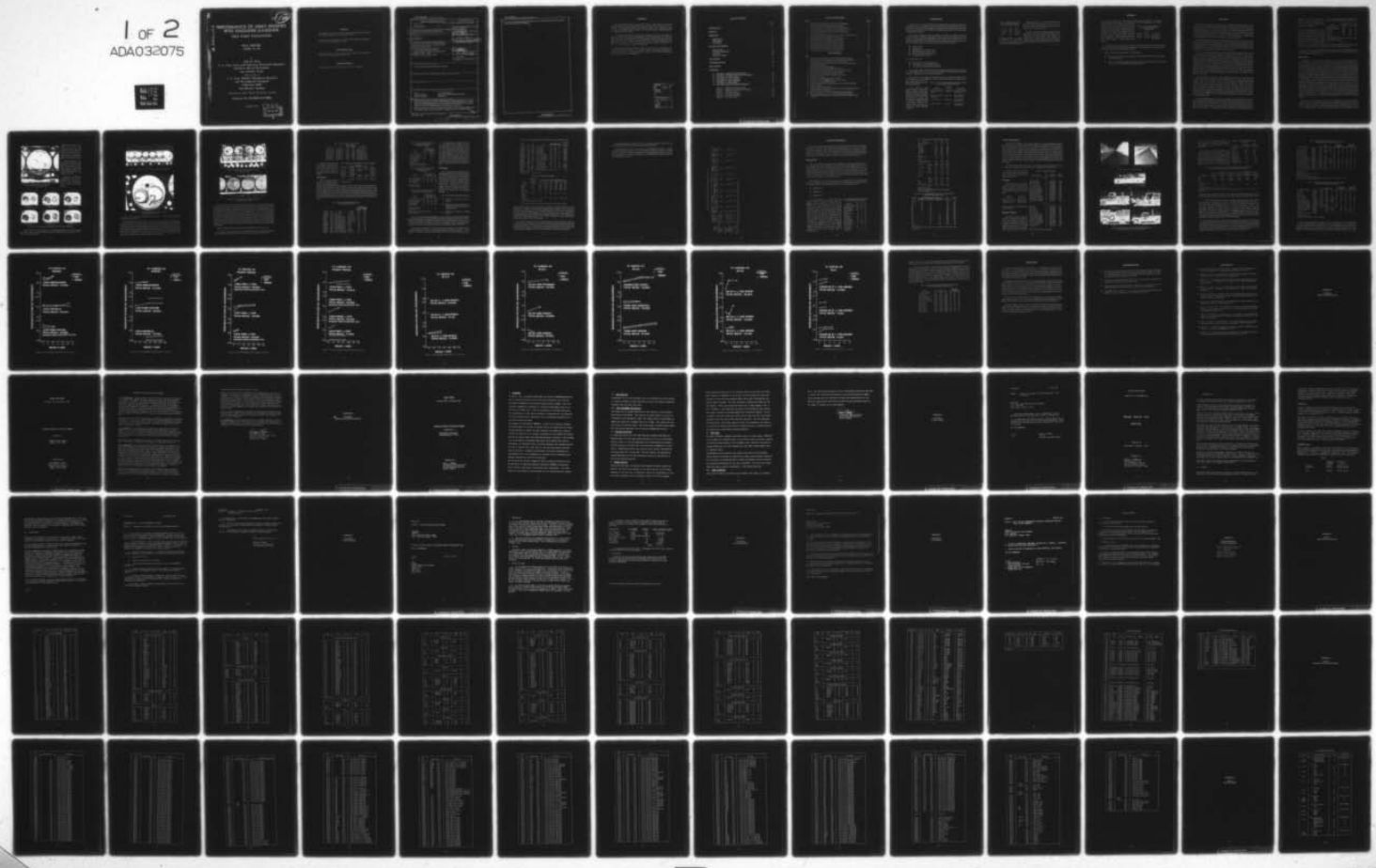
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PERFORMANCE OF ARMY ENGINES WITH UNLEADED GASOLINE

FIELD STUDY EVALUATION

FINAL REPORT
AFLRL No. 82

by

John D. Tosh
U. S. Army Fuels and Lubricants Research Laboratory
Southwest Research Institute
San Antonio, Texas

under contract to

U. S. Army Mobility Equipment Research and Development Command
Laboratory 2000
Fort Belvoir, Virginia

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All gasoline-powered vehicles and equipment at six U.S. Army installations were operated during the evaluation period on VV-G-001690A Regular Grade unleaded gasoline. Special Grade 91.0 RON unleaded gasoline was specified but was unavilable; therefore, unleaded gasoline in the 92.0-94.0 RON range was used throughout the program.

During this evaluation period, no detrimental effects were noted on material handling equipment (MHE), engineer support equipment, or commercial, tactical, or combat vehicles

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operated under typical daily military operation. Also, no increases in maintenance operating costs were noted during this evaluation.

FOREWORD

The work reported herein was conducted at the U. S. Army Fuels and Lubricants Research Laboratory, located at Southwest Research Institute, San Antonio, Texas, under Contracts Nos. DAAD05-72-C-0427 and DAAD02-75-C-0082. The contracting officer's technical representative for this program was Dr. Marjan Kolobielski, USAMERADCOM, Lab. 2000, Fort Belvoir, Virginia.

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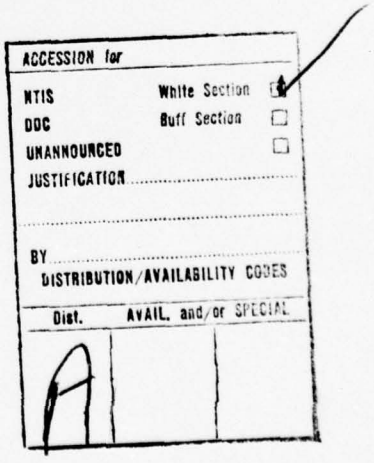


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INTRODUCTION

In mid-1971 the U.S. Army Fuels and Lubricants Research Laboratory began a program under Contract No. DAAD05-72-C-0427 to conduct short-term laboratory engine tests and long-term continuous field surveillance at several military installations with high-density vehicle operations to determine the impact of unleaded gasoline in vehicles operating under typical military conditions.

The short-term laboratory engine tests (Phase I) consisted of intensive engine dynamometer testing of six different spark ignition engine types currently operational in Army vehicles or as powerpacks for field generator sets. The engines were operated for 125 hr at wide open throttle (WOT) and/or 100-percent load output at maximum rpm. One engine of each of the following types was operated on each one of the three test fuels.

- Hercules L-141
- Chrysler 75M
- MIL-STD-2A016 (1.5-kW Gen Set)
- MIL-STD-4A032 (3.0-kW Gen Set)
- MIL-STD-4A084 (10.0-kW Gen Set)
- Continental AVSI-1790-6A

The test fuels used were:

- MIL-G-46015–Conventionally Leaded
- VV-G-001690–Low-Lead (0.5 g/gal. max)
- VV-G-001690–Unleaded (0.07 g/gal. max)

All six engine types performed satisfactorily on all gasoline blends from the standpoint of (1) catastrophic failure, (2) excessive valve or cylinder wear, (3) engine power output and fuel and oil consumption, and (4) emission degradation.

Test results on these engine dynamometer tests were reported in AFLRL Phase I Interim Report No. 21 "Performance of Army Engines with Leaded and Unleaded Gasoline," dated January 1973, Defense Documentation Center Report No. AD 766337.

After satisfactory completion of Phase I, the field surveillance portion of the program (Phase II) was begun. This phase involved total conversion (all gasoline-powered vehicles and equipment) to unleaded gasoline at four Army installations. Those installations, respective conversion dates, and program coordinators are shown at the right in Table 1.

TABLE 1. INSTALLATIONS USED, INSTALLATIONS CONVERSION DATES, AND PROGRAM COORDINATORS

Installation	Conversion Date	Coordinator(s)
Dugway Proving Ground, Utah	December 1972	Cpt. Ronald J. Verdoorn SFC George Dean
Letterkenny Army Depot, Pennsylvania	January 1973	Mr. Fred Stambaugh Mr. Orvil Wenger
Ft. Carson, Colorado	March 1973	Maj. G. A. Wilhelm Mrs. Mary Eaton
Ft. Eustis, Virginia	March 1973	Mr. Henry Powell Mr. Russell Moore

TABLE 2. VEHICLE CATEGORY, DENSITY, AND APPROXIMATE MILES DURING FIRST YEAR OPERATION

Category	No. vehicles	No. miles
Commercial	1482	13,193,114
Tactical	1727	6,473,535
Combat	490	424,872

During the first year of the field surveillance program, 3699 vehicles were operated in excess of 20 million vehicle miles. A breakdown of vehicle category and respective miles are listed in Table 2.

Results of the first-year Field Surveillance Program (Phase II) was reported in AFLRL Final Report No. 54, "Performance of Army Engines with Leaded and Unleaded Gasoline" in January 1975, Defense Documentation Center Report No. AD A005577. It was generally concluded that all Army gasoline-powered equipment and vehicles could be operated on unleaded gasoline under normal military day-to-day type operation with no deleterious effects.

APPROACH

After approximately 20 million miles on 3699 vehicles during the 1-yr unleaded gasoline program under Contract No. DAAD05-72-C-0427, the Department of the Army wanted to obtain more information on tactical and combat vehicles and also to determine the long-range effect on those vehicles already operating on unleaded gasoline. Therefore, the program was extended under Contract No. DAAK02-75-C-0082. This extension enabled the program to continue at the four original installations while adding Ft. Lewis, Washington, and Ft. Riley, Kansas, which have a high density of tactical and combat vehicles.

TABLE 3. ADDED INSTALLATIONS, CONVERSION DATES, AND PROGRAM COORDINATORS

Installation	Conversion date	Coordinator(s)
Ft. Lewis	July 1975	Mr. Harold Feutz
Ft. Riley	July 1975	Mr. Harold Newsome Mrs. Zora Flack

The addition of Ft. Lewis and Ft. Riley increased vehicle density by 3839 vehicles plus many additional pieces of gasoline-powered equipment. The starting dates and program coordinators for Ft. Lewis and Ft. Riley are listed in Table 3.

This extension also provided greater time and mileage to

- Continue the determination of engine octane requirements in vehicles operating solely on unleaded gasoline
- Define any long-range problems resulting in increased maintenance and/or operating cost as a result of prolonged use of unleaded gasoline.

DISCUSSION

In late 1972 and early 1973, four military installations (Dugway Proving Ground, Utah; Letterkenny Army Depot, Pennsylvania; Fort Eustis, Virginia; and Fort Carson, Colorado) were selected for the field study evaluation. Then after approximately 20 million vehicle miles, in mid-1975, Ft. Lewis, Washington and Ft. Riley, Kansas were added to the program to provide greater vehicle density and mileage. All these installations were chosen because of vehicle density, high vehicle utilization, and an adequate mix of both commercial and military vehicles. Also, they were selected for the differing climatic extremes which provided high and low altitudes and dry, humid, hot, and cold conditions.

The original plan was to utilize unleaded gasoline marketed by more than one refiner. However, only American Oil Company (Amoco) was marketing unleaded gasoline in the areas of the four original installations. Amoco thus became (and remains) the sole supplier of unleaded gasoline for the field surveillance program at those installations. When Ft. Lewis and Ft. Riley were added to the program in July 1975, Shell Oil Company became the supplier for Ft. Lewis and APCO Oil Corporation for Ft. Riley.

Prior to receiving unleaded gasoline, each of the participating installations was required to pump all gasoline storage tanks completely dry and let them air dry for a minimum of 2 days in order to avoid contamination. Also, the vehicle fuel tanks were required to be less than one-quarter full before they were charged with the unleaded fuel. In this way the program was begun immediately on gasoline of less than 0.07 g/gal. lead content (0.05 g/gal. at Ft. Lewis and Ft. Riley) which was the maximum lead content allowable at the beginning of Phase II. Also, an octane quality of between 91.0 and 92.5 Research Octane Number (Special Grade), corrected for altitude, was specified for this program. However, refiners in the areas of the installations were marketing a slightly higher octane quality fuel. Therefore, unleaded gasoline in the slightly higher octane range was used throughout the program. However, from July 1974 through August 1976, the octane quality at Dugway Proving Ground and Ft. Eustis had deteriorated slightly from 87.6 and 89.9 [(R + M)/2] to 85.6 and 89.1, respectively.

With the altitude correction factor, the unleaded gasoline used at Ft. Carson, Colorado was just slightly above the Special Grade limitations on octane quality. When the field evaluation was begun in December 1972, Federal Specification VV-G-001690 (Army-MR) allowed only a 3.0 octane number correction. However, Federal Specification VV-G-001690A (Army-MR) became effective on 5 April 1974, and it allowed a 4.5 octane number correction for altitude. Additional precautions were taken early in the program, such as increased fuel sampling for analysis to determine the stability of the lead content below 0.07 g/gal. A program was established through General Material Petroleum Activity (GMPA) for the installations to collect unleaded fuel samples for analysis by both AFLRL and the respective GMPA Eastern and Western Petroleum Division offices (see subsection Fuel Analyses, page 14).

To avoid burdensome record keeping, the installations were required to record only the initial starting and final mileages on all vehicles operating on unleaded gasoline. Since the tactical and combat vehicles were located at Ft. Carson, Ft. Lewis, and Ft. Riley, the personnel at these installations were required to report quarterly mileages and fuel consumption on preselected "control" vehicles. Fuel economy data on these vehicles are shown in the subsection entitled "Fuel Economy." A breakdown of all vehicles and equipment on the program at each

installation is given in Appendix E. However, Table 4 indicates the *approximate* number of commercial, tactical, and combat vehicles used throughout the program.

TABLE 4. APPROXIMATE NUMBER OF COMMERCIAL, TACTICAL, AND COMBAT VEHICLES AT EVALUATION SITES

Installation	Approximate no. of vehicles[a] Commercial	Tactical	Combat
Dugway Proving Ground	312	0	0
Letterkenny Army Depot	480	0	0
Ft. Carson[b]	431	1610	490
Ft. Eustis	259	178	0
Ft. Riley	359	1092	178
Ft. Lewis	960	1193	14

[a]Total number of vehicles fluctuated at each installation due to replacement policy, etc.
[b]See Note, Section 4 of Appendix G.

During this evaluation, several vehicles (less than 0.5 percent of the 2801 commercial vehicles) experienced difficulties. Although the use of unleaded gasoline may or may not have influenced these difficulties, it is important to discuss the engine failures listed below in the proper perspective—that is, there have always been engine failures regardless of fuel used, and the number of failures during this evaluation was in no way considered excessive.

Some of the engine problems listed below were discussed in AFLRL Report No. 54 (DDC Report No. AD A005577) but are also included here since this report covers the complete Unleaded Gasoline Program.

Engine Failures

Originally, it was suspected that problems such as valve recession, pre-ignition, and harmful detonation which could cause problems in engines might be encountered. Therefore, the program coordinator at each installation was asked to document and report any engine failure suspected of being fuel related. Early in the program, one problem identified was that of valve guide failures in the 1971 Ford 351 CID (Windsor) engines. Approximately 25 to 30 of these failures occurred at Dugway, Ft. Eustis, and Letterkenny (Ft. Carson had no vehicles with the Windsor Foundry engine) during the first year of this evaluation. However, the introduction of new improved heads by Ford Motor Company appears to have corrected this problem. Approximately 50 percent of all vehicles equipped with the 351 CID Windsor engine at the three locations listed above experienced failures during the first year. However, it was determined that these failures were not directly associated with the use of unleaded gasoline. During this time, a survey was made of other AMC (now DARCOM) installations using normally leaded gasoline. It was discovered that, at installations using 1971 Ford vehicles with the 351 CID Windsor engine, the failure rate was also approximately 50 percent of the vehicles regardless of fuel used. Also, documentation from Ford Motor Company (Ford Motor Company letter to Ford and Mercury Dealers, dated 1 November 1971) revealed that the warranty on the Windsor engines had been extended an additional 12,000 miles or 12 months. Figure 1 shows a typical exhaust valve guide failure with the elongation of the valve guide hole and the exhaust valve seat. This failure was at Dugway Proving Ground on a vehicle that had 48,908 total miles (13,375 on unleaded gasoline).

Figures 2, 3, 4, and 5 show the valve recession problems encountered during the evaluation. Prior to the program initiation, it was considered by the petroleum and automotive industries that the lack of lead antiknock in gasoline would cause valve recession in pre-1971 vehicles. However, it is difficult to positively identify these three failures with the use of unleaded gasoline. All these valve recession failures occurred at Dugway Proving

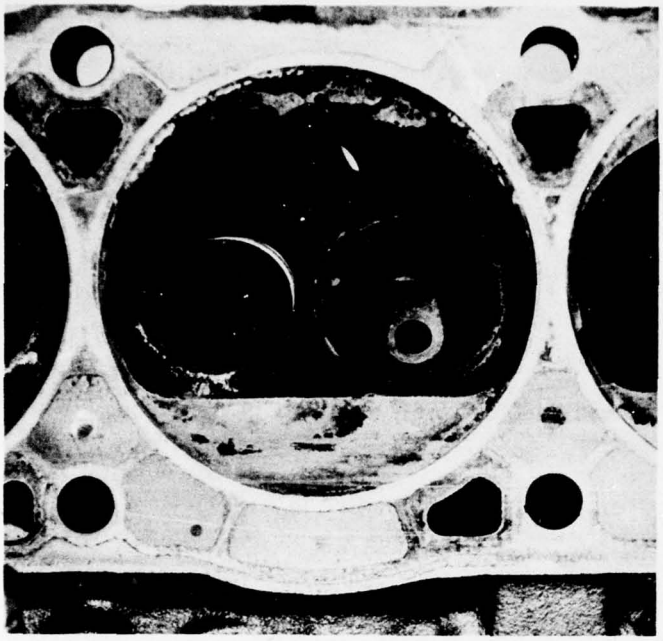


FIGURE 1. TYPICAL EXHAUST VALVE FAILURE, 1971 FORD 351 CID WINDSOR ENGINE

Ground where, of the 317 vehicles at the post, 246 (78 percent) were pre-1971 models. Therefore, three failures out of 246 pre-1971 vehicles does not indicate a trend of valve recession problems with unleaded gasoline.

Figure 2 shows a six-cylinder 240 CID engine from a 1965 Ford pickup. This vehicle had a total of 86,900 miles. Of these, 14,800 miles used unleaded gasoline. The exhaust valves indicate varying degrees of recession.

Figure 3 is a 1970 Ford F-100 pickup, 300 CID six-cylinder engine. This vehicle had a total of 70,900 miles, with 19,500 on unleaded gasoline.

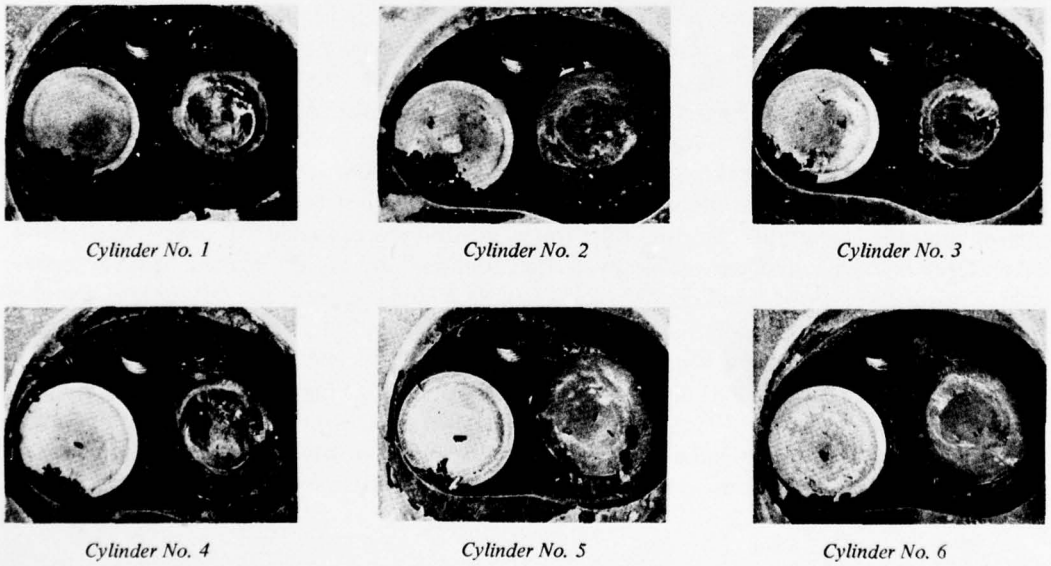


FIGURE 2. 1965 FORD 240 CID ENGINE SHOWING EXHAUST VALVE RECESSION

Figure 4 shows the valve recession in a 1971 Dodge pickup with a 318 CID V-8 engine. The vehicle began the unleaded gasoline program with 40,992 miles, and failed after 23,469 miles on unleaded gasoline.

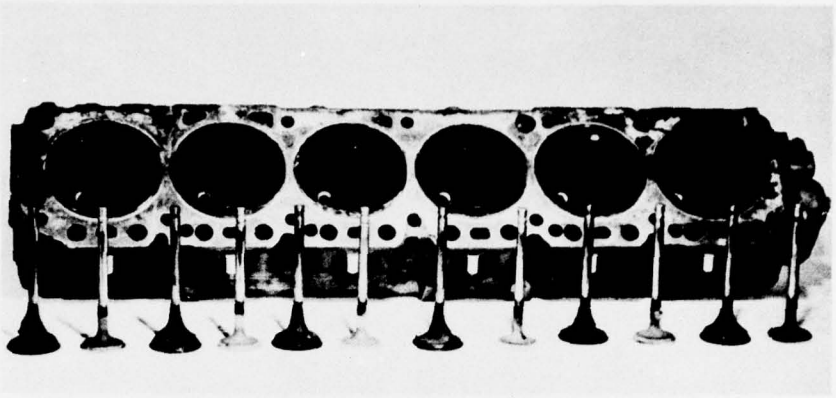


FIGURE 3. 1970 FORD F-100, 300 CID ENGINE SHOWING VALVE RECESSION

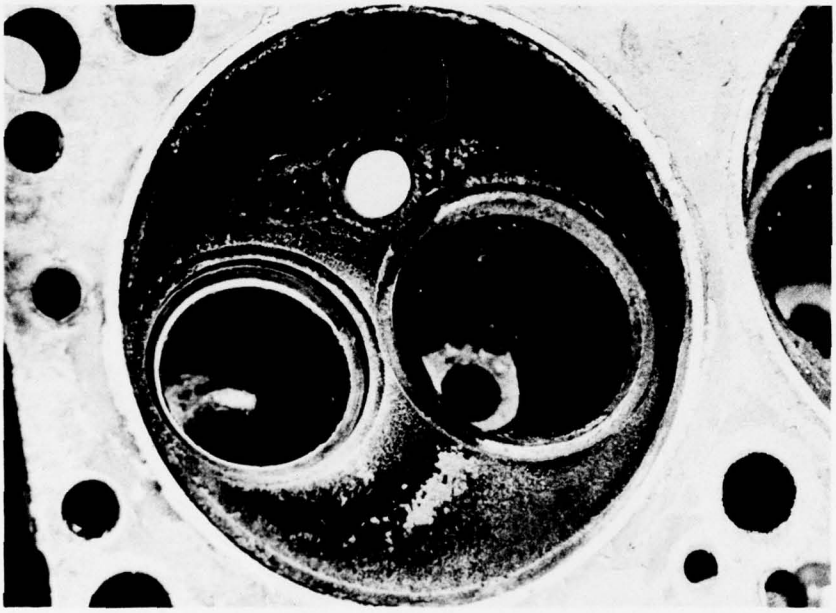


FIGURE 4. 1971 DODGE PICKUP TRUCK, 318 CID V8 ENGINE
SHOWING VALVE RECESSION

Figure 5 is a close-up of the exhaust valve seat in No. 2 cylinder of the 1971 Dodge pickup mentioned previously.

Approximately five engine failures occurred on the Ford (1965-1967) 361 CID engine at Letterkenny Army Depot. The failures encountered have indicated the exhaust valve seat (insert) has fallen out, causing damage to the piston top and/or the valve seat, etc. In some cases, there was indication of valve burning, but this could have occurred when the valve seat failed. Figure 6 shows a typical 361 CID Ford engine in which the exhaust valve seat has fallen out, causing catastrophic failure. This vehicle was a 1967 Ford, 5-ton truck with a total of 57,850 miles and 8,900 on unleaded gasoline. The failure occurred in No. 6 cylinder. All failures in these engines have occurred in the Nos. 6 or 7 cylinder.

