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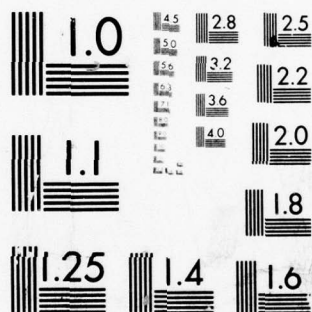
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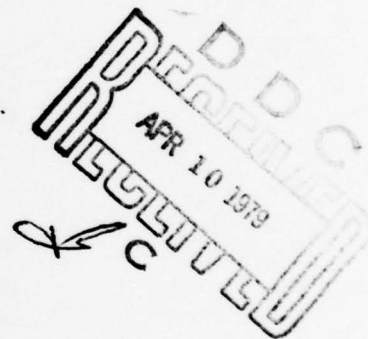
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Report 2253

TRUCK, FORKLIFT, GASOLINE-ENGINE-DRIVEN,
4000-POUND-CAPACITY, PNEUMATIC-TIRED -
USER SURVEY

by
James E. Stephens, Jr.
and
Jesse W. Reid, Jr.

August 1978



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U.S. ARMY MOBILITY EQUIPMENT
RESEARCH AND DEVELOPMENT COMMAND
FORT BELVOIR, VIRGINIA

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER 2253	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) TRUCK, FORKLIFT, GASOLINE-ENGINE-DRIVEN, 4000-POUND-CAPACITY, PNEUMATIC-TIRED - USER SURVEY	5. TYPE OF REPORT & PERIOD COVERED	
7. AUTHOR(s) James E. Stephens, Jr. Jesse W. Reid, Jr.	6. PERFORMING ORG. REPORT NUMBER	
9. PERFORMING ORGANIZATION NAME AND ADDRESS Mechanical & Construction Equip Lab, ATTN: DRDME-HM; U.S. Army Mobility Equipment Research and Development Command, Fort Belvoir, Virginia 22060	8. CONTRACT OR GRANT NUMBER(s) (12) 211P	
11. CONTROLLING OFFICE NAME AND ADDRESS Commander U.S. Army Mobility Equipment Research and Development Command, Fort Belvoir, Virginia 22060	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) (14) MERADCOM-2253	12. REPORT DATE Aug 1978	
	13. NUMBER OF PAGES 212	
	15. SECURITY CLASS. (of this report) Unclassified	
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Material-Handling Equipment Reliability, Availability, and Maintainability (RAM) Forklift Truck Quality Assurance Gasoline Engine Specification Pneumatic Tire Procurement Maintenance		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report is the result of recent emphasis on procuring commercial items in lieu of Military Adaptation of Commercial Items (MACI). Because of this emphasis, the Army's MACI fleet of 1750, 4000-lb-capacity, pneumatic-tired, forklift trucks has been selected for eventual replacement by commercial forklift trucks. Commercial users of four makes of these forklift trucks were surveyed to collect data to help determine their acceptability in performing the anticipated (Continued)		

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Cont' → military mission, and their durability, availability, and maintainability. This assessment was made using the results from the commercial users' survey. This report presents the methodology, results, and conclusions of the assessment. The survey results support the general conclusion that the Reliability, Availability, and Maintainability (RAM) characteristics of the commercial fork-lifts surveyed are acceptable to their commercial users and by inference can be assumed to be acceptable to the Army's requirements.

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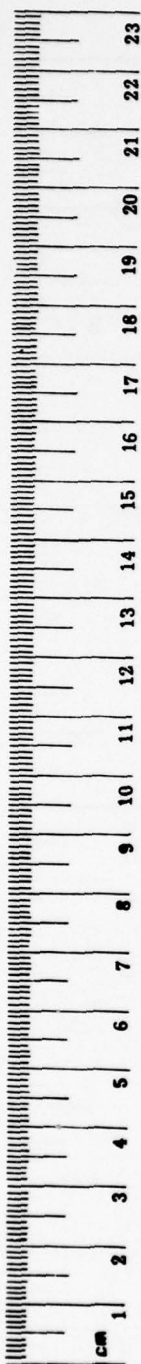
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Knew	Multiply by	To Find	Symbol
LENGTH				
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	metric tons	t
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	L
pt	pints	0.47	liters	L
qt	quarts	0.95	liters	L
gal	gallons	3.8	liters	L
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³
TEMPERATURE (exact)				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

* 1 in = 2.54 cm (exactly).





Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
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LENGTH

mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi

AREA

cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares (10 000 m ²)	2.5	acres	

MASS (weight)

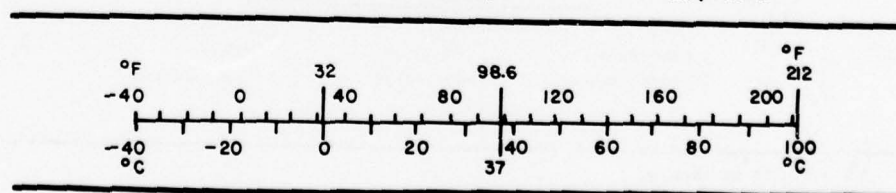
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	metric tons (1000 kg)	1.1	short tons	

VOLUME

ml	milliliters	0.03	fluid ounces	fl oz
L	liters	2.1	pints	pt
L	liters	1.06	quarts	qt
L	liters	0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³

TEMPERATURE (exact)

°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F
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**TRUCK, FORKLIFT, GASOLINE-ENGINE-DRIVEN,
4000-POUND-CAPACITY, PNEUMATIC-TIRED —
USER SURVEY**

I. INTRODUCTION

1. Background. In May 1976, the Office of Management and Budget directed the Government to emphasize the acquisition of commercial, off-the-shelf products in order to achieve optimal effectiveness in supply support operations. The resulting emphasis on procurement of commercial items included forklift trucks used by the Army. Therefore, MERADCOM initiated a program to procure and support commercial forklift trucks for the Army. The major program elements are as follows:

- a. Prepare Manufacturer Survey Questionnaire.
- b. Conduct/Report the Manufacturer Survey.
- c. Prepare User Survey Questionnaire.
- d. Conduct/Report User Survey.
- e. Prepare Procurement Specification.
- f. Procure Commercial Forklift Trucks.
- g. Type Classify.

MERADCOM is responsible primarily for program elements "a" thru "e" which are completed in the fiscal year preceding a scheduled buy. The first two program elements have been completed and are separately reported.¹ The Army presently has an inventory of approximately 1750, 4000-pound-capacity, pneumatic-tired, forklift trucks which can be considered as candidates for replacement by the following commercial forklift trucks:

<u>Manufacturer</u>	<u>Model</u>
Allis Chalmers	ACP 40
Cat	V40B
Clark	C500 Y40
	C300 Y40
Hyster	H40H

TARCOM manages 4000-pound-capacity, pneumatic-tired forklift trucks under Standard Study Number (SSN) M474 (Table 1).

The candidate forklift trucks shown in Figures 1 through 5 were described by their manufacturers as commercial, off-the-shelf, forklift trucks which would satisfy the

¹ L. C. Root, "Manufacturer's Survey Report for the Truck, Forklift, Gasoline-Engine-Driven, 4000-Pound-Capacity, Pneumatic-Tired, 72-Inch Collapsed Mast Height, 144-Inch Lift Height." MERADCOM Report 2243, May 1978.

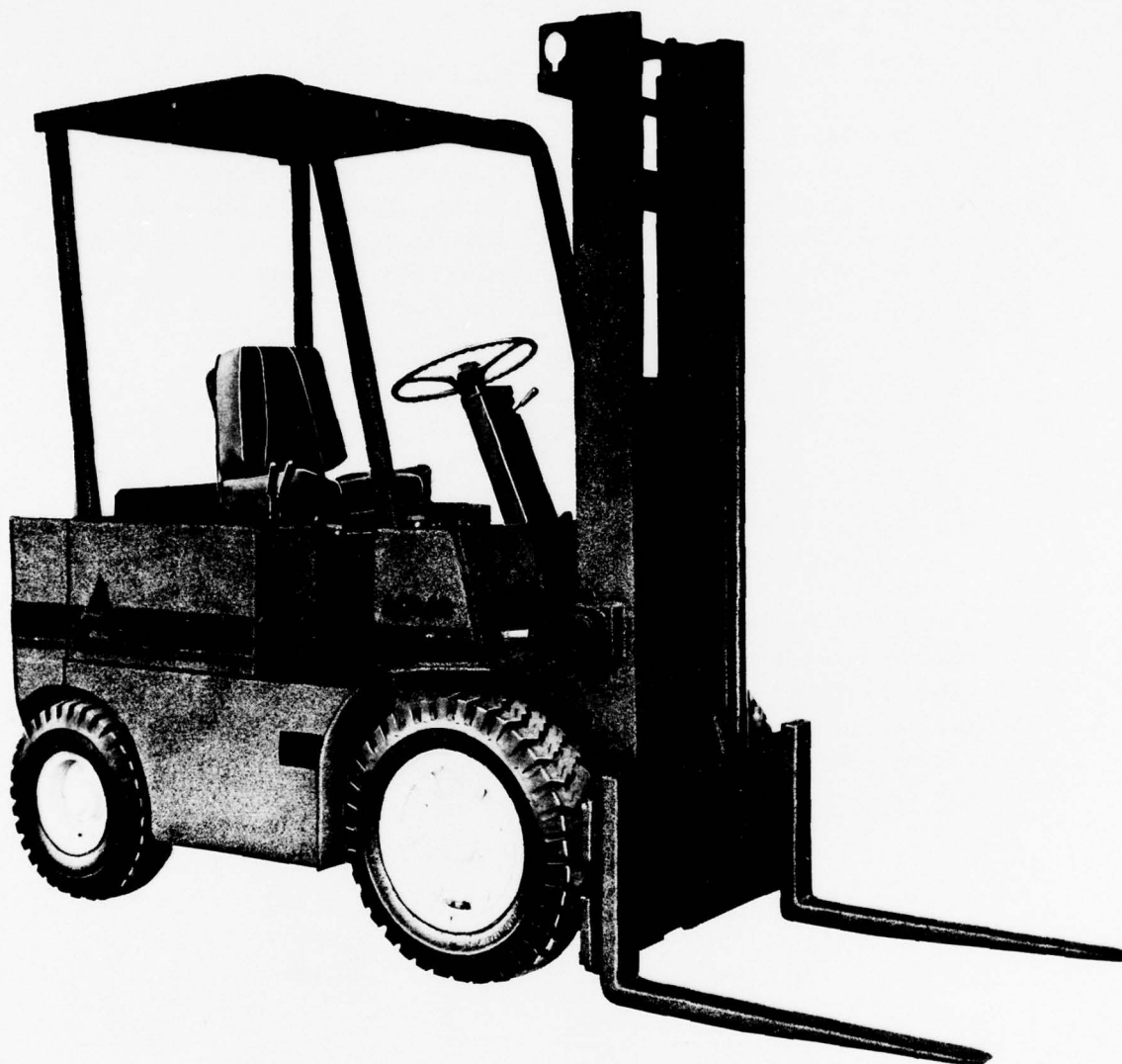


Figure 1. Allis Chalmers forklift truck, Model ACP 40.

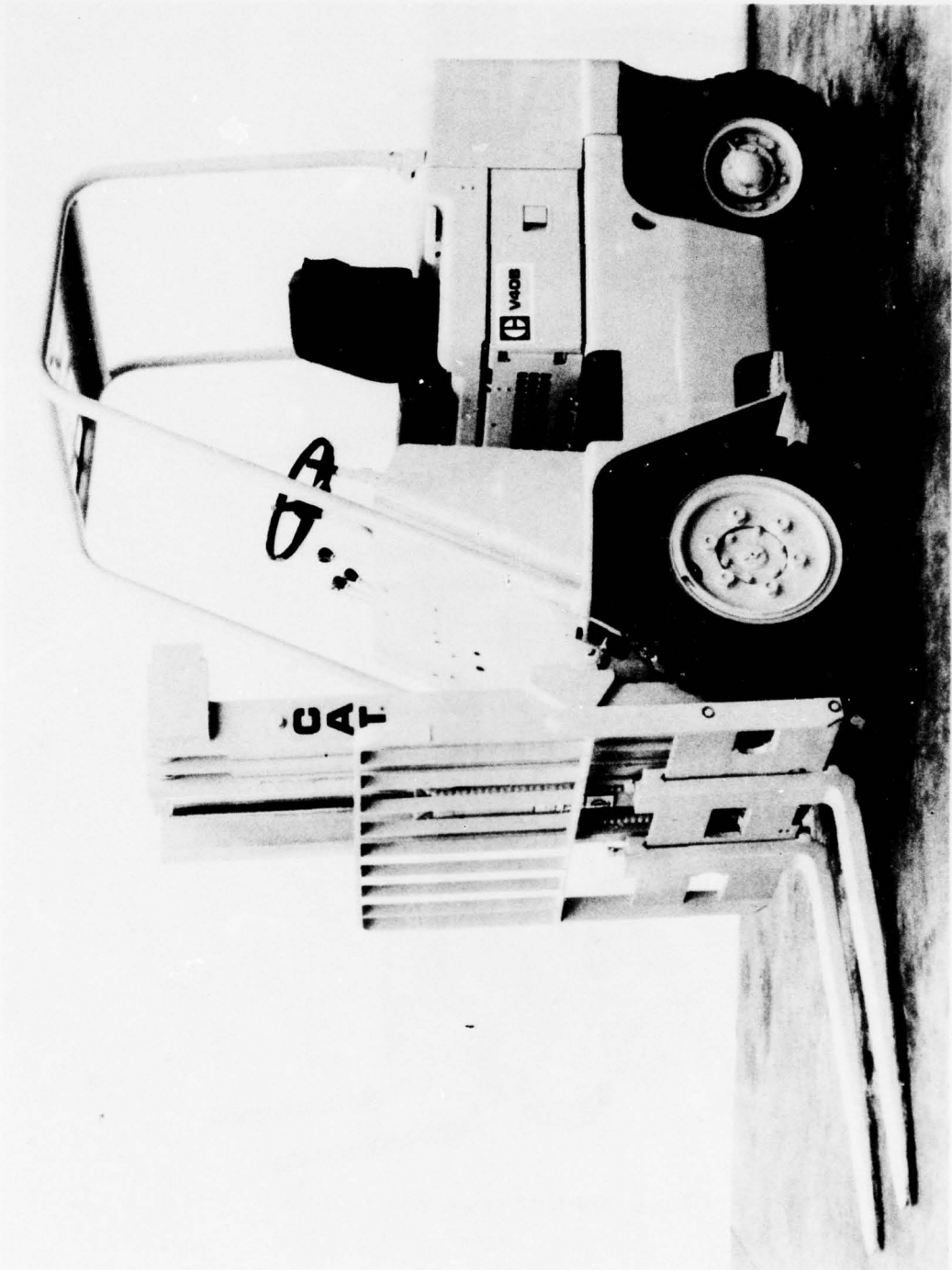


Figure 2. Cat forklift truck, Model V40B.



Figure 3. Clark forklift truck, Model C500Y40.

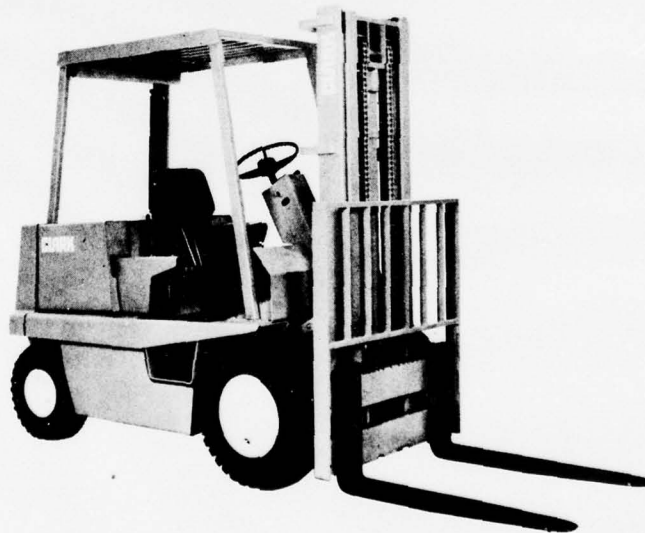


Figure 4. Clark forklift truck, Model C300Y40.

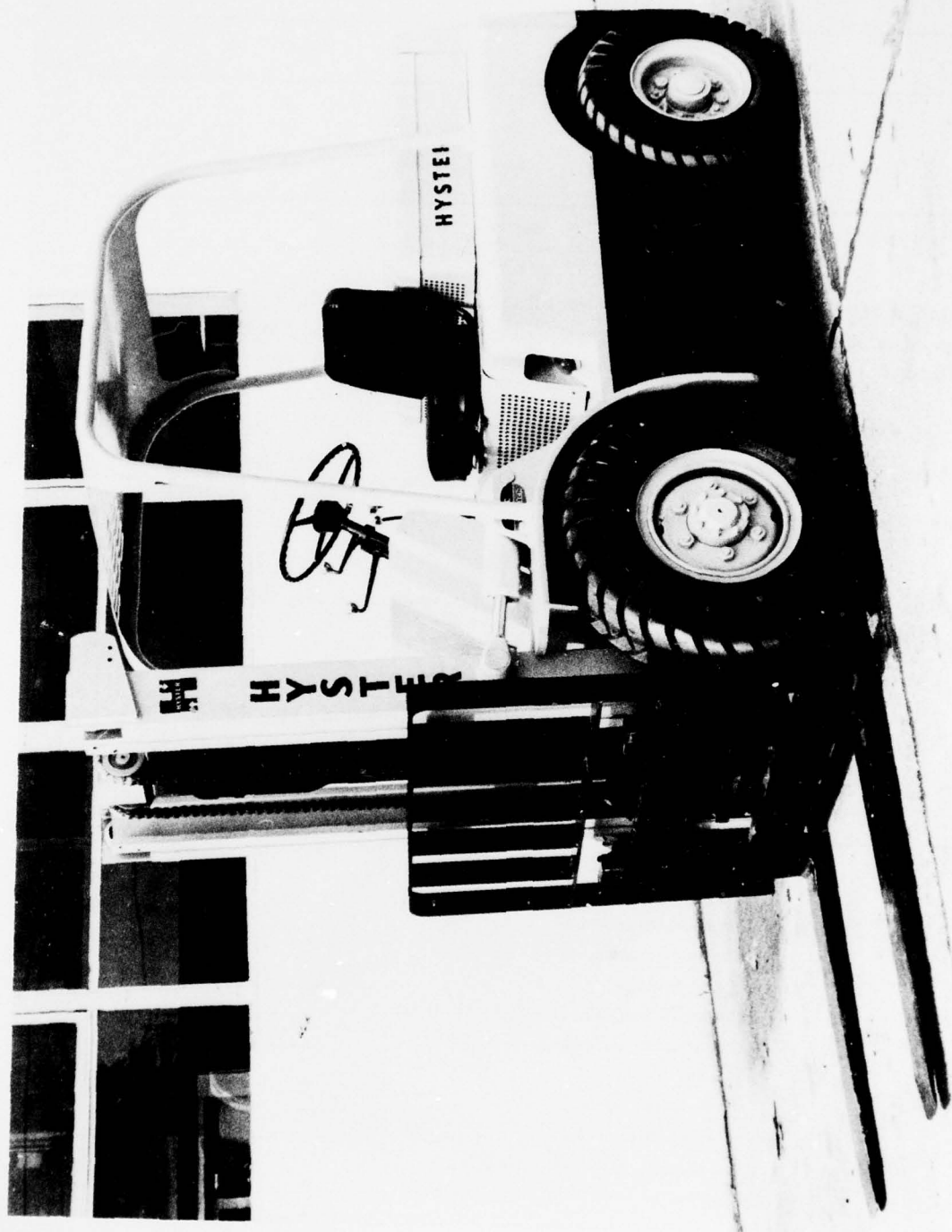


Figure 5. Hyster forklift truck representative model.

Table 1. Distribution of SSN M474 by Line Item Number (LIN)

LIN	TDA(%)	TOE	MISC*
X51380	65	33	2
X51311	100	0	0
X51585	34	34	32

* Maintenance/ Readiness Float, Operational Projects, War Reserves, etc.

Army's requirements. The Army's requirements for this forklift are contained in Specification MIL-T-52932 and Specification Sheet Number 3. Specification Sheet Number 3 is condensed in Table 2 and is presented in full in Appendix A.

2. **Objectives.** The objectives of this report are as follows:

a. To determine how industry manages the life cycle of 4000-pound-capacity, pneumatic-tired forklift trucks.

b. To determine if the Reliability, Availability, and Maintainability (RAM) characteristics of the five candidate forklift trucks are acceptable to the Army using data solicited from their industrial users.

Table 2. General Requirements for 4000-Pound-Capacity, Pneumatic-Tired Forklift Trucks

Item	Parameter	Requirement
1	Lift Capacity (lb)	4000
2	Lift Height (in.)	144
3	Load Center (in.)	24
4	Engine (Type)	Gasoline
5	Tire (Type)	Pneumatic
6	Maneuverability (right-angle turn dimension (in.) with 48-x-48-in. pallet)	
	Without Sideshifter	166
	With Sideshifter	170
7	Collapsed Mast Height (in.)	74
8	Overhead Guard Height (in.)	83

3. **Scope.** This report presents the results and assessment of surveying industrial users of four different makes of commercial 4000-pound-capacity, pneumatic-tired forklift trucks.

II. INVESTIGATION

4. **User Survey Results.** For uniformity, a questionnaire (Appendix B) was used by the Survey Team that visited each user. This questionnaire was an update of a questionnaire used in MERADCOM's FY77 Commercial Material Handling Equipment (CMHE) Program. The update involved designing and adding questions to support a subjective evaluation of RAM and a more comprehensive analysis of the procedures used by industry to purchase forklift trucks. The questions concerning RAM were added to address a finding from last year's survey that commercial users generally do not collect the empirical data necessary to objectively evaluate RAM. The questionnaire was coordinated with TARCOM's Quality Assurance and Maintenance Directorates before use by the survey teams. The names of industrial users and their servicing dealers were obtained from the four manufacturers surveyed previously.² From these lists of users, the goal was to survey at least three users of each forklift model proposed. However, users with more than one Clark C300 Y40 could not be located within the time allotted; therefore, surveys of this model were not conducted. Clark recently introduced the C400 Y40; and, consequently, it does not yet have a significant market presence. Twenty commercial users and one lease fleet (dealer operated) were visited by a three-member survey team comprised of representatives from Engineering (MERADCOM), Quality Assurance (TARCOM), and Maintenance (TARCOM). Two of the users had more than one of the candidate trucks which were surveyed, and the data for each truck has been treated independently in this report. It is significant to note in Table 3 that occasionally the model surveyed was different from the model scheduled for survey. In all instances, the users indicated they had the correct forklift model when the survey trip was arranged. However, this discrepancy of models was discovered when the Survey Team arrived on-site, and there was no choice but to survey the alternate model. A closer review will show that in most instances these trucks are from the manufacturer's family of trucks which included the model which should have been surveyed. The basic difference between models within a family is counterweight; therefore, the data obtained can be assumed valid for purposes of this report. All users were cooperative and attempted to provide the data solicited by the survey team. User codes are used throughout this report because the actual names of the users were considered irrelevant. The compiled data obtained from these surveys is presented in Appendix C.

² L. C. Root, "Manufacturer's Survey Report for the Truck, Forklift, Gasoline-Engine-Driven, 4000-Pound-Capacity, Pneumatic-Tired, 72-Inch Collapsed Mast Height, 144-Inch Lift Height," MERADCOM Report 2243, May 1978.

Table 3. Industrial Users Surveyed and Manufacturer's Model Surveyed

USER CODE	MODEL TO BE SURVEYED	MODEL ACTUALLY SURVEYED
A1	ACP 40	ACP 40
A2	ACP 40	ACP 40
A3	ACP 40	ACP 40
A4	ACP 40	ACP 40
A5	ACP 40	ACP 40
A6	ACP 40	ACP 40
C1	C500 Y40	C500 Y40
C2	C500 Y40	C500 Y40
C3	C500 Y40	C500 Y40
C4 ^(a)	C500 Y40	C500 Y40; C500 Y45
C5 ^(a)	C500 Y40	C500 Y50
C5	C500 Y40	CF 40
C7	C500 Y40	C500 Y40
C8 ^(b)	C500 Y40	C500 Y40
C9	C500 Y40	C500 40; C500 50; C500 Y60
C10	C500 Y40	C500 Y40
H1 ^(b)	H40H	H40H
H2 ^(a)	H40H	H50H
H3	H40H	H50H
H4	H40H	H80C
T1	V40B	V40B
T2	V40B	V40B
T3	V40B	V40B
T4	V40B	V50B

(a) Same User, different plant.

(b) Same User.

III. DISCUSSION

5. Analysis of User Survey Results. A rather wide spectrum of users was surveyed ranging from those having one unit of MHE to those with more than 500 units of MHE in their fleet (Table 4). Their procurement procedures also varied from complete dependence on the dealer's sales engineer to testing demonstrators prior to a buy decision. Ninety percent of the users surveyed are categorized as small users of MHE with fleets of less than 50 units. These users purchased MHE so infrequently and in such small quantities that they can not justify preparing comprehensive specifications

Table 4. Fleet Size vs User's Procurement Procedure

User Code	Estimated Size of User's MHF Fleet	User's Procurement Procedure		
		Specification	Sole Source	Competitive Bid
A1	2	No	No	Yes
A2	80	Yes	No	Yes
A3	30-40	Yes ^(a)	Yes	Yes
A4	500	Yes	Yes	No
A5	5 ^(b)	N/A	N/A	N/A
A6	5	—	—	—
C1	10 ^(c)	Yes	No	Yes
C2	15-20 ^(c)	Yes	No	Yes
C3	189 ^(d)	N/A	N/A	N/A
C4	19 ^(e)	Yes	No	Yes
C5	19 ^(e)	Yes	No	Yes
C6	16	Yes	No	Yes
C7	8 ^(f)	N/A	N/A	Yes
C8	16 ^(f)	Yes	No	Yes
C9	5	No	Yes	No
C10	1	No	Yes	No
H1	16 ^(f)	Yes	No	Yes
H2	19 ^(e)	Yes	No	Yes
H3	7	No	No	Yes
H4	100	Yes	No	Yes
T1	12	Yes	Yes	Yes
T2	9 ^(c)	No	Yes	Yes
T3	5	Yes	No	Yes
T4	1	No	Yes	No

(a) Hired independent consultant to survey manufacturers to determine truck with most economical life-cycle cost.

(b) Trucks are leased.

(c) Trucks are leased with option to buy.

(d) Rental Fleet (Dealer Operated).

(e) Same user — different plant and different trucks.

(f) Same user.

although all users with at least 10 units of MHE stated they used specifications. A closer examination of these specifications revealed they were not performance oriented but more akin to an item description or a purchase order which lists the desired options. These specifications were prepared by the user after consulting with local dealer's sales engineers and/or commercial brochures. All users surveyed, even those using specifications, were not concerned about the components on the truck, which made component data very difficult to obtain. It is known that major users of MHE prepare comprehensive specifications,³ however, this was not found among the users surveyed. One major user limits his solicitations to certain acceptable makes. This acceptability was determined beforehand based on actual testing of a demonstrator by the user. Another user was unique because he hired an independent consultant to evaluate various makes to find the one with the most economical life-cycle cost. Lease with the option to purchase is another technique used by industry to procure acceptable MHE. Implied is the understanding that, if the MHE is found unacceptable for whatever reason during the lease period, the option to buy will not be exercised. Many of the users surveyed were trading their old MHE, and the trade-in allowance for the old MHE was of obvious importance to the user. If the old unit was traded, it would be used until the new unit was delivered; at that time, the trade-in would be returned to the dealership.

Industrial users purchase each forklift truck for a specific task and equip it to match the work-station environment. This is both practical and cost-effective because the user generally assigns a forklift truck to one work station for its entire economic life. Further, most users depend on the dealer's sales engineer to recommend the correct optional equipment to job match the truck to its work station.

Industrial users are not committed to the concept of purchasing a forklift truck merely because it has the lowest initial cost. Instead, preference for make, past performance, dealer location, dealer reputation, parts availability, and lowest cost to own were cited as reasons for purchasing a specific make. From user comments, this preference for a specific make can be related to two factors: the dealer; and the user's operator and/or mechanic. A strong local dealer able to support the user's vehicle logistically regardless of make surveyed definitely has an advantage when the user re-buys. Finally, based on preconceived feelings about a certain make, the operator and/or mechanic may question the acceptability of an alternate make; twelve users stated their operators and/or mechanics had a preference for the make being surveyed. Therefore, if prices are within reason, users tend to buy for reasons other than just initial cost. Generally, the dealer pre-services the new forklift and delivers it to the user. The user will then, at most, inspect the forklift truck to verify receipt of the model and optional equipment ordered. Obviously, the user's procedures are lax by Government standards but are indicative of the user's confidence in his local dealer. The user immediately places the truck into service and uses the warranty period for shake-down.

³ *Modern Materials Handling*, January, 1978; "Why the Emphasis on Specifications."

Table 5 is the user response to the survey question concerning warranties; the table reveals that only 33 percent of the users surveyed correctly stated the warranty provision for their forklift trucks. It is recognized that several of the users lease MHE and others have purchased used MHE or have not purchased MHE recently; nevertheless, this low awareness factor is probably indicative of industry's general opinion that the warranty period is not important because of the rapport which exists between the user and his dealer. To support this observation, several users cited instances of dealers correcting defects which occurred after the warranty period had expired. Obviously, such dealer support is a significant factor used to justify the additional cost, if any, of a more desirable truck. This observation is supported by the 12 users who cited "past performance" or "dealer service" in answer to the survey question, "Why did you purchase this forklift?"

The users surveyed represented industries from the food industry to nuclear power plants. The following list reveals that as expected, pneumatic-tired trucks are used outdoors much of the time:

<u>Limits of Outdoor Use</u>	<u>Number of Users</u>
0-25%	9
25-75%	6
75-100%	9

The trucks are often stored outdoors (five users). Two of these users indicated cold-weather starting problems with outdoor temperature of -40° F and 0° F. An engine heater and battery booster were cited as solutions to these cold-weather start problems.

Table 5. User Response to User Survey Question Concerning Warranties of 4000-Pound-Capacity, Pneumatic-Tired Forklift Trucks

<u>Item</u>	<u>User Response</u>	<u>Users with this response</u>
1	Same as manufacturer's standard warranty	8
2	Conflicts with manufacturer's standard warranty	10
3	User did not know warranty provisions	5
4	User is lessor and did not know warranty provisions	1
5	User specifies warranty provisions	0

The following list was prepared from the survey results to highlight the distribution of various fuel types:

<u>Fuel Type</u>	<u>Number of Users</u>
Gasoline	10
LPG	14
Diesel	0

Fifty-eight percent of the users have equipped their forklifts to use LPG to reduce pollutants. This statistic becomes more impressive when it is considered that the program objective was to survey gasoline-powered forklifts which were difficult to find. The findings of this survey may signal that the Army should re-evaluate its requirement for gasoline-powered, materials-handling equipment in lieu of LPG for the 4000-lb applications. Several users of LPG cited cold-weather start problems, although they stored their forklifts indoors, and a problem of keeping the truck properly tuned.

Commercial users do not have transportability problems because they do not normally move the forklift from one plant to another, and the dealer is responsible for delivering the truck. Pneumatic-tired trucks are driven to and from their job site within the plant. If forklifts cannot be repaired on site, various methods, from towing to carrying on a larger forklift, are used to return a forklift to the maintenance shop.

Industrial users, in general, do not keep the maintenance records required for an objective RAM assessment. Typically, the user charges a forklift with its related maintenance time, parts, and supplies; but most users could not discriminate between scheduled and unscheduled maintenance. Using the estimates given for annual usage, annual maintenance costs, percent labor, and labor rates, maintainability ratios (MR) could be calculated for only seven trucks. These MR's compared favorably to the MR of .06 from MIL-T-52862. Although an objective assessment of RAM could not be made, a subjective evaluation is possible. Table 6 highlights the users' response to several questions related to the RAM characteristics of commercial, 4000-pound, pneumatic-tired forklift trucks. The response indicated the general acceptability of all the makes to their commercial users because all of the users stated they would rebuy the identical make.

