--|-----------------------------|--|--|--|
| VISCOSITY                                                |       | TBM FUEL |      | PPM (PARTS PER MILLION) |       |       |     |           |     |    |    |                          |    | BFLRF |     |      |      |      |      |       |  |                             |  |  |  |
| 40 C                                                     | 100 C | VI       | TAN  | D664                    | DIL % | Fe    | Pb  | Cu        | Sn  | Al | Ni | Mn                       | Si | B     | Mg  | Ca   | P    | Zn   | CODE |       |  |                             |  |  |  |
| DATE                                                     | ODOM  |          |      |                         |       |       |     |           |     |    |    |                          |    |       |     |      |      |      |      |       |  |                             |  |  |  |
| 05-15-85                                                 | 26    | 46.7     | 8.3  | 2.07                    | 2.13  | 2.5   | 50  | 29        | 24  | 14 | 26 | 26                       | 3  | 353   | <1  | 7    | 938  | 989  | 1060 | 14199 |  |                             |  |  |  |
| 08-29-85                                                 | 3224  | 51.3     | 8.5  | 4.18                    | .22   | 1.5   | 200 | 132       | 38  | 49 | 33 | 340                      | 15 | 990   | 1   | 28   | 1460 | 1126 | 1194 | 14587 |  |                             |  |  |  |
| OIL CHANGE AT 3224 MILES                                 |       |          |      |                         |       |       |     |           |     |    |    |                          |    |       |     |      |      |      |      |       |  |                             |  |  |  |
| 09-30-85                                                 | 4881  | 84.0     | 11.8 | 132                     | 7.15  | 3.16  | .9  | 37        | 23  | 11 | 8  | 8                        | 2  | 167   | 41  | 584  | 1620 | 1261 | 1415 | 14637 |  |                             |  |  |  |
| CONVERTED TO METHANOL AT 4881 MILES and B of A Oil Added |       |          |      |                         |       |       |     |           |     |    |    |                          |    |       |     |      |      |      |      |       |  |                             |  |  |  |
| New Unused B of A Oil                                    |       |          |      |                         |       |       |     |           |     |    |    |                          |    |       |     |      |      |      |      |       |  |                             |  |  |  |
|                                                          |       | 137.4    | 14.4 | 103                     | 3.01  | 10.61 |     | 1         | <1  | <1 | 1  | <1                       | <1 | 20    | 282 | 1983 | 6    | 1345 | 1263 | 14748 |  |                             |  |  |  |
| 03-14-86                                                 | 6214  | 125.3    | 13.0 | 97                      | 2.96  | 3.77  | .3  | 41        | 369 | 21 | 36 | 5                        | 6  | 2     | 91  | 14   | 1106 | 100  | 1140 | 14974 |  |                             |  |  |  |
| 03-25-86                                                 | 6696  | 134.5    | 13.8 | 98                      | 2.68  | 2.96  | 0.0 | 55        | 421 | 20 | 36 | 7                        | 1  | 2     | 97  | 2    | 1150 | 76   | 1261 | 15816 |  |                             |  |  |  |
| 06-06-86                                                 | 7592  | 135.5    | 14.4 | 105                     | 5.22  | 3.98  | .2  | 107       | 313 | 24 | 48 | 15                       | 3  | 0     | 73  | 2    | 788  | 190  | 840  | 15180 |  |                             |  |  |  |
| 07-17-86                                                 | 8889  | 138.8    | 16.0 | 122                     | 6.17  | 2.58  | 0.0 | 163       | 358 | 28 | 47 | 15                       | 3  | 0     | 90  | 3    | 930  | 170  | 1410 | 15312 |  |                             |  |  |  |
| 08-22-86                                                 | 10137 | 154.3    | 16.3 | 111                     | 7.07  | 1.96  | 0.0 | 266       | 361 | 33 | 54 | 19                       | 5  | 0     | 86  | 3    | 1038 | 218  | 1878 | 15398 |  |                             |  |  |  |
| 09-24-86                                                 | 11390 | 163.8    | 15.6 | 97                      | 8.87  | 1.35  | 0.0 | 340       | 480 | 38 | 54 | 19                       | 5  | 0     | 88  | 5    | 1240 | 230  | 1288 | 15463 |  |                             |  |  |  |
| OIL CHANGE AT 11391 MILES                                |       |          |      |                         |       |       |     |           |     |    |    |                          |    |       |     |      |      |      |      |       |  |                             |  |  |  |
| 10-31-86                                                 | 12774 | 132.7    | 14.8 | 113                     | 4.94  | 6.28  | 0.0 | 67        | 92  | 21 | 19 | 7                        | 2  | 0     | 32  | 6    | 1010 | 50   | 940  | 1388  |  |                             |  |  |  |
| 12-11-86                                                 | 14101 | 114.9    | 12.9 | 106                     | 2.97  | 8.87  | 0.0 | 43        | 33  | 8  | 7  | 7                        | 0  | 0     | 15  | 52   | 1400 | 510  | 1360 | 1238  |  |                             |  |  |  |
| OIL CHANGE AT 15281 MILES                                |       |          |      |                         |       |       |     |           |     |    |    |                          |    |       |     |      |      |      |      |       |  |                             |  |  |  |
| 02-24-87                                                 | 16857 | 143.8    | 15.4 | 110                     | 5.16  | 7.07  | 0.0 | 88        | 32  | 17 | 7  | 11                       | 2  | 0     | 24  | 7    | 2140 | 120  | 1630 | 1368  |  |                             |  |  |  |
| 04-02-87                                                 | 18129 | 144.0    | 14.4 | 98                      | 3.87  | 5.72  | 0.0 | 111       | 38  | 16 | 7  | 10                       | 4  | 0     | 24  | 20   | 1710 | 100  | 1730 | 1310  |  |                             |  |  |  |
| 05-27-87                                                 | 20126 | 161.0    | 16.2 | 105                     | 4.71  | 5.05  | 0.0 | 191       | 64  | 18 | 13 | 13                       | 6  | 0     | 21  | 2    | 1290 | 58   | 1478 | 1238  |  |                             |  |  |  |
| OIL CHANGE AT 20127 MILES                                |       |          |      |                         |       |       |     |           |     |    |    |                          |    |       |     |      |      |      |      |       |  |                             |  |  |  |
| 07-07-87                                                 | 21330 | 140.2    | 14.7 | 104                     | 5.27  | 6.17  | 0.0 | 69        | 31  | 17 | 9  | 7                        | 2  | 0     | 19  | 8    | 1780 | 40   | 1328 | 1310  |  |                             |  |  |  |
| 08-27-87                                                 | 22707 | 154.3    | 15.5 | 102                     | 5.72  | 6.06  | 0.0 | 85        | 31  | 17 | 3  | 9                        | 4  | 0     | 19  | 10   | 1593 | 48   | 1318 | 1178  |  |                             |  |  |  |
| 10-15-87                                                 | 24760 | 140.3    | 14.7 | 104                     | 7.86  | 3.59  | 0.0 | 167       | 68  | 39 | 12 | 12                       | 8  | 0     | 28  | 3    | 2270 | 60   | 1260 | 1460  |  |                             |  |  |  |
| 16805                                                    |       |          |      |                         |       |       |     |           |     |    |    |                          |    |       |     |      |      |      |      |       |  |                             |  |  |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

REVISION DATE: AUG 11, 1988

FT. ORD METHANOL VEHICLE

ENGINE TYPE: V-6 CHEV S-10

VEHICLE USA #: CM2892

| VEHICLE USEM W/ CR2092 |  |            |  |          |  |     |  |            |  | PPM (PARTS PER MILLION) |  |    |  |    |  |    |  |    |  | BFLRF |  |    |  |   |  |    |  |      |  |  |  |
|------------------------|--|------------|--|----------|--|-----|--|------------|--|-------------------------|--|----|--|----|--|----|--|----|--|-------|--|----|--|---|--|----|--|------|--|--|--|
|                        |  | VISCOSITY  |  | TBM FUEL |  | Fz  |  | Cu         |  | Sn                      |  | Al |  | Ni |  | Mn |  | Si |  | Mg    |  | Ca |  | P |  | Zn |  | CODE |  |  |  |
| DATE                   |  | 40 C 100 C |  | VI       |  | TAN |  | D664 OIL % |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |
|                        |  |            |  |          |  |     |  |            |  |                         |  |    |  |    |  |    |  |    |  |       |  |    |  |   |  |    |  |      |  |  |  |

CONVERTED TO METHANOL AT 6566 MILES and B of A Oil Added

|                       |      |       |      |     |      |       |     |     |    |     |    |    |    |    |    |     |      |      |
|-----------------------|------|-------|------|-----|------|-------|-----|-----|----|-----|----|----|----|----|----|-----|------|------|
| New Unused B of A Oil |      |       |      |     |      |       |     |     |    |     |    |    |    |    |    |     |      |      |
| 02-19-86              | 7510 | 137.4 | 14.4 | 103 | 3.01 | 10.61 |     |     | 1  | <1  | <1 | 1  | <1 | <1 | 20 | 282 | 1903 | 6    |
| 03-24-86              | 0033 | 129.7 | 13.6 | 100 | 2.96 | 4.31  | 0.0 | 0.0 | 34 | 461 | 19 | 51 | 5  | 3  | 2  | 47  | 12   | 1002 |

8034-8059 MILES, BFLRF COLD START TEST

OIL CHANGE AT 8038 MILES

|          |       |       |      |     |      |      |     |     |     |     |    |    |    |   |   |    |    |      |    |
|----------|-------|-------|------|-----|------|------|-----|-----|-----|-----|----|----|----|---|---|----|----|------|----|
| 12-01-86 | 9223  | 131.4 | 14.7 | 113 | 3.48 | 7.97 | 0.0 | 0.0 | 65  | 110 | 14 | 10 | 6  | 1 | 0 | 15 | 19 | 1560 | 40 |
| 01-23-87 | 10364 | 140.7 | 15.6 | 108 | 6.79 | 5.05 | 0.0 | 0.0 | 189 | 145 | 21 | 20 | 13 | 5 | 0 | 34 | 4  | 1770 | 70 |

OIL CHANGE AT 10385 MILES

|          |       |       |      |     |      |      |     |     |     |     |    |    |    |    |   |    |   |      |    |
|----------|-------|-------|------|-----|------|------|-----|-----|-----|-----|----|----|----|----|---|----|---|------|----|
| 04-02-87 | 12429 | 143.9 | 16.2 | 119 | 6.85 | 5.39 | 0.0 | 0.0 | 101 | 38  | 12 | 6  | 10 | 4  | 0 | 16 | 3 | 1760 | 20 |
| 05-18-87 | 13744 | 151.1 | 15.3 | 101 | 5.95 | 5.39 | 0.0 | 0.0 | 201 | 62  | 16 | 13 | 15 | 6  | 0 | 22 | 3 | 2110 | 40 |
| 07-07-87 | 15201 | 170.9 | 16.5 | 101 | 8.08 | 5.72 | 0.0 | 0.0 | 342 | 111 | 22 | 20 | 17 | 13 | 0 | 27 | 2 | 1750 | 40 |

OIL CHANGE AT 15201 MILES

|          |       |       |      |     |      |      |     |     |    |    |    |    |   |   |   |    |    |      |    |
|----------|-------|-------|------|-----|------|------|-----|-----|----|----|----|----|---|---|---|----|----|------|----|
| 08-25-87 | 16580 | 151.1 | 16.1 | 111 | 6.85 | 7.18 | 0.0 | 0.0 | 93 | 29 | 17 | 10 | 9 | 5 | 0 | 18 | 11 | 2170 | 30 |
|----------|-------|-------|------|-----|------|------|-----|-----|----|----|----|----|---|---|---|----|----|------|----|

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

|                       |                  |                         |                          |                             |      |      |     |    |    |    |    |    |    |    |   |      |    |      |      |               |
|-----------------------|------------------|-------------------------|--------------------------|-----------------------------|------|------|-----|----|----|----|----|----|----|----|---|------|----|------|------|---------------|
| VEHICLE USA 01 CM2092 | ENGINE TYPE: V-6 | CHEV S-10               | FT. ORD METHANOL VEHICLE | REVISION DATE: AUG 11, 1980 |      |      |     |    |    |    |    |    |    |    |   |      |    |      |      |               |
| DATE                  | ODOM             | VISCOSITY<br>40 C 100 C | TAN                      | VI                          | TBN  | FUEL | Fc  | Pb | Cu | Sn | Al | Ni | Mn | Si | g | Mg   | Co | P    | Zn   | BFLRF<br>CODE |
| 10-15-87              | 17912            | 167.3 16.4              | 7.41                     | 102                         | 5.05 | 0.0  | 208 | 38 | 19 | 10 | 12 | 10 | 0  | 25 | 4 | 2410 | 50 | 1200 | 1350 | 16006         |

OIL CHANGE AT 19290 MILES

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA 61 CM2093 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

| VEHICLE DATA             |      | VISCOSITY |       | TBN FUEL |      | PPH (PARTS PER MILLION) |       |     |     |    |    |    |     |    |     |    |     | BFLAF |      |      |       |
|--------------------------|------|-----------|-------|----------|------|-------------------------|-------|-----|-----|----|----|----|-----|----|-----|----|-----|-------|------|------|-------|
| DATE                     | ODOM | 40 C      | 100 C | VI       | TAN  | D664                    | DIL % | Fe  | Pb  | Cu | Sn | Al | Mi  | Mn | Si  | B  | Mg  | Ca    | P    | Zn   | CODE  |
| 05-15-85                 | 1218 | 30.2      | 7.9   | 105      | 2.07 | 5.05                    | 2.7   | 162 | 58  | 20 | 22 | 7  | 59  | 8  | 668 | 2  | 36  | 2191  | 900  | 1024 | 14196 |
| 07-25-85                 | 3373 | 48.5      | 9.2   | 174      | 3.07 | 1.88                    | 1.4   | 238 | 126 | 33 | 25 | 13 | 176 | 12 | 888 | <1 | 30  | 2291  | 1074 | 1156 | 14456 |
| OIL CHANGE AT 3373 MILES |      |           |       |          |      |                         |       |     |     |    |    |    |     |    |     |    |     |       |      |      |       |
| 09-03-85                 | 4258 | 77.5      | 11.0  | 131      | 2.40 | 4.06                    | 1.3   | 16  | 25  | 94 | 6  | 2  | 30  | 1  | 100 | 72 | 947 | 260   | 1004 | 1132 | 14505 |
|                          |      |           |       |          |      |                         |       | 16  | 23  | 85 | 10 | 2  | 11  | 2  | 119 | 6  | 944 | 332   | 990  | 1138 | 14605 |

OIL CHANGE AT 3373 MILES

|          |      |      |      |     |      |      |     |    |    |    |    |   |    |   |     |    |     |     |      |      |       |
|----------|------|------|------|-----|------|------|-----|----|----|----|----|---|----|---|-----|----|-----|-----|------|------|-------|
| 09-03-85 | 4258 | 77.5 | 11.0 | 131 | 2.40 | 4.06 | 1.3 | 46 | 25 | 94 | 6  | 2 | 30 | 1 | 100 | 72 | 947 | 260 | 1004 | 1132 | 14595 |
| 09-09-85 | 4591 | 80.8 | 11.3 | 130 | 2.59 | 3.23 | 1.0 | 48 | 29 | 95 | 10 | 2 | 11 | 2 | 119 | 6  | 944 | 332 | 990  | 1138 | 14605 |

CONVERTED TO METHANOL AT 4591 MILES and B of A Oil Added

New Unused B of A Oil

|          |       |       |      |     |      |       |     |     |     |    |    |    |    |    |    |     |      |     |      |      |       |
|----------|-------|-------|------|-----|------|-------|-----|-----|-----|----|----|----|----|----|----|-----|------|-----|------|------|-------|
| 11-27-85 | 4592  | 137.4 | 14.4 | 103 | 3.01 | 10.61 | 0.0 | 1   | <1  | <1 | <1 | <1 | <1 | <1 | 20 | 202 | 1903 | 6   | 1345 | 1263 | 14748 |
| 03-04-86 | 5964  | 131.7 | 13.9 | 102 | 2.49 | 6.72  | 0.5 | 13  | <1  | 19 | <1 | 2  | 1  | 1  | 29 | 231 | 1093 | 48  | 1133 | 1061 | 14746 |
| 05-12-86 | 7265  | 132.5 | 13.3 | 94  | 2.90 | 2.03  | 0.6 | 72  | 616 | 30 | 65 | 5  | 10 | 2  | 42 | 22  | 1151 | 76  | 1204 | 1170 | 14076 |
| 07-02-86 | 8244  | 131.7 | 13.8 | 101 | 4.00 | 2.80  | .5  | 131 | 760 | 29 | 81 | 8  | 10 | 5  | 53 | 4   | 1212 | 119 | 1190 | 1246 | 15143 |
| 09-11-86 | 9376  | 120.4 | 13.2 | 104 | 5.55 | 3.76  | 0.0 | 131 | 370 | 34 | 59 | 12 | 8  | 0  | 43 | 2   | 1000 | 348 | 1290 | 1090 | 15227 |
| 11-03-86 | 10509 | 127.0 | 14.5 | 114 | 6.28 | 5.27  | 0.0 | 117 | 297 | 53 | 51 | 13 | 17 | 0  | 41 | 5   | 1390 | 210 | 1190 | 1450 | 15425 |
|          |       | 124.1 | 13.2 | 100 | 3.93 | 2.69  | 0.0 | 108 | 104 | 24 | 39 | 8  | 7  | 0  | 26 | 1   | 270  | 20  | 700  | 840  | 15527 |

OIL CHANGE AT 10509 MILES

|          |       |       |      |     |      |      |     |     |     |    |    |    |   |   |    |    |      |     |      |      |       |
|----------|-------|-------|------|-----|------|------|-----|-----|-----|----|----|----|---|---|----|----|------|-----|------|------|-------|
| 12-11-86 | 11942 | 144.8 | 14.8 | 102 | 4.43 | 6.52 | 0.0 | 67  | 102 | 21 | 18 | 9  | 3 | 0 | 18 | 17 | 1490 | 70  | 1370 | 1208 | 15699 |
| 03-02-87 | 13208 | 140.1 | 19.8 | 144 | 6.73 | 4.83 | 0.0 | 105 | 105 | 21 | 16 | 13 | 6 | 0 | 21 | 4  | 1500 | 60  | 1430 | 1100 | 15897 |
| 05-18-87 | 14552 | 141.2 | 14.6 | 103 | 5.33 | 4.71 | 0.0 | 183 | 112 | 22 | 16 | 18 | 6 | 0 | 24 | 4  | 1690 | 300 | 1550 | 1360 | 16106 |

OIL CHANGE AT 14581 MILES

|          |       |       |      |     |      |      |     |    |    |    |   |   |   |   |    |    |      |    |      |      |       |
|----------|-------|-------|------|-----|------|------|-----|----|----|----|---|---|---|---|----|----|------|----|------|------|-------|
| 07-24-87 | 15700 | 120.1 | 14.2 | 110 | 5.16 | 7.18 | 0.0 | 53 | 27 | 10 | 0 | 0 | 0 | 0 | 15 | 11 | 2050 | 50 | 1170 | 1260 | 16456 |
|----------|-------|-------|------|-----|------|------|-----|----|----|----|---|---|---|---|----|----|------|----|------|------|-------|

OIL CHANGE AT 17510 MILES

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA 01 CM2094                                    |       |          |           | ENGINE TYPE: L-4 |      |                         |       | CHEV S-10 |     |    |    | FT. ORD METHANOL VEHICLE |    |    |    |       |      |      |      |      |       | REVISION DATE: AUG 11, 1988 |  |  |  |
|----------------------------------------------------------|-------|----------|-----------|------------------|------|-------------------------|-------|-----------|-----|----|----|--------------------------|----|----|----|-------|------|------|------|------|-------|-----------------------------|--|--|--|
| VISCOSITY                                                |       | TBN      |           | FUEL             |      | PPM (PARTS PER MILLION) |       |           |     |    |    |                          |    |    |    | BFLRF |      |      |      |      |       |                             |  |  |  |
| DATE                                                     | ODOM  | 40 C 100 | 100 C 100 | VI               | TAK  | D664                    | OIL % | Fe        | Pb  | Cu | Sn | Al                       | Mn | Si | B  | Mg    | Ca   | P    | Zn   | CODE |       |                             |  |  |  |
| OIL CHANGE AT 3040 MILES                                 |       |          |           |                  |      |                         |       |           |     |    |    |                          |    |    |    |       |      |      |      |      |       |                             |  |  |  |
| 10-02-85                                                 | 4340  | 82.0     | 11.7      | 134              | 2.91 | 3.80                    | .9    | 20        | 36  | 11 | 7  | 7                        | 6  | 1  | 72 | 65    | 567  | 1560 | 1292 | 1434 | 14642 |                             |  |  |  |
| 12-04-85                                                 | 6945  | 86.3     | 11.7      | 127              | 3.89 | 2.72                    | 1.4   | 27        | 71  | 39 | 13 | 3                        | 4  | 1  | 70 | 33    | 611  | 1260 | 1119 | 1354 | 14007 |                             |  |  |  |
| OIL CHANGE AT 6994 MILES                                 |       |          |           |                  |      |                         |       |           |     |    |    |                          |    |    |    |       |      |      |      |      |       |                             |  |  |  |
| 01-14-86                                                 | 7995  | 87.0     | 11.9      | 129              | 2.78 | 2.47                    | 1.1   | 16        | 29  | 92 | 9  | 1                        | 3  | 1  | 33 | 100   | 997  | 321  | 996  | 1125 | 14077 |                             |  |  |  |
| 01-28-86                                                 | 8007  | 92.5     | 12.2      | 124              | 3.44 | 2.36                    | .6    | 20        | 39  | 85 | 11 | 3                        | 3  | 1  | 30 | 83    | 1319 | 343  | 1034 | 1150 | 14070 |                             |  |  |  |
| CONVERTED TO METHANOL AT 9797 MILES and B of A Oil Added |       |          |           |                  |      |                         |       |           |     |    |    |                          |    |    |    |       |      |      |      |      |       |                             |  |  |  |
| New Unused B of A Oil                                    |       | 137.4    | 14.4      | 103              | 3.01 | 10.61                   |       | 1         | 1   | 1  | 1  | 1                        | 1  | 1  | 20 | 202   | 1903 | 6    | 1345 | 1263 | 14740 |                             |  |  |  |
| 9890-10018 MILES, BFLRF COLD START TEST                  |       |          |           |                  |      |                         |       |           |     |    |    |                          |    |    |    |       |      |      |      |      |       |                             |  |  |  |
| 03-24-86                                                 | 9897  | 130.6    | 14.4      | 110              | 2.78 | 6.96                    | -.2   | 12        | 9   | 13 | 1  | 1                        | 4  | 1  | 17 | 156   | 1456 | 17   | 1134 | 1100 | 15229 |                             |  |  |  |
| 10-06-86                                                 | 10025 | 121.5    | 13.7      | 110              | 2.24 | 9.19                    | 0.0   | 31        | 15  | 7  | 5  | 2                        | 1  | 0  | 14 | 133   | 1190 | 30   | 1230 | 1210 | 15471 |                             |  |  |  |
| 12-11-86                                                 | 11251 | 123.4    | 17.3      | 154              | 3.37 | 4.83                    | 0.0   | 117       | 76  | 32 | 11 | 7                        | 10 | 0  | 23 | 12    | 910  | 50   | 1400 | 1110 | 15697 |                             |  |  |  |
| 02-13-87                                                 | 12546 | 141.6    | 14.9      | 106              | 5.67 | 3.93                    | 0.0   | 156       | 108 | 45 | 17 | 8                        | 18 | 0  | 33 | 6     | 1100 | 50   | 1290 | 1070 | 15061 |                             |  |  |  |
| 04-14-87                                                 | 13644 | 145.2    | 15.0      | 104              | 1.46 | 4.71                    | 0.0   | 233       | 161 | 51 | 27 | 11                       | 26 | 0  | 40 | 6     | 1630 | 50   | 1530 | 1200 | 16029 |                             |  |  |  |
| OIL CHANGE AT 13645 MILES                                |       |          |           |                  |      |                         |       |           |     |    |    |                          |    |    |    |       |      |      |      |      |       |                             |  |  |  |
| 06-16-87                                                 | 14047 | 132.9    | 14.1      | 104              | 5.72 | 7.52                    | 0.0   | 71        | 80  | 43 | 11 | 5                        | 10 | 0  | 24 | 19    | 1770 | 20   | 1350 | 1230 | 16221 |                             |  |  |  |
| 08-14-87                                                 | 16009 | 113.3    | 13.5      | 116              | 5.16 | 6.28                    | 0.0   | 105       | 112 | 56 | 18 | 8                        | 14 | 0  | 20 | 3     | 1770 | 40   | 1270 | 1310 | 16571 |                             |  |  |  |
| 10-14-87                                                 | 16530 | 121.0    | 13.0      | 101              | 7.29 | 4.94                    | 0.0   | 170       | 145 | 60 | 31 | 9                        | 21 | 0  | 42 | 3     | 2040 | 50   | 1320 | 1360 | 16002 |                             |  |  |  |
| OIL CHANGE AT 17529 MILES                                |       |          |           |                  |      |                         |       |           |     |    |    |                          |    |    |    |       |      |      |      |      |       |                             |  |  |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA #1 CH2095                                    |       |            |      | ENGINE TYPE: V-6        |      |            |     | CHEV S-10 |     |    |    | FT. ORD METHANOL VEHICLE |     |    |     |     |      |      |      |      |       | REVISION DATE: AUG 11, 1988 |  |  |  |
|----------------------------------------------------------|-------|------------|------|-------------------------|------|------------|-----|-----------|-----|----|----|--------------------------|-----|----|-----|-----|------|------|------|------|-------|-----------------------------|--|--|--|
| VISCOSITY                                                |       | TBN FUEL   |      | PPM (PARTS PER MILLION) |      | BFLRF CODE |     |           |     |    |    |                          |     |    |     |     |      |      |      |      |       |                             |  |  |  |
| DATE                                                     | QDOH  | 40 C 100 C | VI   | TAN                     | D667 | DIL %      | Fe  | Pb        | Cu  | Sn | Al | Ni                       | Mn  | Si | B   | Mg  | Ca   | P    | Zn   |      |       |                             |  |  |  |
| 05-15-85                                                 | 121   | 42.4       | 9.0  | 200                     | 2.16 | 6.96       | 1.6 | 53        | 54  | 22 | 15 | 15                       | 37  | 6  | 515 | 1   | 15   | 2232 | 852  | 1026 | 14200 |                             |  |  |  |
| 09-03-85                                                 | 1785  | 49.4       | 9.1  | 167                     | 2.60 | 2.68       | 1.8 | 116       | 125 | 25 | 25 | 18                       | 220 | 9  | 650 | 20  | 136  | 2140 | 1150 | 1247 | 14506 |                             |  |  |  |
| OIL CHANGE AT 1785 MILES                                 |       |            |      |                         |      |            |     |           |     |    |    |                          |     |    |     |     |      |      |      |      |       |                             |  |  |  |
| 10-02-85                                                 | 2990  | 82.7       | 11.0 | 136                     | 2.78 | 3.56       | 1.8 | 35        | 26  | 0  | 6  | 5                        | 10  | 2  | 120 | 66  | 489  | 1690 | 1305 | 1513 | 14644 |                             |  |  |  |
| 11-12-85                                                 | 4794  | 83.5       | 11.6 | 130                     | 4.08 | 2.77       | 1.4 | 53        | 50  | 9  | 12 | 10                       | 8   | 2  | 140 | 30  | 519  | 1670 | 1342 | 1527 | 14017 |                             |  |  |  |
| OIL CHANGE AT 4794 MILES                                 |       |            |      |                         |      |            |     |           |     |    |    |                          |     |    |     |     |      |      |      |      |       |                             |  |  |  |
| 02-19-86                                                 | 6134  | 85.9       | 11.5 | 125                     | 3.61 | 2.12       | 1.4 | 32        | 16  | 24 | 3  | 3                        | 3   | 1  | 37  | 73  | 1010 | 215  | 957  | 1126 | 14929 |                             |  |  |  |
| 03-07-86                                                 | 6475  | 84.0       | 11.5 | 120                     | 3.80 | 2.62       | 1.9 | 40        | 24  | 76 | 5  | 4                        | 1   | 1  | 35  | 48  | 943  | 100  | 932  | 1000 | 14950 |                             |  |  |  |
| CONVERTED TO METHANOL AT 6475 MILES and B of A Oil Added |       |            |      |                         |      |            |     |           |     |    |    |                          |     |    |     |     |      |      |      |      |       |                             |  |  |  |
| New Unused B of A Oil                                    |       | 137.4      | 14.4 | 103                     | 3.01 | 10.61      |     | 1         | <1  | <1 | 1  | <1                       | <1  |    | 20  | 202 | 1903 | 6    | 1345 | 1263 | 14740 |                             |  |  |  |
| 05-19-86                                                 | 7304  | 131.2      | 14.1 | 105                     | 3.70 | 8.41       | 0.0 | 90        | 73  | 28 | 12 | 13                       | 4   | 0  | 20  | 45  | 2090 | 90   | 1400 | 1400 | 15165 |                             |  |  |  |
| 08-22-86                                                 | 10186 | 140.6      | 15.0 | 108                     | 6.68 | 4.38       | 0.0 | 104       | 210 | 30 | 35 | 18                       | 11  | 0  | 23  | 3   | 1490 | 70   | 1260 | 1390 | 15399 |                             |  |  |  |
| 09-24-86                                                 | 11354 | 151.0      | 16.1 | 112                     | 8.08 | 4.15       | 0.0 | 105       | 191 | 29 | 33 | 16                       | 12  | 0  | 22  | 3   | 1410 | 70   | 1220 | 1290 | 15462 |                             |  |  |  |
| OIL CHANGE AT 11355 MILES                                |       |            |      |                         |      |            |     |           |     |    |    |                          |     |    |     |     |      |      |      |      |       |                             |  |  |  |
| 10-02-86                                                 | 12402 | 137.9      | 16.0 | 132                     | 3.14 | 1.52       | 0.0 | 32        | 57  | 15 | 13 | 6                        | 3   | 0  | 15  | 13  | 1140 | 40   | 980  | 1250 | 15508 |                             |  |  |  |
| 12-11-86                                                 | 13604 | 140.5      | 14.7 | 104                     | 5.39 | 6.40       | 0.0 | 62        | 73  | 18 | 19 | 12                       | 5   | 0  | 19  | 6   | 1540 | 50   | 1500 | 1200 | 15690 |                             |  |  |  |
| OIL CHANGE AT 14921 MILES                                |       |            |      |                         |      |            |     |           |     |    |    |                          |     |    |     |     |      |      |      |      |       |                             |  |  |  |
| 03-05-87                                                 | 16273 | 141.1      | 13.0 | 93                      | 6.28 | 6.62       | 0.0 | 115       | 32  | 65 | 12 | 10                       | 2   | 0  | 20  | 4   | 1760 | 20   | 1270 | 1140 | 15912 |                             |  |  |  |
| 04-02-87                                                 | 17571 | 135.5      | 15.0 | 122                     | 3.93 | 5.27       | 0.0 | 124       | 46  | 53 | 9  | 15                       | 3   | 0  | 14  | 2   | 1490 | 30   | 1150 | 1210 | 15999 |                             |  |  |  |
| 05-12-87                                                 | 19310 | 151.2      | 16.4 | 115                     | 3.93 | 5.72       | 0.0 | 199       | 96  | 60 | 10 | 15                       | 5   | 0  | 16  | 11  | 1030 | 40   | 1410 | 1210 | 16079 |                             |  |  |  |
| OIL CHANGE AT 19311 MILES                                |       |            |      |                         |      |            |     |           |     |    |    |                          |     |    |     |     |      |      |      |      |       |                             |  |  |  |
| 06-16-87                                                 | 21025 | 138.5      | 16.5 | 128                     | 6.00 | 5.84       | 0.0 | 69        | 31  | 30 | 7  | 9                        | 2   | 0  | 11  | 1   | 1690 | 30   | 1310 | 1240 | 16222 |                             |  |  |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA #: CM2895 |       |                         | ENGINE TYPE: V-6 |            |                         | CHEV S-10 |     |     | FT. ORD METHANOL VEHICLE |     |    |    |   |    |    |    |      |      | REVISION DATE: AUG 11, 1988 |       |       |  |  |
|-----------------------|-------|-------------------------|------------------|------------|-------------------------|-----------|-----|-----|--------------------------|-----|----|----|---|----|----|----|------|------|-----------------------------|-------|-------|--|--|
| DATE                  | ODOM  | VISCOSITY<br>40 C 100 C | TEH FUEL         |            | PPM (PARTS PER MILLION) |           |     |     |                          |     |    |    |   |    |    |    |      |      |                             | BFLRF |       |  |  |
|                       |       |                         | TAN              | 0664 OIL % | Fe                      | Pb        | Cu  | Sn  | Al                       | Hi  | Mn | Si | B | Mg | Ca | P  | Zn   | CODE |                             |       |       |  |  |
| 07-14-87              | 22243 | 140.3                   | 16.0             | 129        | 3.14                    | 6.28      | 0.0 | 79  | 34                       | 26  | 9  | 11 | 3 | 0  | 10 | 46 | 1220 | 30   | 1370                        | 970   | 16440 |  |  |
| 10-24-87              | 23319 | 104.9                   | 12.0             | 117        | 3.37                    | 2.92      | 0.0 | 312 | 103                      | 103 | 11 | 14 | 5 | 0  | 16 | 0  | 1100 | 40   | 1350                        | 1190  | 16258 |  |  |
| 02-16-88              | 24261 | 95.0                    | 12.1             | 119        | 6.40                    | 4.38      | 0.0 | 498 | 221                      | 43  | 22 | 19 | 9 | 0  | 25 | 0  | 1250 | 30   | 1060                        | 1290  | 17512 |  |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA #: CM2896                                    |       |          |            | ENGINE TYPE: L-4        |      |       |     | CHEV S-10 |    |    |    | FT. ORD METHANOL VEHICLE |    |       |     |      |      |      |      |       |  | REVISION DATE: AUG 11, 1988 |  |  |  |
|----------------------------------------------------------|-------|----------|------------|-------------------------|------|-------|-----|-----------|----|----|----|--------------------------|----|-------|-----|------|------|------|------|-------|--|-----------------------------|--|--|--|
| VISCOSITY                                                |       | TBN FUEL |            | PPM (PARTS PER MILLION) |      |       |     |           |    |    |    |                          |    | BFLRF |     |      |      |      |      |       |  |                             |  |  |  |
| 40 C 100 C                                               | VI    | TAN      | D664 OIL % | F <sub>2</sub>          | Pb   | Cu    | Sn  | Al        | Ni | Mn | Si | B                        | Mg | Ca    | P   | Zn   | CODE |      |      |       |  |                             |  |  |  |
| DATE                                                     | ODOM  |          |            |                         |      |       |     |           |    |    |    |                          |    |       |     |      |      |      |      |       |  |                             |  |  |  |
| 06-05-85                                                 | 151   | 47.9     | 8.5        | 2.12                    | 5.39 | 1.8   | 30  | 20        | 59 | 16 | 1  | 11                       | 4  | 270   | 62  | 542  | 770  | 1076 | 1217 | 14263 |  |                             |  |  |  |
| 08-29-85                                                 | 2869  | 51.6     | 8.8        | 3.38                    | 2.34 | 1.6   | 72  | 95        | 65 | 36 | 3  | 120                      | 7  | 370   | 24  | 596  | 950  | 1040 | 1231 | 14590 |  |                             |  |  |  |
| OIL CHANGE AT 2869 MILES                                 |       |          |            |                         |      |       |     |           |    |    |    |                          |    |       |     |      |      |      |      |       |  |                             |  |  |  |
| 11-08-85                                                 | 6109  | 88.7     | 12.3       | 3.63                    | 2.88 | .9    | 26  | 43        | 24 | 12 | 2  | 3                        | 1  | 82    | 44  | 575  | 1640 | 1265 | 1497 | 14720 |  |                             |  |  |  |
| OIL CHANGE AT 6109 MILES                                 |       |          |            |                         |      |       |     |           |    |    |    |                          |    |       |     |      |      |      |      |       |  |                             |  |  |  |
| 12-13-85                                                 | 7267  | 72.8     | 10.2       | 2.53                    | 3.52 | 1.0   | 55  | 17        | 85 | 7  | 4  | 2                        | 21 | 25    | 93  | 1072 | 171  | 1033 | 1155 | 14816 |  |                             |  |  |  |
| CONVERTED TO METHANOL AT 8622 MILES and B of A Oil Added |       |          |            |                         |      |       |     |           |    |    |    |                          |    |       |     |      |      |      |      |       |  |                             |  |  |  |
| New Unused B of A Oil                                    |       | 137.4    | 14.4       | 103                     | 3.01 | 10.61 | 1   | 41        | 41 | 1  | 1  | 1                        | 1  | 20    | 282 | 1903 | 6    | 1345 | 1263 | 14748 |  |                             |  |  |  |
| 02-19-86                                                 | 8623  | 89.7     | 11.8       | 123                     | 3.38 | 2.88  | 16  | 40        | 88 | 7  | 1  | 2                        | 1  | 29    | 73  | 980  | 170  | 974  | 1007 | 14914 |  |                             |  |  |  |
| 03-26-86                                                 | 9150  | 128.0    | 13.5       | 100                     | 2.93 | 6.21  | 44  | 237       | 33 | 24 | 3  | 3                        | 0  | 29    | 120 | 1735 | 77   | 1302 | 1256 | 15017 |  |                             |  |  |  |
| 05-19-86                                                 | 10105 | 127.6    | 13.9       | 106                     | 7.70 | 6.45  | 75  | 261       | 48 | 44 | 6  | 10                       | 0  | 29    | 15  | 1428 | 110  | 1100 | 1100 | 15166 |  |                             |  |  |  |
| 08-22-86                                                 | 11358 | 138.1    | 15.5       | 116                     | 7.85 | 5.67  | 123 | 271       | 49 | 47 | 12 | 17                       | 0  | 46    | 4   | 1410 | 130  | 1270 | 1400 | 15400 |  |                             |  |  |  |
| 11-25-86                                                 | 12624 | 123.7    | 13.7       | 107                     | 4.94 | 6.17  | 145 | 261       | 45 | 26 | 13 | 16                       | 0  | 40    | 2   | 1600 | 630  | 1270 | 1270 | 15600 |  |                             |  |  |  |
| OIL CHANGE AT 13404 MILES                                |       |          |            |                         |      |       |     |           |    |    |    |                          |    |       |     |      |      |      |      |       |  |                             |  |  |  |
| 03-05-87                                                 | 13405 | 131.0    | 14.0       | 104                     | 4.38 | 7.97  | 55  | 72        | 23 | 12 | 3  | 5                        | 0  | 28    | 31  | 1420 | 70   | 1210 | 1060 | 15914 |  |                             |  |  |  |
| OIL CHANGE AT 14525 MILES                                |       |          |            |                         |      |       |     |           |    |    |    |                          |    |       |     |      |      |      |      |       |  |                             |  |  |  |
| 06-23-87                                                 | 14535 | 103.4    | 11.7       | 101                     | 3.70 | 6.40  | 39  | 24        | 15 | 0  | 4  | 3                        | 0  | 19    | 10  | 1160 | 440  | 1170 | 1200 | 16247 |  |                             |  |  |  |
| 10-21-87                                                 | 15569 | 143.6    | 14.7       | 101                     | 5.05 | 7.07  | 48  | 34        | 18 | 9  | 3  | 4                        | 0  | 17    | 26  | 2080 | 80   | 1450 | 1100 | 16754 |  |                             |  |  |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA #: CM2097                                    |  |       |  | ENGINE TYPE: V-6 |  |      |  | CHEV S-10 |  |       |  | FT. ORD METHANOL VEHICLE |  |      |  |     |  |     |  |    |  | REVISION DATE: AUG 11, 1988 |  |    |  |     |  |    |  |     |  |      |  |      |  |      |  |      |  |       |  |            |  |
|----------------------------------------------------------|--|-------|--|------------------|--|------|--|-----------|--|-------|--|--------------------------|--|------|--|-----|--|-----|--|----|--|-----------------------------|--|----|--|-----|--|----|--|-----|--|------|--|------|--|------|--|------|--|-------|--|------------|--|
| DATE                                                     |  | ODOM  |  | VISCOSITY        |  | TBN  |  | FUEL      |  | VI    |  | TAN                      |  | FUEL |  | Fe  |  | Pb  |  | Cu |  | Sn                          |  | Al |  | Ni  |  | Mn |  | Si  |  | B    |  | Mg   |  | Ca   |  | P    |  | Zn    |  | BFLAF CODE |  |
| 05-15-85                                                 |  | 34    |  | 37.3             |  | 8.3  |  | 207       |  | 1.90  |  | 6.26                     |  | 4.3  |  | 41  |  | 33  |  | 11 |  | 8                           |  | 3  |  | 32  |  | 4  |  | 451 |  | 1    |  | 16   |  | 2131 |  | 868  |  | 1012  |  | 14282      |  |
| 08-29-85                                                 |  | 2333  |  | 45.3             |  | 8.6  |  | 171       |  | 3.09  |  | 2.10                     |  | 1.7  |  | 164 |  | 111 |  | 22 |  | 39                          |  | 10 |  | 310 |  | 10 |  | 900 |  | <1   |  | 21   |  | 2350 |  | 1070 |  | 1150  |  | 14503      |  |
| OIL CHANGE AT 2333 MILES                                 |  |       |  |                  |  |      |  |           |  |       |  |                          |  |      |  |     |  |     |  |    |  |                             |  |    |  |     |  |    |  |     |  |      |  |      |  |      |  |      |  |       |  |            |  |
| 10-30-85                                                 |  | 3496  |  | 70.1             |  | 11.2 |  | 134       |  | 2.81  |  | 2.65                     |  | 1.6  |  | 32  |  | 16  |  | 6  |  | 9                           |  | 3  |  | 3   |  | 1  |  | 110 |  | 48   |  | 303  |  | 1620 |  | 1114 |  | 1140  |  | 14710      |  |
| 01-07-86                                                 |  | 4760  |  | 84.8             |  | 11.5 |  | 127       |  | 4.53  |  | 2.46                     |  | 1.4  |  | 74  |  | 49  |  | 10 |  | 13                          |  | 0  |  | 4   |  | 2  |  | 159 |  | 20   |  | 490  |  | 1660 |  | 1270 |  | 1393  |  | 14851      |  |
| OIL CHANGE AT 4760 MILES                                 |  |       |  |                  |  |      |  |           |  |       |  |                          |  |      |  |     |  |     |  |    |  |                             |  |    |  |     |  |    |  |     |  |      |  |      |  |      |  |      |  |       |  |            |  |
| 01-29-86                                                 |  | 5751  |  | 82.9             |  | 11.6 |  | 131       |  | 2.82  |  | 2.57                     |  | 1.4  |  | 20  |  | 11  |  | 95 |  | 5                           |  | 2  |  | <1  |  | 34 |  | 106 |  | 1027 |  | 190  |  | 971  |  | 1076 |  | 14879 |  |            |  |
| 02-27-86                                                 |  | 6960  |  | 84.7             |  | 11.5 |  | 126       |  | 3.51  |  | 2.19                     |  | 1.9  |  | 28  |  | 14  |  | 79 |  | 5                           |  | 3  |  | <1  |  | 40 |  | 56  |  | 966  |  | 170  |  | 934  |  | 1009 |  | 14915 |  |            |  |
| 03-14-86                                                 |  | 7576  |  | 87.1             |  | 11.7 |  | 125       |  | 4.46  |  | 2.33                     |  | 0.0  |  | 35  |  | 23  |  | 04 |  | 6                           |  | 3  |  | <1  |  | 43 |  | 38  |  | 1002 |  | 190  |  | 877  |  | 993  |  | 14973 |  |            |  |
| CONVERTED TO METHANOL AT 7576 MILES and B of A Oil Added |  |       |  |                  |  |      |  |           |  |       |  |                          |  |      |  |     |  |     |  |    |  |                             |  |    |  |     |  |    |  |     |  |      |  |      |  |      |  |      |  |       |  |            |  |
| New Unused B of A Oil                                    |  | 137.4 |  | 14.4             |  | 103  |  | 3.01      |  | 10.61 |  | 1                        |  | <1   |  | <1  |  | <1  |  | 1  |  | 1                           |  | 1  |  | 1   |  | 20 |  | 282 |  | 1903 |  | 6    |  | 1345 |  | 1263 |  | 14748 |  |            |  |
| 05-15-86                                                 |  | 8288  |  | 130.0            |  | 13.5 |  | 99        |  | 4.77  |  | 8.13                     |  | 0.0  |  | 54  |  | 235 |  | 30 |  | 30                          |  | 6  |  | 3   |  | 0  |  | 26  |  | 57   |  | 1850 |  | 70   |  | 1350 |  | 1270  |  | 15167      |  |
| 07-03-86                                                 |  | 9670  |  | 133.5            |  | 18.4 |  | 159       |  | 4.21  |  | 5.83                     |  | 0.0  |  | 66  |  | 244 |  | 29 |  | 33                          |  | 12 |  | 6   |  | 0  |  | 28  |  | 5    |  | 1480 |  | 60   |  | 1400 |  | 1110  |  | 15229      |  |
| 07-22-86                                                 |  | 10500 |  | 137.2            |  | 14.5 |  | 105       |  | 5.89  |  | 6.11                     |  | 0.0  |  | 76  |  | 290 |  | 32 |  | 41                          |  | 13 |  | 9   |  | 0  |  | 30  |  | 27   |  | 1660 |  | 70   |  | 1340 |  | 1440  |  | 15326      |  |
| 08-29-86                                                 |  | 11826 |  | 147.0            |  | 15.5 |  | 107       |  | 5.90  |  | 4.94                     |  | 0.0  |  | 101 |  | 291 |  | 35 |  | 44                          |  | 15 |  | 11  |  | 0  |  | 31  |  | 3    |  | 1680 |  | 70   |  | 1300 |  | 1450  |  | 15403      |  |
| OIL CHANGE AT 11826 MILES                                |  |       |  |                  |  |      |  |           |  |       |  |                          |  |      |  |     |  |     |  |    |  |                             |  |    |  |     |  |    |  |     |  |      |  |      |  |      |  |      |  |       |  |            |  |
| 10-02-86                                                 |  | 13019 |  | 140.1            |  | 15.2 |  | 111       |  | 4.21  |  | 7.97                     |  | 0.0  |  | 40  |  | 88  |  | 19 |  | 13                          |  | 6  |  | 2   |  | 0  |  | 21  |  | 27   |  | 1790 |  | 50   |  | 1430 |  | 1500  |  | 15469      |  |
| 11-06-86                                                 |  | 14273 |  | 138.9            |  | 15.4 |  | 113       |  | 5.39  |  | 6.85                     |  | 0.0  |  | 41  |  | 57  |  | 13 |  | 14                          |  | 7  |  | 4   |  | 0  |  | 14  |  | 4    |  | 1230 |  | 30   |  | 1050 |  | 1000  |  | 15529      |  |
| 12-12-86                                                 |  | 15427 |  | 148.3            |  | 14.8 |  | 99        |  | 4.66  |  | 4.94                     |  | 0.0  |  | 95  |  | 118 |  | 19 |  | 20                          |  | 12 |  | 10  |  | 0  |  | 20  |  | 6    |  | 1550 |  | 70   |  | 1480 |  | 1220  |  | 15701      |  |
| OIL CHANGE AT 15427 MILES                                |  |       |  |                  |  |      |  |           |  |       |  |                          |  |      |  |     |  |     |  |    |  |                             |  |    |  |     |  |    |  |     |  |      |  |      |  |      |  |      |  |       |  |            |  |
| 04-02-87                                                 |  | 18141 |  | 145.8            |  | 14.8 |  | 101       |  | 6.28  |  | 5.39                     |  | 0.0  |  | 88  |  | 76  |  | 14 |  | 9                           |  | 13 |  | 11  |  | 0  |  | 17  |  | 1    |  | 1450 |  | 20   |  | 1140 |  | 1240  |  | 16000      |  |
| 05-14-87                                                 |  | 19510 |  | 166.8            |  | 19.3 |  | 132       |  | 7.07  |  | 4.26                     |  | 0.0  |  | 202 |  | 127 |  | 18 |  | 16                          |  | 17 |  | 13  |  | 0  |  | 22  |  | 2    |  | 2110 |  | 50   |  | 1620 |  | 1340  |  | 16098      |  |
| OIL CHANGE AT 19511 MILES                                |  |       |  |                  |  |      |  |           |  |       |  |                          |  |      |  |     |  |     |  |    |  |                             |  |    |  |     |  |    |  |     |  |      |  |      |  |      |  |      |  |       |  |            |  |
| 05-24-87                                                 |  | 20980 |  | 121.9            |  | 14.4 |  | 119       |  | 3.03  |  | 7.41                     |  | 0.0  |  | 59  |  | 34  |  | 12 |  | 7                           |  | 9  |  | 4   |  | 0  |  | 12  |  | 4    |  | 1420 |  | 30   |  | 1240 |  | 1120  |  | 16426      |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA #: CM2897 |       | ENGINE TYPE: V-6 |       | CHEV S-10 |      | FT. ORD METHANOL VEHICLE |                    | REVISION DATE: AUG 11, 1988 |     |    |    |                         |   |      |     |      |               |
|-----------------------|-------|------------------|-------|-----------|------|--------------------------|--------------------|-----------------------------|-----|----|----|-------------------------|---|------|-----|------|---------------|
| DATE                  | ODOM  | VISCOSITY        |       | VI        | TAN  | TBN                      | FUEL<br>0664 DIL % | Fe                          | Pb  | Cu | Sn | PPM (PARTS PER MILLION) |   |      |     |      | BFLRF<br>CODE |
|                       |       | 40 C             | 100 C |           |      |                          |                    |                             |     |    |    | Si                      | B | Mg   | Ca  | P    | Zn            |
| 08-05-87              | 22210 | 131.5            | 21.5  | 191       | 5.27 | 4.15                     | 0.0                | 103                         | 103 | 12 | 9  | 14                      | 2 | 1190 | 140 | 1240 | 1150          |
| 10-14-87              | 23636 | 145.1            | 14.5  | 90        | 5.61 | 3.59                     | 0.0                | 218                         | 84  | 16 | 11 | 24                      | 1 | 1540 | 310 | 1300 | 1440          |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA 01 CM2090                                    |       |          |      | ENGINE TYPE: V-6        |      |       |     | CHEV S-10 |     |    |    | FT. ORD METHANOL VEHICLE |    |       |     |     |      |      |      |      |       | REVISION DATE: AUG 11, 1988 |  |  |  |
|----------------------------------------------------------|-------|----------|------|-------------------------|------|-------|-----|-----------|-----|----|----|--------------------------|----|-------|-----|-----|------|------|------|------|-------|-----------------------------|--|--|--|
| VISCOSITY                                                |       | TBM FUEL |      | PPH (PARTS PER MILLION) |      |       |     |           |     |    |    |                          |    | BFLRF |     |     |      |      |      |      |       |                             |  |  |  |
| 40 C                                                     | 100 C | VI       | TAN  | D664 OIL %              | Fe   | Pb    | Cu  | Sn        | Al  | Mn | Si | B                        | Hg | Ce    | P   | Zn  | CODE |      |      |      |       |                             |  |  |  |
| -----                                                    |       |          |      |                         |      |       |     |           |     |    |    |                          |    |       |     |     |      |      |      |      |       |                             |  |  |  |
| 05-15-85                                                 | 106   | 37.0     | 0.2  | 204                     | 2.04 | 6.28  | 3.4 | 48        | 36  | 13 | 13 | 4                        | 41 | 7     | 546 | 1   | 21   | 2225 | 010  | 1009 | 14201 |                             |  |  |  |
| 06-20-85                                                 | 3017  | 52.9     | 9.5  | 167                     | 2.95 | 4.04  | 1.2 | 155       | 124 | 23 | 41 | 12                       | 44 | 16    | 857 | 0   | 23   | 2605 | 1100 | 1354 | 14367 |                             |  |  |  |
| OIL CHANGE AT 3017 MILES                                 |       |          |      |                         |      |       |     |           |     |    |    |                          |    |       |     |     |      |      |      |      |       |                             |  |  |  |
| 08-30-85                                                 | 5499  | 108.5    | 13.9 | 129                     | 2.19 | 2.17  | .8  | 60        | 32  | 10 | 9  | 6                        | 40 | 2     | 130 | 2   | 389  | 930  | 999  | 1105 | 14570 |                             |  |  |  |
| OIL CHANGE AT 5499 MILES                                 |       |          |      |                         |      |       |     |           |     |    |    |                          |    |       |     |     |      |      |      |      |       |                             |  |  |  |
| CONVERTED TO METHANOL AT 5606 MILES and 0 of A Oil Added |       |          |      |                         |      |       |     |           |     |    |    |                          |    |       |     |     |      |      |      |      |       |                             |  |  |  |
| New Unused B of A Oil                                    |       | 137.4    | 14.4 | 103                     | 3.01 | 10.61 |     | 1         | <1  | <1 | <1 | 1                        | <1 | <1    | 20  | 202 | 1963 | 6    | 1345 | 1263 | 14740 |                             |  |  |  |
| 09-09-85                                                 | 5607  | 86.9     | 12.1 | 134                     | 2.23 | 4.89  | 1.2 | 20        | 7   | 3  | 3  | 2                        | 2  | 1     | 33  | 72  | 486  | 1440 | 1235 | 1350 | 14602 |                             |  |  |  |
| 11-27-85                                                 | 5807  | 121.4    | 13.1 | 102                     | 2.04 | 5.70  | .9  | 97        | 19  | 17 | 0  | 6                        | 2  | 3     | 32  | 173 | 1056 | 167  | 1210 | 1144 | 14739 |                             |  |  |  |
| 02-27-86                                                 | 6095  | 120.2    | 13.5 | 100                     | 2.06 | 3.78  | 0.0 | 124       | 370 | 22 | 51 | 10                       | 2  | 5     | 43  | 17  | 1205 | 150  | 1274 | 1239 | 14916 |                             |  |  |  |
| 04-24-86                                                 | 8348  | 141.0    | 14.2 | 97                      | 3.96 | 2.47  | 0.0 | 196       | 442 | 26 | 60 | 13                       | 9  | 7     | 79  | 4   | 1177 | 1310 | 1244 | 1236 | 15110 |                             |  |  |  |
| 06-11-86                                                 | 9460  | 142.5    | 14.4 | 99                      | 6.17 | 3.70  | 0.0 | 193       | 347 | 30 | 59 | 18                       | 11 | 19    | 67  | 3   | 1150 | 130  | 1260 | 1260 | 15193 |                             |  |  |  |
| OIL CHANGE AT 11160 MILES                                |       |          |      |                         |      |       |     |           |     |    |    |                          |    |       |     |     |      |      |      |      |       |                             |  |  |  |
| 08-22-86                                                 | 11161 | 132.3    | 14.3 | 107                     | 3.25 | 8.70  | 0.0 | 41        | 76  | 14 | 11 | 6                        | 2  | 0     | 22  | 75  | 1640 | 40   | 1200 | 1390 | 15401 |                             |  |  |  |
| 10-19-86                                                 | 12177 | 130.6    | 14.5 | 111                     | 3.93 | 7.97  | 0.0 | 31        | 36  | 11 | 9  | 3                        | 1  | 0     | 15  | 17  | 1130 | 40   | 910  | 1190 | 15511 |                             |  |  |  |
| 12-18-86                                                 | 13323 | 142.5    | 14.5 | 108                     | 5.04 | 5.27  | 0.0 | 92        | 56  | 13 | 9  | 11                       | 3  | 0     | 27  | 3   | 1900 | 50   | 1620 | 1290 | 15711 |                             |  |  |  |
| 03-06-87                                                 | 14425 | 154.1    | 14.2 | 88                      | 6.20 | 4.49  | 0.0 | 170       | 60  | 13 | 13 | 9                        | 10 | 0     | 30  | 2   | 1420 | 40   | 1310 | 1140 | 15916 |                             |  |  |  |
| 05-19-87                                                 | 15614 | 157.7    | 15.7 | 102                     | 2.69 | 5.50  | 0.0 | 270       | 99  | 16 | 17 | 14                       | 10 | 0     | 29  | 14  | 2010 | 60   | 1640 | 1390 | 16101 |                             |  |  |  |
| OIL CHANGE AT 15615 MILES                                |       |          |      |                         |      |       |     |           |     |    |    |                          |    |       |     |     |      |      |      |      |       |                             |  |  |  |
| 07-17-87                                                 | 16016 | 134.9    | 13.0 | 98                      | 6.06 | 7.52  | 0.0 | 49        | 10  | 0  | 0  | 5                        | 3  | 0     | 15  | 6   | 1690 | 10   | 1070 | 1160 | 16453 |                             |  |  |  |
| 10-24-87                                                 | 17093 | 147.5    | 14.1 | 92                      | 0.30 | 5.72  | 0.0 | 110       | 29  | 12 | 9  | 9                        | 4  | 0     | 21  | 3   | 2100 | 40   | 1620 | 1320 | 16756 |                             |  |  |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