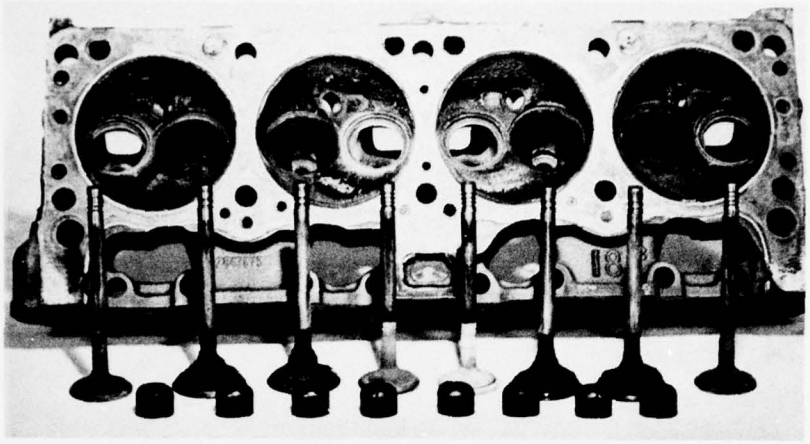


FIGURE 5. CLOSE-UP VIEW OF EXHAUST VALVE SEAT IN 1971 DODGE IN FIGURE 4

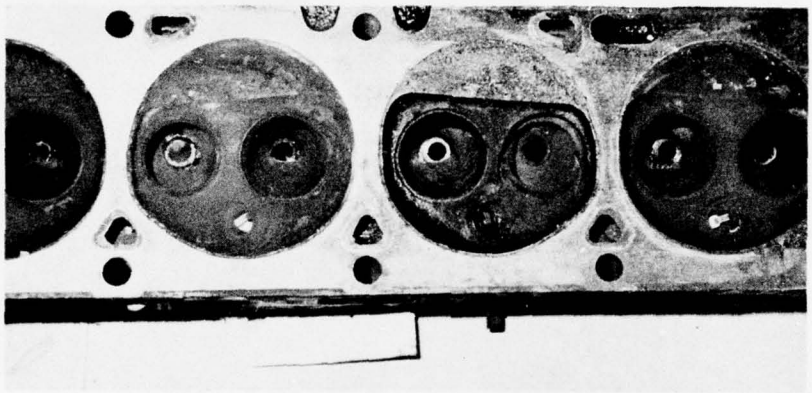


FIGURE 6. 1967 FORD 5-TON, 361 CID ENGINE SHOWING VALVE SEAT INSERT FAILURE

In the vehicle mix, there were numerous older model vehicles (1965 to present), and it was anticipated that engine timing adjustments might be necessary, particularly in the higher compression ratio engines. Throughout the 3 yr of operation on unleaded gasoline at the four original sites and during the 12 months of operation at Ft. Lewis and Ft. Riley, there is no evidence that timing changes or any engine adjustments, other than normal routine maintenance, was necessary to maintain satisfactory engine performance. Also, during the first year at the four original sites, several other engine failures occurred. Some of these consisted of burned exhaust valves, pre-ignition, and detonation problems. However, there is no evidence to indicate that unleaded gasoline, *per se*, was responsible. The "suspected" fuel-related failure rate throughout this program was very low. These failures represented less than 0.5 percent (18 failures out of 2801 commercial vehicles), which is no greater than normally experienced with leaded gasoline.

Additional engine failures noted throughout the evaluation are listed in Table 5.

An extremely interesting point is that, throughout this unleaded gasoline evaluation, not one fuel-related engine failure has been reported in the tactical and combat fleets.

TABLE 5. FUEL-RELATED ENGINE FAILURES

Vehicle	Engine	Mileage at failure		Type of failure
		Total	Unleaded	
1964 Dodge Bus	225 CID Slant 6	68,700	350	Hole in piston top
1964 Ford F-100	240 CID 6 Cyl	59,500	2,800	Hole in piston top
1965 Ford F-250	240 CID 6 Cyl	77,250	5,575	Hole in piston top
1965 Ford F-600	240 CID 6 Cyl	79,500	3,500	Pre-ignition No. 6 cyl
1967 Chevrolet	225 CID 6 Cyl	32,000	16,000	Burned exhaust valve
1970 AMC S/W	232 CID 6 Cyl	76,500	16,800	Burned exhaust valve
1970 Dodge Van	318 CID V-8	21,200	4,350	Burned exhaust valve
1970 IHC 5-Ton	345 Cid V-8	10,300	700	Burned exhaust valve

Throughout this portion of the program, there were approximately 2801 commercial vehicles, 4073 tactical vehicles and 682 combat vehicles which accumulated mileages as shown in Table 6.

TABLE 6. MILEAGE ACCUMULATION BY VEHICLE CATEGORY

Installation	Vehicle type			Total
	Commercial	Tactical	Combat	
Ft. Carson	3,809,668	10,101,556	110,255	14,021,479
Ft. Eustis	4,588,473	2,043,657	—	6,632,130
Letterkenny	4,761,015	—	—	4,761,015
Dugway	3,611,943	—	—	3,611,943
Ft. Lewis[a]	10,275,000	4,649,598	25,000	14,949,598
Ft. Riley[a]	3,365,906	991,200	56,065	4,413,171
	30,412,005	17,786,011	191,255	48,389,336

[a]Approximate mileages.

Fuel Economy

Military installations generally do not maintain fuel consumption and mileage records in a manner that would enable periodic checking. Therefore, the fuel economy obtained on unleaded gasoline is difficult to predict accurately. From the data available, there does not appear to be any significant increase or decrease in economy with unleaded gasoline. Table 7 shows fuel consumption on several vehicles at Dugway Proving Ground for 6 months prior to conversion to unleaded gasoline and also during the first 6 months utilizing unleaded fuel. Some vehicles show an improvement in fuel economy, while others show a decrease. These fluctuations are probably influenced more by type of operation and driver technique than by type of fuel used.

TABLE 7. FUEL CONSUMPTION COMPARISON AT DUGWAY PROVING GROUND

USA No.	Year	Make	Model	Fuel, mpg	
				Leaded Jul-Dec 1972	Unleaded Jan-Jun 1973
OIN73470	1970	Chev Carryall	4 × 4, 6 Cyl	14.5	12.4
OIN73770	1970	Chev Carryall	4 × 4, 6 Cyl	9.6	10.2
IN7389	1965	Ford F-250 Trk, Crgo	3/4-Ton, 4 × 4	15.0	13.8
IN7423	1965	Ford F-250 Trk, Crgo	3/4-Ton, 4 × 4	13.9	19.9
IN7422	1965	Ford F-250 Trk, Crgo	3/4-Ton, 4 × 4	10.6	8.3
IN7380	1965	Ford F-250 Trk, Crgo	3/4-Ton, 4 × 4	7.9	8.8
IN7416	1965	Ford F-250 Trk, Crgo	3/4-Ton, 4 × 4	8.9	11.6
OIS88770	1970	Dodge D-400 Trk, Van	4-Ton	9.1	8.7
IOA43070	1970	Dodge D-400 Trk, Van	4-Ton	8.4	7.8
IS1826	1967	Ford F-600 Trk, Stk	5-Ton	8.9	8.6
OIB36867	1968	Ford F-600 Trk, Stk	5-Ton	5.7	9.0
IN5916	1965	Ford F-759 Trk, Dump	6-1/2-Ton	3.9	3.4
IN5909	1965	Ford F-759 Trk, Dump	6-1/2-Ton	5.9	5.7
IN5959	1965	Ford F-759 Trk, Dump	6-1/2-Ton	6.5	5.7

TABLE 8. FUEL ECONOMY COMPARISON ON SELECTED VEHICLES AT FT. CARSON, COLORADO

Vehicle type	Approximate average miles per gal. 2-yr period	Extended 1-yr period
5 Each 1/2-Ton M151	9.6	15.9[a]
5 Each 1-1/4-Ton M715	7.3	8.1
5 Each C/R Veh M114	3.6	b
5 Each VTR M88	0.2	0.4
5 Each APC M113	2.3	1.8

[a]All M151 replaced with M151A2.
[b]All M114 have been turned in.

TABLE 9. FUEL ECONOMY ON SELECTED VEHICLES AT FT. LEWIS, WASHINGTON

Vehicle type	Average miles per gal. per quarter 1st	2nd	3rd	4th
5 Each 1/4-Ton M151A1	18.1	15.8	15.6	15.4
5 Each 1-1/4-Ton M715	6.5	6.6	5.8	6.9
5 Each VTR M88	0.3	0.3	0.2	0.2
Total Commercial Fleet (12-month operation)	---	---	---	12.5

TABLE 10. FUEL ECONOMY ON SELECTED VEHICLES AT FT. RILEY, KANSAS

Vehicle type	Average miles per gal. per quarter 1st	2nd	3rd	4th
5 Each 1/4-Ton M151A2	10.9	12.0	10.5	11.5
5 Each 1-1/4-Ton M715	11.2	9.9	9.7	6.2[a]
5 Each APC M113	3.1	1.8	1.4	1.4
5 Each VTR M88[b]	0.2	0.2	0.2	0.2
Total Commercial Fleet (12-month operation)	---	---	---	9.9

[a]All M715 except one deleted from inventory.
[b]Includes high idle time.

No comparison can be made for all vehicles in the field evaluation program. However, some indication of fuel economy can be obtained from data presented in Tables 8 through 11. Fuel consumption and mileage records were maintained on certain control vehicles at Ft. Carson, Dugway, Ft. Lewis, and Ft. Riley throughout their participation in the evaluation. Again, the fluctuations in these data probably reflect more on vehicle mission and driver technique than any major increase or decrease in fuel economy from the use of unleaded gasoline.

Fuel Analyses

Fuel properties were monitored by the GMPA Eastern and Western Petroleum Offices and AFLRL. Samples of periodic bulk gasoline shipments received by the six evaluation sites were forwarded to the Petroleum Field Offices and AFLRL for analyses. Complete routine analyses were conducted by the Petroleum Field Offices to ensure that the gasoline samples were within specification limits. At AFLRL, particular emphasis was given to analyzing the samples by the following methods:

- Lead content by atomic absorption.
- Research and motor octane numbers.
- Hydrocarbon-type composition by ASTM D-1318, fluorescent indicator adsorption (FIA).
- Oxidation stability by ASTM D-525.

Table 12 shows the average fuel analyses for each installation as determined by AFLRL and for comparison to the average CONUS unleaded octane quality for winter 1975-1976 as determined by ERDA. Throughout the program, only unleaded gasoline of extremely low-lead content had been received at each of the six installations. This is remarkable considering the major fluctuations in CONUS gasoline supply availability during 1973 and 1974.

The gasoline supplied to Ft. Carson had consistent properties. Low olefin content, outstanding oxidation stability, and an average RON of 88.8 characterized the Ft. Carson gasoline. It should be noted that at the altitude of both Ft. Carson and Dugway, refiners

TABLE 11. FUEL ECONOMY ON SELECTED VEHICLES AT DUGWAY PROVING GROUND

USA vehicle no.	Year	Make	Model	Average miles per gal. 1973	1974	1975	Total miles on unleaded gasoline
CA1477	1972	Ford	Custom Sedan	14.2	12.0	11.9	11,537
OIF63471	1971	Ford	Custom Sedan	18.8	19.6	a	23,038
OIF64471	1971	Ford	Custom Sedan	21.5	16.7	a	13,686
CA2522	1972	AMC	Matador Sedan	17.7	17.8	18.2	29,899
OIF63671	1971	Ford	Custom Sedan	11.7	11.3	a	37,125
OIK02070	1970	Ford	F-100 1/2-Ton Pickup	12.1	11.2	a	39,838
OID92072	1972	Chev	C-10 1/2-Ton Pickup	14.6	11.8	12.1	78,661
OIC07171	1971	Dodge	D-100 1/2-Ton Pickup	10.6	9.5	a	42,528
CA4475	1972	Chev	C-10 1/2-Ton Pickup	11.6	10.7	11.6	67,634
IN1666	1965	Ford	F-100 1/2-Ton Pickup	9.0	13.5	a	16,780
OIM09570	1970	IHC	Scout 800A	12.6	a	a	--
OIN44970	1970	Chev	Carryall GE-21006	15.0	14.3	11.4	25,272
OIN72970	1970	Chev	Carryall KS-10906	13.4	11.8	13.6	17,183
OIC37168	1967	Ford	Truck-tractor F-750	5.5	5.2	5.2	22,649
OIC77370	1969	IHC	8-1/2-Ton Dump, 1890	8.5	6.5	9.7	20,202
IN7255	1965	IHC	Wrecker, F-1700	5.6	a	a	--
OIS24168	1968	IHC	1-1/2-Ton Stake, 13000	9.8	10.5	a	7,224

[a]Vehicle turned in or insufficient fuel data.

TABLE 12. FUEL PROPERTIES SUMMARY

Property average	ERDA 1975-76 winter survey CONUS unleaded avg.	Average for January 1973 through August 1976 Ft. Carson	Dugway	Ft. Eustis	Ft. Letterkenny	Ft. Lewis	Ft. Riley
Lead g/gal.	ND	0.008	0.003	0.012	0.013	0.016	0.013
RON	92.3	88.8	89.2	94.0	94.7	92.0	91.6
MON	84.0	82.2	82.0	84.2	83.8	84.8	84.3
(R+M)2	88.2	85.5	85.6	89.1	89.3	88.4	87.9
FIA % vol Aromatics[a]	ND	23	16	30	27	32	21
Olefins[a]	ND	5	21	24	26	3	4
Oxidation Stability Min.[a]	ND	>1440	425	645	610	>1440	>1440

ND--Not determined as part of this survey.

[a]These data apply only for the period Jan 1973/Aug 1974 at the four original installations.

were allowed to apply the maximum altitude correction and reduce the RON of unleaded gasoline by 4.5 numbers. This correction is allowed because vehicle octane requirements decrease as altitude increases. Thus, the 88.8-RON gasoline at Ft. Carson is roughly equivalent to at least a 93.3-RON gasoline at sea level. Applying the same altitude correction to the Dugway gasoline, the 89.2-RON average at Dugway is equivalent to a 93.7-RON gasoline at sea level. Considering the altitude of Ft. Carson and Dugway, the fuel supplied had a slightly higher octane quality than requested.

The gasolines supplied to Ft. Eustis and Letterkenny had a wide variation in properties, especially aromatic and olefin content. Ft. Eustis and Letterkenny gasolines had rather high average olefin contents, although no problems were encountered due to this fluctuation. Both Ft. Eustis and Letterkenny consistently received gasolines with higher octane quality than specified. The average RON was 94.0 at Ft. Eustis and 94.7 at Letterkenny Army Depot.

The unleaded gasolines supplied to Ft. Lewis and Ft. Riley had octane quality within the specified range, low olefin content, and excellent oxidation stability.

Detailed analyses of the aromatic content of unleaded gasolines from the six installations were determined using a gas chromatographic technique developed by AFLRL. Table 13 shows that the aromatic compositions of unleaded gasolines from the six installations were similar to the aromatic compositions of unleaded gasolines sampled during 1972 in a CONUS gasoline survey.

TABLE 13. AROMATICS ANALYSIS OF UNLEADED GASOLINES BY AFLRL

Source or sample no. Date	Typical 91 RON Unleaded[a] CONUS Survey 1972			Installation: Ft. Carson VII Inf. Tnkr 3-73	Ft. Carson Trk-186 6-25-73	Ft. Eustis 7021-74E-1 8-29-73	Ft. Eustis Delv Trk 1-73	Letterkenny 7030-L-74-1 8-1-73	Letterkenny 7706-L-74-1 8-29-73	Dugway Delv Trk 1-73	Dugway Pmp No. 1 2-73	Dugway PIE TRL No. 11-2114 7-16-73	Dugway PIE TRL No. 11-4255 7-73	Ft. Riley Bldg 7943 1-76	Ft. Lewis NS 1976
Total Aromatics, %	Max	Min	Avg												
By GC	39.3	8.4	28.9	25.3	22.4	28.7	26.5	27.4	19.8	15.6	11.7	15.4	15.7	20.5	27.6
By FIA	39	10	27	23	21	29	26	28	20	17	12	16	15	21	32
% Vol By GC															
Benzene	1.7	0.3	0.9	0.4	0.4	1.2	0.4	1.1	0.6	0.4	0.3	0.3	0.5	0.6	0.8
Toluene	15.9	2.0	6.8	2.6	3.4	7.3	3.4	5.7	3.9	2.0	1.4	1.9	2.0	5.4	3.4
Ethyl Benzene	2.7	0.4	1.5	1.2	1.1	1.3	1.3	1.2	0.9	0.7	0.4	0.6	0.7	0.9	1.1
m+p Xylene	10.5	1.8	5.2	4.0	3.6	4.7	4.8	4.7	3.5	2.8	1.9	2.3	2.2	3.7	4.9
O-Xylene	7.9	0.6	2.2	1.5	1.4	1.8	1.9	1.7	1.3	1.0	0.7	0.9	0.9	1.3	1.8
C_9 + Aromatics	18.6	1.7	13.2	15.6	12.6	12.4	14.7	12.8	9.6	8.7	7.0	9.4	9.4	8.6	15.6

[a]From "Status of Unleaded and Low-Leaded Gasoline Composition," by J.N. Bowden, AFLRL, August 1972.

OCTANE REQUIREMENTS

The octane number requirement increase in engines operating exclusively on unleaded gasoline was of utmost concern to the Department of the Army since there was speculation by industry (especially lead antiknock manufacturers) that great increases could be expected. An important aspect of this evaluation was to determine the ONRI on approximately 30 commercial-type vehicles to determine if Federal Specification VV-G-001690A was adequate to compensate for these suspected engine octane requirement increases.

Reference Fuels

Two series of reference fuels were used in making the octane requirement determinations. Primary reference fuels (PRF) were blended from ASTM grade iso-octane (2, 2, 4-trimethylpentane) and normal heptane; both were obtained from Phillips Petroleum Company. By definition, iso-octane is 100 octane number, and normal heptane is zero octane number. Simple volume percent blends were made to obtain the desired octane number (for example, 80-percent volume iso-octane and 20-percent volume normal heptane gives an 80-octane number blend). Primary Reference Fuels were blended between 64 and 100 octane number, generally in even number increments.

The other series of reference fuels used were the unleaded high sensitivity full boiling range fuels (FBRSU). These fuels were prepared from the following three base blends which were obtained from the Phillips Petroleum Company, Special Products Division:

- RMFD-263-73
- RMFD-264-73
- RMFD-265-73

The compositions of the three base fuel blends are shown in Table 14. Table 15 shows the physical property inspections of the base fuels. FBRSU fuels were blended from 84 to 100 research octane number, generally in even number increments. Table 16 shows the blending composition data which were determined from the average ratings reported by the ten laboratories participating in the 1973 CRC octane requirement survey. For the 1973 AFLRL octane requirement work, 84 RON was the lowest FBRSU fuel used. In making the 1974 and 1975 octane requirement determinations, calculated amounts of normal heptane were added to RMFD-263-73 to obtain FBRSU fuels below 84 RON. The lowest octane number FBRSU fuel blended was 62 RON which contained 26.8-percent volume normal heptane added to RMFD-263-73.

TABLE 14. COMPOSITION OF 1973 CRC-RMFD MOTOR FUELS, VOLUME PERCENT

Blendstocks	263	264	265
Cat Cracked Gasoline	22.4	38.9	11.2
Light Platformate	1.8	---	4.1
70% Cyclopentane	23.3	7.7	13.7
98% Cyclohexane	10.7	---	---
Soltrol 50	---	---	4.9
DIP Light Alkylate	---	6.9	---
RF DIB	2.7	---	7.5
Com. n-Butane	2.2	4.1	2.8
RF n-Heptane	17.2	---	---
Mixed Xylenes	6.0	---	14.8
Heavy Platformate	---	21.0	13.0
Com. Isopentane	2.7	6.9	---
HF Light Alkylate	---	6.3	2.0
RF Iso-octane	---	---	22.7
C_9+ Aromatics	8.1	---	---
Cyclohexane	2.9	---	---
Com. n-Heptane	---	8.2	---
RF Benzene	---	---	3.3

TABLE 15. PROPERTIES OF 1973 CRC-RMFD MOTOR FUELS

Property		263	264	265
Distillation, °F[a]				
IBP		107	97	103
10% evap		143	129	142
30% evap		167	169	182
50% evap		195	205	215
70% evap		230	233	239
90% evap		310	295	285
EP		410	406	351
API Gravity, deg		57.2	58.0	55.9
RVP, lb		7.1	7.8	7.1
Oxidation stability, min		1440+	1440+	1440+
Lead, g/gal.	Spec	<0.05	<0.05	<0.05
	Results	0.0004	0.0023	0.0003
Aromatics	Spec	17 ± 7	30 ± 7	40 ± 7
	Results	21.7	27.9	33.4
Olefins	Spec	10 ± 5	10 ± 5	10 ± 5
	Results	15.0	14.8	7.1
Saturates		63.3	57.3	59.5
RON				
	Spec	83.5 ± 1	91 ± 1	101 ± 1
	Results[b]	84.4	91.6	100.0
MON	Results[b]	76.5	81.7	87.9
Sensitivity (R-M)	Spec	8 ± 0.5	10 ± 0.5	12 ± 0.5
	Results	7.9	9.9	12.1

[a]Reported by fuel supplier.
[b]Average of ratings reported by 10 laboratories participating in 1973 octane requirement survey.

TABLE 16. 1973 UNLEADED HIGH SENSITIVITY FULL-BOILING RANGE REFERENCE FUEL SERIES (FBRSU)

Research no.	Blending Data Composition Percent			Motor octane no.[a]	(R + M)/2[a]
	RMFD-263-73	RMFD-264-73	RMFD-265-73		
84 (84.6)	100	---	---	76.5	80.6
85	85	15	---	77.0	81.0
86	69	31	---	77.7	81.9
87	56	44	---	78.4	82.7
88	44	56	---	79.1	83.6
89	31	69	---	79.8	84.4
90	19	81	---	80.5	85.3
91	7	93	---	81.3	86.2
92	---	95	5	82.0	87.0
93	---	83	17	82.7	87.9
94	---	71	29	83.5	88.8
95	---	61	39	84.2	89.6
96	---	50	50	84.9	90.5
97	---	39	61	85.6	91.3
98	---	27	73	86.3	92.2
99	---	14	86	87.1	93.1
100	---	---	100	87.9	94.0

[a]Average ratings reported by 10 laboratories participating in 1973 CRC octane requirement survey.

Test Sites and Equipment

Although four installations were selected originally for the unleaded gasoline program, only two, Ft. Carson, Colorado and Ft. Eustis, Virginia, were used for the octane evaluation. These installations were selected for the octane number requirement increase (ONRI) determinations because they offered extremes in high and low altitudes, dry and humid, hot and cool conditions. Each installation also provided ideal roads for evaluation of octane requirements, as illustrated in Figure 7. Both posts had a large vehicle density with high utilization and an adequate mix of both commercial and military vehicles, as shown previously in Table 4. For the octane requirement determinations, fifteen vehicles representative of the cross-section of vehicle population, were chosen for octane rating throughout the duration of the program and these are listed in Table 17. Figure 8 illustrates the types of vehicles used in this program.

The vehicles ranged in age from 1961 to 1974 with engine displacements from 225 to 351 cubic inches and also with compression ratios of between 6.7 to 1 and 8.5 to 1.

The CRC method E-15-73 was used to determine the octane number requirement on these vehicles for all three determinations.

TABLE 17. ONRI TEST VEHICLES

Make and model	No. of cyl	Type transmission	Type carburetor
Ft. Eustis			
Dodge 3/4-Ton M-37	6	Std 4 Speed	1 bbl
Dodge 3/4-Ton M-37	6	Std 4 Speed	1 bbl
Dodge 3/4-Ton M-37	6	Std 4 Speed	1 bbl
Jeep 1-1/4-Ton M-715	6	Std 4 Speed	1 bbl
Jeep 1-1/4-Ton M-715	6	Std 4 Speed	1 bbl
Jeep 1-1/4-Ton M-715	6	Std 4 Speed	1 bbl
Kaiser Jeep 1/4-Ton M-151	4	Std 3 Speed	1 bbl
Ford Jeep 1/4-Ton M-151	4	Std 3 Speed	1 bbl
Ford Jeep 1/4-Ton M-151	4	Std 3 Speed	1 bbl
1969 Ambassador Sedan	6	Std 3 Speed	1 bbl
1973 Chevelle Sedan	8	Turbo-Hydra	2 bbl
1970 Ford Falcon Sedan[a]	6	Automatic	1 bbl
1966 Chev 1/2-Ton Pickup	6	Std 3 Speed	1 bbl
1972 Chev 1/2-Ton Pickup	8	Turbo-Hydra	4 bbl
1970 Ford 1/2-Ton Pickup	6	Automatic	1 bbl
Ft. Carson			
M-151 Jeep	4	Std 3 Speed	1 bbl
M-151 Jeep	4	Std 3 Speed	1 bbl
M-151 Jeep	4	Std 3 Speed	1 bbl
M-715 1-1/4-Ton	6	Std 4 Speed	1 bbl
M-715 1-1/4-Ton	6	Std 4 Speed	1 bbl
M-715 1-1/4-Ton	6	Std 4 Speed	1 bbl
1969 Ambassador Sedan	6	Std 3 Speed	1 bbl
1972 Ford Custom Sedan	8	Automatic	2 bbl
1968 Ford Fairlane Sedan	6	Automatic	1 bbl
1968 Chev 1/2-Ton Pickup	6	Std 3 Speed	1 bbl
1964 Dodge 1/2-Ton Pickup	6	Std 3 Speed	1 bbl
1972 Chev 1/2-Ton Pickup	8	Turbo-Hydra	4 bbl
1974 Chev 1/2-Ton Pickup	8	Turbo-Hydra	2 bbl
1973 Chevelle Sedan	8	Turbo-Hydra	2 bbl
M-151 Jeep	4	Std 3 Speed	1 bbl

[a]Vehicle had valves reworked at 68,984 miles.

Lubricants

This program was not designed to monitor the effect of lubricants on octane requirements. However, the following lubricants were used at both test sites for the duration of the program:

Vehicle	Lubricant
Administrative type	MIL-L-46152
Combat/Tactical	MIL-L-2104C

Typical analyses of these lubricants are shown in Table 18.

