

THE INFANTRY SCHOOL
Fort Benning, Georgia

TANK COURSE
1938-39

EMPLOYMENT OF MOTOR VEHICLES

by the

UNITED STATES ARMY

since the

WORLD WAR

including

PRESENT TRENDS

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U S ARMY

J. D. WILMETH
1st Lt., Infantry

TABLE OF CONTENTS

	<u>Page</u>
Cover Page	(unpaged)
Table of Contents	i
Bibliography	ii - v
Footnote Abbreviations	vi
Text	1 - 9
1. Subject Limitation	1
2. At the Close of the War	1
3. The Awakening in 1923	2
4. The Tests of 1928	2
5. From 1928 to 1933	4
6. From 1933 to 1938.	6
7. The Infantry Motorization.	6
8. The Infantry Tests of 1938	7
9. The Present Status	7
10. Present Trends	8
11. Summary	8
12. Conclusions	9
Appendix 1	10
Appendix 2	11
Appendix 3	12
Appendix 4	14
Appendix 5	19
Appendix 6	20
Appendix 7	22
Appendix 8	29
Appendix 9	37

BIBLIOGRAPHY

1. MECHANIZATION

Command and General Staff School
Quarterly. Vol. XVIII No. 70

Some views on mechanization of
U. S. Army by Lt. Col. P. R. Daw-
son, Cavalry, and Maj. E. M. Beni-
tez, C.A.C.

2. MOTORIZED INFANTRY REGIMENT

Infantry School Mailing List Vol.
VIII. No. 70 Chapt. IV.

A resume of the experience of
a typical motorized regiment, the
29th Inf.

3. MILITARY MOTOR TRANSPORT

Army Ordnance. Sept.-Oct. 1936
Nov.-Dec. 1936

A review of our experience and
present problems by Col. Brainerd
Taylor, Q. M. C.

4. MODERN MOBILITY DEPENDS ON MOTOR MAINTENANCE

Infantry School Mailing List. Vol.
XVI Chapt. 7

The title is a condensation of
the subject matter.

5. FOUR DECADES OF MECHAN- IZATION

Army Ordnance. May-June 1937

A review of our mechanization
from 1897 to the present, by Capt.
R. J. Ickes.

6. TWENTY BELOW AND ALL TRANSPORTATION MOVING

Infantry Journal. July-Aug. 1936

A method of easy field starting
by Lt. A. M. Cochran, 29th Inf.

7. CURRENT INFANTRY DEVELOPMENTS

Infantry Journal. Jan.-Feb. 1938

A erudite article giving some of
our present experience with motor
vehicles, by the Chief of Infantry,
Maj. Gen. Lynch.

8. SELF PROPELLED DOUGHBOYS Infantry Journal May-June 1938
- The one man battle carrier is introduced, by Capt. C. D. Eddleman, Infantry.
9. REPORT OF EXPERIMENTAL MECHANIZED FORCE, FORT LEONARD WOOD, MARYLAND. 1928 The official report of the Mechanized Force that experimented in the fall of 1928. On file in the Chassis Group, Tank Section.
10. VEHICLE STANDARDIZATION and UNIFICATION OF MAKE Library paper UG 680 G3
- An informative treatise pointing out the benefits of standardization, by Doctor Engineer Conrad von Gienanth
- { Nos. 11 to 22, Incl. are papers and lectures }
 { prepared by Colonel Brainerd Taylor, Q. M. C., whose }
 { interest in the military characteristics of motor }
 { vehicles has been continuous since his command of }
 { all A. E. F. Motor Transport during the World War. }
 { These librettos cover the entire scope of this mono- }
 { graph. }
11. MOTOR TRANSPORT 1930
12. MILITARY RECORD OF BRAINERD TAYLOR, COLONEL, Q. M. C., UNITED STATES ARMY January, 1936
13. COORDINATION OF MOTOR TRANSPORTATION Testimony given March 9, 1931 by Lt. Col. Taylor before the Interstate Commerce Commission.
14. MILITARY BY MOTOR TRANSPORT REQUIRED BY THE ARMY FOR WAR. January, 1932.
15. REPORT OF ADMINISTRATION OF MOTOR TRANSPORT BRANCH, OFFICE, THE QUARTERMASTER GENERAL, WASHINGTON, D.C. May 1, 1928 to July 1, 1932.
16. THE ARMY'S MOTOR TRANSPORT PROBLEM June, 1934