Responses to the survey question "Which components tend to fail most frequently?" were analyzed, and differences among the various makes surveyed were not evident. Rather, where and how the truck is used and maintained seemed to contribute more to the type and frequency of failure than make. Although it is difficult to conceive, some commercial users did not have a preventive maintenance program. As expected, they were experiencing failures not attributable to the truck but to lack of

Table 6. User Response to RAM-Related Questions

RAM-Related Question	Number of Users Responding		
	Unknown or N/A	Yes	No
Would you rebuy an identical make and model truck?	1 ⁽⁷⁾	23	0
Is there a frequency of failure(s) of the same component?	3	7 ^(5, 6, 8, 10, 15, 19, 20)	13
Since purchasing the forklift, has it been modified by the manufacturer, dealer, or in-house?	0	10 ^(2, 3, 9, 11, 16, 21, 22, 23, 25)	13
Have there been any significant design changes to this model in the last year?	1 ⁽¹²⁾	0	22
Are you dissatisfied with any feature of this forklift truck?	0	2 ⁽¹⁶⁾	21
Are there any undesirable/unsatisfactory operating characteristics associated with this equipment?	0	2 ^(1, 16)	21
Does the forklift truck perform its mission satisfactorily?	0	23	0
Does the forklift perform as well as suggested by manufacturer and/or dealer?	0	23	0
Can operators and/or maintenance personnel be trained without difficulty?	1	22	0

Table 6. User Response to RAM-Related Questions (Continued)

RAM-Related Questions	Number of Users Responding		
	Unknown or N/A	Yes	No
Are there any maintenance tasks which are unduly difficult and/or time consuming?	4	7 (4, 13, 14, 17, 18, 24, 25)	12
Does your mechanic/operator have a preference for this make forklift truck?	5	12	6

- | | |
|---|--|
| <p>(1) Dislikes hydraulic pump in tank.</p> <p>(2) Foam in tires.</p> <p>(3) Converted gas to LPG.</p> <p>(4) Transmission and engine overhaul.</p> <p>(5) Radiators.</p> <p>(6) Head gaskets (2).</p> <p>(7) N/A — Rental Fleet — data not entered for remaining questions.</p> <p>(8) Mast roller studs.</p> <p>(9) Added extra lights.</p> <p>(10) Hydraulic hoses.</p> <p>(11) Added extra lights.</p> <p>(12) This model no longer manufactured.</p> | <p>(13), (14) Transmission.</p> <p>(15) Frequent carburetor adjustment required on LPG trucks.</p> <p>(16) Does not like asbestos clutch pack in transmission.</p> <p>(17) Transmission repair/rebuild.</p> <p>(18) Replacing mast seals.</p> <p>(19) Most cylinder leaks by O-rings.</p> <p>(20) Governor manufactured incorrectly.</p> <p>(21) Added lights.</p> <p>(22) Added lights.</p> <p>(23) Reworked governor.</p> <p>(24), (25) Transmission repair/rebuild.</p> |
|---|--|

maintenance. Because of this inconsistency of maintenance among the users surveyed, isolating unacceptable trucks is not possible with the data from this survey.

The only maintenance task performed by the user's operator is checking fluid levels. All other maintenance is performed by the user's mechanics, although the dealer may be tasked to rebuild the engine and transmission. The user's mechanics rely on the manufacturer's operator, maintenance, and parts manuals as furnished with the truck and the optional rebuild manual. These manuals are used without difficulty with dealer backup when required. Manual updates and bulletins were not always provided to the users, and the users were not participating in manufacturer or dealer training schools although they are available. The users consider this type of training unnecessary because these forklifts are not unique and have been operated and maintained for many years. Therefore, the operator and mechanic do not require training.

To the commercial user, the availability of spare parts is not a large problem because the dealer's past performance and proximity are important factors considered in the user's buy decision. Most of the users surveyed were confident that they could obtain any part except major weldments and body panels in 48 hours or less.

Although the users' responses had large variances, their estimate of maintenance times for frequently performed removal and replacement tasks were average, and Table 7 compares the estimated times to the maintenance times allocated in the existing specification (MIL-T-52862). As can be seen, the averages of their estimates correlate well with the requirements from the existing specification.

Table 7. Comparison of Removal/Replacement Times from User Surveys to Requirements Contained in MIL-T-52862

Component Removed/ Repaired	Removal/Replacement User Survey Time (min.)	Requirement Time (min.) from MIL-T-52862
Starter	54	60
Voltage Regulator	30	30
Battery	24	30
Fan Belt	44	75
Alternator	44	30

The human-factor characteristics of trucks surveyed were acceptable to the users surveyed. Most users either implicitly expect or explicitly state that their MHE, when delivered, is to comply with all applicable State and Federal Safety Codes (including OSHA) and ANSI Safety Standards for powered, industrial trucks.

The users' estimates of the expected life of their forklifts, independent of tax and investment considerations, were examined and were found to be in the 12,000-to-15,000-hour range. Further, the responses appear to be independent of the make or model surveyed. This 12,000-to 15,000-hour range of expected life correlates well to the Army's 11-year service life with a nominal 1000 engine hours per year.

6. Summary of Findings. The findings of surveying commercial users of 4000-pound-capacity, pneumatic-tired forklift trucks from four manufacturers can be summarized as follows:

a. Commercial users purchase forklift trucks in a manner which is most effective for them, i.e., smaller users of MHE tend to depend completely on the dealer's sales engineer while larger companies prepare specifications. These specifications compare in scope to the Government's MACI specifications.

b. Commercial users purchase trucks tailored for a specific job assignment. The trucks are equipped with the optional equipment required to perform properly at a work station where they will be assigned all of their economic life.

c. Commercial users do not transport their forklifts and consider the issue of transportability to be the concern of those who must actually transport the forklift, namely, the dealer and shipper.

d. To the commercial user, the local dealer is the hinge pin upon which the acceptability of a particular make is based.

e. Commercial users do not purchase a forklift just because it has the lowest initial cost but rather consider equally important dealer location, dealer reputation, past performance, operator/mechanic preference, standardization, and cost to own.

f. Commercial inspection procedures are lax by Government standards, and commercial users prefer to place the truck immediately into service and use the warranty period to shake-down the new truck.

g. Warranties are not a major concern for commercial users because of the rapport which has developed between the user and dealer.

h. Pneumatic-tired forklift trucks are purchased for outdoor use and may be stored outdoors. Minor cold-weather start problems are experienced with the makes surveyed.

i. Many pneumatic-tired trucks are equipped for LPG. The primary reason given by commercial users is reduced exhaust emissions.

j. The maintenance literature as furnished by the manufacturer is used without difficulty by commercial users.

k. Commercial users consider the training offered by the manufacturers and dealers to be unnecessary for the type of forklifts surveyed.

l. The following characteristics of the forklift makes surveyed were considered acceptable by their commercial users:

- (1) Reliability.
- (2) Availability.
- (3) Maintainability.
- (4) Durability.
- (5) Safety.
- (6) Human factors.

IV. CONCLUSIONS

7. **Conclusions.** It is concluded that:

a. The RAM characteristics of the commercial, 4000-pound-capacity, pneumatic-tired forklift trucks surveyed are acceptable to the Army, and the risk is low to proceed with material acquisition of any of these trucks.

b. Industrial users cite reasons other than lowest initial cost for purchasing a particular make or model forklift.

c. Industrial users purchase forklift trucks for a specific task in a known work-station environment; and, once purchased, a truck is assigned to that work station all its economic life.

d. Industrial users are not hesitant to prepare a specification to match their requirement even if it precludes competitive pricing.

APPENDIX A

MILITARY SPECIFICATION SHEET TRUCK, LIFT, FORK. PNEUMATIC TIRES; 4000-POUND CAPACITY, 144-INCH LIFT

This specification sheet is approved for use by the U.S. Army Mobility Equipment Research and Development Command, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

The complete requirements for procuring the truck described herein shall consist of this document and the issue in effect of Specification MIL-T-52932(ME).

REQUIREMENTS

1. Capacity: 4000 pounds at 24 inches load center.
2. Collapsed mast height: 74 inches maximum.
3. Maximum fork height: 144 inches minimum.
4. Free lift height: 47 inches minimum.
5. Fork size: 1-13/16 inches maximum thickness X 5-1/16 inches maximum width X 42 inches long, plus 0 inch minus 1/2 inch.
6. Fork spacing: 12 inches to minimum 32 inches.
7. Tires: Drive 2; steer 2.
8. Overhead guard height: 83 inches maximum.
9. Right-angle turn dimension: 166 inches maximum: (Add 4 inches when side shift is used.)
10. Maximum travel speed: 10 mph minimum.
11. Upright tilt: 3 degrees, plus or minus 1/2 degree, forward; 6 degrees minimum rearward.

Custodian:
Army — ME

Preparing activity:
Army — ME

Project 3930-A469-3

FSC 3930

APPENDIX B

USER EVALUATION OF

COMMERCIAL FORKLIFT TRUCKS

PNEUMATIC OR SOLID RUBBER TIRED

GASOLINE ENGINE DRIVEN

COMMERCIAL MATERIALS HANDLING EQUIPMENT (CMHE)

31 Jan 78

USER:

NAME _____

ADDRESS _____

TELEPHONE _____

CONTACT _____

EVALUATOR'S NAME

ORGANIZATION

NOTE:

Code for Data Sources:

U — User Response

O — Observed during survey

C — Extracted from Manufacturer's Brochure

T — Extracted from TIP

A. End Item:

1. Manufacturer _____
2. Model No. _____
3. Date(s) Purchased _____
4. Capacity _____
5. Load Center _____
6. Number of this make/model in fleet _____

B. How was Item Purchased

1. By Specification _____ Sole Source _____ Competitive Bid _____
2. By dealer or mfgr. recommendation _____
3. From commercial brochure _____
4. Other (Describe) _____
5. Was vehicle purchased New? _____ Used? _____
6. Leased _____
7. Maintained by Lessee _____ Lessor _____
8. How is truck inspected/accepted? _____

C. Components and Accessories

1. Engine: Mfgr. _____
Model _____
 - (a) Governor type (velocity, centrifugal) _____
 - (b) Air Cleaner Mfgr., type, and part number _____

 - (c) Positive crankcase ventilation system? _____ Yes _____ No
 - (d) Cooling system: Capacity _____ (qt) Pressure _____ (lb/in²)
 - (e) Oil filter mfgr. and part number _____
 - (f) Battery model, voltage, and capacity _____

(g) Alternator mfgr. and part number _____

(h) Starter mfgr. and part number _____

2. Power Train:

(a) Transmission mfgr. and part number _____

(b) Front-axle mfgr. and part number _____

3. Steering and Brakes

(a) Is truck equipped with power steering? _____ Yes _____ No

(b) Is steering pump separate from main hydraulic pump?

_____ Yes _____ No.

(c) Power steering pump mfgr. and part number _____

(d) Power steering control unit mfgr. and part number _____

(e) Is truck equipped with power brakes? _____ Yes _____ No

(f) Master cylinder mfgr. & part number _____

4. Hydraulic System

(a) Filter mfgr. and part number _____

(b) Main pump mfgr. and part number _____

(c) Fluid level indicator? _____ Yes _____ No. Type _____

5. Uprights, Forks, Fork Carrier, and Load Backrest

(a) Master Roller or slider type? _____

(b) Number of mast stages _____

(c) Mast part number _____

(d) Load backrest type _____ Part Number _____

(e) Sideshifter _____ Yes _____ No

(f) Sideshifter mfgr. and part number _____

(g) Is sideshifter integral part of carriage? _____ Yes _____ No

6. What instruments, guages, and safety devices is the truck equipped with?

- (a) Hourmeter _____
- (b) Ammeter: gauge _____ light _____
- (c) Engine coolant temperature: gauge _____ light _____
- (d) Engine oil pressure: gauge _____ light _____
- (e) Fuel gauge _____
- (f) Transmission pressure: gauge _____ light _____
- (g) Transmission temperature: gauge _____ light _____
- (h) Keyed ignition switch _____
- (i) Rear-view mirror _____
- (j) Retractable overhead guard _____ Yes _____ No _____
- (k) Horn _____
- (l) Floodlight(s) _____ Yes _____ No _____ Quantity _____
- (m) Taillight: _____ Yes _____ No _____
- (n) Directional lights: _____ Yes _____ No _____
- (o) Parking brake: _____
- (p) Tilt cylinder anti-cavitation device: _____ Yes _____ No _____
- (q) Neutral start switch: _____ Yes _____ No _____
- (r) Starter disconnect: _____ Yes _____ No _____
- (s) Restriction indicator: _____ Yes _____ No _____
- (t) Fuel filter: _____ Yes _____ No _____

7. What optional equipment is used?

- (a) Attachments (clamps, ram) _____
- (b) Special lights _____
- (c) Other _____

D. Functional Performance and Characteristics

1. Geographical location (city and state) _____

2. Approximate time truck is operated outside _____
3. Ambient temperature range in which truck operates _____
4. Is truck stored outdoors in cold climate? _____ Yes _____ No
- (a) If Yes, is it difficult to start/operate in cold weather?
_____ Yes _____ No. If so, explain _____
5. Does truck operate in any unusual environmental conditions (i.e., rain, contaminated areas?) _____ Yes _____ No
- (a) If Yes, what environmental condition(s)? _____

- (b) Does the forklift perform properly under these conditions? _____ Yes No
6. What, if any, actions were required to enable proper operations?

E. Characteristics:

1. What type fuel does engine use? LPG _____ Gas _____ Diesel _____
- (a) Will it operate on unleaded fuel? _____ Yes _____ No
- (b) If LPG is used, why? _____
2. What is the capacity of the fuel tank? _____
3. Normal engine operating temperature _____
4. Does the drive train contain the following components?
- (a) Torque converter: _____ Yes _____ No
- (b) Power shift transmission: _____ Yes _____ No
- (c) Hydrostatic transmission: _____ Yes _____ No
- (d) Differential: _____ Yes _____ No
- (e) Positive inching: _____ Yes _____ No
- (f) External transmission filter: _____ Yes _____ No
- (g) Water cooler for transmission _____ Yes _____ No

(h) Universal joint drive shaft _____ Yes _____ No

5. Electrical System

Protected by: _____ Circuit Breakers _____ Fuses

F. Transportability:

1. Have you experienced difficulties loading/ moving forklift to its job site? _____

2. How do you move the forklift from job site to job site? _____

3. What procedure/equipment do you use to transport a "down" forklift? _____

4. Are lifting and/ or tiedown attachments, or locations, provided for ease of shipment? _____

G. Physical Characteristics:

1. Length:

(a) with forks _____ w/ o forks _____

(b) w/ forks & sideshifter _____ w/ o forks & sideshifter _____

2. Width _____

3. Overhead guard height _____

4. Collapsed mast height _____

5. Maximum fork height _____

6. Free lift _____

7. Backrest height _____

8. Tilt forward _____ ° Rearward _____ °

9. Sideshift left _____ in. right _____ in.

10. Carriage width _____

11. Fork dimensions: Length_____Width:_____Thickness _____
Taper Length_____
12. Do forks comply with ANSI MH11.4 (hook type mount)?_____
13. Fork adjustment dimension (measured between outer edges of forks)
Minimum_____Maximum_____
14. Seat clearance to underside of overhead guard_____in.
15. Wheelbase_____
16. Drive tire tread with (ϕ to ϕ)_____
17. Steer tire tread width (ϕ to ϕ)_____
18. Drive tire: Size_____Number _____
19. Steer tire: Size_____
20. Tire type (pneumatic, foam filled, 0 pressure, etc.) _____
_____Why _____

H. Reliability, Availability, and Maintainability Characteristics:

1. General Data:

- (a) Current hourmeter reading (fleet average) _____
- (b) Average age of fleet (years)_____
- (c) Expected life of the forklift (hours) _____
- (d) Expected annual usage (hours)_____
- (e) Expected time between major overhauls _____
- (f) Normal work day (clock-hours) _____
- (g) Shifts per day (number)_____

NOTE: Attach data sheets for questions 1 a and 1 b.

2. Maintenance Factors:

- (a) Scheduled (preventative) and unscheduled maintenance actions during the past
year (cummulative number)_____

(b) Unscheduled maintenance actions requiring at least 1 hour of maintenance time during the year to correct (number) _____

(c) Man-hours required to correct the malfunctions in 2(b) above _____

(d) Clock-hours required to correct malfunctions identified in 2(b) above _____

(e) Total man-hours to complete the actions in 2(a) above _____

(f) Total clock-hours to complete the actions in 2(a) above _____

(Note: The user may not have the data to answer this block of questions.)

3. Maintenance Allocation:

What maintenance is performed by the:

(a) Operator _____

(b) Mechanic _____

4. Maintenance Costs

(a) What is annual maintenance cost per vehicle (fleet average) \$ _____

(b) What percentage is labor _____

(c) Which of these wage scales best describe your mechanics:

\$3.00 — 5.00 hr. _____

5.00 — 7.50 hr. _____

7.50 — 10.00 hr. _____

10.00 — 12.50 hr. _____

12.50 — 15.00 hr. _____

5. Repair Parts:

(a) Average down-time awaiting parts not in dealer's stock (days, hours, weeks)

(b) Which parts tend not to be in dealer's stock _____

(c) Is there a frequency of failure(s) of the same component? Yes _____ No _____

If Yes, Explain _____

(d) Are any components replaced on a scheduled interval (excluding filters)? YES___NO

If Yes, What components (1)_____(2)_____(3)_____(4)_____

Interval_____(1)_____(2)_____(3)_____(4)_____

6. Model Changes/ Field Campaigns:

(a) Since purchasing the forklift, has it been modified by the manufacturer, dealer, and/ or in-house?_____Yes _____No

If Yes, Explain _____

(b) Have there been any significant design changes to this model in the last year of which you are aware?_____Yes _____No.

If Yes, Explain _____

7. Reliability:

(a) Are you dissatisfied with any feature(s) of this forklift truck?

_____Yes_____No. If Yes, Explain _____

(b) Are there any undesirable/unsatisfactory operating characteristics associated with this equipment?_____Yes _____No

If Yes, Explain _____

(c) Does the forklift truck perform its mission satisfactorily? _____Yes No. If

No. Explain _____

(d) Why did you purchase this make/ model forklift truck?_____

(e) Does the forklift truck perform as well as suggested by manufacturer and/ or dealer?

_____Yes _____No. If No, Explain _____

(f) Based on your experience, which of the following sub-systems tend to fail most frequently?

Transmission ()

Engine ()

Steering ()

Drive axle/differential ()

Brakes ()

Hydraulic ()

Mast ()

Electrical System ()

Cooling System()

(g) What are the best features of this truck?_____

8. Maintainability/ Availability

(a) Can operators and/or maintenance personnel be trained without difficulty?

Yes _____ No _____. If No, Explain _____

(b) Are there any maintenance tasks which are unduly difficult and/or time consuming?

_____ Yes _____ No. If Yes, Explain _____

(c) Does your mechanic/operator have a preference for this make forklift truck? Yes _____

No _____. Discuss reason for your answer _____

(d) Is scheduled (preventative) maintenance costly and/or time consuming? Yes _____

No _____. If Yes, Explain _____

(e) Do you defer scheduled maintenance until slack periods? Yes _____ No _____

(f) Are special lubricants and/or fuels required? Yes _____ No _____. If Yes,

Explain _____

(g) Are all components accessible for maintenance with minimum disturbance of other

components? _____ Yes _____ No. If No, Explain _____

(h) Scheduled Maintenance

(1) Replace filters

(a) Engine Oil Interval _____ Time _____

(b) Air Interval _____ Time _____

(c) Fuel Interval _____ Time _____

(d) Transmission Interval _____ Time _____

(e) Hydraulic Interval _____ Time _____

(2) Drain and Refill: Interval _____ Time _____

(a) Engine Oil Interval _____ Time _____

(b) Transmission Oil Interval _____ Time _____

(c) Hydraulic Oil Interval _____ Time _____

(d) Cooling System Interval _____ Time _____

(3) Lubricate Chassis Interval _____ Time _____

(i) Preventative Maintenance Time

(1) Man-hours expended for daily servicing (average) _____

(2) Man-hours expended for weekly preventative maintenance service (average),

(3) Man-hours expended for monthly preventative maintenance service
(average) _____

(j) Component Part Replacement Data: Please indicate the average time required for one man using common and special tools furnished with the unit to remove and replace the following:

- (1) Alternator _____
- (2) Starter _____
- (3) Voltage Regulator _____
- (4) Battery _____
- (5) Fan Belt _____
- (6) Hydraulic Pump _____
- (7) Brake Shoes _____
- (8) Fuel Pump _____

I. Safety & Human Factors (User Comments)

- 1. Are the safety precautions provided by the manufacturer augmented by the user? _____ Yes _____ No. If Yes, Explain _____

- 2. Do you know of any safety hazards that exist during:
 - (a) Operation _____
 - (b) Maintenance _____
- 3. Are the following items/elements adequate:
 - (a) Gauges and monitors _____
 - (b) Controls within easy reach and clearly marked as to their use and function? _____
 - (c) Anti-skid walkway surface _____
 - (d) Are hazardous areas (pinch points) identified? _____ Yes _____ No
- 4. Does the size of the operator inhibit his performance? _____ Yes _____ No
- 5. Does the sound level result in unusual operator fatigue after prolonged operation? _____ Yes _____ No

J. Manuscripts, Manuals, Tools, and Test Equipment (User Comments)

1. Which of the following manuals are provided:

- | | | | | |
|-----------------|-------|-----|-------|----|
| (a) Operator | _____ | Yes | _____ | No |
| (b) Maintenance | _____ | Yes | _____ | No |
| (c) Parts | _____ | Yes | _____ | No |
| (d) Overhaul | _____ | Yes | _____ | No |

2. Are technical bulletins provided periodically by:

- (a) Dealer _____
- (b) Manufacturer _____

3. Do you use the commercial manual as supplied by the manufacturer/dealer?

_____ Yes _____ No.

(a) Do you specify particular format and materials? _____ Yes _____ No

(b) Have any difficulties been encountered in using the manuals to perform the following:

- | | | | | |
|-------------------------|-------|-----|-------|----|
| (1) Operating/ Setup | _____ | Yes | _____ | No |
| (2) Servicing | _____ | Yes | _____ | No |
| (3) Adjustments | _____ | Yes | _____ | No |
| (4) Repair and Overhaul | _____ | Yes | _____ | No |

4. Are special tools required by operators or mechanics to maintain or test/trouble-shoot the equipment? _____ Yes _____ No

(a) If Yes, are they provided by the manufacturer? _____

(b) Is the use of special tools sufficiently described in the operator/ repair manual?

(c) What special tools have you used? _____

K. Training and Logistic Support (User Data)

1. Are dealer repairs performed promptly? _____

2. Is timely technical assistance available when required:

(a) from the dealer? _____

(b) from the manufacturer? _____

3. Do you attempt to standardize makes and/or models of equipment/
within your fleet? _____
4. What is the length of warranty in equipment hours/ months? _____

5. What is the total number of warranty claims? _____
6. Are delays frequently caused by lack of timely receipt of repair parts? _____

7. What repair parts do you keep on hand for this item? _____

If none stocked, why? _____

8. What is the length of time to fill emergency orders when parts are not in dealer's
stock? _____
9. What is the length of time to fill normal orders when parts are not in dealer's
stock? _____
10. Is special training required for:
(a) Operators _____
(b) Maintenance personnel _____
11. Would you rebuy an identical make and model forklift truck? ____ Yes ____ No
Explain answer. _____

NOTES:

APPENDIX C

COMPILED RESULTS FROM SURVEY OF INDUSTRIAL FORKLIFT USERS

Parameter	User		
	A1	A2	A3
A. End Item:			
1. Manufacturer	AC	AC	AC
2. Model No.	ACP/40	ACP/40	ACP/40
3. Date(s) Purchased	77	77	—
4. Capacity (lb)	4000	4000	3450
5. Load Center (in.)	24	24	24
6. Number in Fleet	1	13	2
7. Estimated Size of MHE Fleet	1	30	30-40
B. How was Item Purchased:			
1. By Specification?	No	Yes	Yes
Sole Source?	No	No	—
Competitive Bid?	Yes	Yes	—
2. By Dealer or Mfr. Recommendation?	—	—	—
3. From Commercial Brochure?	—	—	—
4. Other?	One-Page Item Description Plus Demonstration.	—	—
5. Was Vehicle Purchased New/Used?	New	New	New
6. Leased?	—	—	No
7. Maintained by Lessee/Lessor?	—	—	—
8. How is Truck Inspected/Accepted?	—	Checked Against Spec.	—

Parameter	User		
	A1	A2	A3
C. Components & Accessories:			
1. Engine Mfgr.			
Model	Continental F163	Continental F163	Continental F163
Governor Type	Flyball	Flyball	Velocity
Air Cleaner Mfgr.	Donaldson	Donaldson	Cyclopac
Type & Part No.	Dry — UNK	Dry — UNK	FW605-2575
Pos. Crankcase Ventilation System?	Yes	Yes	No
Cooling System Capacity (qt)	10	10	10
Pressure (lb/in ²)	7	7	7
Oil Filter Mfgr.	A-C	A-C	A-C
Part No.	UNK	UNK	4511629-0
Battery Model	ESB	ESB	Allis Chalmers
Voltage (V)	12	12	12
Capacity (Ah)	95	95	30
Alternator Mfgr.	Delco Remy	Delco Remy	Allis Chalmers
Part No.	UNK	UNK	UNK
Starter Mfgr.	Delco Remy	Delco Remy	Allis Chalmers
Part No.	UNK	UNK	UNK
2. Power Train:			
Transmission Mfgr.	Borg Warner	Borg Warner	A-C
Part No.	UNK	UNK	UNK
Front-Axle Mfgr.	A-C	A-C	A-C
Part No.	UNK	UNK	UNK
3. Steering and Brakes			
Truck Equip. with Power Steering?	Yes	Yes	Yes
Steering Pump Separate from Main Hydraulic Pump?	No	No	Yes

Parameter	User		
	A1	A2	A3
Power Steering Pump Mfgr?	N/A	N/A	A-C
Part No.			UNK
Power Steering Control Unit Mfgr?	A-C	A-C	A-C
Part No.	UNK	UNK	UNK
Is Truck Equipped with Power Brakes?	No	No	No
Master Cylinder Mfgr?	Bendix	Bendix	A-C
Part No.	UNK	UNK	UNK
4. Hydraulic System			
Filter Mfgr?	Marvel	Marvel	A-C
Part No.	UNK	UNK	UNK
Main Pump Mfgr?	Webster	Webster	A-C
Part No.	UNK	UNK	UNK
Fluid-Level Indicator?	Yes	Yes	Yes
Type	Dipstick	Dipstick	Dipstick
5. Uprights, Forks, Fork Carrier, and Load Backrest:			
Mast Roller or Slider Type?	Roller	Roller	Roller
Number of Mast Stages?	3	3	3
Mast Part Number?	UNK	UNK	4855046
Load Backrest Type?	Bolt-On	Bolt-On	Cage
Part Number	UNK	UNK	UNK
Sideshifter?	No	Yes	Yes
Sideshifter Mfgr?	N/A	A-C	A-C
Part No.	N/A	UNK	UNK
Sideshifter Integral Part of Carriage?	N/A	Yes	Yes
6. What Instruments, Gauges, and Safety Devices is Truck Equipped With:			
Hourmeter?	Yes	Yes	Yes

Parameter	User		
	A1	A2	A3
Ammeter: Gauge/Light?	Gauge	Gauge	Gauge
Eng. Coolant Temp: Gauge/Light?	Gauge	Gauge	Gauge
Eng. Oil Press: Gauge/Light?	Gauge	Gauge	Gauge
Fuel Gauge?	Yes	Yes	On LPG Bottle
Transmission Press: Gauge/Light?	None	None	None
Transmission Temp: Gauge/Light?	None	None	None
Keyed Ignition Switch?	Yes	Yes	Yes
Rear View Mirror?	No	No	No
Retractable OHG?	No	No	No
Horn?	Yes	Yes	Yes
Flood Light(s)? Qty?	No	No	Yes
Taillight?	No	No	No
Directional Lights?	No	No	No
Parking Brake?	Yes	Yes	Yes
Tilt Cylinder Anti-Cavitation Device?	Yes	Yes	Yes
Neutral Start Switch?	Yes	Yes	Yes
Starter Disconnect?	Yes	Yes	Yes
Restriction Indicator?	No	No	No
Fuel Filter?	Yes	Yes	Yes
7. What Optional Equipment is Used:			
Attachments (Clamps, Ram)?	—	—	Side Slitter
Special Lights?	—	Flashing Light	Safety Lights
Other?	Waterproofed Ignition	Super Soft Tires (Grizzly Tires)	None
D. Functional Performance and Characteristics:			
1. Geographical Location	Hayward, Ca.	L.A., Ca.	Hayward, Ca.
2. Approx. Time Truck Operated Outside	100%	100%	100%

Parameter	User		
	A1	A2	A3
3. Ambient Temp. Range in Which Truck Operates.	Local	55-110° F	60-80° F
4. Is Truck Stored Outdoors in Cold Weather? If Yes, Is It Difficult to Start & Operate in Cold Weather?	No	Yes	No
5. Does Truck Operate in Any Unusual Environmental Conditions (Dirt, Rain, Etc.)? If Yes, What Conditions? Does Forklift Perform Properly Under these Conditions? What, If Any, Actions Were Required to Enable Proper Operations?	N/A	No	N/A
	No	No	No
	N/A	N/A	N/A
	N/A	N/A	N/A
	None	None	None
E. Characteristics:			
1. What Type Fuel Does Engine Use? Will It Operate on Unleaded Fuel? If LPG is Used, Why?	LPG	Gas	LPG
2. What Is Capacity of Fuel Tank?	N/A	Yes	N/A
3. Normal Engine Operating Temp?	Less Pollution	N/A	Less Pollution
	33½ lb	10 gal.	30 lb
4. Does the Drive Train Contain the Following Components?	180° F	180° F	190° F
Torque Converter?	Yes	Yes	Yes
Power Shift Transmission?	Yes	Yes	Yes
Hydrostatic Transmission?	Yes	Yes	Yes
Differential?	No	No	No
Positive Inching?	Yes	Yes	Yes
External Transmission Filter?	Yes	Yes	Yes
Water Cooler for Transmission?	Yes	Yes	Yes
Universal Joint Drive Shaft?	Yes	No	No

Parameter	User		
	A1	A2	A3
5. Electrical System:			
Protected by:			
Circuit Breakers?	No	No	No
Fuses?	Yes	Yes	Yes
F. Transportability:			
1. Have You Experienced Difficulties Loading/ Moving FLT to Its Job Size?	Not Moved.	UNK	No
2. How Do You Move the FLT from Job Site to Job Site?	N/A	—	Drive
3. What Procedure/Equipment Do You Use to Transport a "Down" FLT?	None.	Low Boy.	Repair on Location.
4. Are Lifting and/or Tiedown Attachments or Locations Provided for Ease of Shipment?	No	—	Yes
G. Physical Characteristics:			
1. Length: W/ Forks (in.)	134	134	136
W/O Forks (in.)	92	92	94
W/ Forks & Side Shifter (in.)	—	—	—
W/O Forks & Sideshifter (in.)	—	—	—
2. Width (in.)	45	45	42
3. Overhead Guard Height (in.)	88	88	88
4. Collapsed Mast Height (in.)	73	73	80
5. Maximum Fork Height (in.)	144	144	192
6. Free Lift (in.)	47	47	66
7. Backrest Height (in.)	48	48	47
8. Tilt Forward (°)	5	5	10
Tilt Rearward (°)	10	10	5
9. Sideshift-Left (in.)	4	4	4
Right (in.)	4	4	4

Parameter	User		
	A1	A2	A3
10. Carriage Width (in.)	42	42	42
11. Fork Dimensions: Length (in.)	42	42	42
Width (in.)	4	4	4
Thickness (in.)	1.75	1.75	1.75
Taper Length (in.)	—	—	N/A
12. Forks Comply with ANSI MH 11.4?	Yes	Yes	Yes
13. Fork Adj. Dimension: Minimum (in.)	12	12	8
14. Seat Clearance to OHG (in.)	39	39	41.75
15. Wheelbase (in.)	55	55	54
16. Drive Tire Width $\varnothing$ to $\varnothing$ (in.)	37.5	37.5	—
17. Steer Tire Width $\varnothing$ to $\varnothing$ (in.)	37.5	37.5	—
18. Drive Tire Size	7.00 x 15	7.00 x 15	7.00 x 15
Qty	2	2	2
19. Steer Tire Size	6.50 x 10	6.50 x 10	6.50 x 10
20. Tire Type	PT	PT	PT
Why?	Used Outside	Used Outside	Standard

H. Reliability, Availability, and Maintainability

Characteristics:

1. General Data:

Current Hourmeter Reading (Fleet Av.)	483.7	UNK	0400.1
Av. Age of Fleet (yr)	3/4	16	N/A
Expected Life of FLT (hr)	UNK	10,000	N/A
Expected Annual Usage (hr)	UNK	1,000	UNK
Expected Time Between Major Overhauls	UNK	UNK	5 Years
Normal Work Day (Clock-Hr.)	8	8	16
Shifts Per Day (Number)	1	1	2

Parameter	User		
	A1	A2	A3
2. Maintenance Factors:			
(a) Scheduled (Preventative) and Unscheduled Maintenance Actions During the Past Year (Cumulative No.).	UNK	UNK	N/A
(b) Unscheduled Maintenance Actions Requiring at Least 1 Hour of Maint. Time During the Year to Correct (No.).	UNK	UNK	N/A
(c) Man-Hours Required to Correct the Malfunctions in 2(b) Above.	UNK	UNK	N/A
(d) Clock Hours Required to Correct Malfunctions Identified in 2(b) Above.	UNK	UNK	N/A
(e) Total Man-Hours to Complete the Actions in 2(a) Above.	2-3 Hr./Mo.	UNK	N/A
(f) Total Clock-Hours to Complete the Actions in 2(a) Above.	UNK	UNK	N/A
3. Maintenance Allocation:			
What Maint. is Performed by the Operator?	Daily Checks. All Other.	UNK	None
Mechanic?		UNK	All Other.
4. Maintenance Costs:			
What is Annual Maintenance Cost Per Vehicle (Fleet Av.)?	\$35-40 Plus Labor	UNK	N/A
What Percentage is Labor?	UNK	UNK	N/A
Which of These Wage Scales Best Describe Your Mechanics:	✓	UNK	
\$3.00- 5.00 Hr?			
\$5.00- 7.50 Hr?			
\$7.50-10.00 Hr?			
\$10.00-12.50 Hr?			
\$12.50-15.00 Hr?			