Discussion of Results

The fifteen vehicles at each site that were involved in the ONRI program had previously operated on normally leaded gasoline prior to the installations' conversion to unleaded gasoline except for one 1974 1/2-ton pickup. Table 19 shows the high, low, and average mileage on the vehicles



Ft. Eustis, Virginia



Ft. Carson, Colorado

FIGURE 7. OCTANE EVALUATION COURSES



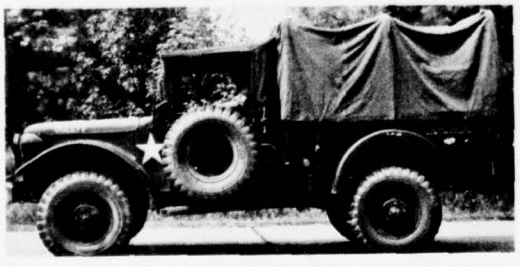
Sedan



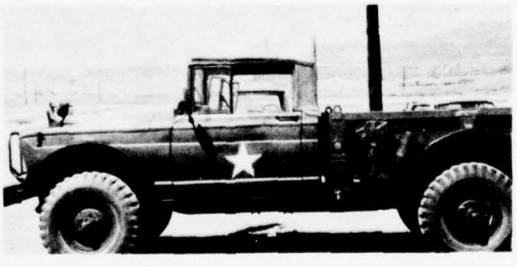
1/2-Ton Pickup



M-151 Jeep



M-37



M-715

FIGURE 8. TYPICAL VEHICLES USED IN OCTANE DETERMINATIONS AT FT. CARSON, COLORADO AND FT. EUSTIS, VIRGINIA

prior to the first octane determinations and also the mileage accumulated on unleaded gasoline during each of the subsequent octane determinations.

The vehicles at Ft. Eustis, Virginia, averaged about a 5.0 number increase in engine octane requirement on Primary Reference Fuel and a 2.0 number increase using Full Boiling Range Sensitive Unleaded Reference Fuels. The lowest octane available in the FBRSU Reference Fuel in 1973 was 84.4; therefore, since some vehicles were below this value, it was impossible

TABLE 18. TYPICAL ANALYSES OF LUBRICANTS USED

Property	Typical MIL-L-2104C	Typical MIL-L-46152
Viscosity, cSt		
210°F	12.74	10.41
100°F	132.6	68.51
Viscosity Index	95	150
Flash Point, °F	445	443
Pour Point, °F	0	−35
Gravity, °API	25.7	28.6
Carbon Residue, %	1.46	1.14
Sulfated Ash, %	1.43	1.12
Total Acid Number	1.6	1.89
Total Base Number	11.2	9.86

TABLE 19. MILEAGE OF VEHICLES USED FOR DETERMINING THE OCTANE NUMBER AT BEGINNING OF PROGRAM AND END OF EACH YEAR'S OPERATION

Mileage	Ft. Carson, Colorado			Ft. Eustis, Virginia		
	Initial determination	Second determination	Third[a] determination	Initial determination	Second determination	Third[a] determination
High	63,332	64,668	57,189	66,711	78,380	71,400
Low	10,995	12,676	14,285	910	3,036	6,151
Average	31,645	34,550	26,845	23,295	30,310	31,023
On Unleaded Gasoline (Average)	1,155	5,585	5,223	b	5,860	8,304

[a]Several vehicles dropped from inventory during this period.
[b]Mileage and date stickers placed on vehicle windshields at beginning of program had been lost or removed prior to octane determination.

to establish any change for those vehicles. Also, there was no difference in octane requirement of the engine whether the vehicles were empty or loaded to maximum gross weight.

In 1973, Full Boiling Range Sensitive Unleaded Reference Fuels in the octane range needed for the altitude of Ft. Carson, Colorado were not available. Therefore, in the initial octane requirement evaluation at Ft. Carson, only Primary Reference Fuels were used. However, the FBRSU reference fuels were blended for the 1974 and 1975 evaluations. Although some vehicles experienced a decrease in engine octane requirement, the overall average octane number increase for all vehicles run at Ft. Carson on Primary Reference Fuels was 5.5 and approximately 2.8 on FBRSU reference fuel. Also, as at Ft. Eustis, the 1974 evaluation showed there was no significant difference whether the vehicle was empty or loaded to maximum gross weight. Therefore, the vehicles were not operated at maximum vehicle gross weight during the 1975 determinations.

Tables 20 and 21 show the overall result of the octane determinations. Also, Table 21 reflects one vehicle (1974 Chev 1/2-ton Pickup No. CB8693) which was received on post after the unleaded gasoline program had begun and had never run on leaded gasoline. This suggests that vehicles run only on unleaded gasoline *may* not show a significant increase in octane requirement. Also, a 1975 Dodge (No. CC6536) was added to the program *new* with a "*clean*" engine, but no ONRI can be noted since determinations were not made in 1976.

TABLE 20. ROAD OCTANE EVALUATION–FT. EUSTIS, VIRGINIA
UNLEADED GASOLINE IMPACT PROGRAM

Make and model	USA no.	Mileage			PRF RON requirements			FBRSU RON requirements		
		1973	1974	1975	1973	1974	1975	1973	1974	1975
Dodge 3/4-Ton M-37	3B6663	10,217	12,689	12,992	74	79	79	a	85	85
Dodge 3/4-Ton M-37	3D9000	1,669	4,234	b	75	77	b	85	87	b
Dodge 3/4-Ton M-37	3C2299	910	3,036	6,151	75	81	81	a	85	85
Jeep 1-1/4-Ton M-715	3G3224	22,452	c	c	60	c	c	a	c	c
Jeep 1-1/4-Ton M-715	3F6617	9,131	c	c	78	c	c	a	c	c
Jeep 1-1/4-Ton M-715	3F3419	6,803	11,648	c	86	87	c	87	91	c
Kaiser Jeep 1/4-Ton M-151	2F4071	25,102	32,108	36,550	81	91	89	a	89	89
Ford Jeep 1/4-Ton M-151	02MV3571	16,283	21,387	22,325	87	89	89	90	91	89
Ford Jeep 1/4-Ton M-151	2N8708	24,155	30,452	37,049	86	91	95	86	89	93
1969 Ambassador Sedan	01B17069	60,953	65,662	71,400	86[d]	87[d]	93[e]	90[d]	89[d]	93[e]
1973 Chevelle Sedan	CB1543	2,479	15,865	29,154	81	81	87	a	83	85
1970 Ford Falcon Sedan[f]	01G35370	66,711	78,380	c	86[a]	87[a]	c	91[a]	89[a]	c
1966 Chev 1/2-Ton Pickup	1P7721	49,600	55,853	c	88	95	c	87	95	c
1972 Chev 1/2-Ton Pickup	01D56572	11,795	17,155	32,565	76	85	87	a	87	89
1970 Ford 1/2-Ton Pickup	01J67970	41,156	45,557	c	83	85	c	a	87	c

[a]Below 84.4 RON.
[b]Engine running so badly–unable to octane.
[c]Dropped from inventory.
[d]At part throttle maximum requirement.
[e]Vehicle has been operating on both unleaded and leaded gasoline for approximately last 2000 miles.
[f]Vehicle had valves reworked at 68,984 miles.

TABLE 21. ROAD OCTANE EVALUATION–FT. CARSON, COLORADO
UNLEADED GASOLINE IMPACT PROGRAM

Make and model	USA no.	Mileage			PRF RON requirements			FEBRSU RON requirements	
		1973	1974	1975	1973	1974	1975	1974	1975
M-151 Jeep	02V68369	27,064	34,798	a	80	85	a	83	a
M-151 Jeep	2R4617	32,149	36,858	a	72	79	a	77	a
M-151 Jeep	2N8341	25,927	27,921	a	80.5	77	a	N/A	a
M-715 1-1/4-Ton[b]	3F8387	21,992	23,027	26,364	68	85	85	85	85
M-715 1-1/4-Ton	3F8305	11,381	12,676	14,285	70	65	83	67	83
M-715 1-1/4-Ton	3F8490	13,107	14,911	15,766	86	87	87	89	89
1969 Ambassador Sedan	01C39669	44,814	49,995	57,189	80	81	81	81	83
1972 Ford Custom Sedan	CA0924	10,995	26,079	38,292	82	87	87	97	97
1968 Ford Fairlane Sedan	01L74468	63,332	a	a	88	a	a	a	a
1968 Chev 1/2-Ton Pickup	01J94468	55,344	64,668	a	68	77	a	77	a
1964 Dodge 1/2-Ton Pickup	1L7393	58,513	64,162	a	84	89	a	95	a
1972 Chev 1/2-Ton Pickup	01D83272	15,114	22,737	34,513	78	81	83	77	77
1974 Chev 1/2-Ton Pickup	CB8693	---	1,249	17,981	---	69	69	<62	61
1973 Chevelle Sedan	CB0834	---	16,199	31,972	---	67	69	<62	61
M-151 Jeep	2K3659	---	16,423	a	---	77	a	73	a
1975 Dodge 1/2-Ton Pickup	CC6536	---	---	5,251	---	---	79	---	85

[a]Dropped from inventory.
[b]Engine work performed between octane determinations.

Data presented in Figures 9 through 17 show that mileages on these vehicles while operating on unleaded gasoline ranged from approximately 2600 miles to over 27,000 miles, and while most did show an initial increase in octane requirement, there are those that stayed essentially the same throughout the evaluation. Most importantly is the fact that regardless of initial starting miles or total miles driven during the evaluation, the octane