17. LECTURE NO. 1 ON THE DEVELOPMENT OF MILITARY MOTOR TRANSPORT. September 25, 1935.
18. LECTURE NO. 2 ON THE DEVELOPMENT OF MILITARY MOTOR TRANSPORT. September 24, 1936
19. LECTURE NO. 3 ON THE DEVELOPMENT OF MILITARY MOTOR TRANSPORT. Oct. 2, 1936
20. LECTURE NO. 4 ON THE DEVELOPMENT OF MILITARY MOTOR TRANSPORT. Oct. 8, 1936
21. ADDRESS Sept. 14, 1936
22. MILITARY THEORIES AND DEVELOPMENT OF MOTOR TRANSPORT.
23. GENERAL CHARACTERISTICS OF VEHICLES. Engineering Data. Vol. II
A report from the Aberdeen Proving Ground tests.
24. MONOGRAPH OF JEROME D. CAMBRE, 1st Lt., Inf. A monograph on Army motorization prepared by a Tank Course Student, 1937-38.
25. PARTIAL REPORT OF TEST OF CROSS COUNTRY CARRIERS FOR INFANTRY. Feb. 7, 1938
A letter from the Infantry Board to the Chief of Infantry listing the experiences thus far encountered in the test of cross country carriers.
26. MECHANIZATION AND MOTORIZATION The Military Engineer. Sept.-Oct., 1937.
A review of our experiences with references to the future, by Col. Gross, C. E.
27. LETTER, QM 451 T-M Series 1938. From the Quartermaster General to the Adjutant General, asking approval of certain types of vehicles.

28. A COMMERCIAL VIEWPOINT
ON THE ARMY'S MOTORI-
ZATION PROGRAM.

Quartermaster Review. May-June
1938

A well written article point-
ing out the difficulties en-
countered when the Army is forced
to use commercial equipment, by
Lt. Col. Willard F. Rockwell,
Q. M. Reserve.

29. WHY NOT PROPER MOTOR
EQUIPMENT FOR THE
UNITED STATES ARMY

Quartermaster Review. Nov.-Dec.
1937. Jan.-Feb. 1938.

An article presenting the
Army's side of the question against
the demands of commercialization.
The influence of Col. Taylor is
strong. By Lt. Colonel Frank O.
Robinson, Q.M. Res.

30. MOTORIZATION OF OUR ARMY

Army Navy Register. 75th Annivers-
ary number.

A resume of present trends and
procurement methods, by the Chief
of Motor Transport, Q. M. Gen.'s
office, Gen. R. H. Jordan.

31. MILITARY CHARACTERISTICS
OF MOTOR VEHICLES

War Department, Office of the
Quartermaster General.

The official requirements of
Army Vehicles revised to July 1,
1938.

FOOTNOTE ABBREVIATIONS

The Bibliography has been numbered in order to obviate the necessity for footnote abbreviations. The number following the footnote number gives the reference. E.g. 1-10 in a footnote means that authority or reference for the first footnote appearing on that page is "Vehicle Standardization and Unification of Make."

EMPLOYMENT OF MOTOR VEHICLES BY THE UNITED STATES
ARMY SINCE THE WORLD WAR INCLUDING PRESENT TRENDS.

1. SUBJECT LIMITATION.-- Before discussing this subject I wish to establish myself on these points.

1. The motor vehicles with which this monograph deals exclude those bearing arms, armor, or tracks. My discussion concerns only vehicles for cargo and passenger purposes as issued by the Quartermaster.

2. Under employment I deal with no strategical or tactical methods. I restrict myself to

- a. Uses (command, cargo, etc.)
- b. Types
- c. Quantity (1)

2. AT THE CLOSE OF THE WAR.-- In 1918-19 we returned to this country 30,000 motor vehicles, having left 5000 in France. (2) In general, they had been used for command, reconnaissance, general cargo, special cargo, and towing. Their employment in these uses was confined to prepared routes, or highways. For a more complete description of uses and types see Appendix 1.