Parameter	User		
	A1	A2	A3
5. Repair Parts:			
Av. Down-Time Awaiting Parts Not in Dealer's Stock?	UNK	UNK	None
Which Parts Tend Not to Be in Dealer's Stock?	UNK	UNK	N/A
Is There a Frequency of Failure(s) of the Same Component?	UNK	UNK	No
If Yes, Explain.	UNK	UNK	N/A
Are Any Components Replaced on a Scheduled Interval (Excluding Filters)?	Yes	UNK	Yes
If Yes, What Components and at What Intervals?	Points — Monthly. Plugs — Monthly.	—	Points — 400 Hr. Plugs — 400 Hr. Cond — 400 Hr.
6. Model Changes/Field Campaigns:			
Since Purchasing the FLT, Has It Been Modified by the Mfgr., Dealer, and/or In-House?	Yes	No	Yes
If Yes, Explain.	Foam in Tires.	N/A	Changed Engine From Gas to LPG.
Have There Been Any Significant Design Changes to this Model in the Last Year of Which You Are Aware?	No	No	No
If Yes, Explain.	N/A	N/A	N/A
7. Reliability:			
Are You Dissatisfied With Any Feature(s) of this FLT?	No	No	No
If Yes, Explain.	N/A	N/A	N/A

Parameter	User		
	A1	A2	A3
Are There Any Undesirable/Unsat. Operating Characteristics Assoc. with this Equipment?	No	No	No
If Yes, Explain.	N/A	N/A	N/A
Does the FLT Perform its Mission Satisfactorily?	Yes	Yes	Yes
If No, Explain.	N/A	N/A	N/A
Why Did You Purchase this Make/Model FLT?	Demonstration and Price.	Low Bid.	—
Does the FLT Perform as Well as Suggested by Mfr. and/or Dealer?	Yes	Yes	Yes
If No, Explain.	N/A	N/A	N/A
Based on Your Experience, Which of the Following Sub-Systems Tend to Fail Most Frequently: Transmission, Engine, Steering, Mast, Brakes, Hydraulic, Drive Axle/Differential, Electrical System, Cooling System?	UNK	UNK	Brakes
What Are the Best Features of this Truck?	More Dependable and Shorter Turning Radius.	UNK	—
8. Maintainability/Availability: Can Operators and/or Maint. Pers. Be Trained Without Difficulty?	Yes	UNK	Yes
Are There Any Maint. Tasks Which Are Unduly Difficult and/or Time Consuming? If Yes, Explain.	No	UNK	Yes
	N/A	—	Engine and Transmission Overhaul.

Parameter	User		
	A1	A2	A3
Does Your Mechanic/Operator Have a Preference for this Make FLT?			
Discuss Reason for your Answer.	Yes Based on Experience.	UNK	Yes
Is Scheduled (Preventative) Maint. Costly and/or Time Consuming?	No N/A	UNK	No N/A
Do You Defer Scheduled Maint. Until Slack Periods?	No	UNK	No
Are Special Lubricants/Fuels Required? If Yes, Explain.	No N/A	UNK	No N/A
Are All Components Accessible for Maint. with Minimum Disturbance of Other Components? If No, Explain.	Yes N/A	UNK	Yes N/A
Scheduled Maintenance:			
(1) Replace Filters:	Interval	Interval	Interval
(a) Engine Oil	30 Days	UNK	100 Hr.
(b) Air	30 Days	UNK	100 Hr.
(c) Fuel	—	UNK	1000 Hr.
(d) Transmission	6 Mos.	UNK	1000 Hr.
(e) Hydraulic	6 Mos.	UNK	1000 Hr.
(2) Drain and Refill:	Time	Time	Time
(a) Engine Oil	15 Min.	UNK	30 Min.
(b) Transmission Oil	—	UNK	30 Min.
(c) Hydraulic Oil	—	UNK	30 Min.
(d) Cooling System	1 Hr.	UNK	45 Min.
(3) Lubricate (Chassis)	Bi-Weekly	UNK	40 Hr.

Parameter	User		
	A1	A2	A3
Preventative Maint. Time:			
(1) Man-Hours Expended for Daily Servicing (Average).	.25	UNK	8
(2) Man-Hours Expended for Weekly Preventative Maint. Service (Average).	—	UNK	40
(3) Man-Hours Expended for Monthly Preventative Maint. Service (Average).	2-3	UNK	160
Component Part Replacement Data:			
Indicate the Average Time Required for One Man Using Common Tools and Special Tools Furnished with the Unit to Remove & Replace the Following:			
Alternator	UNK	UNK	30 Min.
Starter	UNK	UNK	60 Min.
Voltage Regulator	UNK	UNK	10 Min.
Battery	UNK	UNK	10 Min.
Fan Belt	UNK	UNK	120 Min.
Hydraulic Pump	UNK	UNK	60 Min.
Brake Shoes	UNK	UNK	120 Min.
Fuel Pump	UNK	UNK	N/A
Safety and Human Factors:			
1. Are the Safety Precautions Provided by the Mfr. Augmented by the User? If Yes, Explain.	Yes	No	No
	Back-Up Bell; Horn.	N/A	N/A
2. Do You Know of any Safety Hazards that Exist During Operation?	No	No	No

Parameter	User		
	A1	A2	A3
Maintenance?	No	No	No
3. Are the Following Items/Elements Adequate:			
Gauges & Monitors?	Yes	Yes	Yes
Controls Within Easy Reach and Clearly Marked as to their Use and Function?	Yes	Yes	Yes
Anti-Skid Walkway Surface?	Yes	UNK	Yes
Are Hazardous Areas Identified?	No	No	No
4. Does the Size of the Operator Inhibit His Performance?	No	No	No
5. Does the Sound Level Result in Unusual Operator Fatigue after Prolonged Operation?	No	No	No
Manuscripts, Manuals, Tools, and Test Equipment:			
1. Which of the Following Manuals Are Provided:			
Operator?	Yes	Yes	Yes
Maintenance?	Yes	Yes	Yes
Parts?	Yes	Yes	Yes
Overhaul?	No	No	No
2. Are Technical Bulletins Provided Periodically By:			
Dealer?	No	Yes	—
Manufacturer?	No	—	Yes
3. Do You Use the Commercial Manual as Supplied by the Mfgr/Dealer?	Yes	Yes	Yes
Do You Specify Particular Format and Materials?	No	No	No

Parameter	User		
	A1	A2	A3
Have Any Difficulties Been Encountered in Using the Manuals to Perform:			
Operating/Setup?	No	No	No
Servicing?	No	No	No
Adjustments?	No	No	No
Repair & Overhaul?	No	No	No
4. Are Special Tools Required by Operators or Mechanics to Maintain or Test/Troubleshoot the Equipment?	No	UNK	Yes
(a) If Yes, Are They Provided by the Manufacturer?	N/A	UNK	No
(b) Is the Use of Special Tools Sufficiently Described in the Operator/Repair Manual?	N/A	UNK	Yes
(c) What Special Tools Have You Used?	N/A	UNK	OHM Meter
Training and Logistic Support:			
1. Are Dealer Repairs Performed Promptly?	Yes	UNK	Yes
2. Is Timely Technical Assistance Available When Required From:			
The Dealer?	Yes	UNK	Yes
The Manufacturer?	UNK	UNK	Yes
3. Do You Attempt to Standardize Makes and/or Models of Equipment/Components Within Your Fleet?	Yes	UNK	Yes
4. What is the Length of Warranty in Equipment Hours/Months?	1500 Hours or 1 Year	1 Year	90 Days

Parameter	User		
	A1	A2	A3
5. What is the Total Number of Warranty Claims?	5	UNK	None
6. Are Delays Frequently Caused by Lack of Timely Receipt of Repair Parts?	No	UNK	No
7. What Repair Parts Do You Keep on Hand for this Item?	None	UNK	Recommended Mfg. Spare Parts.
If None Stocked, Why?	Readily Available Locally.	N/A	N/A
8. What is the Length of Time to Fill Emergency Orders When Parts Are Not in Dealer's Stock?	UNK	UNK	48 Hours
9. What is the Length of Time to Fill Normal Orders When Parts Are Not in Dealer's Stock?	UNK	UNK	Same Day
10. Is Special Training Required For: Operators?	No	No	No
Maintenance Personnel?	No	No	No
11. Do You Utilize Mfg. Training Schools for Your: Operators?	UNK	UNK	UNK
Mechanics?	UNK	UNK	UNK
12. Would You Rebuy an Identical Make and Model Forklift Truck? Explain Answer.	Yes	Yes	Yes
	Past Experience.	If Low Bid.	Good Performance, Easy Maintenance.

Appendix C-1

Parameter	User		
	A4	A5	A6
A. End Item:			
1. Manufacturer	A-C	A-C	A-C
2. Model No.	ACP 40	ACP 40	ACP 40
3. Date(s) Purchased	74-78	76	77
4. Capacity (lb)	4000	4000	4000
5. Load Center (in.)	24	24	24
6. Number in Fleet	30	3	2
7. Estimated Size of MHE Fleet	500	3	2
B. How was Item Purchased:			
1. By Specification?	Yes	No	No
Sole Source?	Yes	No	No
Competitive Bid?	No	Yes	Yes
2. By Dealer or Mfr. Recommendation?	Yes	—	—
3. From Commercial Brochure?	Used for Ref. Only	—	—
4. Other?	N/A	—	—
5. Was Vehicle Purchased New/Used?	New	New	New
6. Leased?	No	Yes	No
7. Maintained by Lessee/Lessor?	N/A	Lessee	Contract with Lift-Truck Service.
8. How is Truck Inspected/Accepted?	Inspected by Maint. Prior to Acceptance.	Put in Operation.	Put in Operation.
C. Components & Accessories:			
1. Engine Mfr.	Continental Y112	Continental F163	Continental F163
Model	Centrifugal	Flyball	Flyball
Governor Type	UNK	Donaldson	Donaldson
Air Cleaner Mfr.			

Parameter	User		
	A4	A5	A6
Type & Part No.	UNK	UNK	UNK
Pos. Crankcase Ventilation System	No	Yes	Yes
Cooling System Capacity (qt)	UNK	10	10
Pressure (PSI)	UNK	7	7
Oil Filter Mfgr.	UNK	A-C	A-C
Part No.	UNK	UNK	UNK
Battery Model	A-C	ESB	ESB
Voltage (V)	12	12	12
Capacity (Ah)	UNK	95	95
Alternator Mfgr.	Delco	Delco	Delco
Part No.	UNK	UNK	UNK
Starter Mfgr.	Delco	Delco	Delco
Part No.	UNK	UNK	UNK
2. Power Train:			
Transmission Mfgr.	UNK	Borg-Warner	Borg-Warner
Part No.	UNK	UNK	UNK
Front-Axle Mfgr.	UNK	A-C	A-C
Part No.	UNK	UNK	UNK
3. Steering and Brakes:			
Truck Equip With Power Steering?	Yes	Yes	Yes
Steering Pump Separate from Main Hydraulic Pump?	Yes	No	No
Power Steering Pump Mfgr?	UNK	N/A	N/A
Part No.	UNK		
Power Steering Control Unit Mfgr?	UNK	A-C	A-C
Part No.	UNK	UNK	UNK
Is Truck Equipped w/ Power Brakes?	No	No	No
Master Cylinder Mfgr?	UNK	Bendix	Bendix

Parameter	User			
	A4	A5	A6	
Part No.	UNK	UNK	UNK	
4. Hydraulic System:				
Filter Mfgr?	UNK	Marvel	Marvel	
Part No.	UNK	M3544-2500	M3544-2500	
Main Pump Mfgr?	UNK	Webster	Webster	
Part No.	UNK	3YIDS-6-0YDS10-1LG	UNK	
Fluid-Level Indicator?	Yes	Yes	Yes	
Type	Dipstick	Dipstick	Dipstick	
5. Uprights, Forks, Fork Carrier, and Load Backrest:				
Mast Roller or Slider Type?	Roller	Roller	Roller	
Number of Mast Stages?	3	2	2	
Mast Part Number?	UNK	UNK	UNK	
Load Backrest Type?	Not Used	Special Flat Bar	Open Bar	
Part No.	N/A	None	UNK	
Sideshifter?	Yes (As Reqd)	Yes	Yes	
Sideshifter Mfgr?	Longreach 6"	A-C	Cascade	
Part No.	UNK	UNK	UNK	
Sideshifter Integral Part of Carriage?	No	Yes	Yes	
6. What Instruments, Gauges, and Safety Devices Is Truck Equipped With:				
Hourmeter?	Yes	Yes	Yes	
Ammeter: Gauge/Light?	Gauge	Gauge	Gauge	
Eng. Coolant Temp: Gauge/Light?	Gauge	Gauge	Gauge	
Eng. Oil Press: Gauge/Light?	Gauge	Gauge	Gauge	
Fuel Gauge?	Yes	Yes	Yes	

Parameter	User		
	A4	A5	A6
Transmission Press: Gauge/Light?	None	None	None
Transmission Temp: Gauge/Light?	None	None	None
Keyed Ignition Switch?	Yes	Yes	Yes
Rear View Mirror?	Yes (If Needed)	No	No
Retractable OHG?	Yes (As Req'd)	No	No
Horn?	Yes	Yes	Yes
Floodlight(s)? Qty?	As Req'd.	No	No
Taillight?	As Req'd.	No	No
Directional Lights?	As Req'd.	No	No
Parking Brake?	Yes	Yes	Yes
Tilt Cylinder Anti-Cavitation Device?	UNK	Yes	Yes
Neutral Start Switch?	Yes	Yes	Yes
Starter Disconnect?	No	Yes	Yes
Restriction Indicator?	No	No	No
Fuel Filter?	Yes	Yes	Yes
7. What Optional Equipment Is Used:			
Attachments (Clamps, Ram)?	Clamps, Rams as Req'd.	None	Sideshifter
Special Lights?	Flashing Safety Light Installed by User.	None	Flashing Light
Other?	Fire Extinguisher Installed by User.	None	None
D. Functional Performance and Characteristics:			
1. Geographical Location	Greensboro, N.C.	Berkeley, Ca.	Emeryville, Ca.
2. Approx. Time Truck Operated Outside	20 to 30%	10%	10%

Parameter	User		
	A4	A5	A6
3. Ambient Temp. Range in Which Truck Operates.	20° to 90° F	UNK	UNK
4. Is Truck Stored Outdoors in Cold Weather.	No	No	No
If Yes, Is It Difficult to Start/Operate in Cold Weather?	N/A	N/A	N/A
5. Does Truck Operate in Any Unusual Environmental Conditions (Dirt, Rain, Etc.)?	Yes	Yes	No
If Yes, What Conditions?	Areas with Lint	Aluminum Dust	N/A
Does Forklift Perform Properly Under These Conditions?	No	Yes	N/A
What, If Any, Actions Were Required to Enable Proper Operations?	Radiators Cleaned Each Shift.	None	N/A
E. Characteristics:			
1. What Type Fuel Does Engine Use?	LPG	Gas	LPG
Will It Operate on Unleaded Fuel?	N/A	Yes	N/A
If LPG Is Used, Why?	Less Pollution.	N/A	Less Pollution.
2. What Is Capacity of Fuel Tank?	33½ lb.	10 Gal.	UNK
3. Normal Engine Operating Temp.?	180° F	180° F	180° F
4. Does the Drive Train Contain the Following Components:	Yes	Yes	Yes
Torque Converter?	Yes	Yes	Yes
Power Shift Transmission?	No	No	No
Hydrostatic Transmission?			

Parameter	User		
	A4	A5	A6
Differential?	Yes	Yes	Yes
Positive Inching?	Yes	Yes	Yes
External Transmission Filter?	UNK	Yes	Yes
Water Cooler for Transmission?	Yes	Yes	Yes
Universal Joint Drive Shaft?	Yes	Yes	Yes
5. Electrical System Protected By:			
Circuit Breakers?	No	No	No
Fuses?	Yes	Yes	Yes
F. Transportability:			
1. Have You Experienced Difficulties Loading/Moving FLT to its Job Site?	No	Not Moved.	No
2. How Do You Move the FLT From Job Site to Job Site?	Tractor-Trailer	N/A	Drive.
3. What Procedure/Equipment Do You Use to Transport a "Down" FLT?	Tractor-Trailer	None	Maint. Contractor Picks It Up.
4. Are Lifting and/or Tiedown Attachments, or Locations, Provided for Ease of Shipment?	No	No	Tiedowns on Mast and Tow Hook.
G. Physical Characteristics:			
1. Length: W/ Forks (in.)	134	134	134
W/O Forks (in.)	92	92	92
W/ Forks & Sideshifter (in.)	—	—	—
W/O Forks & Sideshifter (in.)	—	—	—
2. Width (in.)	45	45	45
3. Overhead Guard Height (in.)	88	88	88
4. Collapsed Mast Height (in.)	85	73	85

Parameter	User		
	A4	A5	A6
5. Maximum Fork Height (in.)	192	144	130
6. Free Lift (in.)	63	47	15½
7. Backrest Height (in.)	N/A	48	48
8. Tilt Forward (°)	5	5	5
Tilt Rearward (°)	10	10	10
9. Sideshift-Left (in.)	6	4	4
Right (in.)	6	4	4
10. Carriage Width (in.)	42	42	48
11. Fork Dimensions: Length (in.)	30-60	42	42
Width (in.)	4	4	4
Thickness (in.)	1.25	1.75	1.75
Taper Length (in.)	14	14	14
12. Forks Comply With ANSI MH 11.4?	Yes	Yes	Yes
13. Fork Adj. Dimension: Minimum (in.)	12	12	12
Maximum (in.)	42	42	42
14. Seat Clearance to OHG (in.)	39	39	39
15. Wheelbase (in.)	55	55	55
16. Drive Tire Width $\bar{Q}_L$ to $\bar{Q}_L$ (in.)	37.5	37.5	37.5
17. Steer Tire Width $\bar{Q}_L$ to $\bar{Q}_L$ (in.)	34.25	34.25	34.25
18. Drive Tire Size	7.00 x 15	7.00 x 15	7.00 x 15
Qty	2	2	2
19. Steer Tire Size	6.50 x 10	6.50 x 10	6.50 x 10
20. Tire Type	PT-Prefers SRT	Foam Filled	PT
Why?	Maint. Free	Reduces Flats	Standard

H. Reliability, Availability, and Maintainability Characteristics:

I. General Data:

Current Hourmeter Reading (Fleet Av.)

UNK

870

1900

Parameter	User		
	A4	A5	A6
Av. Age of Fleet (Yr.)	6	2	1/2
Expected Life of FLT (Hr.)	30-40,000	12,000	UNK
Expected Annual Usage (Hr.)	3000	4000	2-4000
Expected Time Between Major Overhauls	2500 Hr.	No Overhaul.	5 Yr. (Engine)
Normal Work Day (Clock-Hr.)	24	24	10
Shifts Per Day (Number)	3	3	1
2. Maintenance Factors:			
(a) Scheduled (Preventative) and Unscheduled Maintenance Actions During the Past Year (Cumulative No.).	100-Hr. & 1000-Hr. PM's Number UNK.	3 Unscheduled	1 Per Mo. Plus Monthly Service.
(b) Unscheduled Maintenance Actions Requiring at Least 1 Hour of Maint. Time During the Year to Correct (No.).	100 to 150	3	2 Per Week
(c) Man-Hours Required to Correct the Malfunctions in 2(b) Above.	200 to 300	4-6 Hr. Each For Gaskets. 2 Hr. For Bearing.	UNK
(d) Clock Hours Required to Correct Malfunctions Identified in 2(b) Above.	200 to 300	12	UNK
(e) Total Man-Hours to Complete the Actions in 2(a) Above.	65/Truck	UNK	UNK
(f) Total Clock-Hours to Complete the Actions in 2(a) Above.	65/Truck	UNK	UNK
3. Maintenance Allocation:			
What Maintenance Is Performed By The:			
Operator?	Daily Checks	None	Check Fluid Levels.
Mechanic?	All Other.	All Other.	Minor Repairs.

Parameter	User		
	A4	A5	A6
4. Maintenance Costs:			
What Is Annual Maintenance Cost Per Vehicle (Fleet Av.)?	\$3,000 Including OH and Labor.	UNK	N/A
What Percentage Is Labor?	50%	UNK	N/A
Which of These Wage Scales Best Describe Your Mechanics:			Maint. Work Done By Maint. Contract
\$ 3.00- 5.00 Hr.	✓		
5.00- 7.50 Hr.			
7.50-10.00 Hr.			
10.00-12.50 Hr.			
12.50-15.00 Hr.		✓	
5. Repair Parts:			
Av. Down-Time Awaiting Parts Not In Dealer's Stock?	48	2 Days	One Day
Which Parts Tend Not to Be in Dealer's Stock?	Forged Structural Items.	Starters	UNK
Is There a Frequency of Failure(s) of the Same Component?	Yes. Radiators.	Yes. Head Gaskets (2).	No
If Yes, Explain.	Failure to Clean Out Radiator Fins.	UNK	N/A
Are Any Components Replaced on a Scheduled Interval (Excluding Filters)?	Yes	Yes	Yes
If Yes, What Components and at What Intervals?	Points, Plugs, Condenser Checked Every 100 Hr. and Changed as Req.	Points-As Req. Plugs-As Req.	Points-As Req. Plugs-As Req.

Parameter	User		
	A4	A5	A6
6. Model Changes/Field Campaigns: Since Purchasing the FLT, Has It Been Modified by the Mfgr., Dealer, and/or In-House? If Yes, Explain. Have There Been Any Significant Design Changes to this Model in the Last Year of Which You Are Aware? If Yes, Explain.	No N/A No N/A	No N/A No N/A	No N/A No N/A
7. Reliability: Are You Dissatisfied With Any Feature(s) of this FLT? If Yes, Explain. Are There Any Undesirable/Unsat. Operating Characteristics Assoc. With this Equipment? If Yes, Explain. Does the FLT Perform Its Mission Satisfactorily? If No, Explain. Why Did You Purchase This Make/Model FLT?	No N/A No N/A Yes N/A	No N/A No N/A Yes N/A	No N/A No N/A Yes N/A
Does the FLT Perform as Well as Suggested by Mfgr. and/or Dealer? If No, Explain. Base on Your Experience, Which of the Following Sub-Systems Tend to Fail Most Frequently: Transmission, Engine, Steering?	Past Experience and Standardization. Yes N/A	Dissatisfied with Previous Trucks. Yes N/A	Price and Past Experience. Yes N/A

Parameter	User		
	A4	A5	A6
ing, Mast, Brakes, Hydraulic, Drive Axle/ Differential, Electrical System, Cooling System.			
What Are the Best Features of this Truck?	Cooling System Brakes Hydraulics Continental Engine, Roller Masts, and Good Transmis- sion.	UNK Reliability and Little Mainte- nance.	UNK Ease of Operation Good Visibility, Fast Lift.
8. Maintainability/ Availability: Can Operators and/or Maint. Pers. Be Trained Without Difficulty?	Yes	Yes	Yes
Are There Any Maint. Tasks Which Are Unduly Difficult and/or Time Consuming? If Yes, Explain.	No	No	UNK
Does Your Mechanic/Operator Have a Preference for this Make FLT? Discuss Reason for your Answer.	Yes. Most Mechanics Happy with the Truck. Operator Preference Un- known.	No Don't Care So Long As It Runs.	No
Is Scheduled (Preventative) Maint. Costly and/or Time Consuming? If Yes, Explain.	Yes User Says It Is Worth It to Have Reliable Trucks.	No	Yes Costly, But Neces- sary.
Do You Defer Scheduled Maint. Until Slack Periods?	No	Yes	No
Are Special Lubricants/ Fuels Required?	No	No	No

Parameter	User		
	A4	A5	A6
If Yes, Explain. Are All Components Accessible for Maint. with Minimum Disturbance of Other Components?	N/A	N/A	N/A
If No, Explain.	Yes	Yes	UNK
Scheduled Maintenance:	N/A	N/A	N/A
(1) Replace Filters:	Interval	Time	All Maint. Done Under Contract. Time UNK
(a) Engine Oil	100 Hr.	25 Min.	
(b) Air	100 Hr.	5 Min.	
(c) Fuel	1000 Hr.	25 Min.	
(d) Transmission	1000 Hr.	35 Min.	
(e) Hydraulic	1000 Hr.	35 Min.	
(2) Drain and Refill:			
(a) Engine Oil	100 Hr.	20 Min.	
(b) Transmission Oil	1000 Hr.	20 Min.	
(c) Hydraulic Oil	1000 Hr.	20 Min.	
(d) Cooling System	None		
(3) Lubricate (Chassis)	100 Hr.	20 Min.	
Preventative Maint. Time:			
(1) Man-Hours Expended for Daily Servicing (Average).	.5/24-Hr. Day	.1	.3 to .4
(2) Man-Hours Expended for Weekly Preventative Maint. Service (Average).	1.3/100 Hr. PM	None	None
(3) Man-Hours Expended for Monthly Preventative Maint. Service (Average).	8/1000 Hr. PM	2/Truck	1.75 to 2

Parameter	User		
	A4	A5	A6
Component Part Replacement Data:			
Indicate the Average Time Required For One Man Using Common Tools and Special Tools Furnished With the Unit to Remove & Replace the Following:			
Alternator	30 Min.	UNK	UNK
Starter	45 Min.	UNK	UNK
Voltage Regulator	30 Min.	UNK	UNK
Battery	30 Min.	10 Min.	UNK
Fan Belt	45 Min.	UNK	UNK
Hydraulic Pump	120 Min. (Includes Bleeding System)	UNK	UNK
Brake Shoes	120 Min. (Includes Bleeding, Adj. & Cyl. Re-build)	UNK	UNK
Fuel Pump	45 Min.	UNK	UNK
Safety and Human Factors:			
1. Are the Safety Precautions Provided by the Mfr. Augmented by the User? If Yes, Explain.			
	Yes	Yes	No
	Operator Trng, Flashing Lights, Fire Extinguishers, and Non-Sparking Chain on LP Tanks.	Company Has Own Safety Rules and Regulations.	
2. Do You Know of Any Safety Hazards that Exist During:			
Operation?	Yes. Ctrwt. Bolts Loosen.	No	No
Maintenance?	No	No	No

Parameter	User		
	A4	A5	A6
3. Are the Following Item/Elements Adequate:			
Gauges & Monitors?	Yes	Yes	Yes
Controls Within Easy Reach and Clearly Marked as to Their Use and Function?	Yes	Yes	Yes
Anti-Skid Walkway Surface?	Yes	None	Yes
Are Hazardous Areas Identified?	No	No	No
4. Does the Size of the Operator Inhibit His Performance?	No	No	No
5. Does the Sound Level Result in Unusual Operator Fatigue After Prolonged Operation?	No	No	No
Manuscripts, Manuals, Tools and Test Equipment:			
1. Which of the Following Manuals Are Provided:			
Operator?	Yes	Yes	Yes
Maintenance?	Yes	Yes	Yes
Parts?	Yes	Yes	Yes
Overhaul?	No	No	No
2. Are Technical Bulletins Provided Periodically By:			
Dealer?	Yes	No	Yes
Manufacturer?	Yes	No	No
3. Do You Use the Commercial Manual As Supplied by the Mfgr/ Dealer?	Yes	Yes	Yes
Do You Specify Particular Format and Materials?	No	No	No

Parameter	User		
	A4	A5	A6
Have Any Difficulties Been Encountered In Using the Manuals to Perform:			
Operating/Setup?	No	No	No
Servicing?	No	No	No
Adjustments?	No	No	No
Repair & Overhaul?	No	No	No
4. Are Special Tools Required by Operators or Mechanics to Maintain or Test/Troubleshoot the Equipment?	No	No	No
(a) If Yes, Are They Provided by the Manufacturer?	N/A	N/A	N/A
(b) Is the Use of Special Tools Sufficiently Described in the Operator/Repair Manual?	Yes	N/A	N/A
(c) What Special Tools Have You Used?	None	None	None
Training and Logistic Support:			
1. Are Dealer Repairs Performed Promptly?	Yes	Yes	Yes
2. Is Timely Technical Assistance Available When Required From:			
The Dealer?	Yes	Yes	Yes
The Manufacturer?	Yes	No Experience	No Experience
3. Do You Attempt to Standardize Makes and/or Models of Equipment/Components Within Your Fleet?	Yes	No	Yes
4. What is the Length of Warranty in Equipment Hours/Months?	Std. Warranty	UNK	90 Days
5. What is the Total Number of Warranty Claims?	2/Truck	1	Few
6. Are Delays Frequently Caused by Lack of Timely Receipt of Repair Parts?	No	No	No

Parameter	User		
	A4	A5	A6
7. What Repair Parts Do You Keep on Hand For This Item?			
If None Stocked, Why?			
8. What is the Length of Time to Fill Emergency Orders When Parts Are Not in Dealer's Stock?	48 Hr.	Points, Plugs, Filters	Filters
9. What is the Length of Time to Fill Normal Orders When Parts Are Not in Dealer's Stock?	72 Hr.	8 Hr.	UNK
10. Is Special Training Required For: Operators?	No	24 Hr.	UNK
Maintenance Personnel?	No	No	No
11. Do You Utilize Mfr. Training Schools for Your: Operators?	No	No	No
Mechanics?	No	UNK	UNK
12. Would You Rebuy an Identical Make and Model Forklift Truck? Explain Answer.	Yes	Yes	Yes
	Past Experience, Good Cooperation From the Dealer and Manufacturer.	Past Experience.	Price, Past Experience, and Quality of Truck.