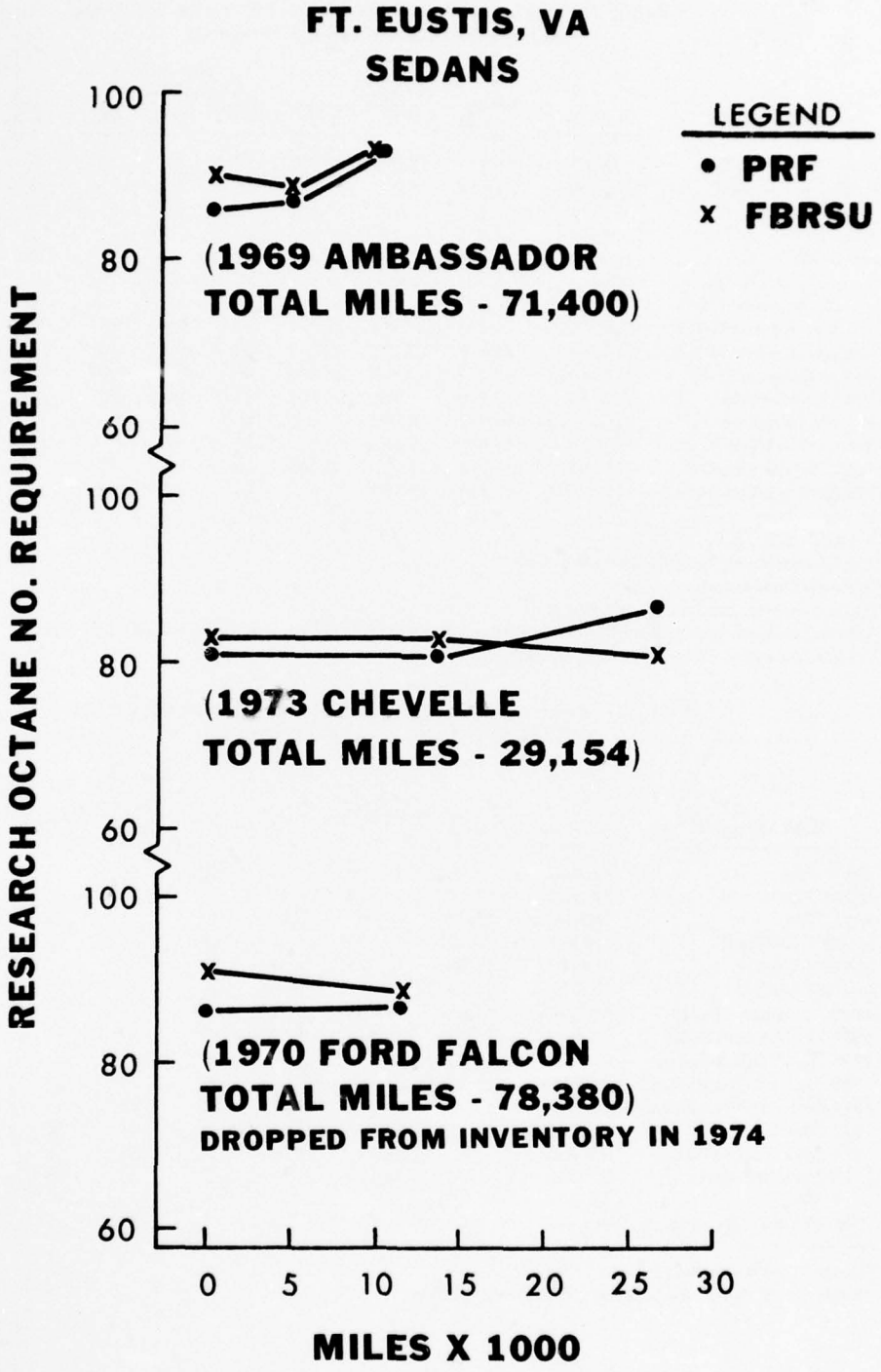


FIGURE 9. OCTANE REQUIREMENT INCREASE, SEDANS, FT. EUSTIS, VA

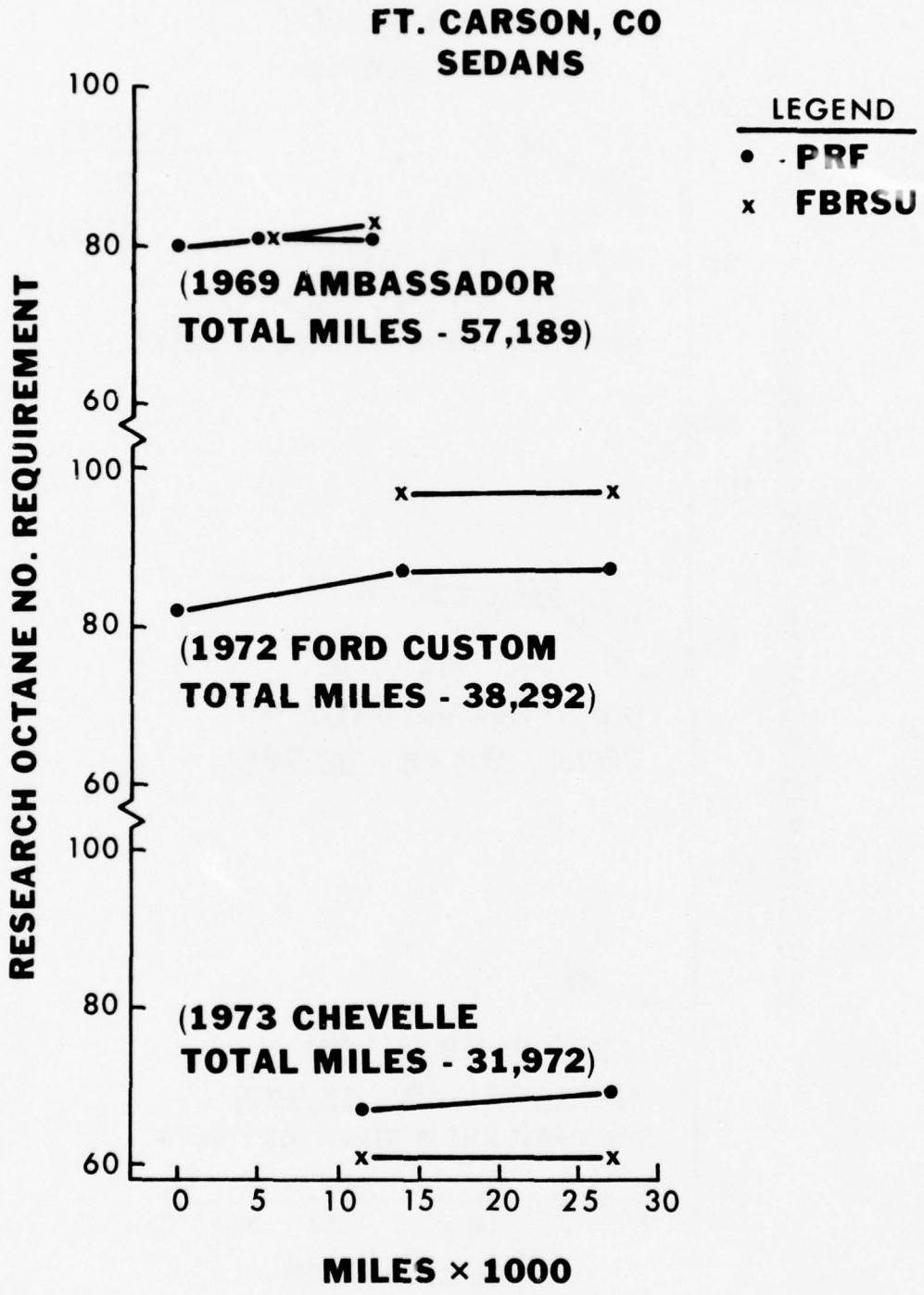


FIGURE 10. OCTANE REQUIREMENT INCREASE, SEDANS, FT. CARSON, CO

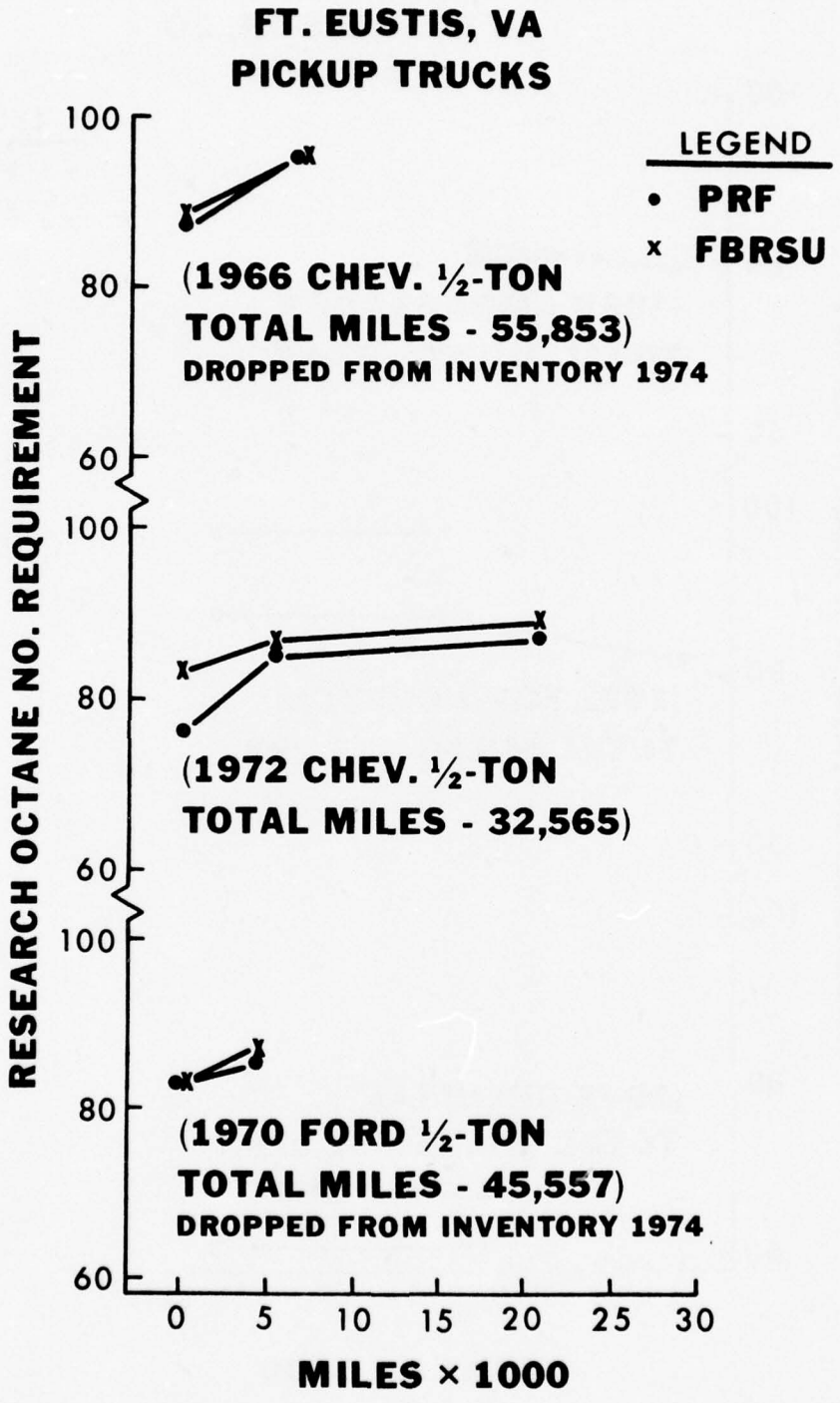


FIGURE 11. OCTANE REQUIREMENT INCREASE, PICKUPS, FT. EUSTIS, VA

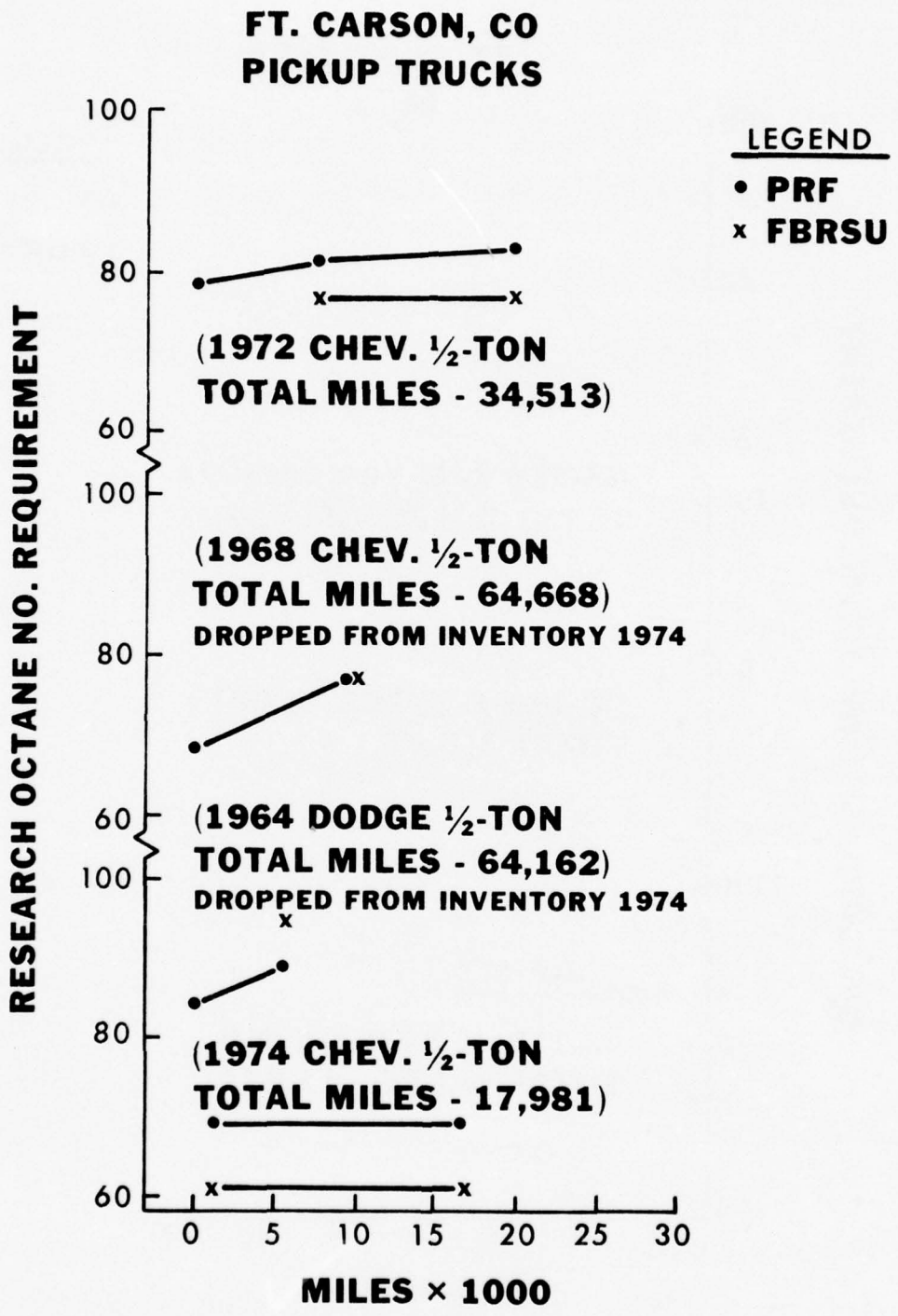


FIGURE 12. OCTANE REQUIREMENT INCREASE, PICKUPS, FT. CARSON, CO

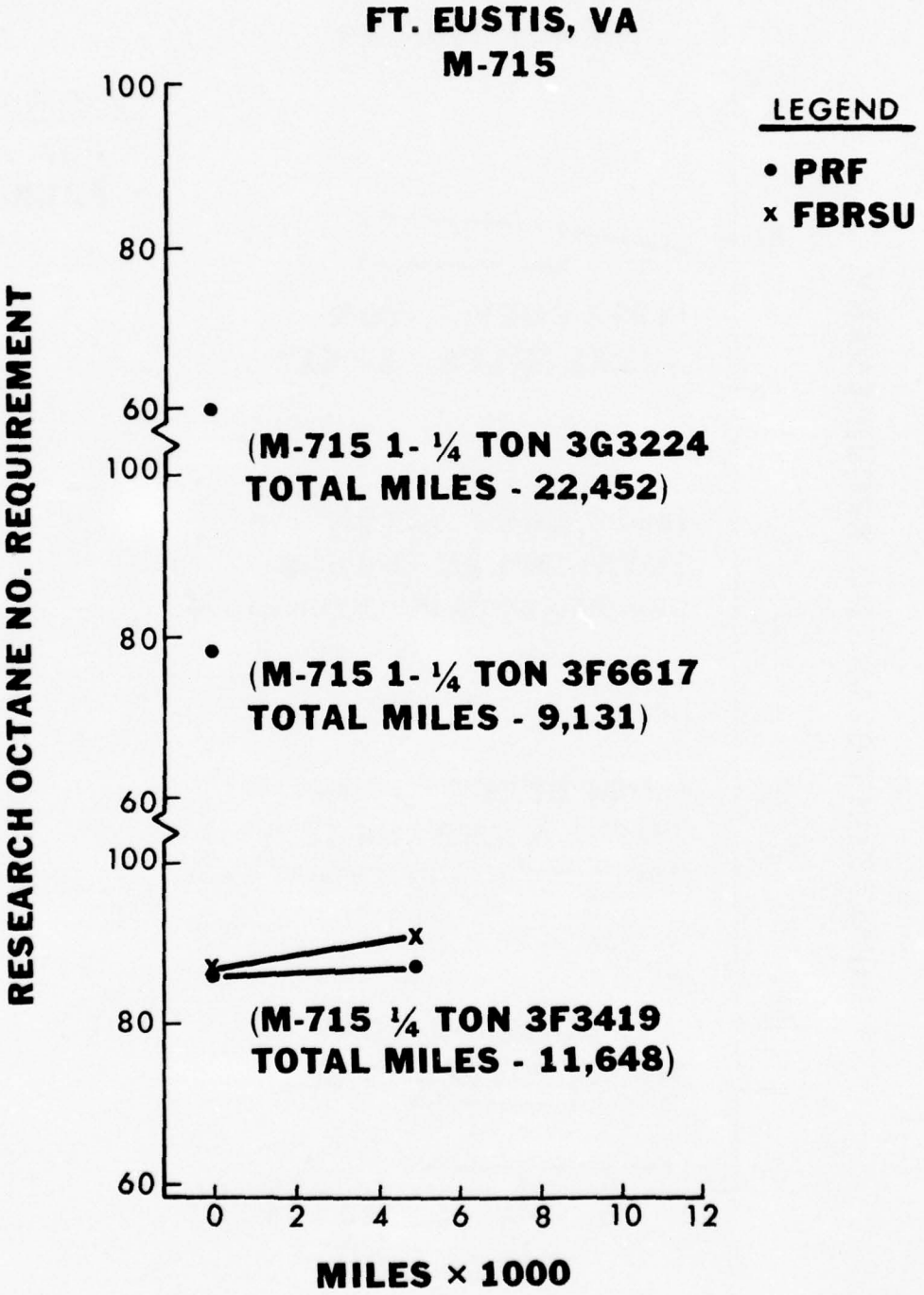


FIGURE 13. OCTANE REQUIREMENT INCREASE, M-151, FT. EUSTIS, VA

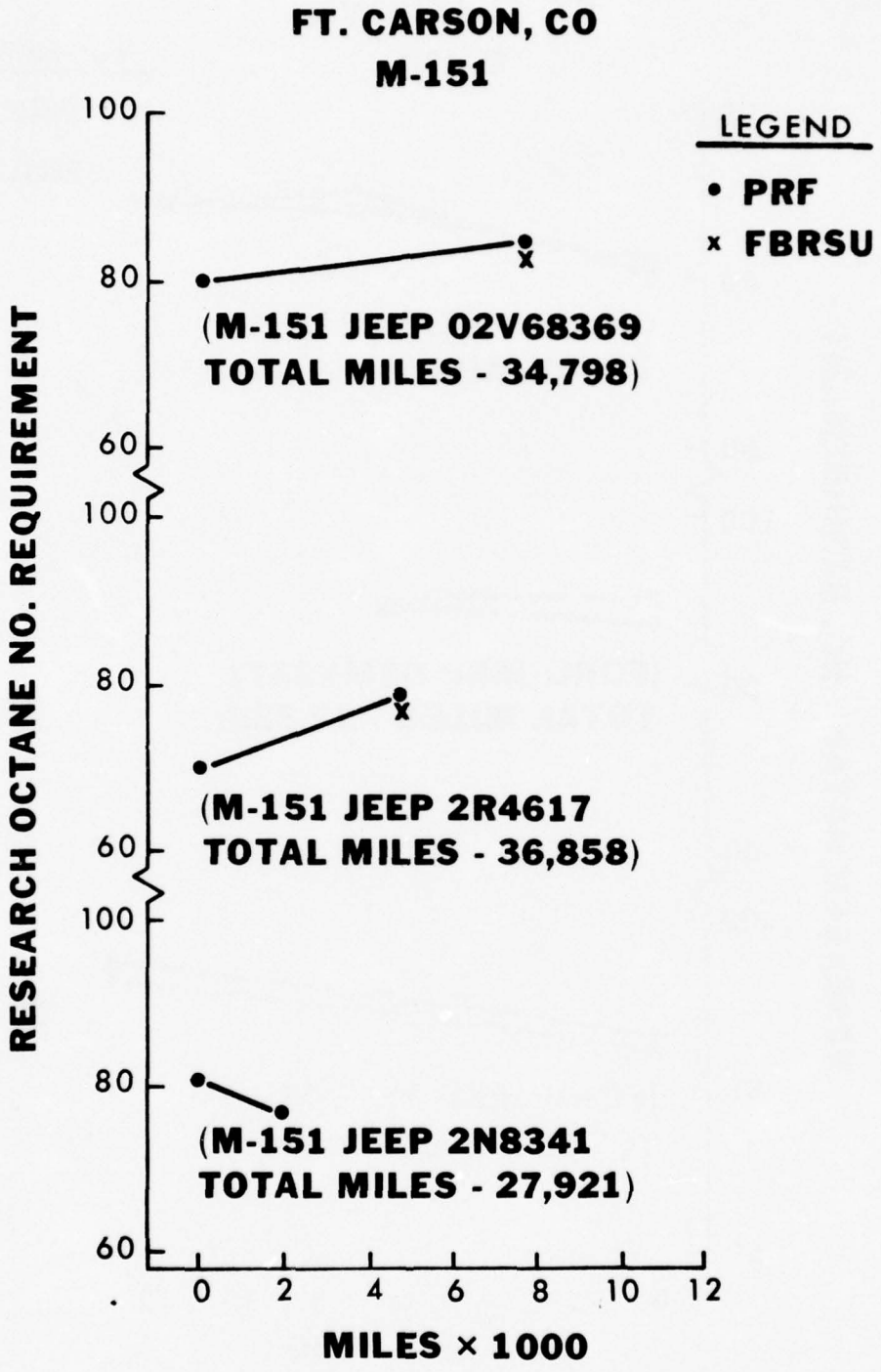


FIGURE 14. OCTANE REQUIREMENT INCREASE, M-151, FT. CARSON, CO

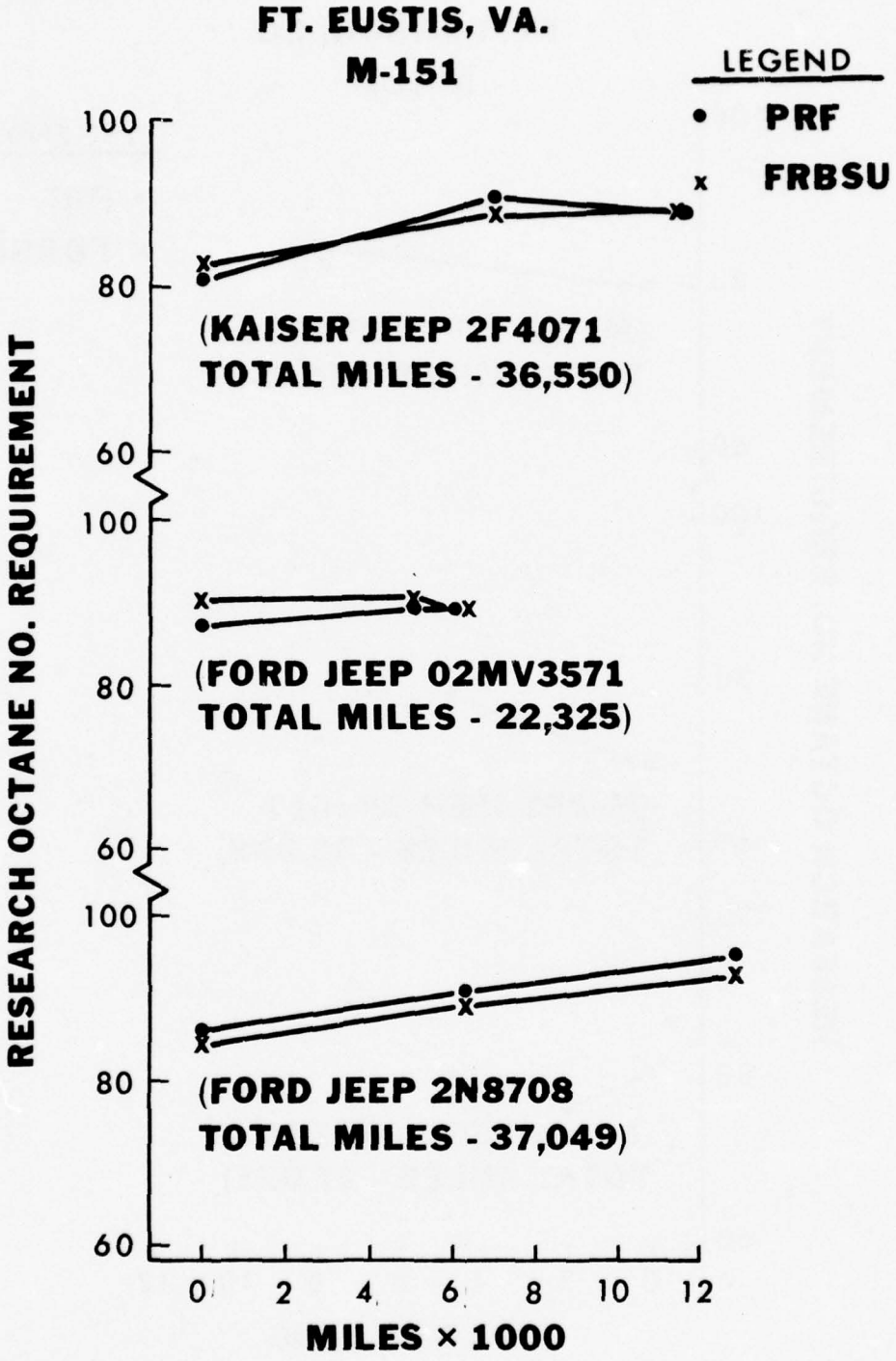


FIGURE 15. OCTANE REQUIREMENT INCREASE, M-715, FT. EUSTIS, VA

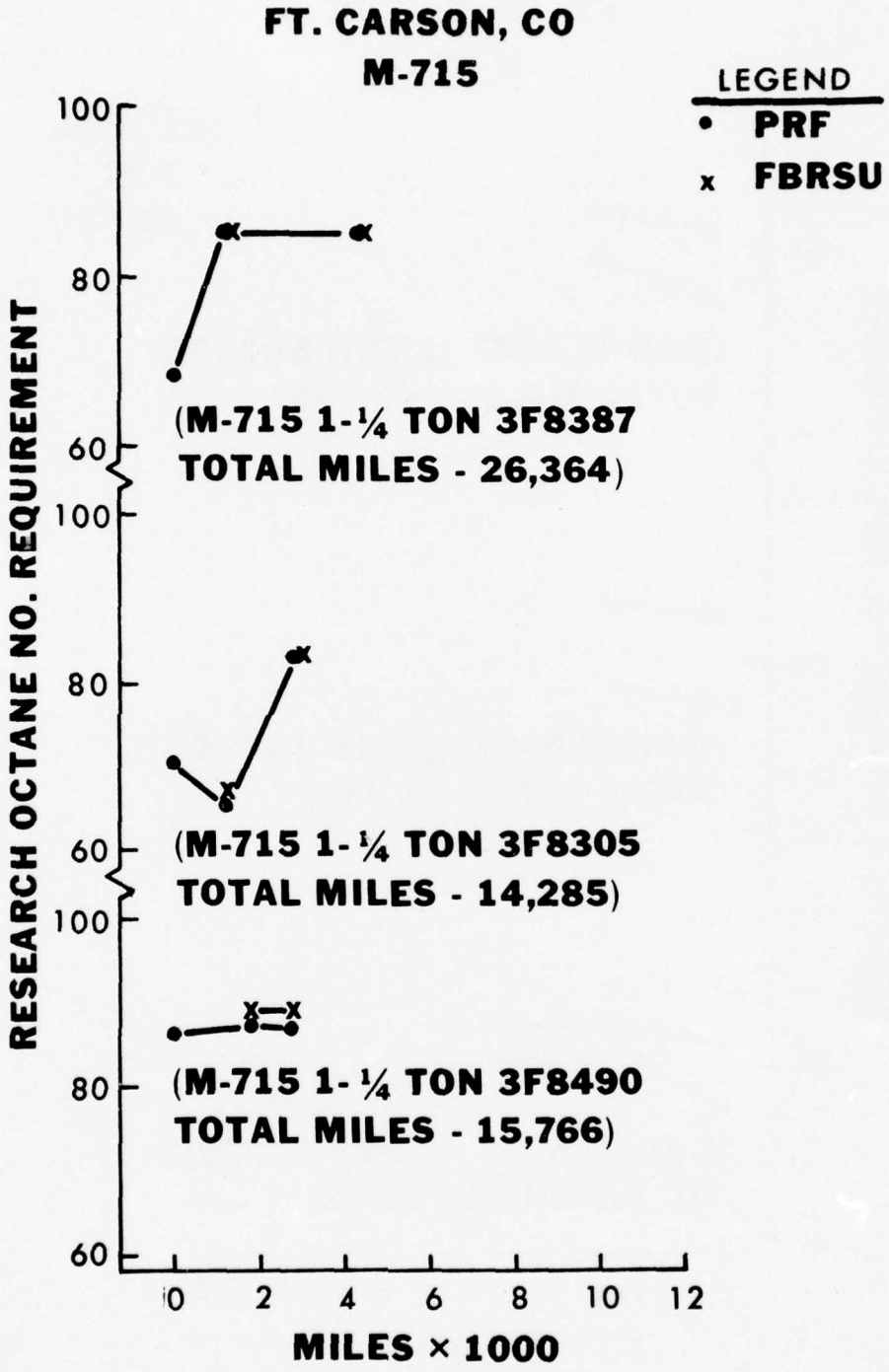


FIGURE 16. OCTANE REQUIREMENT INCREASE, M-715, FT. CARSON, CO

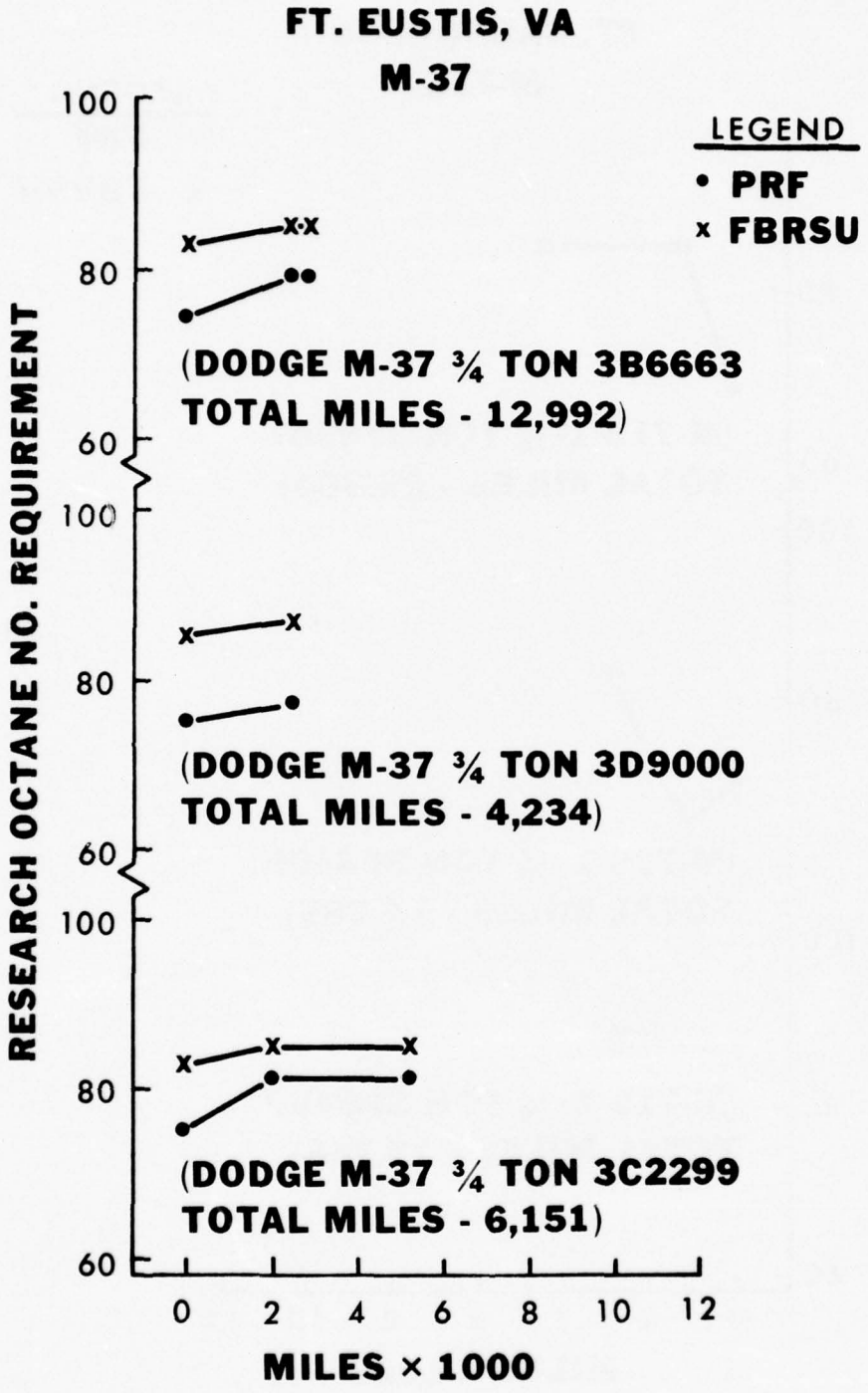


FIGURE 17. OCTANE REQUIREMENT INCREASE, M-37, FT. EUSTIS, VA

requirement increase for all vehicles during this period remained well below the Special Grade requirement (91.0 RON) as set forth in Federal Specification VV-G-001690A.

As can be seen in Tables 20 and 21, some vehicles were dropped from the program during the 3-yr period. However, there were thirteen vehicles in the ONRI evaluation for all three determinations. Table 22 shows the mileages and ONRI on Primary Reference Fuels for those thirteen vehicles. Over the 3-yr period, these vehicles showed an average octane requirement increase of approximately 6.8 octane numbers. It should be pointed out, however, that although there were varying degrees of engine octane requirement increase, the most significant aspect of the ONRI evaluations was that all these vehicles would operate satisfactorily on unleaded gasoline meeting the requirements of Federal Specification VV-G-001690A.

TABLE 22. MILEAGE AND PRF RON REQUIREMENTS ON VEHICLES AVAILABLE FOR THREE DETERMINATIONS

Vehicle make and model	Mileage			PRF RON requirements		
	1973	1974	1975	1973	1974	1975
1969 Amb Sedan	44,814	49,995	57,189	80	81	81
1972 Ford Custom Sedan	10,995	26,079	38,292	82	87	87
1973 Chevelle Sedan	2,479	15,865	29,154	81	81	87
1972 Chev 1/2-Ton Pickup	15,114	22,737	34,513	78	81	83
1972 Chev 1/2-Ton Pickup	11,795	17,155	32,565	76	85	87
M-151 1/4-Ton	25,102	32,108	36,550	81	91	89
M-151 1/4-Ton	16,283	21,387	22,325	87	89	89
M-151 1/4-Ton	24,155	30,452	37,049	86	91	95
M-37 3/4-Ton	10,217	12,689	12,992	74	79	79
M-37 3/4-Ton	910	3,036	6,151	75	81	81
M-715 1-1/4-Ton	21,992	23,027	26,364	68	85	85
M-715 1-1/4-Ton	11,381	12,676	14,285	70	65	83
M-715 1-1/4-Ton	13,107	14,911	15,766	86	87	87

CONCLUSIONS

During this evaluation, which included over 3 yr of operation at four Army installations and 1 yr at two additional Army installations, over 68 million vehicle miles were accumulated on unleaded gasoline. The program utilized approximately 7500 commercial, tactical, and combat-type vehicles and many types of Engineer and Material Handling equipment (MHE). The Engineer and MHE equipment also accumulated several thousand hours on unleaded gasoline without incident.

Throughout the evaluation, there were very few engine failures. None of these could be attributed directly to the use of unleaded gasoline. Also there was no evidence that unleaded gasoline caused any increase in vehicle maintenance cost. On the contrary, it was demonstrated in Phase I of this program and also in the field evaluation, that engines operated on unleaded gasoline are cleaner burning; therefore, maintenance cost *should* be reduced. Also, unleaded gasoline has not altered the fuel economy of any of the vehicles used in this evaluation. It appears that fuel economy is influenced more by driving conditions and driver technique than by type of gasoline used.

In addition to those installations formally participating in this evaluation, USAGMPA advises that many posts, camps, and stations are beginning to use unleaded gasoline on the guidance of DA, and none have reported any difficulty operating on unleaded gasoline.

From the evaluation results it can be concluded that commercial, tactical and combat vehicles and all other equipment used in this program can operate satisfactorily during their normal day-to-day activities without any apparent fuel economy penalties and with no increase in vehicle maintenance or operating costs, *so long as unleaded gasoline meeting VV-G-001690A Federal specification is used.*

RECOMMENDATIONS

- Some agency within DA should continue to monitor the posts, camps, and stations utilizing unleaded gasoline and those that will be converting in the future. The ability to provide fast response to real or suspected problems can mean the difference between minor difficulties and catastrophic engine failures.

- Coordination is needed between the military services in locating and isolating potential engines that will not perform on unleaded gasoline.

- Those agencies involved in this evaluation should continue to provide assistance and any data available to other military services converting to unleaded gasoline.

- USAGMPA should continue to closely monitor all installations utilizing unleaded gasoline to ascertain compliance with VV-G-001690A Specifications.

BIBLIOGRAPHY

(1) Anderson, Paul M., Maj. and French, Eddie J., "Effects of No/Low-Lead Motor Gasoline on Engine Operation," Technical Report SFQT-TR-70-35, June 1971.

(2) Bowden, J. N., "Status of Unleaded and Low-Lead Gasoline Composition," USAFLRL Interim Report No. 16, DDC No. AD 74721, August 1972.

(3) Moffitt, J. V., "Compatibility of Military Standard Engines with Unleaded and Low-Lead Gasoline," USAFLRL Final Report No. 19, DDC No. AD 756511, November 1972.

(4) Russell, J. A., Tosh, J. D., *et. al.*, "Performance of Army Engines with Leaded and Unleaded Gasoline," USAFLRL Interim Report No. 21, DDC No. AD 766337, January 1973.

(5) "Emissions, Performance, and Wear Tests of AVSI-1790-6A Engines using Leaded and Unleaded Gasolines," Supplementary Report to USAFLRL Interim Report No. 21, DDC No. AD 766337, January 1973.

(6) Bowden, J. N., "Storage Stability of Federal Specification Gasoline," USAFLRL Final Report No. 34, DDC No. AD 784282, July 1974.

(7) Gray, J. T., *et. al.*, "Study and Evaluation in the Field of Environmental Pollution Related to the Utilization of Army Materiel," *Final Summary Report* No. 50, DDC No. AD-A003335, October 1974.

(8) Tosh, J. D., Johnston, A. A., and Frame, E. A., "Performance of Army Engines with Leaded and Unleaded Gasoline," USAFLRL Final Report No. 54, DDC No. AD-A005577, January 1975.

(9) Tosh, J. D., Gray, J. T., and Trescott, E. B., "Octane Number Increase of Military Vehicles Operating on Unleaded Gasoline," SAE Paper No. 750937, October 1975.

(10) Bowden, J. N., "Trends in Properties of Unleaded Gasolines," USAFLRL Interim Report No. 57, DDC No. AD-A008407, March 1975.

(11) Shelton, E. M., "Motor Gasolines, Winter 1975-1976," U.S. Energy Research and Development Administration, Report No. BERC/PPS-76/3, June 1976.

APPENDIX A

Final Report
Dugway Proving Ground, Utah

SECOND YEAR REPORT

February 1974 to November 1975

UNLEADED GASOLINE EVALUATION PROGRAM

Conducted AT

DUGWAY PROVING GROUND
Dugway, Utah 84022

Prepared By

MSG GEORGE R. DEAN
Opns. Sgt Equip Pool Br
Dugway Proving Ground
Dugway, Utah 84022

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UNLEADED GASOLINE EVALUATION PROGRAM

I - INTRODUCTION. Executive Order 11507, dated 1970, directed all Branches of the Federal Government provide leadership in all pollution abatement activities. One facet of the overall pollution abatement effort involved utilization of lead free gasolines for compatibility with forthcoming catalytic emmission control systems. In conjunction with the automotive and petroleum industries, research to provide less polluting automobiles and fuels was needed. Proposed regulatory schedules were published by the Environmental Protection Agency in early 1972 for the attenuation and control of lead antiknock compounds. One of the provisions of this schedule was for "general availability" of a lead free grade of gasoline by midyear 1975.

With these factors in mind, the Army is constrained to rigorously investigate the impact of selective or total utilization of unleaded gasoline upon the efficiency of its surface vehicle fleet. Significant impairments to mission and/or increase in support maintenance costs must be identified, and the cause and solutions defined.

II - BACKGROUND. A program was initiated by the Army Materiel Command in midyear 1971. This study included a short term laboratory engine test (Phase I) and a field evaluation program (Phase II) of which Dugway Proving Ground was included. A contract to conduct the evaluation was assigned to the US Army Fuels and Lubricants Research Laboratory, San Antioio, Texas in June 1972.

This report covers findings and results of the second year (Feb 74 through Nov 75) operation of vehicles and equipment at Dugway Proving Ground.

