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USATECOM Project No. 7-4-0450-46 Contract No. <u>DAAEG7-67-6-4152</u> About Report No. <u>DPS 2604A</u>

FINAL REPORT ON

CCMPARISON TEST

GF

CHASSIS, TRAILER, CARGO: 1/4-TON, 2-WHEEL, M416

USA REG NO. 06F23067

BY

W. J. BACH

OCTOBER 1967

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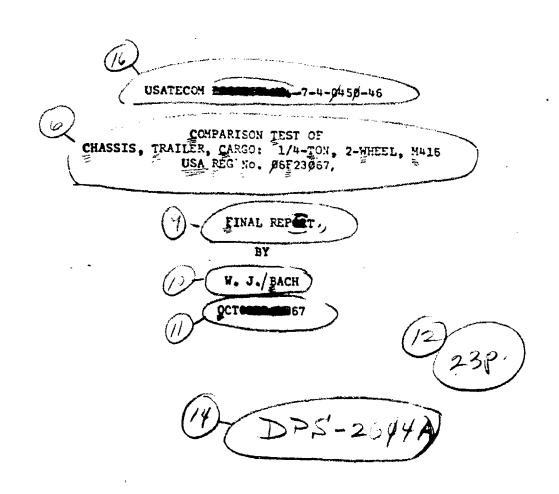
ABERDEEN PROVING GROUND

ABERDEEN PROVING GROUND, MARYLAND

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ABSTRACT

A comparison test was conducted at Aberdeen Proving Ground on a Trailer, Cargo, 1/4-Ton, 2-Wheel, M416 produced under contract no. DAAE07-57-C-4152 with Stevens Manufacturing Company, Ebensburg, Pennsylvania. Tests were conducted from 3 October 1957 through 30 October 1957.

Testing was in accordance with requirements stated in Military Specification MIL-T-10579C dated 1 June 1962 and Interim Amendment dated 24 March 1965.

Vehicle performance and durability were satisfactory.

FOREWORD

Development and Proof Services was responsible for conducting the test and preparing the test report.

ABERDEEN PROVING GROUND ABERDEEN PROVING GROUND, MARYLAND 21005

USATECCM PROJECT NO. 7-4-0450-46

FINAL REPORT ON COMPARISON TEST OF CHASSIS, TRAILER, CAPGO: 1/4-TON, 2-WHEEL, M416 USA REG No. 05F23067

3 OCTOBER TO 30 OCTOBER 1967

SECTION 1. INTRODUCTION

1.1 BACKGROUND

This trailer, USA Reg No. 06F23067, was tested under the current contract, DAAE07-67-C-4152, with the Stevens Manufacturing Company, Ebenshurg, Pennsylvania.

The test trailer was delivered from the contractor's plant at Ebensburg, Pennsylvania, by commercial carrier. It was received in a satisfactory condition in accordance with acceptable shipping procedures on 2 October 1967.

The comparison testing extended from 3 October 1967 to 30 October 1967.

1.2 DESCRIPTION OF MATERIEL

The 1/4-ton, 2-wheel, cargo trailer M416 is designed to be towed by Truck, Utility: 1/4-Ton, 4x4, M151. A two-position bracket for the trailer lunette also makes the trailer adaptable to being towed by Truck, Utility: 1/4-Ton, 4x4, lightweight M422.

This vehicle is a two-wheel general purpose cargo carrier designed to carry a load of 500 pounds cross-country. The body is of one piece welded construction, bolted to the chassis at 14 lug locations. The body is watertight and will float the trailer and a 500-pound load in fording operations. Two drain valves are provided, one in the left front, and one in the right rear of the floor. The trailer is equipped with two taillights which are operated from the towing vehicle.

The support leg is a movable support which is used to keep the trailer upright when the trailer is not connected to a towing vehicle. A canvas paulin, which fastens to hooks welded to the body, covers the trailer cargo.

1.3 TEST OBJECTIVES

To provide evidence of contractor conformance to the specific sections of MIL-T-10579C dated 1 June 1952 and related requirements as outlined in the Procurement/Work Directive dated 10 July 1967. (Refer to Appendix II)

1.4 SUMMARY OF RESULTS

All Engineering Performance and Durability test requirements Were satisfactory.

No Equipment Performance Reports were required during Initial Inspection, none during durability testing and one during the Final Inspection. Three EPR's were written during test for information purposes.

The vehicle was returned to supply channels in an "as is" condition upon completion of test.