APPENDIX C-2

Parameter	User		
	C1	C2	C3
A. End Item:			
1. Manufacturer	Clark	Clark	Clark
2. Model No.	C500-Y40	C500-Y40	C500-Y40
3. Date(s) Purchased	68	Nov 77	N/A
4. Capacity (lb)	5000	5000	4000
5. Load Center (in.)	24	24	24
6. Number in Fleet	4 Trucks. 2 Purchased in Last 6 Mos.	4	Rental Fleet 189
7. Estimated Size of MHE Fleet	10	15-20	Rental Fleet
B. How was Item Purchased:			
1. By Specification?	Yes	Yes	N/A
Sole Source?	No	No	N/A
Competitive Bid?	Yes	Yes	N/A
2. By Dealer or Mfr. Recommendation?	No	Yes	N/A
3. From Commercial Brochure?	No	Yes. Specify What They Want.	N/A
4. Other?	Lease Trucks For 6 Mos. With Option to Buy.	None	N/A
5. Was Vehicle Purchased New/Used?	New	New	N/A
6. Leased?	Yes. Option to Buy.	Yes. Lease With Option to Buy.	Yes
7. Maintained by Lessee/Lessor?	Lessee & Lessor. User Does Minor Maint.	Lessee	Lessor

Parameter	User		
	C1	C2	C3
8. How is Truck Inspected/ Accepted?	By Leasing for 6 Mos; Clark Sends a Maint. Man to Go Over Each Truck After It Arrives.	Mechanics Inspect Truck to See How They Are Going to Maintain It.	N/A
C. Components & Accessories:			
1. Engine Mfgr.			
Model	Continental	Continental	Continental
	F 163	220 020 K	Waukenshau F 163, C 300 C 500, D 155 or D 176
Governor Type	Centrifugal	Centrifugal	Centrifugal
Air Cleaner Mfgr.	Fram	Fram	Clark-Fram
Type & Part No.	UNK	UNK	UNK
Pos. Crankcase Ventilation System	No	Yes	Continental — No Waukenshau — Yes
Cooling System Capacity (qt)	11	UNK	300-12; 500-11
Pressure (PSI)	7	7	7
Oil Filter Mfgr.	Fram	Fram	Clark-Fram
Part No.	UNK	UNK	UNK
Battery Model	Delco-Remy	Delco-Remy	Clark-Prestolite
Voltage (V)	12	12	12
Capacity (Ah)	45	45	UNK
Alternator Mfgr.	Delco-Remy	UNK	Delco-Remy
Part No.	UNK	UNK	UNK
Starter Mfgr.	Delco-Remy	UNK	Delco-Remy
Part No.	UNK	UNK	UNK

Parameter	User		
	C1	C2	C3
2. Power Train:			
Transmission Mfgr.	Clark	Clark	Clark
Part No.	H 200D 10	UNK	UNK
Front-Axle Mfgr.	Clark	Clark	Clark
Part No.	UNK	UNK	UNK
3. Steering and Brakes:			
Truck Equip With Power Steering?	Yes	No	Yes
Steering Pump Separate From Main Hydraulic Pump?	Yes	N/A	Yes
Power Steering Pump Mfgr?	Vickers	N/A	Vickers
Part No.	UNK		UNK
Power Steering Control Unit Mfgr?	Saginaw, Portland	N/A	Clark
Part No.	UNK		UNK
Is Truck Equipped w/ Power Brakes?	No	No	No
Master Cylinder Mfgr?	Wagner	Wagner	Wagner-Lockheed
Part No.	UNK	UNK	UNK
4. Hydraulic System:			
Filter Mfgr?	Clark	Central Ind. Supply	Fram
Part No.	UNK	1799525	UNK
Main Pump Mfgr?	Vickers	Parker-Hannifan	Vickers
Part No.	UNK	Mo7A82J 2334954	UNK
Fluid Level Indicator?	Yes	Yes	Yes
Type	Dipstick	Dipstick	Dipstick
5. Uprights, Forks, Fork Carrier, and Load Backrest:			

Parameter	User		
	C1	C2	C3
Mast Roller or Slider Type?	Roller	Roller	Roller
Number of Mast Stages?	3	2	2 to 4
Mast Part Number?	Mo7342830	UNK	UNK
Load Backrest Type?	Open	Open-Removable	Open
Part Number	UNK	UNK	UNK
Sideshifter?	Yes	No	Yes
Sideshifter Mfgr?	Clark	N/A	Clark-Cascade
Part No.	UNK		UNK
Sideshifter Integral Part of Carriage?	Yes	N/A	No
6. What Instruments, Gauges, and Safety Devices Is Truck Equipped With:			
Hourmeter?	Yes	Yes	Yes
Ammeter: Gauge/Light?	Gauge	Gauge	Gauge
Eng. Coolant Temp: Gauge/Light?	Gauge	Gauge	Gauge
Eng. Oil Press: Gauge/Light?	Gauge	Gauge	Gauge
Fuel Gauge?	LPG Tank	Gauge on LPG Tank	Yes
Transmission Press: Gauge/Light?	None	None	None
Transmission Temp: Gauge/Light?	Light	Light	Light
Keyed Ignition Switch?	Yes	Yes	Yes
Rear View Mirror?	No	No (Added by User)	No
Retractable OHG?	No	No	Opt.
Horn?	Yes	Yes	Yes
Floodlight(s)? Qty?	No (Installed by User)	No	Opt.
Taillight?	No	No	Opt.
Directional Lights?	No	No	Opt.

Parameter	User		
	C1	C2	C3
Parking Brake?	Yes	Yes	Yes
Tilt Cylinder Anti-Cavitation Device?	Yes	Yes	Yes
Neutral Start Switch?	Yes	Yes	Yes
Starter Disconnect?	No	UNK	Yes
Restriction Indicator?	UNK	No	Opt.
Fuel Filter?	Yes	No	Yes
7. What Optional Equipment Is Used: Attachments (Clamps, Ram)?	None	None	Roll Clamps, Rug Poles, Sideshifter
Special Lights?	1 Taillight 1 Foglight None	Blinking Light on OHG None	Rotating Beacon Lights None
Other?			
D. Functional Performance and Characteristics:			
1. Geographical Location	Hood River, Ore.	Everett, Wash.	Colorado, Nebraska Wyoming
2. Approx. Time Truck Operated Outside	Never	1-6 Out of 8 Hrs. 3-Are Used Inside.	90%
3. Ambient Temp. Range in Which Truck Operates.	50-100° F	50-85° F	-40-105° F
4. Is Truck Stored Outdoors in Cold Weather? If Yes, Is It Difficult to Start & Operate in Cold Weather?	No N/A	No N/A	Yes Yes. Requires En- gine Heaters.
5. Does Truck Operate in Any Unusual Environmental Conditions (Dirt, Rain, Etc.)?	No	Yes	Yes

Parameter	User		
	C1	C2	C3
If Yes, What Conditions?	N/A	Rain, Sandblast Area, Dust, Close to Salt Water.	Dust
Does Forklift Perform Properly Under These Conditions?	N/A	Yes	Yes
What, If Any, Actions Were Required to Enable Proper Operations?	None	None	In Cold Conditions Refrigerate Oil Is Used; Cycl Path Air Cleaner for Dusty Conditions, Engine Precleaners.
E. Characteristics:			
1. What Type Fuel Does Engine Use?	LPG	LPG	LPG & Gas
Will It Operate on Unleaded Fuel?	No	No	Yes. 85 Octane
If LPG Is Used, Why?	Burns Fuel Cleaner; Increases Life of Vehicle; Vehicle Requires Less Maint.	Less Fumes, Pollution; Less Likely for People to Steal; Truck Runs Better, Eng. Is Cleaner; 100,000 Mile Engine-Life Expectancy.	Environmental Reasons.
2. What Is Capacity of Fuel Tank?	15 lb.	15 lb.	10.5 Gal.
3. Normal Engine Operating Temp.?	180°F	Approx. 165°F	170°-200°F
4. Does the Drive Train Contain the Following Components: Torque Converter?	Yes	Yes	Yes

Parameter	User		
	C1	C2	C3
Power Shift Transmission?	Yes	No	Yes
Hydrostatic Transmission?	No	Yes	No
Differential?	Yes	Yes	Yes
Positive Inching?	Yes	No	Yes
External Transmission Filter?	Yes	Yes	Yes
Water Cooler For Transmission?	Yes	Yes	Yes
Universal Joint Drive Shaft?	No	No	C300 — Yes C500 — No
5. Electrical System: Protected By:			
Circuit Breakers?	No	No	No
Fuses?	Yes	Yes	Yes
F. Transportability:			
1. Have You Experienced Difficulties Loading/Moving FLT to Its Job Site?	No	No	No
2. How Do You Move the FLT From Job Site to Job Site?	Drive Lift Truck on to Straddle Trailer and Move from Site to Site. Furthest Distance Moved in This Manner Is 17-18 Miles.	They Drive Truck From Site to Site.	They Use a Roll-Back Truck; Chain Truck for Normal Hwy Conditions.
3. What Procedure/Equipment Do You Use to Transport a "Down" FLT?	Use a Larger FLT to Push the "Down" Truck	Use a Larger Forklift to Carry It Back to Maint.	Use a Winch to Place Them on a Roll-Back Truck.

Parameter	User		
	C1	C2	C3
	onto Straddle Carrier, Then Transport to Maint. Shop.	or They Fix It on the Spot.	
4. Are Lifting and/or Tiedown Attachments, or Locations, Provided for Ease of Shipment?	Yes	Yes, Holes in Side of Truck for Tying Down.	Tie-Down Attachments Are Provided as Cutouts in the Frame.
G. Physical Characteristics:			
1. Length: W/ Forks (in.)	126	136.41	136.41
W/O Forks (in.)	84	94.41	94.41
W/ Forks & Sideshifter (in.)	129 1/4	136.41	136.41
W/O Forks & Sideshifter (in.)	84	94.41	94.41
2. Width (in.)	36	45.38	45.38
3. Overhead Guard Height (in.)	83	84.25	84.25
4. Collapsed Mast Height (in.)	82 1/2	73	73
5. Maximum Fork Height (in.)	188	149	149
6. Free Lift (in.)	63 1/4	50	50
7. Backrest Height (in.)	48	84.25	48
8. Tilt Forward (°)	6	6	6
Tilt Rearward (°)	12	12	12
9. Sideshift-Left	1 1/4	UNK	4
Right (in.)	1 1/4	UNK	4
10. Carriage Width (in.)	38	39	39
11. Fork Dimensions: Length (in.)	42	42	42
Width (in.)	5	5	5
Thickness (in.)	1 3/4	2 1/4	2 1/4

Parameter	User		
	C1	C2	C3
	4	4	4
12. Forks Comply with ANSI MH 11.4?	Yes	Yes	Yes
13. Fork Adj. Dimension: Minimum (in.)	10	UNK	10
Maximum (in.)	35	39	39
14. Seat Clearance to OHG (in.)	38 3/4	39.44	40.88
15. Wheelbase (in.)	53	63	63
16. Drive Tire Width $\bar{Q}_L$ to $\bar{Q}_L$ (in.)	33	37.75	37.75
17. Steer Tire Width $\bar{Q}_L$ to $\bar{Q}_L$ (in.)	32 1/4	34.00	34.00
18. Drive Tire Qty	Monarch 2	2	2
19. Steer Tire Size	18 x 5 x 12 1/8	28 x 12 x 20	28 x 12.5 x 20
20. Tire Type	Cushion Tires	Foam Filled	Depends on What is Desired.

Why?

Tires Used
Under Rough
Conditions. They
Use a Grizzly
Bearcat. Metal
Spurs Drive into
Rubber Tire.

H. Reliability, Availability, and Maintainability

Characteristics:

1. General Data:

Current Hourmeter Reading (Fleet Av.)	UNK	UNK	Rotate Rental Trucks Every 5 Yrs.
Av. Age of Fleet (Mos.)	48	4	2000-2500
Expected Life of FLT (Hr.)	20,000	30,000	27
Expected Annual Usage (Hr.)	2,000	1400-1800	10,000-12,000
Expected Time Between Major Overhauls	5 Years	0 (Unload Trucks After 3 Years.	1250
			Do Not Overhaul Trucks.

Parameter	User		
	C1	C2	C3
Normal Work Day (Clock-Hr.)	8	3-16 a Day 1-8 a Day	4
Shifts Per Day (Number)	1	2	1
2. Maintenance Factors:			
(a) Scheduled (Preventative) and Un-scheduled Maintenance Actions During the Past Year (Cumulative No.)	20 Times (Est)	0	Every 170-225 Hr.
(b) Un-scheduled Maintenance Actions Requiring at Least 1 Hour of Maint. Time During the Year to Correct (No.).	10 Actions (Est)	0	9 Times Per Year. Maint. Records Are Kept on Hour, Not by No. of Failures.
(c) Man-Hours Required to Correct the Malfunctions in 2(b) Above.	5 Hr. Per Truck	0	115 Hr. Per Yr. Per Truck (Allows 5+ Hours for Travel).
(d) Clock Hours Required to Correct Malfunctions Identified in 2(b) Above.	5 Hr. Per Truck	0	115 Hr. Per Yr. Per Truck (Allows 5+ Hours for Travel).
(e) Total Man-Hours to Complete the Actions in 2(a) Above.	100 Hr.	0	2 Hr.
(f) Total Clock-Hours to Complete the Actions in 2(a) Above.	100 Hr.	0	2 Hr.
3. Maintenance Allocation: What Maint. Is Performed by the Operator?	Check Oil, Fuel, Tires, Etc.	Check Fuel, Oil Level, Water Level, Tires.	Daily Visual Insp. Operator Must Turn in Check List at Each Shift. This is

Parameter	User		
	C1	C2	C3
Mechanic?	Does All Other Maintenance. Leased Trucks.	Does All Other Maint. Work.	Written into the Clark Program. Clark Will Do All Maint. However, the User Quite Often Does His Own Maint. on the Rental Truck.
4. Maintenance Costs: What Is Annual Maintenance Cost Per Vehicle (Fleet Av.)?	\$750-\$850	They Have Not Had to Do Any Maint. on These Trucks to Date.	\$660
What Percentage Is Labor?	65%	60%	40-45%
Which of These Wage Scales Best Describe Your Mechanics: \$ 3.00 - 5.00 Hr? 5.00 - 7.00 Hr? 7.50 - 10.00 Hr? 10.00 - 12.50 Hr? 12.50 - 15.00 Hr?	✓	✓	✓
5. Repair Parts: Av. Down-Time Awaiting Parts Not in Dealer's Stock?	48 Hrs.	3 Days	Parts Have an 85% Avail. 3 Days Max. Wait.
Which Parts Tend Not to Be in Dealer's Stock?	User Did Not Know as the Dealer Has	Mast Roller Studs.	Low Turn-Over Items, Structural Items; Clark Re-

Parameter	User		
	C1	C2	C3
Is There a Frequency of Failure(s) of the Same Component? If Yes, Explain.	Never Been Out of Part that the User Needed. No N/A	Yes Mast Roller Studs.	quires 2 Sales Per Year to Justify Stocking Item. No N/A
Are Any Components Replaced on a Scheduled Interval (Excluding Filters)? If Yes, What Components and at What Intervals?	Yes Points — 1 Yr Plugs — 1 Yr Oil — 2 Yr Filter — 1 Yr	No N/A	Yes Plugs, Points, Oil Every 170-225 Hr.
6. Model Changes/Field Campaigns: Since Purchasing the FLT, Has It Been Modified by the Mfgr, Dealer, and/or In-House? If Yes, Explain.	Yes. Foglights and Taillights Have Been Added. No	No No	No. Only as Far as Various Attachments Are Concerned. No
Have There Been Any Significant Design Changes to this Model in the Last Year of Which You Are Aware? If Yes, Explain.	No	No	No
7. Reliability: Are You Dissatisfied With Any Feature(s) of this FLT? If Yes, Explain.	No	No Extremely Pleased With the Truck.	No

Parameter	User		
	C1	C2	C3
Are There Any Undesirable/Unsat. Operating Characteristics Assoc. With This Equipment? If Yes, Explain.	No	No	No
Does the FLT Perform Its Mission Satisfactorily? If No, Explain.	Yes	Yes	Yes
Why Did You Purchase this Make/Model FLT?	Past Experience Has Been Very Good. Also, Price Was Competitive With Other Major Brands. Service Is Good.	It Is the Best Piece of Equipment on the Market Presently. It's Reliability Is Greater Than Other Available Trucks.	N/A
Does the FLT Perform as Well as Suggested by Mfr and/or Dealer? If No, Explain.	Yes	Yes	N/A
Based on Your Experience, Which of the Following Sub-Systems Tend to Fail Most Frequently: Transmission, Engine, Steering, Mast, Brakes, Hydraulic, Drive Axle/Differential, Electrical Sys., Cooling Sys?	None	Steering, Brakes, Hydraulic. These Areas Receive the Greatest Wear. Salt Corrosion Has a Great Effect on Brakes.	Hydraulic

Parameter	User		
	C1	C2	C3
What Are the Best Features of this Truck?	Engine is More Accessible Than Other Brands of Forklifts.	There Is Nothing Unique About the Truck.	Heavy Duty Transmission; Waukesha Engine (Built With Diesel Components).
8. Maintainability/Availability: Can Operators and/or Maint. Pers. Be Trained Without Difficulty?	Yes	Yes	Yes
Are There Any Maint. Tasks Which Are Unduly Difficult and/or Time Consuming? If Yes, Explain.	No	No	No
Does Your Mechanic/Operator Have a Preference For This Make FLT? Discuss Reason for Your Answer.	UNK Did Not Have an Answer as Their Mechanics Work on Many Trucks and Were Not Available to Comment.	UNK The Mechanics/Operators Are Not Exposed to Other Equipment Other Than Clark.	N/A
Is Scheduled (Preventative) Maint. Costly and/or Time Consuming? If Yes, Explain.	No	Yes It's Always Time Consuming.	No
Do You Defer Scheduled Maint. Until Slack Periods?	Yes	No	No
Are Special Lubricants/Fuels Required? If Yes, Explain.	No	No	No
Are All Components Accessible for Maint. With Minimum Disturbance of Other Components? If No, Explain.	Yes	Yes	Yes

Parameter	User					
	C1	C2	C3	C1	C2	C3
Scheduled Maintenance:						
(1) Replace Filters:						
(a) Engine Oil	Interval 100 Hr.	Time 10 Min.	Interval 1 Mo.	Time 5 Min.	Interval 170-225 Hr.	Time 10 Min.
(b) Air	100 Hr.	5 Min.	4 Mo.	5 Min.	170-225 Hr.	5 Min.
(c) Fuel	100 Hr.	5 Min.	Use LPG	Unknown	500 Hr.	1 Min.
(d) Transmission	100 Hr.	10 Min.	Unknown	5 Min.	2000 Hr.	30 Min.
(e) Hydraulic	100 Hr.	Unknown	6 Mo.	30 Min.	170-225 Hr.	10-15 Min.
(2) Drain and Refill:						
(a) Engine Oil	100 Hr.	30 Min.	1 Mo.	Unknown	2000 Hr.	10-15 Min.
(b) Transmission Oil	100 Hr.	30 Min.	Never	Fluid Level	2000 Hr.	10-15 Min.
(c) Hydraulic Oil	100 Hr.	20 Min.	1 Yr.	30 Min.	2000 Hr.	10-15 Min.
(d) Cooling System	100 Hr.	10 Min.	1 Mo.	5 Min.	170-225 Hr.	10 Min.
(3) Lubricate (Chassis)						
Preventative Maint. Time:						
(1) Man-Hours Expended for Daily Servicing (Average).	.1		.2			
(2) Man-Hours Expended for Weekly Preventative Maint. Service (Average).	.4		1			
(3) Man-Hours Expended for Monthly Preventative Maint. Service (Average).	3.5		4			
Component Part Replacement Data:						
Indicate the Average Time Required for One Man Using Common Tools and Special Tools Furnished with the Unit to Remove & Replace the Following:						
Alternator	20 Min.		35 Min.			90 Min.
Starter	45 Min.		35 Min.			90 Min.
Voltage Regulator	10 Min.		30 Min.			90 Min.

Parameter	User		
	C1	C2	C3
Battery	10 Min.	20 Min.	60 Min. Includes Cleaning Terminals
Fan Belt	10 Min.	15 Min.	15-20 Min.
Hydraulic Pump	30 Min.	Never Replaced One.	120 Min. Including Resealing.
Brake Shoes	240 Min.	240 Min.	300 Min.
Fuel Pump	N/A	N/A	60 Min.
Safety and Human Factors:			
1. Are the Safety Precautions Provided by the Mfgr. Augmented by the User? If Yes, Explain.	Yes Added Lights and Fire Extinguisher to Truck.	Yes Schooling for Operators.	Yes
2. Do You Know of Any Safety Hazards that Exist During: Operation?	No	No	No
Maintenance?	No	No	No
3. Are the Following Items/Elements Adequate:			
Gauges & Monitors?	Yes	Yes	Yes
Controls Within Easy Reach and Clearly Marked as to their Use and Function?	Yes	Yes	Good
Anti-Skid Walkway Surface?	Wears Away Easily.	Yes, Does Not Last a Long Time.	Yes
Are Hazardous Areas Identified?	Yes	Yes	Yes
4. Does the Size of the Operator Inhibit His Performance?	No	No	No

Parameter	User		
	C1	C2	C3
5. Does the Sound Level Result in Unusual Operator Fatigue After Prolonged Operation?	No	No	No. Meets OSHA Regulations.
Manuscripts, Manuals, Tools, and Test Equipment:			
1. Which of the Following Manuals Are Provided:			
Operator?	Yes	Yes	Yes
Maintenance?	No	Yes	Yes
Parts?	Yes	Yes	No. Opt.
Overhaul?	No	No	No. Opt.
2. Are Technical Bulletins Provided Periodically By:			
Dealer?	Yes	No	Yes
Manufacturer?	No	No	Yes
3. Do You Use the Commercial Manual as Supplied by the Mfr/Dealer?	Yes	Yes	Yes
Do You Specify Particular Format and Materials?	No	No	No
Have Any Difficulties Been Encountered in Using the Manuals to Perform:			
Operating/Setup?	No	No	No
Servicing?	No	No	No
Adjustments?	No	No	No
Repair & Overhaul?	No	N/A	No. Opt.
4. Are Special Tools Required by Operators or Mechanics to Maintain or Test/Troubleshoot the Equipment?	No	No	Yes

Parameter	User		
	C1	C2	C3
(a) If Yes, Are They Provided by the Manufacturer?	N/A	N/A	Packing Tools for Cylinders.
(b) Is the Use of Special Tools Sufficiently Described in the Operator/Repair Manual?	N/A	N/A	In the Overhaul Manuals Only. See Brochure "Clark Parts Package."
(c) What Special Tools Have You Used?	NA	N/A	
Training and Logistic Support:			
1. Are Dealer Repairs Performed Promptly?	Unknown. They Do All Repair Work Except Leased Items. To Date, No Items (Leased) Have Needed Repairs.	Yes	First Come, First Served.
2. Is Timely Technical Assistance Available When Required From: The Dealer?	Yes	Yes	Will Provide Info Over Phone as Required. All Tech. Help Required.
The Manufacturer?	No	Yes	N/A
3. Do You Attempt to Standardize Makes and/or Models of Equipment/Components Within Your Fleet?	Yes	Yes	1 Yr. on Body; 90 Days on Electrical System.
4. What is the Length of Warranty in Equipment Hours/Months?	1 Yr, 10,000 Hr. or 5 Yr. on Engine; 2750 Hr. on Transmission.		1 Yr.

Parameter	User		
	C1	C2	C3
5. What is the Total Number of Warranty Claims?	None	2 or 3	1 or 2 in Past Year.
6. Are Delays Frequently Caused by Lack of Timely Receipt of Repair Parts?	No	Yes	No
7. What Repair Parts Do You Keep on Hand for this Item?	Belt, Hose, Plugs, Points, Filters, Small items.	General Tune-Up Items, Mast Roller Studs.	85% of Total Truck Parts.
If None Stocked, Why?			
8. What is the Length of Time to Fill Emergency Orders When Parts Are Not in Dealer's Stock?	Have Not Needed to Order Parts from Dealer.	3 Days	24 Hours, By Air-Freight From Chicago
9. What is the Length of Time to Fill Normal Orders When Parts Are Not in Dealer's Stock?	Same as Above.	1 Week to 10 Days.	3 Days
10. Is Special Training Required For: Operators?	Yes. General Familiarization with Trucks.	No	Yes, OSHA Requirement.
Maintenance Personnel?	Yes. Training Program Is Available Through Dealer.	No	None
11. Do You Utilize Mfgr. Training Schools for Your: Operators?	—	—	—

Parameter	User		
	C1	C2	C3
Mechanics? 12. Would You Rebuy an Identical Make and Model Forklift Truck? Explain Answer.	Yes Has Had Good Experience with this Truck. Gets a Price Break on Fleet Purchases.	Yes User Feels That Clark Equipment Is a Leader in the State of Art for Forklift Trucks. Also, They Have Had Good Luck Using Clark Equipment.	N/A

APPENDIX C-2 (con't.)

Parameter	User			
	C4	C5	C6	
A. End Item:				
1. Manufacturer	Clark	Clark	Clark	Clark
2. Model No.	C500 Y40/45	C500 Y50	CF 40	CF 40
3. Date(s) Purchased	74-77	75-77	62-66	62-66
4. Capacity (lb)	4000/4500	5000	4000	4000
5. Load Center (in.)	24	24	24	24
6. Number in Fleet	9	4	12	12
7. Estimated Size of MHE Fleet	18	18	16	16
B. How was Item Purchased:				
1. By Specification?	Yes	Yes	Yes	Yes
Sole Source?	No	No	No	No
Competitive Bid?	Yes	Yes	Yes	Yes
2. By Dealer or Mfrgr. Recommendation?	No	No	No	No
3. From Commercial Brochure?	No	No	No	No
4. Other?	No	None	None	None
5. Was Vehicle Purchased New/Used?	New	New	New	New
6. Leased?	No	No	No	No
7. Maintained by Lessee/Lessor?	N/A	N/A	N/A	N/A
8. How is Truck Inspected/Accepted?	Mechanics Inspect Trucks Before Acceptance.	Mechanics Inspect Trucks Before Acceptance.	Unknown Purchased By Previous Company.	Unknown Purchased By Previous Company.
C. Components & Accessories:				
1. Engine Mfrgr.	Waukesha	Continental	Continental	Continental
Model	D176	UNK	UNK	UNK
Governor Type	Mechanical	Mechanical	Mechanical	Mechanical
Air Cleaner Mfrgr.	UNK	Donaldson	UNK-OEM	UNK-OEM

Parameter	User			
	C4	C5	C6	
Type & Part No.	Dry/UNK	Dry/UNK	Fram-Replacement Dry-UNK	
Pos. Crankcase Ventilation System	Yes	Yes	Yes	
Cooling System Capacity (qty)	11	11	UNK	
Pressure (psi)	7	7	UNK	
Oil Filter Mfgr. Part No.	Fram UNK	Fram UNK	UNK-OEM Fram-Replacement UNK	
Battery Model Voltage (V)	Delco 12	Delco 12	Delco 12	
Capacity (Ah)	45	45	45	
Alternator Mfgr. Part No.	Delco UNK	Delco UNK	Delco UNK	
Starter Mfgr. Part No.	Delco UNK	Delco (Dustproof) UNK	Delco UNK	
2. Power Train:				
Transmission Mfgr. Part No.	Clark UNK	Clark UNK	UNK	
Front-Axle Mfgr. Part No.	Clark UNK	Clark UNK	UNK	
3. Steering and Brakes:				
Truck Equip. with Power Steering?	Yes	Yes	Yes	
Steering Pump Separate From Main Hydraulic Pump?	Yes	Yes	Yes	
Power Steering Pump Mfgr.? Part No.	Parker-Hannifan UNK	Parker-Hannifan UNK	UNK	
Power Steering Control Unit Mfgr.? Part No.	Saginaw UNK	Saginaw UNK	UNK	
Is Truck Equipped with Power Brakes?	No	No	No	

Parameter	User		
	C4	C5	C6
Master Cylinder Mfgr.? Part No.	Wagner UNK	Wagner UNK	UNK UNK
4. Hydraulic System Filter Mfgr?	OEM-UNK Fram- Replacement UNK	UNK-OEM Fram- Replacement UNK	UNK-OEM Fram- Replacement UNK
Part No.	Parker-Hannifan UNK	Parker-Hannifan UNK	UNK UNK
Main Pump Mfgr.? Part No.	Yes Dipstick	Yes Dipstick	Yes Dipstick
Fluid Level Indicator? Type			
5. Uprights, Forks, Fork Carrier, and Load Backrest:			
Master Roller or Slider Type?	Roller 3	Roller 3	Slider 3
Number of Mast Stages?	None	Bolt-on 36" High	Bolt-on
Load Backrest Type?	N/A	UNK	UNK
Part Number	Yes	Yes	Yes
Sideshifter?	Clark	Longreach	Cascade
Sideshifter Mfgr?	UNK	UNK	UNK
Part No.	No	No	No
Sideshifter Integral Part of Carriage			
6. What Instruments, Gauges, and Safety Devices is Truck Equipped With:			
Hourmeter?	Yes	Yes	Yes
Ammeter: Gauge/Light?	Light	Light	Gauge
Eng. Coolant Temp: Gauge/Light?	Gauge	Light	Gauge
Eng. Oil Press: Gauge/Light?	Gauge	Gauge	Gauge
Fuel Gauge?	Yes	Yes	Yes
Transmission Press.: Gauge/Light?	None	None	None
Transmission Temp: Gauge/Light?	Light	Light	None
Keyed Ignition Switch?	Yes	Yes	Yes

Parameter	User		
	C4	C5	C6
Rear View Mirror?	No	No	No
Retractable OHG?	No	No	No
Horn?	Yes	Yes	Yes
Floodlight(s)? Qty.?	Yes-2	Yes-2 (front & rear)	No
Tailight?	No	No	No
Directional Lights?	No	No	No
Parking Brake?	Yes	Yes	Yes
Tilt Cylinder Anti-Cavitation Device?	Yes	Yes	Yes
Neutral Start Switch?	Yes	Yes	Yes
Starter Disconnect?	Yes	Yes	No
Restriction Indicator?	No	No	No
Fuel Filter?	Yes	Yes	Yes
7. What Optional Equipment is Used:			
Attachments (Clamps, Ram)?	Clamps; Remote Fork Adjustments.	Clamps	Clamps
Special Lights?	Flashing Light & Flood Lights Added by User.	Flood Lights, Flashing Light.	Flashing Light Added by User.
Other?	Cabs, Heaters, Defrosters.	None	None

D. Functional Performance And Characteristics:

1. Geographical Location
Covington, Va.
2. Approx. Time Truck Operated Outside.
90%
3. Ambient Temp. Range In Which Truck Operates.
0° to 100° F
4. Is Truck Stored Outdoors In Cold Weather? Yes

Covington, Va.
None
60° - 100° F
40° - 100° F
No

AD-A067 089

ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMM--ETC F/G 13/6
TRUCK FORKLIFT, GASOLINE-ENGINE-DRIVEN, 4000-POUND-CAPACITY, PN--ETC(U)
AUG 78 J E STEPHENS, J W REID
MERADCOM-2253

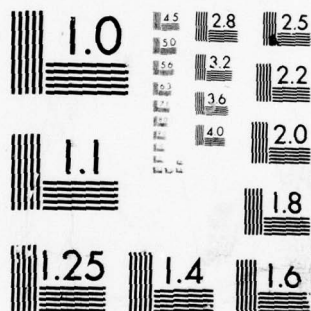
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Parameter	User		
	C4	C5	C6
If Yes, Is It Difficult To Start/Operate In Cold Weather?	Yes. Battery Usually Has To Be Jumped In Extremely Cold Weather	N/A	N/A
5. Does Truck Operate In Any Unusual Environmental Conditions (Dirt, Rain, Etc.)?	Yes	No	No
If Yes, What Conditions?	Carbon Dust	N/A	N/A
Does Forklift Perform Properly Under These Conditions?	Yes	N/A	N/A
What, If Any, Actions Were Required To Enable Proper Operations?	Filters Changed Every 40 Hours.	N/A	N/A
E. Characteristics:			
1. What Type Fuel Does Engine Use?	Gasoline	Gasoline	LPG
Will It Operate On Unleaded Fuel?	Yes	Yes	N/A
If LPG Is Used, Why?	N/A	N/A	Less Pollution
2. What Is Capacity Of Fuel Tank?	10.5 Gal.	10.5 Gal.	30 lb.
3. Normal Engine Operating Temp.?	180° F	180° F	180° F
4. Does The Drive Train Contain The Following Components:			
Torque Converter?	Yes	Yes	Yes
Power Shift Transmission?	Yes	Yes	Yes
Hydrostatic Transmission?	No	No	No
Differential?	Yes	Yes	Yes