III - EVALUATION. This installation had approximately 270 vehicles and 170 pieces of equipment that were gasoline powered. During the second year of operation on unleaded fuel, Dugway Proving Ground (DPG) continued to have many new and imagined problems. Many of the problems reported were of a nonsensical nature and not fuel related. Some complaints were of engines dieseling and although some engines did experience dieseling, there was no evidence of an increase over previously used gasoline. Personnel not aware of the fact that tests were still in progress on the unleaded fuel program, have been known to report their vehicle performed better since going back to leaded gasoline. This points out the fact that people have a tendency to believe unfounded rumors about the use of unleaded fuel. In conclusion, for the second year of operation on the Unleaded Fuel Evaluation Program, no adverse effects were produced on the vehicles or equipment.

During the evaluation period the vehicle and equipment fleet consumed a total of 515,283 gallons of unleaded gasoline. The vehicles were driven a total of 3,611,943 miles during the 19 month period. There has been no noticeable change in miles per gallon performance of vehicles or equipment.

Unleaded Gasoline Evaluation Program (cont'd)

During the second year of operation on this program, there has been no evidence of an increase in maintenance costs attributed to fuel related problems. Interviews with mechanics working in the maintenance facility confirm that no increase in fuel related failures or maintenance requirements have been surfaced. The 351 cubic inch, V8 Ford (Windsor) Engine had been a problem prior to and during the first year evaluation program. This problem was found to be in this particular engine design and not related to the unleaded fuel. The problem was in the valve guide areas and the Ford Motor Company has extended their warranty period because of this problem.

No fuel related problems have developed in the Engineer Equipment using unleaded fuels. Many of the Generator Sets assigned have been used many hours over extended periods with no adverse effects, loss of power, or less efficient operation.

IV - CONCLUSION. This 19 month operation on unleaded gasoline, with some vehicles accumulating a high mileage rate, has shown that military and commercial design vehicles can operate as effectively and efficiently with unleaded fuel as they did with the leaded gasoline.

MSG GEORGE R. DEAN
Opns Sgt, Equipment Pool Branch
Dugway Proving Ground
Dugway, Utah 84022

APPENDIX B

Final Report
Letterkenny Army Depot, Pennsylvania

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FINAL REPORT

January 1973 to January 1976

UNLEADED GASOLINE EVALUATION PROGRAM

Conducted at

Letterkenny Army Depot
Chambersburg, PA 17201

Prepared By:

ORVIL L. WENGER
Letterkenny Liaison Officer
US Army Unleaded Gasoline
Impact Program

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I. BACKGROUND

In October 1972, Letterkenny Army Depot was advised by DARCOM Headquarters that it had been selected as one of the field evaluation test sites for equipment performance on low/unleaded gasoline impact program. The field evaluation program was conducted on a day-to-day performance study of all vehicles of the GTA fleet. With the increased use of unleaded gasolines, it was imperative at that time to determine if Army material was compatible with the new generation of gasolines, and to determine any problems and a practical solution for each.

The program was instituted by DARCOM as a result of an official statement by President Nixon on actions to furthur the use of unleaded and low-leaded content gasoline in federal and state vehicles, the primary goal being to "reduce air pollution and to increase the market for low-leaded and unleaded gasoline in order to make such fuels more generally available." The starting date established for Letterkenny Army Depot was 8 January 1973; however, Letterkenny was fueling its depot operating equipment with unleaded gasoline as early as January 1972, since this was the only type gasoline available from the supplier. Although no monitoring of vehicular performance was accomplished prior to the program date, the depot had not experienced any abnormal problems that could be fuel-related.

The evaluation of the test program was under the general direction of the US Army Fuels and Lubricants Research Laboratory (USAFLRL), San Antonio, Texas, with Mr. John Tosh as their Project Phase Coordinator. The undersigned was Letterkenny's Liaison Officer for the unleaded gasoline program.

II. SITE SELECTION

Letterkenny, one of four evaluation sites, was selected due to the variety of vehicles, moderate to high utilization of such, and climatic conditions different from the other test sites.

III. FUEL PROCUREMENT AND ANALYSIS

Procurement of the unleaded gasoline for Army vehicles is under Federal Specification VV-G-001690. This provides an octane quality to be held to a minimum 91 and a maximum 92.5 RON. The octane quality at Letterkenny is higher than specified, averaging from 93 to 96 RON. Lead content has been well below the specified limit. The olefin content is significantly higher than the previous gasolines, but no obvious problems have resulted.

IV. VEHICLE UTILIZATION

As stated previously, all depot GED operating equipment (GTA, MHE, and Engineer-Type) was utilizing unleaded gasoline as fuel for a considerable period of time, but with the beginning of the unleaded gasoline program, 309 GED vehicles of the GTA fleet were specifically designated for evaluation. Indentifying stickers were placed on each vehicle, recording the starting mileage and starting date. The only vehicles not operating on unleaded gasoline are the three ambulances, which are continuing to be fueled with standard gasoline.

V. PROBLEM ANALYSIS

During the first year of evaluation, shop records indicated several bad heads on 1963 IHC 345 C1D engines, two of which were due to valve guide problems and the other was a catastrophic failure not attributable to fuel. Valve guide problems were also reported on three 351 C1D Ford engines.

These heads were later sent to the research laboratory and then to the Ford Motor Company to determine if the failure was fuel related or if they were inherent to this particular designed engine since other installations were having similar problems. The depot experienced problems with three 361 C1D Ford engines. Valve seat inserts had fallen out of these engines in No. 6 and 7 cylinders. Some indication of exhaust valve burning was also evident. Since then, two more 361 C1D Ford engines have developed problems. One had an exhaust valve seat insert come loose, and the other one had a hole burned alongside the piston top and down into the ring lands. This was apparently from detonation. Other minor engine failures were encountered, but there is no evidence to directly relate them to unleaded gasoline, as similar failures occurred prior to converting to unleaded gasoline.

VI. TIME FRAME

The field evaluation program was extended from one to three years. Extension of the program was considered after it was observed that all failures occurred at relatively high mileage, and the average of most vehicles at the participating installations was just reaching the level where failures might occur to a greater extent.

Approximately 109 new vehicles were added to the fleet and the extended period provided Letterkenny an opportunity to make a more accurate evaluation of the effects of unleaded gasoline on engine performance since the vehicles were operating exclusively on this type of gasoline. As of the final report, there have been no failures contributed to the unleaded gasoline.

VII. FORMAL REPORTING

Print-outs of vehicle utilization were furnished to Mr. Tosh on a quarterly

basis. Mr. Tosh has made periodic visits to Letterkenny during the past year to discuss and observe problems related to the unleaded gasoline program. Status meetings were held quarterly at which time representatives of the research laboratory and installation liaison officers presented reports on the usage of unleaded fuel in Army engines.

ORVIL L. WENGER
Letterkenny Liaison Officer
US Army Unleaded Gasoline
Impact Program

APPENDIX C

Final Report
Ft. Eustis, Virginia

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ATZF-ME-QA 15 Jan 1976

SUBJECT: Second Period Report of Unleaded Gasoline Field Evaluation

Commander
U. S. Army Training and Doctrine Command
ATTN: ATLG-MAT
Fort Monroe, Virginia 23651

1. Reference CONARC/TRADOC letter, ATLOG-MD-EQ, subject: Unleaded Gasoline Field Evaluation, dated 11 December 1972.

2. In compliance with above reference, a final report of all significant activities and findings occurring during the second period of the Unleaded Gasoline Field Evaluation at Fort Eustis is attached.

FOR THE COMMANDER:

1 Incl
as

JAMES H. DEVIESE
1LT AGC
Assistant Adjutant General

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SECOND PERIOD REPORT

MARCH 1974 to NOVEMBER 1975

UNLEADED GASOLINE FIELD

EVALUATION

CONDUCTED AT

FORT EUSTIS, VIRGINIA 23604

PREPARED BY:

RUSSELL E. MOORE, JR.
Equipment Specialist
DIO, Maintenance Division
Quality Assurance Branch
Fort Eustis, Virginia 23604

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I. INTRODUCTION

In 1970, Executive Order 11507 directed that all branches of the Federal Government provided leadership in all pollution-abatement activities.

Since Tetraethyl lead, an anti-knock additive found in most grades of gasoline, was considered a major source of environmental pollution the use of a lead-free gasoline in military equipment immediately became a major aspect of the overall pollution abatement effort.

Prior to this time, unleaded gasoline had not been used to any great extent and the effects of such a fuel on military type equipment was unknown. There were certain problem areas suspected: these included harmful detonation and accelerated valve wear. When considered on a large scale, these problems could reduce the overall material readiness of military equipment and endanger the national defense posture.

Consequently, in mid 1971 the Army initiated a program designed to evaluate the impact unleaded gasoline would have on it's surface fleet. The study was broken into two phases: the first phase consisted of intensive dynameter testing of several high density military standard engines; the second phase involved the evaluation of equipment in the field. During this phase of the evaluation, four installations were converted completely (less aircraft) to the use of unleaded gasoline. Federal Specification VV-G-001690. The four installations chosen for this phase were Fort Eustis, Virginia, Fort Carson, Colorado, Letterkenny Army Depot, Pennsylvania, and Dugway Proving Grounds, Utah.

The principle objectives of the second phase, or the field evaluation phase, were to define the problem areas, if any, arising from the use of unleaded gasoline and to determine the impact it would have on the maintenance, reliability and operating cost of Army equipment.

The field evaluation phase began at Fort Eustis in March 1973 and was originally scheduled to terminate in March 1974. Due to the initial success of the program and the desire to generate greater equipment usage data, Department of the Army directed that it be extended until 30 November 1975.

This report covers the results of the second period of the evaluation at Fort Eustis (March 1974 through November 1975).

II. RESULTS

During the second period of the evaluation, regular monthly liaison visits were made to each of our major maintenance activities. Purpose of these

visits was to gather performance data and to furnish a source of input for the monthly narrative required by the Army Fuels and Lubricants Research Laboratories in San Antonio, Texas. Reports received from the various facilities during this period have always been favorable. All areas concerned with the evaluation have consistently reported no increases in the maintenance down time or operating costs related to the use of unleaded gasoline.

COMPLAINTS

The only complaint received during the monthly visits has been one of excessive detonation, made by the Mobile Equipment Branch of DFAE. Analysis of the complaint showed the problem to be one of improper ignition timing and not due to an incompatibility of the fuel. A detailed analysis of this complaint is contained at Tab A.

The nature of the above complaint (detonation) is not entirely unique to that shop. Although never expressed as a complaint but rather as a comment, several maintenance foremen have indicated a need to re-time the majority of their vehicles after switching to unleaded gasoline. In no case has any foreman ever felt that this has caused him an increased workload or extended equipment down time. Re-timing was usually accomplished during normal scheduled maintenance.

To further amplify this condition, numerous equipment operators, mechanics and maintenance supervisors were interviewed for their opinions of subject fuel. Although comments have generally been favorable, there have been a few complaints of poor engine performance, excessive detonation and/or dieseling. Here again, follow-up action has proven the problem to be either unwarranted or due to improper ignition adjustments.

EQUIPMENT USAGE

Table I contains a breakdown of the types of vehicles used at Fort Eustis, the estimated mileage accrued during the second period, and the approximate amount of fuel consumed. Note that these figures do not include support equipment (i.e., fork lifts, generators, compressors, etc). This type of equipment would account for hundreds of additional hours of operation.

TABLE I

	Estimated Mileage	Approximate Fuel
Tactical	2043657	129205 gallons
Commercial	4588473	444537 gallons
Total	6632130	573742 gallons

An additional item of interest to the evaluation would be the 32, two cycle outboard marine engines maintained by the Special Services Division. During the second period of the evaluation, these engines have accumulated an estimated 350 hours of operation on unleaded gasoline. All reports have indicated unleaded gasoline to be completely compatible with these engines and their type of operation.

III CONCLUSIONS

During the second period of the evaluation, Fort Eustis vehicles have accumulated an estimated 6,632,130 miles. In addition to this, there have been many more hundreds of hours placed on support equipment.

To date, there has been no engine failures that could be attributed to the use of unleaded gasoline. There have been no reported incidences of increased maintenance cost or down time.

The only complaints encountered throughout the entire preogram have been related to detonation. Although these problems have always been easily corrected by readjusting ignition components to proper specifications, the extent of them, which includes tactical and commercial vehicles, suggests that unleaded gasoline is more susceptible to detonation than a leaded gasoline. This greater susceptibility to detonation has made the proper timing of engines very critical. This statement is not meant to detract from the use of unleaded gasoline. It merely means that the use of unleaded gasoline adds greater emphasis to the need to use proper test and diagnostic equipment. It also requires a closer adherence to established procedures and specifications for engine timing. These conditions will not present a burden to the maintenance effort, nor will they reduce equipment reliability, since timing adjustments are already a part of normal scheduled maintenance. They only require that maintenance personnel be aware of them and that maintenance personnel exercise care during engine tune-ups to insure that it is done correctly.

In view of these factors, it can be assumed that Fort Eustis can operate its equipment on unleaded gasoline without adverse affects to its material readiness posture or its operating cost.

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ATZF-ME-QA 8 November 1974

MEMORANDUM FOR: CHIEF, MAINTENANCE DIVISION

SUBJECT: Evaluation of Complaint of the use of Unleaded Gasoline

1. A visit was made to the Mobile Equipment Branch of DFE on 6 Nov 74 by the Installation Unleaded Gasoline Coordinator. Purpose of this visit was to evaluate a complaint of excessive vehicle spark knock (detonation) due to the use of unleaded gasoline. Results of this visit are as follows:

a. Problem Analysis. One test vehicle was selected for the evaluation. Subject vehicle, a truck, 3/4 ton, International Harvester, Model 1110, was given an initial test run to determine extent of problem. Initial test run indicated mild detonation present under light or normal acceleration. Vehicle was returned to shop area for an engine analysis.

b. Results of Engine Analysis. A complete inspection of pertinent ignition components and adjustments indicate the following deficiencies:

1. Dwell off 7° (low)

2. Ignition timing off 5° (advanced)

3. Autolite A82 spark plugs being used in lieu of recommended Champion J-6

c. Actions Taken as a Result of Engine Analysis. Timing and dwell were readjusted to recommended settings. A82 plugs were retained in vehicle.

d. Results of Actions Taken. Vehicle was given a second test run to determine results of readjustments. During second test run, no abnormal detonation or engine operation was detectable. Engine performance completely satisfactory.

2. Conclusions. Subject problem is maintenance related and not due to the use of unleaded gasoline.

ATZF-ME-QA 8 November 1974
SUBJECT: Evaluation of Complaint of the use of
Unleaded Gasoline

3. Recommendations. The following recommendations were made to Mobile Equipment Supervisor.

a. Vehicles experiencing detonation should be carefully checked and readjusted if necessary to insure that they conform to factory tune-up specifications.

b. If problem persists after recommended tune-up specifications are met, the Installation Coordinator should be notified again.

Russell E. Moore

RUSSELL E. MOORE
Installation Coordinator
Unleaded Gasoline Project

APPENDIX D

Final Report
Ft. Carson, Colorado

AFZC-DI-S

SUBJECT: Unleaded Gasoline Final Report

Commander
FORSCOM
ATTN: AFLG-MA-EQ (Mr. Carbo)
Fort McPherson, Georgia 30330

Attached is final report on Unleaded Gasoline Evaluation Test.

FOR THE COMMANDER:

JOSEPH W. GENTRY
[illegible], ACO
[illegible]

1 Incl
as

CF:
TRADOC
(ATLOG-MAT-EQ, Maj Stevens)
with 1 incl
USAFLRL
(Mr. Tosh)
with 1 incl

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1. Background:

a. As a preliminary step in the Army's program to reduce air pollution Fort Carson and Fort Eustis were selected by CONARC to convert totally to unleaded gasoline for a period of one year. This was a test to determine what, if any adverse effects would result from long-term usage of no-lead fuel in the many types of equipment used at the two installations. Dugway Proving Ground and Letterkenny Army Depot were also directed by AMC to participate in the test. Original letter of instruction ATLOG-MS-EQ, Subject: Unleaded Gasoline Field Evaluation, dated 16 January 1973, with Sixth Army 1st Indorsement AMLOG-M4 dated 1 February 1973.

b. The only difficulty in converting Fort Carson to no-lead gasoline was in redistributing the on-hand stocks of leaded fuel so it could be consumed in the least possible time. Total conversion was achieved on 30 April 1973.

2. Purpose:

Tetraethyl lead, the principal additive in leaded gasoline, is a known contributor to air pollution and as such is a prime target for elimination. The US government hopes to lead the nation in switching to unleaded fuel but because of the vast quantities of equipment involved, did not dare to do so without some preliminary testing to determine what, if any, adverse effects may have resulted. It is for this purpose the Army tests were conducted.

3. Conduct of Test:

a. In accordance with CONARC guidelines at the outset of the test, no formal system was set up for capturing data. Instructions were disseminated to all commanders and maintenance supervisors to be aware of the test and to report problems or suspected problems on an exception basis. Contacts were made periodically between coordinator and key personnel in the maintenance shops to determine whether or not any adverse trends were developing. Only one engine failure during the first year was suspected of being fuel related and this, after teardown, proved to be a lubrication problem. There was no noticeable increase in engine failures, burned valves, spark plug usage, or similar problems.

b. In order to keep abreast of the rate at which miles were accruing, five of each type vehicle were selected as "pacer" and mileage on them reported monthly and then changed to quarterly to CONARC. After dissolution of CONARC, 1 July 1973, FORSCOM and TRADOC became the recepients of these reports.

c. Although no total gasoline burning vehicle mileage figures are kept for the post, a rough estimate is possible by multiplying the average mileage on the pacers by the number of those type vehicles in the fleet.

VEHICLE TYPE	AVG MILEAGE	DENSITY	TOTAL ESTIMATED MILEAGE
1/4 T Trucks	6,850	1,263	8,651,550
1 1/4 T Trucks	3,599	394	1,418,006
M114 Series	Entire fleet turned in		
M113 Carrier Family	1,114	8	8,912
M88 VTR's	3,071	33	101,343
5 T Trucks*		32	32,000
Commercial*		663	3,809,668
		TOTAL	14,021,479

d. During the period 1 May 1974 - 30 December 1975 Fort Carson consumed 2,919,309 gallons of no-lead gasoline.

4. Conclusion:

In view of the fact that Fort Carson has been operating strictly on no-lead fuel for three years with no major problems reported, it is safe to assume that Fort Carson can continue to operate on no-lead gasoline indefinately.

*Approximate mileages. Information received after initial release of final report.

APPENDIX E

Final Report
Ft. Lewis, Washington

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AFZH-DII

SUBJECT: Unleaded Gasoline Field Evaluation Final Report

Commander
US Army Forces Command
ATTN: AFLG-REG
Fort McPherson, GA 30330

1. This headquarters has completed the Unleaded Gasoline Field Evaluation Test with no failures that were directly attributable to the use of unleaded gasoline.

2. The tests started 1 July 1975 with the conversion to unleaded fuel. The Phase II Field Study Evaluation initially provided to Fort Lewis depicting the tests previously conducted at four (4) other installations was used as a basis to conduct the local test. The unleaded gasoline evaluation conducted at Fort Lewis parallels the Phase II study.

3. The problem depicted in the Phase II report with the Ford 351 engines was surfaced; however, it was determined that these failures were not associated with the use of unleaded gasoline.

4. Throughout the test engines repaired at the general support level were evaluated during tear-down and no indication of failures due to the conversion to unleaded fuel was detected.

5. Conclusion: In view of evaluation conducted at Fort Lewis it is reasonable to assume continued use of unleaded gasoline would cause no adverse effect to the equipment.

FOR THE COMMANDER:

CF: Mr. Tosh, Southwest Research Institute

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APPENDIX F

Final Report
Ft. Riley, Kansas

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AFZN-DL-M 19 JUL 1976

SUBJECT: Final Quarterly/Semiannually Reports of Selected Vehicles Using No-Lead Gasoline

Commander
United States Army Forces Command
ATTN: AFLG-REG
Fort McPherson, Georgia 30330

1. Reference FORSCOM MSG, AFLG-REG, 091255Z Jun 75, subject: Conversion to Unleaded Fuel and Field Evaluation.

2. Reports required by paragraph 3c, above reference, are inclosed.

FOR THE COMMANDER:

ORIGINAL COPY SIGNED
MELVIN L. TREADWELL
1LT, AGC
ASST AG

3 Incl
1. Year End Report
2. Quarterly Report Tactical/ Combat Vehicles
3. Semiannually Report Commercial Design Vehicles

CF: U.S. Army Fuels and Lubricants Research Laboratory

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YEAR END REPORT

1. Background.

a. The unleaded gasoline field evaluation officially began at Fort Riley on 23 June 1975.

b. Problems encountered during the conversion period.

(1) A delay of a month was encountered in draining and drying the 12,000 gallon underground storage tanks. The TOE pumps were not adequate for this task therefore it was necessary to obtain reciprocal pump from Facilities Engineering.

(2) Redistribution of leaded fuel on hand in the least possible time.

2. Conduct of Test.

a. Instructions were disseminated to all commanders and maintenance supervisors to be aware of the test and to report problems or suspected problems on an exceptional basis.

b. Areas concerned with the evaluation have consistently reported no problems associated with the use of unleaded gasoline. All vehicles reportedly have performed satisfactorily and no items of equipment has been modified or altered in any way to perform this mission while operating on unleaded gasoline.

3. Conclusion. It is reasonable to assume that Fort Riley can continue to operate on unleaded gasoline without adverse effects to the equipment.

APPENDIX G

Field Study Evaluation
Vehicles and Equipment

Section 1. Dugway Proving Ground, Utah
Section 2. Letterkenny Army Depot, Pennsylvania
Section 3. Fort Eustis, Virginia
Section 4. Fort Carson, Colorado
Section 5. Fort Lewis, Washington
Section 6. Fort Riley, Kansas

APPENDIX G

Section 1
Dugway Proving Ground, Utah

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TMP	USA	Year	Make	Pool
Equipment Pool Branch				
1	CA0405	72	Ford	E
2	CA1477	72	Ford	E
4	01F64371	71	Ford	E
5	CB2272	73	Chev	E
6	01F63371	71	Ford	E
7	01F63971	71	Ford	E
9	CA1480	72	Ford	E
11	01F63571	71	Ford	E
12	01F63471	71	Ford	E
13	01F64671	71	Ford	E
15	01H42770	70	Ford	E
17	CB2274	73	Chev	E
19	01F63771	71	Ford	E
21	01H42570	70	Ford	E
22	CA1476	72	Ford	E
23	CB2273	73	Chev	E
24	01F64071	71	Ford	E
26	01F63871	71	Ford	E
27	CA1478	72	Ford	E
29	01H42170	70	Ford	E
31	CA2523	72	AMC	E
33	01A61371	71	Checker	E
43	CA5371	72	IHC	E
44	CA5336	72	IHC	E
56	IM5203	65	GMC	E
58	IM5140	65	GMC	E
60	IM5202	65	GMC	E
65	CB0130	73	Chev	E
66	01H71971	71	Ford	E
67	01H71871	71	Ford	E
75	01K01770	70	Ford	E
88	IS3321	67	Chev	E
113	IN1676	65	Ford	D
127	IP9476	66	Chev	E
171	01C07671	71	Dodge	E
179	IN1619	65	Ford	E
200	IR0456	66	Ford	E
201	IR6824	66	Ford	E
219	IS4256	67	Chev	E
220	IS4261	67	Chev	E
239	IN7389	65	Ford	D
266	IN7383	65	Ford	D
271	IM0063	64	Dodge	D
281	IM0064	64	Dodge	D
297	01J36769	69	Dodge	E
299	01J36969	69	Dodge	E
324	01A42970	70	Dodge	E
326	01S88870	70	Dodge	E
344	IS2174	67	Ford	E
357	IS1822	67	Ford	D

TMP	USA	Year	Make	Pool
Equipment Pool Branch (Cont'd)				
358	IS1823	67	Ford	D
361	IS1826	67	Ford	D
362	IS1827	67	Ford	E
373	IR4214	66	Chev	E
379	01B36567	67	Ford	D
381	01B36767	67	Ford	E
398	IN5959	65	Ford	E
399	IN6253	65	Ford	E
400	IK0802	63	IHC	E
401	01C37168	68	Ford	E
402	IR3028	66	IHC	E
403	IL9729	64	IHC	E
416	IK8370	63	IHC	E
417	IK8369	63	IHC	E
419	IN7255	65	IHC	E
420	IK2000	63	IHC	E
427	7F2522	64	Transport	E
428	7F2523	64	Transport	D
429	01235374	51	Dorsey	D
431	07G17469	69	Rogers	E
435	07F85869	69	Troyler	E
436	07F85869	69	Troyler	E
437	07F86069	69	Troyler	E
438	07F30269	69	Stoughton	E
495	01S24768	68	IHC	E
500	IP5125	65	Dodge	D
503	IP5128	65	Dodge	D
504	IP5129	65	Dodge	D
505	IP5130	65	Dodge	D
506	IP5131	65	Dodge	D
Total: 80				
65th Military Police Platoon				
MP1	01F63671	71	Ford	E
MP2	CA2525	72	AMC	E
MP3	CA2524	72	AMC	E
MP4	01F64571	71	Ford	E
MP5	01F64171	71	Ford	E
Total: 5				
Security				
72	01K02070	70	Ford	E
90	IS3315	67	Chev	E
108	01C07171	71	Dodge	E
110	CA4466	72	Chev	E
130	01C07571	71	Dodge	E
175	01C07871	71	Dodge	E
205	CA4468	72	Chev	E
Total: 7				