REVISION DATE: AUG 11, 1980

FT. ORD METHANOL VEHICLE

CHEV S-10

VEHICLE USA #: CM2899

ENGINE TYPE: L-4

| DATE     | ODOM | VISCOSITY |       | VI  | TAN  | TBN  | FUEL | Fe | Pb | Cu | Sn | Al | PPM (PARTS PER MILLION) |   |     |    |     |      | Hg   | Ca   | P     | Zn | 9FLRF<br>CODE |
|----------|------|-----------|-------|-----|------|------|------|----|----|----|----|----|-------------------------|---|-----|----|-----|------|------|------|-------|----|---------------|
|          |      | 40 C      | 100 C |     |      |      |      |    |    |    |    |    | Si                      | B | Mn  | Ni | Mo  |      |      |      |       |    |               |
| 06-05-85 | 1079 | 50.5      | 8.7   | 152 | 3.06 | 4.50 | 1-2  | 66 | 43 | 23 | 23 | 3  | 11                      | 5 | 284 | 12 | 134 | 1398 | 1040 | 1227 | 14260 |    |               |
| 77-24-85 | 4702 | 74.5      | 9.9   | 113 | 3.42 | 3.51 | 1.4  | 52 | 72 | 15 | 20 | 2  | 8                       | 4 | 157 | 21 | 687 | 897  | 932  | 1031 | 14466 |    |               |

OIL CHANGE AT 5038 MILES

09-03-85 5405 82.5 11.7 134 2.21 4.95 1.6 14 15 84 3 .1 10 <1 40 90 1030 130 1028 1100 14593  
TRANSFERRED TO JPL

CONVERTED TO METHANOL AT 7892 MILES and 8 of A Oil Added

New Unused B of A Oil  
137.4 14.4 103 3.01 10.61 1 <1 <1 <1 <1 <1 20 282 1983 6 1345 1263 14740

OIL CHANGE AT 7893 MILES

RETURNED TO FOCA ON 9-11-86

09-08-86 7904 128.9 14.1 107 2.75 4.88 0.0 124 403 43 55 19 15 0 50 18 1140 70 1240 1350 15407  
01-14-87 10162 130.2 14.1 106 7.13 6.17 0.0 107 128 30 24 12 14 0 45 3 1450 70 1540 1056 15626  
06-02-87 12360 135.4 14.5 106 6.40 7.29 0.0 81 134 38 20 6 0 0 20 16 2380 100 1570 1420 16147

OIL CHANGE AT 13645 MILES

10-16-87 15706 152.1 15.5 104 3.20 9.99 0.0 19 16 9 3 4 2 0 11 60 2030 30 1270 1090 16787  
05-16-88 20618 151.6 15.6 105 3.82 4.49 0.0 238 273 66 21 13 23 0 35 2 1530 60 1100 1280 17632

TRANSFERRED TO SIDP @ 20618 MILES

OIL CHANGE TO PARAMINS 10W30 AT 20618 MI

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA #; CH2900                                    |       |          |      | ENGINE TYPE; V-6        |      |       |      | CHEV S-10 |     |    |    | FT. ORD METHANOL VEHICLE |     |       |     |     |      |      |      |      |       | REVISION DATE; AUG 11, 1988 |  |  |  |
|----------------------------------------------------------|-------|----------|------|-------------------------|------|-------|------|-----------|-----|----|----|--------------------------|-----|-------|-----|-----|------|------|------|------|-------|-----------------------------|--|--|--|
| VISCOSITY                                                |       | TBN FUEL |      | PPH (PARTS PER MILLION) |      |       |      |           |     |    |    |                          |     | BFLRF |     |     |      |      |      |      |       |                             |  |  |  |
| 40 C                                                     | 100 C | VI       | TAN  | D664 OIL %              | Fe   | Pb    | Cu   | Sn        | Al  | Hi | Mn | Si                       | B   | Mg    | Ca  | P   | Zn   | CODE |      |      |       |                             |  |  |  |
| -----                                                    |       |          |      |                         |      |       |      |           |     |    |    |                          |     |       |     |     |      |      |      |      |       |                             |  |  |  |
| DATE                                                     | ODOM  | 20       | 49.9 | 8.5                     | 147  | 2.13  | 4.83 | 2.6       | 107 | 28 | 23 | 26                       | 5   | 28    | 19  | 346 | <1   | 12   | 1535 | 936  | 1047  | 14193                       |  |  |  |
| HAD ACCIDENT AT 1700 MILES                               |       |          |      |                         |      |       |      |           |     |    |    |                          |     |       |     |     |      |      |      |      |       |                             |  |  |  |
| 08-30-85                                                 | 2563  | 58.7     | 8.7  | 124                     | 2.25 | 3.48  | .9   | 107       | 54  | 23 | 29 | 5                        | 130 | 11    | 540 | 20  | 496  | 990  | 1072 | 1163 | 14577 |                             |  |  |  |
| OIL CHANGE AT 2563 MILES                                 |       |          |      |                         |      |       |      |           |     |    |    |                          |     |       |     |     |      |      |      |      |       |                             |  |  |  |
| 10-11-85                                                 | 3953  | 84.6     | 11.7 | 130                     | 2.56 | 3.19  | 1.0  | 35        | 17  | 7  | 11 | 2                        | 6   | 2     | 108 | 61  | 532  | 1510 | 1267 | 1329 | 14705 |                             |  |  |  |
| 12-19-85                                                 | 5715  | 88.9     | 11.4 | 118                     | 3.40 | 3.62  | 1.7  | 59        | 30  | 8  | 18 | 7                        | 4   | 2     | 124 | 25  | 537  | 1688 | 1207 | 1338 | 14841 |                             |  |  |  |
| OIL CHANGE AT 5913 MILES                                 |       |          |      |                         |      |       |      |           |     |    |    |                          |     |       |     |     |      |      |      |      |       |                             |  |  |  |
| 12-24-85                                                 | 5914  | 88.4     | 12.1 | 130                     | 2.53 | 5.97  | 1.7  | 11        | 5   | 82 | 1  | 1                        | <1  | <1    | 22  | 110 | 935  | 101  | 913  | 992  | 14842 |                             |  |  |  |
| 01-08-86                                                 | 7296  | 98.4     | 12.1 | 127                     | 2.86 | 2.73  | 1.3  | 20        | 9   | 96 | 4  | 2                        | <1  | 1     | 20  | 87  | 1024 | 41   | 868  | 1017 | 14843 |                             |  |  |  |
| CONVERTED TO METHANOL AT 7296 MILES and B of A Oil Added |       |          |      |                         |      |       |      |           |     |    |    |                          |     |       |     |     |      |      |      |      |       |                             |  |  |  |
| New Unused B of A Oil                                    |       |          |      |                         |      |       |      |           |     |    |    |                          |     |       |     |     |      |      |      |      |       |                             |  |  |  |
| 03-21-86                                                 | 7862  | 137.4    | 14.4 | 103                     | 3.01 | 10.61 |      | 1         | <1  | <1 | <1 | 1                        | <1  | <1    | 20  | 202 | 1903 | 6    | 1345 | 1263 | 14748 |                             |  |  |  |
| 05-21-86                                                 | 8881  | 128.2    | 13.6 | 101                     | 2.93 | 5.88  | 0.0  | 43        | 28  | 18 | 5  | 5                        | 3   | <1    | 27  | 10  | 1229 | 24   | 1183 | 1158 | 14989 |                             |  |  |  |
| 12-15-86                                                 | 11654 | 130.5    | 13.3 | 96                      | 7.07 | 6.73  | .1   | 75        | 227 | 25 | 35 | 8                        | 4   | 0     | 34  | 7   | 1798 | 108  | 1320 | 1238 | 15168 |                             |  |  |  |
| OIL CHANGE AT 11655 MILES                                |       |          |      |                         |      |       |      |           |     |    |    |                          |     |       |     |     |      |      |      |      |       |                             |  |  |  |
| 03-03-87                                                 | 12745 | 133.8    | 14.3 | 106                     | 5.27 | 6.85  | 0.0  | 63        | 54  | 16 | 10 | 6                        | 2   | 0     | 24  | 14  | 1520 | 60   | 1230 | 1160 | 15988 |                             |  |  |  |
| 06-01-87                                                 | 14103 | 145.9    | 14.4 | 96                      | 6.28 | 5.61  | 0.0  | 165       | 85  | 20 | 19 | 14                       | 5   | 0     | 38  | 2   | 2180 | 90   | 1480 | 1380 | 16146 |                             |  |  |  |
| OIL CHANGE AT 14103 MILES                                |       |          |      |                         |      |       |      |           |     |    |    |                          |     |       |     |     |      |      |      |      |       |                             |  |  |  |
| 09-08-87                                                 | 15196 | 126.3    | 18.9 | 169                     | 2.24 | 5.61  | 0.0  | 86        | 39  | 40 | 7  | 10                       | 4   | 0     | 16  | 7   | 1010 | 170  | 1100 | 1068 | 16674 |                             |  |  |  |
| 10-15-87                                                 | 15668 | 116.5    | 13.1 | 107                     | 6.17 | 4.49  | 0.0  | 109       | 32  | 19 | 7  | 10                       | 2   | 9     | 19  | 3   | 1520 | 158  | 1238 | 1268 | 16887 |                             |  |  |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

REVISION DATE: AUG 11, 1980

| VEHICLE USA 0: CM2901 |          | ENGINE TYPE: V-6 |      | CHEV S-10 |       | FT. ORD METHANOL VEHICLE |     |    |    |    |     |    |     |    |     | REVISION DATE: AUG 11, 1980 |      |      |       |  |  |  |  |  |  |
|-----------------------|----------|------------------|------|-----------|-------|--------------------------|-----|----|----|----|-----|----|-----|----|-----|-----------------------------|------|------|-------|--|--|--|--|--|--|
| VISCOSITY             |          | TBM              |      | FUEL      |       | PPM (PARTS PER MILLION)  |     |    |    |    |     |    |     |    |     | 9FLRF                       |      |      |       |  |  |  |  |  |  |
| 40 C                  | 100 C    | %I               | TAN  | D664      | DIL % | Fe                       | Pb  | Cu | Sn | Al | Mn  | Si | Hg  | Ca | P   | Zn                          | CODE |      |       |  |  |  |  |  |  |
| 44.2                  | 7.9      | 153              | 2.04 | 5.27      | 3.1   | 35                       | 35  | 21 | 14 | 2  | 35  | 5  | 474 | 6  | 121 | 1275                        | 990  | 1152 | 14107 |  |  |  |  |  |  |
| 50.1                  | 0.7      | 152              | 2.25 | 3.62      | 1.1   | 64                       | 60  | 29 | 32 | 5  | 46  | 0  | 652 | 3  | 150 | 1360                        | 1019 | 1160 | 14355 |  |  |  |  |  |  |
| 50.3                  | 0.4      | 142              | 3.32 | 1.61      | 1.7   | 92                       | 132 | 23 | 38 | 5  | 153 | 0  | 676 | 1  | 136 | 1571                        | 1051 | 1136 | 14563 |  |  |  |  |  |  |
| ODOM                  | DATE     |                  |      |           |       |                          |     |    |    |    |     |    |     |    |     |                             |      |      |       |  |  |  |  |  |  |
| 47                    | 05-15-85 |                  |      |           |       |                          |     |    |    |    |     |    |     |    |     |                             |      |      |       |  |  |  |  |  |  |
| 2521                  | 06-19-85 |                  |      |           |       |                          |     |    |    |    |     |    |     |    |     |                             |      |      |       |  |  |  |  |  |  |
| 4915                  | 08-14-85 |                  |      |           |       |                          |     |    |    |    |     |    |     |    |     |                             |      |      |       |  |  |  |  |  |  |

## OIL CHANGE AT 4915 MILES

## CONVERTED TO METHANOL AT 5243 MILES and 8 of A Oil Added

| New Unused B of A Oil |       |       |      |      |       |      |     |     |     |    |    |    |    |     |      |      |      |      |       |  |
|-----------------------|-------|-------|------|------|-------|------|-----|-----|-----|----|----|----|----|-----|------|------|------|------|-------|--|
|                       | 137.4 | 14.4  | 103  | 3.01 | 10.61 |      | 1   | <1  | <1  | 1  | <1 | <1 | 20 | 202 | 1903 | 6    | 1345 | 1263 | 14740 |  |
| 09-09-85              | 5244  | 76.7  | 11.4 | 135  | 2.30  | 4.68 | 1.3 | 17  | 19  | 7  | 0  | 3  | 93 | 77  | 494  | 1510 | 1264 | 1428 | 14604 |  |
| 11-27-85              | 5440  | 124.4 | 13.3 | 101  | 2.32  | 5.32 | .8  | 155 | 17  | 20 | 13 | 6  | 46 | 143 | 1072 | 176  | 1224 | 1159 | 14742 |  |
| 03-27-86              | 6770  | 139.5 | 14.3 | 100  | 2.95  | 2.69 | 0.0 | 215 | 522 | 28 | 65 | 0  | 55 | 6   | 1063 | 40   | 1292 | 1104 | 15010 |  |
| 05-30-86              | 9100  | 142.1 | 15.2 | 109  | 5.69  | 3.37 | .1  | 290 | 433 | 30 | 65 | 14 | 56 | 3   | 1340 | 170  | 1250 | 1210 | 15169 |  |
| 07-01-86              | 10696 | 152.0 | 15.5 | 103  | 7.41  | 2.36 | 0.0 | 260 | 340 | 30 | 65 | 16 | 52 | 3   | 940  | 130  | 1090 | 1130 | 15217 |  |
| 07-31-86              | 11617 | 140.4 | 14.5 | 96   | 6.17  | 2.30 | 0.0 | 342 | 369 | 33 | 72 | 10 | 59 | 4   | 1240 | 190  | 1200 | 1370 | 15329 |  |
| 09-24-86              | 12059 | 161.9 | 15.2 | 94   | 8.02  | 1.35 | 0.0 | 487 | 411 | 40 | 69 | 20 | 61 | 3   | 1300 | 210  | 1290 | 1410 | 15466 |  |

## OIL CHANGE AT 12059 MILES

|          |       |       |      |     |      |      |     |     |     |    |    |    |   |   |    |    |      |    |      |      |       |
|----------|-------|-------|------|-----|------|------|-----|-----|-----|----|----|----|---|---|----|----|------|----|------|------|-------|
| 11-06-86 | 14077 | 140.9 | 14.4 | 100 | 3.93 | 7.41 | 0.0 | 01  | 00  | 17 | 19 | 6  | 3 | 0 | 19 | 21 | 1200 | 50 | 1040 | 1200 | 15530 |
| 01-15-87 | 15640 | 142.0 | 10.0 | 149 | 7.57 | 5.61 | 0.0 | 106 | 121 | 21 | 26 | 10 | 5 | 0 | 26 | 3  | 1400 | 70 | 1530 | 1110 | 15020 |

## OIL CHANGE AT 15649 MILES

|          |       |       |      |     |      |      |     |     |    |    |    |    |   |   |    |    |      |    |      |      |       |
|----------|-------|-------|------|-----|------|------|-----|-----|----|----|----|----|---|---|----|----|------|----|------|------|-------|
| 03-06-87 | 16762 | 133.2 | 14.4 | 107 | 5.27 | 7.29 | 0.0 | 55  | 32 | 11 | 0  | 4  | 2 | 0 | 14 | 15 | 1390 | 20 | 1100 | 1040 | 15917 |
| 05-07-87 | 18104 | 143.7 | 14.9 | 104 | 5.04 | 4.71 | 0.0 | 145 | 40 | 15 | 10 | 11 | 4 | 0 | 20 | 3  | 1920 | 40 | 1370 | 1210 | 16070 |
| 06-19-87 | 19370 | 133.0 | 14.2 | 104 | 4.32 | 7.74 | 0.0 | 59  | 10 | 11 | 0  | 6  | 1 | 0 | 16 | 19 | 1900 | 30 | 1200 | 1410 | 16245 |
| 10-15-87 | 21707 | 147.9 | 15.2 | 104 | 6.73 | 5.95 | 0.0 | 191 | 23 | 14 | 21 | 0  | 6 | 0 | 27 | 5  | 2660 | 40 | 2050 | 1510 | 16000 |

## OIL CHANGE AT 23430 MILES

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2902 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1980

| DATE     | ODOM | VISCOSITY |       | VI  | TAN  | TBM<br>D664 DIL % | PPM (PARTS PER MILLION) |     |    |    |    |    |     |    |     |    | BFLRF<br>CODE |      |      |      |       |
|----------|------|-----------|-------|-----|------|-------------------|-------------------------|-----|----|----|----|----|-----|----|-----|----|---------------|------|------|------|-------|
|          |      | 40 C      | 100 C |     |      |                   | Fc                      | Pb  | Cu | Sn | Al | Mi | Mn  | Si | B   | Hg |               | Ca   | P    | Zn   |       |
| 05-15-85 | 01   | 46.0      | 0.5   | 164 | 2.05 | 3.14              | 2.8                     | 83  | 31 | 16 | 15 | 2  | 43  | 6  | 504 | <1 | 10            | 909  | 967  | 1023 | 14195 |
| 09-03-85 | 3060 | 51.1      | 0.5   | 143 | 2.44 | 1.30              | .9                      | 204 | 07 | 24 | 42 | 0  | 340 | 15 | 900 | <1 | 20            | 1440 | 1112 | 1159 | 14504 |

## OIL CHANGE AT 3060 MILES

|          |      |      |      |     |      |      |     |    |    |    |    |   |    |   |     |    |     |      |      |      |       |
|----------|------|------|------|-----|------|------|-----|----|----|----|----|---|----|---|-----|----|-----|------|------|------|-------|
| 10-29-85 | 6152 | 04.1 | 12.0 | 130 | 2.99 | 2.71 | 1.2 | 42 | 20 | 7  | 10 | 3 | 6  | 2 | 175 | 33 | 362 | 1610 | 1116 | 1147 | 14711 |
| 12-02-85 | 7705 | 09.9 | 12.1 | 120 | 3.06 | 2.30 | 1.4 | 64 | 28 | 10 | 14 | 6 | 14 | 4 | 232 | 40 | 440 | 921  | 1269 | 1307 | 14743 |

## CONVERTED TO METHANOL AT 7705 MILES and 8 of A Oil Added

| New Unused B of A Oil |       |       |      |     |      |       |      |     |     |    |    |    |    |    |    |     |      |     |      |      |       |
|-----------------------|-------|-------|------|-----|------|-------|------|-----|-----|----|----|----|----|----|----|-----|------|-----|------|------|-------|
| 02-28-86              | 9460  | 137.4 | 14.4 | 103 | 3.01 | 10.61 |      | 1   | <1  | <1 | <1 | 1  | <1 | <1 | 20 | 202 | 1903 | 6   | 1345 | 1263 | 14740 |
| 05-07-86              | 10627 | 134.2 | 13.0 | 90  | 2.54 | 3.46  | 0.0  | 73  | 042 | 19 | 90 | 7  | 7  | 3  | 75 | 5   | 1066 | 320 | 1256 | 1195 | 14956 |
| 09-12-86              | 13063 | 126.0 | 13.0 | 95  | 3.16 | 2.54  | 40.0 | 154 | 735 | 21 | 93 | 10 | 7  | 8  | 7  | 3   | 933  | 610 | 1376 | 1395 | 15133 |
| 11-24-86              | 14136 | 100.0 | 14.3 | 69  | 4.20 | 1.50  | 0.0  | 395 | 420 | 33 | 79 | 17 | 0  | 0  | 82 | 2   | 060  | 730 | 1110 | 1550 | 15420 |
|                       |       |       |      |     |      |       |      | 459 | 404 | 32 | 61 | 21 | 7  | 0  | 69 | 1   | 090  | 700 | 1130 | 1400 | 15500 |

## OIL CHANGE AT 14146 MILES

## OIL CHANGE AT 15152 MILES

|          |       |       |      |     |      |      |     |    |     |    |    |    |   |   |    |    |      |     |      |      |       |
|----------|-------|-------|------|-----|------|------|-----|----|-----|----|----|----|---|---|----|----|------|-----|------|------|-------|
| 03-02-87 | 15153 | 89.4  | 16.0 | 204 | 2.69 | 5.27 | 0.0 | 27 | 129 | 20 | 17 | 10 | 3 | 0 | 42 | 6  | 1270 | 320 | 1300 | 1150 | 15090 |
| 05-13-87 | 16390 | 143.1 | 18.6 | 146 | 4.60 | 5.95 | 0.0 | 95 | 49  | 13 | 8  | 9  | 3 | 0 | 22 | 10 | 1660 | 50  | 1270 | 1100 | 16000 |

## OIL CHANGE AT 16391 MILES

|          |       |       |      |     |      |      |     |     |    |    |    |    |   |   |    |   |      |    |      |      |       |
|----------|-------|-------|------|-----|------|------|-----|-----|----|----|----|----|---|---|----|---|------|----|------|------|-------|
| 07-28-87 | 17570 | 130.5 | 13.4 | 97  | 4.49 | 6.85 | 0.0 | 71  | 19 | 9  | 0  | 0  | 2 | 0 | 10 | 7 | 1420 | 10 | 1020 | 950  | 16457 |
| 08-03-87 | 17690 | 130.4 | 14.9 | 100 | 5.61 | 6.96 | 0.0 | 102 | 20 | 11 | 6  | 8  | 3 | 0 | 18 | 3 | 1700 | 30 | 1240 | 1170 | 16469 |
| 10-16-87 | 19003 | 157.7 | 15.7 | 102 | 7.06 | 4.30 | 0.0 | 317 | 58 | 19 | 11 | 14 | 9 | 0 | 45 | 3 | 2100 | 50 | 1470 | 1560 | 16010 |