1.5 CONCLUSIONS

- It is concluded that:
- 2- a.: Performance of the vehicle was satisfactory. (Refer to par 2.3)
 - b. Endurance and reliability are satisfactory. (Refer to par 2.4)

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SECTION 2. DETAILS OF TEST

2.1 INITIAL INSPECTION

No discrepancies were detected upon the accomplishment of initial inspection.

2.2 LOAD DISTRIBUTION

Load Distribution was as follows:

Location	W/O Payload Lb	W/Cross-Country Payload - Lb*	W/Highway Payload - Lb**
Left Wheel	260	495	646
Right Wheel	٥٣٥	.500	683
Pintle	80	95	68
Total	610	1090	1397

^{*} Specified Cross-Country Payload - 500 lb

2.3 ENGINEERING PERFORMANCE

To determine performance characteristics of the M416 Trailer for compliance with MIL-T-10579C entitled, "Trailer, Amphibious; Trailer, Cargo: General Purpose, 2-Wheel, 1/4-Ton to 1-1/2-Ton," dated 1 June 1962.

Test	Requirements	Results
Highway Operation	Para 3.5.1.1, When concurrently transporting the applicable payload of 750 pounds uniformly distributed over load area, and being towed over level, smooth, improved, and prepared hard-surfaced roads at the appropriate sustained speed up to 50 mph each vehicle shall track the towing vehicle without weaving from side to side of the path of the towing vehicle moving in a straight line and without swaying laterally to the extent which adversely affects the controllability of the vehicle combina-	Satisfactory
	tion.	

^{**} Specified Highway Payload - 750 1b

Test	Requirements	Results
Cross-Country operation	Para 3.5.1.2, When simultaneously carrying the applicable payload of 500 pounds uniformly distributed over load area, and being towed over unimproved roads, trails, open fields, roiling hills, and cross-country terrain at the appropriate speed up to 30 mph, each vehicle shall follow the prime mover without damage to itself or to the prime mover.	Satisfactory
Gradeability	Para 3.5.2, When towed over a dry, hard surface free of loose material, each vehicle shall exhibit stability and gradeability spenified in 3.5.2.1 and 3.5.2.2.	Satisfactory
Longitudinal slopes	Para 3.5.2.1, The vehicle shall follow the towing vehicle without weaving to the extent which adversely affects the controllability of the vehicle combina- tion when ascending or descending longitudinal inclines having a 40% grade.	Satisfactory
Side slopes	Para 3.5.2.2, The vehicle shall follow the prime mover without slipping or upsetting when operating, either right or left, on slopes having a 20% grade.	Satisfactory
Turning ability	Para 3.5.3, When coupled to the prime mover operating in its minimum turning circle, each vehicle shall follow without cramping or side slipping, without damage to the towed vehicle or prime mover and without interference between the towed vehicle and prime mover.	Satisfactory
Braking ability	Para 3.5.4, As specified. Para 3.5.4.1	Satisfactory
Parking brake	Para 3.5.4.1, The parking (hand) brake shall hold each vehicle on a dry, hard surfaced 30% grade when uncoupled from the prime mover and resting on its landing legs and headed down incline.	Satisfactory

Test

Pequirements

Results

Satisfactory

Fording

Para 3.5.5. The vehicle shall ford hard-bottomed, salt or fresh water crossing of depths great enough to completely submerge the chassis, and shall withstand such immersion for periods up to 15 minutes duration without damage to the vehicle or its components. Cargo body shall be immersed in water, either attached or detached from the chassis, in a horizontal position, to a depth of 12 inches above the floor level and shall show no leakage in 5 minutes. The valves, when closed, shall not have a sealer or any substance applied to form a seal.

Satisfactory

Landing Leg

Para 3.5.6, With vehicle uncoupled from the prime mover, the landing leg shall exhibit capacity to support and hold the fully loaded vehicle, and shall withstand, without damage, the strains imposed when coupling or uncoupling the prime mover. The landing leg shall extend and retract; and when retracted, shall provide ground clearance for cross-country operation.

Reliability

Para 3.5.9, The vehicle shall operate at least 2560 niles in a military environment without failure due to workmanship or materials; and when subjected to military operating conditions shall exhibit flexural stiffness and torsional rigidity to withstand bending and twisting without evidence of permanent set or part failure.