TMP	USA	Year	Make	Pool
		Meddac		
3	CA1475	72	Ford	E
20	CA2522	72	AMC	D
76	01L30669	69	Pont	E
77	CA2976	72	Dodge	E
78	CA2925	72	Dodge	E
79	CA2935	72	Dodge	E
80	CA2977	72	Dodge	E
81	CA2910	72	Dodge	E
82	01A25472	72	Dodge	E
84	CA6001	72	IHC	E
85	CA6013	73	IHC	E
86	CA2953	72	Dodge	E
87	CA6012	73	IHC	E
190	01A54669	69	IHC	E
Total: 14				
		Aircraft Maintenance Contractor		
PAMI 1	01F85569	69	AMC	D
PAMI 2	IN1667	65	Ford	D
PAMI 3	01A32870	70	IHC	D
PAMI 8	01A33670	70	IHC	D
Total: 4				
		Facilities Engineering Division		
73	01K01870	70	Ford	E
89	IS3317	67	Chev	E
92	IP9467	66	Chev	E
93	01J81368	68	Chev	E
95	IN1685	65	Ford	E
98	01J79568	68	Chev	E
99	01D92072	72	Chev	E
100	IP9457	66	Chev	D
101	IL8230	64	Dodge	E
103	IP9468	66	Chev	E
105	IP9456	66	Chev	E
109	01J81168	68	Chev	E
111	IP9423	66	Chev	E
115	IN1670	65	Ford	E
116	01J79368	68	Chev	E
118	IN1673	65	Ford	E
121	01C07471	71	Dodge	E
123	01J80668	68	Chev	E
124	IN1674	65	Ford	E
125	01J83868	68	Chev	E
128	01K01970	70	Ford	E
129	CA4475	72	Chev	E
131	01C07771	71	Dodge	E
132	IP9478	66	Chev	E

TMP	USA	Year	Make	Pool
Facilities Engineering Division (Cont'd)				
134	CA4476	72	Chev	E
135	IP9475	66	Chev	E
137	IN1671	65	Ford	E
141	01J82268	68	Chev	E
142	IN1679	65	Ford	E
143	IP9461	66	Chev	E
147	01J79468	68	Chev	E
149	IP9466	66	Chev	E
152	01J80868	68	Chev	E
154	IP9455	66	Chev	E
155	IP9472	66	Chev	D
156	01K06670	70	Ford	E
157	01J82068	68	Chev	E
158	01C06971	71	Dodge	E
160	CA4464	72	Chev	E
161	IN1682	65	Ford	E
167	IP9480	66	Chev	E
170	01K02170	70	Ford	E
173	01J33563	63	Ford	E
183	01J79268	68	Chev	E
185	01E19769	69	Chev	E
188	01E20069	69	Chev	E
189	CA4470	72	Chev	E
203	CA4474	72	Chev	E
204	CA4467	72	Chev	E
387	IL1481	64	Ford	E
389	IL1482	64	Ford	E
390	IN5916	65	Ford	D
391	IN5909	65	Ford	D
392	IN5915	65	Ford	D
393	IN5925	65	Ford	D
395	IL9135	64	IHC	E
405	01C77370	70	IHC	D
Total: 57				
Fire Prevention				
8	CA1479	72	Ford	E
71	01K02370	70	Ford	E
120	IP9450	66	Chev	D
Total: 3				
Safety				
18	CA2521	72	AMC	E
126	01C07371	71	Dodge	E
117	IP9474	66	Chev	D
265	IN7404	65	Ford	D
285	IM0067	64	Dodge	D
Total: 5				

TMP	USA	Year	Make	Pool
Mail & Records				
164	IN1668	65	Ford	E
162	IN1666	65	Ford	E
Total: 2				
HHC Supply				
176	CA4469	72	Chev	E
Total: 1				
Supply Management Branch				
138	IP9447	66	Chev	E
168	CA4473	72	Chev	E
169	IP9452	66	Chev	E
Total: 3				
Commissary				
323	01S88770	70	Dodge	E
Total: 1				
Housing				
102	01C07071	71	Dodge	E
148	CA4471	72	Chev	E
325	01A43070	70	Dodge	E
174	CA4472	72	Chev	E
Total: 4				
Maintenance Branch				
97	01K06770	70	Ford	E
382	01B36867	67	Ford	E
Total: 2				
Metal Shop				
182	01J79968	68	Chev	E
359	IS1824	67	Ford	E
Total: 2				
Golf Course				
139	IN1677	65	Ford	E
Total: 1				
Pho[illegible] Branch				
145	01J81068	68	Chev	D
207	01N73070	70	Chev	D

TMP	USA	Year	Make	Pool
Photo Branch (Cont'd)				
215	01N72770	70	Chev	D
290	IM0068	64	Dodge	D
330	IM3065	64	Dodge	D
331	IM3066	64	Dodge	D
334	IN6589	65	IHC	D
Total: 7				
Munitions Branch				
104	01J82368	68	Chev	D
136	IN1681	65	Ford	D
150	IP9424	66	Chev	D
163	01D91972	72	Chev	D
165	IP9479	66	Chev	D
181	01J80468	68	Chev	D
186	01K06570	70	Ford	D
211	01N73670	70	Chev	D
221	IS4254	67	Chev	D
243	IN7373	65	Ford	D
248	IN7412	65	Ford	D
258	IM0074	64	Dodge	D
275	IN7413	65	Ford	D
276	IN7405	65	Ford	D
278	IM0061	64	Dodge	D
289	IN7421	65	Ford	D
301	01J96469	69	Chev	D
356	IS1821	67	Ford	D
475	01S22468	68	IHC	D
479	01S22868	68	IHC	D
499	IP5124	65	Dodge	D
Total: 21				
Engineering Branch				
166	IN1665	65	Ford	D
Total: 1				
Test Division				
14	01F64271	71	Ford	D
146	01J79768	68	Chev	D
262	IN7390	65	Ford	D
268	IN7399	65	Ford	D
279	IN7393	65	Ford	D
498	IP5123	65	Dodge	D
Total: 6				
Test Control Branch				
180	01J81568	68	Chev	D

TMP	USA	Year	Make	Pool
Test Control Branch (Cont'd)				
224	01N73170	70	Chev	D
225	01N73370	70	Chev	D
228	01N73770	70	Chev	D
231	IN7420	65	Ford	D
300	01J96369	69	Chev	D
Grid Services Branch				
140	IN1680	65	Ford	D
159	IN1660	65	Ford	D
177	IN1683	65	Ford	D
244	IN7422	65	Ford	D
250	IN7397	65	Ford	D
254	IN7379	65	Ford	D
263	IN7392	65	Ford	D
291	IN7401	65	Ford	D
295	IN7411	65	Ford	D
380	01B36667	67	Ford	D
386	IN5761	65	Dodge	D
388	IR6305	66	Ford	D
496	01S24868	68	IHC	D
497	01S24968	68	IHC	D
507	IP5132	65	Dodge	D
Total: 15				
Protective Branch				
184	01E19669	69	Chev	D
227	01N72670	70	Chev	D
246	IN7374	65	Ford	D
329	IM3064	64	Dodge	D
481	01S23068	68	IHC	D
Total: 5				
Grid Operations Branch				
468	01S23568	68	IHC	D
469	01S22068	68	IHC	D
470	01S22968	68	IHC	D
471	01S23768	68	IHC	D
472	01S22368	68	IHC	D
473	01S22668	68	IHC	D
474	01S23368	68	IHC	D
476	01S22568	68	IHC	D
477	01S24368	68	IHC	D
478	01S24168	68	IHC	D
480	01S23968	68	IHC	D
482	01S22168	68	IHC	D
483	01S24268	68	IHC	D
484	01S24468	68	IHC	D

TMP	USA	Year	Make	Pool
Grid Operations Branch (Cont'd)				
485	01S23468	68	IHC	D
486	01S24068	68	IHC	D
487	01S22768	68	IHC	D
488	01S23868	68	IHC	D
489	01S23268	68	IHC	D
490	01S22268	68	IHC	D
491	01S23168	68	IHC	D
492	01S23668	68	IHC	D
493	01S24568	68	IHC	D
494	01S24668	68	IHC	D
Total: 24				
Life Sciences Laboratory Division				
10	01H41970	70	Ford	D
144	01C07971	71	Dodge	D
153	01J81868	68	Chev	D
172	IN1678	65	Ford	D
193	01M09670	70	IHC	D
238	IM0060	64	Dodge	D
240	IN7423	65	Ford	D
255	IN7398	65	Ford	D
287	IN7425	65	Ford	D
345	IS2173	67	Ford	D
378	01B36467	67	Ford	D
501	IP5126	65	Dodge	D
502	IP5127	65	Dodge	D
Total: 13				
Chem Lab Division				
112	IR7633	66	Chev	D
Total: 1				
Meteorology Division				
25	01H42370	70	Ford	E
Total: 1				
Met Operations Branch				
206	01N73270	70	Chev	D
218	01N73470	70	Chev	D
223	01N72970	70	Chev	D
233	IN7414	65	Ford	D
237	IN7406	65	Ford	D
Total: 5				
Communications Branch				
199	01B13671	71	Dodge	E
Total: 1				

TMP	USA	Year	Make	Pool
Re-Enlistment NCOIC				
16 Total: 1	01F64471	71	Ford	E
Procurement Office				
178 Total: 1	01J81768	68	Chev	SLC
Quality Assurance Office				
191 Total: 1	01M09570	70	IHC	E
Calibration Branch				
298 Total: 1	01J36869	69	Dodge	D
Suitability Evaluation				
217 Total: 1	01N45070	70	Chev	E
Chemical Technology Branch				
202 Total: 1	IR8615	66	Ford	D
Instrument Maintenance Branch				
74	01K02270	70	Ford	D
94	01J82168	68	Chev	D
107	CA4465	72	Chev	D
282	IN7416	65	Ford	D
360	IS1825	67	Ford	D
363 Total: 6	IS1828	67	Ford	D
Sig Met Team				
119	01C07271	71	Dodge	D
216	01N44970	70	Chev	D
222	IS4255	67	Chev	D
208	01N72870	70	Chev	D
226	01N73570	70	Chev	D
264	IN7380	65	Ford	D
267	IN7408	65	Ford	D
280 Total: 8	IN7395	65	Ford	D

Admin No.	Vehicle	Year	Make	Serial No.	USA No.
801	Trk Fork	64	A/C	26117000	10663380
802	Trk Fork	64	A/C	26095000	10663210
803	Bomb Lift	64	Intferm	47	47
804	Trk Fork	64	A/C	25669000	10663079
805	Trk Fork	64	A/C	26092000	10663320
806	Trk Fork	65	A/C	26203000	10663370
808	Trk Fork	64	A/C	26119000	10663219
809	Trk Fork	65	A/C	26172000	10663349
810	Bomb Lift	64	Intferm	48	48
807	Trk Fork	64	A/C	25462000	10363466
811	Trk Fork	64	A/C	30653000	10363233
812	Trk Fork	64	A/C	25277000	10363345
813	Trk Fork	64	A/C	25461000	10363463
817	Tractor	64	Clark	RA226	10263569
818	Tractor	64	Clark	RR301	10263644
819	Tractor	64	Clark	RA162	10263505
820	Tractor	64	Clark	RR247	10263590
824	Trk Fork	64	Clark	RP545	10463432
826	Trk Fork	64	Tow Mtr	M502P650027	10464039
827	Trk Fork	64	Tow Mtr	M502P650009	10464040
880	Trk Fork	62	Hyster	C6D1644F	10361106
881	Trk Fork	63	Hyster	C6D2159G	10863168
550	Grader	57	Cat	8T21508	8A7373
551	Grader	67	Cat	8T21511	8A7376
552	Grader	57	Cat	99E6625	8C5062
553	Grader	63	Cat	99E6626	8C5061
555	Grader	62	Huber	MD1068	8B8529
586	Crane	65	Little Giant	326568	8D5156
587	Crane	60	Quickway	20350	8B1372
588	Crane	65	American	GS6595W	8C6868
590	Crane	66	Unit	66272	8D8753
619	Cbl Lyr			SC159	SC159
644	Comp Trk	66	Jaeger	RC27968	8D8278
655	Trk Rfuse	73	IHC	2J791CCA12889	CA7359
657	Trk Dist	52	Roscoe	1469	8016023
658	Trk Dist	59	Etmyre	307996	5B9430
655	Loader	65	Hale	621177	8D4749
669	Ditcher	63	Charles M.W.	5229	5229
671	Roller	65	Gallion	TC58G50393	8D4597
673	Sweeper	64	Elgin	K527C53	K527C53
674	Sweeper	43	F.G. Hough	TTS291	0112816
688	Roller	49	William B.	3129	0744048
692	Magnet	66	Eriez	28007C	N/A
700	Lub Unit	58	Cemco	2361	01401351
703	Mixer	55	Essick	52911547	N/A
704	Mixer	66	Gilson	2366	N/A
705	Mixer	59	Mueller	42392	N/A
710	Scraper	51	Deerborn	45201	N/A
790	Tractor	65	Cat	42A6244	8D4599
793	Tractor	70	Case	7300323	08C36270
791	Tractor			9202155	2U15143
792	Tractor	52	Cat	2U14885	9202515

Admin No.	Vehicle	Year	Make	Serial No.	USA No.
832	Tractor	73	Case	8726586	N/A
833	Tractor	64	IHC	5615J	N/A
834	Tractor	64	IHC	5610J	N/A
835	Tractor	64	IHC	5607J	N/A
837	Tractor	58	Oliver	4210087116	4753384
838	Tractor	63	IHC	8875601	N/A
Total: 58					

GENERATOR ROSTER

Bumper No.	Serial No.	Size	Stock No.	Make	Year	Model
B02						
B07	738636	5 KW	61150748830	Onan	1964	8XR3100A
B09	738506	5 KW	61150748830	Onan	1964	5GF8XR3100A
B10	738561	5 KW	61150748830	Onan	1964	5GF8XR3100A
B12						
B24	981977	5 KW	6115X971148	Onan	1967	5 CCK
B25						
B26	981979	5 KW	6115X971148	Studebaker	1967	5 CCK
B27	981980	5 KW	6115X971148	Onan	1967	5 CCK
B28	981931	5 KW	6115X971148	Onan	1967	5 CCK
B29	981982	5 KW	6115X971148	Onan	1967	5 CCK
B30	981983	5 KW	6115X971148	Onan	1967	5 CCK
B31	981984	5 KW	6115X971148	Onan	1967	5 CCK
B32	981985	5 KW	6115X971148	Onan	1967	5 CCK
B33						
C01	FA651332	10 KW	61157928260	Fermont	1966	J109
C02						
C03	FA6500900	10 KW	61157928260	Fermont	1966	J109
C04	FA6403785	10 KW	61157928260	Fermont	1966	SF 10 MD
C05	FA650431	10 KW	61157928260	Fermont	1966	SF 10 MD
C06	FA651344	10 KW	61157928260	Fermont	1966	J109
C07	FA6403787	10 KW	6115798260	Fermont	1966	J109
C08						
C09	FA644076	10 KW	61157928260	Fermont	1966	J109
C10						
C11						
C12	FA6501339	10 KW	61157928260	Fermont	1966	J109
C13						
C14	FA651353	10 KW	61157928260	Fermont	1966	J109
C17	25301	10 KW	6115X976748	Marble Card	1947	J4
C18	26752	10 KW	6115X976748	Marble Card	1947	J4
C19	87C981576	10 KW	6115X971147	Studebaker	1967	10RJC4N4A
C20	87C981575	10 KW	6115X971147	Studebaker	1967	10RJC4N4A
D21	290243	25 KW	6115X971149	Kohler	1967	30R081
D22	290244	25 KW	6115X971149	Kohler	1967	30R081
D23	290245	25 KW	6115X971149	Kohler	1967	30R081
D24	290246	25 KW	6115X971149	Kohler	1967	30R081
D25	290247	25 KW	6115X971149	Kohler	1967	30R081
C26	FA6403805	10 KW	61157928260	Fermont	1966	J109
C27	FA6501340	10 KW	61157928260	Fermont	1966	J109
C21	87C981574	10 KW	6115X971147	Studebaker	1967	10RJC4N4A
C22	87C981577	10 KW	6115X971147	Studebaker	1967	10RJC4N4A
C23	87C981578	10 KW	6115X971147	Studebaker	1967	10RJC4N4A
C24	FA651376	10 KW	61157928260	Fermont	1966	J109
C25	FA6403781	10 KW	61157928260	Fermont	1966	J109
D26	290248	25 KW	6115X971149	Kholer	1967	30R081
D27	290249	25 KW	6115X971149	Kohler	1967	30R081
D28	HA3210212	25 KW	6115X971149	Kohler	1967	30R081
D29	290251	25 KW	6115X971149	Kohler	1967	30R081

GENERATOR ROSTER (Cont'd)

Bumper No.	Serial No.	Size	Stock No.	Make	Year	Model
D30	290252	25 KW	6115X971149	Kohler	1967	30R081
E01	27979A	60 KW	6115X971146	Stevens	1964	3400
E02	98285	60 KW	6115X971146	Gene Elect	1967	3400
E03	97979B	60 KW	6115X971146	Palmer Elect	1967	3400
E04	97225	60 KW	6115X971146	Electric Mach	1967	3400
E05	EA671026	60 KW	61159374388	Onan	1969	60 MD/CIED
F02	96840	100 KW	6115X971145	Allis Chalmers	1967	11000
F03	96666	100 KW	6115X971145	Allis Chalmers	1967	11000
F51	11	100 KW	61157983444	Detroit Diesel	1963	6910A
F54	19	100 KW	61157983444	Detroit Diesel	1966	6910A
F55	55	100 KW	61157983444	Detroit Diesel	1966	6910A
F56	46	100 KW	61157983444	Detroit Diesel	1966	6910A
F57	154	100 KW	61153C15761	Consolidated Diesel	1963	4180
F58	153	100 KW	61153015761	Consolidated Diesel	1963	4180
F60	418046	100 KW	61153015761	Consolidated Diesel	1963	4180
F01	98002	100 KW	6115X971145	Allis Chalmers	1967	11000
Total: 65						

APPENDIX G

Section 2
Letterkenny Army Depot, Pennsylvania

Serial No.	Make, Model	Description
A0S33		Lift off aerial bucket
A00S1		Truck, 4-Ton
Q0001	1964	Truck, Fork Lift, 2000 lb
Q0002	1964	Truck, Fork Lift, 2000 lb
Q0003	1964	Truck, Fork Lift, 2000 lb
Q0080	1953	Crane, Trk element, 6000 lb
Q0081	1966	Crane, Truck Fork, 10,000 lb
Q0082	1966	Crane, Truck Ford, 10,000 lb
Q0101	1962	Truck, Fork Lift, 4000 lb
Q0102	1962	Truck, Fork Lift, 4000 lb
Q0103	1962	Truck, Fork Lift, 4000 lb
Q0104	1962	Truck, Fork Lift, 4000 lb
Q0105	1962	Truck, Fork Lift, 4000 lb
Q0106	1970	Truck, Fork Lift, 4000 lb
Q0107	1970	Truck, Fork Lift, 4000 lb
Q0108	1960	Truck, Fork Lift, 4000 lb
Q0109	1965	Truck, Fork Lift, 4000 lb
Q0110	1965	Truck, Fork Lift, 4000 lb
Q0111	1965	Truck, Fork Lift, 4000 lb
Q0112	1965	Truck, Fork Lift, 4000 lb
Q0113	1964	Truck, Fork Lift, 4000 lb
Q0137	1965	Truck, Fork Lift, 4000 lb
Q0139	1965	Truck, Fork Lift, 4000 lb
Q0140	1965	Truck, Fork Lift, 4000 lb
Q0141	1954	Truck, Fork Lift, 4000 lb
Q0142	1965	Truck, Fork Lift, 4000 lb
Q0393	1971	Truck, Fork Lift, 4000 lb
Q0394	1971	Truck, Fork Lift, 4000 lb
Q0395	1971	Truck, Fork Lift, 4000 lb
Q0396	1971	Truck, Fork Lift, 4000 lb
Q0397	1971	Truck, Fork Lift, 4000 lb
Q0398	1971	Truck, Fork Lift, 4000 lb
Q0399	1971	Truck, Fork Lift, 4000 lb
Q0400	1971	Truck, Fork Lift, 4000 lb
Q0402	1971	Truck, Fork Lift, 4000 lb
Q0404	1964	Truck, Fork Lift, 4000 lb
Q0406	1971	Truck, Fork Lift, 4000 lb
Q0408	1971	Truck, Fork Lift, 4000 lb
Q0409	1958	Truck, Fork Lift, 4000 lb
Q0410	1971	Truck, Fork Lift, 4000 lb
Q0413	1971	Truck, Fork Lift, 4000 lb
Q0414	1964	Truck, Fork Lift, 4000 lb
Q0415	1971	Truck, Fork Lift, 4000 lb
Q0416	1971	Truck, Fork Lift, 4000 lb
Q0417	1971	Truck, Fork Lift, 4000 lb
Q0418	1971	Truck, Fork Lift, 4000 lb
Q0419	1971	Truck, Fork Lift, 4000 lb
Q0423	1971	Truck, Fork Lift, 4000 lb
Q0426	1964	Truck, Fork Lift, 4000 lb
Q0427	1971	Truck, Fork Lift, 4000 lb
Q0428	1958	Truck, Fork Lift, 4000 lb

Serial No.	Make, Model	Description
Q0431	1958	Truck, Fork Lift, 4000 lb
Q0435	1958	Truck, Fork Lift, 4000 lb
Q0438	1971	Truck, Fork Lift, 4000 lb
Q0440	1971	Truck, Fork Lift, 4000 lb
Q0441	1958	Truck, Fork Lift, 4000 lb
Q0443	1958	Truck, Fork Lift, 4000 lb
Q0444	1971	Truck, Fork Lift, 4000 lb
Q0445	1971	Truck, Fork Lift, 4000 lb
Q0448	1971	Truck, Fork Lift, 4000 lb
Q0457	1964	Truck, Fork Lift, 4000 lb
Q0458	1965	Truck, Fork Lift, 4000 lb
Q0459	1965	Truck, Fork Lift, 4000 lb
Q0460	1965	Truck, Fork Lift, 4000 lb
Q0461	1965	Truck, Fork Lift, 4000 lb
Q0462	1965	Truck, Fork Lift, 4000 lb
Q0463	1965	Truck, Fork Lift, 4000 lb
Q0464	1965	Truck, Fork Lift, 4000 lb
Q0465	1965	Truck, Fork Lift, 4000 lb
Q0466	1965	Truck, Fork Lift, 4000 lb
Q0467	1965	Truck, Fork Lift, 4000 lb
Q0468	1964	Truck, Fork Lift, 4000 lb
Q0469	1964	Truck, Fork Lift, 4000 lb
Q0470	1958	Truck, Fork Lift, 4000 lb
Q0471	1964	Truck, Fork Lift, 4000 lb
Q0472	1964	Truck, Fork Lift, 4000 lb
Q0473	1964	Truck, Fork Lift, 4000 lb
Q0474	1964	Truck, Fork Lift, 4000 lb
Q0475	1965	Truck, Fork Lift, 4000 lb
Q0476	1965	Truck, Fork Lift, 4000 lb
Q0484	1965	Truck, Fork Lift, 4000 lb
Q0485	1964	Truck, Fork Lift, 4000 lb
Q0486	1964	Truck, Fork Lift, 4000 lb
Q0487	1971	Truck, Fork Lift, 4000 lb
Q0488	1971	Truck, Fork Lift, 4000 lb
Q0489	1971	Truck, Fork Lift, 4000 lb
Q0490	1971	Truck, Fork Lift, 4000 lb
Q0491	1971	Truck, Fork Lift, 4000 lb
Q0492	1971	Truck, Fork Lift, 4000 lb
Q0493	1971	Truck, Fork Lift, 4000 lb
Q0494	1971	Truck, Fork Lift, 4000 lb
Q0495	1971	Truck, Fork Lift, 4000 lb
Q0496	1971	Truck, Fork Lift, 4000 lb
Q0497	1971	Truck, Fork Lift, 4000 lb
Q0498	1971	Truck, Fork Lift, 4000 lb
Q0499	1971	Truck, Fork Lift, 4000 lb
Q0501	1962	Truck, Fork Lift, 6000 lb
Q0502	1964	Truck, Fork Lift, 6000 lb
Q0503	1962	Truck, Fork Lift, 6000 lb
Q0504	1964	Truck, Fork Lift, 6000 lb
Q0505	1964	Truck, Fork Lift, 6000 lb
Q0506	1962	Truck, Fork Lift, 6000 lb

Serial No.	Make, Model		Description
Q0507		1962	Truck, Fork Lift, 6000 lb
Q0508		1964	Truck, Fork Lift, 6000 lb
Q0509		1964	Truck, Fork Lift, 6000 lb
Q0510		1964	Truck, Fork Lift, 6000 lb
Q0511		1962	Truck, Fork Lift, 6000 lb
Q0512		1962	Truck, Fork Lift, 6000 lb
Q0515		1964	Truck, Fork Lift, 6000 lb
Q0516		1964	Truck, Fork Lift, 6000 lb
Q0517		1964	Truck, Fork Lift, 6000 lb
Q0518		1964	Truck, Fork Lift, 6000 lb
Q0519		1964	Truck, Fork Lift, 6000 lb
Q0520		1964	Truck, Fork Lift, 6000 lb
Q0521		1964	Truck, Fork Lift, 6000 lb
Q0522		1964	Truck, Fork Lift, 6000 lb
Q0523		1964	Truck, Fork Lift, 6000 lb
Q0524		1964	Truck, Fork Lift, 6000 lb
Q0525		1964	Truck, Fork Lift, 6000 lb
Q0526		1964	Truck, Fork Lift, 6000 lb
Q0531		1965	Truck, Fork Lift, 6000 lb
Q0532		1965	Truck, Fork Lift, 6000 lb
Q0533		1965	Truck, Fork Lift, 6000 lb
0Q534		1965	Truck, Fork Lift, 6000 lb
Q0535		1965	Truck, Fork Lift, 6000 lb
Q0536		1965	Truck, Fork Lift, 6000 lb
Q0544		1962	Truck, Fork Lift, 6000 lb
Q0602	Minn Moline	1960	Tractor, Gas, 4000 lb
Q0603	"	1960	Tractor, Gas, 4000 lb
Q0604	"	1960	Tractor, Gas, 4000 lb
Q0605	"	1960	Tractor, Gas, 4000 lb
Q0606	"	1960	Tractor, Gas, 4000 lb
Q0607	"	1960	Tractor, Gas, 4000 lb
Q0615	"	1960	Tractor, Gas, 4000 lb
Q0616	"	1960	Tractor, Gas, 4000 lb
Q0617	"	1960	Tractor, Gas, 4000 lb
Q0618	"	1960	Tractor, Gas, 4000 lb
Q0619	"	1960	Tractor, Gas, 4000 lb
Q0621	"	1960	Tractor, Gas, 4000 lb
Q0622	"	1960	Tractor, Gas, 4000 lb
Q0624	"	1960	Tractor, Gas, 4000 lb
Q0625	"	1960	Tractor, Gas, 4000 lb
Q0627	"	1960	Tractor, Gas, 4000 lb
Q0628	"	1960	Tractor, Gas, 4000 lb
Q0629	"	1960	Tractor, Gas, 4000 lb
Q0632	"	1960	Tractor, Gas, 4000 lb
Q0633	"	1960	Tractor, Gas, 4000 lb
Q0636	"	1960	Tractor, Gas, 4000 lb
Q0650	"	1960	Tractor, Gas, 4000 lb
Q0700		1963	Truck, Fork, Gas, 15,000 lb
Q0701		1963	Truck, Fork, Gas, 15,000 lb
Q0702		1963	Truck, Fork, Gas, 15,000 lb