Parameter	User		
	C4	C5	C6
Positive Inching?	Yes	Yes	Yes
External Transmission Filter?	Yes	Yes	No
Water Cooler For Transmission?	Yes	Yes	Yes
Universal Joint Drive Shaft?	No	No	No
5. Electrical System			
Protected By:			
Circuit Breakers?	No	No	No
Fuses?	Yes	Yes	Yes
F. Transportability:			
1. Have You Experienced Difficulties Loading/Moving FLT To Its Job Site?	No	No	No
2. How Do You Move The FLT From Job Site to Job Site?	Drive	Drive	Drive
3. What Procedure/Equipment Do You Use To Transport A "Down" FLT?	Tow Or Repair On Site.	Tow Or Repair On Site.	Tow Or Repair On Site.
4. Are Lifting And/Or Tiedown Attachments, Or Locations Provided For Ease Of Shipment?	No	No	No
G. Physical Characteristics:			
1. Length: With Forks (in.)	136	136	UNK
W/O Forks (in.)	94.4	94.4	UNK
W/ Forks & Side Shifter (in.)	—	—	UNK
W/O Forks & Sideshifter (in.)	—	—	UNK
2. Width (in.)	45.38	45.38	UNK

Parameter	User		
	C4	C5	C6
3. Overhead Guard Height (in.)	84.25	84.25	UNK
4. Collapsed Mast Height (in.)	73	79	UNK
5. Maximum Fork Height (in.)	149	167	UNK
6. Free Lift (in.)	50	50	UNK
7. Backrest Height (in.)	N/A	36	UNK
8. Tilt Forward (°)	6	6	UNK
Tilt Rearward (°)	12	12	UNK
9. Sideshift-Left (in.)	4	4	UNK
Sideshift-Right (in.)	4	4	UNK
10. Carriage Width (in.)	41	39	UNK
11. Fork Dimensions:	Length (in.)	42	UNK
Width (in.)	5	5	UNK
Thickness (in.)	1.75	1.75	UNK
Taper Length (in.)	30	30.18	UNK
12. Forks Comply With ANSI MH 11.4?	Yes	Yes	UNK
13. Fork Adj. Dimension:	Minimum (in.)	10	UNK
Maximum (in.)	39	39	UNK
14. Seat Clearance to OHG (in.)	39.4	39.4	UNK
15. Wheelbase (in.)	63	63	UNK
16. Drive Tire Width $\bar{Q}$ to $\bar{Q}$ (in.)	37.75	37.75	UNK
17. Steer Tire Width $\bar{Q}$ to $\bar{Q}$ (in.)	34	34	UNK
18. Drive Tire Size	7.00×12	7.00×12	UNK
Qty	2	2	UNK
19. Steer Tire Size	6.50×10	6.50×10	UNK
20. Tire Type	PT	PT	SRT
Why?	Outside Use	Rough Driving Surface; Rail Track Crossings	Whse. Use Only

Parameter	User			
	C4	C5	C6	
H. Reliability, Availability, and Maintainability Characteristics:				
I. General Data:				
Current Hourmeter Reading (Fleet Av.)	UNK	3000	UNK	
Av. Age of Fleet (Yr).	4	2	13	
Expected Life of FLT (Hr).	*5,000	10,000+	30,000	
Expected Annual Usage (Hr).	*6,000	2,000+	6,000	
Expected Time Between Major Overhauls.	*5,000	10,000+	30,000	
Normal Work Day (Clock-Hr).	*24	8+	16	
Shifts Per Day (Number).	*3	1+	2	
*Outside Trucks +Whse. Trucks				
2. Maintenance Factors:				
(a) Scheduled (Preventative) and Unscheduled Maintenance Actions During the Past Year (Cumulative No.)	UNK	380	UNK	
(b) Unscheduled Maintenance Actions Requiring at Least 1 Hour of Maintenance Time During the Year to Correct (No.).	UNK	360	UNK	
(c) Man-Hours Required to Correct the Malfunctions in 2(b) Above.	UNK	720	UNK	
(d) Clock Hours Required to Correct Malfunctions Identified In 2(b) Above.	UNK	720	UNK	
(e) Total Man-Hours to Complete the Actions In 2(a) Above.	UNK	780	UNK	
(f) Total Clock-Hours to /complete the Actions In 2(a) Above.	UNK	780	UNK	

Parameter	User		
	C4	C5	C6
Are Any Components Replaced on a Scheduled Interval (Excluding Filters)?	No	No	No
If Yes, What Components and at What Intervals?	N/A	N/A	N/A
6. Model Changes/Field Campaigns:			
Since Purchasing the FLT, Has It Been Modified By the Mfr., Dealer, and/or In-House?	Yes	No	No
If Yes, Explain.	Added Lights.	N/A	N/A
Have There Been Any Significant Design Changes to This Model in the Last Year of Which You Are Aware?	No	No	This Model No Longer Manufactured.
	N/A	N/A	N/A
If Yes, Explain.			
7. Reliability:			
Are You Dissatisfied With Any Feature(s) of This FLT?	No	No	No
If Yes, Explain.	N/A	N/A	N/A
Are There Any Undesirable/Unsat. Operating Characteristics Assoc. With This Equipment?	No	No	No
If Yes, Explain.	N/A	N/A	N/A
Does the FLT Perform Its Mission Satisfactorily?	Yes	Yes	Yes
If No, Explain.	N/A	N/A	N/A
Why Did You Purchase This Make/Model FLT?	Nearest Dealer; Past Performance.	Low Bidder.	Parts in Inventory; Try to Standardize; Most Bought

Parameter	User			from Previous Owner of Plant; Past Performance.
	C4	C5	C6	
Does the FLT Perform as Well as Suggested By Mfr. and/or Dealer? If No, Explain.	Yes	Yes		Yes
Based on Your Experience, Which of the Following Sub-Systems Tend to Fail Most Frequently: Transmission, Engine, Steering, Mast, Brakes, Hydraulic, Drive Axle/Differential, Electrical Sys., Cooling Sys.?	1. Brakes - Car- bon Dust. 2. Hydraulic - Hose Reels Cause Rupture. 3. Steering - RR Tracks. 4. Elec. Sys. - RR Tracks Catch Wir- ing Occasionally.	Steering - Driv- ing Across Rail Tracks.		Hydraulic Hoses.
What Are the Best Features of This Truck?	Performs Well; Well Built; Mini- mum Down Time.	Does Its Job; Available Dealer Service.		User Satisfied With Its Performance.
8. Maintainability/Availability: Can Operators and/or Maint. Pers. Be Trained Without Difficulty? Are There Any Maint. Tasks Which Are Unduly Difficult and/or Time/ Consuming? If Yes, Explain.	Yes	Yes		Yes
	Yes. Difficult Work Sent to Dealer	Yes. Difficult Work Sent to Dealer.		No

Parameter	User		
	C4	C5	C6
Does Your Mechanic/Operator Have a Preference for this Make FLT?			
Discuss Reason for Your Answer.	Yes Clark Truck Used for Years.	Yes More Familiar With Clark Trucks.	Yes Clark Truck Used For Years.
Is Scheduled (Preventative) Maint. Costly and/or Time Consuming?	Yes.	Yes	No
If Yes, Explain.	Trucks Out of Service Costly.	Trucks Out of Service Costly.	N/A
Do You Defer Scheduled Maint. Until Slack Periods?	Yes	Yes	No
Are Special Lubricants/Fuels Required?	No	No	No
If Yes, Explain.	N/A	N/A	N/A
Are All Components Accessible for Maint. With Minimum Disturbance of Other Components?	Yes	Yes	Yes
If No, Explain.	N/A	N/A	N/A
Scheduled Maintenance:			
1. Replace Filters:			
(a) Engine Oil	Interval 40 Hr	Interval 240 Hr	Interval 150 Hr
(b) Air	Time 10 Min.	Time 10 Min.	Time 10 Min.
(c) Fuel	As Req.	As Req.	As Req.
(d) Hydraulic	40 Hr	240 Hr	As Req.
(e) Transmission	40 Hr	240 Hr	As Req.
2. Drain and Refill:			
(a) Engine Oil	40 Hr	240 Hr	150 Hr
(b) Transmission Oil	As Req.	As Req.	As Req.
(c) Hydraulic Oil	As Req.	As Req.	As Req.
	*Est. (Never Done)		

Parameter	User					
	C4	C5	C6	C5	C6	C6
(d) Cooling System	Yearly	30 Min.	As Req'd.	30 Min.	Yearly	30 Min.
3. Lubricate (Chassis)	40 Hr	15 Min.	240 Hr	20 Min.	150 Hr	20 Min.
Preventative Maint. Time:						
1. Man-Hours Expended for Daily Servicing (Average).	2		2		4	
2. Man-Hours Expended for Weekly Preventative Maint. Service (Average).	10		10		20	
3. Man-Hours Expended for Monthly Preventative Maint. Service (Average).	40		40		80	
Component Part Replacement Data:						
Indicate the Average Time Required for One Man Using Common Tools and Special Tools Furnished With the Unit to Remove & Replace the Following:						
Alternator	45 Min.		45 Min.		60 Min.	
Starter	45 Min.		45 Min.		60 Min.	
Voltage Regulator	30 Min.		30 Min.		30 Min.	
Battery	15 Min.		15 Min.		30 Min.	
Fan Belt	30 Min.		30 Min.		30 Min.	
Hydraulic Pump	30 Min.		30 Min.		60 Min.	
Brake Shoes	120 Min.		120 Min.		240 Min.	
Fuel Pump	30 Min.		30 Min.		N/A	
Safety and Human Factors:						
1. Are the Safety Precautions Provided by the Mfgr. Augmented by the User? If Yes, Explain.	Yes.	User Adds Flood Lights and Flashing Light.	Yes.	Adds Flashing Light.	Yes.	Safety Classes for All Operators.

Parameter	User		
	C4	C5	C6
2. Do You Know of Any Safety Hazards That Exist During: Operation? Maintenance?	No No	No No	No No
3. Are the Following Items/Elements Adequate: Gauges & Monitors? Controls Within Easy Reach and Clearly Marked as to Their Use and Function? Anti-Skid Walkway Surface?	Yes Yes Yes	Yes Yes Yes	Yes Yes Yes
4. Does the Size of the Operator Inhibit His Performance?	Not Required	Not Required	Not Required
5. Does the Sound Level Result in Unusual Operator Fatigue After Prolonged Operation?	No	No	No
Manuscripts, Manuals, Tools, and Test Equipment:	No	No	No
1. Which of the Following Manuals Are Provided: Operator? Maintenance? Parts? Overhaul?	Yes Yes Yes No	Yes Yes Yes No	Yes Yes Yes No
2. Are Technical Bulletins Provided Periodically By: Dealer? Manufacturer?	Yes No	Yes No	Yes No

Parameter	User		
	C4	C5	C6
3. Do You Use the Commercial Manual As Supplied by the Mfgr./Dealer?	Yes	Yes	Yes
Do You Specify Particular Format and Materials?	No	No	No
Have Any Difficulties Been Encountered In Using the Manuals to Perform:			
Operating/Setup?	No	No	No
Servicing?	No	No	No
Adjustments?	No	No	No
Repair and Overhaul?	No	No	No
4. Are Special Tools Required By Operators or Mechanics to Maintain or Test/Troubleshoot the Equipment?	No	No	No
(a) If Yes, Are They Provided by the Manufacturer?	N/A	N/A	N/A
(b) Is the Use of Special Tools Sufficiently Described in the Operator Repair Manual?	N/A	N/A	N/A
(c) What Special Tools Have You Used?	N/A	N/A	N/A
Training and Logistic Support:			
1. Are Dealer Repairs Performed Promptly?	Yes	Yes	Yes
2. Is Timely Technical Assistance Available When Required From:			
The Dealer?	Yes	Yes	Yes
The Manufacturer?	Yes, Through Dealer.	Yes, Through Dealer.	Yes, Through Dealer.

Parameter	User		
	C4	C5	C6
3. Do you Attempt to Standardize Makes and/or Models of Equipment/Components Within Your Fleet?	Yes	Yes	Yes
4. What Is the Length of Warranty in Equipment Hours/Months?	New - 6 Mos. or 1000 Hr.	90 Days	UNK
5. What Is the Total Number of Warranty Claims?	2	Very Few	None
6. Are Delays Frequently Caused by Lack of Timely Receipt of Repair Parts?	Not Frequently	Yes	No
7. What Repair Parts Do You Keep On Hand For This Item?	Hoses, Filters, Points, Plugs, Alternators, Batteries, Tires. N/A	Hoses, Starters, Tires, Alternators, Cylinders, Control Linkages. N/A	Filters, Tires, Starters, Alternators, Cylinders. N/A
If None Stocked, Why?			
8. What Is the Length of Time to Fill Emergency Orders When Parts Are Not in Dealer's Stock?	2-3 Days	2-3 Days	1 Week
9. What Is the Length of Time to Fill Normal Orders When Parts Are Not in Dealer's Stock?	1-7 Days	1 Week	2 Weeks
10. Is Special Training Required for: Operators?	Yes	No	No
Maintenance Personnel?	No	Yes	Yes
11. Do You Utilize Mfr. Training Schools For Your: Operators?	No	No	No
Mechanics?	No	No	Yes

Parameter	User		
	C4	C5	C6
12. Would You Rebuy an Identical Make and Model Forklift Truck? Explain Answer.	Yes. Past Experience, Performance, and Dealer Service.	Yes Past Experience, and Dealer.	Yes Past Experience, and Have Standardized on Clark Trucks.

APPENDIX C-2 (con't)

Parameter	User		
	C7	C8	C9
A. End Item:			
1. Manufacturer	Clark	Clark	Clark
2. Model No.	C500 Y40	C500 Y40	C500 Y60/ Y50/Y40
3. Date(s) Purchased	Jan 78	73	71-73-74
4. Capacity (lb.)	4000	4000	4000, 5000, 6000
5. Load Center (in.)	24	24	24
6. Number in Fleet	8	6	5
7. Estimated Size of MHE Fleet	8	16	5
B. How was Item Purchased:			
1. By Specification?	No	Yes	No
Sole Source?	No	No	Yes
Competitive Bid?	Yes	Yes	No
2. By Dealer or Mfgr. Recommendation?	No	Yes	Yes, Dealer.
3. From Commercial Brochure?	No	No	No
4. Other?	Dealer Survey of Facility. 3 Bidders.	No	No
5. Was Vehicle Purchased New/Used?	Leased New	New	Used
6. Leased?	Yes	No	No
7. Maintained by Lessee/Lessor?	Lessor	N/A	N/A
8. How is Truck Inspected/Accepted?	N/A	Visually In- spected, and Operated by User Before Accept- ance.	Visually In- spected, and Operational Use/ Demonstration.

Parameter	User		
	C7	C8	C9
C. Components & Accessories:			
1. Engine Mfgr.			
Model	Clark D176	Waukesha UNK	Continental UNK
Governor Type	Centrifugal	Mechanical	Centrifugal
Air Cleaner Mfgr.	Donaldson	Donaldson	OEM-UNK
Type & Part No.	UNK / UNK	Dry / UNK	AC-Replace- ment, Dry / UNK
Pos. Crankcase Ventilation System	Yes	Yes	No
Cooling System Capacity (qt)	UNK	11	UNK
Pressure (PSI)	UNK	7	UNK
Oil Filter Mfgr.	Clark	Purolator	OEM-UNK
Part No.	UNK	UNK	Fram-Replace- ment UNK
Battery Model			
Voltage (V)	UNK	Delco	Exide
Capacity (Ah)	12	12	12
Alternator Mfgr.	UNK	45	45
Part No.	Delco	Delco	Delco
Starter Mfgr.	UNK	UNK	UNK
Part No.	Delco	Delco	Delco
2. Power Train:			
Transmission Mfgr.	Clark	Clark	Clark
Part No.	UNK	UNK	UNK
Front-Axle Mfgr.	Clark	Clark	Clark
Part No.	UNK	UNK	UNK
3. Steering and Brakes:			
Truck Equip With Power Steering?	Yes	Yes	Yes

Parameter	User		
	C7	C8	C9
Steering Pump Separate From Main Hydraulic Pump?	Yes	Yes	Yes
Power Steering Pump Mfgr?	UNK	Parker	Saginaw
Part No.	UNK	UNK	UNK
Power Steering Control Unit Mfgr?	UNK	Saginaw	UNK
Part No.	UNK	UNK	UNK
Is Truck Equipped With Power Brakes?	No	No	No
Master Cylinder Mfgr?	UNK	Wagner	Wagner
Part No.	UNK	UNK	UNK
4. Hydraulic System:			
Filter Mfgr?	Clark	Central Ind. Supply	OEM-UNK Fram-Replace-ment
Part No.	UNK	UNK	UNK
Main Pump Mfgr?	UNK	Parker	Vickers
Part No.	UNK	UNK	UNK
Fluid Level Indicator?	Yes	Yes	Yes
Type	Dipstick	Dipstick	Dipstick
5. Uprights, Forks, Fork Carrier, and Load Backrest:			
Mast Roller or Slider Type?	Roller	Roller	Roller
Number of Mast Stages?	3	3	2
Mast Part Number?	UNK	UNK	UNK
Load Backrest Type?	Bolt-On	None. Don't Use.	Bolt-On
Part Number	UNK	UNK	UNK
Sideshifter?	Yes	Yes	No
Sideshifter Mfgr?	Clark	Clark	N/A
Part No.	D-544	UNK	N/A

Parameter	User		
	C7	C8	C9
Sideshifter Integral Part of Carriage?	Yes	Yes	N/A
6. What Instruments, Gauges, and Safety Devices is Truck Equipped With:			
Hourmeter?	Yes	Yes	2-Yes, 3-No
Ammeter: Gauge/Light?	Gauge	Gauge	2-Gauge, 3-Light
Eng. Coolant Temp: Gauge/Light?	Light	Gauge	Yes
Eng. Oil Press: Gauge/Light?	Light	Gauge	2-Gauge, 3-Light
Fuel Gauge?	On Tank	Yes	Yes
Transmission Press: Gauge/Light?	None	None	None
Transmission Temp: Gauge/Light?	Light	Light	None
Keyed Ignition Switch?	Yes	Yes	Yes
Rear View Mirror?	Yes	No	No
Retractable OHG?	On 1 Truck Only.	No	No
Horn?	Yes	Yes	Yes
Floodlight(s)? Qty?	No	Yes-2	None
Taillight?	No	Yes	None
Directional Lights?	No	None	None
Parking Brake?	Yes	Yes	Yes
Tilt Cylinder Anti-Cavitation Device?	No	Yes	Yes
Neutral Start Switch?	Yes	Yes	2-Yes, 3-No
Starter Disconnect?	No	Yes	2-Yes, 3-No
Restriction Indicator?	No	None	None
Fuel Filter?	Yes	Yes	Yes
7. What Optional Equipment Is Used:			
Attachments (Clamps, Ram)?	Paper Roll Clamp	Clamps & Box Clamps.	None
Special Lights?	Flasher	Flood Lights & Blinking Light on O.H.G.	None
Other?	None	None	None

Parameter	User		
	C7	C8	C9
D. Functional Performance and Characteristics:			
1. Geographical Location	Claremont, N.H. Ryegate, Vt.	Petersburg, Va.	Roanoke, Va.
2. Approx. Time Truck Operated Outside	5%	50%	100%
3. Ambient Temp. Range in Which Truck Operates.	60° F	10° to 100° F	0-95° F
4. Is Truck Stored Outdoors in Cold Weather?	No	No*	No
If Yes, Is It Difficult to Start & Operate in Cold Weather?	N/A	*Difficult to Start in Cold Weather Because LP Gas Freezes.	N/A
E. Characteristics:			
1. What Type Fuel Does Engine Use?	LPG	LPG	2-LPG, 3-Gas
Will It Operate on Unleaded Fuel?	No	No	3-Yes
If LPG Is Used, Why?	Less Pollution.	Safer Than Gasoline, Less Pollution, Trucks Used Inside.	Inside Operation, Less Odor.
2. What Is Capacity of Fuel Tank?	40 Lb.	30 lb.	LPG-30 Lb. Gas-11 Gal.
3. Normal Engine Operating Temp?	180° F	180° F	180° F

Parameter	User		
	C7	C8	C9
4. Does the Drive Train Contain the Following Components:			
Torque Converter?	Yes	Yes	2-Yes, 3-No
Power Shift Transmission?	Yes	Yes	2-Yes, 3-No
Hydrostatic Transmission?	No	No	No
Differential?	Yes	Yes	Yes
Positive Inching?	Yes	Yes	No-Discon- nected.
External Transmission Filter?	No	Yes	No
Water Cooler for Transmission?	No	Yes	No
Universal Joint Drive Shaft?	Yes	No	2-Yes, 3-No
5. Electrical System Protected By:			
Circuit Breakers?	No	No	No
Fuses?	Yes	Yes	Yes
F. Transportability:			
1. Have You Experienced Difficulties Loading/Moving FLT to its Job Site?	No	No	No
2. How Do You Move the FLT From Job Site to Job Site?	Flatbed Truck	Closed Truck Van or Driven.	Drive
3. What Procedure/Equipment Do You Use to Transport a "Down" FLT?	Maintenance Contractor Responsibility.	Tow or Repair on Site.	Tow
4. Are Lifting and/or Tiedown Attachments, or Locations, Provided for Ease of Shipment?	No	Yes, But Don't Use.	1-Yes, 4-No

Parameter	User		
	C7	C8	C9
G. Physical Characteristics:			
1. Length: W/ Forks (in.)	139	No Forks Used	123.5
W/O Forks (in.)	97	94.41	81.5
W/ Forks & Sideshifter	141.75		
W/O Forks & Sideshifter (in.)			
2. Width (in.)	42	94.41	
3. Overhead Guard Height (in.)	84	45.38	41.5
4. Collapsed Mast Height (in.)	86	84.25	82.8
5. Maximum Fork Height (in.)	144	73	83
6. Free Lift (in.)	63	149	130
7. Backrest Height (in.)	48	50	16
8. Tilt Forward (°)	6	Not Used	48
Tilt Rearward (°)	12	6	6
9. Sideshift-Left (in.)	4	12	10
Right (in.)	4	4	N/A
10. Carriage Width (in.)	4	4	N/A
11. Fork Dimensions: Length (in.)	45	39	36
Width (in.)	42	N/A	2-48, 3-42
Thickness (in.)	5	N/A	5
Taper Length (in.)	1½	N/A	1.75
12. Forks Comply With ANSI MH 11.4?	UNK	N/A	N/A
13. Fork Adj. Dimension: Minimum (in.)	Yes	N/A	Yes
Maximum (in.)	10	N/A	10
14. Seat Clearance to OHG (in.)	39	N/A	36
15. Wheelbase (in.)	39	39.4	39.5
16. Drive Tire Width Ɔ to Ɔ (in.)	63	63	53
17. Steer Tire Width Ɔ to Ɔ (in.)	37.75	37.75	33.5
18. Drive Tire Size	34	34	32.0
	7.00 x 12	7.00 x 12	18 x 18 x 12.12

Parameter	User		
	C7	C8	C9
19. Steer Tire Size	6.50 x 10	6.50 x 10	18 x 5 x 12.12
20. Tire Type	PT	PT	PT & SRT
Why?	Used Outside On & Off Hard Surface.	Used Outside On & Off Hard Surface.	PT Used Outside SRT Used In-side.

H. Reliability, Availability, and Maintainability

Characteristics:

1. General Data:

Current Hourmeter Reading (Fleet Av.).	3300	2000	2000
Av. Age of Fleet (Yr).	2	4	5
Expected Life of FLT (Hr.).	20,000	5000	UNK
Expected Annual Usage (Hr.).	3900	500	400
Expected Time Between Major Overhauls.	10,000	UNK	UNK
Normal Work Day (Clock-Hr.).	8	7.5	7
Shifts Per Day (Number).	3	1	1

2. Maintenance Factors:

(a) Scheduled (Preventative) and Unscheduled Maintenance Actions During the Past Year (Cumulative No.).	UNK	9	8
(b) Unscheduled Maintenance Actions Requiring at Least 1 Hour of Maint. Time During the Year to Correct (No.).	UNK	2	3
(c) Man-Hours Required to Correct the Malfunctions in 2(b) Above.	UNK	2.5	7
(d) Clock Hours Required to Correct Malfunctions Identified in 2(b) Above.	UNK	2.5	7
(e) Total Man-Hours to Complete the Actions in 2(a) Above.	UNK	24.5	47

Parameter	User		
	C7	C8	C9
(f) Total Clock-Hours to Complete the Actions in 2(a) Above.			
3. Maintenance Allocation:			
What Maintenance Is Performed by the Operator?	UNK	24.5	47
Mechanic?	None	Checks Fluid Levels, Lights, & Tire Pressure.	Checks Fluid Levels.
	Maintenance Con- tractor.	All Other.	All Other.
			Note: Mechanic & Operator May Be the Same Depending on Employee Driving Truck.
4. Maintenance Costs:			
What is Annual Maintenance Cost Per Vehicle (Fleet Av.)?	UNK	UNK	\$50.00
What Percentage is Labor?	UNK	50%	50%
Which of these Wage Scales Best Describe Your Mechanics:			UNK
\$ 3.00- 5.00 Hr.			
5.00- 7.50 Hr?			
7.50-10.00 Hr?			
10.00-12.50 Hr?			
12.50-15.00 Hr?			
5. Repair Parts:			
Av. Down-Time Awaiting Parts Not in Dealer's Stock?	24 Hr.	24 Hr.	3 Days

Parameter	User		
	C7	C8	C9
Which Parts Tend Not to be in Dealer's Stock?	None	None	None
Is There a Frequency of Failure(s) of the Same Component?	No	No	Yes
If Yes, Explain.	N/A	N/A	Carburetor Adj. on LP Trucks.
Are Any Components Replaced on a Scheduled Interval (Excluding Filters)?	UNK	No	Yes
If Yes, What Components and at What Intervals?	UNK	N/A	Points & Plugs Changed Annually.
6. Model Changes/Field Components: Since Purchasing the FLT, Has It Been Modified by the Mfr., Dealer, and/or In-House?	No	Yes	No
If Yes, Explain.	N/A	In-House — Added Lights.	N/A
Have There Been Any Significant Design Changes to this Model in the Last Year of Which You Are Aware?	No	No	No
If Yes, Explain.	N/A	N/A	N/A
7. Reliability: Are You Dissatisfied With Any Feature(s) of this FLT?	No	Yes	No

Parameter	User		
	C7	C8	C9
If Yes, Explain.	N/A	Asbestos Clutch Packs in Transmission. Newer Trucks Have Asbestos Eliminated by OSHA	N/A
Are There Any Undesirable/ Unsat. Operating Characteristics Assoc. With this Equipment?	No	Yes	No
If Yes, Explain.	N/A	See Above.	N/A
Does the FLT Perform Its Mission Satisfactorily?	Yes	Yes	Yes
If No, Explain.	N/A	N/A	N/A
Why Did You Purchase this Make/ Model Model FLT?	Lease. Competitive Bid	Low Bid	Brand Name; Nearness of Dealer; Price of Truck.
Does the FLT Perform as Well as Suggested by Mfr. and/or Dealer?	Yes	Yes	Yes
If No, Explain.			
Based on Your Experience, Which of the Following Sub-Systems Tend to Fail Most Frequently: Transmission, Engine, Steering, Mast, Brakes, Hydraulic, Drive Axle/ Differential, Electrical Sys., Cooling Sys?	UNK	Transmission-1	Brakes-1 Electrical Sys-2
What Are the Best Features of this Truck?	UNK	Nothing in Particular. Good Truck Except for Transmission Problems.	Ease of Operation; Low Maintenance Costs; Smoothness of Hydraulic System.

Parameter	User		
	C7	C8	C9
8. Maintainability/ Availability: Can Operator and/or Maint. Pers. be Trained Without Difficulty? If Yes, Explain.	Yes. In-House Training With Dealer Assistance. Maint. Contract.	Yes	Yes
Are There Any Maint. Tasks Which Are Unduly Difficult and/or Time Consuming? If Yes, Explain.	No	Yes Repairing Trans- mission.	Yes Replacing Seals on Mast Cylin- der.
Does Your Mechanic/Operator Have a Preference for this Make FLT? Discuss Reason for Your Answer.	UNK	No	No Clark Is the Only Truck They've Ever Had.
Is Scheduled (Preventative) Maint. Costly and/or Time Consuming? If Yes, Explain.	Yes Takes Away From Production Time.	No	No
Do You Defer Scheduled Maint. Until Slack Periods? Are Special Lubricants/Fuels Required? If Yes, Explain.	No No N/A	Yes, Occasionally No N/A	Yes No N/A
Are All Components Accessible for Maint. With Minimum Disturbance of Other Components? If No, Explain.	Yes N/A	Yes N/A	Yes N/A

Parameter	User					
	C7	C8	C9			
Scheduled Maintenance:						
(1) Replace Filters:						
(a) Engine Oil	Interval 250 Hr.	Time UNK	Interval 150 Hr.	Time 10 Min.	Interval Annually	Time 15 Min.
(b) Air	250 Hr.	UNK	150 Hr.	10 Min.	Annually	10 Min.
(c) Fuel	250 Hr.	UNK	1000 Hr.	30 Min.	Annually	10 Min.
(d) Transmission	1000 Hr.	UNK	As Reqd.	10 Min.	As Reqd.	UNK
(e) Hydraulic	500 Hr.	UNK	As Reqd.	60 Min.	As Reqd.	UNK
(2) Drain and Refill:						
(a) Engine Oil	500 Hr.	UNK	150 Hr.	30 Min.	Annually	30 Min.
(b) Transmission Oil	1000 Hr.	UNK	As Reqd.	60 Min.	As Reqd.	UNK
(c) Hydraulic Oil	2000 Hr.	UNK	As Reqd.	60 Min.	As Reqd.	UNK
(d) Cooling System	2000 Hr.	UNK	500 Hr.	30 Min.	Annually	20 M
(3) Lubricate (Chassis)	250 Hr.	UNK	150 Hr.	15 Min.	Annually	90 Min.
Preventative Maint. Time:						
(1) Man-Hours Expended for Daily Servicing (Average).	.5		2/Truck		None	
(2) Man-Hours Expended for Weekly Preventative Maint. Service (Average).	1.25		1/Truck		None	
(3) Man-Hours Expended for Monthly Preventative Maint. Service (Average).	2.25		3.5 to 4/Truck		None	
Component Part Replacement Data:						
Indicate the Average Time Required for One Man Using Common Tools and Special Tools Furnished with the Unit to Remove & Replace the Following:						
Alternator	60 Min.		30 Min.		90 Min.	
Starter	60 Min.		90 Min.		60 Min.	
Voltage Regulator	60 Min.		30 Min.		30 Min.	
Battery	30 Min.		30 Min.		30 Min.	