## OIL CHANGE AT 20419 MILES

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA #: CM3613         |       | ENGINE TYPE: L-4        |      | CHEV CITATION |      | PRESIDIO METHANOL VEHICLE |                | PPH (PARTS PER MILLION) |     | Mg  |    | P  |    | Zn |     | BFLRF |      | REVISION DATE: AUG 11, 1980 |      |
|-------------------------------|-------|-------------------------|------|---------------|------|---------------------------|----------------|-------------------------|-----|-----|----|----|----|----|-----|-------|------|-----------------------------|------|
| DATE                          | ODOM  | VISCOSITY<br>40 C 100 C | VI   | TAN           | TBN  | FUEL<br>D664 OIL %        | F <sub>2</sub> | Pb                      | Cu  | Sn  | Al | Mi | Mn | Si | 0   | 0     | 0    | 0                           | 0    |
| New Unused 8 of A Oil         |       |                         |      |               |      |                           |                |                         |     |     |    |    |    |    |     |       |      |                             |      |
|                               | 137.0 | 13.7                    | 94   | 2.22          |      |                           | 1              | 41                      | 14  | 41  | 1  | 41 | 41 | 10 | 221 | 1140  | 10   | 1555                        | 1257 |
| OIL CHANGE AT 28603 MILES     |       |                         |      |               |      |                           |                |                         |     |     |    |    |    |    |     |       |      |                             |      |
| 05-29-85                      | 18029 | 130.9                   | 13.1 | 94            | 2.40 | 7.07                      | 0.0            | 39                      | 10  | 26  | 5  | 7  | 1  | 1  | 20  | 157   | 1131 | 60                          | 1981 |
| 06-20-85                      | 20125 | 154.5                   | 14.9 | 95            | 3.94 | 2.10                      | 0.0            | 69                      | 173 | 57  | 29 | 9  | 5  | 4  | 23  | 14    | 1110 | 90                          | 1007 |
| 07-08-85                      | 22357 | 107.7                   | 16.0 | 94            | 5.96 | 1.30                      | 0.0            | 97                      | 292 | 105 | 42 | 8  | 15 | 8  | 29  | 6     | 1113 | 314                         | 1771 |
| 08-27-85                      | 28603 | 193.2                   | 17.4 | 96            | 5.05 | 1.57                      | 0.0            | 59                      | 114 | 80  | 22 | 4  | 10 | 2  | 24  | 15    | 1140 | 41                          | 1294 |
| OIL CHANGE AT 28603 MILES     |       |                         |      |               |      |                           |                |                         |     |     |    |    |    |    |     |       |      |                             |      |
| 09-05-85                      | 30320 | 160.7                   | 15.2 | 95            | 2.94 | 4.10                      | 0.0            | 22                      | 24  | 31  | 4  | 2  | 4  | 1  | 15  | 37    | 1134 | 41                          | 1131 |
| 09-23-85                      | 33227 | 106.0                   | 16.9 | 95            | 5.24 | 2.60                      | 0.0            | 44                      | 65  | 63  | 17 | 2  | 0  | 1  | 26  | 15    | 1264 | 36                          | 1204 |
| OIL FILTER CHANGE, 1 QT ADDED |       |                         |      |               |      |                           |                |                         |     |     |    |    |    |    |     |       |      |                             |      |
| OIL CHANGE AT 35239 MILES     |       |                         |      |               |      |                           |                |                         |     |     |    |    |    |    |     |       |      |                             |      |
| 10-07-85                      | 35240 | 159.5                   | 15.0 | 93            | 3.57 | 2.57                      | .1             | 26                      | 42  | 35  | 7  | 3  | 4  | 1  | 22  | 6     | 1302 | 27                          | 1224 |
| 11-08-85                      | 36417 | 143.5                   | 14.2 | 96            | 2.45 | 3.64                      | .4             | 52                      | 50  | 54  | 15 | 6  | 5  | 41 | 20  | 10    | 1237 | 31                          | 1250 |
| 11-28-85                      | 37149 | 157.4                   | 15.4 | 90            | 3.57 | 2.38                      | 0.0            | 55                      | 68  | 68  | 20 | 7  | 5  | 1  | 22  | 4     | 1263 | 33                          | 1211 |
| 01-08-86                      | 37495 | 134.9                   | 13.7 | 96            | 2.56 | 2.18                      | 1.0            | 155                     | 91  | 91  | 20 | 12 | 10 | 2  | 34  | 6     | 966  | 40                          | 1253 |
| OIL CHANGE AT 37495 MILES     |       |                         |      |               |      |                           |                |                         |     |     |    |    |    |    |     |       |      |                             |      |
| 02-11-86                      | 37529 | 132.3                   | 13.6 | 96            | 3.09 | 2.19                      | 0.0            | 231                     | 145 | 101 | 31 | 17 | 12 | 1  | 36  | 4     | 1150 | 44                          | 1240 |
| 04-11-86                      | 39170 | 154.0                   | 15.1 | 97            | 2.59 | 2.80                      | 0.0            | 272                     | 245 | 149 | 30 | 14 | 11 | 6  | 34  | 10    | 974  | 39                          | 1192 |
| 05-27-86                      | 40250 | 177.9                   | 16.0 | 100           | 4.43 | 1.57                      | 0.0            | 427                     | 270 | 108 | 44 | 20 | 20 | 0  | 41  | 4     | 1000 | 70                          | 1350 |
| 03-04-86                      | 44457 | 101.3                   | 21.0 | 137           | 6.56 | 1.01                      | 0.0            | 461                     | 239 | 201 | 49 | 23 | 22 | 0  | 43  | 7     | 1100 | 90                          | 1390 |
| OIL CHANGE AT 44457 MILES     |       |                         |      |               |      |                           |                |                         |     |     |    |    |    |    |     |       |      |                             |      |
| 08-15-86                      | 45909 | 160.3                   | 15.9 | 102           | 3.40 | 5.05                      | 0.0            | 72                      | 40  | 61  | 9  | 9  | 4  | 0  | 17  | 9     | 1120 | 40                          | 1220 |
| 09-05-86                      | 48097 | 102.3                   | 15.0 | 154           | 2.06 | 3.98                      | 0.0            | 73                      | 32  | 50  | 0  | 9  | 4  | 0  | 10  | 3     | 610  | 530                         | 1100 |
| 09-22-86                      | 49154 | 111.9                   | 17.4 | 171           | 3.40 | 2.24                      | 0.0            | 86                      | 42  | 73  | 9  | 9  | 5  | 0  | 20  | 2     | 590  | 600                         | 1230 |
| OIL CHANGE AT 49154 MILES     |       |                         |      |               |      |                           |                |                         |     |     |    |    |    |    |     |       |      |                             |      |
| 09-22-86                      | 49155 | 140.1                   | 14.4 | 101           | 2.01 | 9.80                      | 0.0            | 0                       | 3   | 3   | 2  | 0  | 0  | 0  | 9   | 170   | 1040 | 10                          | 1410 |
| OIL CHANGE AT 49154 MILES     |       |                         |      |               |      |                           |                |                         |     |     |    |    |    |    |     |       |      |                             |      |
| 09-22-86                      | 49155 | 140.1                   | 14.4 | 101           | 2.01 | 9.80                      | 0.0            | 0                       | 3   | 3   | 2  | 0  | 0  | 0  | 9   | 170   | 1040 | 10                          | 1410 |
| OIL CHANGE AT 49154 MILES     |       |                         |      |               |      |                           |                |                         |     |     |    |    |    |    |     |       |      |                             |      |
| 09-22-86                      | 49155 | 140.1                   | 14.4 | 101           | 2.01 | 9.80                      | 0.0            | 0                       | 3   | 3   | 2  | 0  | 0  | 0  | 9   | 170   | 1040 | 10                          | 1410 |
| OIL CHANGE AT 49154 MILES     |       |                         |      |               |      |                           |                |                         |     |     |    |    |    |    |     |       |      |                             |      |
| 09-22-86                      | 49155 | 140.1                   | 14.4 | 101           | 2.01 | 9.80                      | 0.0            | 0                       | 3   | 3   | 2  | 0  | 0  | 0  | 9   | 170   | 1040 | 10                          | 1410 |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA #: CN3613     |       |                         | ENGINE TYPE: L-4 |     | CHEV CITATION |                    | PRESIDIO METHANOL VEHICLE |     |     |     |                         |    |    |      |    |      | REVISION DATE: AUG 11, 1988 |       |       |       |
|---------------------------|-------|-------------------------|------------------|-----|---------------|--------------------|---------------------------|-----|-----|-----|-------------------------|----|----|------|----|------|-----------------------------|-------|-------|-------|
| DATE                      | ODOM  | VISCOSITY<br>40 C 100 C | VI               | TAN | TBN           | FUEL<br>D664 OIL % | Fe                        | Pb  | Cu  | Sn  | PPM (PARTS PER MILLION) |    |    |      |    |      |                             |       | BFLRF |       |
|                           |       |                         |                  |     |               |                    |                           |     |     |     | Al                      | Mn | Si | B    | Mg | Ca   | P                           | Zn    | CODE  |       |
| New Unused B of A Oil     |       |                         |                  |     |               |                    |                           |     |     |     |                         |    |    |      |    |      |                             |       |       |       |
|                           |       | 137.0                   | 13.7             | 94  | 2.22          |                    | 1                         | 21  | 14  | 21  | 1                       | 21 | 21 | 1140 | 10 | 1555 | 1237                        | 14363 |       |       |
| 03-30-87                  | 57939 | 133.1                   | 16.6             | 134 | 3.25          | 3.14               | 0.0                       | 164 | 147 | 137 | 16                      | 14 | 0  | 10   | 3  | 1220 | 420                         | 1130  | 15903 |       |
| OIL CHANGE AT 57940 MILES |       |                         |                  |     |               |                    |                           |     |     |     |                         |    |    |      |    |      |                             |       |       |       |
| 05-13-87                  | 60120 | 144.2                   | 15.2             | 107 | 5.05          | 5.95               | 0.0                       | 45  | 21  | 44  | 4                       | 6  | 2  | 0    | 21 | 45   | 1740                        | 30    | 1340  | 16230 |
| OIL CHANGE AT 60120 MILES |       |                         |                  |     |               |                    |                           |     |     |     |                         |    |    |      |    |      |                             |       |       |       |
| 06-10-87                  | 62039 | 147.0                   | 16.2             | 116 | 6.96          | 4.38               | 0.0                       | 261 | 02  | 124 | 17                      | 20 | 10 | 0    | 00 | 5    | 1900                        | 70    | 1540  | 16212 |
| OIL CHANGE AT 62041 MILES |       |                         |                  |     |               |                    |                           |     |     |     |                         |    |    |      |    |      |                             |       |       |       |
| 06-10-87                  | 62042 | 135.1                   | 13.5             | 94  | 2.69          | 8.08               | 0.0                       | 2   | 4   | 2   | 5                       | 0  | 0  | 0    | 7  | 182  | 2640                        | 30    | 1660  | 16213 |
| 06-11-87                  | 62642 | 131.4                   | 15.3             | 120 | 3.03          | 7.97               | 0.0                       | 45  | 21  | 44  | 4                       | 6  | 2  | 0    | 21 | 45   | 1740                        | 30    | 1340  | 16232 |
| 11-30-87                  | 62913 | 154.0                   | 12.6             | 64  | 2.47          | 6.06               | 0.0                       | 295 | 60  | 89  | 14                      | 24 | 0  | 0    | 40 | 10   | 1070                        | 0     | 1230  | 17513 |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA 01 CM3614     |       |            |                   | ENGINE TYPE: V-6        |      | CHEV CITATION |       | PRESIDIO METHANOL VEHICLE |    |    |    |    |    |       |      |       |  | REVISION DATE: AUG 11, 1980 |  |  |  |
|---------------------------|-------|------------|-------------------|-------------------------|------|---------------|-------|---------------------------|----|----|----|----|----|-------|------|-------|--|-----------------------------|--|--|--|
| VISCOSITY                 |       | TBN FUEL   |                   | PPM (PARTS PER MILLION) |      |               |       |                           |    |    |    |    |    | 0FLNR |      |       |  |                             |  |  |  |
| DATE                      | ODOM  | 40 C 100 C | VI TAN D664 OIL % | Fe                      | Pb   | Cu            | Sn    | Al                        | Mn | Si | S  | Mg | Ca | P     | Zn   | CODE  |  |                             |  |  |  |
| New Unused B of A Oil     |       |            |                   |                         |      |               |       |                           |    |    |    |    |    |       |      |       |  |                             |  |  |  |
|                           |       | 137.0      | 13.7              | 94                      | 2.22 |               |       |                           |    |    |    |    |    |       |      |       |  |                             |  |  |  |
|                           |       |            |                   |                         |      | 1             | <1    | 14                        | <1 | 1  | <1 | <1 | 10 | 221   | 1140 | 10    |  |                             |  |  |  |
|                           |       |            |                   |                         |      |               |       |                           |    |    |    |    |    | 1555  | 1257 | 14363 |  |                             |  |  |  |
| 05-29-85                  | 10333 | 132.5      | 13.3              | 95                      | 2.49 | 5.84          | Trace |                           |    |    |    |    |    | 20    | 1230 | 1254  |  |                             |  |  |  |
| 07-15-85                  | 22340 | 167.1      | 15.6              | 95                      | 3.93 | 2.20          | 0.0   |                           |    |    |    |    |    | 49    | 1362 | 1229  |  |                             |  |  |  |
|                           |       |            |                   |                         |      | 119           |       | 260                       | 34 | 32 | 9  | 13 | 2  | 101   | 12   | 1191  |  |                             |  |  |  |
|                           |       |            |                   |                         |      |               |       |                           |    |    |    |    |    | 49    | 1362 | 1229  |  |                             |  |  |  |
|                           |       |            |                   |                         |      |               |       |                           |    |    |    |    |    |       |      |       |  |                             |  |  |  |
| OIL CHANGE AT 22340 MILES |       |            |                   |                         |      |               |       |                           |    |    |    |    |    |       |      |       |  |                             |  |  |  |
| 08-27-85                  | 25455 | 155.6      | 14.9              | 94                      | 2.47 | 4.47          | 0.0   |                           |    |    |    |    |    |       |      |       |  |                             |  |  |  |
|                           |       |            |                   |                         |      | 9             |       | 14                        | 6  | <1 | 1  | 2  | <1 | 17    | 20   | 1146  |  |                             |  |  |  |
|                           |       |            |                   |                         |      |               |       |                           |    |    |    |    |    | <1    | 1136 | 1044  |  |                             |  |  |  |
| OIL CHANGE AT 25455 MILES |       |            |                   |                         |      |               |       |                           |    |    |    |    |    |       |      |       |  |                             |  |  |  |
| 09-04-85                  | 26101 | 152.6      | 14.6              | 94                      | 2.44 | 5.91          | 0.0   |                           |    |    |    |    |    |       |      |       |  |                             |  |  |  |
|                           |       |            |                   |                         |      | 6             |       | 7                         | 5  | <1 | 1  | 1  | <1 | 13    | 52   | 1104  |  |                             |  |  |  |
|                           |       |            |                   |                         |      |               |       |                           |    |    |    |    |    | <1    | 1123 | 1013  |  |                             |  |  |  |
| OIL CHANGE AT 26101 MILES |       |            |                   |                         |      |               |       |                           |    |    |    |    |    |       |      |       |  |                             |  |  |  |
| 09-23-85                  | 27208 | 157.5      | 15.0              | 95                      | 3.08 | 2.60          | 0.0   |                           |    |    |    |    |    |       |      |       |  |                             |  |  |  |
|                           |       |            |                   |                         |      | 24            |       | 34                        | 9  | 6  | 2  | 3  | 1  | 19    | 5    | 1295  |  |                             |  |  |  |
| 10-07-85                  | 28117 | 159.0      | 15.4              | 97                      | 3.10 | 2.77          | 0.0   |                           |    |    |    |    |    | 24    | 1224 | 1176  |  |                             |  |  |  |
|                           |       |            |                   |                         |      | 26            |       | 43                        | 9  | 6  | 3  | 3  | 1  | 21    | 10   | 1342  |  |                             |  |  |  |
|                           |       |            |                   |                         |      |               |       |                           |    |    |    |    |    | 26    | 1223 | 1192  |  |                             |  |  |  |
| OIL CHANGE AT 29106 MILES |       |            |                   |                         |      |               |       |                           |    |    |    |    |    |       |      |       |  |                             |  |  |  |
| 11-09-85                  | 30300 | 154.4      | 14.9              | 96                      | 2.02 | 7.97          | < .9  |                           |    |    |    |    |    |       |      |       |  |                             |  |  |  |
|                           |       |            |                   |                         |      | 44            |       | 31                        | 7  | 10 | 4  | 2  | <1 | 19    | 6    | 1203  |  |                             |  |  |  |
| 01-13-86                  | 34605 | 202.0      | 18.3              | 100                     | 7.66 | .71           | 0.0   |                           |    |    |    |    |    | 26    | 1244 | 1190  |  |                             |  |  |  |
|                           |       |            |                   |                         |      | 200           |       | 415                       | 23 | 27 | 10 | 10 | 7  | 34    | 2    | 1211  |  |                             |  |  |  |
|                           |       |            |                   |                         |      |               |       |                           |    |    |    |    |    | 425   | 1369 | 1503  |  |                             |  |  |  |
| OIL CHANGE AT 34605 MILES |       |            |                   |                         |      |               |       |                           |    |    |    |    |    |       |      |       |  |                             |  |  |  |
| 02-11-86                  | 38123 | 199.6      | 17.7              | 96                      | 5.54 | 2.03          | 0.0   |                           |    |    |    |    |    |       |      |       |  |                             |  |  |  |
|                           |       |            |                   |                         |      | 136           |       | 102                       | 21 | 15 | 6  | 0  | 3  | 22    | 5    | 1300  |  |                             |  |  |  |
|                           |       |            |                   |                         |      |               |       |                           |    |    |    |    |    | 142   | 1377 | 1432  |  |                             |  |  |  |
| OIL CHANGE AT 38123 MILES |       |            |                   |                         |      |               |       |                           |    |    |    |    |    |       |      |       |  |                             |  |  |  |
| 02-11-86                  | 38124 | 153.0      | 14.6              | 93                      | 2.02 | 7.73          | 0.0   |                           |    |    |    |    |    |       |      |       |  |                             |  |  |  |
|                           |       |            |                   |                         |      | 11            |       | 13                        | 4  | <1 | <1 | 5  | <1 | 25    | 5    | 1241  |  |                             |  |  |  |
| 02-20-86                  | 39144 | 160.9      | 15.6              | 98                      | 3.35 | 2.90          | < .3  |                           |    |    |    |    |    | 25    | 1240 | 1164  |  |                             |  |  |  |
|                           |       |            |                   |                         |      | 36            |       | 37                        | 23 | 4  | 2  | 6  | <1 | 16    | 46   | 1295  |  |                             |  |  |  |
| 03-07-86                  | 40050 | 107.9      | 16.7              | 93                      | 5.60 | 2.26          | 0.0   |                           |    |    |    |    |    | 30    | 1294 | 1276  |  |                             |  |  |  |
|                           |       |            |                   |                         |      | 65            |       | 92                        | 26 | 0  | 5  | 0  | 1  | 16    | 9    | 1351  |  |                             |  |  |  |
|                           |       |            |                   |                         |      |               |       |                           |    |    |    |    |    | 44    | 1265 | 1239  |  |                             |  |  |  |
| OIL CHANGE AT 41209 MILES |       |            |                   |                         |      |               |       |                           |    |    |    |    |    |       |      |       |  |                             |  |  |  |
| 03-19-86                  | 42247 | 154.4      | 15.0              | 96                      | 3.15 | 5.23          | 0.0   |                           |    |    |    |    |    |       |      |       |  |                             |  |  |  |
|                           |       |            |                   |                         |      | 33            |       | 20                        | 13 | 3  | 4  | 6  | <1 | 37    | 131  | 1150  |  |                             |  |  |  |
|                           |       |            |                   |                         |      |               |       |                           |    |    |    |    |    | 24    | 1193 | 1071  |  |                             |  |  |  |
|                           |       |            |                   |                         |      |               |       |                           |    |    |    |    |    |       |      |       |  |                             |  |  |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA 0: CM3614                 |       |                         | ENGINE TYPE: V-6 |     |                        | CHEV CITATION |     |     | PRESIDIO METHANOL VEHICLE |                         |    |    |    |    |     |      |      |      | REVISION DATE: AUG 11, 1983 |       |       |  |  |
|---------------------------------------|-------|-------------------------|------------------|-----|------------------------|---------------|-----|-----|---------------------------|-------------------------|----|----|----|----|-----|------|------|------|-----------------------------|-------|-------|--|--|
| DATE                                  | ODOM  | VISCOSITY<br>40 C 100 C | VI               | TAN | TBM FUEL<br>D664 DIL % | Fe            | Pb  | Cu  | Sn                        | PPM (PARTS PER MILLION) |    |    |    |    | Mg  | Ca   | P    | Zn   | 0FLRF<br>CODE               |       |       |  |  |
|                                       |       |                         |                  |     |                        |               |     |     |                           | Al                      | Mi | Mn | Si | S  |     |      |      |      |                             |       |       |  |  |
| New Unused 8 of A Oil                 |       |                         |                  |     |                        |               |     |     |                           |                         |    |    |    |    |     |      |      |      |                             |       |       |  |  |
|                                       |       | 137.0                   | 13.7             | 94  | 2.22                   |               | 1   | 41  | 14                        | 41                      | 1  | 41 | 41 | 10 | 221 | 1140 | 10   | 1555 | 1257                        | 14363 |       |  |  |
| 03-25-86                              | 43303 | 163.5                   | 15.6             | 97  | 3.33                   | 2.71          | 0.0 | 40  | 16                        | 19                      | 8  | 3  | 1  | 2  | 29  | 83   | 1673 | 94   | 1200                        | 1100  | 14900 |  |  |
| 04-02-86                              | 44121 | 162.8                   | 15.5             | 97  | 2.78                   | 2.56          | 0.0 | 45  | 29                        | 16                      | 4  | 5  | 3  | 41 | 27  | 3    | 1299 | 26   | 1313                        | 1212  | 15014 |  |  |
| 06-17-86                              | 45176 | 148.6                   | 15.2             | 103 | 3.20                   | 5.11          | 0.0 | 57  | 29                        | 29                      | 5  | 9  | 5  | 0  | 34  | 12   | 1190 | 20   | 1320                        | 1110  | 15190 |  |  |
| 06-26-86                              | 46388 | 165.2                   | 16.2             | 102 | 4.43                   | 3.98          | 0.0 | 66  | 59                        | 29                      | 10 | 10 | 7  | 0  | 31  | 5    | 1100 | 30   | 1230                        | 1170  | 15206 |  |  |
| DEADLINED 7-6-86 047217 MILES         |       |                         |                  |     |                        |               |     |     |                           |                         |    |    |    |    |     |      |      |      |                             |       |       |  |  |
| 08-20-86                              | 47262 | 176.7                   | 16.5             | 98  | 5.27                   | 3.40          | 0.0 | 89  | 85                        | 36                      | 10 | 13 | 0  | 0  | 33  | 4    | 1220 | 40   | 1350                        | 1390  | 15392 |  |  |
| OIL CHANGE AT 47263 MILES             |       |                         |                  |     |                        |               |     |     |                           |                         |    |    |    |    |     |      |      |      |                             |       |       |  |  |
| 08-20-86                              | 47264 | 137.2                   | 16.0             | 132 | 2.36                   | 6.79          | 0.0 | 2   | 2                         | 4                       | 0  | 0  | 0  | 0  | 15  | 180  | 1250 | 30   | 1200                        | 1210  | 15393 |  |  |
| RETURNED TO DUTY 10-5-86 047270 MILES |       |                         |                  |     |                        |               |     |     |                           |                         |    |    |    |    |     |      |      |      |                             |       |       |  |  |
| 10-17-86                              | 47923 | 154.7                   | 14.0             | 95  | 2.91                   | 6.96          | 0.0 | 27  | 29                        | 34                      | 9  | 4  | 6  | 0  | 14  | 28   | 1200 | 30   | 1010                        | 1290  | 15506 |  |  |
| OIL CHANGE AT 53115 MILES             |       |                         |                  |     |                        |               |     |     |                           |                         |    |    |    |    |     |      |      |      |                             |       |       |  |  |
| 12-02-86                              | 53116 | 139.1                   | 13.6             | 92  | 1.74                   | 9.20          | 0.0 | 3   | 9                         | 1                       | 0  | 0  | 0  | 0  | 6   | 171  | 1030 | 20   | 1660                        | 1250  | 15505 |  |  |
| 01-08-87                              | 55009 | 136.3                   | 10.0             | 156 | 3.03                   | 5.39          | 0.0 | 76  | 42                        | 19                      | 6  | 13 | 4  | 0  | 10  | 5    | 1690 | 00   | 1340                        | 1270  | 15705 |  |  |
| OIL CHANGE AT 56159 MILES             |       |                         |                  |     |                        |               |     |     |                           |                         |    |    |    |    |     |      |      |      |                             |       |       |  |  |
| 01-30-87                              | 56160 | 134.6                   | 14.1             | 102 | 3.37                   | 0.19          | 0.0 | 18  | 10                        | 9                       | 3  | 2  | 0  | 0  | 6   | 21   | 1630 | 330  | 1760                        | 1190  | 15032 |  |  |
| 02-05-87                              | 57036 | 142.5                   | 14.9             | 105 | 2.92                   | 8.08          | 0.0 | 19  | 17                        | 7                       | 0  | 3  | 1  | 0  | 6   | 62   | 1590 | 100  | 1350                        | 1170  | 15039 |  |  |
| 03-25-87                              | 58939 | 110.0                   | 13.2             | 107 | 4.26                   | 6.06          | 0.0 | 43  | 30                        | 11                      | 3  | 6  | 2  | 0  | 0   | 7    | 1300 | 360  | 1100                        | 1320  | 15902 |  |  |
| OIL CHANGE AT 61704 MILES             |       |                         |                  |     |                        |               |     |     |                           |                         |    |    |    |    |     |      |      |      |                             |       |       |  |  |
| 05-07-87                              | 61705 | 100.4                   | 14.1             | 132 | 3.00                   | 8.50          | 0.0 | 5   | 7                         | 0                       | 0  | 0  | 0  | 0  | 5   | 206  | 2050 | 60   | 1350                        | 1550  | 16077 |  |  |
| 06-04-87                              | 63007 | 144.7                   | 14.7             | 100 | 4.15                   | 6.73          | 0.0 | 35  | 29                        | 23                      | 2  | 9  | 2  | 0  | 10  | 33   | 2460 | 270  | 1640                        | 1610  | 16143 |  |  |
| 01-15-88                              | 65640 | 141.5                   | 14.6             | 162 | 3.37                   | 5.84          | 0.0 | 108 | 53                        | 25                      | 12 | 14 | 3  | 0  | 24  | 11   | 1420 | 300  | 1360                        | 1710  | 17514 |  |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA #: CM3615     |       |       | ENGINE TYPE: L-4 |       | CHEV CITATION |      | PRESIDIO METHANOL VEHICLE |                         |     |     |    |    |     |      |    |      | REVISION DATE: AUG 11, 1988 |       |      |      |       |  |
|---------------------------|-------|-------|------------------|-------|---------------|------|---------------------------|-------------------------|-----|-----|----|----|-----|------|----|------|-----------------------------|-------|------|------|-------|--|
| VISCOSITY                 |       | TBN   |                  | FUEL  |               |      |                           | PPH (PARTS PER MILLION) |     |     |    |    |     |      |    |      |                             | BFLRF |      |      |       |  |
| 40 C 100 C                | VI    | TAN   | D664             | DIL % | Fe            | Pb   | Cu                        | Sn                      | Al  | Hi  | Mn | Si | B   | Hg   | Ca | P    | Zn                          | CODE  |      |      |       |  |
| New Unused B of A Oil     |       |       |                  |       |               |      |                           |                         |     |     |    |    |     |      |    |      |                             |       |      |      |       |  |
| 137.0                     | 13.7  | 94    | 2.22             |       | 1             | <1   | 14                        | <1                      | 1   | <1  | <1 | 10 | 221 | 1140 | 10 | 1555 | 1257                        | 14363 |      |      |       |  |
| 05-29-85                  | 16163 | 132.3 | 13.3             | 94    | 2.62          | 6.17 | 0.0                       | 39                      | 21  | 24  | 7  | 5  | 1   | <1   | 25 | 161  | 1007                        | 57    | 1706 | 1244 | 14361 |  |
| 06-20-85                  | 18635 | 150.1 | 15.1             | 95    | 3.99          | 2.30 | 0.0                       | 60                      | 409 | 77  | 52 | 11 | 12  | 4    | 30 | 7    | 1172                        | 90    | 1740 | 1104 | 14449 |  |
| 07-08-85                  | 20435 | 174.6 | 15.9             | 93    | 6.04          | 1.50 | 0.0                       | 91                      | 400 | 110 | 74 | 13 | 20  | 7    | 30 | 4    | 1173                        | 116   | 1735 | 1230 | 14451 |  |
| OIL CHANGE AT 20435 MILES |       |       |                  |       |               |      |                           |                         |     |     |    |    |     |      |    |      |                             |       |      |      |       |  |
| 08-27-85                  | 26284 | 204.0 | 17.7             | 92    | 7.52          | .49  | 0.0                       | 59                      | 204 | 139 | 40 | 5  | 12  | <1   | 31 | 3    | 1097                        | <1    | 1363 | 1095 | 14630 |  |
| OIL CHANGE AT 26284 MILES |       |       |                  |       |               |      |                           |                         |     |     |    |    |     |      |    |      |                             |       |      |      |       |  |
| 09-04-85                  | 27235 | 154.2 | 14.0             | 95    | 2.74          | 3.71 | 0.0                       | 15                      | 30  | 35  | 4  | 2  | 4   | <1   | 14 | 20   | 1046                        | <1    | 1100 | 963  | 14631 |  |
| 09-23-85                  | 29749 | 150.4 | 15.7             | 101   | 4.14          | 2.74 | 0.0                       | 24                      | 55  | 57  | 12 | 3  | 5   | 1    | 21 | 36   | 1232                        | 32    | 1104 | 1130 | 14671 |  |
| OIL CHANGE AT 29749 MILES |       |       |                  |       |               |      |                           |                         |     |     |    |    |     |      |    |      |                             |       |      |      |       |  |
| 10-03-85                  | 31240 | 145.0 | 15.0             | 103   | 3.02          | 2.91 | 0.0                       | 15                      | 34  | 34  | 10 | 2  | 3   | 1    | 10 | 4    | 1233                        | 23    | 1150 | 1109 | 14570 |  |
| 11-06-85                  | 33610 | 163.9 | 15.5             | 95    | 4.31          | 1.94 | 0.0                       | 63                      | 169 | 116 | 45 | 8  | 10  | 2    | 32 | 4    | 1330                        | 45    | 1231 | 1213 | 14694 |  |
| OIL CHANGE AT 33610 MILES |       |       |                  |       |               |      |                           |                         |     |     |    |    |     |      |    |      |                             |       |      |      |       |  |
| 11-06-85                  | 33611 | 141.5 | 14.5             | 101   | 2.02          | 6.49 | 0.0                       | 7                       | 15  | 13  | 3  | <1 | 1   | <1   | 20 | 165  | 1212                        | 20    | 1129 | 1092 | 14693 |  |
| 12-16-85                  | 35715 | 155.3 | 14.9             | 95    | 3.26          | 2.42 | 0.0                       | 81                      | 115 | 85  | 25 | 6  | 6   | 1    | 30 | 6    | 1333                        | 42    | 1234 | 1229 | 14829 |  |
| 02-11-86                  | 36356 | 117.7 | 13.9             | 110   | 2.55          | 3.07 | 0.0                       | 72                      | 83  | 87  | 13 | 3  | 6   | 1    | 24 | 3    | 1053                        | 29    | 1075 | 1020 | 14894 |  |
| OIL CHANGE AT 36356 MILES |       |       |                  |       |               |      |                           |                         |     |     |    |    |     |      |    |      |                             |       |      |      |       |  |
| 02-11-86                  | 36357 | 144.0 | 14.3             | 96    | 2.71          | 7.06 | 0.0                       | 0                       | 6   | 10  | <1 | <1 | <1  | <1   | 26 | 169  | 1160                        | 19    | 1212 | 1111 | 14895 |  |
| 02-28-86                  | 38670 | 157.2 | 15.2             | 97    | 3.22          | 2.61 | 0.0                       | 43                      | 49  | 49  | 12 | 3  | 5   | <1   | 22 | 4    | 1293                        | 29    | 1211 | 1190 | 14920 |  |
| 03-10-86                  | 40261 | 171.5 | 16.0             | 96    | 5.03          | 2.24 | 0.0                       | 59                      | 82  | 79  | 10 | 4  | 4   | 1    | 29 | 2    | 1265                        | 37    | 1205 | 1190 | 14955 |  |
| OIL CHANGE AT 40261 MILES |       |       |                  |       |               |      |                           |                         |     |     |    |    |     |      |    |      |                             |       |      |      |       |  |
| 03-10-86                  | 40262 | 148.0 | 14.4             | 94    | 2.77          | 7.64 | 0.0                       | 7                       | 6   | 9   | 2  | <1 | <1  | <1   | 25 | 159  | 1105                        | 19    | 1169 | 1070 | 14953 |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA #         | CH3615 | ENGINE TYPE             | L-4  | CHEV CITATION | PRESIDIO METHANOL VEHICLE | REVISION DATE      | AUG 11, 1988                                         |    |    |    |    |               |    |    |     |      |      |      |      |       |       |
|-----------------------|--------|-------------------------|------|---------------|---------------------------|--------------------|------------------------------------------------------|----|----|----|----|---------------|----|----|-----|------|------|------|------|-------|-------|
| DATE                  | ODOM   | VISCOSITY<br>40 C 100 C | VI   | TAN           | TBN                       | FUEL<br>D664 DIL % | PPM (PARTS PER MILLION)<br>Fe Pb Cu Sn Al Hf Mn Si B | Mo | Ca | P  | Zn | 9FLRF<br>CODE |    |    |     |      |      |      |      |       |       |
| New Unused B of A Oil |        | 137.8                   | 13.7 | 94            | 2.22                      |                    | 1                                                    | <1 | 14 | <1 | 1  | <1            | <1 | 10 | 221 | 1148 | 10   | 1555 | 1257 | 14363 |       |
| 04-25-86              | 41285  | 158.4                   | 15.2 | 96            | 3.14                      | 5.16               | 0.0                                                  | 41 | 55 | 44 | 9  | 5             | 2  | 0  | 19  | 13   | 1520 | 50   | 1250 | 1310  | 15170 |

HAD ACCIDENT, NOT IN PROGRAM ANY LONGER

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA #: CN3616     |  |       |  | ENGINE TYPE: V-6 |  |                         |  | CHEV CITATION |  |      |  | PRESIDIO METHANOL VEHICLE |  |     |  |     |  |    |  |    |  | REVISION DATE: AUG 11, 1980 |  |     |  |      |  |     |  |      |  |      |  |            |  |            |  |       |  |       |  |
|---------------------------|--|-------|--|------------------|--|-------------------------|--|---------------|--|------|--|---------------------------|--|-----|--|-----|--|----|--|----|--|-----------------------------|--|-----|--|------|--|-----|--|------|--|------|--|------------|--|------------|--|-------|--|-------|--|
| VISCOSITY                 |  | TBN   |  | FUEL             |  | PPM (PARTS PER MILLION) |  | Fe            |  | Pb   |  | Cu                        |  | Sn  |  | Al  |  | Ni |  | Mn |  | Si                          |  | S   |  | Mg   |  | Ca  |  | P    |  | Zn   |  | BFLRF CODE |  |            |  |       |  |       |  |
| 40 C 100 C                |  | VI    |  | TAN              |  | D664 OIL %              |  | Fe            |  | Pb   |  | Cu                        |  | Sn  |  | Al  |  | Ni |  | Mn |  | Si                          |  | S   |  | Mg   |  | Ca  |  | P    |  | Zn   |  | BFLRF CODE |  |            |  |       |  |       |  |
| DATE                      |  | ODOM  |  | VI               |  | TAN                     |  | D664 OIL %    |  | Fe   |  | Pb                        |  | Cu  |  | Sn  |  | Al |  | Ni |  | Mn                          |  | Si  |  | S    |  | Mg  |  | Ca   |  | P    |  | Zn         |  | BFLRF CODE |  |       |  |       |  |
| New Unused B of A Oil     |  |       |  |                  |  |                         |  |               |  |      |  |                           |  |     |  |     |  |    |  |    |  |                             |  |     |  |      |  |     |  |      |  |      |  |            |  |            |  |       |  |       |  |
| 137.0                     |  | 13.7  |  | 94               |  | 2.22                    |  | 1             |  | <1   |  | 14                        |  | <1  |  | 1   |  | <1 |  | <1 |  | 18                          |  | 221 |  | 1148 |  | 18  |  | 1555 |  | 1257 |  | 14363      |  |            |  |       |  |       |  |
| 05-29-85                  |  | 28257 |  | 135.2            |  | 13.6                    |  | 95            |  | 2.19 |  | 5.06 Trace                |  | 31  |  | 63  |  | 43 |  | 9  |  | 3                           |  | <1  |  | 59   |  | 129 |  | 1151 |  | 59   |  | 1280       |  | 1252       |  | 14362 |  |       |  |
| 06-24-85                  |  | 30244 |  | 153.5            |  | 14.6                    |  | 93            |  | 3.11 |  | 2.90 0.0                  |  | 55  |  | 295 |  | 40 |  | 38 |  | 5                           |  | 11  |  | 2    |  | 96  |  | 5    |  | 1195 |  | 42         |  | 1206       |  | 1173  |  | 14448 |  |
| 07-15-85                  |  | 32257 |  | 180.0            |  | 16.4                    |  | 95            |  | 4.07 |  | 1.99 0.0                  |  | 89  |  | 424 |  | 47 |  | 54 |  | 9                           |  | 14  |  | 4    |  | 104 |  | 3    |  | 1250 |  | 69         |  | 1321       |  | 1295  |  | 14454 |  |
| OIL CHANGE AT 32257 MILES |  |       |  |                  |  |                         |  |               |  |      |  |                           |  |     |  |     |  |    |  |    |  |                             |  |     |  |      |  |     |  |      |  |      |  |            |  |            |  |       |  |       |  |
| 08-26-85                  |  | 34090 |  | 151.7            |  | 14.9                    |  | 98            |  | 2.82 |  | 4.37 0.0                  |  | 31  |  | 50  |  | 12 |  | 3  |  | 2                           |  | 6   |  | <1   |  | 23  |  | 13   |  | 1048 |  | <1         |  | 1119       |  | 1021  |  | 14632 |  |
| OIL CHANGE AT 34090 MILES |  |       |  |                  |  |                         |  |               |  |      |  |                           |  |     |  |     |  |    |  |    |  |                             |  |     |  |      |  |     |  |      |  |      |  |            |  |            |  |       |  |       |  |
| 09-20-85                  |  | 35000 |  | 153.1            |  | 14.7                    |  | 94            |  | 2.64 |  | 4.47 0.0                  |  | 28  |  | 7   |  | 9  |  | 1  |  | 2                           |  | <1  |  | <1   |  | 23  |  | 15   |  | 1269 |  | 24         |  | 1247       |  | 1195  |  | 14677 |  |
| 11-08-85                  |  | 37552 |  | 167.4            |  | 15.6                    |  | 94            |  | 4.43 |  | 2.25 0.0                  |  | 98  |  | 63  |  | 13 |  | 20 |  | 8                           |  | 9   |  | 2    |  | 45  |  | 2    |  | 1360 |  | 41         |  | 1243       |  | 1255  |  | 14718 |  |
| OIL CHANGE AT 37552 MILES |  |       |  |                  |  |                         |  |               |  |      |  |                           |  |     |  |     |  |    |  |    |  |                             |  |     |  |      |  |     |  |      |  |      |  |            |  |            |  |       |  |       |  |
| 11-08-85                  |  | 37553 |  | 150.7            |  | 14.5                    |  | 94            |  | 2.51 |  | 6.87 0.0                  |  | 6   |  | 5   |  | 3  |  | <1 |  | <1                          |  | 5   |  | <1   |  | 28  |  | 170  |  | 1167 |  | 19         |  | 1169       |  | 1062  |  | 14717 |  |
| 01-15-86                  |  | 39370 |  | 159.5            |  | 15.1                    |  | 96            |  | 4.50 |  | 2.64 0.0                  |  | 86  |  | 31  |  | 11 |  | 12 |  | 5                           |  | 2   |  | 2    |  | 40  |  | 2    |  | 1273 |  | 33         |  | 1221       |  | 1159  |  | 14855 |  |
| OIL CHANGE AT 40595 MILES |  |       |  |                  |  |                         |  |               |  |      |  |                           |  |     |  |     |  |    |  |    |  |                             |  |     |  |      |  |     |  |      |  |      |  |            |  |            |  |       |  |       |  |
| 02-11-86                  |  | 40596 |  | 152.7            |  | 14.6                    |  | 94            |  | 2.91 |  | 8.08 0.0                  |  | 9   |  | 4   |  | 3  |  | <1 |  | <1                          |  | 5   |  | <1   |  | 24  |  | 171  |  | 1211 |  | 18         |  | 1201       |  | 1127  |  | 14897 |  |
| 03-07-86                  |  | 41463 |  | 157.3            |  | 15.2                    |  | 97            |  | 2.85 |  | 4.53 0.0                  |  | 34  |  | 13  |  | 9  |  | 2  |  | 2                           |  | 1   |  | <1   |  | 23  |  | 10   |  | 1253 |  | 24         |  | 1222       |  | 1137  |  | 14952 |  |
| 04-09-86                  |  | 43210 |  | 159.7            |  | 15.3                    |  | 97            |  | 3.23 |  | 5.11 1.1                  |  | 27  |  | 12  |  | 6  |  | 2  |  | 3                           |  | <1  |  | 1    |  | 20  |  | 29   |  | 1196 |  | 22         |  | 1135       |  | 1128  |  | 15025 |  |
| 05-05-86                  |  | 44228 |  | 164.8            |  | 15.7                    |  | 97            |  | 3.95 |  | 3.01 .2                   |  | 54  |  | 17  |  | 7  |  | 7  |  | 3                           |  | 1   |  | 1    |  | 32  |  | 2    |  | 1376 |  | 29         |  | 1392       |  | 1349  |  | 15121 |  |
| 06-04-86                  |  | 45316 |  | 166.5            |  | 16.0                    |  | 99            |  | 5.05 |  | 3.65 0.0                  |  | 78  |  | 28  |  | 10 |  | 8  |  | 6                           |  | 2   |  | 0    |  | 28  |  | 2    |  | 1380 |  | 40         |  | 1350       |  | 15171 |  |       |  |
| 06-17-86                  |  | 45965 |  | 173.9            |  | 17.9                    |  | 113           |  | 4.04 |  | 3.59 0.0                  |  | 71  |  | 30  |  | 9  |  | 11 |  | 6                           |  | 2   |  | 0    |  | 21  |  | 3    |  | 1700 |  | 30         |  | 1480       |  | 1240  |  | 15184 |  |
| 08-15-86                  |  | 48242 |  | 168.1            |  | 16.2                    |  | 100           |  | 5.11 |  | 4.38 0.0                  |  | 85  |  | 52  |  | 20 |  | 11 |  | 7                           |  | 2   |  | 0    |  | 25  |  | 6    |  | 1200 |  | 48         |  | 1270       |  | 1310  |  | 15391 |  |
| OIL CHANGE AT 48242 MILES |  |       |  |                  |  |                         |  |               |  |      |  |                           |  |     |  |     |  |    |  |    |  |                             |  |     |  |      |  |     |  |      |  |      |  |            |  |            |  |       |  |       |  |
| 08-15-86                  |  | 48243 |  | 149.1            |  | 15.0                    |  | 101           |  | 2.97 |  | 7.46 0.0                  |  | 2   |  | 2   |  | 4  |  | 0  |  | 0                           |  | 0   |  | 0    |  | 14  |  | 193  |  | 1100 |  | 20         |  | 1290       |  | 1150  |  | 15390 |  |
| 10-01-86                  |  | 49612 |  | 163.8            |  | 15.8                    |  | 99            |  | 3.76 |  | 5.05 0.0                  |  | 39  |  | 18  |  | 16 |  | 5  |  | 5                           |  | 0   |  | 0    |  | 16  |  | 3    |  | 1270 |  | 30         |  | 1300       |  | 1210  |  | 15459 |  |
| 10-29-86                  |  | 50721 |  | 158.2            |  | 15.1                    |  | 92            |  | 4.60 |  | 4.71 0.0                  |  | 39  |  | 16  |  | 12 |  | 7  |  | 4                           |  | 1   |  | 0    |  | 12  |  | 1    |  | 780  |  | 30         |  | 980        |  | 1110  |  | 15585 |  |
| 11-19-86                  |  | 51587 |  | 162.0            |  | 15.8                    |  | 100           |  | 4.15 |  | 4.60 0.0                  |  | 50  |  | 22  |  | 13 |  | 6  |  | 6                           |  | 1   |  | 0    |  | 15  |  | 15   |  | 1270 |  | 30         |  | 1340       |  | 1260  |  | 15578 |  |
| 07-08-87                  |  | 56405 |  | 181.0            |  | 20.2                    |  | 130           |  | 7.63 |  | 1.80 0.0                  |  | 399 |  | 297 |  | 42 |  | 11 |  | 13                          |  | 9   |  | 0    |  | 26  |  | 1    |  | 1070 |  | 400        |  | 1340       |  | 1350  |  | 16260 |  |
| 12-15-87                  |  | 58878 |  | 123.7            |  | 11.6                    |  | 76            |  | 3.93 |  | 2.92 0.0                  |  | 354 |  | 184 |  | 37 |  | 11 |  | 13                          |  | 8   |  | 0    |  | 16  |  | 1    |  | 490  |  | 30         |  | 1150       |  | 1210  |  | 17515 |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CH0436 ENGINE TYPE: I-4 FORD ESCORT FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

| DATE | ODOM | VISCOSITY<br>40 C 100 C | VI | TAN | D664 DIL % | TBN FUEL | Fe | Pb | Cu | Sn | Al | PPM (PARTS PER MILLION) |   |    |    |   | Hg | Ca | P | Zn | BFLRF<br>CODE |
|------|------|-------------------------|----|-----|------------|----------|----|----|----|----|----|-------------------------|---|----|----|---|----|----|---|----|---------------|
|      |      |                         |    |     |            |          |    |    |    |    |    | Si                      | B | Mn | Mo | S |    |    |   |    |               |