Serial No.	Make, Model		Description
Q0703		1963	Truck, Fork, Gas, 15,000 lb
Q0704		1963	Truck, Fork, Gas, 15,000 lb
Q0705		1963	Truck, Fork, Gas, 15,000 lb
Q0706		1963	Truck, Fork, Gas, 15,000 lb
Q0707		1963	Truck, Fork, Gas, 15,000 lb
Q0708		1963	Truck, Fork, Gas, 15,000 lb
Q0709		1963	Truck, Fork, Gas, 15,000 lb
Q0710		1963	Truck, Fork, Gas, 15,000 lb
Q0711		1963	Truck, Fork, Gas, 15,000 lb
Q0715		1958	Truck, Fork, Gas, 20,000 lb
AO782	Ford	1965	Truck, Tractor, 28,000 GVW
AO783	Ford	1965	Truck, Tractor, 28,000 GVW
AO787	IHC	1964	Truck, Tractor, 28,000 GVW
AO789	IHC	1964	Truck, Tractor, 28,000 GVW
AO791	Ford	1965	Truck, Tractor, 28,000 GVW
AO794	Ford	1965	Truck, Tractor, 28,000 GVW
AO796	Ford	1965	Truck, Tractor, 5-ton
AO798	IHC	1964	Truck, Tractor, 28,000 GVW
AO801	IHC	1972	Truck, Tractor, 39,500 GVW 6 X 4
AO854	IHC	1962	Truck, Dump, 41,980 GVW
AO856	IHC	1969	Truck, Dump, 28,000 GVW 4 X 2
AO857	IHC	1969	Truck, Dump, 28,000 GVW 4 X 2
AO863	IHC	1962	Truck, Dump, 41,980 GVW
AO866	IHC	1962	Truck, Dump, 24,000 GVW
AO867	IHC	1962	Truck, Dump, 24,000 GVW
AO869	IHC	1962	Truck, Dump, 24,000 GVW
AO873	IHC	1962	Truck, Dump, 24,000 GVW
AO874	IHC	1962	Truck, Dump, 24,000 GVW 4 X 2
A0878	IHC	1971	Truck, Dump, 28,000 GVW 4 X 2
A0879	IHC	1971	Truck, Dump, 28,000 GVW 4 X 2
A0880	IHC	1971	Truck, Dump, 28,000 GVW 4 X 2
AO881	IHC	1971	Truck, Dump, 28,000 GVW 4 X 2
AO884	IHC	1966	Truck, Dump, 28,000 GVW 4 X 2
AO891	Checker	1973	Bus, 12 Pax, 4 X 2, 7,680 GVW
AO892	Checker	1973	Bus, 12 Pax, 4 X 2, 5,300 GVW
AO895	Ford	1963	Bus, 20 Pax, 14,000 GVW
AO896	Dodge	1963	Bus, 20 Pax, 14,000 GVW
AO897	Dodge	1963	Bus, 20 Pax, 14,000 GVW
AO898	IHC	1972	Bus, 25 Pax, 19,460 GVW
AO899	Dodge	1963	Bus, 25 Pax, 19,460 GVW
AO900	IHC	1972	Bus, 25 Pax, 19,460 GVW
AO940	IHC	1963	Bus, Amb. 44 Pax, 30,000 GVW
AO942	IHC	1965	Bus, Amb. 44 Pax, 30,000 GVW
AO955	Scout	1970	Truck, 1/2-ton, 3,900 GVW
AO975	Dodge	1964	Truck, Cargo (4 X 4), 7,000 GVW
AO977	Dodge	1964	Truck, Cargo (4 X 4), 7,000 GVW
A1009	Dodge	1972	Truck, Carryall 8 Pax, 5,400 GVW
A1010	Dodge	1974	Truck, Carryall, 1/2-ton, 5,500 GVW
A1011	Dodge	1974	Truck, Carryall, 1/2-ton, 5,500 GVW
A1012	Chev	1974	Truck, Cargo, 1/2-ton, PU, 5,000 GVW

Serial No.	Make, Model		Description
A1013	Dodge	1974	Truck, Carryall, 1/2-ton, 5,500 GVW
A1014	Dodge	1974	Truck, Carryall, 1/2-ton, 5,500 GVW
A1015	Dodge	1974	Truck, Carryall, 1/2-ton, 5,500 GVW
A1016	Dodge	1974	Truck, Carryall, 1/2-ton, 5,500 GVW
A4001	INT	1962	Truck, Van Expan
A4002	REO	1964	Truck, Van Expan
A4004	REO	1964	Truck, Van Expan
A4005	REO	1965	Truck, Van Expan
A4006	INT	1962	Truck, Van Expan
A4007	REO	1964	Truck, Van Expan
A4008	INT	1962	Truck, Van Expan
A4009	REO	1964	Truck, Van Expan
A4010	REO	1964	Truck, Van Expan
A4011	REO	1964	Truck, Van Expan
A4012	REO	1964	Truck, Van Expan
A4013	INT	1962	Truck, Van Expan
A0052		1968	Truck, Telephone, 5800 GVW
A0053		1968	Truck, Telephone Maintenance, 5800 GVW
A0054		1968	Truck, Telephone Maintenance, 5800 GVW
A0055		1968	Truck, Telephone Maintenance, 5800 GVW
A0056	IHC	1974	Truck, Maintenance, 3/4-ton
A0001	Ford	1972	Sedan, 4-door, 8 cylinder
A0003	Ford	1972	Sedan, 4-door, 8 cylinder
A0004	GM	1973	Auto Sedan, 4 door, 8 cylinder
A0005	Ford	1972	Auto Sedan, 4-door, 8 cylinder
A0006	GM	1973	Auto Sedan, 4-door, 8 cylinder
A0007	GM	1973	Auto Sedan, 4 door, 8 cylinder
A0008	Ford	1972	Sedan, 4-door, 8 cylinder
A0009	Ford	1972	Sedan, 4-door, 8 cylinder
A0010	Ford	1972	Sedan, 4-door, 8 cylinder
A0015	Amer	1969	Sedan, 6 cylinder
A0021	Ford	1971	Sedan, 4-door, 8 cylinder
A0028	Amer	1969	Sedan, 6 cylinder
A0029	Ford	1970	Sedan, 4-door, 6 cylinder
A0030	Ford	1971	Sedan, 4-door, 8 cylinder
A0031	Ford	1971	Sedan, 4-door, 8 cylinder
A0032	Ford	1971	Sedan, 4-door, 8 cylinder
A0033	Ford	1971	Sedan, 4-door, 8 cylinder
A0034	Ford	1971	Sedan, 4-door, 8 cylinder
A0035	Ford	1971	Sedan, 4-door, 8 cylinder
A0037	Ford	1970	Sedan, 4-door, 6 cylinder
A0040	Ford	1971	Sedan, 4-door, 6 cylinder
A0041	Amer	1972	Sedan, 4-door, 8 cylinder
A0042	Amer	1972	Sedan, 4-door, 8 cylinder
A0043	Amer	1972	Sedan, 4-door, 8 cylinder
A0044	Amer	1972	Sedan, 4-door, 8 cylinder
A0045	Ford	1971	Sedan, 4-door, 8 cylinder
A0101	GMC	1971	Truck, Panel, 6100 GVW
A0102	Chyrs	1972	Truck, Panel, 5300 GVW
A0104	GM	1971	Truck, Panel, 6100 GVW
A0106	GM	1971	Truck, Panel, 6100 GVW

Serial No.	Make, Model		Description
A0108	GM	1971	Truck, Panel, 6100 GVW
A0109	GM	1971	Truck, Panel, 6100 GVW
A0110	Chrys	1970	Truck, Panel, 5200 GVW
A0120	Ford	1965	Truck, Cargo, 1-ton, PU, 7000 GVW
A0122	Ford	1965	Truck, Cargo, 1-ton, PU, 7000 GVW
A0126	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0127	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0128	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0131	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0132	Ford	1970	Truck, Cargo, PU, 5025 GVW
A0133	GM	1972	Truck, Cargo, PU, 5025 GVW
A0135	Dodge	1971	Truck, Cargo, PU, 4800 GVW
A0136	Dodge	1971	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0137	Dodge	1971	Truck, Cargo, PU, 4800 GVW
A0140	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0141	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0143	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0144	Dodge	1971	Truck, Cargo, PU, 4800 GVW
A0145	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0147	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0148	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0149	Dodge	1971	Truck, Cargo, PU, 4800 GVW
A0151	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0152	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0153	Dodge	1971	Truck, Cargo, PU, 4800 GVW
A0154	GM	1972	Truck, Cargo, PU, 5025 GVW
A0155	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0156	Chev	1975	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0157	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0158	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0159	Chev	1972	Truck, Cargo, PU, 5025 CVW
A0160	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0161	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0162	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0163	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0165	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0166	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0167	Ford	1970	Truck, cargo, PU, 5000 GVW
A0168	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0169	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0170	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0171	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0175	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0176	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0177	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0179	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0180	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0181	GM	1972	Truck, Cargo, PU, 5025 GVW
A0182	GM	1972	Truck, Cargo, PU, 5025 GVW
A0183	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0184	GM	1972	Truck, Cargo, PU, 5025 GVW

Serial No.	Make, Model		Description
A0186	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0187	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0188	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0189	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0191	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0192	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0193	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0194	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0195	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0196	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0197	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0198	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0199	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0200	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0201	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0203	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0204	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0205	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0206	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0207	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0208	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0209	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0210	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0211	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0212	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0213	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0214	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0215	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0216	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0217	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0220	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0222	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0223	Ford	1970	Truck, Cargo, PU, 4800 GVW
A0224	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0228	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0230	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0231	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0223	Ford	1970	Truck, Cargo, PU, 4800 GVW
A0224	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0228	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0230	Chev	1969	Truck, Cargo, PU, 4800 CVW
A0231	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0233	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0234	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0236	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0238	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0239	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0242	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0245	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0247	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0254	Ford	1970	Truck, Cargo, PU, 5000 GVW

Serial No.	Make, Model		Description
A0267	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0268	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0269	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0270	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0273	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0279	Amer	1970	Station Wagon
A0280	GMC	1973	Station Wagon, 3 seat
A0281	GMC	1973	Station Wagon, 3 seat
A0283	Ford	1971	Station Wagon, 3 seat
A0287	GMC	1973	Station Wagon, 3 seat
A0288	Amer	1970	Station Wagon
A0289	GMC	1973	Station Wagon, 3 seat
A0290	Amer	1970	Station Wagon
A0291	GMC	1971	Station Wagon, 3 seat
A0353	Dodge	1963	Truck, S–P, 19,000 GVW
A0450	Dodge	1965	Truck, Van, 16,000 GVW
A0451	Dodge	1965	Truck, Van, 16,000 GVW
A0453	Ford	1964	Truck, Van, 16,000 GVW
A0456	Dodge	1963	Truck, Van, Cargo, 16,000 GVW
A0458	Dodge	1970	Truck, 21,000 GVW
A0459	Dodge	1970	Truck, 21,000 GVW
A0460	Dodge	1970	Truck, 21,000 GVW
A0461	Dodge	1970	Truck, 21,000 GVW
A0462	Dodge	1970	Truck, 21,000 GVW
A0463	Dodge	1971	Truck, Van, 16,000 GVW
A0464	Dodge	1971	Truck, Van, 16,000 GVW
A0465	Dodge	1971	Truck, Van, 16,000 GVW
A0466	Dodge	1971	Truck, Van, 16,000 GVW
A0467	Dodge	1971	Truck, Van, 16,000 GVW
A0468	Dodge	1971	Truck, Van, 16,000 GVW
A0469	Dodge	1971	Truck, Van, 16,000 GVW
A0470	IHC	1972	Truck, Van, 19,000 GVW
A0471	IHC	1972	Truck, Van, 19,000 GVW
A0472	IHC	1972	Truck, Van, 19,000 GVW
A0473	IHC	1972	Truck, Van, 19,000 GVW
A0474	IHC	1972	Truck, Van, 19,000 GVW
A0475	IHC	1972	Truck, Van, 19,000 GVW
A0476	IHC	1972	Truck, Van, 19,000 GVW
A0477	IHC	1972	Truck, Van, 19,000 GVW
A0478	IHC	1972	Truck, Van, 19,000 GVW
A0479	IHC	1972	Truck, Van, 19,000 GVW
A0480	Chev	1972	Truck, Van, 19,000 GVW
A0481	IHC	1972	Truck, Van, 19,000 GVW
A0483	IHC	1972	Truck, Van, 19,000 GVW
A0484	IHC	1972	Truck, Van, 19,000 GVW
A0500	Dodge	1964	Truck, S + P (4 + 4), 19,000 GVW
A0501	Dodge	1964	Truck, S + P (4 + 4), 19,000 GVW
A0503	Dodge	1964	Truck, S + P (4 + 4), 19,000 GVW
A0504	Dodge	1964	Truck, S + P (4 + 4), 19,000 GVW
A0507	Dodge	1964	Truck, Tank Wtr (4 + 4), 19,000 GVW
A0509	Dodge	1964	Truck, Tank Wtr, (4 + 4), 19,000 GVW

Serial No.	Make, Model		Description
A0510	Dodge	1964	Truck, Tank Wtr, (4 + 4), 19 000 GVW
A0523	Ford	1968	Truck, S + P, 19,000 GVW
A0524	Chev	1966	Truck, S + P, W/C, 19,000 GVW
A0525	Chev	1967	Truck, S + P, 19,000 GVW
A0526	Ford	1968	Truck, S + P, 19,000 GVW
A0528	Chev	1967	Truck, S + P, 19,000 GVW
A0530	Chev	1967	Truck, S + P, 19,000 GVW
A0532	Ford	1965	Truck, S + P, 19,000 GVW
A0533	Ford	1968	Truck, S + P, 19,000 GVW
A0534	Ford	1968	Truck, S + P, 19,000 GVW
A0535	Chev	1967	Truck, S + P, 19,000 GVW
A0536	Ford	1965	Truck, S + P, 19,000 GVW
A0537	Chev	1966	Truck, S + P, 19,000 GVW
A0540	Chev	1966	Truck, S + P, 19,000 GVW
A0541	Ford	1968	Truck, S + P, 19,000 GVW
A0542	Chev	1967	Truck, S + P, 19,000 GVW
A0543	Chev	1966	Truck, S + P, 19,000 GVW
A0544	Ford	1965	Truck, S + P, 19,000 GVW
A0545	Chev	1967	Truck, S + P, 19,000 GVW
A0549	Ford	1968	Truck, S + P, 19,000 GVW
A0551	Chev	1966	Truck, S + P, 19,000 GVW
A0553	Chev	1966	Truck, S + P, 19,000 GVW
A0556	Ford	1965	Truck, S + P, 19,000 GVW
A0557	IHC	1972	Truck, S + P, 19,000 GVW
A0558	IHC	1972	Truck, S + P, 19,000 GVW
A0559	IHC	1972	Truck, S + P, 19,000 GVW
A0560	IHC	1972	Truck, S + P, 19,000 GVW
A0561	IHC	1972	Truck, S + P. 19,000 GVW
A0565	Chev	1972	Truck, S + P, 19,000 GVW
A0567	Chev	1967	Truck, S + P, 19,000 GVW
A0569	Chev	1966	Truck, S + P, 19,000 GVW
A0570	Chev	1966	Truck, S + P, 19,000 GVW
A0578	Chev	1967	Truck, S + P, 19,000 GVW
A0585	Chev	1966	Truck, S + P, 19,000 GVW
A0586	Chev	1967	Truck, S + P, 19,000 GVW
A0589	Ford	1968	Truck, S + P, 19,000 GVW
A0590	Ford	1965	Truck, S + P, 19,000 GVW
A0592	Ford	1965	Truck, S + P, 19,000 GVW
A0596	Chev	1967	Truck, S + P, 19,000 GVW
A0597	Chev	1967	Truck, S + P, 19,000 GVW
A0601	Ford	1967	Truck, Tank Gas, 19,000 GVW
A0602	Ford	1967	Truck, Tank Gas, 19,000 GVW
A0607	Ford	1967	Truck, Tank Gas, 19,000 GVW
A0610	Ford	1967	Truck, Tank Gas, 19,000 GVW
A0613	Dodge	1965	Truck, Tank Gas, 19,000 GVW
A0614	Dodge	1965	Truck, Tank Gas, 19,000 GVW
A0616	Dodge	1965	Truck, Tank Gas, 19,000 GVW
A0651	IHC	1965	Truck, Wrecker, 34,500 GVW
A0652	IHC	1965	Truck, Wrecker, 34,500 GVW
A0653	IHC	1965	Truck, Wrecker, 34,500 GVW
A0655	IHC	1965	Truck, Wrecker, 34,500 GVW

Serial No.	Make, Model		Description
A0659	IHC	1963	Truck, Wrecker, 34,500 GVW
A0633	IHC	1963	Truck, Wrecker, 34,500 GVW
A0670	IHC	1953	Truck, Wrecker, 36,000 GVW
A0715	IHC	1964	Truck, Tractor, 28,000 GVW
A0716	IHC	1970	Truck, Tractor, 28,000 GVW
A0717	IHC	1970	Truck, Tractor, 28,000 GVW
A0718	Ford	1967	Truck, Tractor, 28,000 GVW
A0719	Ford	1967	Truck, Tractor, 28,000 GVW
A0720	Ford	1967	Truck, Tractor, 28,000 GVW
A0721	Ford	1967	Truck, Tractor, 28,000 GVW
A0722	Ford	1967	Truck, Tractor, 28,000 GVW
A0727	Ford	1967	Truck, Tractor, 28,000 GVW
A0728	Ford	1967	Truck, Tractor, 28,000 GVW
A0730	Ford	1967	Truck, Tractor, 28,000 GVW
A0735	Ford	1967	Truck, Tractor, 28,000 GVW
A0742	Ford	1967	Truck, Tractor, 28,000 GVW
A0745	Ford	1967	Truck, Tractor, 28,000 GVW
A0747	Ford	1967	Truck, Tractor, 28,000 GVW
A0748	Ford	1967	Truck, Tractor, 28,000 GVW
A0750	Ford	1967	Truck, Tractor, 28,000 GVW
A0751	Ford	1967	Truck, Tractor, 28,000 GVW
A0754	Ford	1967	Truck, Tractor, 28,000 GVW
A0756	Ford	1967	Truck, Tractor, 28,000 GVW
A0757	Ford	1967	Truck, Tractor, 28,000 GVW
A0758	Ford	1967	Truck, Tractor, 28,000 GVW
A0759	Ford	1967	Truck, Tractor, 28,000 GVW
A0765	Ford	1967	Truck, Tractor, 28,000 GVW
A0769	Ford	1967	Truck, Tractor, 28,000 GVW
A0770	Ford	1967	Truck, Tractor, 28,000 GVW
A0773	Ford	1965	Truck, Tractor, 28,000 GVW
A0774	Ford	1965	Truck, Tractor, 28,000 GVW
A0775	Ford	1965	Truck, Tractor, 28,000 GVW
A0780	Ford	1965	Truck, Tractor, 28,000 GVW
Q0900		1972	Transporter
ED006		1961	Tractor, wheeled industrial
ED011		1971	Kettle, heat, bituminus
ED015		1970	Saw, demo, concrete
ED016		1965	Chipper, wood
ED021		1967	Tamper, buckfill
ED025		1971	Generator, 10KW
ED026		1970	Crane, Shovel, Truck, 20-ton
ED031		1951	Sprayer, insecticide
ED034		1942	Shredder, mech.
ED039		1970	Snow plow
ED040		1967	Generator 30KW
ED041		1963	Snow plow
ED042		1963	Snow plow
ED046		1959	Mixer, concrete
ED047		1973	Saw, masonry disk

Serial No.	Make, Model		Description
ED060		1973	SOD Cutter, 8 hp
ED062		1968	Sweeper, SP. vac
ED069		1971	Mower, riding
ED086		1958	Welder, 3KW
ED092		1972	Tractor, Agr. w/sickle bar
ED098		1972	Tractor, Agr. w/sickle bar
ED113		1972	Tractor, Agr. w/sickle bar
ED116		1968	Auger, earth
ED119		1965	Saw, chain
ED130		1948	Snow removal unit
ED139		1972	Tractor, Agr. w/sickle bar
ED140		1972	Tractor, Agr. w/sickle bar
ED151		1962	Generator, 15KW
ED159		1972	Tractor, Agr. w/sickle bar
ED160	Massey		
	Ferguson	1972	Tractor, Agr.
ED161	"	1972	Tractor, Agr.
ED162		1958	Generator, 15KW
ED164		1968	Welder
ED173	Massey		
	Ferguson	1972	Tractor, Agr.
ED175	"	1972	Tractor, Agr.
ED176	"	1972	Tractor, Agr.
ED177	"	1972	Tractor, Agr.
ED180	"	1971	Sweeper
ED186		1967	Pump, Rec. power
ED187		1971	Spreader, cinder
ED188		1971	Spreader, cinder
ED192	IHC	1969	Tractor, Agr.
ED193	IHC	1969	Tractor, Agr.
ED194		1971	Welder, 300 Amp
ED195		1970	Generator, 5KW
ED221		1953	Welder, 300 Amp
ED229		1962	Generator, 10KW
ED239	Jacobson	1963	Tractor, Agr.
ED244		1952	Roller, 58-ton
ED247	Jacobson	1968	Tractor, Agr.
ED250	Ford	1967	Tractor, Agr.
ED251		1967	Roller, 10—20 ton
ED264	IHC	1965	Tractor, Agr.
ED277		1951	Locomotive Spotter
ED284			Kettle, heating
ED289		1969	Excavator Truck
ED290		1969	Excavator Truck
ED311		1972	Spider, Tie
EO067		1970	Sweeper
EO069		1955	Sweeper
EO070		1970	Sweeper
EO071		1965	Sweeper
EO072		1970	Sweeper
EO073		1970	Sweeper

Serial No.	Make, Model		Description
EO074		1970	Sweeper
EO197		1971	Welder, 300 Amp
EO230		1968	Generator, 30KW
EO231		1968	Generator, 30KW
EO307		1959	Generator, 10KW
EO310		1959	Generator, 10KW
EO311		1959	Generator, 10KW
EO313		1959	Generator, 10KW
EO315		1959	Generator, 10KW
EO316		1959	Generator, 10KW
EO317		1959	Generator, 10KW
EO322		1959	Generator, 10KW
EO327		1962	Generator, 10KW
EO328		1962	Generator, 10KW
EO370		1970	Crane, Shovel, Truck, 20-ton
EO372		1959	Crane, Shovel, Truck, 20-ton
EO440		1962	Compressor, Rotary
EO441		1962	Compressor, Rotary
EO444		1962	Compressor, Rotary
EO445		1962	Compressor, Rotary
EO446		1962	Compressor, Rotary
EO855		1959	Crane, Shovel, Truck, 20-ton
EO858		1959	Crane, Shovel, Truck, 20-ton
EO901		1971	Tractor, wheeled, lawn, 12 hp
EO902	Minn Moline	1958	Tractor, Agr.
E1140		1961	Crane, Shovel, Truck, 20-ton
E1141		1961	Crane, Shovel, Truck, 20-ton
E1313		1959	Welder, MAC, ARC
E1318		1952	Welder, 300 Amp
E355A		1962	Generator, 7.5KW
E453A		1966	Compressor, 8CFM

APPENDIX G

Section 3
Fort Eustis, Virginia

PRECEDING PAGE BLANK-NOT FILMED

TMP COMMERCIAL VEHICLES

ACVC	MANUFACTURER	YR	QUANTITY
	(1) Auto Ambulance		LIN No. B04294
1A0104	GMC (Oldsmobile)	73	1
1A0101	GMC (Oldsmobile)	71	3
	(2) Sedan		LIN No. B04715
1B0202	AMC	69	11
	Ford	70	14
	Ford	68	2
1B0203	AMC	72	11
	Ford	72	5
	GMC (Chevrolet)	73	8
1B0203	Ford	71	10
	(3) Auto S/W		
1C0302	GMC (Chevrolet)	73	1
	AMC	67	3
	Ford	71	2
	(4) Bus Motor		LIN No. C39696
1D0471	Checker	69	1
	Checker	73	1
1D0427	INTH	68	3
	(5) Bus Motor		LIN No. C39696
1D0426	INTH	69	2
1D0412	INTH	68	4
1D0426	INTH	70	1
	(6) Truck, Ambulance		LIN No. X38695
1H0102	Dodge	73	1
	(7) Truck, Van		LIN NO. X38365
1H0102	Dodge	72	2
	Dodge	69	1
1H0103	INTH	73	1
	(8) Truck, Cargo		LIN NO. X39598
1T1203	GMC (Chevrolet)	72	16
	GMC (Chevrolet)	74	31
	GMC (Chevrolet)	66	2
	Dodge	71	4
	GMC (Chevrolet)	69	6
	Ford	70	28
	(9) Truck, Cargo		LIN NO. X39893
1T2203	INTH	74	1
1T2204	Dodge	70	2