Upon demobilization the Army found itself with a garage full of obsolete motors which were the derision of the highways when shown in public. Although its commercial contemporaries fell by the wayside as the years took toll of their shoddy construction, the Class "B" truck, a result of the coalescence of the War Department and the Automobile Industry, continued to operate. It never quit, but its long life finally made it so embarrassing for an army that had become modernity conscious that it was ordered into retirement after fifteen years service. (3) This is an uncontested ALL-American record for motor endurance.

1 - These restrictions are the subjects of other monographs.
2 - 29
3 - Many are still operating. A large portion of our fire equipment is Class B material.

3. THE AWAKENING IN 1923.-- It took five years for the War Department to convince Congress that the past war was not, by virtue of democratic decree, necessarily our last; and since it might not be our last, we stood to the eyes of even the most beef-witted, stingily equipped with modern vehicles.

A board of officers who had been investigating the relative cost, proficiency, and maintenance of a four line team as compared to a Ford truck brought to the attention of Congress that the horse and the mule were competing with the blunderbuss for cases in the museum.

"The initial cost of an escort wagon with its four mules is \$1000.00. Running and maintaining expenses have been tabulated to show that the animal drawn transportation costs five times as much as the motor vehicles." (1)

In 1923 Congress responded by decreeing in Section 5-a of the National Defense Act that in time of peace an activity concerned with the utilization of Industry during war should give thought to arranging for procurement of all needs for the next war. Although the decree mentioned nothing definite concerning motorization, it vested in the War Department the power to make its own decision in the matter.

Whether to have vehicles made to order or to buy commercial vehicles was an eristic point among the General Staff. And although the majority leaned towards Standardization the case was won by the SAE when it convinced those with the power of decision that "standardization means obsolescence." (2) An ineluctable impediment to the standardizers was cost, for three commercial vehicles could be bought for the price of one made-to-measure.

4. THE TESTS OF 1928.-- For five years words took the place of action. Army appropriations were indigent; no equipment had been purchased since the war; the class B's continued to represent Army motorization. But in 1928 under the incessant

urging of Major General Douglas MacArthur, a postulant for modern equipment, and, at this time, Commanding General of the Third Corps Area, the War Department formed an Experimental Mechanized Force. See Appendix 2.

By July 1 the Force was assembled at Fort Leonard Wood, Maryland. It is not intempestive here to point out that the term 'mechanized' at this time meant what we class as both motorized and mechanized today. The distinction between the two was one of the results of this test.

Before dealing with these experiments I wish to reiterate that prior to this time the Army had never used motor vehicles other than on surfaces designed for their operation. Though employment in the war often approximated cross country conditions, still this type of travel was considered exceptional and the hegemony of the mule and escort wagon in the field remained uncontested. For the test a large number of commercial vehicles were purchased. But for the chauvinists who favored Standardization only the class B's remained, a specious representation. Under these unequipollent conditions Standardization was defeated before the game opened.

Ten using services in the Army were represented in the tests. In the list of models, shown in Appendix 3, I have included the tanks, armored cars, and tractors merely as a point of interest. I shall not deal with the mechanized tests.

A total of 158 vehicles of heterodox make and model were tested over neighboring terrain from the 2d of July to the 1st of October, although only one month and twenty days of this period was spent with the motorized section.

A number of similar and variegated opinions and conclusions of members and observers of the tests are thought condign to be listed in a separate department. See Appendix 4.

Briefly summarized the Experiment furnished these conclusions.

- a. The Class B was dead.
- b. No vehicle built on government specifications was necessary because the commercial field could meet every contemplated use.
- c. A cross country car, as a special type, was unnecessary as passenger cars could be used to better advantage.
- d. Trucks should have 4 wheel drive, pneumatic tires, and be overpowered, and overbraked.
- e. Motorcycles are satisfactory as is.
- f. Trailers are unnecessary and a bother.

These added uses for motor vehicles had been found:

- a. Cross country use of light cars and trucks.
- b. Armored cars added. (1)
- c. Kitchen trucks replaced trailers.