Satisfactory

2.4 DUPABILITY

The endurance test miles were as follows:

Course	Gross vehicle Veight rounds	Tire Pressure	Actual Miles	Specified Miles
Pelgian Block	1090	25 1b	60	60
Level Cross-Country	1090	22 1b	1002	1000
Hilly Cross-Country	1090	22 1b	500	500
Paved	1397	25 1b	1046	1000
Totals	•		2609	2560

2.5 FINAL INSPECTION

During final inspection one defect was found:

EPR No. (K-2) 3 - Leakage at hub cap.

Entry of water in wheel cavity during fording operations is attributed to metal press fit of the caps to the hubs.

All Equipment Performance Reports submitted during the test are summarized in Appendix I.

SECTION 3. APPENDICES

TYPES OF THUTBERTS

B . DESIGN A . DEFICIENCY M - NAMPACTURING B - SHORTCOMING Cther

Comparison Test of Trailer, Cargo, 1/4-Ten reger, 2-Wheel, M416, USA Reg No. 06F23067 (TECP 700-700 Interim Pam. 60-20) EP SUMMARY SHEET

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		Q	E4	Start of test		0		Test started 3 Oct 67.
		₽	F4.	End of test operations		2608		Testing completed 30 Oct 67.
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CONTINUATION OR SUPPORTING SIEET

PAGE 2 OF 5-67

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Test Directive for Trailer, Cargo, 4 Ton, M416

- 1. The purpose of this directive is to provide Aberdeen Proving Ground, Maryland, authority to perform three tests as follows:
 - a. One Initial Production Test in Dec 67
 - b. One Comparison Test in Mar 68
 - c. One Comparison Test in Jun 68
- 2. In the event production delays negate the above dates, this office will provide a revised schedule when information becomes available.
- 3. Vehicles will be produced by Stevens Mfg. Co., Ebensburg, Pennsunder Contract DAAE07-67-C-4152 administered by DCASD, Pittsburgh, Pennsylvania.
- 4. Tests will be conducted in accordance with scope of work outlined herein.
- 5. Project No OKP-ICT-67-A43, has been assigned to this program. All correspondence issued relative to this directive shall include as a minimum, vehicle designation, USA Reg No and last five digits of the contract number.
- 6. Spare part support for the Initial Production Test vehicle will be furnished by the contractor at no cost to the government. Spare part support for the Comparison Test vehicles will be procured by the proving ground from the contractor utilizing project funds.
- 7. Notify Quality Test Branch (AMSTA-QKP), Mr. Finnie by teletype, upon receipt of a test vehicle at the proving ground.
- 8. Vehicle test must be completed and a final report distributed within 45 days after receipt of test vehicle, in order that necessary corrective actions can be incorporated in production at the earliest opportunity.

9. Purpose of Tests

The purpose of these tests is to provide evidence of conformance to contractual requirements, capability of manufaction methods, adequacy of quality assurance procedures and ability the required level of quality throughout the production cycle.

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1	EH-7-80018-01-81-12	4510.54.3551

24 Mar 1965.

Test	Eng Ref Para	CA Ref Para
Highway Operation	3.5.1.1	4.5.2
Cross-Country-Operation	3.5.1.2	
Parking Brakes	3.5.4.1	4.5.2
Fording Ability	3.5.5.	
Turning Ability	3.5.3	4.5.2
Landing Leg	3.5.6	4.5.2
Gradeability	3,5,2	•

f. Endurance

Each vehicle shall be subjected to 2,560 miles of operation in accordance with the following table.

Course	Mileage .	Payload
Mard Surface (Highway)	1000 miles at variable speeds up to 50 miles per hour.	Highway _
Level Cross-Country	1000 miles at variable speeds up to the required cross-country speeds.	Cross-Country
Hilly Cross-Country	500 miles at variable speeds up to required cross-country speeds.	Cross-Country
Belgian Block	60 miles at speeds applicable to conditions of terrain.	Cross-Country

g. Final Inspection

Upon completion of endurance operation, a final inspection shall be conducted, including a tear down of those components where test operation may indicate a need for more detailed investigation. Inspection should also evaluate workmanship.

12. Photographic Coverage

All incidents of failure. In addition to inclusion of photographs in final report, forward two copies each to Quality Test Branch (AMSTA-QKI) ATTN: Mr. R. G. Finnie immediately after a failure occurs.

COMMUNITOR OF STREET CAMES CITIET

PROD AMONG CODE (#16-7-89018-01-8H-10) 4510, 84.3551

10. Score of Operation

Continued observation shall be made regarding performance and endamance characteristics throughout the entire duration of each test.