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OCT 76 J D TOSH DAAK02-75-C-0082
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TMP COMMERCIAL VEHICLES (Cont'd)

ACVC	MANUFACTURER	YR	QUANTITY
	(10) Truck, C/A		LIN NO. X42064
1J1101	Ford	66	4
	Ford	65	1
	Dodge	68	4
1J1103	Dodge	69	3
	Dodge	71	1
1J1104	Dodge	72	4
	Dodge	74	1
	Ford*	75	8
	(11) Truck, Dump		LIN NO. X43589
1K1551	Ford	65	2
1K1553	INTH	70	2
	(12) Truck, Multi-Step Delivery		
1L1352	GMC (Chevrolet)	74	8
	(13) Truck, Panel		
1M1155	Dodge	72	5
	Dodge	70	1
	(14) Truck, Panel		
1M1151	Ford	65	1
	Ford	66	1
	Ford	67	3
	(15) Truck, Stake		
101301	INTH	74	4
	Dodge	70	1
	Ford	66	13
	GMC (Chevrolet)	67	3
101304	Dodge	69	4
	INTH	70	15
	(16) Truck Tanker		
1P1651	Dodge	70	1
	Ford	64	1
1P1653	Ford	67	1
	GMC (Chevrolet)	66	1
1P3652	INTH	63	1
	INTH	65	4
	(17) Truck, Tractor		
1Q1504	Ford	67	5
	Ford	65	2
	INTH	64	1
	INTH	70	3
	INTH	66	5

TMP COMMERCIAL VEHICLES (Cont'd)

ACVA	MANUFACTURER	YR	QUANTITY
	(18) Truck, Utility		
1R70501	Jeep	73	5
	Jeep	72	2
	INTH	70	2
	(19) Truck, Van Cargo		
1S1401	INTH	71	3
	Dodge	67	3
	Dodge	70	2
1S1402	INTH	71	1
	(20) Truck, Wrecker		
1T3602	INTH	66	1
	INTH	65	1

INVENTORY POST ENG

ACVC	MANUFACTURER	YR	QUANTITY
	(1) Trk, 3/4 ton, Maint Utility		
	INTH	74	45
	INTH	72	15
	Dodge	70	29
	(2) Trk, Line Maint		
	Ford 1 ton	68	1
	INTH 2½ ton	67	1
	INTH 5 ton	73	1
	(3) Trk, Dump 5 ton		
	INTH	65	2
	INTH	69	1
	(4) Trk, Maint Utility		
	Ford, 1½ ton	67	1
	Ford, 2½ ton	68	1

504TH MP'S

ACVC	MANUFACTURER	YR	QUANTITY
1M1156	Dodge	74	1
111203	GMC (Chevrolet)	74	1
1B0203	Ford	73	3
1B0203	Ford	72	8
1B0203	Ford	71	11
1B0203	AMC Rambler	72	1

EQUIPMENT LIST

Type Equipment	Quantity
Air Compressor	30
Generators:	
1.5 to 25 kw (150 1.5 to 5.0)	162
Portable Heaters (400,000 BTU Units)	7
Tank & Pump Units (600 gal tank w/liquid pumps)	14
Welders (Portable)	13
Warehouse Tractors (Tugs)	20
Forklifts (2000 to 15,000 lbs)	115
Pumps (Liquid)	22
Lubrication servicing units (Portable)	1
Cranes	4
Insecticide Sprayer	1
Hydraulic Test Stand	9
Lawn Mowers	225
Outboard Motors	41
Industrial Tractors	29
Escalators (Road equipment)	2
Road Rollers	1
Road Sweepers	2
Vac-all	2

TACTICAL VEHICLES

All tactical vehicles at Ft. Eustis are assigned to the 7th Group. There are 178 vehicles, a breakdown by vehicle type and model is as follows:

Truck, Utility 1/4-ton M151	10
Truck, Utility 1/4-ton M151A1	82
Truck, Utility 1/4-ton M151A2	55
Truck, 3/4-ton, M37D1	7
Truck, 5/4-ton, M715	–
Total	178

APPENDIX G

Section 4
Fort Carson, Colorado

ADMINISTRATIVE VEHICLES

Nomenclature	Make	Year	Number on hand
Auto, Sedan	Chevrolet	1966	1
Auto, Sedan	Chevrolet	1967	5
Auto, Sedan	Ford	1968	1
Auto, Sedan	AMC	1969	1
Auto, Sedan	Ford	1970	5
Auto, Sedan	AMC	1970	2
Auto, Sedan	Ford	1971	18
Auto, Sedan	Ford	1972	18
Auto, Sedan	Chevrolet	1973	28
Auto, Station Wagon	AMC	1969	2
Auto, Station Wagon	AMC	1970	1
Auto, Station Wagon	Ford	1971	1
Bus, 12 & 25 Pax	Ford	1962	1
Bus, 12 & 25 Pax	Ford	1963	5
Bus, 12 & 25 Pax	Dodge	1963	5
Bus, 12 & 25 Pax	Chevrolet	1965	1
Bus, 12 & 25 Pax	IHC	1968	2
Bus, 12 & 25 Pax	Ford	1971	1
Bus, 12 & 25 Pax	IHC	1971	2
Bus, 12 & 25 Pax	IHC	1972	1
Bus, 12 & 25 Pax	Ford	1974	2
Truck, Ambulance, Van	GMC	1968	4
Truck, Ambulance, Van	Dodge	1969	2
Truck, Ambulance, Van	Dodge	1972	5
Truck, Ambulance, Van	Dodge	1973	3
Truck, Ambulance, Van	GMC	1973	1
Truck, Ambulance, Van	Chevrolet	1973	1
Truck, Pickup 1/2-Ton	Dodge	1964	9
Truck, Pickup 1/2-Ton	Dodge	1965	1
Truck, Pickup 1/2-Ton	Ford	1965	17
Truck, Pickup 1/2-Ton	Chevrolet	1966	17
Truck, Pickup 1/2-Ton	Chevrolet	1968	6
Truck, Pickup 1/2-Ton	Chevrolet	1969	3
Truck, Pickup 1/2-Ton	Ford	1970	31
Truck, Pickup 1/2-Ton	Dodge	1971	11
Truck, Pickup 1/2-Ton	Chevrolet	1972	29
Truck, Pickup 1/2-Ton	Chevrolet	1974	33
Truck, Pickup 1/2-Ton	Dodge	1975	5
Truck, Cargo 1-Ton	Dodge	1965	3
Truck, Cargo 1-Ton	Dodge	1966	6
Truck, Cargo 1-Ton	Dodge	1968	2
Truck, Cargo 1-Ton	Dodge	1970	2

ADMINISTRATIVE VEHICLES (Cont'd)

Nomenclature	Make	Year	Number on hand
Truck, Cargo, Stake, 1-Ton	Ford	1966	4
Truck, Cargo, Stake, 1-Ton	Dodge	1972	8
Truck, Carryall, 1/2-Ton	Ford	1965	3
Truck, Carryall, 1/2-Ton	Ford	1966	1
Truck, Carryall, 1/2-Ton	Ford	1967	1
Truck, Carryall, 1/2-Ton	Dodge	1968	1
Truck, Carryall, 1/2-Ton	Chevrolet	1969	1
Truck, Carryall, 1/2-Ton	Dodge	1969	1
Truck, Carryall, 1/2-Ton	Chevrolet	1971	2
Truck, Carryall, 1/2-Ton	Dodge	1971	1
Truck, Carryall, 1/2-Ton	Dodge	1972	13
Truck, Carryall, 1/2-Ton	Dodge	1974	10
Truck, Carryall, 1/2-Ton	Ford	1974	5
Truck, Panel	Ford	1965	1
Truck, Panel	IHC	1968	1
Truck, Panel	Dodge	1969	2
Truck, Panel	Chevrolet	1971	1
Truck, Panel	Dodge	1972	5
Truck, Panel	Dodge	1974	2
Truck, Multi-Delivery	Chevrolet	1966	1
Truck, Multi-Delivery	Chevrolet	1972	2
Truck, Multi-Delivery	Chevrolet	1974	3
Truck, Utility, 1/2-Ton	IHC	1970	6
Truck, Utility, 1/2-Ton	AMC Jeep	1972	1
Truck, Utility, 1/2-Ton	AMC Jeep	1973	3
Truck, Ref, Van and Truck, Tanker	Ford	1963	2
Truck, Ref, Van and Truck, Tanker	Ford	1964	2
Truck, Ref, Van and Truck, Tanker	Chevrolet	1965	4
Truck, Ref, Van and Truck, Tanker	Ford	1966	1
Truck, Ref, Van and Truck, Tanker	Ford	1968	2
Truck, Ref, Van and Truck, Tanker	Chevrolet	1969	3
Truck, Ref, Van and Truck, Tanker	Dodge	1970	1
Truck, Ref, Van and Truck, Tanker	Dodge	1972	1
Truck, Ref, Van and Truck, Tanker	GMC	1975	1
Truck, Stake and Van, 4-5 Ton	Dodge	1963	3
Truck, Stake and Van, 4-5 Ton	Ford	1964	1
Truck, Stake and Van, 4-5 Ton	Ford	1965	2
Truck, Stake and Van, 4-5 Ton	Chevrolet	1966	1
Truck, Stake and Van, 4-5 Ton	Ford	1967	4
Truck, Stake and Van, 4-5 Ton	Chevrolet	1967	5
Truck, Stake and Van, 4-5 Ton	Dodge	1967	6

ADMINISTRATIVE VEHICLES (Cont'd)

Nomenclature	Make	Year	Number on hand
Truck, Stake and Van, 4-5 Ton	IHC	1970	5
Truck, Stake and Van, 4-5 Ton	IHC	1972	3
Truck, Stake and Van, 4-5 Ton	IHC	1975	1
Truck, Dump, Tractor, Wrecker, S & P, 5-10-Ton	IHC	1963	1
Truck, Dump, Tractor, Wrecker, S & P, 5-10-Ton	IHC	1964	3
Truck, Dump, Tractor, Wrecker, S & P, 5-10-Ton	IHC	1965	1
Truck, Dump, Tractor, Wrecker, S & P, 5-10-Ton	Ford	1965	2
Truck, Dump, Tractor, Wrecker, S & P, 5-10-Ton	IHC	1966	7
Truck, Dump, Tractor, Wrecker, S & P, 5-10-Ton	IHC	1967	2
Truck, Dump, Tractor, Wrecker, S & P, 5-10-Ton	Ford	1968	2
Truck, Dump, Tractor, Wrecker, S & P, 5-10-Ton	IHC	1970	10
Truck, Dump, Tractor, Wrecker, S & P, 5-10-Ton	IHC	1971	4
Scooter, 3-Wheel, Gas Driven	Cushman	1970	3
Scooter, 3-Wheel, Gas Driven	Cushman	1971	2
Scooter, 3-Wheel, Gas Driven	West Coaster	1972	3
Scooter, 3-Wheel, Gas Driven	Cushman	1973	3
Scooter, 3-Wheel, Gas Driven	OMC Link	1974	9

Numerous items such as lawn mowers, industrial tractors, generators, etc.

Lists for Engineer and Material Handling Equipment not available.

Note: The above listing does not include the 19th Military Police, Civil Engineer, and three other Investigative Agency vehicles on Post.

TACTICAL VEHICLES

Nomenclature	Number on hand
Truck, Utility, 1/4-Ton, M151 Series	816
Truck, Utility, 1-1/4-Ton, M715 Series (Amb. Included)*	204
Truck, M-43	1

COMBAT VEHICLES

Carrier, Armored, M113†	26
Carrier, Armored, M114†	3
Recovery Vehicle, Tank (Med), M88	29

*Most M715 Series vehicles have been replaced throughout the program with commercial design vehicles.
†The M113 and M114 Series vehicles are undergoing dieselization, therefore most gasoline-powered vehicles were replaced during the course of this evaluation.

APPENDIX G

Section 5
Fort Lewis, Washington

MOTOR TRANSPORT BRANCH
Fort Lewis, Washington 98433

LISTING OF COMMERCIAL DESIGN VEHICLES BY YEAR AND MAKE

Sedans

19	1969 American Motors
1	1970 American Motors
23	1972 American Motors
6	1970 Ford
33	1971 Ford
25	1972 Ford
26	1973 Chevrolet

12 Pax Bus

1	1971 Ford
1	1971 Checker
2	1974 Ford

20 Pax Bus

1	1963 Ford
1	1963 Dodge

29 Pax Bus

2	1967 IHC

25 Pax Bus

14	1972 IHC
3	1975 IHC

1/2 Ton Pickups

1	1968 Chevrolet
2	1969 Chevrolet
66	1970 Ford
23	1971 Dodge
40	1972 Chevrolet
72	1974 Chevrolet

Carryalls

6	1970 Chevrolet
1	1970 GMC
31	1971 Dodge
11	1972 Dodge
3	1974 Dodge
3	1974 Ford
1	1974 Chrysler

44 Pax Bus

4	1965 GMC
1	1966 GMC
3	1967 GMC
2	1969 GMC
6	1970 GMC
9	1971 GMC

Station Wagons

7	1969 American Motors
3	1970 American Motors
5	1971 Ford

AMB Metro

3	1971 Oldsmobile
1	1971 Oldsmobile

AMB Conversion

33	1969 Dodge
2	1970 Dodge
8	1972 Dodge
2	1973 Dodge
1	1973 GMC

AMB Field

7	1972 IHC

Utility

7	1967 Ford
6	1969 IHC
14	1970 IHC
17	1970 Jeep
3	1971 IHC
1	1971 Jeep
2	1971 Chrysler
1	1971 Dodge
1	1972 AMC
2	1973 Jeep
1	1973 IHC
1	1974 Chevrolet
2	1974 Chrysler
10	1975 Jeep

LISTING OF COMMERCIAL DESIGN VEHICLES BY YEAR AND MAKE (Cont'd)

Panels

3	1967 Ford
3	1969 Dodge
6	1971 Dodge
6	1972 Dodge
1	1972 Chrysler
12	1974 Dodge

Multi-Stop

3	1966 Chevrolet
4	1971 Dodge
1	1972 Chevrolet
1	1974 Chevrolet

1 Ton Stake 4 X 2

2	1966 Ford
44	1967 Chevrolet
9	1967 Dodge
7	1969 Chevrolet
3	1970 Dodge
15	1970 Ford
4	1972 Chevrolet
4	1972 Dodge
2	1972 GMC
6	1974 IHC

5 Ton Tractor

1	1966 IHC
40	1967 Ford

10 Ton Tractor

1	1967 IHC
1	1967 GMC

5 Ton Stake

22	1967 Ford
12	1968 Ford
13	1969 Dodge
1	1972 IHC

1000 Water Tanker

1	1967 Dodge

1 Ton Cargo 4 X 4

8	1968 Dodge

1 Ton Cargo 4 X 2

7	1965 Dodge

1-1/2 Ton Van Truck

4	1965 Dodge
5	1966 Chevrolet
5	1967 Chevrolet
1	1967 Ford
13	1967 Dodge
12	1970 Dodge
3	1971 Dodge
16	1971 IHC
3	1974 GMC
10	1975 IHC

Dump Truck

3	1963 IHC
1	1963 Ford
1	1964 IHC
2	1969 IHC

TRLR–10 to 15 Ton

1	1963 Spencer
2	1964 Miller
1	1968 Troyler

TRLR–20 Ton Stake

4	1969 Rogers

TRLR, Van 10-15 Ton

1	1969 Stoughton
1	1970 Stoughton
9	1972 Stoughton

Lowboy 25 Ton

1	1964 Transport
1	1965 Lacross
1	1967 Rogers Brothers

LISTING OF COMMERCIAL DESIGN VEHICLES BY YEAR AND MAKE (Cont'd)

12000 Gal. Tanker (Gas)

1	1966 Ford
3	1967 Ford
1	1974 IHC

2400 Gal. Tanker (Gas)

7	1964 IHC

Wrecker (10 Ton)

1	1963 IHC
3	1965 IHC

5 Ton Wrecker

1	1966 Ford
1	1967 Chevrolet

Refer Van

2	1970 Miller

Personnel Vans

1	1963 Southern Coach
13	1970 Miller
7	1970 Stoughton
1	1971 Stoughton

Motorcycle

2	1969 Harley Davidson
2	1971 Harley Davidson
3	1975 Harley Davidson

Scooter

1	1971 Cushman
1	1973 Cushman

Model	Nomenclature		No. of Vehicles
	1/4 Ton		
M38A1	Trk Utility		1
M151A1	Trk Utility		170
M151A1C	Trk Utility		20
M151A2	Trk Utility		667
M718	Trk Ambulance		3
M825	Trk Utility		43
		Sub Total	904
	1-1/4 Ton		
M715	Trk Cargo		328
M715 WW	Trk Cargo		89
XM726 WW	Trk Maint		11
M725	Trk Ambulance		33
		Sub Total	461
	2-1/2 Ton		
V17AMTQW WW	Trk Maint		6
M49C	Trk Tanker		12
		Sub Total	18

LISTING OF COMMERCIAL DESIGN VEHICLES BY YEAR AND MAKE (Cont'd)

Model	Nomenclature		No. of Vehicles
	5 Ton		
M246 WW	Trk Wrecker		3
M139	Trk Bridge Trans		9
M54WW	Trk Cargo		3
M543 WW	Trk Wrecker		5
		Sub Total	20
	Combat		
M88	Tank Recovery Vehicle		14
		Sub Total	14
	Other Equipment		
B 01756	Auger Skid M & D		1
F 39241	Crane Rt 5 Ton		2
F 39328	Crane Rt 20 Ton		11
F 43364	Crane 12 Ton 22 MB		2
F 43414	Crane 20 Ton		5
F 49399	Crusher SCR 75 Ton		2
F 81880	Decon App. M12A1		2
G 28212	Dist Water M15		9
G 29945	Ditching Machine		2
J 35414	Gen Set PU 401M		2
J 35424	Gen Set PU 402M		2
J 35561	Gen Set PU 407M		7
J 35869	Gen Set 10 KW		10
J 36383	Gen Set PU 406 A M		2
J 37205	Gen Set PU 551 M		2
J 38369	Gen Set 60 DG		1
J 41931	Gen Set PU 620		1
J 47480	Gen Set PU 618 M		5
J 49809	Gen Set PU 332 A/G		31
J 35414	Gen Set PU 401 (Trl Med)		2
J 35835	Gen Set G113 (Trl Mtd)		4
J 36109	Gen Set 301 AC (Trl Mtd)		1
J 36304	Gen Set 301 AC (Trl Mtd)		4
J 36383	Gen Set 406 M (Trl Mtd)		7
J 36725	Gen Set 52300 (Trl Mtd)		1
J 38301	Gen Set 60 DGF (Trl Mtd)		3
J 41178	Gen Set PU 564 A/C		1
J 41452	Gen Set PU 304 (Trl Mtd)		3
J 41589	Gen Set PU 322 (Trl Mtd)		2
J 41786	Gen Set PU 332 A/C (Trl Mtd)		5
		Sub Total	132

LISTING OF COMMERCIAL DESIGN VEHICLES BY YEAR AND MAKE (Cont'd)

Model	Nomenclature	No. of Vehicles
	Other Equipment (Cont'd)	
J 41819	Gen Set PU 375 BG (Trl Mtd)	1
J 42100	Gen Set PU 619 M (Trl Mtd)	31
J 46252	Gen Set PU 625 G (Trl Mtd)	39
J 46258	Gen Set PU 628 G (Tel Mtd)	20
J 46384	Gen Set PU 617 M (Trl Mtd)	29
J 47617	Gen Set PU 618 M (Trl Mtd)	19
J 47617	Gen Set PU 620 M (Trl Mtd)	34
J 49946	Gen Set PU 564 A/G (Trl Mtd)	12
J 74852	Grader 440Ha	1
L 85420	Lub & Svc Unit Eng 3	1
T 10138	Shop Equip Contract Maint (Mtd)	11
Y 48323	Welding Set Trlr Mtd	2
K 25205	Heater Hot Oil (Trl Mtd)	1
L 85283	Lub & Svc Unit Eng 3	4
L 85420	Lub & Svc Unit Eng 3	8
T 10138	Shop Set Contract Maint	10
U 12063	Spreader Aggregate	5
U 76871	Sweeper Towed	1
V 19950	Tank Liquid Trlr Mtd	27
V 27070	Target Towing M93	7
	Sub Total	395
	Grand Total	**1798**

APPENDIX G

Section 6
Ft. Riley, Kansas

ADMINISTRATIVE VEHICLES

Nomenclature	Make	Year	Number on hand
Auto, Ambul, Metro	Oldsmobile	1973	2
Auto, Ambul, Metro	Oldsmobile	1971	1
Auto, Sedan	Chevrolet	1973	17
Auto, Sedan	American Motors	1972	3
Auto, Sedan	Ford	1972	11
Auto, Sedan	Falcon	1970	7
Auto, Sedan	American Motors	1969	2
Auto, Sedan	American Motors	1970	9
Auto, Sedan	Falcon	1971	23
Auto, Sedan	Ford	1968	1
Auto, S/W	Chevrolet	1973	1
Auto, S/W	American Motors	1969	1
Auto, S/W	American Motors	1970	1
Bus, 12-Passenger	Ford	1971	1
Bus, 25-Passenger	IHC	1972	2
Bus, 25-Passenger	IHC	1970	7
Bus, 25-Passenger	IHC	1968	2
Bus, 29-Passenger	IHC	1967	4
Scooter, Mtr, 3-wheel	Cushman	1970	18
Semi-trailer, Ref, 12-Ton	Copco	1972	3
Truck, Ambul, Conver	Chevrolet	1973	4
Truck, Ambul, Conver	Dodge	1973	4
Truck, Ambul, Conver	IHC	1967	1
Truck, Cargo, 1/2-Ton	Chevrolet	1974	42
Truck, Cargo, 1/2-Ton	Chevrolet	1972	24
Truck, Cargo, 1/2-Ton	Dodge	1971	8
Truck, Cargo, 1/2-Ton	Ford	1970	20
Truck, Cargo, 1/2-Ton	Chevrolet	1969	16
Truck, Cargo, 1-Ton	IHC	1974	2
Truck, Cargo, 1-Ton	Dodge	1968	3
Truck, C/A, 1/2-Ton	Ford	1967	1
Truck, C/A, 1/2-Ton	Dodge	1972	21
Truck, C/A, 1/2-Ton	Ford	1974	2
Truck, Dump, 24000 GVW	Ford	1963	1
Truck, Dump, 28000 GVW	GMC	1970	4
Truck, Dump, 28000 GVW	IHC	1969	1

ADMINISTRATIVE VEHICLES (Cont'd)

Nomenclature	Make	Year	Number on hand
Truck, M/Stop	Chevrolet	1974	1
Truck, M/Stop	Chevrolet	1972	1
Truck, M/Stop	Dodge	1971	2
Truck, M/Stop	Chevrolet	1969	1
Truck, Panel	Ford	1967	1
Truck, Panel	Dodge	1969	2
Truck, Panel	Dodge	1972	8
Truck, Panel	Dodge	1974	2
Truck, Ref, Van	GMC	1975	1
Truck, Stk, 1-Ton	IHC	1974	11
Truck, Stk, 1-Ton	Dodge	1969	9
Truck, Stk, 5-Ton	Dodge	1969	1
Truck, Stk, 5-Ton	Ford	1967	8
Truck, Stk, 5-Ton	IHC	1970	9
Truck, Tank, Fuel, 1200 Gal	IHC	1968	2
Truck, Tank, Gas, 1200 Gal	Ford	1967	1
Truck, Tank, Refuel, 2400 Gal	IHC	1964	3
Truck, Tractor, 24000 GVW	IHC	1966	1
Truck, Tractor, 28000 GVW	IHC	1966	4
Truck, Tractor, 28000 GVW	Ford	1968	3
Truck, Tractor, 28000 GVW	IHC	1970	1
Truck, Tractor, 6 × 4	IHC	1964	1
Truck, Utility, 1/2-Ton	IHC	1970	1
Truck, Van, 16000 GVW	IHC	1975	4
Truck, Van, 4-1/2-Ton	IHC	1972	5
Truck, Van, 4-1/2-Ton	Dodge	1970	2
Truck, Van, 4-1/2-Ton	Dodge	1967	3
Truck, Wrecker, 34500 GVS	Ford	1964	1
		Grand Total	**359**

TACTICAL & COMBAT VEHICLES

Nomenclature		Number on hand
Wheeled Vehicles		
Trk. Utl. 1/4-Ton M151 Series (AMB included)		714
Trk. Utl. 1-1/4-Ton M715 Series (AMB included)		254
Trk. Cargo 5-Ton M54		3
Trk. Bridge 5-Ton M139 Series		47
Trk. Trac. 5-Ton M52		10
Trk. Trac. 5-Ton M246		1
Trk. Trac. 10-Ton M123		2
	Sub Total	1031
Tracked Vehicles		
Carrier, Armored M113		137
Recovery, vehicle (med) M88		21
Carrier, Motor M106		4
	Sub Total	162
	Grand Total	**1193**

OTHER EQUIPMENT

Forklift	18
Grader (Huber)	12
Scoop-Loader	37
Crane (Commercial 25-Ton)	6
Crane (Various Sizes)	6
Roller (10-15-Ton)	5

Numerous other small items such as lawn mowers, industrial tractors, various capacity generator sets, etc.

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