As an aside it is didactic to note that oils used were termed medium, heavy, extra heavy, super heavy, and ultra heavy.

5. FROM 1928 to 1933.-- In the same month that the Experimental Force was disbanded Mr. Christie produced a convertible wheel and track tank, and----

"So extraordinary were the results achieved in the first tests in October, 1928, that not only did military mechanization enthusiasts in this country advocate immediate adoption but ----

"The light tanks of the World War were intended for strategical transport on trucks because their life on tracks was short. Since then the goal has been to eliminate the use of trucks and to develop light tanks which are possessed of sufficient stamina and speed to possess their own strategical mobility. The Christie tanks first proved that this effect might be achieved." (2)

I offer this here not as a tidbit in tank development, but to show why and when the tank carrier was dropped from our list of motor vehicles.

General Douglas MacArthur became Chief of Staff in November, 1930, and Motorization immediately received an impetus.

1 - Beyond the scope of this paper. Offered here merely as a point of interest.

2 - 5

Fortunately, now, the General's powers did not stop with experimentation. He was in a position to get the really more essential item--money. One of MacArthur's first orders--

War Dept., AGO March 15, 1930 - To the Quartermaster General.

1. A.G. 111 is rescinded and the following substituted therefor:

a. The following priorities for the development of a wheeled motor transportation purposes are authorized.

- (1) Priority No. 1 - Development of suitable types of light chassis for military purposes.
- (2) Priority No. 2 - Development of suitable types of medium chassis for military purposes.
- (3) Priority No. 3 - Development of suitable types of heavy chassis for military purposes.

All of the above types to combine standard road performance with maximum cross-country ability-- these chassis to be of commercial types capable of prompt quantity production.

- (4) Priority No. 4 - Development of types of bodies for the several chassis in categories 1, 2, 3 above, designed to meet the special requirements of the different Arms and Services - priority of development subject to the Secretary of War's approval on recommendation of the Arms and Services.
- (5) Priority No. 5 - Development of suitable equipment for the proper maintenance and servicing of approved types of motor vehicles.

* * * * *

On Aug. 14, 1931 the 29th Infantry was designated as test regiment for the War Department.

"The motor transportation arrived at Fort Benning on September 26, 1931. On Feb. 6, the 2nd Battalion became a motorized battalion in so far as the available transportation would permit.

The vehicles assigned to the 29th Infantry consisted of:

- 1 motorcycle, solo
- 5 light passenger cars
- 3 light delivery $\frac{1}{4}$ ton trucks
- 20 $1\frac{1}{2}$ ton trucks, 4 wheel, 4 wheel drive.

1 1½ ton truck, 4 wheel, 2 wheel drive.
1 1½ ton truck experimental
1 truck, tank, gasoline, 1000 gallons.
1 trailer, tank, water, 300 gallons
18 2 ton trucks, 4 wheel, 4 wheel drive,
U. S. A.

Of this transportation only the five light passenger cars and the eighteen 2-ton trucks have proven their ability as cross country vehicles (Dec. 1932) (1)

Tests at Benning showed:

- a. All trucks should have six cylinder engines.
- b. Pneumatic, heavy duty, low pressure tires are required.
- c. Sturdy bumpers, towing hooks, and pintles are necessary.
- d. No vehicle is suitable without four wheel drive, four wheel brakes, and independent emergency brakes.

6. FROM 1933 to 1938.-- On February 1 of 1933 virtually all motor equipment of the Army was sequestered and sent to Japan via the scrap iron market, and an extensive program of motorization with new commercial equipment was undertaken. In the following two years 3500 vehicles were purchased from Army appropriations, while, amazingly, 8800 were purchased from PWA funds. (2)

By 1937 the Army had 13,500 motorcycles, trucks, and cars. This still left a deficiency of 6300 under the 19,874 vehicles authorized by Tables for peace time allowances.