FORD ESCORT RECEIVED FROM CEC

NEW UNUSED B OF A OIL

|          |       |       |      |     |      |      |     |    |    |    |   |    |   |   |   |   |   |     |      |      |      |       |
|----------|-------|-------|------|-----|------|------|-----|----|----|----|---|----|---|---|---|---|---|-----|------|------|------|-------|
| 07-27-86 | 9181  | 100.9 | 15.3 | 160 | 2.92 | 7.74 | 0.0 | 24 | 9  | 2  | 0 | 9  | 0 | 0 | 0 | 7 | 5 | 630 | 1730 | 1690 | 1960 | 15337 |
| 04-17-87 | 11306 | 92.5  | 18.3 | 219 | 2.47 | 2.81 | 0.0 | 73 | 23 | 10 | 0 | 15 | 0 | 0 | 0 | 9 | 0 | 410 | 1090 | 1590 | 1360 | 16030 |
| 06-22-87 | 12589 | 98.0  | 11.8 | 110 | 3.37 | 2.81 | 0.0 | 98 | 27 | 14 | 0 | 20 | 2 | 0 | 0 | 9 | 0 | 340 | 1120 | 1020 | 1320 | 16246 |

OIL CHANGE AT 13649 MILES

|          |       |      |      |    |      |      |     |    |    |   |   |   |   |   |   |   |   |     |      |      |      |       |
|----------|-------|------|------|----|------|------|-----|----|----|---|---|---|---|---|---|---|---|-----|------|------|------|-------|
| 09-08-87 | 13650 | 94.2 | 10.8 | 98 | 3.03 | 4.94 | 0.0 | 37 | 12 | 7 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 350 | 1030 | 1300 | 1300 | 16671 |
|----------|-------|------|------|----|------|------|-----|----|----|---|---|---|---|---|---|---|---|-----|------|------|------|-------|

OIL CHANGE AT 16599 MILES

|          |       |      |      |     |      |      |     |     |    |    |   |    |   |   |   |    |   |     |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|-----|----|----|---|----|---|---|---|----|---|-----|------|------|------|-------|
| 05-16-88 | 19326 | 97.2 | 12.4 | 121 | 3.59 | 4.49 | 0.0 | 103 | 38 | 22 | 0 | 13 | 0 | 0 | 0 | 11 | 0 | 450 | 1370 | 1150 | 1560 | 17631 |
|----------|-------|------|------|-----|------|------|-----|-----|----|----|---|----|---|---|---|----|---|-----|------|------|------|-------|

TRANSFERRED TO SIDP @ 19326 MILES

OIL CHANGE TO PARAMINS 10U30 AT 19327 MI

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #: CH0437 | ENGINE TYPE: 1-4 | FORD ESCORT             | FT. ORD METHANOL VEHICLE | PPM (PARTS PER MILLION) |                    |    |    |    |    |    |   |    |    | REVISION DATE: AUG 11, 1988 |    |       |      |
|-----------------------|------------------|-------------------------|--------------------------|-------------------------|--------------------|----|----|----|----|----|---|----|----|-----------------------------|----|-------|------|
|                       |                  |                         |                          | Fe                      | Pb                 | Cu | Sn | Al | Mn | Si | B | Mg | Ca | P                           | Zn | BFLRF | CODE |
| DATE                  | ODOM             | VISCOSITY<br>40 C 100 C | TAN                      | TBN                     | FUEL<br>D664 DIL % |    |    |    |    |    |   |    |    |                             |    |       |      |

FORD ESCORT RECEIVED FROM CEC

NEW UNUSED B OF A OIL

|                           |       |       |      |     |      |      |     |    |    |    |   |    |   |   |    |     |      |      |      |       |       |
|---------------------------|-------|-------|------|-----|------|------|-----|----|----|----|---|----|---|---|----|-----|------|------|------|-------|-------|
| 07-28-86                  | 12061 | 91.5  | 12.1 | 125 | 2.36 | 2.92 | 0.0 | 51 | 35 | 10 | 0 | 11 | 1 | 0 | 0  | 200 | 980  | 1200 | 1300 | 15341 |       |
| 10-31-86                  | 13397 | 127.6 | 12.9 | 93  | 2.81 | 2.36 | 0.0 | 54 | 49 | 13 | 9 | 20 | 2 | 0 | 12 | 0   | 260  | 1170 | 920  | 1620  | 15514 |
| OIL CHANGE AT 14392 MILES |       |       |      |     |      |      |     |    |    |    |   |    |   |   |    |     |      |      |      |       |       |
| 02-13-87                  | 14433 | 102.6 | 13.6 | 132 | 3.31 | 6.40 | 0.0 | 24 | 13 | 5  | 0 | 5  | 0 | 0 | 5  | 9   | 610  | 1230 | 1600 | 1470  | 15859 |
| 07-08-87                  | 16667 | 119.4 | 12.9 | 101 | 4.71 | 6.51 | 0.0 | 29 | 19 | 13 | 0 | 8  | 0 | 0 | 10 | 7   | 1440 | 140  | 1350 | 1290  | 16430 |
| 09-04-87                  | 17735 | 127.6 | 15.8 | 130 | 5.05 | 5.95 | 0.0 | 28 | 23 | 13 | 2 | 9  | 0 | 0 | 0  | 3   | 1160 | 100  | 1170 | 1050  | 16670 |
| 11-02-87                  | 18681 | 120.4 | 11.5 | 70  | 2.02 | 4.26 | 0.0 | 55 | 60 | 21 | 6 | 14 | 1 | 0 | 0  | 1   | 1060 | 130  | 1470 | 1200  | 16050 |

OIL CHANGE AT 18682 MILES

OIL CHANGE AT 24001 MILES

|          |       |      |      |     |      |      |     |    |    |    |   |   |   |   |   |   |     |     |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|----|----|---|---|---|---|---|---|-----|-----|------|------|-------|
| 05-11-88 | 24008 | 81.0 | 10.9 | 121 | 3.14 | 3.37 | 0.0 | 26 | 50 | 27 | 0 | 8 | 0 | 0 | 9 | 0 | 600 | 270 | 1060 | 1300 | 17613 |
|----------|-------|------|------|-----|------|------|-----|----|----|----|---|---|---|---|---|---|-----|-----|------|------|-------|

TRANSFERRED TO SIOP @ 24008 MILES

OIL CHANGE TO PARAMINS 10W30 AT 24009 MI

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

REVISION DATE: AUG 11, 1988

FT. ORD METHANOL VEHICLE

ENGINE TYPE: I-4

VEHICLE USA #: CH438

| DATE | ODOM | VISCOSITY |       | VI | TAN | TBN FUEL |       | Fe | Pb | Cu | Sn | Al | PPM (PARTS PER MILLION) |   |   |  | Mg | Ca | P | Zn | BFLRF CODE |
|------|------|-----------|-------|----|-----|----------|-------|----|----|----|----|----|-------------------------|---|---|--|----|----|---|----|------------|
|      |      | 40 C      | 100 C |    |     | D664     | DIL % |    |    |    |    |    | Si                      | S | B |  |    |    |   |    |            |

FORD ESCORT RECEIVED FROM CEC

NEW UNUSED B OF A OIL

|          |       |      |      |     |      |      |     |     |    |    |   |    |   |   |   |   |     |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|-----|----|----|---|----|---|---|---|---|-----|------|------|------|-------|
| 07-28-86 | 12211 | 81.8 | 10.8 | 118 | 2.52 | 7.24 | 0.0 | 69  | 15 | 5  | 0 | 7  | 0 | 0 | 0 | 0 | 640 | 1750 | 1590 | 1000 | 15340 |
| 10-02-86 | 13201 | 97.2 | 12.0 | 114 | 2.19 | 7.63 | 0.0 | 85  | 23 | 8  | 2 | 13 | 1 | 0 | 1 | 1 | 580 | 1500 | 1460 | 1710 | 15460 |
| 12-11-86 | 14595 | 96.6 | 11.6 | 108 | 2.81 | 5.84 | 0.0 | 113 | 38 | 12 | 5 | 20 | 1 | 0 | 0 | 0 | 590 | 1610 | 1500 | 1560 | 15700 |

OIL CHANGE AT 15983 MILES

|          |       |      |      |     |      |      |     |     |    |    |   |    |   |   |   |   |     |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|-----|----|----|---|----|---|---|---|---|-----|------|------|------|-------|
| 05-29-87 | 17071 | 97.6 | 16.9 | 109 | 2.69 | 2.81 | 0.0 | 50  | 20 | 13 | 0 | 9  | 0 | 0 | 0 | 0 | 590 | 1310 | 1630 | 1630 | 16145 |
| 08-25-87 | 18199 | 91.2 | 11.5 | 115 | 4.04 | 3.59 | 0.0 | 83  | 33 | 28 | 0 | 15 | 1 | 0 | 0 | 0 | 520 | 1210 | 1380 | 1620 | 16576 |
| 10-30-87 | 19718 | 93.6 | 11.6 | 113 | 2.81 | 0.00 | 0.0 | 122 | 63 | 25 | 3 | 17 | 2 | 0 | 0 | 0 | 420 | 1220 | 1430 | 1360 | 16848 |

OIL CHANGE AT 19719 MILES

TRANSFERRED TO SIDP @ 22043 MILES

|          |       |       |      |     |      |      |     |    |    |    |   |   |   |   |   |   |     |      |      |      |       |
|----------|-------|-------|------|-----|------|------|-----|----|----|----|---|---|---|---|---|---|-----|------|------|------|-------|
| 05-10-88 | 22044 | 105.1 | 13.1 | 121 | 2.92 | 8.75 | 0.0 | 50 | 25 | 17 | 0 | 4 | 0 | 0 | 0 | 0 | 750 | 1810 | 1600 | 1940 | 17612 |
|----------|-------|-------|------|-----|------|------|-----|----|----|----|---|---|---|---|---|---|-----|------|------|------|-------|

OIL CHANGE TO PARANING 10W30 AT 22844 MI

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #1: CH0439 |  | ENGINE TYPE: I-4 |  | FORD ESCORT |  | FT. ORD METHANOL VEHICLE |  |                         |  |    |  |    |  |    |  | REVISION DATE: AUG 11, 1980 |  |       |  |    |  |    |  |   |  |    |  |    |  |   |  |    |  |      |  |
|------------------------|--|------------------|--|-------------|--|--------------------------|--|-------------------------|--|----|--|----|--|----|--|-----------------------------|--|-------|--|----|--|----|--|---|--|----|--|----|--|---|--|----|--|------|--|
| DATE                   |  | VISCOSITY        |  | TAN         |  | TBN FUEL                 |  | PPH (PARTS PER MILLION) |  |    |  |    |  |    |  |                             |  | BFLRF |  |    |  |    |  |   |  |    |  |    |  |   |  |    |  |      |  |
| 000M                   |  | 40 C 100 C       |  | VI          |  | D664 DIL %               |  | Fe                      |  | Pb |  | Cu |  | Sn |  | Al                          |  | Ni    |  | Mn |  | Si |  | B |  | Mg |  | Ca |  | P |  | Zn |  | CODE |  |

FORD ESCORT RECEIVED FROM CEC

NEW UNUSED B OF A OIL

|          |       |      |      |     |      |      |     |    |    |    |   |    |   |   |   |    |   |     |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|----|----|---|----|---|---|---|----|---|-----|------|------|------|-------|
| 07-28-86 | 11693 | 85.7 | 11.5 | 124 | 2.13 | 2.30 | 0.0 | 55 | 23 | 5  | 0 | 9  | 0 | 0 | 0 | 0  | 0 | 390 | 1410 | 1370 | 1600 | 15339 |
| 09-12-86 | 12661 | 97.4 | 13.6 | 140 | 2.69 | 3.09 | 0.0 | 59 | 27 | 6  | 0 | 13 | 0 | 0 | 0 | 0  | 1 | 500 | 1350 | 1250 | 1700 | 15429 |
| 03-02-87 | 14420 | 93.9 | 11.6 | 112 | 2.36 | 2.81 | 0.0 | 95 | 44 | 15 | 3 | 15 | 2 | 0 | 0 | 11 | 0 | 440 | 1400 | 1260 | 1450 | 15099 |

OIL CHANGE AT 14422 MILES

|          |       |      |      |     |      |      |     |    |    |    |   |    |   |   |   |   |   |     |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|----|----|---|----|---|---|---|---|---|-----|------|------|------|-------|
| 05-08-87 | 15572 | 93.2 | 11.4 | 110 | 3.14 | 5.61 | 0.0 | 34 | 15 | 9  | 0 | 0  | 0 | 0 | 0 | 0 | 0 | 610 | 1300 | 1510 | 1610 | 16073 |
| 08-17-87 | 16798 | 90.7 | 11.5 | 117 | 3.14 | 3.82 | 0.0 | 57 | 25 | 14 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 420 | 1910 | 1320 | 1370 | 16570 |

OIL CHANGE AT 18434 MILES

|          |       |      |      |     |      |      |     |    |    |    |   |   |   |   |   |   |   |     |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|----|----|---|---|---|---|---|---|---|-----|------|------|------|-------|
| 05-04-88 | 19196 | 90.3 | 11.6 | 110 | 2.36 | 4.60 | 0.0 | 37 | 35 | 24 | 0 | 9 | 0 | 0 | 0 | 6 | 0 | 420 | 1440 | 1290 | 1630 | 17610 |
|----------|-------|------|------|-----|------|------|-----|----|----|----|---|---|---|---|---|---|---|-----|------|------|------|-------|

TRANSFERRED TO SIDP @ 19196 MILES

OIL CHANGE TO PARAMINS 10030 AT 19196 MI

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #: CH0440 |      | ENGINE TYPE: I-4 |       | FORD ESCORT |     | FT. ORD METHANOL VEHICLE |    | REVISION DATE: AUG 11, 1980 |    |    |    |    |    |   |    |   |
|-----------------------|------|------------------|-------|-------------|-----|--------------------------|----|-----------------------------|----|----|----|----|----|---|----|---|
| DATE                  | ODOM | VISCOSITY        |       | TBN FUEL    |     | PPM (PARTS PER MILLION)  |    | BFLRF                       |    |    |    |    |    |   |    |   |
|                       |      | 40 C             | 100 C | VI          | TAN | D664 OIL %               | Fe | Pb                          | Cu | Sn | Al | Mn | Si | B | Ca | P |

FORD ESCORT RECEIVED FROM CEC

NEW B OF A OIL

|          |       |      |      |     |      |      |     |     |    |    |   |    |   |   |   |   |   |     |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|-----|----|----|---|----|---|---|---|---|---|-----|------|------|------|-------|
| 07-28-86 | 12524 | 98.4 | 15.1 | 161 | 2.92 | 5.50 | 0.0 | 21  | 8  | 1  | 0 | 4  | 0 | 0 | 0 | 0 | 4 | 630 | 1600 | 1560 | 1070 | 15330 |
| 09-11-86 | 13643 | 93.2 | 12.6 | 131 | 2.81 | 7.07 | 0.0 | 45  | 13 | 3  | 0 | 9  | 0 | 0 | 0 | 0 | 1 | 590 | 1460 | 1340 | 1050 | 15424 |
| 12-09-86 | 14608 | 87.5 | 11.7 | 125 | 2.69 | 5.72 | 0.0 | 78  | 23 | 6  | 0 | 15 | 0 | 0 | 0 | 0 | 9 | 500 | 1490 | 1340 | 1610 | 15660 |
| 02-27-87 | 15756 | 88.1 | 12.5 | 138 | 3.37 | 4.04 | 0.0 | 102 | 35 | 13 | 0 | 19 | 1 | 0 | 0 | 0 | 9 | 540 | 1360 | 1490 | 1520 | 15092 |

OIL CHANGE AT 15757 MILES

|          |       |       |      |     |      |      |     |     |    |    |   |    |   |   |   |   |    |     |      |      |      |       |
|----------|-------|-------|------|-----|------|------|-----|-----|----|----|---|----|---|---|---|---|----|-----|------|------|------|-------|
| 05-08-87 | 17052 | 100.5 | 12.4 | 116 | 3.82 | 5.84 | 0.0 | 61  | 21 | 6  | 0 | 13 | 0 | 0 | 0 | 0 | 10 | 590 | 1460 | 1450 | 1710 | 16074 |
| 07-30-87 | 18381 | 94.4  | 13.5 | 144 | 2.69 | 4.00 | 0.0 | 84  | 35 | 10 | 0 | 16 | 1 | 0 | 0 | 0 | 8  | 0   | 1200 | 1150 | 1410 | 16467 |
| 10-24-87 | 19497 | 97.3  | 11.1 | 99  | 3.93 | 2.47 | 0.0 | 133 | 63 | 14 | 0 | 18 | 0 | 0 | 0 | 0 | 10 | 440 | 1360 | 1410 | 1400 | 16755 |

OIL CHANGE AT 19719 MILES

|          |       |       |      |     |      |      |     |     |    |    |   |    |   |   |   |   |   |   |     |     |      |      |       |
|----------|-------|-------|------|-----|------|------|-----|-----|----|----|---|----|---|---|---|---|---|---|-----|-----|------|------|-------|
| 11-05-87 | 20248 | 109.9 | 12.0 | 110 | 2.47 | 0.00 | 0.0 | 103 | 63 | 25 | 4 | 18 | 2 | 0 | 0 | 0 | 9 | 2 | 910 | 920 | 1300 | 1410 | 16049 |
|----------|-------|-------|------|-----|------|------|-----|-----|----|----|---|----|---|---|---|---|---|---|-----|-----|------|------|-------|

OIL CHANGE AT 20249 MILES

OIL CHANGE AT 21097 MILES

|          |       |      |      |     |      |      |     |    |    |    |   |    |   |   |   |   |   |   |     |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|----|----|---|----|---|---|---|---|---|---|-----|------|------|------|-------|
| 05-17-88 | 23502 | 95.1 | 12.0 | 117 | 3.59 | 7.07 | 0.0 | 75 | 34 | 27 | 0 | 11 | 0 | 0 | 0 | 0 | 7 | 0 | 510 | 1390 | 1290 | 1550 | 17634 |
|----------|-------|------|------|-----|------|------|-----|----|----|----|---|----|---|---|---|---|---|---|-----|------|------|------|-------|

TRANSFERRED TO SIDP @ 23503 MILES

OIL CHANGE TO PARAMINS 10U30 AT 23503 MI

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA 0: CH0445 |      | ENGINE TYPE: I-4 |       | FORD ESCORT |    | SADP METHANOL VEHICLE |       | REVISION DATE: AUG 11, 1980 |    |    |    |    |    |    |   |    |    |       |
|-----------------------|------|------------------|-------|-------------|----|-----------------------|-------|-----------------------------|----|----|----|----|----|----|---|----|----|-------|
| DATE                  | QDOM | VISCOSITY        |       | TAN         | VI | TBM FUEL              |       | PPM (PARTS PER MILLION)     |    |    |    |    |    |    |   |    |    | BFLRF |
|                       |      | 40 C             | 100 C |             |    | D664                  | OIL % | Fe                          | Pb | Cu | Sn | Al | Mn | Si | 0 | Mg | Ca |       |

FORD ESCORT RECEIVED FROM CEC

DEADLINED SINCE 1-6-87 @ 9946 MILES

NEW UNUSED 20W-40 MOTOR CRAFT OIL

OIL CHANGE AT 9980 MILES

04-01-87 9989 92.7 18.1 216 2.81 7.63 0.0 83 21 4 0 12 0 0 9 1 530 1460 1240 1540 16002

NO FUEL DATA REPORTED FOR 632 MILES

07-09-87 13783 106.8 13.8 130 2.81 5.27 0.0 75 20 4 0 9 1 0 8 0 610 1680 1640 1790 16419

OIL CHANGE AT 13783 MILES

10-20-87 14737 104.5 13.0 120 2.69 5.05 0.0 23 7 1 0 4 0 0 7 1 370 1230 1520 1480 16799

OIL CHANGE AT 14737 MILES

03-02-88 15720 94.8 12.3 123 2.19 6.62 0.0 32 12 9 0 12 0 0 8 0 370 980 1180 1150 17390

OIL CHANGE TO PANAMINS 10W30 AT 15720 MI

07-11-88 16488 78.3 11.8 164 2.64 8.87 0.0 37 10 5 0 8 0 0 7 0 130 2690 1580 1570 17744

OIL CHANGE AT 16488 MILES

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

| VEHICLE USA #1: CH0491 |      | ENGINE TYPE: V-6 |       | CHEV CITATION |     | FT. ORD METHANOL VEHICLE |    | REVISION DATE: AUG 11, 1980 |    |    |    |    |    |   |    |    |   |       |
|------------------------|------|------------------|-------|---------------|-----|--------------------------|----|-----------------------------|----|----|----|----|----|---|----|----|---|-------|
| DATE                   | ODOM | VISCOSITY        |       | VI            | TAN | TBN FUEL                 |    | PPM (PARTS PER MILLION)     |    |    |    |    |    |   |    |    |   | BFLRF |
|                        |      | 40 C             | 100 C |               |     | Fe                       | Pb | Cu                          | Sn | Al | Hi | Mn | Si | B | Mg | Ca | P |       |

SENT TO FOCA FROM JPL

NEW UNUSED 2 OF A OIL

OIL CHANGE AT 32398 MILES

|          |       |       |      |     |      |      |     |     |     |     |    |    |    |   |   |    |   |      |     |      |      |       |
|----------|-------|-------|------|-----|------|------|-----|-----|-----|-----|----|----|----|---|---|----|---|------|-----|------|------|-------|
| 02-27-87 | 33399 | 107.1 | 11.3 | 90  | 2.58 | 5.16 | 0.0 | 0.0 | 108 | 112 | 31 | 19 | 13 | 3 | 0 | 46 | 5 | 1370 | 240 | 1490 | 1300 | 15093 |
| 07-29-87 | 35061 | 114.2 | 13.1 | 110 | 2.81 | 5.39 | 0.0 | 0.0 | 117 | 103 | 22 | 11 | 16 | 6 | 0 | 57 | 3 | 1200 | 440 | 1240 | 1400 | 16450 |
| 10-14-87 | 35960 | 112.9 | 12.8 | 107 | 2.69 | 4.71 | 0.0 | 0.0 | 179 | 147 | 27 | 18 | 17 | 7 | 0 | 73 | 3 | 1330 | 600 | 1570 | 1660 | 16004 |

OIL CHANGE AT 37160 MILES

|          |       |       |      |     |      |      |     |     |     |    |    |   |    |   |   |    |   |      |     |      |      |       |
|----------|-------|-------|------|-----|------|------|-----|-----|-----|----|----|---|----|---|---|----|---|------|-----|------|------|-------|
| 05-17-88 | 39440 | 145.6 | 15.0 | 103 | 2.81 | 6.96 | 0.0 | 0.0 | 107 | 39 | 16 | 3 | 15 | 2 | 0 | 42 | 4 | 1470 | 300 | 1430 | 1350 | 17635 |
|----------|-------|-------|------|-----|------|------|-----|-----|-----|----|----|---|----|---|---|----|---|------|-----|------|------|-------|

TRANSFERRED TO SIDP 2 39440 MILES

OIL CHANGE TO PARAFINS 10W30 AT 39441 MI

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #: CH0539 |      | ENGINE TYPE: I-4        |    | FORD ESCORT |                        | SADP METHANOL VEHICLE |    |    |    |    |    |    |   |    |   | REVISION DATE: AUG 11, 1988 |               |
|-----------------------|------|-------------------------|----|-------------|------------------------|-----------------------|----|----|----|----|----|----|---|----|---|-----------------------------|---------------|
| DATE                  | ODOM | VISCOSITY<br>40 C 100 C | VI | TAN         | TBM FUEL<br>D664 OIL % | Fe                    | Pb | Cu | Sn | Al | Mn | Si | B | Mg | P | Zn                          | 8FLRF<br>CODE |

## FORD ESCORT RECEIVED FROM CEC

## NEW UNUSED 20W-40 MOTOR CRAFT OIL

|          |       |      |      |     |      |      |     |     |    |    |   |    |   |   |    |   |     |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|-----|----|----|---|----|---|---|----|---|-----|------|------|------|-------|
| 02-18-87 | 11402 | 87.4 | 11.7 | 125 | 1.80 | 4.04 | 3.0 | 100 | 36 | 10 | 3 | 20 | 1 | 0 | 11 | 0 | 330 | 1100 | 1090 | 1400 | 16001 |
|----------|-------|------|------|-----|------|------|-----|-----|----|----|---|----|---|---|----|---|-----|------|------|------|-------|

## OIL CHANGE AT 11002 MILES

|          |       |       |      |     |      |      |     |    |    |    |   |    |   |   |    |   |     |      |      |      |       |
|----------|-------|-------|------|-----|------|------|-----|----|----|----|---|----|---|---|----|---|-----|------|------|------|-------|
| 05-17-87 | 15142 | 100.0 | 12.3 | 116 | 2.36 | 3.93 | 0.0 | 97 | 21 | 10 | 2 | 20 | 0 | 0 | 11 | 0 | 560 | 1310 | 1600 | 1570 | 16095 |
|----------|-------|-------|------|-----|------|------|-----|----|----|----|---|----|---|---|----|---|-----|------|------|------|-------|

## OIL CHANGE AT 15142 MILES

|          |       |      |      |     |      |      |     |    |   |   |   |   |   |   |   |   |     |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|---|---|---|---|---|---|---|---|-----|------|------|------|-------|
| 08-26-87 | 16502 | 96.1 | 12.3 | 121 | 2.19 | 5.73 | 0.0 | 26 | 6 | 3 | 0 | 7 | 0 | 0 | 6 | 0 | 340 | 1060 | 1130 | 1230 | 16563 |
|----------|-------|------|------|-----|------|------|-----|----|---|---|---|---|---|---|---|---|-----|------|------|------|-------|

## OIL CHANGE AT 16502 MILES

|          |       |      |      |     |      |      |     |    |   |   |   |   |   |   |   |   |     |     |     |      |       |
|----------|-------|------|------|-----|------|------|-----|----|---|---|---|---|---|---|---|---|-----|-----|-----|------|-------|
| 12-28-87 | 17873 | 81.8 | 11.0 | 122 | 1.91 | 3.93 | 0.0 | 21 | 7 | 3 | 0 | 5 | 0 | 0 | 5 | 0 | 100 | 750 | 830 | 1000 | 17089 |
|----------|-------|------|------|-----|------|------|-----|----|---|---|---|---|---|---|---|---|-----|-----|-----|------|-------|

## OIL CHANGE AT 17873 MILES

|          |       |      |      |     |      |      |     |    |   |   |   |   |   |   |   |   |     |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|---|---|---|---|---|---|---|---|-----|------|------|------|-------|
| 01-25-88 | 18573 | 92.2 | 12.1 | 123 | 2.13 | 6.28 | 0.0 | 20 | 6 | 6 | 0 | 5 | 0 | 0 | 6 | 0 | 390 | 1310 | 1010 | 1390 | 17202 |
|----------|-------|------|------|-----|------|------|-----|----|---|---|---|---|---|---|---|---|-----|------|------|------|-------|

## OIL CHANGE TO PARAMINS 10W30 AT 18573 MI

|          |       |      |     |    |      |       |     |    |   |   |   |   |   |   |   |   |     |      |      |      |       |
|----------|-------|------|-----|----|------|-------|-----|----|---|---|---|---|---|---|---|---|-----|------|------|------|-------|
| 02-23-88 | 18734 | 65.9 | 8.3 | 94 | 2.81 | 10.80 | 0.0 | 12 | 5 | 2 | 0 | 3 | 0 | 0 | 5 | 1 | 100 | 2430 | 1310 | 1600 | 17329 |
|----------|-------|------|-----|----|------|-------|-----|----|---|---|---|---|---|---|---|---|-----|------|------|------|-------|

## OIL CHANGE AT 18734 MILES

|          |       |      |      |     |      |       |     |    |   |    |   |   |   |   |   |   |    |      |      |      |       |
|----------|-------|------|------|-----|------|-------|-----|----|---|----|---|---|---|---|---|---|----|------|------|------|-------|
| 05-18-88 | 19629 | 77.5 | 11.9 | 148 | 2.81 | 11.90 | 0.0 | 27 | 8 | 11 | 0 | 2 | 0 | 0 | 8 | 0 | 70 | 3340 | 1540 | 1870 | 17704 |
|----------|-------|------|------|-----|------|-------|-----|----|---|----|---|---|---|---|---|---|----|------|------|------|-------|

## OIL CHANGE AT 19629 MILES

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

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VEHICLE USA #: CH0540 ENGINE TYPE: I-4 FORD ESCORT SADD METHANOL VEHICLE REVISION DATE: AUG 11, 1980

| DATE                                     | ODOH  | VISCOSITY<br>40 C 100 C | VI   | TAN | TBN  | FUEL<br>D664 CIL % | Fe  | Pb  | Cu | Sn | Al | H <sub>2</sub> | Mn | Si | S  | Mg | Ca  | P    | Zn   | SELARF<br>CODE |       |
|------------------------------------------|-------|-------------------------|------|-----|------|--------------------|-----|-----|----|----|----|----------------|----|----|----|----|-----|------|------|----------------|-------|
| FORD ESCORT RECEIVED FROM CEC            |       |                         |      |     |      |                    |     |     |    |    |    |                |    |    |    |    |     |      |      |                |       |
| NEW UNUSED 28U-40 MOTOR CRAFT OIL        |       |                         |      |     |      |                    |     |     |    |    |    |                |    |    |    |    |     |      |      |                |       |
| 03-15-87                                 | 12270 | 81.7                    | 10.9 | 120 | 2.24 | 2.02               | 0.0 | 131 | 27 | 15 | 4  | 24             | 2  | 0  | 11 | 0  | 320 | 1000 | 1100 | 1260           | 15952 |
| OIL CHANGE AT 12270 MILES                |       |                         |      |     |      |                    |     |     |    |    |    |                |    |    |    |    |     |      |      |                |       |
| 05-13-87                                 | 12843 | 93.3                    | 12.2 | 127 | 2.47 | 5.62               | 0.0 | 43  | 11 | 7  | 0  | 8              | 0  | 0  | 0  | 1  | 650 | 1490 | 1020 | 1760           | 16092 |
| OIL CHANGE AT 12843 MILES                |       |                         |      |     |      |                    |     |     |    |    |    |                |    |    |    |    |     |      |      |                |       |
| 08-05-87                                 | 15902 | 105.6                   | 13.1 | 120 | 3.48 | 5.84               | 0.0 | 50  | 9  | 6  | 0  | 12             | 0  | 0  | 0  | 0  | 440 | 1480 | 1360 | 1600           | 16475 |
| OIL CHANGE AT 15902 MILES                |       |                         |      |     |      |                    |     |     |    |    |    |                |    |    |    |    |     |      |      |                |       |
| 12-10-87                                 | 16374 | 91.1                    | 12.0 | 124 | 2.13 | 6.85               | 0.0 | 56  | 0  | 0  | 0  | 0              | 0  | 0  | 0  | 0  | 570 | 1450 | 1570 | 1500           | 16959 |
| OIL CHANGE AT 16374 MILES                |       |                         |      |     |      |                    |     |     |    |    |    |                |    |    |    |    |     |      |      |                |       |
| 03-01-88                                 | 17345 | 72.9                    | 10.3 | 126 | 1.35 | 4.60               | 0.0 | 39  | 8  | 7  | 0  | 5              | 0  | 0  | 0  | 0  | 350 | 550  | 1060 | 1190           | 17327 |
| OIL CHANGE TO PARAMINS 10U30 AT 17345 MI |       |                         |      |     |      |                    |     |     |    |    |    |                |    |    |    |    |     |      |      |                |       |
| 07-08-88                                 | 18730 | 94.2                    | 12.1 | 121 | 1.51 | 5.39               | 0.0 | 43  | 9  | 9  | 0  | 6              | 0  | 0  | 0  | 0  | 550 | 1420 | 1560 | 1570           | 17742 |
| OIL CHANGE AT 18730 MILES                |       |                         |      |     |      |                    |     |     |    |    |    |                |    |    |    |    |     |      |      |                |       |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #: CH0541                    |       | ENGINE TYPE: I-4        |      | FORD ESCORT |      | SADP METHANOL VEHICLE |     | PPH (PARTS PER MILLION) |    |    |    |    |    |    |    |    |     | REVISION DATE: AUG 11, 1980 |      |               |       |
|------------------------------------------|-------|-------------------------|------|-------------|------|-----------------------|-----|-------------------------|----|----|----|----|----|----|----|----|-----|-----------------------------|------|---------------|-------|
| DATE                                     | 000M  | VISCOSITY<br>40 C 100 C | YI   | TAM         | TBN  | FUEL<br>D664 OIL %    | Fe  | Pb                      | Cu | Sn | Al | Ni | Mn | Si | B  | Mg | Ca  | P                           | Zn   | SELEF<br>CODE |       |
| FORD ESCORT RECEIVED FROM CEC            |       |                         |      |             |      |                       |     |                         |    |    |    |    |    |    |    |    |     |                             |      |               |       |
| NEW UNUSED 20W-40 MOTOR CRAFT OIL        |       |                         |      |             |      |                       |     |                         |    |    |    |    |    |    |    |    |     |                             |      |               |       |
| 03-06-87                                 | 16876 | 75.7                    | 10.8 | 130         | 2.58 | 1.46                  | 0.0 | 219                     | 58 | 15 | 5  | 21 | 1  | 0  | 10 | 0  | 270 | 910                         | 940  | 970           | 15919 |
| OIL CHANGE AT 16876 MILES                |       |                         |      |             |      |                       |     |                         |    |    |    |    |    |    |    |    |     |                             |      |               |       |
| 05-13-87                                 | 18418 | 79.5                    | 11.3 | 132         | 2.30 | 5.73                  | 0.0 | 100                     | 26 | 19 | 0  | 15 | 0  | 0  | 10 | 0  | 590 | 1350                        | 1730 | 1630          | 16094 |
| OIL CHANGE AT 18418 MILES                |       |                         |      |             |      |                       |     |                         |    |    |    |    |    |    |    |    |     |                             |      |               |       |
| 08-26-87                                 | 20633 | 92.1                    | 11.9 | 121         | 2.58 | 5.16                  | 0.0 | 47                      | 16 | 9  | 0  | 10 | 0  | 0  | 7  | 0  | 320 | 1030                        | 1110 | 1200          | 16565 |
| OIL CHANGE AT 20633 MILES                |       |                         |      |             |      |                       |     |                         |    |    |    |    |    |    |    |    |     |                             |      |               |       |
| 12-03-87                                 | 23078 | 86.6                    | 11.4 | 121         | 2.13 | 6.06                  | 0.0 | 51                      | 13 | 8  | 0  | 11 | 1  | 0  | 9  | 0  | 380 | 1200                        | 1370 | 1270          | 17040 |
| OIL CHANGE AT 23078 MILES                |       |                         |      |             |      |                       |     |                         |    |    |    |    |    |    |    |    |     |                             |      |               |       |
| 01-03-88                                 | 24361 | 84.7                    | 11.3 | 122         | 2.08 | 3.59                  | 0.0 | 57                      | 11 | 7  | 0  | 7  | 0  | 0  | 7  | 0  | 390 | 1100                        | 1300 | 1360          | 17326 |
| OIL CHANGE TO PARAMINS 10030 AT 24361 MI |       |                         |      |             |      |                       |     |                         |    |    |    |    |    |    |    |    |     |                             |      |               |       |
| 07-08-88                                 | 26341 | 65.0                    | 9.0  | 115         | 2.81 | 7.29                  | 0.0 | 53                      | 12 | 7  | 0  | 10 | 1  | 0  | 11 | 0  | 110 | 2960                        | 1470 | 1760          | 17746 |
| OIL CHANGE AT 26341 MILES                |       |                         |      |             |      |                       |     |                         |    |    |    |    |    |    |    |    |     |                             |      |               |       |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