Parameter	User		
	C7	C8	C9
Fan Belt	30 Min.	30 Min.	45 Min.
Hydraulic Pump	120 Min.	60 Min.	UNK
Brake Shoes	360-480 Min.	240 Min.	270 Min.
Fuel Pump	90 Min.	N/A	90 Min. LP - N/A
Safety and Human Factors:			
1. Are the Safety Precautions Provided by the Mfr. Augmented by the User? If Yes, Explain.	Yes Flasher Light.	Yes User Adds Lights.	No N/A
2. Do You Know of Any Safety Hazards That Exist During Operation? Maintenance?	No No	No No	No No
3. Are the Following Items/Elements Adequate: Gauges & Monitors? Controls Within Easy Reach and Clearly Marked as to Their Use and Function? Anti-Skid Walkway Surface? Are Hazardous Areas Identified?	Yes Yes Yes No	Yes Yes Yes None Known.	Yes Yes No Not Req'd.
4. Does the Size of the Operator Inhibit His Performance?	No	No	No
5. Does the Sound Level Result in Unusual Operator Fatigue After Prolonged Operation?	No	No	No
Manuscripts, Manuals, Tools, and Test Equipment:			
	No	No	No

Parameter	User		
	C7	C8	C9
(1) Which of the Following Manuals Are Provided:			
Operator?	Yes	Yes	Yes
Maintenance?	No	Yes	Yes
Parts?	No	Yes	No
Overhaul?	No	Yes	No
2. Are Technical Bulletins Provided Periodically by:			
Dealer?	No	No	No
Manufacturer?	No	No	No
3. Do You Use the Commercial Manual as Suggested by the Mfgr/Dealer?	Yes	Yes	Yes
Do You Specify Particular Format and Materials?	No	No	No
Have Any Difficulties Been Encountered in Using the Manuals to Perform:			
Operating/Setup?	No	No	No
Servicing?	N/A	No	No
Adjustments?	N/A	No	No
Repair & Overhaul?	N/A	No	No
4. Are Special Tools Required by Operators or Mechanics to Maintain or Test/Troubleshoot the Equipment?	No	No	No
(a) If Yes, Are They Provided by the Manufacturer?	N/A	N/A	N/A
(b) Is the Use of Special Tools Sufficiently Described in the Operating/Repair Manual?	N/A	N/A	N/A
(c) What Special Tools Have You Used?	N/A	N/A	N/A

Parameter	User		
	C7	C8	C9
Training and Logistic Support:			
1. Are Dealer Repairs Performed Promptly?	Yes	Yes	Yes
2. Is Timely Technical Assistance Available When Required From: The Dealer? The Manufacturer?	Yes Dealer Contacts Mfgr.	Yes Yes, Through Dealer.	Yes UNK
3. Do You Attempt to Standardize Makes and/or Models of Equipment Components Within Your Fleet?	No	No	Yes
4. What is the Length of Warranty in Equipment Hours/Months?	N/A	90 Days	90 Days
5. What is the Total Number of Warranty Claims?	N/A	3 or 4	None
6. Are Delays Frequently Caused by Lack of Timely Receipt of Repair Parts?	No	No	No
7. What Repair Parts Do You Keep on Hand for this Item?	None.	Starters, Alternators, Brake Shoes, Hoses, Tires.	None.
If None Stocked, Why?			
	Dealer Does Maintenance.		Can't Anticipate Needs; Dealer Is Close By.
8. What is the Length of Time to Fill Emergency Orders When Parts Are Not in Dealer's Stock?	3 Days	24 Hr.	48 Hr.
9. What is the Length of Time to Fill Normal Orders When Parts Are Not in Dealer's Stock?	24 Hr.	24 Hr.	3 Days

Parameter	User		
	C7	C8	C9
10. Is Special Training Required For: Operators?	Dealer Does Training.	Yes, Company Classes and OJT.	No
Maintenance Personnel?		No	No
11. Do You Utilize Mfgr. Training School for Your:			
Operators?	UNK	No	No
Mechanics?	UNK	No	No
12. Would You Rebuy an Identical Make and Model Forklift Truck? Explain Answer.	Yes	Qualified Yes. Purchase Would Depend on Price and Mfgr. Replac- ing the Asbestos Clutch Pack in the Transmission (New- er Models Have Had the Asbestos Re- placed.)	Yes Reliability of Trucks; Excel- lent Cost/ Use Factor; Good Dealer Service.

APPENDIX C-2 (con't.)

Parameter	C10	User
A. End Item:		
1. Manufacturer	Clark	
2. Model No.	C500 Y40	
3. Date(s) Purchased	May 75	
4. Capacity (lb)	4500	
5. Load Center (in.)	24	
6. Number in Fleet	1	
7. Estimated Size of MHE Fleet	1	
B. How was Item Purchased:		
1. By Specification?	No	
Sole Source?	Yes	
Competitive Bid?	No	
2. By Dealer or Mfr. Recommendation?	No	
3. From Commercial Brochure?	No	
4. Other?	Having Good Experience With Clark Equipment.	
5. Was Vehicle Purchased New/Used?	New	
6. Leased?	Yes	
7. Maintained by Lessee/Lessor?	N/A	
8. How is Truck Inspected/Accepted?	Yardmen Do a Physical Check on Truck When Received.	
C. Components & Accessories:		
1. Engine Mfr.	UNK	
Model	UNK	

Parameter	User	
	C10	
Governor Type	UNK	
Air Cleaner Mfgr.	UNK	
Type & Part No.	UNK	
Pos. Crankcase Ventilation System	UNK	
Cooling System Capacity (qt)	UNK	
Pressure (PSI)	UNK	
Oil Filter Mfgr.	UNK	
Part No.	UNK	
Battery Model	UNK	
Voltage (V)	UNK	
Capacity (Ah)	UNK	
Alternator Mfgr.	UNK	
Part No.	UNK	
Starter Mfgr.	UNK	
Part No.	UNK	
2. Power Train:		
Transmission Mfgr.	UNK	
Part No.	UNK	
Front-Axle Mfgr.	UNK	
Part No.	UNK	
3. Steering and Brakes:		
Truck Equip With Power Steering?	Yes	
Steering Pumps Separate From Main Hydraulic Pump?	UNK	
Power Steering Pump Mfgr?	UNK	
Part No.	UNK	
Power Steering Control Unit Mfgr?	UNK	
Part No.	UNK	

Parameter		CI0	User
Is Truck Equipped W/ Power Brakes?			
Master Cylinder Mfgr?			UNK
Part No.			UNK
4. Hydraulic System			
Filter Mfgr?			UNK
Part No.			UNK
Main Pump Mfgr?			UNK
Part No.			UNK
Fluid Level Indicator?			UNK
Type			UNK
Backrest:			
5. Uprights, Forks, Fork Carrier,			
Mast Roller or Slider Type?			Roller
Number of Mast Stages?			3
Mast Part Number?			UNK
Load Backrest Type?			UNK
Part Number			UNK
Sideshifter?			Yes
Sideshifter Mfgr?			UNK
Part No.			UNK
Sideshifter Integral Part of Carriage?			UNK
6. What Instruments, Gauges, and Safety			
Devices Is Truck Equipped With:			
Hourmeter?			Yes
Ammeter: Gauge/Light?			Gauge
Eng. Coolant Temp: Gauge/Light?			Gauge
Eng. Oil Press: Gauge/Light?			Gauge
Fuel Gauge?			Yes

Parameter	C10	User
Transmission Press: Gauge	None	
Transmission Press: Gauge/Light?	None	
Transmission Temp: Gauge/Light?	None	
Keyed Ignition Switch?	Yes	
Rear View Mirror?	No	
Retractable OHG?	No	
Horn?	Yes	
Floodlight(s)? Qty?	Yes. 3 Installed by User.	
Taillight?	No	
Directional Lights?	No	
Parking Brake?	Yes	
Tilt Cylinder Anti-Cavitation Device?	No	
Neutral Start Switch?	Yes	
Starter Disconnect?	No	
Restriction Indicator?	No	
Fuel Filter?	Yes	
7. What Optional Equipment Is Used:		
Attachments (Clamps, Ram)?	Sideshifter	
Special Lights?	Foglights	
Other?	None	
D. Functional Performance and Characteristics:		
1. Geographical Location	Aurora, Colorado	
2. Approx. Time Truck Operated Outside.	10%	
3. Ambient Temp. Range in Which Truck Operates:	0-90° F	
4. Is Truck Stored Outdoors in Cold Weather?	Yes	

Parameter	C10	User
If Yes, Is It Difficult to Start/Operate in Cold Weather? 5. Does Truck Operate in Any Unusual Environmental Conditions (Dirt, Rain, Etc.)? If Yes, What Conditions? Does Forklift Perform Properly Under These Conditions? What, If Any, Actions Were Required to Enable Proper Operations?	No No N/A N/A None	
E. Characteristics:		
1. What Type Fuel Does Engine Use? Will It Operate on Unleaded Fuel? If LPG Is Used, Why? 2. What Is Capacity of Fuel Tank? 3. Normal Engine Operating Temp? 4. Does the Drive Train Contain the Following Components: Torque Converter? Power Shift Transmission? Hydrostatic Transmission ? Differential? Positive Inching? External Transmission Filter? Water Cooler for Transmission? Universal Joint Drive Shaft? 5. Electrical System: Protected by:	Gas UNK N/A UNK 180° F UNK No UNK Yes Yes UNK No Yes	

Parameter		C10	User
Circuit Breakers? Fuses?			
F. Transportability:			
1. Have You Experienced Difficulties Loading/Moving FLT to its Job Site?			
2. How Do You Move the FLT from Job Site to Job Site?			
3. What Procedure/Equipment Do You Use to Transport a "Down" FLT?			
4. Are Lifting and/or Tiedown Attachments, or Locations, Provided for Ease of Shipment?			
G. Physical Characteristics:			
1. Length: W/ Forks (in.)			
W/O Forks (in.)			
W/ Forks & Sideshifter (in.)			
W/O Forks & Sideshifter (in.)			
2. Width (in.)			
3. Overhead Guard Height (in.)			
4. Collapsed Mast Height (in.)			
5. Maximum Fork Height (in.)			

Parameter		CIO	User
6. Free Lift (in.)		50	
7. Backrest Height (in.)		84.25	
8. Tilt Forward (°)		6	
Tilt Rearward (°)		12	
9. Sideshifter-Left (in.)		UNK	
Right (in.)		UNK	
10. Carriage Width (in.)		39	
11. Fork Dimensions: Length (in.)		42	
Width (in.)		5	
Thickness (in.)		2 1/4	
Taper Length (in.)		4	
12. Forks Comply With ANSI MH 11.4?		Yes	
13. Fork Adj. Dimension: Minimum (in.)		UNK	
Maximum (in.)		39	
14. Seat Clearance to OHG (in.)		39.44	
15. Wheelbase (in.)		63	
16. Drive Tire Width $\bar{Q}$ to $\bar{Q}$ (in.)		37.75	
17. Steer Tire Width $\bar{Q}$ to $\bar{Q}$ (in.)		34.00	
18. Drive Tire Size	Qty	7 x 12 x 12	
19. Steer Tire Size		6 1/2 x 10 x 10	
20. Tire Type		SRT	
Why?		PT Tire Turning Radials.	

H. Reliability, Availability, and Maintainability Characteristics:

1. General Data:

User Does Not Do Any Maint. He Lets

Parameter	CIO	User
Current Hourmeter Reading (Fleet Av.)	Dealer Come In at Specific Intervals.	
Av. Age of Fleet (Yr.)	UNK	
Expected Life of FLT (Hr.)	UNK	
Expected Annual Usage (Hr.)	UNK	
Expected Time Between Major Overhauls	UNK	
Normal Work Day (Clock-hr.)	N/A	
Shifts Per Day (Number)	8	
	1	
2. Maintenance Factors:		
(a) Scheduled (Preventative) and Unscheduled Maintenance Actions During the Past Year (Cumulative No.).	N/A	
(b) Unscheduled Maintenance Actions Requiring at Least 1 Hour of Maint. Time During the Year to Correct (No.)	N/A	
(c) Man-Hours Required to Correct the Malfunctions in 2(b) Above.	N/A	
(d) Clock Hours Required to Correct Malfunctions Identified in 2(b) Above.	N/A	
(e) Total Man-Hours to Complete the Actions in 2(a) Above.	N/A	
(f) Total Clock-Hours to Complete the Actions in 2(a) Above.	N/A	
3. Maintenance Allocation:		
What Maint. Is Performed by the:		
Operator?		
Mechanic?		
	Checks Fluid Levels.	
	All Maintenance Is Done by Clark Dealers.	

Parameter	C10	User
4. Maintenance Costs:		
What Is Annual Maintenance Cost Per Vehicle (Fleet Av.)?	N/A	
What Percentage Is Labor?	N/A	
Which of These Wage Scales Best Describe Your Mechanics:		
\$ 3.00- 5.00 Hr.	N/A	
5.00- 7.50 Hr?	N/A	
7.50-10.00 Hr?	N/A	
10.00-12.50 Hr?	N/A	
12.50-15.00 Hr?	N/A	
5. Repair Parts:		
Av. Down-Time Awaiting Parts Not in Dealer's Stock?	N/A	
Which Parts Tend Not to be in Dealer's Stock?	N/A	
Is There a Frequency of Failure(s) of the Same Components?	N/A	
If Yes, Explain.		
Are Any Components Replaced on a Scheduled Interval (Excluding Filters)?	N/A	
If Yes, What Components and at What Intervals?	N/A	
6. Model Changes/Field Campaigns:		
Since Purchasing the FLT, Has It Been Modified by the Mfr., Dealer, and/or In-House?	No	
If Yes, Explain.	N/A	

Parameter	C10	User
Have There Been Any Significant Design Changes to this Model in the Last Year of Which You Are Aware?	No N/A	
If Yes, Explain.		
7. Reliability:		
Are You Dissatisfied With Any Feature(s) of this FLT?	No N/A	
If Yes, Explain.		
Are There Any Undesirable/Unsat. Operating Characteristics Assoc. With this Equipment?	No N/A	
If Yes, Explain.		
Does the FLT Perform Its Mission Satisfactorily?	Yes N/A	
If No, Explain.		
Why Did You Purchase this Make/Model FLT?	User Has Had a Good History With Clark Equipment.	
Does the FLT Perform as Well as Suggested		
Does the FLT Perform as Well as Suggested by Mfr and/or Dealer?	Yes	
If No, Explain.		
Based on your Experience, Which of the Following Sub-Systems Tend to Fail Most Frequently: Transmission, Engine, Steering, Mast, Brakes, Hydraulic, Drive Axle/Differential, Electrical Sys., Cooling Sys?		
What Are the Best Features of this Truck?	Engine, Mast Easy to Operate. Good Visibility.	

Parameter	User	
	C10	
8. Maintainability/Availability: Can Operators and/or Maint. Pers. be Trained Without Difficulty? Are There Any Maint. Tasks Which Are Unduly Difficult and/or Time Consuming? If Yes, Explain. Does Your Mechanic/Operator Have a Preference for this Make FLT? Discuss Reason for Your Answer.	Yes N/A	
Is Scheduled (Preventative) Maint. Costly and/or Time Consuming? If Yes, Explain. Do You Defer Scheduled Maint. Until Slack Periods? Are Special Lubricants/Fuels Required? If Yes, Explain. Are All Components Accessible for Maint. with Minimum Disturbance of Other Components? If No, Explain. Scheduled Maintenance: (1) Replace Filters: (a) Engine Oil (b) Air (c) Fuel (d) Transmission (e) Hydraulic	Yes Operators Insist on This Truck. They Like the Way It Handles. N/A N/A No No N/A N/A N/A N/A N/A N/A N/A N/A N/A	

Parameter	C10	User
(2) Drain and Refill:		
(a) Engine Oil	N/A	
(b) Transmission Oil	N/A	
(c) Hydraulic Oil	N/A	
(d) Cooling System	N/A	
(3) Lubricate (Chassis)	All Maintenance Performed by Dealer.	
Preventative Maint. Time:		
(1) Man-Hours Expended for Daily Servicing (Average).		
(2) Man-Hours Expended for Weekly Preventative Maint. Service (Average).		
(3) Man-Hours Expended for Monthly Preventative Maint. Service (Average).		
Component Part Replacement Data:		
Indicate the Average Time Required for One Man Using Common Tools and Special Tools Furnished with the Unit to Remove & Replace the Following:		
Alternator	UNK	
Starter	UNK	
Voltage Regulator	UNK	
Battery	UNK	
Fan Belt	UNK	
Hydraulic Pump	UNK	
Brake Shoes	UNK	
Fuel Pump	UNK	

Parameter	User	
	C10	
Safety and Human Factors:		
1. Are the Safety Precautions Provided by the Mfr. Augmented by the User? If Yes, Explain.	Yes They Equip the Truck With a Fire Extinguisher.	
2. Do You Know of Any Safety Hazards That Exist During Operation? Maintenance?	No N/A	
3. Are the Following Items/Elements Adequate: Gauges & Monitors? Controls Within Easy Reach and Clearly Marked as to Their Use and Function? Anti-Skid Walkway Surface?	Yes Yes Yes. Tends to Come Off. Yes	
Are Hazardous Areas Identified?		
4. Does the Size of the Operator Inhibit His Performance?	No	
5. Does the Sound Level Result in Unusual Operator Fatigue After Prolonged Operation?	No	
Manuscripts, Manuals, Tools and Test Equipment:		
1. Which of the Following Manuals Are Provided: Operator? Maintenance?	Yes Yes	

Parameter	User	
	CIO	
Parts?	No	
Overhaul?	No	
2. Are Technical Bulletins Provided Periodically By:		
Dealer?	No	
Manufacturer?	No	
3. Do You Use the Commercial Manual as Supplied by the Mfg/Dealer?	Yes	
Do You Specify Particular Format and Materials?	No	
Have Any Difficulties Been Encountered in Using the Manuals to Perform:		
Operating/Setup?	No	
Servicing?	N/A	
Adjustments?	N/A	
Repair & Overhaul?	N/A	
4. Are Special Tools Required by Operators or Mechanics to Maintain or Test/Troubleshoot the Equipment?	N/A	
(a) If Yes, Are They Provided by the Manufacturer?	N/A	
(b) Is the Use of Special Tools Sufficiently Described in the Operator/Repair Manual?	N/A	
(c) What Special Tools Have You Used?	N/A	
Training and Logistic Support:		
1. Are Dealer Repairs Performed Promptly?	Yes	

Parameter	C10	User
2. Is Timely Technical Assistance Available When Required From: The Dealer? The Manufacturer?	Yes Never Needed.	
3. Do You Attempt to Standardize Makes and/or Models of Equipment/Components Within Your Fleet?	Yes	
4. What is the Length of Warranty in Equipment Hours/Months?	12 Months	
5. What is the Total Number of Warranty Claims?	None	
6. Are Delays Frequently Caused by Lack of Timely Receipt of Repair Parts?	N/A	
7. What Repair Parts Do You Keep on Hand for this Item? If None Stocked, Why?	None Because Maintenance Performed by Dealer.	
8. What is the Length of Time to Fill Emergency Orders When Parts Are Not in Dealer's Stock?	N/A	
9. What is the Length of Time to Fill Normal Orders When Parts Are Not in Dealer's Stock?	N/A	
10. Is Special Training Required For: Operators? Maintenance Personnel?	No N/A	
11. Do You Utilize Mfr. Training Schools for Your: Operators?	UNK	

Parameter	User
Mechanics?	C10
12. Would You Rebuy an Identical Make and Model Forklift Truck?	UNK
Explain Answer.	Yes Past Experience.

APPENDIX C-3

Parameter	User		
	H1	H2	H3
A. End Item:			
1. Manufacturer	Hyster	Hyster	Hyster
2. Model No.	H40H	H50H	H50H
3. Date(s) Purchased	73	75-78	2 in 77, 1 Prior to 77
4. Capacity (lb)	4000	5000	5000
5. Load Center (in.)	24	24	24
6. Number in Fleet	10	5	3
7. Estimate Size of MHE Fleet	16	18	7
B. How was Item Purchased:			
1. By Specification?	Yes	Yes	No
Sole Source?	No	No	No
Competitive Bid?	Yes	Yes	Yes
2. By Dealer or Mfr. Recommendation?	Yes. Dealer Makes Recomm. to User. User Makes Final Decision.	No	Consults With Dealer's Sales Engineer.
3. From Commercial Brochure?	No	No	No
4. Other?	No	No	Hyster Has Best Reputation For Service Parts in Chicago Area.
5. Was Vehicle Purchased New/Used?	New	New	2 Purchased New.
6. Leased?	No	No	Yes (1)
7. Maintained by Lessee/Lessor?	N/A	Lessee When Leased.	Lessee

Parameter	User		
	H1	H2	H3
8. How Is Truck Inspected/ Accepted?	Visually Inspected, Operated Before Acceptance.	Mechanics Inspect Truck Before Acceptance.	Verified Against Purchase Order.
C. Components & Accessories:			
1. Engine Mfgr.			
Model	Ford	Continental	Ford
Governor Type	UNK	UNK	192
Air Cleaner Mfgr.	Velocity	Velocity	Centrifugal
Type & Part No.	AC	NEFCO	NEFCO
Pos. Crankcase Ventilation System	Dry & UNK	Dry & UNK	Dry & UNK
Cooling System Capacity (qt)	Yes	Yes	Yes
Pressure (PSI)	12	12	12
Oil Filter Mfgr.	15	15	15
Part No.	Motorcraft	Autolite	UNK
Battery Model	UNK	UNK	UNK
Voltage (V)	Willard	Willard	UNK
Capacity (Ah)	12	12	UNK
Alternator Mfgr.	70	70	UNK
Part No.	Delco	Delco	Delco
Starter Mfgr.	UNK	UNK	UNK
Part No.	Delco	Delco	UNK
2. Power Train:	UNK	UNK	UNK
Transmission Mfgr.			
Part No.	Hyster	Hyster	Hyster
Front-Axle Mfgr.	UNK	UNK	UNK
Part No.	Hyster	Hyster	Hyster
	UNK	UNK	UNK

Parameter	User		
	H1	H2	H3
3. Steering and Brakes:			
Truck Equip With Power Steering?	Yes	Yes	Yes
Steering Pump Separate From Main Hydraulic Pump?	No	No	No
Power Steering Pump Mfgr?	N/A	N/A	UNK
Part No.	N/A	N/A	UNK
Power Steering Control Unit Mfgr?	Ross Gear & Tool Co.	Ross Gear & Tool Co.	UNK
Part No.	UNK	UNK	UNK
Is Truck Equipped W/ Power Brakes?	No	No	No
Master Cylinder Mfgr?	Delco or Wagner	Wagner	UNK
Part No.	UNK	UNK	UNK
4. Hydraulic System:			
Filter Mfgr?	Hyster	Hyster — OEM. Replaced With Fram Filters.	UNK
Part No.	UNK	UNK	UNK
Main Pump Mfgr?	Hyster	Warner	UNK
Part No.	UNK	UNK	UNK
Fluid Level Indicator?	Yes	Yes	Yes
Type	Dipstick	Dipstick	Dipstick
5. Uprights, Forks, Fork Carrier, and Load Backrest:			
Mast Roller or Slider Type?	Roller	Roller	Roller
Number of Mast Stages?	3	3	2 & 3
Mast Part Number?	UNK	UNK	UNK
Load Backrest Type?	Trucks Not Equipped With Backrests.	None	Bolt-On

Parameter	User		
	H1	H2	H3
Part No.	UNK	UNK	UNK
Sideshifter?	Yes	Yes	Yes
Sideshifter Mfgr?	Cascade	Longreach	Hyster
Part No.	UNK	UNK	UNK
Sideshifter Integral Part of Carriage?	Yes	No	
6. What Instruments, Gauges, and Safety Devices Is Truck Equipped With:			
Hourmeter?	Yes	Yes	Yes
Ammeter: Gauge/Light?	Gauge	Light	Gauge
Eng. Coolant Temp: Gauge/Light?	Gauge	Light	Gauge
Eng. Oil Press: Gauge/Light?	Light	Light	Gauge
Fuel Gauge?	Yes	Yes	Yes
Transmission Press: Gauge/Light?	None	None	
Transmission Temp: Gauge/Light?	Gauge	None	Light
Keyed Ignition Switch?	Yes	Yes	Yes
Rear View Mirror?	No	No	No
Retractable OHG?	No	No	No
Horn?	Yes	Yes	Yes
Floodlight(s)? Qty?	Yes — 2	Yes — 2	No
Taillight?	No	No	No
Directional Lights?	No	No	No
Parking Brake?	Yes	Yes	Yes
Tilt Cylinder Anti-Cavitation Device?	Yes	Yes	Yes
Neutral Start Switch?	Yes	Yes	Yes
Starter Disconnect?	Yes	Yes	Yes
Restriction Indicator?	Yes	No	Yes
Fuel Filter?	Yes	Yes	Yes

Parameter	User		
	H1	H2	H3
7. What Optional Equipment Is Used: Attachments (Clamps, Ram)?			
Special Lights?	Clamps for Barrels and Boxes. Yes. Flood Lights & Blink- ing Light on OHG. None	Clamps for Paper Rolls. Yes. User Puts on Flashing Light & Flood Lights. None	Clamps None
Other?			None
D. Functional Performance and Characteristics:			
1. Geographical Location	Petersburg, Va. 50%	Covington, Va. 5%	Chicago 50%
2. Approx. Time Truck Operated Outside.	10° to 100° F	60° to 100° F	-20° to 100° F +
3. Ambient Temp. Range in Which Truck Operates.	No	No	No
4. Is Truck Stored Outdoors in Cold Weather? If Yes, Is It Difficult to Start/Operate in Cold Weather?	No Answer is No, But User States the Truck is Difficult to Start in Cold Weather Because LPG Freezes.	No N/A	No N/A
5. Does Truck Operate in Any Unusual Environmental Conditions (Dirt, Rain, Etc.)? If Yes, What Conditions? Does Forklift Perform Properly Under These Conditions?	No N/A N/A	No N/A N/A	Yes Heat No

Parameter	User		
	H1	H2	H3
What, If Any, Actions Were Required to Enable Proper Operations?	N/A	N/A	Radiator Must Be Maintained in Clean Working Order.
E. Characteristics:			
1. What Type Fuel Does Engine Use?	LPG	Gasoline	LPG
Will It Operate on Unleaded Fuel?	N/A	Yes	N/A
If LPG Is Used, Why?	Used Inside Whse, Less Pollution & Safer Than Gasoline.	N/A	Less Pollution, Plants Are Set Up For LPG, No Fuel Handling by Operators.
2. What Is Capacity of Fuel Tank?	30 lb.	13 Gal.	33 lb.
3. Normal Engine Operating Temp?	180° F	180° F	180° F
4. Does the Drive Train Contain the Following Components:			
Torque Converter?	Yes	Yes	Yes
Power Shift Transmission?	Yes	Yes	Yes
Hydrostatic Transmission?	No	No	
Differential?	Yes	Yes	Yes
Positive Inching?	No	Yes	Yes
External Transmission Filter?	Yes	Yes	Yes
Water Cooler for Transmission?	Yes	Yes	Yes
Universal Joint Drive Shaft?	No	No	Yes
5. Electrical System:			
Protected By:			
Circuit Breakers?	No	No	No
Fuses?	Yes	Yes	Yes

Parameter	User		
	H1	H2	H3
F. Transportability:			
1. Have You Experienced Difficulties Loading / Moving FLT to its Job Site?	No	No	Rarely
2. How Do You Move the FLT From Job Site to Job Site?	Closed Truck Van.	Drive.	On Stake Truck With Chain.
3. What Procedure/Equipment Do You Use to Transport a "Down" FLT?	Repair on Site. or Tow.	Tow or Repair On Site.	Tow (Push) With Another Truck or Repair on Site.
4. Are Lifting and/or Tiedown Attachments, or Locations, Provided for Ease of Shipments?	No	No	No
G. Physical Characteristics:			
1. Length: W/ Forks (in.)	No Forks	No Forks	136.05
W/O Forks (in.)	94.05	94.05	94.05
W/ Forks & Sideshifter (in.)	101.55	101.55	101.55
W/O Forks & Sideshifter (in.)			
2. Width (in.)	45.25	45.25	45.25
3. Overhead Guard Height (in.)	81.6	81.6	81.6
4. Collapsed Mast Height (in.)	71.5	71.5	71.5
5. Maximum Fork Height (in.)	N/A	N/A	150
6. Free Lift (in.)	45.6	45.0	45.6
7. Backrest Height (in.)	Not Used.	Not Used.	48.25
8. Tilt Forward (°)	5	5	5
Rearward (°)	6	6	6
9. Sideshift-Left (in.)	4	4	4
Right (in.)	4	4	4
10. Carriage Width (in.)	45.9	45.9	45.9

Parameter	User		
	H1	H2	H3
11. Fork Dimensions: Length (in.)	N/A	N/A	42
Width (in.)	N/A	N/A	5
Thickness (in.)	N/A	N/A	.38
Taper Length (in.)	N/A	N/A	
12. Forks Comply With ANSI MH 11.4?	N/A	N/A	Yes
13. Fork Adj. Dimension: Minimum (in.)	N/A	N/A	12
Maximum (in.)	N/A	N/A	42
14. Seat Clearance to OHG (in.)	40.2	40.2	40.2
15. Wheelbase (in.)	61.25	61.25	61.25
16. Drive Tire Width Q_L to Q_L (in.)	37.5	37.5	37.5
17. Steer Tire Width Q_L to Q_L (in.)	37.5	37.5	37.5
18. Drive Tire Size	7.00 x 15	7.00 x 15	7.00 x 15 x 12 Ply Bearcat
Qty	2	2	2
19. Steer Tire Size	6.50 x 10	6.50 x 10	6.50 x 10 Bearcat
20. Tire Type	PT	PT & SRT	Solid
Why?	Outside Use & Off Hard Sur-face.	Outside & In-side Use.	Bearcat Grizzly Super Soft No Maint., Ride Like PT's, Doesn't Chip.
H. Reliability, Availability, and Maintainability Characteristics:			
I. General Data:			
Current Hourmeter Reading (Fleet Av.).	2000	3000	UNK. Hourmeters Not Maintained.
Av. Age of Fleet (Yr).	4	3	2-3
Expected Life of FLT (Hr).	5000	15,000	7
Expected Annual Usage (Hr).	500	5,000	2000-6000

Parameter	User		
	H1	H2	H3
Expected Time Between Major Overhauls.	5000 Hr.	15,000 Hr.	No Data.
Normal Work Day (Clock-Hr.).	7½	24	8 Hr. in One Plant, 24 Hr. in 2nd
Shifts Per Day (Number)	1	3	1 Shift 3 Shift
2. Maintenance Factors:			
(a) Scheduled (Preventative) and Unscheduled Maintenance Actions During the Past Year (Cumulative No.).	4/Trk	UNK	UNK
(b) Unscheduled Maintenance Actions Requiring at Least 1 Hour of Maint. Time During the Year to Correct (No.).	1/Trk.	1/Day	UNK
(c) Man-Hours Required to Correct the Malfunctions in 2(b) Above.	2.4/Trk	2 Hrs.	UNK
(d) Clock Hours Required to Correct Malfunctions Identified in 2(b) Above.	2.4/Trk	2 Hrs.	UNK
(e) Total Man-Hours to Complete the Actions in 2(a) Above.	22	UNK	UNK
(f) Total Clock-Hours to Complete the Actions in 2(a) Above.	22	UNK	UNK
3. Maintenance Allocation:			
What Maint. Is Performed by the Operator?	Checks Fluid Levels & Tire Pressures. All Other.	None (Adds Fuel Only.) All Other.	Checks Fluid Levels. All Other.
Mechanic?			
4. Maintenance Costs:			
What Is Annual Maintenance Cost Per Vehicle (Fleet Av.)?	UNK	\$500.00 Until It Gets 10,000 Hrs., Then Costs Jump 3 to 5 Times.	UNK

Parameter	User		
	H1	H2	H3
What Percentage Is Labor? Which of These Wage Scales Best Describe Your Mechanics:	At Least 50%	30%	UNK
\$ 3.00- 5.00 Hr.	✓	✓	
5.00- 7.50 Hr.			
7.50-10.00 Hr.			
10.00-12.50 Hr?			
12.50-15.00 Hr?			
5. Repair Parts:			
Av. Down-Time Awaiting Parts Not in Dealer's Stock?	24 Hr.	3 Days	This Has Not Been a Problem.
Which Parts Tend Not to Be in Dealer's Stock?	Varies.	Varies.	Not a Problem.
Is There a Frequency of Failure(s) of the Same Component? If Yes, Explain.	Yes Cascade O- Rings on Cylin- ders Leak.	No N/A	Yes Governor Manufac- tured Incorrectly.
Are Any Components Replaced on a Sched- uled Interval (Excluding Filters)? If Yes, What Components and at What Intervals?	No N/A	No N/A	No N/A
6. Model Changes/Field Campaigns: Since Purchasing the FLT, Has It Been Modified by the Mfr., Dealer, and/or In-House? If Yes, Explain.	Yes Added Lights.	Yes Added Lights.	Yes Reworked Gov- ernor.