The National Guard fared equally well. In 1933 the Guard had 5,136 vehicles, all of World War model. By 1934 8000 modern vehicles had been purchased. The Guard's total requirements are 17,266. (3)

7. INFANTRY MOTORIZATION.-- Prior to 1933 an infantry regiment contained 8 passenger cars, 86 carts, 6 motorcycles, 3 trucks, 44 wagons, and 18 rolling kitchens -- 165 vehicles in all. In 1933 --

1 - 24
2 - 30
3 - 28

"The Infantry Board introduced for consideration four types of motorized regiment conveniently designated as A, B, C, and D. In Type A all units except the rifle companies of two battalions have motor transport. It thus includes one completely motorized battalion. Type B is the same except that none of the nine rifle companies are motorized. Type C has only its combat and field trains equipped with motors, and Type D the combat trains alone. None of these types, it will be noticed, is completely motorized.

"An all motorized regiment is not included. Organic motor transport for rifle companies is uneconomical and bound to be idle much of the time while troops are in battle or bivouac. This does not mean, however, that trucks for the transportation of troops are looked upon with disfavor, but that truck pools at corps, army, and GHQ are considered better means of furnishing trucks or busses for this purpose. Pooled transport would not lie idle for days at a time but could be used continually." (1)

8. THE INFANTRY TESTS OF 1938.-- In the spring of this year under the aegis of the Infantry Board vehicles of all track, half-track, all-power, and half-power wheels received extensive testing to determine their suitability for ammunition carriers in the forward combat zone. But as the nature of these tests is an integral part of the subject of another monograph I shall not deal with them here except to state that wheeled mounts, whose virtue over battle field terrain was dubious, proved a paragon at negotiating the offered obstacles, and thus dealt an internecine blow to track vehicles. A $\frac{1}{2}$ ton 4 x 4 was the find of the season. See Appendix 5 for complete list.

9. THE PRESENT STATUS.-- For a complete list of uses and types see Appendix 6.

a. Uses have not changed since 1930 when the tank carrier was dropped.

b. Types. Although experiment has changed the characteristics of the desired type, the actual type purchased continues to be the commercial model.

c. Quantity has changed greatly. Where quondam 6300 vehicles sufficed our peace time requirements, now 20,000 are authorized. As of July 1938 we had 15,300

of this number, and are procuring others from time to time. At present rate of purchase we would be fully motorized by 1942. However, a cloud adumbrates this sunny prognostication. In the December 25 number of the Army-Navy Register for 1937 there was no Santa Claus.

"If no more funds than are at present appropriated, each fiscal year after 1940 will see from 1000 to 1250 vehicles retired."

This annual attenuation would be almost equipollent to the number purchased yearly.

10. PRESENT TRENDS.-- The trend today is toward cross country work as the general rule and roads the exception. Fast, light, highpowered, open cars with four wheel drive are wanted to replace both the top heavy command cars and the impotent, ill balanced reconnaissance cars. Only the 5 to 10 ton trucks are conceded highways as a usual medium of travel, and even they must be prepared to negotiate short cross country demands.

The demand is for $\frac{1}{2}$ ton trucks on the battlefield, $1\frac{1}{2}$ ton trucks in the forward zones, and 5-8 ton trucks using the pavements in rear areas. The day of the heavy truck, once thought valetudinarian, is now in the ascendancy because of its economy of operation over that of the number of small trucks required to carry the same load.

11. SUMMARY.-- Employment of Quartermaster vehicles during the war was as follows:

a. Use

- Command
- Reconnaissance
- General Cargo
 - Classes I,II,III,IV of supply
 - Troops
- Special Cargo
 - Water, gas, and oil (tank trucks)
 - Mobile repair shop
 - Ambulance
 - Field lighting
 - Wrecker
 - Dump
 - Pigeon loft
 - Telephone maintenance
 - Tank carrier

Prime movers
Coast artillery pieces.
Trailers
Trailers
Kitchen
Water

Today the list is much the same with these exceptions.

Command - none
Reconnaissance - none
General cargo - none
Special cargo
Tank carriers deleted
Water purification added
Balloon-tender and carrier added
Kitchen added
Prime movers
Gas shovel added
Ponton bridge equipment added
Trailers
Mobile meteorological added
Signal communication added
Pigeon loft added
Sound and flash ranging added

For a complete listing see Appendix 6

b. Types-- From the top heavy, high silhouetted, four cylindered, solid tired, ill sprung vehicle of the war to the low, high powered, pneumatic tired carrier of today is a transition worthy of some reflection. The Army has turned from Standardization to Commercialization.