REVISION DATE: AUG 11, 1980

VEHICLE USA #: CH0542 ENGINE TYPE: I-4 FORD ESCORT SADD METHANOL VEHICLE

| DATE                                     | ODOM  | VISCOSITY<br>40 C 100 C | YI   | TAN | D664 DIL % | TBH FUEL | PPH (PARTS PER MILLION) |    |    |    |    |    |    | BFLRF<br>CODE |    |   |     |      |      |      |       |
|------------------------------------------|-------|-------------------------|------|-----|------------|----------|-------------------------|----|----|----|----|----|----|---------------|----|---|-----|------|------|------|-------|
|                                          |       |                         |      |     |            |          | Fe                      | Pb | Cu | Sn | Al | Mn | Si |               | Mg | P | Zn  |      |      |      |       |
| FORD ESCORT RECEIVED FROM CEC            |       |                         |      |     |            |          |                         |    |    |    |    |    |    |               |    |   |     |      |      |      |       |
| NO ACTIVITY RECORDED SINCE 13815 MILES   |       |                         |      |     |            |          |                         |    |    |    |    |    |    |               |    |   |     |      |      |      |       |
| NEW UNUSED 20W-40 MOTOR CRAFT OIL        |       |                         |      |     |            |          |                         |    |    |    |    |    |    |               |    |   |     |      |      |      |       |
| OIL CHANGE AT 14315 MILES                |       |                         |      |     |            |          |                         |    |    |    |    |    |    |               |    |   |     |      |      |      |       |
| 06-29-87                                 | 15000 | 81.3                    | 11.4 | 131 | 1.28       | 4.94     | 0.0                     | 52 | 21 | 18 | 0  | 13 | 0  | 0             | 10 | 1 | 400 | 1320 | 1400 | 1540 | 16244 |
| OIL CHANGE AT 15000 MILES                |       |                         |      |     |            |          |                         |    |    |    |    |    |    |               |    |   |     |      |      |      |       |
| 10-13-87                                 | 15591 | 76.5                    | 10.5 | 122 | 2.47       | 6.62     | 0.0                     | 33 | 13 | 6  | 0  | 8  | 0  | 0             | 7  | 1 | 360 | 1260 | 10   | 1290 | 16785 |
| OIL CHANGE AT 15591 MILES                |       |                         |      |     |            |          |                         |    |    |    |    |    |    |               |    |   |     |      |      |      |       |
| 12-28-87                                 | 17611 | 79.0                    | 11.2 | 132 | 3.70       | 6.28     | 0.0                     | 20 | 5  | 2  | 0  | 7  | 0  | 0             | 4  | 0 | 210 | 840  | 870  | 1010 | 17090 |
| U . CHANGE AT 17615 MILES                |       |                         |      |     |            |          |                         |    |    |    |    |    |    |               |    |   |     |      |      |      |       |
| 02-02-88                                 | 17805 | 88.8                    | 13.7 | 157 | 2.36       | 6.96     | 0.0                     | 23 | 3  | 0  | 0  | 2  | 0  | 0             | 4  | 1 | 330 | 1100 | 970  | 1290 | 17219 |
| OIL CHANGE TO PARAMINS 10U30 AT 17805 MI |       |                         |      |     |            |          |                         |    |    |    |    |    |    |               |    |   |     |      |      |      |       |
| OIL CHANGE AT 17819 MILES                |       |                         |      |     |            |          |                         |    |    |    |    |    |    |               |    |   |     |      |      |      |       |
| 02-24-88                                 | 17963 | 91.2                    | 12.0 | 129 | 2.81       | 7.41     | 0.0                     | 16 | 5  | 1  | 0  | 4  | 0  | 0             | 6  | 2 | 610 | 1560 | 1580 | 1770 | 17331 |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

|                       |                  |                         |                       |                             |     |                    |    |    |    |    |    |                         |    |   |    |    |   |    |                  |
|-----------------------|------------------|-------------------------|-----------------------|-----------------------------|-----|--------------------|----|----|----|----|----|-------------------------|----|---|----|----|---|----|------------------|
| VEHICLE USA #: CH0342 | ENGINE TYPE: I-4 | FORD ESCORT             | SADP METHANOL VEHICLE | REVISION DATE: AUG 11, 1988 |     |                    |    |    |    |    |    |                         |    |   |    |    |   |    |                  |
| DATE                  | ODOM             | VISCOSITY<br>40 C 100 C | VI                    | TAM                         | TBN | FUEL<br>D664 DIL % | Fe | Pb | Cu | Sn | Al | PPM (PARTS PER MILLION) | Si | B | Mg | Ca | P | Zn | SELENIUM<br>CODE |

OIL CHANGE AT 10447 MILES

|          |       |      |      |     |      |      |     |    |    |   |    |   |   |   |    |   |     |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|----|---|----|---|---|---|----|---|-----|------|------|------|-------|
| 05-10-88 | 10449 | 84.0 | 11.0 | 110 | 1.35 | 7.07 | 0.0 | 52 | 11 | 9 | 17 | 6 | 3 | 0 | 13 | 1 | 650 | 1340 | 1550 | 1770 | 17705 |
|----------|-------|------|------|-----|------|------|-----|----|----|---|----|---|---|---|----|---|-----|------|------|------|-------|

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CH0543 ENGINE TYPE: 1-4 FORD ESCORT S40P METHANOL VEHICLE REVISION DATE: AUG 11, 1988

| DATE                                     | ODOM  | VISCOSITY<br>40 C 100 C | VI   | TAN | TBN  | FUEL<br>D664 DYL % | Fe  | Pb | Cu | Sn | Al | Ni | Mn | Si | B  | Mg | Ca  | P    | Zn   | BFLRF<br>CODE |       |
|------------------------------------------|-------|-------------------------|------|-----|------|--------------------|-----|----|----|----|----|----|----|----|----|----|-----|------|------|---------------|-------|
| FORD ESCORT RECEIVED FROM CEC            |       |                         |      |     |      |                    |     |    |    |    |    |    |    |    |    |    |     |      |      |               |       |
| NO RECORDED DATA SINCE 12889 MILES       |       |                         |      |     |      |                    |     |    |    |    |    |    |    |    |    |    |     |      |      |               |       |
| NEW UNUSED 20W-40 MOTOR CRAFT OIL        |       |                         |      |     |      |                    |     |    |    |    |    |    |    |    |    |    |     |      |      |               |       |
| 02-02-87                                 | 13372 | 95.8                    | 11.4 | 106 | 2.47 | 5.27               | 0.0 | 77 | 25 | 9  | 2  | 13 | 0  | 0  | 9  | 0  | 440 | 1280 | 1430 | 1490          | 15884 |
| OIL CHANGE AT 13772 MILES                |       |                         |      |     |      |                    |     |    |    |    |    |    |    |    |    |    |     |      |      |               |       |
| 06-25-87                                 | 15594 | 91.9                    | 12.0 | 123 | 2.81 | 5.16               | 0.0 | 61 | 19 | 11 | 0  | 13 | 1  | 0  | 11 | 1  | 610 | 1370 | 1310 | 1740          | 16243 |
| OIL CHANGE AT 15594 MILES                |       |                         |      |     |      |                    |     |    |    |    |    |    |    |    |    |    |     |      |      |               |       |
| 10-19-87                                 | 17980 | 103.3                   | 17.7 | 189 | 3.82 | 5.05               | 0.0 | 42 | 13 | 6  | 0  | 12 | 0  | 0  | 10 | 1  | 410 | 1340 | 1410 | 1520          | 16791 |
| OIL CHANGE AT 17980 MILES                |       |                         |      |     |      |                    |     |    |    |    |    |    |    |    |    |    |     |      |      |               |       |
| 01-26-88                                 | 18754 | 94.5                    | 12.2 | 122 | 2.02 | 7.29               | 0.0 | 36 | 10 | 3  | 0  | 6  | 0  | 0  | 7  | 0  | 400 | 1250 | 1040 | 0             | 17195 |
| OIL CHANGE TO PARAMINS 10W30 AT 18754 MI |       |                         |      |     |      |                    |     |    |    |    |    |    |    |    |    |    |     |      |      |               |       |
| 04-28-88                                 | 20244 | 71.2                    | 10.0 | 123 | 2.69 | 7.74               | 0.0 | 59 | 16 | 9  | 0  | 12 | 2  | 0  | 16 | 0  | 160 | 4770 | 1560 | 2200          | 17556 |
| OIL CHANGE AT 20327 MILES                |       |                         |      |     |      |                    |     |    |    |    |    |    |    |    |    |    |     |      |      |               |       |
| 07-12-88                                 | 20499 | 73.6                    | 9.6  | 109 | .84  | 10.50              | 0.0 | 21 | 5  | 2  | 0  | 3  | 1  | 0  | 6  | 2  | 50  | 2970 | 1140 | 1790          | 17834 |
| OIL CHANGE AT 20499 MILES                |       |                         |      |     |      |                    |     |    |    |    |    |    |    |    |    |    |     |      |      |               |       |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY P  
-FUELED ADMINISTRATIVE  
VEHICLE DEMC  
-N PROGRAM - PHASE 11

| VEHICLE USA 01: CH0544 |      | ENGINE TYPE: I-4 |       | FORD ESCORT |     | SADP METHANOL VEHICLE |    | REVISION DATE: AUG 11, 1980 |    |    |    |    |   |    |    |   |    |       |      |
|------------------------|------|------------------|-------|-------------|-----|-----------------------|----|-----------------------------|----|----|----|----|---|----|----|---|----|-------|------|
| DATE                   | ODOM | VISCOSITY        |       | VI          | TAN | TBN FUEL              |    | PPH (PARTS PER MILLION)     |    |    |    |    |   |    |    |   |    | BFLRF |      |
|                        |      | 40 C             | 100 C |             |     | Fe                    | Pb | Cu                          | Sn | Al | Mn | Si | B | Mo | Ca | P | Zn |       | CODE |
|                        |      | 40 C             | 100 C |             |     |                       |    |                             |    |    |    |    |   |    |    |   |    |       |      |

FORD ESCORT RECEIVED FROM CEC

NO DATA GIVEN BETWEEN 2373 & 2930 MILES

NEW UNUSED 20W-40 MOTOR CRAFT OIL

|          |      |      |      |     |      |      |     |     |    |    |   |    |   |   |    |   |     |      |     |      |       |
|----------|------|------|------|-----|------|------|-----|-----|----|----|---|----|---|---|----|---|-----|------|-----|------|-------|
| 02-05-87 | 3441 | 82.5 | 11.5 | 130 | 2.24 | 3.59 | 0.0 | 246 | 66 | 34 | 8 | 36 | 2 | 0 | 44 | 3 | 440 | 1680 | 890 | 1260 | 15887 |
|----------|------|------|------|-----|------|------|-----|-----|----|----|---|----|---|---|----|---|-----|------|-----|------|-------|

OIL CHANGE AT 3441 MILES

|          |      |      |      |     |      |      |     |    |    |    |   |    |   |   |    |   |     |      |      |      |       |
|----------|------|------|------|-----|------|------|-----|----|----|----|---|----|---|---|----|---|-----|------|------|------|-------|
| 06-01-87 | 4460 | 91.1 | 12.5 | 133 | 3.03 | 5.61 | 0.0 | 95 | 23 | 25 | 0 | 11 | 0 | 0 | 13 | 0 | 510 | 1320 | 1540 | 1500 | 16140 |
|----------|------|------|------|-----|------|------|-----|----|----|----|---|----|---|---|----|---|-----|------|------|------|-------|

OIL CHANGE AT 4460 MILES

|          |      |       |      |     |      |      |     |    |    |    |   |    |   |   |    |   |     |      |      |      |       |
|----------|------|-------|------|-----|------|------|-----|----|----|----|---|----|---|---|----|---|-----|------|------|------|-------|
| 08-04-87 | 8947 | 102.6 | 12.5 | 115 | 3.59 | 4.83 | 0.0 | 99 | 16 | 13 | 0 | 19 | 0 | 0 | 11 | 0 | 450 | 1350 | 1300 | 1690 | 16474 |
|----------|------|-------|------|-----|------|------|-----|----|----|----|---|----|---|---|----|---|-----|------|------|------|-------|

OIL CHANGE AT 8947 MILES

|          |       |       |      |     |      |      |     |    |    |   |   |    |   |   |    |   |     |      |      |      |       |
|----------|-------|-------|------|-----|------|------|-----|----|----|---|---|----|---|---|----|---|-----|------|------|------|-------|
| 09-30-87 | 12601 | 101.0 | 13.5 | 133 | 2.92 | 4.94 | 0.0 | 62 | 12 | 8 | 0 | 13 | 0 | 0 | 10 | 0 | 510 | 1460 | 1650 | 1640 | 16750 |
|----------|-------|-------|------|-----|------|------|-----|----|----|---|---|----|---|---|----|---|-----|------|------|------|-------|

OIL CHANGE AT 12601 MILES

OIL CHANGE AT 12790 MILES

|          |       |      |      |     |      |      |     |    |   |   |   |   |   |   |   |   |     |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|---|---|---|---|---|---|---|---|-----|------|------|------|-------|
| 01-25-88 | 13109 | 98.2 | 12.7 | 124 | 3.25 | 7.63 | 0.0 | 19 | 6 | 0 | 0 | 3 | 0 | 0 | 5 | 0 | 440 | 1290 | 1060 | 1470 | 17203 |
|----------|-------|------|------|-----|------|------|-----|----|---|---|---|---|---|---|---|---|-----|------|------|------|-------|

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #1 CH0544                  |       | ENGINE TYPE: I-4        |      | FORD ESCORT |      | SADP METHANOL VEHICLE |     |    |    |    |    |    |    |    |    | REVISION DATE: AUG 11, 1988 |     |      |      |               |       |
|----------------------------------------|-------|-------------------------|------|-------------|------|-----------------------|-----|----|----|----|----|----|----|----|----|-----------------------------|-----|------|------|---------------|-------|
| DATE                                   | ODOM  | VISCOSITY<br>40 C 100 C | VI   | TAN         | TBN  | FUEL<br>D664 DIL %    | Fe  | Pb | Cu | Sn | Al | Hi | Mn | Si | B  | Mg                          | Ca  | P    | Zn   | BFLRF<br>CODE |       |
| OIL CHANGE TO P. VHS 10W30 AT 13109 MI |       |                         |      |             |      |                       |     |    |    |    |    |    |    |    |    |                             |     |      |      |               |       |
| 02-24-88                               | 13879 | 78.5                    | 10.1 | 110         | 2.86 | 11.20                 | 0.0 | 32 | 5  | 4  | 0  | 7  | 0  | 0  | 0  | 0                           | 130 | 3190 | 1520 | 1890          | 17330 |
| 04-27-88                               | 14654 | 75.5                    | 10.2 | 118         | 2.69 | 9.95                  | 0.0 | 44 | 8  | 6  | 0  | 7  | 2  | 0  | 11 | 1                           | 140 | 4840 | 1590 | 2340          | 17559 |
| OIL CHANGE AT 14655 MILES              |       |                         |      |             |      |                       |     |    |    |    |    |    |    |    |    |                             |     |      |      |               |       |
| 07-13-88                               | 15463 | 80.7                    | 10.2 | 108         | 2.52 | 10.50                 | 0.0 | 37 | 10 | 5  | 0  | 10 | 2  | 0  | 9  | 1                           | 50  | 3660 | 1430 | 1890          | 17851 |
| OIL CHANGE AT 16463 MILES              |       |                         |      |             |      |                       |     |    |    |    |    |    |    |    |    |                             |     |      |      |               |       |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #1 CH0545 |      | ENGINE TYPE: I-4 |       | FORD ESCORT |     | SADP METHANOL VEHICLE |     | REVISION DATE: AUG 11, 1980 |       |    |    |    |    |    |    |                         |   |    |    |       |
|-----------------------|------|------------------|-------|-------------|-----|-----------------------|-----|-----------------------------|-------|----|----|----|----|----|----|-------------------------|---|----|----|-------|
| DATE                  | ODOM | VISCOSITY        |       | VI          | TAN | FUEL                  | TBH | D664                        | OIL % | Fe | Pb | Cu | Sn | Al | Ni | PPM (PARTS PER MILLION) |   |    |    | BFLRF |
|                       |      | 40 C             | 100 C |             |     |                       |     |                             |       |    |    |    |    |    |    | Si                      | S | Mg | Ca |       |

FORD ESCORT RECEIVED FROM CEC

NO DATA SINCE 12910 MILES

NEW UNUSED 20W-40 MOTOR CRAFT OIL

02-02-87 13548 107.2 12.3 106 2.58 4.38 0.0 156 34 12 0 19 0 0 13 0 620 1630 1620 1730 15885  
OIL CHANGE AT 13548 MILES

04-08-87 18341 106.4 12.6 111 3.03 3.93 0.0 121 27 14 0 19 1 0 9 0 560 1450 1100 1590 16003  
OIL CHANGE AT 18341 MILES

07-13-87 20819 106.3 12.2 105 2.24 3.82 0.0 111 21 11 0 15 1 0 11 0 550 1430 1440 1640 16423  
OIL CHANGE AT 20819 MILES

10-07-87 22560 98.0 12.1 115 1.74 5.05 0.0 56 13 6 0 13 0 0 10 0 480 1370 1470 1520 16784  
OIL CHANGE AT 22560 MILES

01-11-88 22613 93.3 12.1 123 .45 7.07 0.0 15 5 0 0 5 0 0 5 2 440 1470 1280 1540 17106  
OIL CHANGE AT 22613 MILES

01-25-88 22733 98.0 11.2 100 3.14 7.52 0.0 12 3 0 0 3 0 0 3 2 410 1120 1040 1270 17200

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #: CN0545                    |       | ENGINE TYPE: J-4        |     | FORD ESCORT |      | SADP METHANOL VEHICLE |     |    |    |    |    |    |    |    |   | REVISION DATE: AUG 11, 1980 |     |      |      |               |       |
|------------------------------------------|-------|-------------------------|-----|-------------|------|-----------------------|-----|----|----|----|----|----|----|----|---|-----------------------------|-----|------|------|---------------|-------|
| DATE                                     | ODOM  | VISCOSITY<br>40 C 100 C | VI  | TAN         | TBN  | FUEL<br>D664 OIL %    | Fe  | Pb | Cu | Sn | Al | MI | Mn | Si | B | Mg                          | Ca  | P    | Zn   | BFLRF<br>CODE |       |
| OIL CHANGE TO PARAMINS 10W30 AT 22733 MI |       |                         |     |             |      |                       |     |    |    |    |    |    |    |    |   |                             |     |      |      |               |       |
| 92-24-88                                 | 23004 | 72.4                    | 9.6 | 111         | 1.80 | 12.50                 | 0.0 | 14 | 4  | 1  | 0  | 4  | 0  | 0  | 0 | 2                           | 120 | 2940 | 1520 | 1730          | 17333 |
| OIL CHANGE AT 23087 MILES                |       |                         |     |             |      |                       |     |    |    |    |    |    |    |    |   |                             |     |      |      |               |       |
| 05-11-88                                 | 23519 | 74.4                    | 9.9 | 114         | 3.03 | 12.40                 | 0.0 | 15 | 5  | 2  | 0  | 3  | 0  | 0  | 6 | 2                           | 60  | 3450 | 1470 | 1020          | 17615 |
| OIL CHANGE AT 23519 MILES                |       |                         |     |             |      |                       |     |    |    |    |    |    |    |    |   |                             |     |      |      |               |       |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #                            | CH0546 | ENGINE TYPE: I-4        | FORD ESCORT | SADP METHANOL VEHICLE | REVISION DATE: AUG 11, 1988 |      |     |     |    |    |    |    |    |   |    |    |     |      |      |      |       |
|------------------------------------------|--------|-------------------------|-------------|-----------------------|-----------------------------|------|-----|-----|----|----|----|----|----|---|----|----|-----|------|------|------|-------|
| DATE                                     | 000H   | VISCOSITY<br>40 C 100 C | YI          | TAN                   | TORQUE<br>D664 OIL %        | FUEL | Fe  | Pb  | Cu | Sn | Al | Si | Mn | B | Mo | Ca | P   | Zn   | CODE |      |       |
| FORD ESCORT RECEIVED FROM CEC            |        |                         |             |                       |                             |      |     |     |    |    |    |    |    |   |    |    |     |      |      |      |       |
| NO OPERATIONAL DATA 8164 TO 9049 MILES   |        |                         |             |                       |                             |      |     |     |    |    |    |    |    |   |    |    |     |      |      |      |       |
| NEW UNUSED 20W-40 MOTOR CRAFT OIL        |        |                         |             |                       |                             |      |     |     |    |    |    |    |    |   |    |    |     |      |      |      |       |
| 02-04-87                                 | 9535   | 65.9                    | 10.6        | 150                   | 1.69                        | 4.04 | 0.0 | 119 | 43 | 16 | 4  | 19 | 1  | 0 | 14 | 0  | 250 | 1260 | 1300 | 1370 | 15886 |
| OIL CHANGE AT 9538 MILES                 |        |                         |             |                       |                             |      |     |     |    |    |    |    |    |   |    |    |     |      |      |      |       |
| 05-13-87                                 | 13628  | 105.9                   | 12.6        | 112                   | 3.03                        | 4.83 | 0.0 | 112 | 24 | 16 | 0  | 16 | 0  | 0 | 10 | 0  | 680 | 1590 | 1060 | 1810 | 16093 |
| OIL CHANGE AT 13628 MILES                |        |                         |             |                       |                             |      |     |     |    |    |    |    |    |   |    |    |     |      |      |      |       |
| 08-03-87                                 | 17004  | 113.6                   | 14.5        | 130                   | 2.92                        | 4.04 | 0.0 | 91  | 21 | 8  | 0  | 15 | 2  | 0 | 10 | 0  | 400 | 1250 | 1150 | 1520 | 16473 |
| OIL CHANGE AT 17004 MILES                |        |                         |             |                       |                             |      |     |     |    |    |    |    |    |   |    |    |     |      |      |      |       |
| 11-24-87                                 | 18356  | 64.6                    | 10.9        | 115                   | 1.35                        | 5.50 | 0.0 | 60  | 0  | 0  | 0  | 0  | 0  | 0 | 0  | 0  | 340 | 1080 | 1190 | 1250 | 16960 |
| OIL CHANGE AT 18356 MILES                |        |                         |             |                       |                             |      |     |     |    |    |    |    |    |   |    |    |     |      |      |      |       |
| 03-02-88                                 | 20704  | 98.5                    | 14.3        | 149                   | 1.12                        | 2.69 | 0.0 | 67  | 16 | 13 | 0  | 8  | 0  | 0 | 0  | 0  | 310 | 1010 | 1250 | 1350 | 17328 |
| OIL CHANGE TO PARAMINS 10W30 AT 20704 MI |        |                         |             |                       |                             |      |     |     |    |    |    |    |    |   |    |    |     |      |      |      |       |
| 07-11-88                                 | 22163  | 79.6                    | 10.3        | 112                   | 2.47                        | 7.07 | 0.0 | 64  | 19 | 11 | 0  | 10 | 1  | 0 | 11 | 0  | 130 | 2890 | 1610 | 1630 | 17800 |
| OIL CHANGE AT 22163 MILES                |        |                         |             |                       |                             |      |     |     |    |    |    |    |    |   |    |    |     |      |      |      |       |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA 01 CN0547 ENGINE TYPE: I-4 FORD ESCORT SADD METHANOL VEHICLE REVISION DATE: AUG 11, 1980

| DATE                                     | ODOM  | VISCOSITY<br>40 C 100 C | VI   | TAN | TBN  | FUEL<br>D664 OIL % | Fe  | Pb  | Cu | Sn | Al | Hi | Mn | Si | B  | Mg | Ca  | P    | Zn   | BFLRF<br>CODE |       |
|------------------------------------------|-------|-------------------------|------|-----|------|--------------------|-----|-----|----|----|----|----|----|----|----|----|-----|------|------|---------------|-------|
| FORD ESCORT RECEIVED FROM CEC            |       |                         |      |     |      |                    |     |     |    |    |    |    |    |    |    |    |     |      |      |               |       |
| NEW UNUSED 20W-40 MOTOR CRAFT OIL        |       |                         |      |     |      |                    |     |     |    |    |    |    |    |    |    |    |     |      |      |               |       |
| 02-16-87                                 | 12671 | 84.3                    | 11.8 | 132 | 2.02 | 8.75               | 0.0 | 151 | 15 | 4  | 0  | 11 | 0  | 0  | 10 | 2  | 620 | 1400 | 1700 | 1540          | 15880 |
| OIL CHANGE AT 12671 MILES                |       |                         |      |     |      |                    |     |     |    |    |    |    |    |    |    |    |     |      |      |               |       |
| 05-17-87                                 | 17580 | 106.7                   | 12.9 | 116 | 3.14 | 3.14               | 0.0 | 118 | 13 | 10 | 0  | 24 | 0  | 0  | 17 | 0  | 590 | 1560 | 1840 | 1740          | 16896 |
| OIL CHANGE AT 17580 MILES                |       |                         |      |     |      |                    |     |     |    |    |    |    |    |    |    |    |     |      |      |               |       |
| 08-25-87                                 | 19520 | 108.3                   | 12.3 | 120 | 3.03 | 6.40               | 0.0 | 26  | 7  | 2  | 0  | 8  | 0  | 0  | 7  | 1  | 420 | 1250 | 1170 | 1300          | 16562 |
| OIL CHANGE AT 19520 MILES                |       |                         |      |     |      |                    |     |     |    |    |    |    |    |    |    |    |     |      |      |               |       |
| 12-16-87                                 | 24581 | 104.7                   | 13.3 | 125 | 3.03 | 1.91               | 0.0 | 93  | 24 | 10 | 0  | 18 | 1  | 0  | 9  | 0  | 380 | 1250 | 1310 | 1220          | 17066 |
| OIL CHANGE AT 24581 MILES                |       |                         |      |     |      |                    |     |     |    |    |    |    |    |    |    |    |     |      |      |               |       |
| 04-03-88                                 | 25185 | 92.9                    | 16.5 | 193 | 2.02 | 5.61               | 0.0 | 35  | 10 | 5  | 0  | 11 | 0  | 0  | 0  | 0  | 380 | 1800 | 1190 | 1190          | 17391 |
| OIL CHANGE TO PARAMINS 10W30 AT 25185 MI |       |                         |      |     |      |                    |     |     |    |    |    |    |    |    |    |    |     |      |      |               |       |
| 07-08-88                                 | 26114 | 71.1                    | 10.5 | 135 | 2.69 | 8.30               | 0.0 | 28  | 10 | 4  | 0  | 6  | 0  | 0  | 7  | 0  | 140 | 2790 | 1670 | 1640          | 17743 |
| OIL CHANGE AT 26114 MILES                |       |                         |      |     |      |                    |     |     |    |    |    |    |    |    |    |    |     |      |      |               |       |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #                            | CH0548 | ENGINE TYPE | 1-4        | FORD ESCORT | SADP METHANOL VEHICLE | PPH (PARTS PER MILLION) |     |      |    |    |    |    |    |    |    | 8FLRF |   |      |      |      |      |       |  |
|------------------------------------------|--------|-------------|------------|-------------|-----------------------|-------------------------|-----|------|----|----|----|----|----|----|----|-------|---|------|------|------|------|-------|--|
| DATE                                     | ODOM   | VISCOSITY   | 40 C 100 C | VI          | TAN                   | 0664 DIL %              | TBN | FUEL | Fe | Pb | Cu | Sn | Al | Bi | Mn | Si    | B | Mg   | Ca   | P    | Zn   | CODE  |  |
| FORD ESCORT RECEIVED FROM CEC            |        |             |            |             |                       |                         |     |      |    |    |    |    |    |    |    |       |   |      |      |      |      |       |  |
| NEW UNUSED 20W-40 MOTOR CRAFT OIL        |        |             |            |             |                       |                         |     |      |    |    |    |    |    |    |    |       |   |      |      |      |      |       |  |
| 02-16-87                                 | 14114  | 85.3        | 12.3       | 140         | 1.68                  | 5.27                    | 0.0 | 0.0  | 56 | 25 | 11 | 3  | 18 | 1  | 0  | 9     | 1 | 320  | 1010 | 1340 | 1330 | 15889 |  |
| OIL CHANGE AT 14114 MILES                |        |             |            |             |                       |                         |     |      |    |    |    |    |    |    |    |       |   |      |      |      |      |       |  |
| 06-04-87                                 | 15759  | 100.3       | 13.0       | 126         | 2.81                  | 6.96                    | 0.0 | 0.0  | 63 | 16 | 11 | 0  | 11 | 0  | 0  | 9     | 3 | 1000 | 1450 | 1690 | 1720 | 16153 |  |
| OIL CHANGE AT 15759 MILES                |        |             |            |             |                       |                         |     |      |    |    |    |    |    |    |    |       |   |      |      |      |      |       |  |
| 10-05-87                                 | 16883  | 97.1        | 17.2       | 194         | 2.19                  | 5.95                    | 0.0 | 0.0  | 22 | 8  | 4  | 0  | 6  | 0  | 0  | 6     | 1 | 420  | 1200 | 1450 | 1370 | 16783 |  |
| OIL CHANGE AT 16883 MILES                |        |             |            |             |                       |                         |     |      |    |    |    |    |    |    |    |       |   |      |      |      |      |       |  |
| 01-26-88                                 | 18325  | 81.0        | 11.1       | 125         | 4.38                  | 5.72                    | 0.0 | 0.0  | 40 | 10 | 7  | 0  | 7  | 9  | 0  | 8     | 0 | 480  | 1070 | 1000 | 1380 | 17194 |  |
| OIL CHANGE TO PARAMINS 10W30 AT 18325 MI |        |             |            |             |                       |                         |     |      |    |    |    |    |    |    |    |       |   |      |      |      |      |       |  |
| 04-27-88                                 | 18407  | 73.6        | 10.6       | 131         | 2.36                  | 14.40                   | 0.0 | 0.0  | 15 | 3  | 2  | 0  | 0  | 1  | 0  | 9     | 3 | 150  | 5140 | 1680 | 2360 | 17558 |  |
| OIL CHANGE AT 18407 MILES                |        |             |            |             |                       |                         |     |      |    |    |    |    |    |    |    |       |   |      |      |      |      |       |  |
| 07-20-88                                 | 18727  | 68.8        | 8.6        | 95          | 1.12                  | 11.50                   | 0.0 | 0.0  | 18 | 10 | 11 | 0  | 0  | 1  | 0  | 8     | 1 | 120  | 3740 | 1580 | 2140 | 18101 |  |
| OIL CHANGE AT 18727 MILES                |        |             |            |             |                       |                         |     |      |    |    |    |    |    |    |    |       |   |      |      |      |      |       |  |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #: CH0549                    |       | ENGINE TYPE: I-4        |      | FORD ESCORT |      | SADP METHANOL VEHICLE |     | REVISION DATE: AUG 11, 1988 |    |    |    |                                       |   |    |    |   |     |               |      |      |       |
|------------------------------------------|-------|-------------------------|------|-------------|------|-----------------------|-----|-----------------------------|----|----|----|---------------------------------------|---|----|----|---|-----|---------------|------|------|-------|
| DATE                                     | ODOM  | VISCOSITY<br>40 C 100 C | VI   | TAN         | TBN  | FUEL<br>0664 OIL %    | Fe  | Pb                          | Cu | Sn | Al | PPM (PARTS PER MILLION)<br>Hf Mn Si S | B | Hg | Cd | P | Zn  | 8FLKF<br>CODE |      |      |       |
| FORD ESCORT RECEIVED FROM CEC            |       |                         |      |             |      |                       |     |                             |    |    |    |                                       |   |    |    |   |     |               |      |      |       |
| NEW UNUSED 20W-40 MOTOR CRAFT OIL        |       |                         |      |             |      |                       |     |                             |    |    |    |                                       |   |    |    |   |     |               |      |      |       |
| 03-15-87                                 | 14996 | 100.2                   | 12.1 | 112         | 2.24 | 3.25                  | 0.0 | 110                         | 26 | 9  | 3  | 26                                    | 1 | 0  | 10 | 0 | 640 | 1480          | 1360 | 1750 | 15954 |
| OIL CHANGE AT 14996 MILES                |       |                         |      |             |      |                       |     |                             |    |    |    |                                       |   |    |    |   |     |               |      |      |       |
| 05-17-87                                 | 15872 | 100.2                   | 18.1 | 201         | 2.24 | 5.62                  | 0.0 | 45                          | 10 | 4  | 0  | 13                                    | 0 | 0  | 9  | 0 | 670 | 1430          | 1840 | 1720 | 15097 |
| OIL CHANGE AT 15872 MILES                |       |                         |      |             |      |                       |     |                             |    |    |    |                                       |   |    |    |   |     |               |      |      |       |
| 07-09-87                                 | 16476 | 106.9                   | 13.1 | 119         | 2.81 | 7.29                  | 0.0 | 24                          |    | 1  | 0  | 5                                     | 0 | 0  | 7  | 2 | 690 | 1650          | 1740 | 1010 | 16420 |
| OIL CHANGE AT 16476 MILES                |       |                         |      |             |      |                       |     |                             |    |    |    |                                       |   |    |    |   |     |               |      |      |       |
| 10-16-87                                 | 17052 | 100.6                   | 12.4 | 116         | 3.14 | 7.18                  | 0.0 | 21                          | 6  | 2  | 0  | 6                                     | 0 | 0  | 6  | 2 | 580 | 1480          | 1540 | 1560 | 16790 |
| OIL CHANGE AT 17052 MILES                |       |                         |      |             |      |                       |     |                             |    |    |    |                                       |   |    |    |   |     |               |      |      |       |
| 01-26-88                                 | 17460 | 91.4                    | 13.9 | 155         | 2.47 | 7.18                  | 0.0 | 16                          | 4  | 0  | 0  | 5                                     | 0 | 0  | 5  | 0 | 360 | 1080          | 990  | 1220 | 17197 |
| OIL CHANGE TO PARAMINS 10W30 AT 17460 MI |       |                         |      |             |      |                       |     |                             |    |    |    |                                       |   |    |    |   |     |               |      |      |       |
| 05-11-88                                 | 18020 | 70.9                    | 9.6  | 114         | 3.14 | 9.65                  | 0.0 | 32                          | 11 | 7  | 0  | 9                                     | 0 | 0  | 9  | 0 | 110 | 3220          | 1500 | 1730 | 17614 |
| OIL CHANGE AT 18020 MILES                |       |                         |      |             |      |                       |     |                             |    |    |    |                                       |   |    |    |   |     |               |      |      |       |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #: CH0530 | ENGINE TYPE: 1-4 | FORD ESCORT             | SADP METHANOL VEHICLE | REVISION DATE: AUG 11, 1988 |    |    |    |    |    |                                     |    |   |    |               |
|-----------------------|------------------|-------------------------|-----------------------|-----------------------------|----|----|----|----|----|-------------------------------------|----|---|----|---------------|
| DATE                  | ODOM             | VISCOSITY<br>40 C 100 C | VI TAN                | TGH FUEL<br>0664 OIL %      | Fc | Pb | Cu | Sn | Al | PPM (PARTS PER MILLION)<br>Mg Si Mn | Co | P | 2n | BFLRF<br>CODE |

FORD ESCORT RECEIVED FROM CEC

NEW UNUSED 20W-40 MOTOR CRAFT OIL

|                          |       |       |      |     |      |      |     |    |    |   |   |    |   |   |    |   |     |      |      |      |       |
|--------------------------|-------|-------|------|-----|------|------|-----|----|----|---|---|----|---|---|----|---|-----|------|------|------|-------|
| 03-06-87                 | 8734  | 88.5  | 11.8 | 124 | 1.68 | 5.51 | 0.0 | 56 | 20 | 0 | 0 | 13 | 0 | 0 | 10 | 1 | 450 | 1230 | 1320 | 1360 | 15920 |
| OIL CHANGE AT 8734 MILES |       |       |      |     |      |      |     |    |    |   |   |    |   |   |    |   |     |      |      |      |       |
| 06-04-87                 | 9863  | 96.4  | 11.6 | 109 | 2.59 | 7.29 | 0.0 | 47 | 15 | 4 | 0 | 3  | 0 | 0 | 9  | 0 | 700 | 1470 | 1750 | 1720 | 16152 |
| OIL CHANGE AT 9863 MILES |       |       |      |     |      |      |     |    |    |   |   |    |   |   |    |   |     |      |      |      |       |
| 09-23-87                 | 12078 | 100.0 | 12.6 | 120 | 2.92 | 5.95 | 0.0 | 45 | 20 | 5 | 0 | 14 | 0 | 0 | 9  | 0 | 610 | 1530 | 1800 | 1690 | 16749 |

OIL CHANGE AT 12078 MILES

OIL CHANGE TO PARAMINS 10W30 AT 12335 MI

|          |       |      |      |     |      |       |     |    |    |    |   |   |   |   |    |   |     |      |      |      |       |
|----------|-------|------|------|-----|------|-------|-----|----|----|----|---|---|---|---|----|---|-----|------|------|------|-------|
| 02-24-88 | 12401 | 68.4 | 8.9  | 103 | 3.09 | 10.30 | 0.0 | 13 | 7  | 3  | 0 | 2 | 0 | 0 | 5  | 2 | 100 | 2440 | 1400 | 1640 | 17332 |
| 05-16-88 | 12543 | 58.6 | 10.7 | 176 | 3.14 | 11.00 | 0.0 | 65 | 22 | 12 | 0 | 4 | 1 | 0 | 11 | 1 | 150 | 2650 | 1260 | 1560 | 17633 |

OIL CHANGE AT 12543 MILES

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #1 CH0551 |      | ENGINE TYPE: I-4 |       | FORD ESCORT |     | SADP METHANOL VEHICLE   |    | REVISION DATE: AUG 11, 1980 |    |    |    |    |    |   |    |            |
|-----------------------|------|------------------|-------|-------------|-----|-------------------------|----|-----------------------------|----|----|----|----|----|---|----|------------|
| DATE                  | ODOM | VISCOSITY        |       | TBN FUEL    |     | PPM (PARTS PER MILLION) |    |                             |    |    |    |    |    |   |    | 9FLRF CODE |
|                       |      | 40 C             | 100 C | V1          | TAN | D664 OIL %              | Fe | Pb                          | Cu | Sn | Al | Mn | Si | B | Mo |            |