11. Tost Plan

a. Initial Inspection

- (1) Upon receipt of each test vehicle an inspection shall be performed to assume that proper preparation for shipment was made including blockage and securement, if on rail cars. In the event vehicle are towed over the road from the contractor's facility to the proving ground, inspection shall ascertain that no damage has resulted from malfunction of brakes, lubricants, etc., while being towed, or that any damage or pilferage has occurred.
- (2) Perform operational check of brakes, suspension, an electrical systems.
- (3) Report and correct all discrepancies prior to start of vehicle test operation.
- (4) Lubricate and prepare vehicle in accordance with applicable publications.

b. Initial Adjustment

To be performed on gravel or hard surfaced roads. Necessiadjustments are to be made before start of general test operations.

c. Vehicle Loading

After completion of initial inspection, the vehicle shall be payloaded as required in Table II, MIL-T-10579C.

d. Maintenance and Inspection

perform required maintenance in accordance with published maintenance directives. Conduct complete visual inspection of each test vehicle daily in accordance with appropriate technical publications as may be required by special instructions.

e. Performance

of MIL-T-10579C, dated 1 June 1962, and Interim Amendment 1, dated

FORM L LOOSA

13. Vehicle Disposition

Upon completion of all tests and examinations, dispose of vehicle through normal channels in "as is" condition.

14. Reporting

- a. All pertinent information, major test incidents, and/or vehicle failures shall be immediately reported by telephone and confirmed by teletype to AMSTA-OKP, Mr. R. G. Finnie.
- b. Equipment Performance Reports (AMSTA Form 1025) shall be forwarded per distribution list below, within 72 hours after incidents occur.
- c. Final report shall be forwarded upon completion of all test operations and evaluation of data, for each vehicle tested, per distribution list below. Final report is to include conclusions and recommendations relative to capability of the vehicle to satisfy the requirements set forth in this directive.

d. Distribution

Number of Copies

	Equipment Performance Reports	Final Report
US Army Tank-Automotive Command		•
ATTN: AMSTA QKP	2	2
AMSTA REW	· 1	. 1
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AMSTA RTT	l (Repro)	1
AMSTA RTS	1	1
Tech Library	1	1
Dir, DCASD, Pittsburgh ATTN: DCRP-DPOE 1610 S. Federal Bldg. 1000 Liberty Avenue	6	6
Pittsburgh, Pennsylvania	15222	

APPENDIX III - REFERENCES

- 1. AMC Form 1095A/1006A Procurement/Vork Directive dated 10 July 1967.
- 2. Contract No. DAAE07-67-C-4152.

APPEIDIX IV - DISTRIBUTION LIST

	No. COPIES
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Commanding General	
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Commanding General	
US Army Test and Evaluation Command 21005	
Aberdeen Proving Ground, Manual Party	1
ATTN: AMSTE-TA	1
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Commanding Officer	
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· Warren, Michigan	40090	3 TEST TITE	Comparison
		4 SPECIFIC SUB	TEST Initial imprection
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7 QUANTITY 1		B LIFE PEFICO	
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Trailer, cargo, l serial no. 2.	IMPORPATION 1/4-ton, 2-wheel, M416	USA Reg No. OGF	e MANUFACTURE f OTHER
serial no. 2.			I OTHER
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Testing of e	1/4-ton, 2-vheel, M416 subject vehicle began	0et 67.	23067
CEFECTIVE MATERIAL SENT 26. INDICATED ACTION:	1/4-ton, 2-wheel, M416 subject vehicle began	0ct 67.	23067
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			EQUIPMENT PE	RFO	RMANCE	REPORT		
FROM:	Automotive Divis	lor				OFFICE SYMBOL	-	STEAP-ES-TU
1110	Aberdeen Proving Ground, Maryland 2100		XÓ5		DATE:		31 Oct 67	
Store acon Training or commit					EPR NO.		(5-2) 3	
1. TO	TO Commanding General			2.	2. USATECOM PROJ NO.			7-4-0450-46
US Army Tank-Automotive Command				ROT & E PROJ NO.		•		
j	ATTI: ANGEN-COP		•		CONTRACT NO. 3. TEST TITLE			DAAE07-67-C-4152
	Warren, Michigan		£09 0	3.			Comerison .	
•				4	SPECIFIC S	SUB TEST		Final instaction
			I MAJO	R 178	M CATA			
5. 200	1416			6.	SERIAL N	0.		2
7. QUAN				8	LIFE PER	100		2608 miles
9 MFR	Stere	:3	lig Co.	IO	USA NO.			C5723057
				APT	DATA			-
II. NOME	ENCLATURE Cap,]							
			}-560á	:3.	MER. PAR	T NO.		33116-43438
	NING NO.			15	MFR.			
IS QUAL	MTITY 1			17.	NEXT ASS	EMBLY		Eub
18 STD.	GOVT. GRP 13			19	PART TES	T LIFE		2608 miles
20 DESC	RIPTION Legici	23						
		_						
			III. IN	CIDEN	T CATA			
21 035	ERVED DURING	22	TEST ENVIRONMENT	123	ACTION TA	KEN .	24	INCIDENT CLASS
0	PERATION		e PAVED ROAD		B. REPLAC	EO		a. DEFICIENCY
X b. M	AINTENANCE		b. WATER CROSSING		S REPAIR	ED	K	b. SHORTCOMING
c		X	c FILL DISPECTION	$- \bot x$	C BEARI	G REPACKED		c. SUG. IMPROVEMENT
25. INC	IDENT DESCRIPTION						Ĺ	d. DESIGN
•								e. MANUFACTURE
j	At final inst	pec	tion there was appr	ixor	ately or	e-half		1. OTHER
ten s	poon water in the	ri	ight hub cap. Entry	Was	between	hub and		
hub c	ap.							