Parameter	User		
	H1	H2	H3
Have There Been Any Significant Design Changes to this Model in the Last Year of Which You Are Aware?			
If Yes, Explain.	No	No	No
	N/A	N/A	N/A
7. Reliability:			
Are You Dissatisfied With Any Feature(s) of this FLT?			
If Yes, Explain.	No	No	No
	N/A	N/A	N/A
Are There Any Undesirable/Unsat. Operating Characteristics Assoc. With this Equipment?			
If Yes, Explain.	No	No	No
	N/A	N/A	N/A
Does the FLT Perform Its Mission Satisfactorily?			
If No, Explain.	Yes	Yes	Yes
	N/A	N/A	N/A
Why Did You Purchase this Make/Model FLT?			
	Low Bid and Type of Truck Needed to Accomplish Mission.	Dealer Low Bid; Parts Easy to Get; Less Time Required to Do Maintenance.	Good Dealer Service and Reasonable Initial Cost.
Does the FLT Perform as Well as Suggested by Mfr. and/or Dealer?			
If No, Explain.	Yes	Yes	Yes
	N/A	N/A	N/A
Based on Your Experience, Which of the Following Sub-systems Tend to Fail Most Frequently: Transmission, Engine, Steering, Mast, Brakes, Hydraulic, Drive Axle/Differential, Electrical Sys., Cooling Sys?	Hydraulic Lines	Steering. Caused By Running Over	Steering Rod Ends

Parameter	User		
	H1	H2	H3
What Are the Best Features of this Truck?	Parts Availability; Reliability of Truck; Competence of Dealer.	RR Tracks and Wedging Wheels. Easy to Get Parts and Takes Less Time to Perform Maintenance.	Good Dealer Service; Parts Availability in Chicago Area.
8. Maintainability/Availability: Can Operators and/or Maint. Pers. be Trained Without Difficulty? Are There Any Maint. Tasks Which Are Unduly Difficult and/or Time Consuming? If Yes, Explain.	Yes Yes Changing or Re-pairing a Transmission.	Yes Yes Transmissions and Engines Are Sent Out to the Dealer to Work On.	Yes No
Does Your Mechanic/Operator Have a Preference for This Make FLT? Discuss Reason for Your Answer.	Yes Mechanic Most Familiar With This Truck. Very Little Maintenance Work Required; Seldom Have Break Downs.	Yes More Familiar With This Type Equip.	No
Is Scheduled (Preventative) Maint. Costly and/or Time Consuming? If Yes, Explain.	No	Yes Costs to Take Trucks Out of Service.	No

Parameter	User			
	H1	H2	H3	
Do You Defer Scheduled Maint. Until Slack Periods?	Yes, Occasionally. No N/A	Yes No N/A	No No N/A	
Are Special Lubricants/Fuels Required? If Yes, Explain.				
Are All Components Accessible for Maint. With Minimum Disturbance of Other Components? If No, Explain.	Yes N/A	Yes N/A	Yes N/A	
Scheduled Maintenance:				
(1) Replace Filters:	Interval	Time	Interval	Time
(a) Engine Oil	150 Hr.	10 Min.	Weekly	10 Min.
(b) Air	150 Hr.	10 Min.	Weekly	5 Min.
(c) Fuel	1000 Hr.	30 Min.	Non-Set	10 Min.
(d) Transmission	10,000 Hr.	10 Min.	Never	UNK
(e) Hydraulic	5,000 Hr.	1 Hr.	Never	30 Min.
(2) Drain and Refill:				
(a) Engine Oil	150 Hr.	30 Min.	Weekly	10 Min.
(b) Transmission Oil	As Req'd.	1 Hr.	Never	
(c) Hydraulic Oil	As Req'd.	1 Hr.	Never	
(d) Cooling System	500 Hr.	30 Min.	Non-Set	
(3) Lubricate (Chassis)	150 Hr.	15 Min.	Weekly	5-10 Min.
Preventative Maint. Time:				
(1) Man-Hours Expended for Daily Servicing (Average)	.25 to .4	2	5/6 Trucks For All Maint. (5M+USM)	
(2) Man-Hours Expended for Weekly Preventative Maint. Service (Average).	1 to 1.5	10	See Above	
(3) Man-Hours Expended for Monthly Preventative Maint. Service (Average).	4 to 6	40	See Above	

Parameter	User		
	H1	H2	H3
Component Part Replacement Data:			
Indicate the Average Time Required For One Man Using Common Tools and Special Tools Furnished With the Unit to Remove & Replace the following:			
Alternator	30 Min.	45 Min.	20 Min.
Starter	90 Min.	45 Min.	20 Min.
Voltage Regulator	30 Min.	30 Min.	In Alternator: N/A
Battery	30 Min.	15 Min.	10-15 Min.
Fan Belt	30 Min.	30 Min.	10-15 Min.
Hydraulic Pump	60 Min.	30 Min.	240 Min.
Brake Shoes	240 Min.	120 Min.	240 Min.
Fuel Pump	None	30 Min.	Doesn't Know. No Experience.
Safety and Human Factors:			
1. Are the Safety Precautions Provided by the Mfgr. Augmented by the User? If Yes, Explain.	Yes User Adds Lights.	Yes User Adds Lights.	No
2. Do You Know of Any Safety Hazards that Exist During Operation? Maintenance?	No No	No No	No No
3. Are the Following Items/Elements Adequate: Gauges & Monitors? Controls Within Easy Reach and Clearly Marked as to Their Use and Function?	Yes Yes	Yes Yes	Yes Yes

Parameter	User		
	H1	H2	H3
Anti-Skid Walkway Surface?	No	Yes	Yes
Are Hazardous Areas Identified?	Not Req'd.	Not Req'd.	Yes
4. Does the Size of the Operator Inhibit His Performance?	No	No	No
5. Does the Sound Level Result in Unusual Operator Fatigue After Prolonged Operation?	No	No	No
Manuscripts, Manuals, Tools, and Test Equipment:			
1. Which of the Following Manuals Are Provided:			
Operator?	Yes	Yes	Yes
Maintenance?	Yes	Yes	Yes
Parts?	Yes	Yes	Yes
Overhaul?	No	No	No
2. Are Technical Bulletins Provided Periodically By:			
Dealer?	Yes	Yes	Yes
Manufacturer?	No	Yes	No
3. Do You Use the Commercial Manual as Supplied by the Mfrgr/Dealer?	Yes	Yes	Yes
Do You Specify Particular Format and Materials?	No	No	No
Have Any Difficulties Been Encountered in Using the Manuals to Perform:			
Operating/Setup?	No	No	No
Servicing?	No	No	No
Adjustments?	No	No	No
Repair & Overhaul?	No	No	No

Parameter	User		
	H1	H2	H3
4. Are Special Tools Required by Operators or Mechanics to Maintain or Test/Troubleshoot the Equipment?			
(a) If Yes, Are They Provided by the Manufacturer?	No	No	No
(b) Is the Use of Special Tools Sufficiently Described in the Operator/Repair Manual?	N/A	N/A	Available From Dealer.
(c) What Special Tools Have You Used?	N/A	N/A	Yes
Training and Logistic Support:	N/A	N/A	Test Gauges.
1. Are Dealer Repairs Performed Promptly?	Yes	Yes	Yes
2. Is Timely Technical Assistance Available When Required From:			
The Dealer?	Yes	Yes	Yes
The Manufacturer?	Yes. Through the Dealer.	Yes. Through the Dealer.	Yes
3. Do You Attempt to Standardize Makes and/or Models of Equipment/Components Within Your Fleet?	No	Yes	Yes
4. What Is the Length of Warranty in Equipment Hours/Months?	90 Days	90 Days	6 Mos. or 1000 Hrs.
5. What Is the Total Number of Warranty Claims?	2 For 10 Trucks.	Very Few.	UNK
6. Are Delays Frequently Caused By Lack of Timely Receipt of Repair Parts?	No	Not Frequently.	No
7. What Repair Parts Do You Keep on Hand For this Item?	Starters, Alternators, Brake Shoes, Wheel	Hoses, Starters, Tires, Alternators, Control	Ignition Parts, Filters, Low Pressure Regulator (LPG),

02	Parameter	User		
		H1	H2	H3
	If None Stocked, Why?			
	8. What Is the Length of Time to Fill Emergency Orders When Parts Are Not in Dealer's Stock?	N/A	N/A	N/A
	9. What Is the Length of Time to Fill Normal Orders When Parts Are Not in Dealer's Stock?	24 Hr.	2-3 Days	1 Week
	10. Is Special Training Required For: Operators? Maintenance Personnel?	24 Hr. Yes, OJT Yes, OJT	1 Week No Yes, Apprentice Program.	1 Week No No
	11. Do You Utilize Mfgr. Training Schools For Your: Operators? Mechanics?	No No	No No	
	12. Would You Rebuy an Identical Make and Model Forklift Truck? Explain Answer.	Yes But Answer Must Be Predi- cated on Price or Low Bid. Price Being Equal, Answer Definite- ly Yes. Truck Is Well Constructed and Is Easy to Maintain.	Yes Past Experience and Dealer Service.	Yes

APPENDIX C-3 (con't.)

Parameter		User
H4		
A. End Item:		
1. Manufacturer	Hyster	
2. Model No.	UNK	
3. Date(s) Purchased	75-76	
4. Capacity (lb)	8000	
5. Load Center (in.)	24	
6. Number in Fleet	3-5	
7. Estimated Size of MHE Fleet	100	
B. How was Item Purchased:		
1. By Specification?	Yes	
Sole Source?	No	
Competitive Bid?	Yes	
2. By Dealer or Mfr. Recommendation?	No	
3. From Commercial Brochure?	Yes	
4. Other?	All Bidders Must Qualify By Having a Demo Checked Out.	
5. Was Vehicle Purchased New/Used?	New	
6. Leased?	No	
7. Maintained by Lessee/Lessor?	N/A	
8. How is Truck Inspected/Accepted?	New Trucks Are Inspected, Lubed, Bumper No. Added, Verified Against Purchase Order.	

Parameter		H4	User
C. Components & Accessories:			
1. Engine Mfgr.			
Model		Ford 4 Cyl (Std)	
Governor Type		192 GHA 6005 A	
Air Cleaner Mfgr.		Hoof	
		Hyster OEM —	
		Uses Hastings Re-	
		placement.	
		Dry — UNK	
		Yes	
		12	
		15	
		UNK — OEM	
		Hastings —	
		Replacement	
		UNK	
		Delco — OEM	
		Gould — Replace-	
		ment	
		12	
		70	
		Delco-Remy	
		(Enclosed for GS)	
		UNK	
		Delco-Remy	
		(Enclosed for GS)	
		UNK	
		Hyster	
		UNK	
Type & Part No.			
Pos. Crankcase Ventilation System			
Cooling System Capacity (qt)			
Pressure (PSI)			
Oil Filter Mfgr.			
Part No.			
Battery Model			
Voltage (V)			
Capacity (Ah)			
Alternator Mfgr.			
Part No.			
Starter Mfgr.			
Part No.			
2. Power Train:			
Transmission Mfgr.			
Part No.			

Parameter	H4	User
Front-Axle Mfgr. Part No.	Hyster UNK	
3. Steering and Brakes:		
Truck Equip With Power Steering?	Yes	
Steering Pump Separate From Main Hydraulic Pump?	No	
Power Steering Pump Mfgr?	N/A	
Part No.		
Power Steering Control Unit Mfgr?	Ross Gear & Tool Co.	
Part No.	UNK	
Is Truck Equipped With Power Brakes?	No	
Master Cylinder Mfgr?	Wagner Elec.	
Part No.	UNK	
4. Hydraulic System		
Filter Mfgr?	Hyster — OEM Hastings — Replacement	
Part No.	UNK	
Main Pump Mfgr?	Warner-Motive	
Part No.	UNK	
Fluid Level Indicator?	Yes	
Type	Dipstick	
5. Uprights, Forks, Fork Carrier and Load Backrest:		
Mast Roller or Slide Type?	Roller	
Number of Mast Stages?	3	
Mast Part Number?	UNK	
Load Backrest Type?		
Part Number		

Parameter	User	
	H4	
Sideshifter?	No	
Sideshifter Mfgr?	N/A	
Part No.		
Sideshifter Integral Part of Carriage?	N/A	
6. What Instruments, Gauges, and Safety Devices is Truck Equipped With:		
Hourmeter?	Yes	
Ammeter: Gauge/Light?	Gauge	
Eng. Coolant Temp: Gauge/Light?	Gauge	
Eng. Oil Press: Gauge/Light?	Gauge	
Fuel Gauge?	Yes	
Transmission Press: Gauge/Light?		
Transmission Temp: Gauge/Light?		
Keyed Ignition Switch?	Yes	
Rear View Mirror?	Yes	
Retractable OHG?	No	
Horn?	Yes	
Floodlight(s)? Qty?	Yes. 4 (2 F & 2 R)	
Taillight?	No	
Directional Lights?	No	
Parking Brake?	Yes	
Tilt Cylinder Anti-Cavitation Device?	Yes	
Neutral Start Switch?	N/A Manual Trans.	
Starter Disconnect?	Yes	
Restriction Indicator?	No	
Fuel Filter?	Yes	
7. What Optional Equipment is Used:		
Attachments (Clamps, Ram)?		
Special Lights?		
Other?		
	Clamps, Push/Pull	

Parameter		User
H4		
D. Functional Performance and Characteristics:		
1. Geographical Location	Argo, Illinois	
2. Approx. Time Truck Operated Outside	95-100%	
3. Ambient Temp. Range in Which Truck Operates.	-20° to 90° F	
4. Is Truck Stored Outdoors in Cold Weather?	No	
If Yes, Is It Difficult to Start/Operate in Cold Weather?	N/A	
5. Does Truck Operate in Any Unusual Environmental Conditions (Dirt, Rain, Etc.)?	No	
If Yes, What Conditions?	N/A	
Does Forklift Perform Properly Under These Conditions?	N/A	
What, If Any, Actions Were Requested to Enable Proper Operations?	N/A	
E. Characteristics:		
1. What Type Fuel Does Engine Use?	Gas	
Will It Operate on Unleaded Fuel?	Yes	
If LPG Is Used, Why?	N/A	
2. What Is Capacity of Fuel Tank?	7 Gal.	
3. Normal Engine Operating Temp?	180° F	
4. Does the Drive Train Contain the Following Components: Torque Converter?	Yes. Note Larger Trucks Have Manual Trans.	

Parameter		H4	User
Power Shift Transmission?		Yes	
Hydrostatic Transmission?		No	
Differential?		Yes	
Positive Inching?		Yes	
External Transmission Filter?		Yes	
Water Cooler for Transmission?		No	
Universal Joint Drive Shaft?		Yes	
5. Electrical System			
Protected By:			
Circuit Breakers?		No	
Fuses?		Yes	
F. Transportability:			
1. Have You Experienced Difficulties Loading/Moving FLT to its Job Site?		Not Moved.	
2. How Do you Move the FLT from Job Site to Job Site?		N/A	
3. What Procedure/Equipment Do You Use to Transport a "Down" FLT?		N/A	
4. Are Lifting and/or Tiedown Attachments, or Locations, Provided for Ease of Shipment?		No	
G. Physical Characteristics:			
1. Length: W/ Forks (in.)		136	
W/O Forks (in.)		94.05	
W/ Forks & Sideshifter (in.)		143.55	
W/O Forks & Sideshifter (in.)		94.05	
2. Width (in.)		45.25	

Parameter		User
	H4	
3. Overhead Guard Height (in.)	81.62	
4. Collapsed Mast Height (in.)	71.5	
5. Maximum Fork Height (in.)	150	
6. Free Lift (in.)	45.56	
7. Backrest Height (in.)	48.25	
8. Tilt Forward (°)	5	
Tilt Rearward (°)	6	
9. Sideshift-Left (in.)	4	
Right (in.)	4	
10. Carriage Width (in.)	45.9	
11. Fork Dimensions: Length (in.)	42	
Width (in.)	5	
Thickness (in.)	.38	
Taper Length (in.)	—	
12. Forks Comply With ANSI MH 11.4?	Yes	
13. Fork Adj. Dimension: Minimum (in.)	12	
Maximum (in.)	42	
14. Seat Clearance to OHG (in.)	40.2	
15. Wheelbase (in.)	61.25	
16. Drive Tire Width $\bar{Q}_d$ to $\bar{Q}_l$ (in.)	37.5	
17. Steer Tire Width $\bar{Q}_s$ to $\bar{Q}_l$ (in.)	37.5	
18. Drive Tire Size	7.00 x 15	
Qty	2	
19. Steer Tire Size	6.50 x 10	
20. Tire Type	PT	
Why?	Used Outside	

Parameter	H4	User
H. Reliability, Availability, and Maintainability Characteristics:		
1. General Data		
Current Hourmeter Reading (Fleet Av.)	6912	
Av. Age of Fleet (Yr.)	—	
Expected Life of FLT (Hr.)	16,000 — If Maint. Costs Are Reasonable.	
Expected Annual Usage (Hr.)	2000	
Expected Time Between Major Overhauls	UNK	
Normal Work Day (Clock-Hr.)	16	
Shifts Per Day (Number)	2	
2. Maintenance Factors:		
(a) Scheduled (Preventative) and Unscheduled Maintenance Actions During the Past Year (Cumulative No.).	UNK	
(b) Unscheduled Maintenance Actions Requiring at Least 1 Hour of Maint. Time During the Year to Correct (No.).	UNK	
(c) Man-Hours Required to Correct the Malfunctions in 2(b) Above.	UNK	
(d) Clock Hours Required to Correct Malfunctions Identified in 2(b) Above.	UNK	
(e) Total Man-Hours to Complete the Actions in 2(a) Above.	UNK	
(f) Total Clock-Hours to Complete the Actions in 2(a) Above.	UNK	
3. Maintenance Allocation:		
What Maint. Is Performed by the:		

Parameter	User
Operator?	H4
Mechanic?	Checks Fluid Levels. All Other.
4. Maintenance Costs:	
What Is Annual Maintenance Cost Per Vehicle (Fleet Av.)?	—
What Percentage Is Labor?	—
Which of these Wage Scales Best Describe Your Mechanics:	
\$ 3.00- 5.00 Hr?	
5.00- 7.50 Hr?	
7.50-10.00 Hr?	
10.00-12.50 Hr?	
12.50-15.00 Hr?	
5. Repair Parts:	
Av. Down-Time Awaiting Parts Not in Dealer's Stock?	24 Hr.
Which Parts Tend Not to Be in Dealer's Stock?	Major Welded Assemblies.
Is There a Frequency of Failure(s) of the Same Component?	No
If Yes, Explain.	N/A
Are Any Components Replaced on a Scheduled Interval (Excluding Filters)?	No
If Yes, What Components and at What Intervals?	N/A

Parameter	H4	User
6. Model Changes/Field Campaigns: Since Purchasing the FLT, Has It Been Modified by the Mfgr, Dealer, and/or In-House? If Yes, Explain. Have There Been Any Significant Design Changes to this Model in the Last Year of Which You Are Aware? If Yes, Explain.	No N/A No N/A	
7. Reliability: Are You Dissatisfied With Any Feature(s) of this FLT? If Yes, Explain. Are There Any Undesirable/Unsat. Operating Characteristics Assoc. With this Equipment? If Yes, Explain.	No N/A Yes Hydraulic Pump in Tank.	
Does the FLT Perform Its Mission Satisfactorily? If No, Explain. Why Did You Purchase this Make/Model FLT?	Yes N/A Saw at MHE Show, Arranged for Demonstrator, Liked It; Allowed Hyster to Bid on Next Purchase. Hyster Has Been Responsive.	

Parameter	H4	User
Does the FLT Perform as Well as Suggested by Mfgr and/or Dealer? If No, Explain.	Yes N/A	
Based on Your Experience, Which of the Following Sub-Systems Tend to Fail Most Frequently: Transmission, Engine, Steering, Mast, Brakes, Hydraulic, Drive Axle/ Differential, Electrical Sys., Cooling Sys?		
What Are the Best Features of this Truck?	Hydraulic Past History, Exhaust Emissions Discharged Up High.	
8. Maintainability/ Availability: Can Operators and/or Maint. Pers. Be Trained Without Difficulty?	Yes. (Schedules Mfgr. Schools in Plant. No N/A	
Are There Any Maint. Tasks Which Are Unduly Difficult and/or Time Consuming? If Yes, Explain.	Yes	
Does Your Mechanic/Operator Have a Preference for this Make FLT? Discuss Reason for Your Answer.	Toss-up Between Yale & Hyster. No N/A	
Is Scheduled (Preventative) Maint. Costly and/or Time Consuming? If Yes, Explain.		

Parameter	H4	User
Do You Defer Scheduled Maint. Until Slack Periods?	No	
Are Special Lubricants/Fuels Required?	No	
If Yes, Explain.	N/A	
Are All Components Accessible for Maint. with Minimum Disturbance of Other Components?	Yes	
If No, Explain.	N/A	
Scheduled Maintenance:		
(1) Replace Filters:	Interval	Time
(a) Engine Oil	150-200 Hr.	30 Min.
(b) Air	150-200 Hr.	5 Min.
(c) Fuel	Non Set	5 Min.
(d) Transmission	Oil Clutch	N/A
(e) Hydraulic	Non Set	N/A
(2) Drain and Refill:		
(a) Engine Oil	150-200 Hr.	30 Min.
(b) Transmission Oil	N/A	
(c) Hydraulic Oil	Non Set	
(d) Cooling System	Annually	45 Min.
(3) Lubricate (Chassis)	150-200 Hr.	30 Min.
Preventative Maint. Time:		
(1) Man-Hours Expended for Daily Servicing (Average).	UNK	
(2) Man-Hours Expended for Weekly Preventative Maint. Service (Average).	UNK	
(3) Man-Hours Expended for Monthly Preventative Maint. Service (Average).	UNK	

Parameter	H4	User
Component Part Replacement Data:		
Indicate the Average Time Required for One Man Using Common Tools and Special Tools Furnished with the Unit to Remove & Replace the Following:		
Alternator	60 Min.	
Starter	60 Min.	
Voltage Regulator	15 Min.	
Battery	15 Min.	
Fan Belt	30 Min.	
Hydraulic Pump	60 Min.	
Brake Shoes	240 Min.	
Fuel Pump	30 Min.	
Safety and Human Factors:		
1. Are the Safety Precautions Provided by the Mfr. Augmented by the User?	No	
If Yes, Explain.	N/A	
2. Do You Know of Any Safety Hazards That Exist During:		
Operation?	No	
Maintenance?	No	
3. Are the Following Items/Elements Adequate:		
Gauges & Monitors	Yes	
Controls Within Easy Reach and Clearly Marked as to Their Use and Function?	Yes	
Anti-Skid Walkway Surface?	Yes	
Are Hazardous Areas Identified?	Yes	

Parameter	User	
	H4	
4. Does the Size of the Operator Inhibit His Performance?	No	
5. Does the Sound Level Result in Unusual Operator Fatigue After Prolonged Operation?	No	
Manuscripts, Manuals, Tools, and Test Equipment:		
1. Which of the Following Manuals Are Provided:		
Operator?	Yes	
Maintenance?	Yes	
Parts?	Yes	
Overhaul?	No	
2. Are Technical Bulletins Provided Periodically By:		
Dealer?	—	
Manufacturer?	—	
3. Do You Use the Commercial Manual as Supplied by the Mfr/Dealer?	Yes	
Do You Specify Particular Format and Materials?	No	
Have Any Difficulties Been Encountered in Using the Manuals to Perform:		
Operating/Setup?	No	
Servicing?	No	
Adjustments?	No	
Repair & Overhaul?	No	
4. Are Special Tools Required by Operators or Mechanics to Maintain or Test/Troubleshoot the Equipment?	No	

Parameter	H4	User
(a) If Yes, Are They Provided by the Manufacturer?	N/A	
(b) Is the Use of Special Tools Sufficiently Described in the Operator/Repair Manual?	N/A	
(c) What Special Tools Have You Used?	N/A	
Training and Logistic Support:		
1. Are Dealer Repairs Performed Promptly?	Yes	
2. Is Timely Technical Assistance Available When Required From: The Dealer?	Yes	
The Manufacturer?	Not Required.	
3. Do You Attempt to Standardize Makes and/or Models of Equipment/Components Within Your Fleet?	Yes, Within Reason.	
4. What is the Length of Warranty in Equipment Hours/Months?	90 Day or 500 Hours.	
5. What Is the Total Number of Warranty Claims?	UNK	
6. Are Delays Frequently Caused by Lack of Timely Receipt of Repair Parts?	No	
7. What Repair Parts Do You Keep on Hand for this Item?	Complete Array of Ignition Parts, Starter, Alternator, Brakes, Filters, Etc.	
If None Stocked, Why?	N/A	

Parameter	H4	User
8. What Is the Length of Time to Fill Emergency Orders When Parts Are Not in Dealers Stock?	Has Not Been a Problem.	
9. What Is the Length of Time to Fill Normal Orders When Parts Are Not in Dealer's Stock?	24 Hours.	
10. Is Special Training Required For: Operators? Maintenance Personnel?	No No	
11. Do You Utilize Mfgr. Training Schools for Your: Operators? Mechanics?		
12. Would You Rebuy an Identical Make and Model Forklift Truck? Explain Answer.	Yes However, If Hyster Costs Significantly More, It Would be Difficult to Justify the Extra Cost.	

APPENDIX C-4

Parameter	User		
	T1	T2	T3
A. End Item:			
1. Manufacturer	Towmotor	Towmotor	Towmotor
2. Model No.	V40B	V40B	V40B
3. Date(s) Purchased	75-76	2-73; 4-76	76
4. Capacity (lb)	4000	4000	4000
5. Load Center (in.)	24	24	24
6. Number in Fleet	6	6	5
7. Estimated Size of MHE Fleet	12	9	5
B. How was Item Purchased:			
1. By Specification?	No	No	Yes
Sole Source?	Yes	No	No
Competitive Bid?	Yes	Yes	Yes
2. By Dealer or Mfr. Recommendation?	No	Dealer Makes Quote.	No
3. From Commercial Brochure?	Yes. Condensed Best of All Worlds.		No
4. Other?	Compare Prices, Services of 2 Makes Available Locally — Hyster Towmotor	Lease-Purchase	N/A
5. Was Vehicle Purchased New/Used?	New	New	New
6. Leased?	No	Yes. For Three Years and Then Exercises Option to Buy.	No
7. Maintained by Lessee/Lessor?	N/A	Lessee	N/A

Parameter	User		
	T1	T2	T3
8. How Is Truck Inspected / Accepted?	Visually Insp. Against P.O. Immed. Placed in Service, Supervisor Closely Watches New Trucks for Any Warranty Problems.	Checked Against Purchase Order. Immed. Put Into Service as It Has Been Preserved by Dealer.	User Checks For Proper Operation on Delivery.
C. Components & Accessories:			
1. Engine Mfr.			
Model	Continental F163	Continental F162	Continental F163
Governor Type	UNK	UNK	Centrifugal
Air Cleaner Mfr.	Cat	Farr (Opt. Air Handling Pkg. From Cat Is Used)	United Air Cleaner
Type & Part No.	Dry — UNK		
Pos. Crankcase Ventilation System	No	UNK	Dry Type-105D45
Cooling System Capacity (qt)	14	Yes	Yes
Pressure (PSI)	7	11	11
Oil Filter Mfr.	Cat	7	7
Part No.	UNK	Cat	Puralator; Cat
Battery Model	Cat-OEM	UNK	UNK
Voltage (V)		Cat-OEM; Dekal-Repl.	Prestolite
Capacity (Ah)			12
Alternator Mfr	Delco	Delco	67
			Delco

Parameter	User		
	T1	T2	T3
Part No.	UNK	6G28	UNK
Starter Mfgr.	Delco	UNK	Delco
Part No.	UNK	UNK	UNK
2. Power Train:			
Transmission Mfgr.	Cat	Cat-Manual	Cat
Part No.	UNK	UNK	UNK
Front-Axle Mfgr.	Cat	Cat	Cat
Part No.	UNK	UNK	UNK
3. Steering and Brakes:			
Truck Equip With Power Steering?	Yes	Yes	Yes
Steering Pump Separate From Main Hydraulic Pump?	Yes	No	Yes
Power Steering Pump Mfgr?	Cat	UNK	Eaton Corp.
Part No.	UNK	UNK	UNK
Power Steering Control Unit Mfgr?	Cat	UNK	UNK
Part No.	UNK	UNK	UNK
Is Truck Equipped W/ Power Brakes?	No	No	No
Master Cylinder Mfgr?	UNK	UNK	Wagner Elec. Corp.
Part No.	UNK	UNK	UNK
4. Hydraulic System			
Filter Mfgr?	Cat	Cat	Walker Mfg. Co.
Part No.	UNK	UNK	DX 1650 AN
Main Pump Mfgr?	UNK	Cat	Borg Warner Corp.
Part No.	UNK	UNK	S305-16EJ5-2-L
Fluid Level Indicator?	Yes	Yes	Yes
Type	Dipstick	Dipstick	Dipstick
5. Uprights, Forks, Fork Carrier, and Load Backrest:			
Mast Roller or Slider Type?	Slider	Slider	Slider

Parameter	User		
	T1	T2	T3
Number of Mast Stages?	3	3	3
Mast Part Number?	UNK	345628	UNK
Load Backrest Type?	Modified by User.	UNK	UNK
Part Number	UNK	UNK	UNK
Sideshifter?	Yes	Yes	Yes
Sideshifter Mfgr?	Specified in P.O.	UNK	Cat
Part No.	UNK	UNK	357737
Sideshifter Integral Part of Carriage?	Yes	Yes	Yes
6. What Instruments, Gauges, and Safety Devices Is Truck Equipped With:			
Hourmeter?	Yes	Yes	Yes
Ammeter: Gauge/Light?	Gauge	Gauge	Gauge
Eng. Coolant Temp: Gauge/Light?	Gauge	Gauge	Gauge
Eng. Oil Press: Gauge/Light?	Gauge	Gauge	Gauge
Fuel Gauge?	On LPG Tank.	Yes	Yes
Transmission Press: Gauge/Light?	Light	N/A	None
Transmission Temp: Gauge/Light?	None	N/A	None
Keyed Ignition Switch?	Yes	Yes	Yes
Rear View Mirror?	None	Yes	No
Retractable OHG?	No	No	No
Horn?	Yes	Yes	Yes
Floodlight(s)? Qty?	No	No	Yes — 3
Taillight?	No	No	Yes
Directional Lights?	No	No	No
Parking Brake?	Yes	Yes	Yes
Tilt Cylinder Anti-Cavitation Device?	Yes	Yes	Yes
Neutral Start Switch?	Yes	No	Yes

Parameter	User		
	T1	T2	T3
Starter Disconnect?	No	Yes	No
Restriction Indicator?	No	Yes	No
Fuel Filter?	In LPG System.	Yes	No
7. What Optional Equipment Is Used:			
Attachments (Clamps, Ram)?	None	Bucket	None
Special Lights?	None	None	None
Other?	Air Handling Pkg.	None	None
D. Functional Performance and Characteristics:			
1. Geographical Location	Claysburgh, Pa.	Robeson, Pa.	Hartsville, Tn.
2. Approx. Time Truck Operated Outside	100%	100%	30%
3. Ambient Temp. Range in Which Truck Operates.	0° to 105° F	0° to 90° F	0° to 100° F
4. Is Truck Stored Outdoors in Cold Weather?	No	Yes	No
If Yes, Is It Difficult to Start/Operate in Cold Weather?	LPG Difficult to Start in Cold Weather. Maint. Shed Built to Store Trucks Overnight. Temp. Kept Above 32° F.	No	N/A
5. Does Truck Operate In Any Unusual Environmental Conditions (Dirt, Rain, Etc.)?	Yes	Yes	Yes
If Yes, What Conditions?	Sand, Dust, Refractory Debris.	Dust	Dust, Mud, Loose Gravel.