FORD ESCORT RECEIVED FROM CEC

NEW UNUSED 20W-40 MOTOR CRAFT OIL

03-14-87 17010 93.4 11.9 118 3.14 3.14 0.0 114 25 10 5 21 1 0 11 0 570 1440 1380 1770 15953

OIL CHANGE AT 17010 MILES

07-09-87 18194 98.9 13.1 130 2.36 5.95 0.0 54 12 4 0 10 0 0 0 620 1570 1600 1710 16421

OIL CHANGE AT 18194 MILES

10-16-87 19420 99.0 12.2 115 3.03 6.06 0.0 30 9 3 0 10 0 0 7 490 1420 1430 1590 16789

OIL CHANGE AT 19420 MILES

02-22-88 20355 85.3 13.9 160 1.68 5.72 0.0 47 13 7 0 8 0 0 8 370 1130 1260 1420 17324

OIL CHANGE TO PARANINS 10W30 AT 20355 MI

07-11-88 21342 69.6 12.6 183 3.98 11.20 0.0 29 9 5 0 6 0 0 0 80 2500 1470 1490 17731

OIL CHANGE AT 21342 MILES

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #: CH0552                    | ENGINE TYPE: I-4 | FORD ESCORT             | SAOP METHANOL VEHICLE | REVISION DATE: AUG 11, 1988 |                        |       |     |     |    |    |    |    |    |   |    |    |     |      |      |            |
|------------------------------------------|------------------|-------------------------|-----------------------|-----------------------------|------------------------|-------|-----|-----|----|----|----|----|----|---|----|----|-----|------|------|------------|
| DATE                                     | ODOM             | VISCOSITY<br>40 C 100 C | VI                    | TAN                         | TBH FUEL<br>D664 DIL % | Fe    | Pb  | Cu  | Sn | Al | Mi | Mn | Si | B | Mo | Ca | P   | Zn   | CODE |            |
| FORD ESCORT RECEIVED FROM CEC            |                  |                         |                       |                             |                        |       |     |     |    |    |    |    |    |   |    |    |     |      |      |            |
| NEW UNUSED 20W-40 MOTOR CRAFT OIL        |                  |                         |                       |                             |                        |       |     |     |    |    |    |    |    |   |    |    |     |      |      |            |
| 03-06-87                                 | 14654            | 82.8                    | 11.2                  | 124                         | 2.02                   | 6.28  | 0.0 | 104 | 44 | 17 | 4  | 15 | 0  | 0 | 12 | 1  | 520 | 1310 | 1320 | 1410 15921 |
| OIL CHANGE AT 14654 MILES                |                  |                         |                       |                             |                        |       |     |     |    |    |    |    |    |   |    |    |     |      |      |            |
| 06-24-87                                 | 15183            | 87.4                    | 11.5                  | 121                         | 1.51                   | 5.39  | 0.0 | 34  | 13 | 9  | 0  | 7  | 0  | 0 | 8  | 2  | 480 | 1488 | 1470 | 1740 16239 |
| OIL CHANGE AT 15183 MILES                |                  |                         |                       |                             |                        |       |     |     |    |    |    |    |    |   |    |    |     |      |      |            |
| 10-02-87                                 | 15696            | 87.9                    | 12.5                  | 138                         | 1.91                   | 7.07  | 0.0 | 43  | 9  | 4  | 0  | 0  | 0  | 0 | 9  | 1  | 590 | 1470 | 1740 | 1630 16748 |
| OIL CHANGE AT 15696 MILES                |                  |                         |                       |                             |                        |       |     |     |    |    |    |    |    |   |    |    |     |      |      |            |
| 01-25-88                                 | 16031            | 64.9                    | 12.7                  | 200                         | 1.57                   | 5.05  | 0.0 | 28  | 8  | 3  | 0  | 6  | 0  | 0 | 6  | 1  | 0   | 670  | 1200 | 1040 17196 |
| OIL CHANGE TO PARAMINS 10W30 AT 16031 MI |                  |                         |                       |                             |                        |       |     |     |    |    |    |    |    |   |    |    |     |      |      |            |
| 02-24-88                                 | 16146            | 62.5                    | 9.0                   | 120                         | 2.81                   | 11.60 | 0.0 | 20  | 9  | 4  | 0  | 4  | 0  | 0 | 0  | 1  | 100 | 2470 | 1330 | 1490 17334 |
| 05-10-88                                 | 16459            | 55.9                    | 10.3                  | 175                         | 2.47                   | 11.70 | 0.0 | 37  | 18 | 11 | 0  | 5  | 0  | 0 | 8  | 0  | 100 | 2760 | 1160 | 1510 17611 |
| OIL CHANGE AT 16459 MILES                |                  |                         |                       |                             |                        |       |     |     |    |    |    |    |    |   |    |    |     |      |      |            |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #1 CH0553 |      | ENGINE TYPE: I-4 |    | FORD ESCORT |            | SADP METHANOL VEHICLE   |    | REVISION DATE: AUG 11, 1988 |    |    |    |    |   |    |    |       |    |      |
|-----------------------|------|------------------|----|-------------|------------|-------------------------|----|-----------------------------|----|----|----|----|---|----|----|-------|----|------|
| DATE                  | ODOM | VISCOSITY        | VI | TAN         | IBH FUEL   | PPM (PARTS PER MILLION) |    |                             |    |    |    |    |   |    |    | BFLRF |    |      |
|                       |      | 40 C 100 C       |    |             | D664 DIL % | Fc                      | Pb | Cu                          | Sn | Al | Mn | Si | B | Mg | Ca | P     | Zn | CODE |

FORD ESCORT RECEIVED FROM CEC

NEW UNUSED 20W-40 MOTOR CRAFT OIL

11-20-87 9909 100.3 12.3 115 2.92 8.53 0.0 71 29 7 0 13 0 0 9 1 550 1390 1570 1520 15891

OIL CHANGE AT 9909 MILES

06-02-87 10866 97.8 13.3 135 2.81 6.62 0.0 42 13 5 0 0 0 0 8 0 630 1410 1690 1650 16150

OIL CHANGE AT 10866 MILES

09-23-87 13892 111.5 13.0 111 1.91 4.94 0.0 40 14 4 0 10 0 0 8 0 430 1210 1290 1420 16685

OIL CHANGE AT 13892 MILES

01-26-88 15592 96.9 12.6 125 2.81 5.50 0.0 65 16 6 0 12 0 0 11 0 430 1340 1020 1410 17198

OIL CHANGE TO PARAMINS 10W30 AT 15592 MI

04-27-88 16353 64.8 9.7 132 2.47 9.20 0.0 46 15 8 0 9 2 0 14 0 140 4710 1600 2230 17557

OIL CHANGE AT 16353 MILES

07-18-88 16836 72.5 9.6 111 3.65 12.60 0.0 19 7 7 0 5 1 0 6 1 60 3170 1360 1760 17852

OIL CHANGE AT 16836 MILES

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #: CH0554 |      | ENGINE TYPE: I-4 |       | FORD ESCORT |     | SADP METHANOL VEHICLE |     | REVISION DATE: AUG 11, 1988 |                         |    |    |    |    |    |    |    |   |    |    |   |    |  |            |
|-----------------------|------|------------------|-------|-------------|-----|-----------------------|-----|-----------------------------|-------------------------|----|----|----|----|----|----|----|---|----|----|---|----|--|------------|
| DATE                  | ODOM | VISCOSITY        |       | VI          | TAN | D664 P/L %            | TBN | FUEL                        | PPM (PARTS PER MILLION) |    |    |    |    |    |    |    |   |    |    |   |    |  | BFLRF CODE |
|                       |      | 40 C             | 100 C |             |     |                       |     |                             | Fe                      | Pb | Cu | Sa | Al | Hi | Mn | Si | B | Mg | Ca | P | Zn |  |            |

FORD ESCORT RECEIVED FROM CEC

NEW UNUSED 20W-40 MOTOR CRAFT OIL

02-23-87 14659 86.0 11.8 127 2.24 4.71 0.0 65 26 9 0 9 0 0 0 0 9 0 250 1020 1190 1270 15918

OIL CHANGE AT 14659 MILES

06-02-87 18102 104.0 12.5 113 5.05 7.52 0.0 60 16 5 0 11 0 0 0 0 12 0 870 1620 1670 1820 16151

OIL CHANGE AT 18102 MILES

09-16-87 20224 102.2 12.7 119 3.14 6.28 0.0 42 13 4 0 9 0 0 0 0 8 10 580 1030 1090 1300 16683

OIL CHANGE AT 20224 MILES

01-06-88 22159 93.8 14.8 165 2.81 4.83 0.0 39 9 4 0 9 0 0 0 0 8 0 290 940 1020 1220 17097

OIL CHANGE AT 22159 MILES

03-07-88 23221 94.6 12.1 120 2.64 6.06 0.0 35 10 6 0 11 0 0 0 0 7 0 410 1120 1270 1300 17392

OIL CHANGE TO PARAMINS 10W30 AT 23221

07-08-88 24089 74.4 10.6 129 2.75 8.75 0.0 42 12 4 0 5 0 0 0 0 7 0 120 2630 1550 1630 17801

OIL CHANGE AT 24089 MILES

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CH0555 ENGINE TYPE: 1-4 FORD ESCORT SADD METHANOL VEHICLE REVISION DATE: AUG 11, 1980

| DATE                                     | OIL   | VISCOSITY<br>40 C 100 C | VI   | TAN | FUEL<br>D664 DIL % | Fe    | Pb  | Cu  | Sn | Al | PPM (PARTS PER MILLION) |    |    |   | Mg | Ca | P   | Zn   | SFLRF<br>CODE |      |       |
|------------------------------------------|-------|-------------------------|------|-----|--------------------|-------|-----|-----|----|----|-------------------------|----|----|---|----|----|-----|------|---------------|------|-------|
|                                          |       |                         |      |     |                    |       |     |     |    |    | Si                      | Mn | Bi | B |    |    |     |      |               |      |       |
| FORD ESCORT RECEIVED FROM CEC            |       |                         |      |     |                    |       |     |     |    |    |                         |    |    |   |    |    |     |      |               |      |       |
| NEW UNUSED 20W-40 MOTOR CRAFT OIL        |       |                         |      |     |                    |       |     |     |    |    |                         |    |    |   |    |    |     |      |               |      |       |
| 03-15-87                                 | 13493 | 90.5                    | 11.1 | 109 | 2.36               | 2.02  | 0.0 | 167 | 59 | 28 | 6                       | 23 | 1  | 0 | 14 | 0  | 430 | 1390 | 1210          | 1510 | 15955 |
| OIL CHANGE AT 13493 MILES                |       |                         |      |     |                    |       |     |     |    |    |                         |    |    |   |    |    |     |      |               |      |       |
| 07-09-87                                 | 14129 | 95.8                    | 12.0 | 116 | 2.24               | 6.51  | 0.0 | 119 | 20 | 23 | 0                       | 9  | 1  | 0 | 10 | 1  | 520 | 1420 | 1490          | 1620 | 16422 |
| OIL CHANGE AT 14129 MILES                |       |                         |      |     |                    |       |     |     |    |    |                         |    |    |   |    |    |     |      |               |      |       |
| 10-16-87                                 | 14801 | 89.2                    | 11.5 | 118 | 2.81               | 6.28  | 0.0 | 90  | 11 | 8  | 0                       | 10 | 0  | 0 | 8  | 1  | 510 | 1140 | 1460          | 1430 | 16788 |
| OIL CHANGE AT 14801 MILES                |       |                         |      |     |                    |       |     |     |    |    |                         |    |    |   |    |    |     |      |               |      |       |
| 03-01-88                                 | 15916 | 88.4                    | 14.0 | 163 | 1.51               | 2.69  | 0.0 | 55  | 16 | 20 | 0                       | 7  | 0  | 0 | 0  | 0  | 310 | 960  | 1250          | 1370 | 17325 |
| OIL CHANGE TO PARAMINS 10W30 AT 15916 MI |       |                         |      |     |                    |       |     |     |    |    |                         |    |    |   |    |    |     |      |               |      |       |
| OIL CHANGE AT 16074 MILES                |       |                         |      |     |                    |       |     |     |    |    |                         |    |    |   |    |    |     |      |               |      |       |
| 07-11-88                                 | 16878 | 76.3                    | 9.6  | 103 | 2.81               | 10.30 | 0.0 | 36  | 13 | 8  | 0                       | 6  | 0  | 0 | 6  | 0  | 110 | 2330 | 1430          | 1470 | 17745 |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #1 CH0356 |  | ENGINE TYPE: I-4 |  | FORD ESCORT |  | SADP METHANOL VEHICLE   |  |            |  |    |  |    |  |    |  | REVISION DATE: AUG 11, 1988 |  |    |  |    |  |    |  |    |  |   |  |    |  |    |  |   |  |    |  |      |  |
|-----------------------|--|------------------|--|-------------|--|-------------------------|--|------------|--|----|--|----|--|----|--|-----------------------------|--|----|--|----|--|----|--|----|--|---|--|----|--|----|--|---|--|----|--|------|--|
|                       |  | VISCOSITY        |  | TBN FUEL    |  | PPM (PARTS PER MILLION) |  |            |  |    |  |    |  |    |  | BFLNF                       |  |    |  |    |  |    |  |    |  |   |  |    |  |    |  |   |  |    |  |      |  |
| DATE                  |  | 40 C 100 C       |  | VI          |  | TAN                     |  | D664 OIL % |  | Fe |  | Pb |  | Cu |  | Sn                          |  | Al |  | Ni |  | Mn |  | Si |  | B |  | Hg |  | Ca |  | P |  | Zn |  | CODE |  |
| 000M                  |  |                  |  |             |  |                         |  |            |  |    |  |    |  |    |  |                             |  |    |  |    |  |    |  |    |  |   |  |    |  |    |  |   |  |    |  |      |  |

FORD ESCORT RECEIVED FROM CEC

NEW UNUSED 20W-40 MOTOR CRAFT OIL

03-06-87 14295 93.3 12.5 129 1.80 5.95 0.0 51 23 14 3 13 1 0 11 0 440 1350 1340 1460 15922

OIL CHANGE AT 14295 MILES

06-15-87 14849 91.8 15.4 178 1.18 7.63 0.0 28 28 7 0 5 0 0 7 0 500 1300 1530 1540 16217

OIL CHANGE AT 14849 MILES

08-26-87 18692 103.5 15.4 157 2.47 4.94 0.0 38 10 3 0 13 0 0 7 0 310 1050 1050 1270 16564

OIL CHANGE AT 18692 MILES

12-02-87 19564 81.7 11.3 128 2.02 6.73 0.0 35 9 4 0 12 1 0 0 0 560 1440 1460 1470 17039

OIL CHANGE AT 19564 MILES

OIL CHANGE TO PARAMINS 10W30 AT 19613 MI

02-24-88 20061 77.0 10.1 111 3.03 11.20 0.0 27 10 3 0 9 0 0 11 1 170 3260 1590 1770 17335

04-10-88 20498 73.5 9.5 107 2.58 11.90 0.0 27 7 3 0 7 0 0 7 0 90 3080 1270 1690 17608

OIL CHANGE AT 20498 MILES

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #                            | CHASSIS | ENGINE TYPE             | 1-4  | FORD ESCORT | SADP METHANOL VEHICLE | REVISION DATE: AUG 11, 1980 |     |      |    |    |    |    |    |   |                         |               |     |      |      |      |       |
|------------------------------------------|---------|-------------------------|------|-------------|-----------------------|-----------------------------|-----|------|----|----|----|----|----|---|-------------------------|---------------|-----|------|------|------|-------|
| DATE                                     | ODOM    | VISCOSITY<br>40 C 100 C | VI   | TAN         | TBN                   | FUEL<br>0664 OIL %          | Fe  | Pb   | Cu | Sn | Al | Si | Mn | B | PPH (PARTS PER MILLION) | 8FLRF<br>CODE |     |      |      |      |       |
| FORD ESCORT RECEIVED FROM CEC            |         |                         |      |             |                       |                             |     |      |    |    |    |    |    |   |                         |               |     |      |      |      |       |
| NEW UNUSED 20W-40 MOTOR CRAFT OIL        |         |                         |      |             |                       |                             |     |      |    |    |    |    |    |   |                         |               |     |      |      |      |       |
| 02-18-87                                 | 11130   | 87.4                    | 11.8 | 127         | 1.85                  | 3.92                        | 0.0 | 11.4 | 39 | 18 | 4  | 18 | 1  | 0 | 16                      | 0             | 650 | 1510 | 1460 | 1640 | 15890 |
| OIL CHANGE AT 11130 MILES                |         |                         |      |             |                       |                             |     |      |    |    |    |    |    |   |                         |               |     |      |      |      |       |
| 05-01-87                                 | 13022   | 100.7                   | 15.7 | 166         | 2.81                  | 5.39                        | 0.0 | 68   | 20 | 15 | 0  | 14 | 0  | 0 | 15                      | 0             | 590 | 1300 | 1510 | 1540 | 16149 |
| OIL CHANGE AT 13022 MILES                |         |                         |      |             |                       |                             |     |      |    |    |    |    |    |   |                         |               |     |      |      |      |       |
| 09-22-87                                 | 14503   | 92.6                    | 12.3 | 127         | 2.24                  | 4.94                        | 0.0 | 40   | 9  | 5  | 0  | 10 | 0  | 0 | 9                       | 0             | 380 | 980  | 1860 | 1190 | 16684 |
| OIL CHANGE AT 14503 MILES                |         |                         |      |             |                       |                             |     |      |    |    |    |    |    |   |                         |               |     |      |      |      |       |
| 01-23-88                                 | 15387   | 90.3                    | 11.6 | 118         | 2.92                  | 6.73                        | 0.0 | 27   | 5  | 3  | 0  | 6  | 0  | 0 | 7                       | 0             | 310 | 1020 | 940  | 1130 | 17199 |
| OIL CHANGE TO PARAMINS 10U30 AT 15387 MI |         |                         |      |             |                       |                             |     |      |    |    |    |    |    |   |                         |               |     |      |      |      |       |
| 04-10-88                                 | 17608   | 85.2                    | 10.1 | 98          | 3.82                  | 8.64                        | 0.0 | 41   | 15 | 12 | 0  | 12 | 0  | 0 | 11                      | 1             | 130 | 3440 | 1490 | 1830 | 17609 |
| OIL CHANGE AT 17608 MILES                |         |                         |      |             |                       |                             |     |      |    |    |    |    |    |   |                         |               |     |      |      |      |       |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

| VEHICLE USA #1 X79115 |      | ENGINE TYPE: I-4 |       | CHRYSLER K-CAR |     | USAF METHANOL VEHICLE |    | REVISION DATE: AUG 11, 1988 |    |    |    |    |    |    |   |    |    |       |
|-----------------------|------|------------------|-------|----------------|-----|-----------------------|----|-----------------------------|----|----|----|----|----|----|---|----|----|-------|
| DATE                  | ODOM | VISCOSITY        |       | VI             | TAN | FUEL                  |    | PPH (PARTS PER MILLION)     |    |    |    |    |    |    |   |    |    | BFLRF |
|                       |      | 40 C             | 100 C |                |     | DIL %                 | Fe | Pb                          | Cu | Sn | Al | Hf | Mn | Si | B | Mg | Ca |       |

CHRYSLER CONVERTED "K" CAR

NEW UNUSED LUBRIZOL (AL-15427)

|          |       |      |      |     |      |      |     |     |    |    |    |    |   |   |   |   |     |    |    |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|-----|----|----|----|----|---|---|---|---|-----|----|----|------|------|------|-------|
| 12-17-86 | 29245 | 63.1 | 8.8  | 113 | 2.69 | 8.75 | 0.0 | 32  | 12 | 21 | 7  | 13 | 0 | 0 | 0 | 0 | 99  | 80 | 20 | 2660 | 1360 | 1450 | 15632 |
| 02-09-87 | 29570 | 64.8 | 10.7 | 155 | 3.14 | 4.94 | 0.0 | 69  | 30 | 35 | 19 | 24 | 2 | 0 | 0 | 0 | 162 | 78 | 30 | 2728 | 1420 | 1540 | 15649 |
| 04-22-87 | 31742 | 68.9 | 9.9  | 126 | 2.58 | 8.08 | 0.0 | 105 | 42 | 40 | 22 | 40 | 2 | 0 | 0 | 0 | 156 | 39 | 30 | 2630 | 1530 | 1590 | 16027 |
| 05-15-87 | 32363 | 72.5 | 12.0 | 162 | 2.47 | 9.30 | 0.0 | 144 | 46 | 52 | 27 | 64 | 3 | 0 | 0 | 0 | 172 | 39 | 30 | 2950 | 1296 | 1770 | 16668 |

OIL CHANGE AT 32364 MILES

|          |       |      |      |     |      |      |     |    |    |    |   |    |   |   |   |   |    |    |    |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|----|----|---|----|---|---|---|---|----|----|----|------|------|------|-------|
| 07-14-87 | 33883 | 71.2 | 10.3 | 130 | 2.81 | 5.50 | 0.0 | 62 | 29 | 17 | 0 | 37 | 1 | 0 | 0 | 0 | 55 | 59 | 30 | 3200 | 1430 | 1690 | 16424 |
| 09-02-87 | 35621 | 77.1 | 13.0 | 171 | 1.80 | 7.18 | 0.0 | 89 | 50 | 28 | 4 | 78 | 2 | 0 | 0 | 0 | 68 | 0  | 30 | 3150 | 1360 | 1890 | 16578 |

OIL CHANGE AT 35621 MILES

|          |       |      |      |     |      |       |     |    |    |    |   |    |   |   |   |   |    |    |    |      |      |      |       |
|----------|-------|------|------|-----|------|-------|-----|----|----|----|---|----|---|---|---|---|----|----|----|------|------|------|-------|
| 10-02-87 | 36523 | 64.8 | 10.4 | 150 | 2.36 | 10.40 | 0.0 | 30 | 22 | 8  | 0 | 24 | 0 | 0 | 0 | 0 | 20 | 71 | 30 | 2990 | 1610 | 1640 | 16751 |
| 01-15-88 | 38648 | 71.1 | 11.1 | 141 | 3.70 | 8.98  | 0.0 | 54 | 24 | 14 | 0 | 68 | 0 | 0 | 0 | 0 | 27 | 38 | 20 | 3120 | 1070 | 1630 | 17190 |

OIL CHANGE AT 38650 MILES

|          |       |      |      |     |      |       |     |    |    |    |   |     |   |   |   |   |    |    |    |      |      |      |       |
|----------|-------|------|------|-----|------|-------|-----|----|----|----|---|-----|---|---|---|---|----|----|----|------|------|------|-------|
| 02-16-88 | 39368 | 65.6 | 10.5 | 149 | 2.58 | 10.30 | 0.0 | 36 | 15 | 9  | 0 | 30  | 0 | 0 | 0 | 0 | 12 | 59 | 30 | 2890 | 1240 | 1650 | 17323 |
| 05-04-88 | 41850 | 74.0 | 11.4 | 147 | 4.26 | 3.93  | 0.0 | 86 | 53 | 18 | 0 | 104 | 2 | 0 | 0 | 0 | 20 | 67 | 40 | 6150 | 1420 | 2680 | 17584 |

OIL CHANGE AT 41850 MILES

|          |       |      |      |     |      |      |     |     |    |    |   |     |   |   |   |   |    |    |    |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|-----|----|----|---|-----|---|---|---|---|----|----|----|------|------|------|-------|
| 06-09-88 | 42812 | 67.4 | 10.4 | 141 | 6.73 | 8.64 | 0.0 | 42  | 9  | 7  | 0 | 45  | 1 | 0 | 0 | 0 | 8  | 83 | 20 | 3090 | 1560 | 1620 | 17732 |
| 07-06-88 | 43412 | 72.9 | 11.3 | 147 | 3.37 | 9.31 | 0.0 | 103 | 23 | 17 | 0 | 152 | 4 | 0 | 0 | 0 | 22 | 88 | 50 | 3920 | 1590 | 2550 | 18109 |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: X79116 ENGINE TYPE: J-4 CHRYSLER K-CAR USAF METHANOL VEHICLE REVISION DATE: AUG 11, 1980

| DATE | ODOM | VISCOSITY<br>40 C 100 C | VI | TAK | TAK<br>D664 OIL % | FUEL | F <sub>2</sub> | Pb | Cu | Sn | Al | PPH (PARTS PER MILLION)<br>Ni Mn Si | Mg | Ca | P | Zn | BFLRF<br>CODE |
|------|------|-------------------------|----|-----|-------------------|------|----------------|----|----|----|----|-------------------------------------|----|----|---|----|---------------|
|------|------|-------------------------|----|-----|-------------------|------|----------------|----|----|----|----|-------------------------------------|----|----|---|----|---------------|

## CHRYSLER CONVERTED "K" CAR

## NEW UNUSED LUBRIZOL (AL-15427)

|          |       |      |      |     |      |       |     |     |    |    |    |    |   |   |     |    |    |      |      |      |       |
|----------|-------|------|------|-----|------|-------|-----|-----|----|----|----|----|---|---|-----|----|----|------|------|------|-------|
| 12-17-86 | 29808 | 62.3 | 10.9 | 168 | 2.92 | 8.98  | 0.0 | 15  | 14 | 8  | 5  | 10 | 0 | 0 | 186 | 95 | 30 | 2960 | 1530 | 1570 | 15679 |
| 02-09-87 | 30183 | 65.6 | 9.7  | 130 | 3.03 | 9.54  | 0.0 | 53  | 38 | 23 | 17 | 22 | 0 | 0 | 191 | 75 | 40 | 3040 | 1540 | 1660 | 15840 |
| 04-02-87 | 31242 | 63.4 | 10.4 | 153 | 2.58 | 11.33 | 0.0 | 105 | 46 | 27 | 25 | 27 | 1 | 0 | 182 | 58 | 40 | 2780 | 1210 | 1620 | 15986 |

## OIL CHANGE AT 31243 MILES

|          |       |      |      |     |      |      |     |    |    |    |   |    |   |   |     |    |    |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|----|----|---|----|---|---|-----|----|----|------|------|------|-------|
| 04-03-87 | 31250 | 64.5 | 10.0 | 140 | 2.69 | 8.98 | 0.0 | 21 | 5  | 3  | 0 | 6  | 0 | 0 | 36  | 90 | 30 | 3030 | 1270 | 1710 | 15987 |
| 04-15-87 | 31844 | 66.2 | 10.5 | 147 | 2.24 | 7.97 | 0.0 | 26 | 16 | 7  | 0 | 11 | 0 | 0 | 75  | 83 | 30 | 3160 | 1370 | 1690 | 16008 |
| 07-27-87 | 33861 | 68.0 | 10.2 | 135 | 3.59 | 8.30 | 0.0 | 51 | 37 | 18 | 3 | 35 | 2 | 0 | 105 | 41 | 30 | 2020 | 1100 | 1590 | 16459 |

## OIL CHANGE AT 33861 MILES

|          |       |      |      |     |      |       |     |    |    |    |   |    |   |   |    |    |    |      |      |      |       |
|----------|-------|------|------|-----|------|-------|-----|----|----|----|---|----|---|---|----|----|----|------|------|------|-------|
| 11-10-87 | 36877 | 74.6 | 11.1 | 139 | 2.58 | 13.92 | 0.0 | 47 | 25 | 16 | 0 | 48 | 0 | 0 | 48 | 51 | 40 | 3250 | 1470 | 1750 | 16847 |
|----------|-------|------|------|-----|------|-------|-----|----|----|----|---|----|---|---|----|----|----|------|------|------|-------|

## OIL CHANGE AT 36877 MILES

|          |       |      |      |     |      |      |     |     |    |    |    |    |   |   |     |    |    |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|-----|----|----|----|----|---|---|-----|----|----|------|------|------|-------|
| 02-29-88 | 39885 | 74.8 | 11.0 | 137 | 1.80 | 3.62 | 0.0 | 105 | 46 | 27 | 25 | 27 | 1 | 0 | 182 | 58 | 40 | 2780 | 1210 | 1620 | 17322 |
|----------|-------|------|------|-----|------|------|-----|-----|----|----|----|----|---|---|-----|----|----|------|------|------|-------|

## OIL CHANGE AT 39885 MILES

|          |       |      |      |     |      |      |     |    |    |    |   |    |   |   |    |    |    |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|----|----|---|----|---|---|----|----|----|------|------|------|-------|
| 03-04-88 | 40724 | 66.5 | 13.2 | 204 | 2.52 | 8.98 | 0.0 | 15 | 10 | 4  | 0 | 25 | 0 | 0 | 0  | 52 | 20 | 2320 | 1160 | 1280 | 17393 |
| 07-08-88 | 42902 | 76.3 | 11.4 | 141 | 4.88 | 6.51 | 0.0 | 85 | 44 | 14 | 0 | 25 | 0 | 0 | 27 | 47 | 30 | 3760 | 1610 | 2000 | 17804 |

## OIL CHANGE AT 42902 MILES

|          |       |      |      |     |      |      |     |    |    |   |   |    |   |   |    |     |    |      |      |      |       |
|----------|-------|------|------|-----|------|------|-----|----|----|---|---|----|---|---|----|-----|----|------|------|------|-------|
| 07-08-88 | 43100 | 66.7 | 10.5 | 146 | 2.36 | 5.05 | 0.0 | 32 | 12 | 7 | 0 | 50 | 2 | 0 | 19 | 109 | 60 | 3700 | 1570 | 2570 | 18110 |
|----------|-------|------|------|-----|------|------|-----|----|----|---|---|----|---|---|----|-----|----|------|------|------|-------|

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

REVISION DATE: AUG 11, 1988

VEHICLE USA #: X79117 ENGINE TYPE: J-4 CHRYSLER K-CAR USAF METHANOL VEHICLE

| DATE                          | OIL   | VISCOSITY<br>40 C 100 C | VI   | TAH | D664 OIL % | TBN  | FUEL | Fe  | Pb | Cu | Sn | Al  | Ni | Mn | Si  | S  | B  | PPH (PARTS PER MILLION) |      |      |       | BFLAF |
|-------------------------------|-------|-------------------------|------|-----|------------|------|------|-----|----|----|----|-----|----|----|-----|----|----|-------------------------|------|------|-------|-------|
|                               |       |                         |      |     |            |      |      |     |    |    |    |     |    |    |     |    |    | Mo                      | Ca   | P    | Zn    |       |
| CHRYSLER CONVERTED "K" CAR    |       |                         |      |     |            |      |      |     |    |    |    |     |    |    |     |    |    |                         |      |      |       |       |
| NEW UNUSED LUBRIZOL VAL-15427 |       |                         |      |     |            |      |      |     |    |    |    |     |    |    |     |    |    |                         |      |      |       |       |
| 12-17-86                      | 23540 | 63.7                    | 10.4 | 152 | 2.47       | 8.84 | 0.0  | 26  | 23 | 35 | 7  | 11  | 0  | 0  | 142 | 56 | 20 | 3130                    | 1510 | 1610 | 15680 |       |
| 02-09-87                      | 30674 | 70.2                    | 10.5 | 136 | 2.92       | 9.54 | 0.0  | 15  | 58 | 54 | 19 | 22  | 2  | 0  | 184 | 72 | 30 | 3060                    | 1350 | 1730 | 15850 |       |
| 04-16-87                      | 32550 | 72.7                    | 11.3 | 148 | 2.36       | 7.97 | 0.0  | 105 | 59 | 65 | 31 | 41  | 3  | 0  | 205 | 41 | 40 | 3100                    | 1230 | 1800 | 16009 |       |
| 05-12-87                      | 32874 | 75.6                    | 10.7 | 128 | 2.02       | 7.86 | 0.0  | 115 | 79 | 61 | 33 | 51  | 3  | 0  | 223 | 37 | 40 | 3040                    | 1280 | 1810 | 16067 |       |
| OIL CHANGE AT 32875 MILES     |       |                         |      |     |            |      |      |     |    |    |    |     |    |    |     |    |    |                         |      |      |       |       |
| 09-14-87                      | 36321 | 73.6                    | 10.9 | 137 | 1.91       | 6.73 | 0.0  | 51  | 36 | 34 | 0  | 49  | 0  | 0  | 59  | 40 | 20 | 2570                    | 1200 | 1510 | 16664 |       |
| OIL CHANGE AT 36321 MILES     |       |                         |      |     |            |      |      |     |    |    |    |     |    |    |     |    |    |                         |      |      |       |       |
| OIL CHANGE AT 39411 MILES     |       |                         |      |     |            |      |      |     |    |    |    |     |    |    |     |    |    |                         |      |      |       |       |
| 01-05-88                      | 39413 | 72.6                    | 10.9 | 139 | 2.24       | 9.88 | 0.0  | 55  | 31 | 24 | 0  | 54  | 0  | 0  | 35  | 25 | 20 | 2960                    | 980  | 1540 | 17086 |       |
| 05-09-88                      | 42692 | 70.9                    | 11.2 | 150 | 2.24       | 4.60 | 0.0  | 53  | 53 | 21 | 4  | 144 | 2  | 0  | 28  | 39 | 30 | 4540                    | 1270 | 2140 | 17599 |       |
| OIL CHANGE AT 42692 MILES     |       |                         |      |     |            |      |      |     |    |    |    |     |    |    |     |    |    |                         |      |      |       |       |
| 06-17-88                      | 43200 | 67.6                    | 10.9 | 152 | 6.73       | 7.97 | 0.0  | 85  | 33 | 14 | 0  | 149 | 1  | 0  | 19  | 73 | 30 | 3460                    | 1540 | 1820 | 17802 |       |
| 07-08-88                      | 43823 | 72.2                    | 11.2 | 147 | 2.19       | 3.14 | 0.0  | 148 | 44 | 21 | 7  | 372 | 4  | 0  | 30  | 66 | 50 | 3660                    | 1460 | 2380 | 18111 |       |

LUBRICANT DATA AND TRACE METALS FROM  
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE  
VEHICLE DEMONSTRATION PROGRAM - PHASE II

REVISION DATE: AUG 11, 1988

VEHICLE USA #1 X79118 ENGINE TYPE: I-4 CHRYSLER K-CAR USAF METHANOL VEHICLE

| DATE                           | ODOM  | VISCOSITY<br>40 C 100 C | VI   | TAN | IGN FUEL<br>D664 OIL % | FC    | PB  | CU | SO | NI | PPM (PARTS PER MILLION) |    |    |     |    | BFLRF |      |      |      |       |
|--------------------------------|-------|-------------------------|------|-----|------------------------|-------|-----|----|----|----|-------------------------|----|----|-----|----|-------|------|------|------|-------|
|                                |       |                         |      |     |                        |       |     |    |    |    | HI                      | Mn | SI | B   | MO |       | Ca   | P    | Zn   |       |
| CHRYSLER CONVERTED "K" CAR     |       |                         |      |     |                        |       |     |    |    |    |                         |    |    |     |    |       |      |      |      |       |
| NEW UNUSED LUBRIZOL (AL-15427) |       |                         |      |     |                        |       |     |    |    |    |                         |    |    |     |    |       |      |      |      |       |
| 12-17-86                       | 30328 | 59.1                    | 9.4  | 140 | 0.00                   | 0.0   | 40  | 11 | 15 | 3  | 7                       | 0  | 0  | 111 | 75 | 20    | 2530 | 1360 | 1370 | 15681 |
| 02-23-87                       | 31659 | 66.9                    | 9.7  | 126 | 2.92                   | 9.98  | 50  | 46 | 31 | 16 | 24                      | 2  | 0  | 106 | 70 | 40    | 2790 | 1480 | 1570 | 15894 |
| 04-13-87                       | 33295 | 73.1                    | 11.0 | 140 | 2.19                   | 7.63  | 77  | 54 | 36 | 19 | 41                      | 3  | 0  | 132 | 44 | 40    | 3350 | 1330 | 1050 | 16006 |
| OIL CHANGE AT 33295 MILES      |       |                         |      |     |                        |       |     |    |    |    |                         |    |    |     |    |       |      |      |      |       |
| 04-14-87                       | 33296 | 69.8                    | 10.7 | 142 | 3.82                   | 2.50  | 14  | 7  | 5  | 0  | 7                       | 0  | 0  | 22  | 92 | 30    | 3290 | 1410 | 1620 | 16007 |
| 06-31-87                       | 36394 | 74.7                    | 15.1 | 214 | 2.13                   | 7.18  | 57  | 34 | 18 | 2  | 10                      | 0  | 0  | 56  | 34 | 20    | 2290 | 1170 | 1270 | 16566 |
| OIL CHANGE AT 36394 MILES      |       |                         |      |     |                        |       |     |    |    |    |                         |    |    |     |    |       |      |      |      |       |
| OIL CHANGE AT 39496 MILES      |       |                         |      |     |                        |       |     |    |    |    |                         |    |    |     |    |       |      |      |      |       |
| 12-21-87                       | 39596 | 73.1                    | 10.9 | 138 | 2.47                   | 9.54  | 36  | 27 | 15 | 0  | 57                      | 0  | 0  | 23  | 20 | 20    | 2200 | 970  | 1320 | 17085 |
| 01-22-88                       | 40286 | 67.2                    | 10.4 | 142 | 2.74                   | 11.30 | 35  | 16 | 7  | 0  | 41                      | 1  | 0  | 15  | 51 | 20    | 2800 | 950  | 1430 | 17192 |
| 04-18-88                       | 42542 | 68.5                    | 11.8 | 169 | 2.69                   | 9.54  | 60  | 67 | 20 | 5  | 120                     | 2  | 0  | 29  | 53 | 40    | 4640 | 1350 | 2200 | 17554 |
| OIL CHANGE AT 42542 MILES      |       |                         |      |     |                        |       |     |    |    |    |                         |    |    |     |    |       |      |      |      |       |
| 05-18-88                       | 43593 | 69.5                    | 10.8 | 145 | 4.49                   | 7.63  | 56  | 22 | 9  | 0  | 96                      | 2  | 0  | 15  | 65 | 20    | 3380 | 1300 | 1640 | 17636 |
| 07-09-88                       | 44602 | 72.9                    | 11.6 | 153 | 2.36                   | 6.28  | 147 | 39 | 23 | 0  | 105                     | 5  | 0  | 23  | 28 | 30    | 3970 | 980  | 2050 | 18112 |

**APPENDIX F**

**ENGINE WEAR MEASUREMENTS WITH  
MANUFACTURER'S PRODUCTION SPECIFICATIONS**

# U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

Engine Type: GM 2.5L, L-4  
Vehicle No.: CM 3613  
Vehicle Type: Chevrolet Citation  
Location: Presidio of San Francisco, California

|          |        |
|----------|--------|
| Fuel     | Miles  |
| Unleaded | 17,462 |
| M-85     | 45,151 |
| Total    | 62,613 |