DEFECTIVE MATERIAL SENT TO:

26. INDICATED ACTION:

Wheel bearings were cleaned and repacked.

DEFICIENCIES AND SECRETOMINGS ARE SUBJECT TO RECLASSIFICATION

CONTINUATION SHEET ATTACHED () YES (x) NO SKETCH ATTACHED ()YES (x) NO PHOTO ATTACHED () YES (X) NO

W. J. Bach, Test Director

DATE & HOUR OF INCIDENT 30 Oct 67

	EQUIPMENT	PERFORMAN	CE REPORT				
FROM: Automotive	Division, D2PS		OFFICE SYM	BOL: STRP-TS-TU			
	oving Ground, Paryland	21005	DATE:	31 Cct 67	31 Cct 67		
3.552 + 55 - 55			EPR NO.	(2-2) 4			
I. TO Commanding Gene	eral	2. USATI	ECOM PROJ NO.	7-4-0450-46			
US Army Tank-Automotive Command.			E PROJ NO.				
ATTH: ANGEL-C		CONT	RACT NO.	P:AE07-67-C-41	52		
Warren, Machigan 48090			TITLE	Commarison	Commarison		
			FIC SUB TEST	Firel inspection	ca		
	I. ***	AJOR ITEM DA	7.3				
5. MOCEL 🥍	:16	6 559:2		2	2		
7. QUANTITY 1		O. LIFE	PERIOD	2503 -1105 -			
9. MFR. 51	teyens life Co.	HO USA :	49.	06727067			
		r, egar gara					
II. NOMENCLATURE							
12.FSN		13 MFR	IS MER PART NO.				
14 DRAWING NO.		15.12FR,	15. WFR.				
16.QUANTITY		17. NEXT	I7. NEXT ASSEMBLY I9. PART TEST LIFE				
IS. STD. GOVT. GRP.		19. PART					
20 DESCRIPTION .	End of test						
	ш.	INCIDENT DA	ΥA		-		
ZI OBSERVED DURING	22.TEST ENVIRONMENT	23. ACT (C	N TAKEN	24 INCIDENT CLASS			
a OPERATION	o PAVED RCAD	o RE	PLACED	O. DEFICIENCY			
b MAINTENANCE	b. WATER CROSSING	b.RE	CERIAS	b. SHORTCOMING			
٤.	C.	C.		c. SUG. IMPROVEMS	ENT		
25. INCIDENT DESCRIPT		d. DESIGN					
•	-			e. MANUFACTURE			
	INFORMATION			I OTHER			
· <u>:</u>							
	Vehicle testing complet		_				

DEFECTIVE MATERIAL SENT TO:

26. INDICATED ACTION:

Vehicle returned to supply channels in "as is" condition.

DEFICIENCIES AND SHORTCOMINGS ARE SUBJECT TO RECLASSIFICATION

CONTINUATION SHEET ATTACHED () YES (X NO SKETCH ATTACHED () YES (X) NO PHOTO ATTACHED () YES (x) NO

W. J. Bach, Test Director
DATE 8 HOUR OF INCIDENT
30 Oct 67