Parameter	User		
	T1	T2	T3
Does Forklift Perform Properly Under These Conditions?	Yes, With Equip. Noted Below.	Yes	Yes
What, If Any, Actions Were Required to Enable Proper Operations?	Air-Handling Package Offered As an Option By Towmotor.	Added Farr Air Cleaners on 2 Newest Trucks.	None
E. Characteristics:			
1. What Type Fuel Does Engine Use?	LPG	Gas	Gas
Will It Operate on Unleaded Fuel?		UNK	Yes
If LPG Is Used, Why?	Less Pollution and Extends Engine Life.	N/A. (Doesn't Like the LPG Smell).	N/A
2. What Is Capacity of Fuel Tank?	40 lb.	9.3 Gal.	9.3 Gal.
3. Normal Engine Operating Temp?	190° F	160°-180° F	UNK
4. Does the Drive Train Contain the Following Components:			
Torque Converter?	Yes	Yes	No
Power Shift Transmission?		No. Manual Clutch.	No
Hydrostatic Transmission?	Yes	No	Yes
Differential?	Yes	Yes	Yes
Positive Inching?	N/A	N/A	Yes
External Transmission Filter?	Yes	No	Yes
Water Cooler for Transmission?	Yes	No	Yes
Universal Joint Drive Shaft?	No	Yes	Yes

Parameter	User		
	T1	T2	T3
5. Electrical System: Protected By: Circuit Breakers? Fuses?	No Yes	No Yes	No Yes
F. Transportability:			
1. Have You Experienced Difficulties Loading/Moving FLT to Its Job Site?	No	Does Not Move.	No
2. How Do You Move the FLT From Job Site to Job Site?	By Flatbed.	N/A	Flatbed Truck With Ramp.
3. What Procedure/Equipment Do You Use to Transport a "Down" FLT?	By Flatbed.	N/A	Downed Truck Pushed Onto Flatbed With Another Truck.
4. Are Lifting and/or Tiedown Attachments, or Locations, Provided for Ease of Shipment?	No. Uses Mast Towing Eye Truck Structure.	N/A	Yes
G. Physical Characteristics:			
1. Length: W/ Forks (in.)			131
W/O Forks (in.)			95
W/ Forks & Sideshifter (in.)	136	138	
W/O Forks & Sideshifter (in.)	98	96	
2. Width (in.)	48	58 1/4 W/ Dual Drive Wheels	47.5
3. Overhead Guard Height (in.)	UNK	87	87
4. Collapsed Mast Height (in.)	73	73 1/2	73.5
5. Maximum Fork Height (in.)	158	156	156

Parameter	User		
	T1	T2	T3
6. Free Lift (in.)	Full Free	Full Free	47
7. Backrest Height (in.)	36	48	48
8. Tilt Forward (°)	Std.	Std.	6
Tilt Rearward (°)	Std.	Std.	8
9. Sideshift-Left (in.)	4	4	4
Right (in.)	4	4	4
10. Carriage Width (in.)	44	38	47
11. Fork Dimensions: Length (in.)	36	42	36
Width (in.)	4	4	4
Thickness (in.)	1.5	1.75	1.5
Taper Length (in.)	UNK	22	22
12. Forks Comply With ANSI MH 11.4?	Yes	Yes	Yes
13. Fork Adj. Dimension: Minimum (in.)	37	8	9.5
Maximum (in.)	8	37	44
14. Seat Clearance to OHG (in.)	UNK	39	40
15. Wheelbase (in.)	56.5	56	56
16. Drive Tire Width $\bar{Q}$ to $\bar{Q}$ (in.)	40	34 Inboard Tires.	40
17. Steer Tire Width $\bar{Q}$ to $\bar{Q}$ (in.)	36	35	34.6
18. Drive Tire Size	7.00 x 12 NHS 12 Ply	7.00 x 12	7.00 x 12
Qty	2 MITC Solver	4	2
	5.50 x 10	6.50 x 10	6.50 x 10
19. Steer Tire Size	NHS 10 Ply		
20. Tire Type	PT Bearcat	SRT	PT
	Armor guard		
Why?		Better Wear Under Service Conditions Encountered.	Used Outdoors.

Parameter	User		
	T1	T2	T3
H. Reliability, Availability, and Maintainability Characteristics:			
1. General Data:			
Current Hourmeter Reading (Fleet Av.).	5500 (Est)	1844	880
Av. Age of Fleet (Yr).	2-3	2 New in 73 4 New in 76	1.5
Expected Life of FLT (Hr).	UNK	UNK	10,000-15,000
Expected Annual Usage (Hr).	1000	UNK	800
Expected Time Between Major Overhauls.	5-7000 Hr.	4000 Hr.	None Planned
Normal Work Day (Clock-Hr).	8	8/Shift	16
Shifts Per Day (Number)	1	2	2
2. Maintenance Factors:			
(a) Scheduled (Preventative) and Unscheduled Maintenance Actions During the Past Year (Cumulative No.).	N/A. Maint. Had Been Performed by Local Auto Garage Until the Fall of 77. No Record Available.	12 in 908 Hr. — Old 1. 7 in 2662 Hr. — Old 2. 8 on 4 New.	60 Scheduled/ 5 Trucks. UNK-Unscheduled.
(b) Unscheduled Maintenance Actions Requiring at Least 1 Hour of Maint. Time During the Year to Correct (No.).	N/A	8 of 12 on Old 1 4 of 7 on Old 2 0 of 8 on 4 New Trucks.	15
(c) Man-Hours Required to Correct the Malfunctions in 2(b) Above.	N/A	UNK	30
(d) Clock Hours Required to Correct Malfunctions Identified in 2(b) Above.	N/A	UNK	15

Parameter	User		
	T1	T2	T3
(e) Total Man-Hours to Complete the Actions in 2(a) Above.	N/A	UNK	60
(f) Total Clock-Hours to Complete the Actions in 2(a) Above.	N/A	UNK	60
3. Maintenance Allocation: What Maint. Is Performed by the Operator?	Checks Fluid Levels. Workers Are Assigned a FLT & Are on Incentives. They Do Not Report Problems Until End of Work Day. Mechanics Work Evening Shift.	None	Checks Fluid Levels.
Mechanic?	All Other Except Rebuild.	All Other.	All Other.
4. Maintenance Costs: What Is Annual Maintenance Cost Per Vehicle (Fleet Av.)?	UNK	UNK	UNK
What Percentage Is Labor?	UNK	UNK	75%
Which of These Wage Scales Best Describe Your Mechanics: \$ 3.00- 5.00 Hr? 5.00- 7.50 Hr? 7.50-10.00 Hr? 10.00-12.00 Hr? 12.50-15.00 Hr?	✓		✓

Parameter	User		
	T1	T2	T3
5. Repair Parts: Av. Down-Time Awaiting Parts Not in Dealer's Stock?	24 Hr.	Can Be Months.	UNK.Has Not Had Any Problems.
Which Parts Tend Not to Be in Dealer's Stock?	Heavy Parts/ Mast Parts.	Parts in Rebuild Kit/Brake Parts Dist/Carb. Parts.	UNK
Is There a Frequency of Failure(s) of the Same Component? If Yes, Explain.	No N/A	No N/A (Radiator on Older Trucks.)	No N/A
Are Any Components Replaced on a Scheduled Interval (Excluding Filters)? If Yes, What Components and at What Intervals?	No N/A	No N/A	No N/A
6. Model Changes/Field Campaigns: Since Purchasing the F.L.T., Has It Been Modified by the Mfr., Dealer, and/or In-House? If Yes, Explain.	Yes Air-Handling Package Added to Older Truck.	Yes On 2 Old Trucks Radiator Brackets Were Changed From Engine to Frame Mount.	No N/A
Have There Been Any Significant Design Changes to this Model in the Last Year of Which You Are Aware? If Yes, Explain.	No N/A	Yes Moved Oil Reservoirs.	No N/A

Parameter	User		
	T1	T2	T3
7. Reliability:			
Are You Dissatisfied With Any Feature(s) of this FLT?			
If Yes, Explain.	Yes	No	No
	Seat Cushions	N/A	N/A
	Don't Last/Horn		
	Buttons Suscept-		
	able to Dropped		
	Objects.		
Are There Any Undesirable/Unsat. Oper-	No	No	No
ating Characteristics Assoc. With this	N/A	N/A	N/A
Equipment?			
If Yes, Explain.	Yes	Yes	Yes
Does the FLT Perform Its Mission Satis-	N/A	N/A	N/A
factorily?			
If No, Explain.			
Why Did You Purchase this Make/Model	Good Dealer	Capacity vs Size/	Low Bidder.
FLT?	Service, Required	Parts Inter-	
	a Small 4000	changeable With	
	Lb Pt Truck.	Trucks Already	
		on Hand.	
Does the FLT Perform as Well as Sug-	Yes	Yes	Yes
gested by Mfr. and/or Dealer?	N/A	N/A	N/A
If No, Explain.			
Based on Your Experience, Which of the			
Following Sub-systems Tend to Fail Most			
Frequently: Transmission, Engine, Steer-			
ing, Mast, Brakes, Hydraulic, Drive Axle/			
Differential, Electrical Sys., Cooling Sys?	Hydraulic (1);	Elec. Sys. (1);	Hydraulic Hoses,
	Electrical Starter	Hydraulic Hoses	But Not Frequently
	System (2); Seat	(2); Transmission	

Parameter	User		
	T1	T2	T3
	Cushions (3); Steering (4); Mast (5); Transmission (6); Engine (6); Brakes (3); Mast (6); Cooling System (6); Drive/Axle Differential (6).	(3); Engine (3); Steering (3); Drive Axle/Differential (3); Brakes (3); Mast (3); Cooling System (3).	
What Are the Best Features of this Truck?	Smallest Size (DIM) 4000# FL Available, Likes Independent Axle on Rough Ground.	Accessible for Maintenance.	User Indicates No Features Better Than Any Other FLT.
8. Maintainability/ Availability: Can Operators and/or Maint. Pers. Be Trained Without Difficulty?	Yes	Yes	Yes
Are There Any Maint. Tasks Which Are Unduly Difficult and/or Time Consuming?	No	No	No
If Yes, Explain.	N/A	N/A	N/A
Does Your Mechanic/Operator Have a Preference for this Make FLT?	Yes	Yes	UNK
Discuss Reason for Your Answer.	Operators Like the Truck Once They Become Familiar With the Left-foot Directional Control.	Accessible	N/A
Is Scheduled (Preventative) Maint. Costly and/or Time Consuming?	No	No	No

Parameter	User			
	T1	T2	T3	
If Yes, Explain.	N/A	N/A	N/A	
Do You Defer Scheduled Maint. Until Slack Periods?	Yes	Yes	Yes	
Are Special Lubricants/Fuels Required?	No	No	No	
If Yes, Explain.	N/A	N/A	N/A	
Are All Components Accessible For Maint. with Minimum Disturbance of Other Components?	Yes	Yes	Yes	
If No, Explain.	N/A	N/A	N/A	
Scheduled Maintenance;				
(1) Replace Filters:	Interval	Interval	Interval	Time
(a) Engine Oil	100 Hr.	30-20 Min.	250 Hr.	10 Min.
(b) Air	200 Hr.	20-10 Min.	250 Hr.	10 Min.
(c) Fuel		250 Hr.		UNK
(d) Transmission	2000 Hr.	30-30 Min.		30 Min.
(e) Hydraulic	As Req'd.	30-15 Min.	4000 Hr.	45 Min.
(2) Drain and Refill:				
(a) Engine Oil	100 Hr.	30-15 Min.	250 Hr.	30 Min.
(b) Transmission Oil	2000 Hr.	45-30 Min.		UNK
(c) Hydraulic Oil	As Req'd.	60-20 Min.	4000 Hr.	UNK
(d) Cooling System	1000 Hr.	60-20 Min.	4000 Hr.	UNK
(3) Lubricate (Chassis)	100 Hr.	45-60 Min.	250 Hr.	20 Min.
Preventative Maint. Time:				
(1) Man-Hours Expended for Daily Servicing (Average).	No Program at Present Time; Is Being Set Up.	.5/6 Trucks	.1/Truck	
(2) Man-Hours Expended for Weekly Preventative Maint. Service (Average).	N/A	None	None	

Parameter	User		
	T1	T2	T3
(3) Man-Hours Expended for Monthly Preventative Maint. Service (Average).	N/A	2-3/250 Hours	2/Truck
Component Part Replacement Data:			
Indicate the Average Time Required For One Man Using Common Tools and Special Tools Furnished With the Unit to Remove & Replace the Following:			
Alternator	Superv. Maint.		
Starter	60 Min.	20 Min.	15 Min.
Voltage Regulator	60 Min.	35 Min.	30 Min.
Battery	30 Min.	30 Min.	10 Min.
Fan Belt	60 Min.	30 Min.	15 Min.
Hydraulic Pump	60 Min.	50 Min.	45 Min.
Brake Shoes	240 Min.	120-180 Min.	UNK
Fuel Pump	300 Min.	180-240 Min.	UNK
Safety and Human Factors:	N/A	30 Min.	30 Min.
1. Are the Safety Precautions Provided by the Mfgr. Augmented by the User? If Yes, Explain.	No	No	Yes User Requires Forks to Be Tilted Rearward at All Times While Traveling.
2. Do You Know of Any Safety Hazards That Exist During: Operation? Maintenance?	No No	No No	No No

Parameter	User		
	T1	T2	T3
3. Are the Following Items/Elements Adequate:			
Gauges & Monitor?	Yes	Yes	Yes
Controls Within Easy Reach and Clearly Marked as to Their Use and Function?	Yes	Yes	Yes
Anti-Skid Walkway Surface?	Yes	Yes	Yes
Are Hazardous Areas Identified?	Yes	Yes	Yes
4. Does the Size of the Operator Inhibit His Performance?	No	No	No
5. Does the Sound Level Result in Unusual Operator Fatigue After Prolonged Operation?	No	No	No
Manuscripts, Manuals, Tools and Test Equipment:			
1. Which of the Following Manuals Are Provided:			
Operator?	Yes	Yes	Yes
Maintenance?	Yes	Yes	Yes
Parts?	Yes	Yes	UNK
Overhaul?	No	No	No
2. Are Technical Bulletins Provided Periodically By:			
Dealer?	Yes	No	UNK
Manufacturer?	No	No	UNK
3. Do You Use the Commercial Manual as Supplied by the Mfg./Dealer?	Yes	Yes	Yes
Do You Specify Particular Format and Materials?	No	No	No

Parameter	User		
	T1	T2	T3
Have Any Difficulties Been Encountered in Using the Manuals to Perform:			
Operating/Setup?	No	Yes	No
Servicing?	No	No	No
Adjustments?	No	Yes	No
Repair & Overhaul?	No	No	No
4. Are Special Tools Required by Operators or Mechanics to Maintain or Test/Troubleshoot the Equipment?	Yes	Yes	No
(a) If Yes, Are They Provided by the Manufacturer?	No	No	N/A
(b) Is the Use of Special Tools Sufficiently Described in the Operator/Repair Manual?	Yes	No	UNK
(c) What Special Tools Have You Used?	Pressure Gauge and Transmission Tools.	12 Point Socket	None
Training and Logistic Support:			
1. Are Dealer Repairs Performed Promptly?	Yes	Yes	Yes
2. Is Timely Technical Assistance Available When Required From:			
The Dealer?	Yes	Yes	Yes
The Manufacturer?	UNK	UNK. No History	UNK. No History
3. Do You Attempt to Standardize Makes and/or Models of Equipment/Components Within Your Fleet?	Yes	Yes	No
4. What Is the Length of Warranty in Equipment Hours/Months?	UNK	500 Hr./180 Days	UNK

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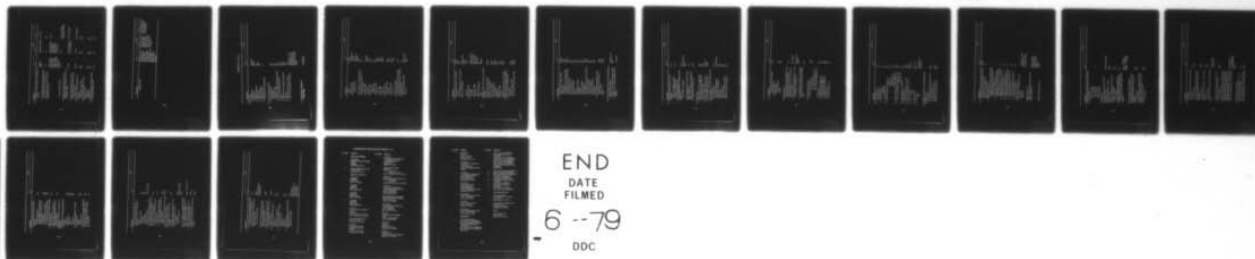
ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMM--ETC F/G 13/6
TRUCK FORKLIFT, GASOLINE-ENGINE-DRIVEN, 4000-POUND-CAPACITY, PN--ETC(U)
AUG 78 J E STEPHENS, J W REID

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Parameter	User		
	T1	T2	T3
5. What Is the Total Number of Warranty Claims?	Engine — 1 Mast — 1	Emergency Brake — 1	3/5 Trks.
6. Are Delays Frequently Caused by Lack of Timely Receipt of Repair Parts?	No	No	No
7. What Repair Parts Do You Keep On Hand For this Item?	Starter, Fan-Belt, Ignition Repair Parts, Hoses, Filters, Steering Parts, Bearings.	Gen/Alternator Belts/Ignition Parts/Hoses/Starter Filters/Fuel Pump.	None.
If None Stocked, Why?	N/A	N/A	Parts Are Readily Available at Dealer.
8. What Is the Length of Time to Fill Emergency Orders When Parts Are Not in Dealer's Stock?	24 Hr.	2-3 Days Good Parts Availability.	(No Experience)
9. What Is the Length of Time to Fill Normal Orders When Parts Are Not in Dealer's Stock?	24 Hr.	2 Days	(No Experience)
10. Is Special Training Required For: Operators?	No	No	No
Maintenance Personnel?	No	No	No
11. Do You Utilize Mfgr. Training Schools For Your: Operators?	No	No	No
Mechanics?	No	No	No
12. Would You Rebuy an Identical Make and Model Forklift Truck?	Yes	Yes	Yes

Parameter	User		
	T1	T2	T3
Explain Answer.	But Has Never Made Comparison Between Brands. Bought Cat Because It Was Cheaper and Smaller Than Hyster. Size Is Important.	Likes Size and Maneuverability. However, Has Never Tried New Trucks From the Competition.	Past Performance & Good Service From Dealer.

APPENDIX C-4 (con't.)

Parameter	T4	User
A. End Item:		
1. Manufacturer	Towmotor	
2. Model No.	V50B	
3. Date(s) Purchased	75	
4. Capacity (lb)	5000	
5. Load Center (in.)	24	
6. Number in Fleet	1	
7. Estimated Size of MHE Fleet	1	
B. How was Item Purchased:		
1. By Specification?	No	
Sole Source?	Yes	
Competitive Bid?	No	
2. By Dealer or Mfr. Recommendation?	Yes	
3. From Commercial Brochure?	Yes	
4. Other?	N/A	
5. Was Vehicle Purchased New/Used?	New	
6. Leased?	No	
7. Maintained By Lessee/Lessor?	N/A	
8. How Is Truck Inspected/Accepted?	Operation of FLT Checked by User. and Inspected For Missing or Broken Parts.	
C. Components & Accessories:		
1. Engine Mfr.	Continental	

Parameter	User	
	T4	
Model	F163	
Governor Type	Centrifugal	
Air Cleaner Mfgr.	United	
Type & Part No.	Dry Type -- 105045	
Pos. Crankcase Ventilation System	Yes	
Cooling System Capacity (qt)	11	
Pressure (PSI)	7	
Oil Filter Mfgr.	Purolator	
Part No.	UNK	
Battery Model	Cat.	
Voltage (V)	12	
Capacity (Ah)	67	
Alternator Mfgr.	Delco	
Part No.	UNK	
Starter Mfgr.	Delco	
Part No.	UNK	
2. Power Train:		
Transmission Mfgr.	Cat.	
Part No.	UNK	
Front-Axle Mfgr.	Cat.	
Part No.	UNK	
3. Steering and Brakes:		
Truck Equip With Power Steering?	Yes	
Steering Pump Separate From Main Hydraulic Pump?	Yes	
Power Steering Pump Mfgr?	Eaton Corp.	
Part No.	UNK	

Parameter	T4	User
Power Steering Control Unit Mfgr?	UNK	
Part No.	UNK	
Is Truck Equipped W/ Power Brakes?	No	
Master Cylinder Mfgr?	Wagner Elec. Corp.	
Part No.	UNK	
4. Hydraulic System		
Filter Mfgr?	Walker Mfg. Co.	
Part No.	DX 1650 AN	
Main Pump Mfgr?	Borg Warner	
Part No.	16EJ5-Z-L	
Fluid Level Indicator?	Yes	
Type	Dipstick	
5. Uprights, Forks, Fork Carrier, and Load Backrest?		
Mast Roller or Slider Type?	Roller	
Number of Mast Stages?	2	
Mast Part Number?	UNK	
Load Backrest Type?	Bar	
Part Number	UNK	
Sideshifter?	No	
Sideshifter Mfgr?	Cat	
Part No.	UNK	
Sideshifter Integral Part of Carriage?	Yes	
6. What Instruments, Gauges, and Safety Devices Is Truck Equipped With:		
Hourmeter?	Yes	
Ammeter: Gauge/Light?	Gauge	
Eng. Coolant Temp: Gauge/Light?	Gauge	

Parameter		User	
		T4	
Eng. Oil Press: Gauge/Light?		Gauge	
Fuel Gauge?		Yes	
Transmission Press: Gauge/Light?		Light	
Transmission Temp: Gauge/Light?		None	
Keyed Ignition Switch?		Yes	
Rear View Mirror?		No	
Retractable OHG?		No	
Horn?		Yes	
Floodlight(s)? Qty(?)		No	
Taillight?		No	
Directional Lights?		No	
Parking Brake?		Yes	
Tilt Cylinder Anti-Cavitation Device?		UNK	
Neutral Start Switch?		Yes	
Starter Disconnect?		Yes	
Restriction Indicator?		No	
Fuel Filter?		Yes	
7. What Optional Equipment Is Used:			
Attachments (Clamps, Ram)?		None	
Special Lights?		None	
Other?		None	

D. Functional Performance and Characteristics:

1. Geographical Location
Lebannon, Tn.
2. Approx. Time Truck Operated Outside.
30%
3. Ambient Temp. Range in Which Truck Operates.
5° to 85° F

Parameter	T4	User
4. Is Truck Stored Outdoors in Cold Weather? If Yes, Is It Difficult to Start/ Operate in Cold Weather?	No N/A	
5. Does Truck Operate in Any Unusual Environmental Conditions (Dirt, Rain, Etc.)? If Yes, What Conditions?	Yes Livestock Feed Dust.	
Does Forklift Perform Properly Under These Conditions?	Yes	
What, If Any, Actions Were Required to Enable Proper Operations?	None	
E. Characteristics:		
1. What Type Fuel Does Engine Use?	Gas	
Will It Operate on Unleaded Fuel?	Yes	
If LPG Is Used, Why?	N/A	
2. What Is Capacity of Fuel Tank?	9.3 Gal.	
3. Normal Engine Operating Temp?	UNK	
4. Does the Drive Train Contain the Follow- ing Components:		
Torque Converter?	Yes	
Power Shift Transmission?	No (Manual)	
Hydrostatic Transmission?	No	
Differential?	Yes	
Positive Inching?	No	
External Transmission Filter?	No	
Water Cooler for Transmission?	No	

Parameter	T4	User
Universal Joint Drive Shaft?	Yes	
5. Electrical System: Protected By:		
Circuit Breakers?	No	
Fuses?	Yes	
F. Transportability:		
1. Have You Experienced Difficulties Loading/Moving FLT to its Job Site?	No	
2. How Do You Move the FLT From Job Site to Job Site?	Not Moved.	
3. What Procedure/Equipment Do You Use to Transport a "Down" FLT?	Picked-up by Dealer.	
4. Are Lifting and/or Tie-down Attachments, or Locations, Provided for Ease of Shipment?	Yes	
G. Physical Characteristics:		
1. Length: W/ Forks (in.)	138	
W/O Forks (in.)	96	
W/ Forks & Sideshifter (in.)		
W/O Forks & Sideshifter (in.)		
2. Width (in.)	42	
3. Overhead Guard Height (in.)	87	
4. Collapsed Mast Height (in.)	83	
5. Maximum Fork Height (in.)	144	
6. Free Lift (in.)	17	
7. Backrest Height (in.)	48	

Parameter	User	
	T4	
8. Tilt Forward (°)	6	
Tilt Rearward (°)	12	
9. Sideshift-Left (in.)	4	
Right (in.)	4	
10. Carriage Width (in.)	42	
11. Fork Dimensions: Length (in.)	42	
Width (in.)	4	
Thickness (in.)	1.75	
Taper Length (in.)	22	
12. Forks Comply With ANSI MH 11.4?	Yes	
13. Fork Adj. Dimension: Minimum (in.)	10	
Maximum (in.)	37	
14. Seat Clearance to OHG (in.)	40	
15. Wheelbase (in.)	56	
16. Drive Tire Width $\bar{Q}$ to $\bar{Q}$ (in.)	UNK	
17. Steer Tire Width $\bar{Q}$ to $\bar{Q}$ (in.)	UNK	
18. Drive Tire Size	7.00 x 12	
Qty	2	
19. Steer Tire Size	7.00 x 12	
20. Tire Type	PT	
Why?	Standard Tire Furnished.	

H. Reliability, Availability, and Maintainability Characteristics:

1. General Data:	
Current Hourmeter Reading (Fleet Av.)	4891
Av. Age of Fleet (Yr.)	3
Expected Life of FLT (Hr.)	10 Yr.
Expected Annual Usage (Hr.)	1000

Parameter	T4	User
Expected Time Between Major Overhauls	None	
Normal Work Day (Clock-Hr.)	8	
Shifts Per Day (Number)	1	
2. Maintenance Factors:		
(a) Scheduled (Preventative) and Unscheduled Maintenance Actions During the Past Year (Cumulative No.)	3	
(b) Unscheduled Maintenance Actions Requiring at Least 1 Hour of Maint. Time During the Year to Correct (No.).	2	
(c) Man-Hours Required to Correct the Malfunctions in 2(b) Above.	23	
(d) Clock Hours Required to Correct Malfunctions Identified in 2(b) Above.	23	
(e) Total Man-Hours to Complete the Actions in 2(a) Above.	24	
(f) Total Clock-Hours to Complete the Actions in 2(a) Above.	24	
3. Maintenance Allocation:		
What Maint. Is Performed by the Operator?		Changes Oil, Filter.
Mechanic?		All Other Performed by Dealer.
4. Maintenance Costs:		
What Is Annual Maintenance Cost Per Vehicle (Fleet Av.)?		\$500.00 Annual Contract With Dealer For PM Contract.
What Percentage Is Labor?		UNK

Parameter	T4	User
Which of These Wage Scales Best Describe Your Mechanic:		
\$ 3.00- 5.00 Hr?		
5.00- 7.50 Hr?		
7.50-10.00 Hr?	✓	
10.00-12.50 Hr?		
12.50-15.00 Hr?		
5. Repair Parts:		
Av. Down-Time Awaiting Parts Not in Dealer's Stock?	Dealer Does Maint.	
Which Parts Tend Not to Be in Dealer's Stock?	UNK	
Is There a Frequency of Failure(s) of the Same Component?	No	
If Yes, Explain.	N/A	
Are Any Components Replaced on a Scheduled Interval (Excluding Filters)?	Yes	
If Yes, What Components and at What Intervals?	Oil — Monthly Plugs — 6 Months Points — 6 Months	
6. Model Changes/Field Campaigns:		
Since Purchasing the FLT, Has It Been Modified by the Mfgr, Dealer, and/or In-House?	No	
If Yes, Explain.	N/A	
Have There Been Any Significant Design Changes to this Model in the Last Year of Which You Are Aware?	No	
If Yes, Explain.	N/A	

Parameter		User	
		T4	
7. Reliability:			
Are You Dissatisfied With Any Feature(s) of this FLT?		No	
If Yes, Explain.		N/A	
Are There Any Undesirable/Unsat. Operating Characteristics Assoc. With this Equipment?		No	
If Yes, Explain.		N/A	
Does the FLT Perform Its Mission Satisfactorily?		Yes	
If No, Explain.		N/A	
Why Did You Purchase this Make/Model FLT?		Price, Service From Dealer.	
Does the FLT Perform as Well as Suggested by Mfgr. and/or Dealer?		Yes	
If No, Explain.		N/A	
Based on Your Experience, Which of the Following Sub-systems Tend to Fail Most Frequently: Transmission, Engine, Steering, Mast, Brakes, Hydraulic, Drive Axle/Differential, Electrical Sys., Cooling Sys?		Transmission ⁽ⁱ⁾	
What Are the Best Features of this Truck?		It's Dependable; Virtually Trouble Free.	
8. Maintainability/Availability:			
Can Operators and/or Maint. Pers. Be Trained Without Difficulty?		Yes	
Are There Any Maint. Tasks Which Are Unduly Difficult and/or Time Consuming?		UNK	

Parameter	T4	User
If Yes, Explain. Does Your Mechanic/Operator Have a Preference for this Make FLT? Discuss Reason for Your Answer. Is Scheduled (Preventative) Maint. Costly and/or Time Consuming? If Yes, Explain. Do You Defer Scheduled Maint. Until Slack Periods? Are Special Lubricants/Fuels Required? If Yes, Explain. Are All Components Accessible for Maint. with Minimum Disturbance of Other Components? If No, Explain. Scheduled Maintenance: (1) Replace Filters: (a) Engine Oil (b) Air (c) Fuel (d) Transmission (e) Hydraulic (2) Drain and Refill: (a) Engine Oil (b) Transmission Oil (c) Hydraulic Oil (d) Cooling System	No Would Use Any Truck Furnished. No N/A Yes No N/A UNK Dealer Performs Maintenance. Interval Time 30 Days 15 Min. 30 Days 15 Min. 30 Days 15 Min. Yearly 15 Min. 30 Days 15 Min. 30 Days 30 Min. As Reqd. 30 Min. As Reqd. 30 Min. Yearly 30 Min.	

Parameter	T4		User
	30 Days	30 Min.	
(3) Lubricate (Chassis) Preventative Maint. Time:			
(1) Man-Hours Expended for Daily Servicing (Average).	.25		
(2) Man-Hours Expended for Weekly Preventative Maint. Service (Average).	None		
(3) Man-Hours Expended for Monthly Preventative Maint. Service (Average).	2		
Component Part Replacement Data:			
Indicate the Average Time Required for One Man Using Common Tools and Special Tools Furnished With the Unit to Remove & Replace the Following:			
Alternator		20 Min.	
Starter		30 Min.	
Voltage Regulator		15 Min.	
Battery		10 Min.	
Fan Belt		35-40 Min.	
Hydraulic Pump		90 Min.	
Brake Shoes		180 Min.	
Fuel Pump		30 Min.	
Safety and Human Factors:			
1. Are the Safety Precautions Produced by the Mfr. Augmented by the User? If Yes, Explain.	No		
2. Do You Know of Any Safety Hazards That Exist During: Operation?	N/A		
Maintenance?	No		
	No		

Parameter	User	
	T4	
3. Are the Following Items/Elements Adequate:		
Gauges & Monitors?	Yes	
Controls Within Easy Reach and Clearly Marked as to Their Use and Function?	Yes	
Anti-Skid Walkway Surface?	Yes	
Are Hazardous Areas Identified?	Yes	
4. Does the Size of the Operator Inhibit His Performance?	No	
5. Does the Sound Level Result in Unusual Operator Fatigue After Prolonged Operation?	No	
Manuscripts, Manuals, Tools and Test Equipment:		
1. Which of the Following Manuals Are Provided:		
Operator?	Yes	
Maintenance?	Yes	
Parts?	No	
Overhaul?	No	
2. Are Technical Bulletins Provided Periodically By:		
Dealer?	No	
Manufacturer?	No	
3. Do You Use the Commercial Manual as Supplied by the Mfgr/Dealer?	Yes	
Do You Specify Particular Format and Materials?	No	

Parameter	User	
	T4	
Have Any Difficulties Been Encountered in Using the Manuals to Perform:		
Operating/Setup?	No	
Servicing?	No	
Adjustments?	No	
Repair & Overhaul?	Done by Dealer.	
4. Are Special Tools Required by Operators or Mechanics to Maintain or Test/Troubleshoot the Equipment?	No	
(a) If Yes, Are They Provided by the Manufacturer?	N/A	
(b) Is the Use of Special Tools Sufficiently Described in the Operator/Repair Manual?	UNK	
(c) What Special Tools Have You Used?	None	
Training and Logistic Support:		
1. Are Dealer Repairs Performed Promptly?	Yes	
2. Is Timely Technical Assistance Available When Required From:		
The Dealer?	Yes	
The Manufacturer?	UNK (No Experience.	
3. Do You Attempt to Standardize Makes and/ or Models of Equipment/Components Within Your Fleet?	Only 1 Truck. N/A	
4. What Is the Length of Warranty in Equipment Hours/Months?	UNK	
5. What Is the Total Number of Warranty Claims?	None	

Parameter	T4	User
6. Are Delays Frequently Caused by Lack of Timely Receipt of Repair Parts?	No	
7. What Repair Parts Do You Keep On Hand for this Item? If None Stocked, Why?	None Dealer Performs Maintenance.	
8. What Is the Length of Time to Fill Emergency Orders When Parts Are Not in Dealer's Stock?	UNK	
9. What Is the Length of Time to Fill Normal Orders When Parts Are Not in Dealer's Stock?	2 Days	
10. Is Special Training Required For: Operators? Maintenance Personnel?	No N/A	
11. Do You Utilize Mfgr. Training Schools for Your: Operators? Mechanics?	No No	
12. Would You Rebuy an Identical Make Model Forklift Truck? Explain Your Answer.	Yes Forklift Has Very Few Failures and Excellent Dealer Service.	

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