## Engine Wear Measurements(a)

|                                         | Cylinder Number |                          |                       |                      |          |          |          |          |
|-----------------------------------------|-----------------|--------------------------|-----------------------|----------------------|----------|----------|----------|----------|
|                                         | <u>1</u>        |                          | <u>2</u>              |                      | <u>3</u> |          | <u>4</u> |          |
| Compression Ring Gaps                   |                 |                          |                       |                      |          |          |          |          |
| Top                                     | 0.034           |                          | 0.030                 |                      | 0.031    |          | 0.030    |          |
| Bottom                                  | 0.028           |                          | 0.028                 |                      | 0.029    |          | 0.030    |          |
| Cylinder Bore Diameter                  | <u>L*</u>       | <u>T</u>                 | <u>L</u>              | <u>T</u>             | <u>L</u> | <u>T</u> | <u>L</u> | <u>T</u> |
| Top                                     | 4.0025          | 4.0035                   | 4.0019                | 4.0038               | 4.0029   | 4.0040   | 4.0031   | 4.0034   |
| Middle                                  | 4.0023          | 4.0019                   | 4.0026                | 4.0019               | 4.0032   | 4.0021   | 4.0027   | 4.0023   |
| Bottom                                  | 4.0010          | 4.0019                   | 4.0016                | 4.0012               | 4.0022   | 4.0016   | 4.0010   | 4.0022   |
| Out of Round                            | 0.0010          |                          | 0.0019                |                      | 0.0011   |          | 0.0003   |          |
| Taper                                   | 0.0015          |                          | 0.0003                |                      | 0.0007   |          | 0.0021   |          |
| Camshaft Lobe Height                    | <u>I</u>        | <u>E</u>                 | <u>I</u>              | <u>E</u>             | <u>I</u> | <u>E</u> | <u>I</u> | <u>E</u> |
|                                         | 0.229           | 0.228                    | 0.229                 | 0.226                | 0.228    | 0.228    | 0.229    | 0.228    |
| Valve Stem to Guide Clearance           |                 |                          |                       |                      |          |          |          |          |
| Top                                     | 0.0030          | 0.0028                   | 0.0031                | 0.0021               | 0.0026   | 0.0025   | 0.0027   | 0.0019   |
| Bottom                                  |                 | 0.0030                   |                       | 0.0037               |          | 0.0036   |          | 0.0033   |
| Connecting Rod Bearings                 |                 |                          |                       |                      |          |          |          |          |
| Plastigage Clearance                    | 0.0020          |                          | 0.0020                |                      | 0.0018   |          | 0.0018   |          |
| End of Test Compression Pressure (psig) | 145             |                          | 145                   |                      | 135      |          | 145      |          |
| Crankshaft Main Bearings                | <u>1</u>        | <u>2</u>                 | <u>3</u>              | <u>4</u>             | <u>5</u> |          |          |          |
| Plastigage Clearance                    | 0.0020          | 0.0020                   | 0.0021                | 0.0017               | 0.0023   |          |          |          |
| End of Test Blow-By Rate                | <u>RPM</u>      | <u>Oil Pressure, psi</u> | <u>Flow Rate, cfm</u> | <u>Pressure, in.</u> |          |          |          |          |
|                                         | 800             | Not taken                | 0.180                 | 1.2                  |          |          |          |          |
|                                         | 1800            | Not taken                | 0.165                 | 1.4                  |          |          |          |          |

## Manufacturer's Production Specifications

|                        |               |                               |                 |
|------------------------|---------------|-------------------------------|-----------------|
| Compression Ring Gaps  |               | Valve Stem to Guide Clearance |                 |
| Top                    | 0.010 - 0.022 | Intake                        | 0.0010 - 0.0027 |
| Bottom                 | 0.010 - 0.027 | Exhaust                       |                 |
| Cylinder Bore Diameter |               | Top                           | 0.0010 - 0.0027 |
| Out of Round           | 0.0014        | Bottom                        | 0.0020 - 0.0037 |
| Taper                  | 0.0005        | Connecting Rod Bearings       |                 |
| Camshaft Lobe Height   |               | Clearance                     | 0.0005 - 0.0026 |
| Intake/Exhaust         | 0.227         | Crankshaft Main Bearings      |                 |
|                        |               | Clearance                     | 0.0005 - 0.0022 |

- a = All measurements are in inches  
\* = L = Longitudinal; T = Transversal  
I = Intake; E = Exhaust

# **U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM**

Engine Type: GM 2.8L, V-6  
 Vehicle No.: CM 3614  
 Vehicle Type: Chevrolet Citation  
 Location: Presidio of San Francisco, California

|                   |               |
|-------------------|---------------|
| Fuel              | Miles         |
| Unleaded Gasoline | 18,441        |
| M-85              | 45,569        |
| Total             | <u>64,010</u> |

|                                                  | <u>1</u>                  |          | <u>2</u>                             |          | <u>3</u>                                |          | <u>4</u>                           |          | <u>5</u>           |          | <u>6</u> |          |
|--------------------------------------------------|---------------------------|----------|--------------------------------------|----------|-----------------------------------------|----------|------------------------------------|----------|--------------------|----------|----------|----------|
| Compression Ring Gaps                            |                           |          |                                      |          |                                         |          |                                    |          |                    |          |          |          |
| Top                                              | 0.035                     |          | 0.036                                |          | 0.029                                   |          | 0.030                              |          | 0.028              |          | 0.024    |          |
| Bottom                                           | 0.025                     |          | 0.027                                |          | 0.025                                   |          | 0.025                              |          | 0.025              |          | 0.025    |          |
| Cylinder Bore Diameter                           | <u>L*</u>                 | <u>T</u> | <u>L</u>                             | <u>T</u> | <u>L</u>                                | <u>T</u> | <u>L</u>                           | <u>T</u> | <u>L</u>           | <u>T</u> | <u>L</u> | <u>T</u> |
| Top                                              | 3.5052                    | 3.5070   | 3.5054                               | 3.5075   | 3.5058                                  | 3.5072   | 3.5043                             | 3.5090   | 3.5052             | 3.5060   | 3.5051   | 3.5087   |
| Middle                                           | 3.5045                    | 3.5060   | 3.5045                               | 3.5061   | 3.5047                                  | 3.5062   | 3.5046                             | 3.5042   | 3.5046             | 3.5057   | 3.5045   | 3.5043   |
| Bottom                                           | 3.5041                    | 3.5058   | 3.5044                               | 3.5060   | 3.5043                                  | 3.5060   | 3.5050                             | 3.5046   | 3.5045             | 3.5057   | 3.5051   | 3.5048   |
| Out of Round                                     | 0.0018                    |          | 0.0021                               |          | 0.0014                                  |          | 0.0047                             |          | 0.0008             |          | 0.0036   |          |
| Taper                                            | 0.0011                    |          | 0.0010                               |          | 0.0015                                  |          | 0.0007                             |          | 0.0007             |          | 0.0000   |          |
|                                                  | <u>I</u>                  | <u>E</u> | <u>I</u>                             | <u>E</u> | <u>I</u>                                | <u>E</u> | <u>I</u>                           | <u>E</u> | <u>I</u>           | <u>E</u> | <u>I</u> | <u>E</u> |
| Camshaft Lobe Height                             | 0.228                     | 0.259    | 0.227                                | 0.260    | 0.230                                   | 0.260    | 0.230                              | 0.240    | 0.229              | 0.261    | 0.228    | 0.262    |
| Valve Stem to Guide Clearance                    | 0.0030                    | 0.0035   | 0.0030                               | 0.0030   | 0.0018                                  | 0.0055   | 0.0030                             | 0.0050   | 0.0030             | 0.0035   | 0.0030   | 0.0035   |
| Connecting Rod Bearings<br>Plastigage Clearance  | 0.0020                    |          | 0.0017                               |          | 0.0025                                  |          | 0.0025                             |          | 0.0025             |          | 0.0020   |          |
| Crankshaft Main Bearings<br>Plastigage Clearance |                           |          | <u>1</u><br>0.0020                   |          | <u>2</u><br>0.0020                      |          | <u>3</u><br>0.0020                 |          | <u>4</u><br>0.0030 |          |          |          |
| End of Test Compression Pressure (psig)          | 165                       |          | 160                                  |          | 180                                     |          | 140                                |          | 180                |          | 135      |          |
| End of Test Blow-By Rate                         | <u>RPM</u><br>500<br>1800 |          | <u>Oil Pressure, psi</u><br>35<br>50 |          | <u>Flow Rate, cfm</u><br>0.150<br>0.185 |          | <u>Pressure, in.</u><br>0.3<br>1.0 |          |                    |          |          |          |

## Manufacturer's Production Specifications

|                                     |                 |                                                 |                 |
|-------------------------------------|-----------------|-------------------------------------------------|-----------------|
| Compression Ring Gaps<br>Top/Bottom | 0.010 - 0.020   | Valve Stem to Guide Clearance<br>Intake/Exhaust | 0.0010 - 0.0027 |
| Cylinder Bore Diameter              | 3.5050 ± 0.0015 | Connecting Rod Bearings<br>Clearance            | 0.0014 - 0.0037 |
| Out of Round                        | 0.0008          | Crankshaft Main Bearings<br>Clearance           | 0.0016 - 0.0032 |
| Taper                               | 0.0008          |                                                 |                 |
| Camshaft Lobe Height                |                 |                                                 |                 |
| Intake                              | 0.231           |                                                 |                 |
| Exhaust                             | 0.263           |                                                 |                 |

- a = All measurements are in inches  
 \* = L = Longitudinal; T = Transversal  
 I = Intake; E = Exhaust

**U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE  
DEMONSTRATION TEST PROGRAM**

|               |                                       |          |        |
|---------------|---------------------------------------|----------|--------|
| Engine Type:  | GM 2.5L L-4                           | Fuel     | Miles  |
| Vehicle No.:  | CM 3615                               | Unleaded | 16,185 |
| Vehicle Type: | Chevrolet Citation                    | M-85     | 25,120 |
| Location:     | Presidio of San Francisco, California | Total    | 41,305 |

Engine Wear Measurements(a)

|                                         | Cylinder Number |        |                   |        |                |        |               |        |
|-----------------------------------------|-----------------|--------|-------------------|--------|----------------|--------|---------------|--------|
|                                         | 1               |        | 2                 |        | 3              |        | 4             |        |
| Compression Ring Gaps                   |                 |        |                   |        |                |        |               |        |
| Top                                     | 0.029           |        | 0.028             |        | 0.026          |        | 0.029         |        |
| Bottom                                  | 0.036           |        | 0.035             |        | 0.033          |        | 0.038         |        |
| Cylinder Bore Diameter                  | L*              | T      | L                 | T      | L              | T      | L             | T      |
| Top                                     | 4.0020          | 4.0025 | 4.0030            | 4.0025 | 4.0019         | 4.0012 | 4.0021        | 4.0030 |
| Middle                                  | 4.0019          | 4.0027 | 4.0023            | 4.0032 | 4.0018         | 4.0022 | 4.0022        | 4.0030 |
| Bottom                                  | 4.0017          | 4.0020 | 4.0018            | 4.0024 | 4.0010         | 4.0016 | 4.0024        | 4.0018 |
| Out of Round                            | 0.0005          |        | 0.0005            |        | 0.0007         |        | 0.0009        |        |
| Taper                                   | 0.0003          |        | 0.0012            |        | 0.0009         |        | 0.0023        |        |
| Camshaft Lobe Height                    | I               | E      | I                 | E      | I              | E      | I             | E      |
|                                         | 0.230           | 0.230  | 0.232             | 0.232  | 0.241          | 0.230  | 0.231         | 0.230  |
| Valve Stem to Guide Clearance           |                 |        |                   |        |                |        |               |        |
| Top                                     | 0.0025          | NT     | 0.0026            | NT     | 0.0023         | NT     | 0.0025        | N.T.   |
| Bottom                                  |                 | 0.0031 |                   | 0.0032 |                | 0.0031 |               | 0.0033 |
| Connecting Rod Bearings                 |                 |        |                   |        |                |        |               |        |
| Plastigage Clearance                    | 0.0038          |        | 0.0028            |        | 0.0029         |        | 0.0032        |        |
| End of Test Compression Pressure (psig) | NT              |        | NT                |        | NT             |        | NT            |        |
| Crankshaft Main Bearings                |                 |        |                   |        |                |        |               |        |
| Plastigage Clearance                    | 1               |        | 2                 |        | 3              |        | 4             | 5      |
|                                         | 0.0028          |        | 0.0023            |        | 0.0024         |        | 0.0023        | 0.0027 |
| End of Test Blow-By Rate                | RPM             |        | Oil Pressure, psi |        | Flow Rate, cfm |        | Pressure, in. |        |
|                                         | NT              |        | NT                |        | NT             |        | NT            |        |

Manufacturer's Production Specifications

|                        |               |                               |                 |
|------------------------|---------------|-------------------------------|-----------------|
| Compression Ring Gaps  |               | Valve Stem to Guide Clearance |                 |
| Top                    | 0.010 - 0.022 | Intake                        | 0.0010 - 0.0027 |
| Bottom                 | 0.010 - 0.027 | Exhaust                       |                 |
| Cylinder Bore Diameter |               | Top                           | 0.0010 - 0.0027 |
| Out of Round           | 0.0014        | Bottom                        | 0.0020 - 0.0037 |
| Taper                  | 0.0005        | Connecting Rod Bearings       |                 |
| Camshaft Lobe Height   |               | Clearance                     | 0.0005 - 0.0026 |
| Intake/Exhaust         | 0.227         | Crankshaft Main Bearings      |                 |
|                        |               | Clearance                     | 0.0005 - 0.0022 |

- a = All measurements are in inches  
 \* = L = Longitudinal; T = Transversal  
 I = Intake; E = Exhaust; NT = Not taken

# U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

Engine Type: GM 2.8L V-6  
Vehicle No.: CM 3616  
Vehicle Type: Chevrolet Citation  
Location: Presidio of San Francisco, California

|                   |        |
|-------------------|--------|
| Fuel              | Miles  |
| Unleaded Gasoline | 28,257 |
| M-85              | 30,613 |
| Total             | 58,870 |

## Engine Wear Measurements(a)

|                                               | Cylinder Number |        |                   |        |                |        |               |        |             |        |        |        |
|-----------------------------------------------|-----------------|--------|-------------------|--------|----------------|--------|---------------|--------|-------------|--------|--------|--------|
|                                               | 1               |        | 2                 |        | 3              |        | 4             |        | 5           |        | 6      |        |
| Compression Ring Gaps                         |                 |        |                   |        |                |        |               |        |             |        |        |        |
| Top                                           | 0.036           |        | 0.031             |        | 0.022          |        | 0.026         |        | Broken      |        | 0.021  |        |
| Bottom                                        | 0.019           |        | 0.022             |        | 0.024          |        | 0.022         |        | 0.022       |        | 0.022  |        |
| Cylinder Bore Diameter                        |                 |        |                   |        |                |        |               |        |             |        |        |        |
|                                               | L*              | T      | L                 | T      | L              | T      | L             | T      | L           | T      | L      | T      |
| Top                                           | 3.5074          | 3.5077 | 3.5074            | 3.5097 | 3.5063         | 3.5077 | 3.5086        | 3.5073 | 3.5058      | 3.5068 | 3.5054 | 3.5068 |
| Middle                                        | 3.5049          | 3.5057 | 3.5053            | 3.5057 | 3.5053         | 3.5060 | 3.5056        | 3.5057 | 3.5052      | 3.5057 | 3.5046 | 3.5057 |
| Bottom                                        | 3.5045          | 3.5057 | 3.5050            | 3.5056 | 3.5048         | 3.5059 | 3.5052        | 3.5057 | 3.5050      | 3.5057 | 3.5043 | 3.5057 |
| Out of Round                                  | 0.0003          |        | 0.0023            |        | 0.0014         |        | 0.0007        |        | 0.0010      |        | 0.0014 |        |
| Taper                                         | 0.0029          |        | 0.0024            |        | 0.0015         |        | 0.0014        |        | 0.0008      |        | 0.0011 |        |
|                                               | I               | E      | I                 | E      | I              | E      | I             | E      | I           | E      | I      | E      |
| Camshaft Lobe Height                          | 0.231           | 0.250  | 0.230             | 0.253  | 0.228          | 0.260  | 0.231         | 0.258  | 0.227       | 0.252  | 0.223  | 0.256  |
| Valve Stem to Guide Clearance                 | 0.0030          | 0.0030 | 0.0030            | 0.0040 | 0.0030         | 0.0040 | 0.0040        | 0.0040 | 0.0030      | 0.0040 | 0.0030 | 0.0040 |
| Connecting Rod Bearings Plastigage Clearance  | 0.0030          |        | 0.0050            |        | 0.0020         |        | 0.0020        |        | 0.0020      |        | 0.0015 |        |
| Crankshaft Main bearings Plastigage Clearance |                 |        | 1<br>0.0030       |        | 2<br>0.0030    |        | 3<br>0.0030   |        | 4<br>0.0030 |        |        |        |
| End of Test Compression Pressure (psig)       | 155             |        | 155               |        | 150            |        | 160           |        | 130         |        | 160    |        |
| End of Test Blow-By Rate                      | RPM             |        | OIL Pressure, psi |        | Flow Rate, cfm |        | Pressure, in. |        |             |        |        |        |
|                                               | 800             |        | Not taken         |        | 0.300          |        | 1.6           |        |             |        |        |        |
|                                               | 1800            |        | Not taken         |        | 0.375          |        | 2.2           |        |             |        |        |        |

## Manufacturer's Production Specifications

|                        |                 |                                    |                 |
|------------------------|-----------------|------------------------------------|-----------------|
| Compression Ring Gaps  |                 | Valve Stem to Guide Clearance      |                 |
| Top/Bottom             | 0.010 - 0.020   | Intake, Exhaust                    | 0.0010 - 0.0027 |
| Cylinder Bore Diameter | 3.5050 ± 0.0015 | Connecting Rod Bearings Clearance  | 0.0014 - 0.0037 |
| Out of Round           | 0.0008          | Crankshaft Main Bearings Clearance | 0.0016 - 0.0032 |
| Taper                  | 0.0008          |                                    |                 |
| Camshaft Lobe Height   |                 |                                    |                 |
| Intake                 | 0.231           |                                    |                 |
| Exhaust                | 0.263           |                                    |                 |

- a = All measurements are in inches  
\* = L = Longitudinal; T = Transversal  
I = Intake; E = Exhaust

**U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE  
DEMONSTRATION TEST PROGRAM**

Engine Type: GM 2.5L, L-4  
Vehicle No.: CM 2879  
Vehicle Type: Chevrolet S-10 PU  
Location: Fort Ord, California

|             |              |
|-------------|--------------|
| <u>Fuel</u> | <u>Miles</u> |
| Unleaded    | 4,908        |
| M-85        | 12,295       |
| Total       | 17,203       |

Engine Wear Measurements(a)

|                                               | Cylinder Number |                          |                       |                      |          |          |          |          |
|-----------------------------------------------|-----------------|--------------------------|-----------------------|----------------------|----------|----------|----------|----------|
|                                               | <u>1</u>        |                          | <u>2</u>              |                      | <u>3</u> |          | <u>4</u> |          |
| Compression Ring Gaps                         |                 |                          |                       |                      |          |          |          |          |
| Top                                           | 0.020           |                          | 0.017                 |                      | 0.019    |          | 0.019    |          |
| Bottom                                        | 0.022           |                          | 0.025                 |                      | 0.021    |          | 0.022    |          |
| Cylinder Bore Diameter                        | <u>L*</u>       | <u>T</u>                 | <u>L</u>              | <u>T</u>             | <u>L</u> | <u>T</u> | <u>L</u> | <u>T</u> |
| Top                                           | 4.0019          | 4.0009                   | 4.0016                | 4.0018               | 4.0014   | 4.0014   | 4.0019   | 4.0010   |
| Middle                                        | 4.0018          | 4.0015                   | 4.0016                | 4.0013               | 4.0017   | 4.0013   | 4.0015   | 4.0013   |
| Bottom                                        | 4.0010          | 4.0021                   | 4.0016                | 4.0013               | 4.0019   | 4.0009   | 4.0002   | 4.0018   |
| Out of Round                                  | 0.0010          |                          | 0.0002                |                      | 0.0000   |          | 0.0009   |          |
| Taper                                         | 0.0009          |                          | 0.0000                |                      | 0.0005   |          | 0.0017   |          |
| Camshaft Lobe Height                          | <u>I</u>        | <u>E</u>                 | <u>I</u>              | <u>E</u>             | <u>I</u> | <u>E</u> | <u>I</u> | <u>E</u> |
|                                               | 0.229           | 0.230                    | 0.230                 | 0.230                | 0.225    | 0.227    | 0.230    | 0.230    |
| Valve Stem to Guide Clearance                 |                 |                          |                       |                      |          |          |          |          |
| Top                                           | 0.0017          | 0.0026                   | 0.0021                | 0.0023               | 0.0020   | 0.0020   | 0.0021   | 0.0024   |
| Bottom                                        |                 | 0.0028                   |                       | 0.0029               |          | 0.0031   |          | 0.0028   |
| Connecting Rod Bearing Plastigage Clearance   | 0.0020          |                          | 0.0020                |                      | 0.0020   |          | 0.0020   |          |
| End of Test Compression Pressure (psig)       | 143             |                          | 148                   |                      | 148      |          | 142      |          |
| Crankshaft Main Bearings Plastigage Clearance | <u>1</u>        |                          | <u>2</u>              |                      | <u>3</u> |          | <u>4</u> | <u>5</u> |
|                                               | 0.0020          |                          | 0.0020                |                      | 0.0020   |          | 0.0020   | 0.0020   |
| End of Test Blow-By Rate                      | <u>RPM</u>      | <u>Oil Pressure, psi</u> | <u>Flow Rate, cfm</u> | <u>Pressure, in.</u> |          |          |          |          |
|                                               | 800             | 30                       | 0.198                 | 0.1                  |          |          |          |          |
|                                               | 1800            | 34                       | 0.199                 | 0.1                  |          |          |          |          |

Manufacturer's Production Specifications

|                                     |               |                                    |                 |
|-------------------------------------|---------------|------------------------------------|-----------------|
| Compression Rings Gaps              |               | Valve Stem to Guide Clearance      |                 |
| Top                                 | 0.010 - 0.022 | Intake                             | 0.0010 - 0.0027 |
| Bottom                              | 0.010 - 0.027 | Exhaust                            |                 |
| Cylinder Bore Diameter              |               | Top                                | 0.0010 - 0.0027 |
| Out of Round                        | 0.0014        | Bottom                             | 0.0020 - 0.0037 |
| Taper                               | 0.0005        | Connecting Rod Bearings Clearance  | 0.0005 - 0.0026 |
| Camshaft Lobe Height Intake/Exhaust | 0.227         | Crankshaft Main Bearings Clearance | 0.0005 - 0.0022 |

- a = All measurements are in inches  
 \* = L = Longitudinal; T = Transversal  
 I = Intake; E = Exhaust

**U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE  
DEMONSTRATION TEST PROGRAM**

Engine Type: GM 2.5L, L-4  
Vehicle No: CM 2883  
Vehicle Type: Chevrolet S-10 PU  
Location: Fort Ord, California

|          |        |
|----------|--------|
| Fuel     | Miles  |
| Unleaded | 6,020  |
| M-85     | 8,662  |
| Total    | 14,752 |

Engine Wear Measurements<sup>(a)</sup>

|                                         | Cylinder Number |        |                   |        |                |        |               |        |
|-----------------------------------------|-----------------|--------|-------------------|--------|----------------|--------|---------------|--------|
|                                         | 1               |        | 2                 |        | 3              |        | 4             |        |
| Compression Ring Gaps                   |                 |        |                   |        |                |        |               |        |
| Top                                     | 0.021           |        | 0.020             |        | 0.012          |        | 0.018         |        |
| Bottom                                  | 0.025           |        | 0.025             |        | 0.025          |        | 0.026         |        |
| Cylinder Bore Diameter                  | L*              | T      | L                 | T      | L              | T      | L             | T      |
| Top                                     | 4.0016          | 4.0016 | 4.0016            | 4.0014 | 4.0018         | 4.0016 | 4.0016        | 4.0010 |
| Middle                                  | 4.0016          | 4.0017 | 4.0011            | 4.0015 | 4.0013         | 4.0017 | 4.0016        | 4.0017 |
| Bottom                                  | 4.0006          | 4.0016 | 4.0010            | 4.0015 | 4.0018         | 4.0014 | 4.0005        | 4.0020 |
| Out of Round                            | 0.0000          |        | 0.0002            |        | 0.0002         |        | 0.0006        |        |
| Taper                                   | 0.0010          |        | 0.0006            |        | 0.0000         |        | 0.0010        |        |
|                                         | I               | E      | I                 | E      | I              | E      | I             | E      |
| Camshaft Lobe Height                    | 0.229           | 0.230  | 0.229             | 0.230  | 0.228          | 0.230  | 0.229         | 0.229  |
| Valve Stem to Guide Clearance           |                 |        |                   |        |                |        |               |        |
| Top                                     | 0.0019          | 0.0024 | 0.0024            | 0.0028 | 0.0022         | 0.0020 | 0.0021        | 0.0027 |
| Bottom                                  |                 | 0.0034 |                   | 0.0034 |                | 0.0030 |               | 0.0037 |
| Connecting Rod Bearings                 |                 |        |                   |        |                |        |               |        |
| Plastigage Clearance                    | 0.0015          |        | 0.0020            |        | 0.0020         |        | 0.0020        |        |
| End of Test Compression Pressure (psig) | 145             |        | 140               |        | 150            |        | 145           |        |
| Crankshaft Main Bearings                |                 |        |                   |        |                |        |               |        |
| Plastigage Clearance                    | 0.0020          |        | 0.0015            |        | 0.0015         |        | 0.0015        |        |
| End of Test Blow-By Rate                | RPM             |        | Oil Pressure, psi |        | Flow Rate, cfm |        | Pressure, in. |        |
|                                         | 800             |        | 32                |        | 0.395          |        | 0.2           |        |
|                                         | 1800            |        | 34                |        | 0.280          |        | 0.2           |        |

Manufacturer's Production Specifications

|                        |               |                               |                 |
|------------------------|---------------|-------------------------------|-----------------|
| Compression Ring Gaps  |               | Valve Stem to Guide Clearance |                 |
| Top                    | 0.010 - 0.022 | Intake                        | 0.0010 - 0.0027 |
| Bottom                 | 0.010 - 0.027 | Exhaust                       |                 |
| Cylinder Bore Diameter |               | Top                           | 0.0010 - 0.0027 |
| Out of Round           | 0.0014        | Bottom                        | 0.0020 - 0.0037 |
| Taper                  | 0.0005        | Connecting Rod Bearings       |                 |
| Camshaft Lobe Height   |               | Clearance                     | 0.0005 - 0.0026 |
| Intake/Exhaust         | 0.227         | Crankshaft Main Bearings      |                 |
|                        |               | Clearance                     | 0.0005 - 0.0022 |

- a = All measurements are in inches  
 \* = L = Longitudinal; T = Transversal  
 I = Intake; E = Exhaust

# U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

Engine Type: GM 2.8L, V-6  
Vehicle No.: CM 2884  
Vehicle Type: Chevrolet S-10 PU  
Location: Fort Ord, California

|                   |               |
|-------------------|---------------|
| <u>Fuel</u>       | <u>Miles</u>  |
| Unleaded Gasoline | 15,595        |
| M-85              | 0             |
| <b>Total</b>      | <b>15,595</b> |

## Engine Wear Measurements<sup>(a)</sup>

|                                         | Cylinder Number |          |                          |          |                       |          |                      |          |          |          |          |          |
|-----------------------------------------|-----------------|----------|--------------------------|----------|-----------------------|----------|----------------------|----------|----------|----------|----------|----------|
|                                         | <u>1</u>        |          | <u>2</u>                 |          | <u>3</u>              |          | <u>4</u>             |          | <u>5</u> |          | <u>6</u> |          |
| Compression Ring Gaps                   |                 |          |                          |          |                       |          |                      |          |          |          |          |          |
| Top                                     | 0.022           |          | 0.020                    |          | 0.020                 |          | 0.018                |          | 0.018    |          | 0.020    |          |
| Bottom                                  | Broken          |          | 0.022                    |          | 0.022                 |          | 0.019                |          | 0.025    |          | 0.022    |          |
| Cylinder Bore Diameter                  | <u>L*</u>       | <u>T</u> | <u>L</u>                 | <u>T</u> | <u>L</u>              | <u>T</u> | <u>L</u>             | <u>T</u> | <u>L</u> | <u>T</u> | <u>L</u> | <u>T</u> |
| Top                                     | 3.5063          | 3.5056   | 3.5058                   | 3.5054   | 3.5060                | 3.5059   | 3.5050               | 3.5053   | 3.5051   | 3.5057   | 3.5050   | 3.5059   |
| Middle                                  | 3.5049          | 3.5057   | 3.5047                   | 3.5056   | 3.5048                | 3.5059   | 3.5045               | 3.5053   | 3.5041   | 3.5057   | 3.5040   | 3.5060   |
| Bottom                                  | 3.5044          | 3.5063   | 3.5047                   | 3.5059   | 3.5046                | 3.5063   | 3.5047               | 3.5059   | 3.5041   | 3.5058   | 3.5039   | 3.5063   |
| Out of Round                            | 0.0007          |          | 0.0004                   |          | 0.0001                |          | 0.0003               |          | 0.0006   |          | 0.0009   |          |
| Taper                                   | 0.0019          |          | 0.0011                   |          | 0.0014                |          | 0.0003               |          | 0.0010   |          | 0.0011   |          |
|                                         | <u>I</u>        | <u>E</u> | <u>I</u>                 | <u>E</u> | <u>I</u>              | <u>E</u> | <u>I</u>             | <u>E</u> | <u>I</u> | <u>E</u> | <u>I</u> | <u>E</u> |
| Camshaft Lobe Height                    | 0.233           | 0.226    | 0.234                    | 0.275    | 0.230                 | 0.262    | 0.248                | 0.269    | 0.225    | 0.260    | 0.242    | 0.260    |
| Valve Stem to Guide Clearance           | 0.0030          | 0.0055   | 0.0040                   | 0.0070   | 0.0030                | 0.0055   | 0.0030               | 0.0045   | 0.0030   | 0.0055   | 0.0030   | 0.0055   |
| Connecting Rod Bearings                 |                 |          |                          |          |                       |          |                      |          |          |          |          |          |
| Plastigage Clearance                    | 0.0020          |          | 0.0015                   |          | 0.0020                |          | 0.0015               |          | 0.0020   |          | 0.0015   |          |
| Crankshaft Main Bearings                |                 |          |                          |          |                       |          |                      |          |          |          |          |          |
| Plastigage Clearance                    |                 |          | <u>1</u>                 |          | <u>2</u>              |          | <u>3</u>             |          | <u>4</u> |          |          |          |
|                                         |                 |          | 0.0030                   |          | 0.0020                |          | 0.0025               |          | 0.0020   |          |          |          |
| End of Test Compression Pressure (psig) | 130             |          | 135                      |          | 130                   |          | 147                  |          | 130      |          | 135      |          |
| End of Test Blow-By Rate                | <u>RPM</u>      |          | <u>Oil Pressure, psi</u> |          | <u>Flow Rate, cfm</u> |          | <u>Pressure, in.</u> |          |          |          |          |          |
|                                         | 800             |          | 43                       |          | 0.365                 |          | 0.2                  |          |          |          |          |          |
|                                         | 1800            |          | 49                       |          | 0.370                 |          | 0.3                  |          |          |          |          |          |

## Manufacturer's Production Specifications

|                        |                 |  |                               |                 |
|------------------------|-----------------|--|-------------------------------|-----------------|
| Compression Ring Gaps  |                 |  | Valve Stem to Guide Clearance |                 |
| Top/Bottom             | 0.010-0.020     |  | Intake/Exhaust                | 0.0010 - 0.0027 |
| Cylinder Bore Diameter | 3.5050 ± 0.0015 |  | Connecting Rod Bearings       |                 |
| Out of Round           | 0.0008          |  | Clearance                     | 0.0014 - 0.0037 |
| Taper                  | 0.0008          |  | Crankshaft Main Bearings      |                 |
| Camshaft Lobe Height   |                 |  | Clearance                     | 0.0016 - 0.0032 |
| Intake                 | 0.231           |  |                               |                 |
| Exhaust                | 0.263           |  |                               |                 |

- <sup>a</sup> = All measurements are in inches  
 \* = L = Longitudinal; T = Transversal  
 I = Intake; E = Exhaust

# U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

Engine Type: GM 2.8L, V-6  
Vehicle No.: CM 2885  
Vehicle Type: Chevrolet S-10 PU  
Location: Fort Ord, California

|                   |               |
|-------------------|---------------|
| <u>Fuel</u>       | <u>Miles</u>  |
| Unleaded Gasoline | 18,147        |
| M-85              | 0             |
| <b>Total</b>      | <b>18,147</b> |

## Engine Wear Measurements(a)

|                                         | Cylinder Number |                          |                       |                      |          |          |          |          |          |          |          |          |
|-----------------------------------------|-----------------|--------------------------|-----------------------|----------------------|----------|----------|----------|----------|----------|----------|----------|----------|
|                                         | <u>1</u>        |                          | <u>2</u>              |                      | <u>3</u> |          | <u>4</u> |          | <u>5</u> |          | <u>6</u> |          |
| Compression Ring Gaps                   |                 |                          |                       |                      |          |          |          |          |          |          |          |          |
| Top                                     | 0.018           |                          | 0.016                 |                      | 0.016    |          | 0.016    |          | 0.017    |          | 0.021    |          |
| Bottom                                  | 0.019           |                          | 0.017                 |                      | 0.015    |          | 0.015    |          | 0.017    |          | 0.018    |          |
| Cylinder Bore Diameter                  | <u>L*</u>       | <u>T</u>                 | <u>L</u>              | <u>T</u>             | <u>L</u> | <u>T</u> | <u>L</u> | <u>T</u> | <u>L</u> | <u>T</u> | <u>L</u> | <u>T</u> |
| Top                                     | 3.5049          | 3.5054                   | 3.5054                | 3.5060               | 3.5057   | 3.5060   | 3.5054   | 3.5056   | 3.5062   | 3.5069   | 3.5049   | 3.5059   |
| Middle                                  | 3.5044          | 3.5054                   | 3.5053                | 3.5059               | 3.5054   | 3.5061   | 3.5053   | 3.5056   | 3.5059   | 3.5069   | 3.5048   | 3.5060   |
| Bottom                                  | 3.5042          | 3.5055                   | 3.5055                | 3.5056               | 3.5057   | 3.5064   | 3.5054   | 3.5053   | 3.5061   | 3.5071   | 3.5050   | 3.5062   |
| Out of Round                            | 0.0005          |                          | 0.0006                |                      | 0.0003   |          | 0.0002   |          | 0.0007   |          | 0.0010   |          |
| Taper                                   | 0.0007          |                          | 0.0001                |                      | 0.0000   |          | 0.0000   |          | 0.0001   |          | 0.0001   |          |
|                                         | <u>I</u>        | <u>E</u>                 | <u>I</u>              | <u>E</u>             | <u>I</u> | <u>E</u> | <u>I</u> | <u>E</u> | <u>I</u> | <u>E</u> | <u>I</u> | <u>E</u> |
| Camshaft Lobe Height                    | 0.221           | 0.259                    | 0.226                 | 0.262                | 0.217    | 0.263    | 0.230    | 0.263    | 0.226    | 0.254    | 0.236    | 0.255    |
| Valve Stem to Guide Clearance           | 0.0030          | 0.0035                   | 0.0025                | 0.0030               | 0.0020   | 0.0035   | 0.0025   | 0.0035   | 0.0025   | 0.0035   | 0.0030   | 0.0035   |
| Connecting Rod Bearings                 |                 |                          |                       |                      |          |          |          |          |          |          |          |          |
| Plastigage Clearance                    | 0.0020          |                          | 0.0020                |                      | 0.0020   |          | 0.0025   |          | 0.0020   |          | 0.0020   |          |
| Crankshaft Main Bearings                |                 |                          |                       |                      |          |          |          |          |          |          |          |          |
| Plastigage Clearance                    | <u>1</u>        |                          | <u>2</u>              |                      | <u>3</u> |          | <u>4</u> |          |          |          |          |          |
|                                         | 0.0030          |                          | 0.0030                |                      | 0.0030   |          | 0.0030   |          |          |          |          |          |
| End of Test Compression Pressure (psig) | 170             |                          | 165                   |                      | 170      |          | 170      |          | 170      |          | 170      |          |
| End of Test Blow-By Rate                | <u>RPM</u>      | <u>Oil Pressure, psi</u> | <u>Flow Rate, cfm</u> | <u>Pressure, in.</u> |          |          |          |          |          |          |          |          |
|                                         | 800             | 34                       | 0.430                 | 0.2                  |          |          |          |          |          |          |          |          |
|                                         | 1800            | 36                       | 0.525                 | 0.2                  |          |          |          |          |          |          |          |          |

## Manufacturer's Production Specifications

|                        |                 |                               |                 |
|------------------------|-----------------|-------------------------------|-----------------|
| Compression Ring Gaps  |                 | Valve Stem to Guide Clearance |                 |
| Top/Bottom             | 0.010 - 0.020   | Intake/Exhaust                | 0.0010 - 0.0027 |
| Cylinder Bore Diameter | 3.5050 ± 0.0015 | Connecting Rod Bearings       |                 |
| Out of Round           | 0.0008          | Clearance                     | 0.0014 - 0.0037 |
| Taper                  | 0.0008          | Crankshaft Main Bearings      |                 |
| Camshaft Lobe Height   |                 | Clearance                     | 0.0016 - 0.0032 |
| Intake                 | 0.231           |                               |                 |
| Exhaust                | 0.263           |                               |                 |

- a = All measurements are in inches  
 \* = L = Longitudinal; T = Transversal  
 I = Intake; E = Exhaust

**U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE  
DEMONSTRATION TEST PROGRAM**

Engine Type: GM 2.8L, V-6  
Vehicle No. CM 2889  
Vehicle Type: Chevrolet S-10 PU  
Location: Fort Ord, California

|                   |              |
|-------------------|--------------|
| <u>Fuel</u>       | <u>Miles</u> |
| Unleaded Gasoline | 6,526        |
| M-85              | 10,905       |
| Total             | 17,431       |

Engine Wear Measurements<sup>(a)</sup>

|                                         | Cylinder Number |          |                          |          |                       |          |                      |          |          |          |          |          |
|-----------------------------------------|-----------------|----------|--------------------------|----------|-----------------------|----------|----------------------|----------|----------|----------|----------|----------|
|                                         | <u>1</u>        |          | <u>2</u>                 |          | <u>3</u>              |          | <u>4</u>             |          | <u>5</u> |          | <u>6</u> |          |
| Compression Ring Gaps                   |                 |          |                          |          |                       |          |                      |          |          |          |          |          |
| Top                                     | 0.023           |          | 0.025                    |          | 0.026                 |          | 0.023                |          | 0.023    |          | 0.023    |          |
| Bottom                                  | 0.022           |          | 0.022                    |          | 0.022                 |          | 0.026                |          | 0.022    |          | 0.023    |          |
| Cylinder Bore Diameter                  | <u>L*</u>       | <u>T</u> | <u>L</u>                 | <u>T</u> | <u>L</u>              | <u>T</u> | <u>L</u>             | <u>T</u> | <u>L</u> | <u>T</u> | <u>L</u> | <u>T</u> |
| Top                                     | 3.5065          | 3.5060   | 3.5050                   | 3.5049   | 3.5059                | 3.5063   | 3.5056               | 3.5057   | 3.5055   | 3.5057   | 3.5056   | 3.5057   |
| Middle                                  | 3.5055          | 3.5058   | 3.5043                   | 3.5048   | 3.5053                | 3.5060   | 3.5051               | 3.5055   | 3.5048   | 3.5054   | 3.5050   | 3.5057   |
| Bottom                                  | 3.5051          | 3.5059   | 3.5043                   | 3.5048   | 3.5052                | 3.5059   | 3.5050               | 3.5054   | 3.5048   | 3.5054   | 3.5048   | 3.5058   |
| Out of Round                            | 0.0005          |          | 0.0001                   |          | 0.0004                |          | 0.0001               |          | 0.0002   |          | 0.0001   |          |
| Taper                                   | 0.0014          |          | 0.0007                   |          | 0.0007                |          | 0.0006               |          | 0.0007   |          | 0.0008   |          |
|                                         | <u>I</u>        | <u>E</u> | <u>I</u>                 | <u>E</u> | <u>I</u>              | <u>E</u> | <u>I</u>             | <u>E</u> | <u>I</u> | <u>E</u> | <u>I</u> | <u>E</u> |
| Camshaft Lobe Height                    | 0.231           | 0.255    | 0.229                    | 0.256    | 0.236                 | 0.262    | 0.228                | 0.261    | 0.229    | 0.271    | 0.225    | 0.256    |
| Valve Stem to Guide Clearance           | 0.0030          | 0.0040   | 0.0030                   | 0.0025   | 0.0030                | 0.0035   | 0.0030               | 0.0030   | 0.0030   | 0.0035   | 0.0035   | 0.0020   |
| Connecting Rod Bearings                 |                 |          |                          |          |                       |          |                      |          |          |          |          |          |
| Plastigage Clearing                     | 0.0030          |          | 0.0030                   |          | 0.0020                |          | 0.0020               |          | 0.0030   |          | 0.0030   |          |
| Crankshaft Main Bearings                |                 |          |                          |          |                       |          |                      |          |          |          |          |          |
| Plastigage Clearance                    |                 |          | <u>1</u>                 |          | <u>2</u>              |          | <u>3</u>             |          | <u>4</u> |          |          |          |
|                                         |                 |          | 0.0025                   |          | 0.0025                |          | 0.0025               |          | 0.0030   |          |          |          |
| End of Test Compression Pressure (psig) |                 |          |                          |          |                       |          |                      |          |          |          |          |          |
|                                         | 125             |          | 123                      |          | 121.5                 |          | 124                  |          | 120      |          | 123      |          |
| End of Test Blow-By Rate                |                 |          |                          |          |                       |          |                      |          |          |          |          |          |
|                                         | <u>RPM</u>      |          | <u>Oil Pressure, psi</u> |          | <u>Flow Rate, cfm</u> |          | <u>Pressure, in.</u> |          |          |          |          |          |
|                                         | 800             |          | 32                       |          | 0.36                  |          | Not taken            |          |          |          |          |          |
|                                         | 1800            |          | 43                       |          | 0.40                  |          | Not taken            |          |          |          |          |          |

Manufacturer's Production Specifications

|                        |                 |                               |                 |
|------------------------|-----------------|-------------------------------|-----------------|
| Compression Ring Gaps  |                 | Valve Stem to Guide Clearance |                 |
| Top/Bottom             | 0.010 - 0.020   | Intake/Exhaust                | 0.0010 - 0.0027 |
| Cylinder Bore Diameter | 3.5050 ± 0.0015 | Connecting Rod Bearings       |                 |
| Out of Round           | 0.0008          | Clearance                     | 0.0014 - 0.0037 |
| Taper                  | 0.0008          | Crankshaft Main Bearings      |                 |
| Camshaft Lobe Height   |                 | Clearance                     | 0.0016 - 0.0032 |
| Intake                 | 0.231           |                               |                 |
| Exhaust                | 0.263           |                               |                 |

- a = All measurements are in inches  
 \* = L = Longitudinal; T = Transversal  
 I - Intake; E = Exhaust

# U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

Engine Type: GM 2.5L, L-4  
Vehicle No.: CM 2890  
Vehicle Type: Chevrolet S-10, PU  
Location: Fort Ord, California

Fuel  
Unleaded  
M-85  
Total

Miles  
18,725  
0  
18,725

## Engine Wear Measurements(a)

|                                         | Cylinder Number |        |                   |        |                |        |               |        |
|-----------------------------------------|-----------------|--------|-------------------|--------|----------------|--------|---------------|--------|
|                                         | 1               |        | 2                 |        | 3              |        | 4             |        |
| Compression Ring Gaps                   |                 |        |                   |        |                |        |               |        |
| Top                                     | 0.014           |        | 0.014             |        | 0.014          |        | 0.013         |        |
| Bottom                                  | 0.022           |        | 0.020             |        | 0.021          |        | 0.019         |        |
| Cylinder Bore Diameter                  |                 |        |                   |        |                |        |               |        |
|                                         | L*              | T      | L                 | T      | L              | T      | L             | T      |
| Top                                     | 4.0016          | 4.0007 | 4.0022            | 4.0015 | 4.0017         | 4.0019 | 4.0019        | 4.0010 |
| Middle                                  | 4.0014          | 4.0014 | 4.0022            | 4.0018 | 4.0018         | 4.0015 | 4.0015        | 4.0019 |
| Bottom                                  | 4.0007          | 4.0019 | 4.0021            | 4.0018 | 4.0020         | 4.0012 | 4.0002        | 4.0020 |
| Out of Round                            | 0.0009          |        | 0.0007            |        | 0.0002         |        | 0.0009        |        |
| Taper                                   | 0.0009          |        | 0.0001            |        | 0.0003         |        | 0.0017        |        |
| Camshaft Lobe Height                    | I               | E      | I                 | E      | I              | E      | I             | E      |
|                                         | 0.229           | 0.230  | 0.229             | 0.226  | 0.220          | 0.228  | 0.229         | 0.230  |
| Valve Stem to Guide Clearance           |                 |        |                   |        |                |        |               |        |
| Top                                     | 0.0017          | 0.0026 | 0.0015            | 0.0026 | 0.0015         | 0.0026 | 0.0015        | 0.0023 |
| Bottom                                  |                 | 0.0030 |                   | 0.0030 |                | 0.0029 |               | 0.0029 |
| Connecting Rod Bearings                 |                 |        |                   |        |                |        |               |        |
| Plastigage Clearance                    | 0.0015          |        | 0.0020            |        | 0.0020         |        | 0.0015        |        |
| End of Test Compression Pressure (psig) | 145             |        | 150               |        | 145            |        | 130           |        |
| Crankshaft Main Bearings                |                 |        |                   |        |                |        |               |        |
| Plastigage Clearance                    | 1               |        | 2                 | 3      | 4              | 5      |               |        |
|                                         | 0.0030          |        | 0.0015            | 0.0015 | 0.0015         | 0.0015 |               |        |
| End of Test Blow-By Rate                | RPM             |        | Oil Pressure, psi |        | Flow Rate, cfm |        | Pressure, in. |        |
|                                         | 800             |        | 34                |        | 0.335          |        | 0.1           |        |
|                                         | 1800            |        | 39                |        | 0.215          |        | 0.1           |        |

## Manufacturer's Production Specifications

|                        |               |                               |                 |
|------------------------|---------------|-------------------------------|-----------------|
| Compression Ring Gaps  |               | Valve Stem to Guide Clearance |                 |
| Top                    | 0.010 - 0.022 | Intake                        | 0.0010 - 0.0027 |
| Bottom                 | 0.010 - 0.027 | Exhaust                       |                 |
| Cylinder Bore Diameter |               | Top                           | 0.0010 - 0.0027 |
| Out of Round           | 0.0014        | Bottom                        | 0.0020 - 0.0037 |
| Taper                  | 0.0005        | Connecting Rod Bearings       |                 |
| Camshaft Lobe Height   |               | Clearance                     | 0.0005 - 0.0026 |
| Intake/Exhaust         | 0.227         | Crankshaft Main Bearings      |                 |
|                        |               | Clearance                     | 0.0005 - 0.0022 |

- a = All measurements are in inches  
 \* = L = Longitudinal; T = Transversal  
 I = Intake; E = Exhaust

**U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE  
DEMONSTRATION TEST PROGRAM**

Engine Type: GM 2.8L, V-6  
Vehicle No. CM 2895  
Vehicle Type: Chevrolet S-10 PU  
Location: Fort Ord, California

|                   |        |
|-------------------|--------|
| Fuel              | Miles  |
| Unleaded Gasoline | 6,473  |
| M-85              | 17,786 |
| Total             | 24,261 |

Engine Wear Measurements<sup>(a)</sup>

|                                               | Cylinder Number |        |                   |        |                |        |               |        |             |        |        |        |
|-----------------------------------------------|-----------------|--------|-------------------|--------|----------------|--------|---------------|--------|-------------|--------|--------|--------|
|                                               | 1               |        | 2                 |        | 3              |        | 4             |        | 5           |        | 6      |        |
| Compression Ring Gaps                         |                 |        |                   |        |                |        |               |        |             |        |        |        |
| Top                                           | 0.023           |        | 0.026             |        | Broken         |        | 0.025         |        | 0.022       |        | 0.024  |        |
| Bottom                                        | 0.025           |        | 0.024             |        | 0.022          |        | 0.023         |        | 0.024       |        | 0.025  |        |
| Cylinder Bore Diameter                        | L*              | T      | L                 | T      | L              | T      | L             | T      | L           | T      | L      | T      |
| Top                                           | 3.5053          | 3.5057 | 3.5051            | 3.5054 | 3.5044         | 3.5056 | 3.5048        | 3.5054 | 3.5047      | 3.5055 | 3.5044 | 3.5058 |
| Middle                                        | 3.5043          | 3.5057 | 3.5043            | 3.5052 | 3.5044         | 3.5056 | 3.5043        | 3.5052 | 3.5040      | 3.5053 | 3.5037 | 3.5055 |
| Bottom                                        | 3.5042          | 3.5059 | 3.5042            | 3.5053 | 3.5044         | 3.5056 | 3.5044        | 3.5053 | 3.5041      | 3.5053 | 3.5036 | 3.5057 |
| Out of Round                                  | 0.0004          |        | 0.0003            |        | 0.0012         |        | 0.0006        |        | 0.0008      |        | 0.0014 |        |
| Taper                                         | 0.0011          |        | 0.0009            |        | 0.0000         |        | 0.0004        |        | 0.0006      |        | 0.0008 |        |
|                                               | I               | E      | I                 | E      | I              | E      | I             | E      | I           | E      | I      | E      |
| Camshaft Lobe Height                          | 0.237           | 0.256  | 0.227             | 0.260  | 0.230          | 0.262  | 0.230         | 0.252  | 0.228       | 0.267  | 0.224  | 0.258  |
| Valve Stem to Guide Clearance                 | 0.0030          | 0.0050 | 0.0030            | 0.0060 | 0.0030         | 0.0050 | 0.0030        | 0.0050 | 0.0030      | 0.0030 | 0.0040 | 0.0050 |
| Connecting Rod Bearings Plastigage Clearance  | 0.0017          |        | 0.0020            |        | 0.0020         |        | 0.0020        |        | 0.0015      |        | 0.0015 |        |
| Crankshaft Main Bearings Plastigage Clearance |                 |        | 1<br>0.0030       |        | 2<br>0.0020    |        | 3<br>0.0030   |        | 4<br>0.0025 |        |        |        |
| End of Test Compression Pressure (psig)       | 168             |        | 160               |        | 165            |        | 163           |        | 163         |        | 163    |        |
| End of Test Blow-By Rate                      | RPM             |        | Oil Pressure, psi |        | Flow Rate, cfm |        | Pressure, in. |        |             |        |        |        |
|                                               | 800             |        | 26                |        | 0.308          |        | 0.2           |        |             |        |        |        |
|                                               | 1800            |        | 41                |        | 0.315          |        | 0.3           |        |             |        |        |        |

Manufacturer's Production Specifications

|                        |                 |                                    |                 |
|------------------------|-----------------|------------------------------------|-----------------|
| Compression Ring Gaps  |                 | Valve Stem to Guide Clearance      |                 |
| Top/Bottom             | 0.010 - 0.020   | Intake/Exhaust                     | 0.0010 - 0.0027 |
| Cylinder Bore Diameter | 3.5050 ± 0.0015 | Connecting Rod Bearings Clearance  | 0.0014 - 0.0037 |
| Out of Round           | 0.0008          | Crankshaft Main Bearings Clearance | 0.0016 - 0.0032 |
| Taper                  | 0.0008          |                                    |                 |
| Camshaft Lobe Height   |                 |                                    |                 |
| Intake                 | 0.231           |                                    |                 |
| Exhaust                | 0.263           |                                    |                 |

- a = All measurements are in inches  
• = L = Longitudinal; T = Transversal  
I = Intake; E = Exhaust

# U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

Engine Type: 1.6 Liter  
Vehicle No.: CN0438  
Vehicle Type: Ford Escort  
Location: Fort Ord, California

|             |              |
|-------------|--------------|
| <u>Fuel</u> | <u>Miles</u> |
| M-85        | 23.690       |
| Total       | 23.690       |

## Engine Wear Measurements<sup>(a)</sup>

|                                               | Cylinder Number |                   |                |        |               |        |             |        |
|-----------------------------------------------|-----------------|-------------------|----------------|--------|---------------|--------|-------------|--------|
|                                               | 1               |                   | 2              |        | 3             |        | 4           |        |
| Compression Ring Gaps                         |                 |                   |                |        |               |        |             |        |
| Top                                           | 0.048           |                   | 0.033          |        | 0.032         |        | 0.037       |        |
| Bottom                                        | 0.038           |                   | 0.042          |        | 0.039         |        | 0.040       |        |
| Cylinder Bore Diameter                        |                 |                   |                |        |               |        |             |        |
|                                               | L*              | T                 | L              | T      | L             | T      | L           | T      |
| Top                                           | 3.1512          | 3.1506            | 3.1519         | 3.1509 | 3.1512        | 3.1506 | 3.1512      | 3.1506 |
| Middle                                        | 3.1523          | 3.1508            | 3.1526         | 3.1510 | 3.1522        | 3.1508 | 3.1519      | 3.1511 |
| Bottom                                        | 3.1526          | 3.1506            | 3.1523         | 3.1513 | 3.1519        | 3.1510 | 3.1520      | 3.1510 |
| Out of Round                                  | 0.0006          |                   | 0.0010         |        | 0.0006        |        | 0.0006      |        |
| Taper                                         | 0.0014          |                   | 0.0004         |        | 0.0007        |        | 0.0008      |        |
|                                               | I               | E                 | I              | E      | I             | E      | I           | E      |
| Camshaft Lobe Height                          | 0.226           | 0.228             | 0.228          | 0.227  | 0.219         | 0.226  | 0.226       | 0.223  |
| Valve Stem to Guide Clearance                 | 0.0040          | 0.0060            | 0.0040         | 0.0060 | 0.0030        | 0.0070 | 0.0040      | 0.0070 |
| Connecting Rod Bearings Plastigage Clearance  | 0.0015          |                   | 0.0015         |        | 0.0015        |        | 0.0015      |        |
| End of Test Compression Pressure (psig)       | 200             |                   | 200            |        | 200           |        | 200         |        |
| Crankshaft Main bearings Plastigage Clearance | 1<br>0.0015     |                   | 2<br>0.0015    |        | 3<br>0.0015   |        | 4<br>0.0015 |        |
|                                               |                 |                   |                |        |               |        | 5<br>0.0017 |        |
| End of Test Blow-By Rate                      | RPM             | Oil Pressure, psi | Flow Rate, cfm |        | Pressure, in. |        |             |        |
|                                               | 800             | 15                | 0.260          |        | <0.1          |        |             |        |
|                                               | 1800            | 31                | 0.500          |        | <0.1          |        |             |        |

## Manufacturer's Production Specifications

|                        |               |                                    |                 |
|------------------------|---------------|------------------------------------|-----------------|
| Compression Ring Gaps  |               | Valve Stem to Guide Clearance      |                 |
| Top                    | 0.012 - 0.020 | Intake                             | 0.0008 - 0.0027 |
| Bottom                 | 0.012 - 0.020 | Exhaust                            | 0.0018 - 0.0037 |
| Cylinder Bore Diameter |               | Connecting Rod Bearings Clearance  | 0.0008 - 0.0015 |
| Out of Round           | 0.001         | Crankshaft Main Bearings Clearance | 0.0008 - 0.0015 |
| Taper                  | 0.010         |                                    |                 |
| Camshaft Lobe Height   |               |                                    |                 |
| Intake/Exhaust         | 0.224-0.229   |                                    |                 |

- a = All measurements are in inches  
 \* = L = Longitudinal; T = Transversal  
 I = Intake; E = Exhaust

**U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE  
DEMONSTRATION TEST PROGRAM**

Engine Type: 1.6 Liter  
Vehicle No.: CN0440  
Vehicle Type: Ford Escort  
Location: Fort Ord, California

|             |              |
|-------------|--------------|
| <u>Fuel</u> | <u>Miles</u> |
| M-85        | 23,847       |
| Total       | 23,847       |

Engine Wear Measurements(a)

Cylinder Number

|                                               | <u>1</u>   |                          | <u>2</u>              |                      | <u>3</u> |          | <u>4</u> |          |
|-----------------------------------------------|------------|--------------------------|-----------------------|----------------------|----------|----------|----------|----------|
| Compression Ring Gaps                         |            |                          |                       |                      |          |          |          |          |
| Top                                           | 0.035      |                          | 0.031                 |                      | 0.033    |          | 0.032    |          |
| Bottom                                        | 0.037      |                          | 0.037                 |                      | 0.037    |          | 0.038    |          |
| Cylinder Bore Diameter                        | <u>L*</u>  | <u>T</u>                 | <u>L</u>              | <u>T</u>             | <u>L</u> | <u>T</u> | <u>L</u> | <u>T</u> |
| Top                                           | 3.1521     | 3.1508                   | 3.1514                | 3.1509               | 3.1518   | 3.1510   | 3.1518   | 3.1512   |
| Middle                                        | 3.1531     | 3.1508                   | 3.1524                | 3.1509               | 3.1529   | 3.1511   | 3.1531   | 3.1514   |
| Bottom                                        | 3.1531     | 3.1507                   | 3.1521                | 3.1510               | 3.1525   | 3.1513   | 3.1528   | 3.1515   |
| Out of Round                                  | 0.0013     |                          | 0.0003                |                      | 0.0008   |          | 0.0006   |          |
| Taper                                         | 0.0010     |                          | 0.0007                |                      | 0.0007   |          | 0.0010   |          |
|                                               | <u>I</u>   | <u>E</u>                 | <u>I</u>              | <u>E</u>             | <u>I</u> | <u>E</u> | <u>I</u> | <u>E</u> |
| Camshaft Lobe Height                          | 0.227      | 0.226                    | 0.227                 | 0.216                | 0.227    | 0.215    | 0.227    | 0.211    |
| Valve Stem to Guide Clearance                 | 0.0025     | 0.0050                   | 0.0030                | 0.0050               | 0.0025   | 0.0040   | 0.0040   | 0.0040   |
| Connecting Rod Bearings Plastigage Clearance  | 0.0015     |                          | 0.0015                |                      | 0.0015   |          | 0.0015   |          |
| End of Test Compression Pressure (psig)       | 210        |                          | 205                   |                      | 200      |          | 210      |          |
| Crankshaft Main Bearings Plastigage Clearance |            | <u>1</u>                 |                       | <u>2</u>             |          | <u>3</u> |          | <u>5</u> |
|                                               |            | 0.0015                   |                       | 0.0010               |          | 0.0015   |          | 0.0010   |
| End of Test Blow-By Rate                      | <u>RPM</u> | <u>Oil Pressure, psi</u> | <u>Flow Rate, cfm</u> | <u>Pressure, in.</u> |          |          |          |          |
|                                               | 300        | 15                       | 0.320                 | <0.1                 |          |          |          |          |
|                                               | 1800       | 31                       | 0.375                 | <0.1                 |          |          |          |          |

Manufacturer's Production Specifications

|                                     |               |                                    |                 |
|-------------------------------------|---------------|------------------------------------|-----------------|
| Compression Ring Gaps               |               | Valve Stem to Guide Clearance      |                 |
| Top                                 | 0.012 - 0.020 | Intake                             | 0.0008 - 0.0027 |
| Bottom                              | 0.012 - 0.020 | Exhaust                            | 0.0018 - 0.0037 |
| Cylinder Bore Diameter              |               | Connecting Rod Bearings Clearance  | 0.0008 - 0.0015 |
| Out of Round                        | 0.001         |                                    |                 |
| Taper                               | 0.010         | Crankshaft Main Bearings Clearance | 0.0008 - 0.0015 |
| Camshaft Lobe Height Intake/Exhaust | 0.224-0.229   |                                    |                 |

a = All measurements are in inches  
\* = L = Longitudinal; T = Transversal  
I = Intake; E = Exhaust

# U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

Engine Type: 1.6 Liter  
Vehicle No.: CN0545  
Vehicle Type: Ford Escort  
Location: Sierra Army Depot

|             |              |
|-------------|--------------|
| <u>Fuel</u> | <u>Miles</u> |
| M-85        | 24,873       |
| Total       | 24,873       |

## Engine Wear Measurements(a)

|                                         | Cylinder Number |                          |                       |          |                      |          |          |          |
|-----------------------------------------|-----------------|--------------------------|-----------------------|----------|----------------------|----------|----------|----------|
|                                         | <u>1</u>        |                          | <u>2</u>              |          | <u>3</u>             |          | <u>4</u> |          |
| Compression Ring Gaps                   |                 |                          |                       |          |                      |          |          |          |
| Top                                     | 0.032           |                          | 0.030                 |          | 0.030                |          | 0.032    |          |
| Bottom                                  | 0.037           |                          | 0.035                 |          | Broken               |          | 0.035    |          |
| Cylinder Bore Diameter                  |                 |                          |                       |          |                      |          |          |          |
|                                         | <u>L*</u>       | <u>T</u>                 | <u>L</u>              | <u>T</u> | <u>L</u>             | <u>T</u> | <u>L</u> | <u>T</u> |
| Top                                     | 3.1524          | 3.1512                   | 3.1515                | 3.1510   | 3.1522               | 3.1512   | 3.1522   | 3.1511   |
| Middle                                  | 3.1532          | 3.1513                   | 3.1522                | 3.1508   | 3.1530               | 3.1512   | 3.1527   | 3.1513   |
| Bottom                                  | 3.1531          | 3.1512                   | 3.1520                | 3.1509   | 3.1525               | 3.1514   | 3.1525   | 3.1513   |
| Out of Round                            | 0.0012          |                          | 0.0003                |          | 0.0010               |          | 0.0011   |          |
| Taper                                   | 0.0007          |                          | 0.0003                |          | 0.0003               |          | 0.0003   |          |
| Camshaft Lobe Height                    | <u>I</u>        | <u>E</u>                 | <u>I</u>              | <u>E</u> | <u>I</u>             | <u>E</u> | <u>I</u> | <u>E</u> |
|                                         | 0.227           | 0.225                    | 0.227                 | 0.227    | 0.227                | 0.227    | 0.228    | 0.227    |
| Valve Stem to Guide Clearance           | 0.0050          | 0.0060                   | 0.0040                | 0.0070   | 0.0040               | 0.0060   | 0.0040   | 0.0060   |
| Connecting Rod Bearings                 |                 |                          |                       |          |                      |          |          |          |
| Plastigage Clearance                    | 0.0015          |                          | 0.0015                |          | 0.0015               |          | 0.0015   |          |
| End of Test Compression Pressure (psig) | 200             |                          | 210                   |          | 210                  |          | 160      |          |
| Crankshaft Main Bearings                |                 |                          |                       |          |                      |          |          |          |
| Plastigage Clearance                    | <u>1</u>        |                          | <u>2</u>              |          | <u>3</u>             |          | <u>4</u> |          |
|                                         | 0.0015          |                          | 0.0015                |          | 0.0015               |          | 0.0015   |          |
| End of Test Blow-By Rate                | <u>RPM</u>      | <u>Oil Pressure, psi</u> | <u>Flow Rate, c/m</u> |          | <u>Pressure, in.</u> |          |          |          |
|                                         | 800             | 22                       | 0.390                 |          | <0.1                 |          |          |          |
|                                         | 1800            | 47                       | 0.420                 |          | <0.1                 |          |          |          |

## Manufacturer's Production Specifications

|                        |               |                               |                 |
|------------------------|---------------|-------------------------------|-----------------|
| Compression Ring Gaps  |               | Valve Stem to Guide Clearance |                 |
| Top                    | 0.012 - 0.020 | Intake                        | 0.0008 - 0.0027 |
| Bottom                 | 0.012 - 0.020 | Exhaust                       | 0.0018 - 0.0037 |
| Cylinder Bore Diameter |               | Connecting Rod Bearings       |                 |
| Out of Round           | 0.001         | Clearance                     | 0.0008 - 0.0015 |
| Taper                  | 0.010         | Crankshaft Main Bearings      |                 |
| Camshaft Lobe Height   |               | Clearance                     | 0.0008 - 0.0015 |
| Intake/Exhaust         | 0.224-0.229   |                               |                 |

- a = All measurements are in inches  
 \* = L = Longitudinal; T = Transversal  
 I = Intake; E = Exhaust

**U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE  
DEMONSTRATION TEST PROGRAM**

Engine Type: 1.6 Liter  
Vehicle No. CN0547  
Vehicle Type: Ford Escort  
Location: Sierra Army Depot

|              |               |
|--------------|---------------|
| <u>Fuel</u>  | <u>Miles</u>  |
| M-85         | 26,609        |
| <b>Total</b> | <b>26,609</b> |

Engine Wear Measurements<sup>(a)</sup>

Cylinder Number

|                                               | <u>1</u>   |                          | <u>2</u>              |                      | <u>3</u> |          | <u>4</u> |          |
|-----------------------------------------------|------------|--------------------------|-----------------------|----------------------|----------|----------|----------|----------|
| Compression Ring Gaps                         |            |                          |                       |                      |          |          |          |          |
| Top                                           | 0.036      |                          | 0.035                 |                      | 0.032    |          | 0.033    |          |
| Bottom                                        | 0.037      |                          | Broken                |                      | 0.037    |          | 0.036    |          |
| Cylinder Bore Diameter                        | <u>L*</u>  | <u>T</u>                 | <u>L</u>              | <u>T</u>             | <u>L</u> | <u>T</u> | <u>L</u> | <u>T</u> |
| Top                                           | 3.1512     | 3.1507                   | 3.1517                | 3.1512               | 3.1515   | 3.1512   | 3.1511   | 3.1505   |
| Middle                                        | 3.1525     | 3.1507                   | 3.1526                | 3.1511               | 3.1529   | 3.1512   | 3.1521   | 3.1510   |
| Bottom                                        | 3.1528     | 3.1504                   | 3.1524                | 3.1513               | 3.1526   | 3.1514   | 3.1519   | 3.1510   |
| Out of Round                                  | 0.0005     |                          | 0.0005                |                      | 0.0003   |          | 0.0005   |          |
| Taper                                         | 0.0016     |                          | 0.0007                |                      | 0.0011   |          | 0.0008   |          |
|                                               | <u>I</u>   | <u>E</u>                 | <u>I</u>              | <u>E</u>             | <u>I</u> | <u>E</u> | <u>I</u> | <u>E</u> |
| Camshaft Lobe Height                          | 0.227      | 0.227                    | 0.227                 | 0.228                | 0.229    | 0.226    | 0.227    | 0.229    |
| Valve Stem to Guide Clearance                 | 0.0040     | 0.0050                   | 0.0030                | 0.0040               | 0.0040   | 0.0040   | 0.0030   | 0.0050   |
| Connecting Rod Bearings Plastigage Clearing   | 0.0010     |                          | 0.0010                |                      | 0.0010   |          | 0.0010   |          |
| End of Test Compression Pressure (psig)       | 210        |                          | 195                   |                      | 210      |          | 170      |          |
| Crankshaft Main Bearings Plastigage Clearance |            | <u>1</u>                 |                       | <u>2</u>             |          | <u>3</u> |          | <u>4</u> |
|                                               |            | 0.0015                   |                       | 0.0015               |          | 0.0015   |          | 0.0015   |
| End of Test Blow-By Rate                      | <u>RPM</u> | <u>Oil Pressure, psi</u> | <u>Flow Rate, cfm</u> | <u>Pressure, in.</u> |          |          |          |          |
|                                               | 800        | 20                       | 0.515                 | <0.1                 |          |          |          |          |
|                                               | 1800       | 35                       | 0.350                 | <0.1                 |          |          |          |          |

Manufacturer's Production Specifications

|                        |                |                                    |                 |
|------------------------|----------------|------------------------------------|-----------------|
| Compression Ring Gaps  |                | Valve Stem to Guide Clearance      |                 |
| Top                    | 0.0012 - 0.020 | Intake                             | 0.0008 - 0.0027 |
| Bottom                 | 0.0012 - 0.020 | Exhaust                            | 0.0018 - 0.0037 |
| Cylinder Bore Diameter |                | Connecting Rod Bearings Clearance  | 0.0008 - 0.0015 |
| Out of Round           | 0.001          |                                    |                 |
| Taper                  | 0.010          | Crankshaft Main Bearings Clearance | 0.0008 - 0.0015 |
| Camshaft Lobe Height   |                |                                    |                 |
| Intake/Exhaust         | 0.224-0.229    |                                    |                 |

- a = All measurements are in inches  
 \* = L = Longitudinal; T = Transversal  
 I = Intake; E = Exhaust

**APPENDIX G**  
**CRC DEPOSIT RATINGS FOR INSPECTED VEHICLES**

**U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE  
DEMONSTRATION TEST PROGRAM**

**CRC Ratings for Test Engines**

|                         |           |           |           |           |           |
|-------------------------|-----------|-----------|-----------|-----------|-----------|
| Type Engine: GM         | 2.5L, L-4 | 2.5L, L-4 | 2.5L, L-4 | 2.5L, L-4 | 2.5L, L-4 |
| Type Vehicle: Chevrolet | S-10 PU   | S-10 PU   | S-10 PU   | Citation  | Citation  |
| Vehicle Number:         | CM 2890   | CM 2883   | CM 2872   | CM 3613   | CM 3615   |
| Unleaded Fuel Miles     | 18,725    | 6,090     | 4,908     | 17,762    | 16,185    |
| M-85 Fuel Miles         | 0         | 8,662     | 12,295    | 45,151    | 22,120    |
| Total Miles             | 18,725    | 14,752    | 17,203    | 62,913    | 41,305    |

**Sludge Merit Ratings\***

|                    |      |      |      |      |    |
|--------------------|------|------|------|------|----|
| Rocker Arm Cover   | 9.75 | 9.75 | 9.75 | 9.60 | NR |
| Front Seal Housing | 9.75 | 9.60 | 9.40 | 9.60 | NR |
| Oil Pan            | 9.75 | 9.60 | 9.10 | 9.75 | NR |
| Valve Deck         | 9.75 | 9.75 | 9.68 | 9.61 | NR |
| Underside of Block | 9.75 | 9.75 | 9.75 | 9.75 | NR |
| Average            | 9.75 | 9.69 | 9.54 | 9.66 |    |

**Varnish Ratings\***

|                  |      |      |      |      |         |
|------------------|------|------|------|------|---------|
| Piston Skirts    | 9.80 | 9.90 | 9.80 | 9.75 | 9.82    |
| Ring Sticking    | Free | Free | Free | Free | Free    |
| Rocker Arm Cover | ..   | ..   | ..   | ..   | ..      |
| Cam Cover Baffle | ..   | ..   | ..   | ..   | ..      |
| Cylinder Walls   | 8.66 | 9.85 | 9.78 | 9.80 | 9.90*** |
| Oil Pan          | ..   | ..   | ..   | ..   | ..      |
| Average          | 9.23 | 9.88 | 9.79 | 9.78 | 9.87    |

**Other Ratings\***

|                          |       |        |      |       |      |
|--------------------------|-------|--------|------|-------|------|
| Oil Rings, % Clogging    | < 1   | < 1    | < 1  | < 1   | NR   |
| Oil Screen, % Clogging   | < 1   | < 1    | < 1  | < 1   | NR   |
| Intake Valve Deposits*   | 8.38+ | 8.38   | 7.33 | 8.22  | 7.00 |
| Intake Ports, % Plugged  | < 5   | < 5 ++ | < 5  | 31.25 | NR   |
| Exhaust Ports, % Plugged | 10    | NR     | NR   | NR    | NR   |

- 
- = 10 = Most clean
  - .. = Component could not be rated due to painted surface
  - \*\*\* = Heavy rust in No. 3, light and heavy rust on No. 4
  - = Valves and seats pitted; light exhaust leakage
  - ++ = Foreign object in No. 4 cylinder (wire or cotter pin)
  - NR = Not rated

**U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE  
DEMONSTRATION TEST PROGRAM**

**CRC Ratings for Test Engines**

|                         |           |           |           |           |           |           |
|-------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Type Engine: GM         | 2.8L, V-6 | 2.8L, V-6 | 2.8L, V-6 | 2.8L, V-6 | 2.8L, V-6 | 2.8L, V-6 |
| Type Vehicle: Chevrolet | S-10 PU   | S-10 PU   | S-10 PU   | S-10 PU   | Citation  | Citation  |
| Vehicle No.:            | CM 2895   | CM 2889   | CM 2885   | CM 2884   | CM 3616   | CM 3614   |
| Unleaded Fuel Miles     | 6,465     | 6,526     | 18,147    | 15,595    | 28,257    | 65,640    |
| M-85 Fuel Miles         | 17,795    | 10,905    | 0         | 0         | 30,613    | 0         |
| Total Miles             | 24,261    | 17,431    | 18,147    | 15,595    | 58,870    | 65,640    |

**Sludge Merit Ratings\***

|                                 |      |      |      |      |      |      |
|---------------------------------|------|------|------|------|------|------|
| Left Rocker Arm Cover           | 9.40 | 8.20 | 9.62 | 9.42 | 9.10 | 9.72 |
| Right Rocker Arm Cover          | 9.60 | 8.71 | 9.64 | 9.46 | 8.99 | 9.75 |
| Underside of<br>Intake Manifold | 9.68 | 9.60 | 9.75 | 9.72 | 9.40 | 9.66 |
| Oil Pan                         | 7.60 | 8.68 | 9.60 | 9.72 | 2.15 | 9.60 |
| Left Valve Deck                 | 9.60 | 9.10 | 9.75 | 9.75 | 9.50 | 9.75 |
| Right Valve Deck                | 9.40 | 9.50 | 9.75 | 9.75 | 9.50 | 9.75 |
| Pushrod Chamber                 | 9.50 | 6.10 | 9.75 | 9.75 | 9.50 | 9.75 |
| Timing Gear Cover               | 9.50 | 9.60 | 9.64 | 9.68 | 9.41 | 9.75 |
| Average                         | 9.29 | 8.69 | 9.69 | 9.66 | 8.44 | 9.72 |

**Varnish Ratings\***

|                     |      |      |      |      |      |      |
|---------------------|------|------|------|------|------|------|
| Piston Skirts       | 9.50 | 9.44 | 6.38 | 9.19 | 9.52 | 9.57 |
| Rocker Arm Covers   | 6.03 | 7.85 | 8.76 | 7.27 | 6.90 | 6.95 |
| Valve Lifter Bodies | 9.53 | 9.67 | 7.36 | 8.92 | 9.19 | 8.97 |
| Cylinder Walls      | 9.42 | 9.12 | 7.35 | 7.94 | NR   | 9.33 |
| Oil Pan             | 6.40 | 6.52 | 7.25 | 8.45 | 8.65 | 7.15 |
| Average             | 8.18 | 8.41 | 7.21 | 8.16 | 8.57 | 8.39 |

**Other Ratings**

|                                |      |      |      |      |      |      |
|--------------------------------|------|------|------|------|------|------|
| Oil Screen % Clogging          | < 1  | < 1  | < 1  | < 1  | < 1  | < 1  |
| Intake Valve Deposits*         | 7.65 | 7.48 | 8.25 | 7.75 | 8.18 | 6.80 |
| Intake Valve Ports, % Clogging | < 5  | < 5  | < 5  | < 1  | < 1  | 12.5 |

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\* = 10 = Most clean  
NR = Not rated

**U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE  
DEMONSTRATION TEST PROGRAM**

**CRC Ratings for Test Engines**

|                |             |             |             |             |
|----------------|-------------|-------------|-------------|-------------|
| Type Engine    | 1.6 Liter   | 1.6 Liter   | 1.6 Liter   | 1.6 Liter   |
| Type Vehicle   | Ford Escort | Ford Escort | Ford Escort | Ford Escort |
| Vehicle Number | CN0545      | CN0547      | CN0438      | CN0440      |
| M85 Fuel Miles | 24,873      | 26,609      | 23,690      | 23,847      |
| Total Miles    | 24,873      | 26,609      | 23,690      | 23,847      |

**Sludge Merit Ratings\***

|                    |      |      |      |      |
|--------------------|------|------|------|------|
| Rocker Arm Cover   | 5.78 | 9.60 | 9.52 | 9.70 |
| Front Seal Housing | 9.73 | 9.80 | 9.62 | 9.65 |
| Oil Pan            | 9.70 | 9.70 | 9.64 | 9.63 |
| Valve Deck         | 9.70 | 9.75 | 9.60 | 9.27 |
| Underside of Block | 9.75 | 9.75 | 9.75 | 9.75 |
| Average            | 8.93 | 9.72 | 9.63 | 9.60 |

**Varnish Ratings\***

|                  |      |      |      |      |
|------------------|------|------|------|------|
| Piston Skirts    | 9.50 | 9.73 | 9.50 | 9.90 |
| Ring Sticking    | Free | Free | Free | Free |
| Rocker Arm Cover | 4.30 | 5.85 | 5.40 | 4.65 |
| Cam Cover Baffle | NR   | NR   | NR   | NR   |
| Cylinder Walls   | 9.50 | 9.95 | 9.50 | 9.95 |
| Oil Pan          | 6.80 | 7.95 | 6.85 | 7.38 |
| Average          | 7.53 | 8.37 | 7.81 | 7.97 |

**Other Ratings\***

|                        |      |      |      |      |
|------------------------|------|------|------|------|
| Oil Rings, % Clogging  | < 1  | < 1  | < 1  | 0    |
| Oil Screen, % Clogging | < 1  | < 1  | < 1  | < 1  |
| Intake Valve Deposits* | 8.50 | 9.00 | 8.50 | 8.85 |

---

\* = 10 = Most clean  
NR = Not Rated

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| 4. PERFORMING ORGANIZATION REPORT NUMBER(S)<br>Interim Report BFLRF No. 233                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |       |                                                  | 5. MONITORING ORGANIZATION REPORT NUMBER(S)                                                      |                                                                                                      |                                |
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| 11. TITLE (Include Security Classification)<br>Final Report on U.S. Army Methanol-Fueled Administrative Vehicle Demonstration Program (U)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                                                  |                                                                                                  |                                                                                                      |                                |
| 12. PERSONAL AUTHOR(S)<br>Baber, Burl B., Lestz, Sidney J., and LePera, Maurice E (Belvoir RDE Center)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |       |                                                  |                                                                                                  |                                                                                                      |                                |
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| 16. SUPPLEMENTARY NOTATION<br>See notation 16 on back of this form.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |                                                  |                                                                                                  |                                                                                                      |                                |
| 17. COSATI CODES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |                                                  | 18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)                |                                                                                                      |                                |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |                                                  | Fleet Test M85 Engine Conversion                                                                 |                                                                                                      |                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |                                                  | Methanol Fuel M85 Engine Oils                                                                    |                                                                                                      |                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |                                                  | M85 Engine M85 Refueling Stations                                                                |                                                                                                      |                                |
| 19. ABSTRACT (Continue on reverse if necessary and identify by block number)<br>A methanol-fueled fleet test demonstration program was conducted using administrative-type vehicles to determine the feasibility of using methanol as an alternative fuel. Over 1,026,000 miles were accumulated using 64 administrative-type vehicles. Approximately 750,000 of these miles were accumulated using M85 methanol fuel. Existing engines engineered for use with gasoline and special methanol engines engineered for use with M85 methanol fuel were included in the demonstration program.<br><br>Fuel economy, in miles per gallon, obtained for vehicles using M85 fuel is shown to be approximately one-half that obtained using regular unleaded gasoline. When the costs of M85 fuel and unleaded gasoline are included in economic calculations, it is shown that using M85 increases the fuel cost by a factor of approximately 3.0.<br><br>No catastrophic engine failure occurred using either fuel. Even though wear rates, indicated from used oil sample analyses, obtained when using M85 fuel appear to be 2 to 4 times those obtained using unleaded gasoline, actual |       |                                                  |                                                                                                  |                                                                                                      |                                |
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(Continued)

## 16. SUPPLEMENTARY NOTATION

Color photographs showing wear in the engines of the vehicles are on file at Belvoir RDE Center, STRBE-VF. To conserve project funds, a limited number of reports that include Appendices C and E have been printed. Offices receiving all appendices are noted in the attached distribution list. Complete copies may be obtained from the Defense Technical Information Center.

## 19. ABSTRACT

wear, from inspections and measurements, does not appear to be as severe. No significant increase in individual vehicle maintenance, other than increased oil drains, was noted for the methanol vehicles.

M85 refueling stations were set up at four fleet test sites, and no significant operational problem, safety or otherwise, was encountered during the program.



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