In addition to these types, among the unarmored wheeled motor vehicles the Army has several thousand of special nature, such as road grading equipment, wheeled tractors for towing planes, fire engines, and motorized balloons which have not entered this discussion.

c. Quantity-- From a peace time requirement of 8300 to one of 20,000.

From a mobilization status of from 85,000 to 343,000 in the first year.

From a war time operation of 216 different models requiring 648,000 parts to a peace time operation of 360 models with 1,000,000 parts.

12. CONCLUSIONS.-- I have pointed out (a) uses (b) types and (c) quantity of motor vehicles in the Army today. I have no comment to make on uses and quantity, except to favor an increase of both in times of peace wherever such employment would shorten time, an element so utterly neglected in peace--scvital in war. But my particular disrelish is with the types of vehicles that are being supplied. However, as my ratiocinations are in the estate of Procurement, and, hence, only tangentially concerned with Employment, I have not offered them in the main body of this monograph, but I devote some length to a critical treatise in Appendices 7 & 8.

A P P E N D I C E S

APPENDIX 1

WAR TIME STOCK OF MOTOR VEHICLES

Command:

General Officers - - - - - Cadillac touring or sedan
Colonels - - - - - Dodge touring, Ford touring, Buick
touring

Reconnaissance - - - - - White Bus, F.W.D. bus
Jeffery Quad

Cargo, General

Liberty Class "B", 5 tons
Liberty, Class "B" 3 tons
FWD, 3 tons
FWD, 1½ tons
Coleman, 3 tons
Coleman, 1½ tons
Walter, 3 tons
International 1.1 truck
GMC ¾ ton
White 2½ tons
Federal 1½ ton
Corbitt 1½ ton
Reo 1½ ton
Acme 1½ ton
Ford light
Dodge light
Packard 1½ ton
Jeffery Quad 2 ton
White 1½ ton
Riker 2 ton
Riker 2½ ton
Mack 5 ton

Cargo, Special

Special converted Class "B" tank carrier, 7½ tons
FWD tank carrier
Class "B" 759 gal. tank (liquid)
FWD 525 gal. tank
Class "B" Machine Shop
FWD wrecker

Draft

Liberty Class "B" 6 wheel
Liberty Class "B" 6 ton
Mack 6 ton
Indiana "Big Steve"
Caterpillar Tractor
Cletrac Tractor

Messenger Service

Indian Motorcycle

These were types purchased in quantity. I give them here
as representative, not as a complete listing.

APPENDIX 2

ORDER FOR EXPERIMENTAL MECHANIZED FORCE

AG 354.2 (12-21-27)

December 31, 1927

Subject: Experimental Mechanized Force
composed of Regular Army units.

To: The Commanding General, Third Corps Area,
Baltimore, Maryland.

1. A mechanized force will be assembled at Camp Meade, Md., during the summer of 1928, under your command to develop and test its tactical and strategical employments, and for study and test of the organization and equipment of this force, with a view to developing correct organization and equipment for the motorization and mechanization of appropriate units of the Army.

This force will, as far as practicable, be equipped with transportation and motor vehicles of the latest approved design, and its operations will include work over terrain sufficiently varied and difficult, and under such conditions of weather as will determine the powers and limitations of motor vehicles and transportation as compared with animals and animal-drawn transportation under similar conditions.

* * * * *

By order of the Secretary of War:

Robert L. Collins, Adjutant General.

GENERAL ORDERS }
No. 16. }

HEADQUARTERS THIRD CORPS AREA
UNITED STATES ARMY
Baltimore, Maryland
January 28, 1928

* * * * *

3. The Command will be assembled at Camp Meade, Maryland, as soon after July 1, 1928, as practicable.

* * * * *

By command of Major General MacARTHUR:

I.C.JENKS
Colonel, General Staff
Chief of Staff.

OFFICIAL:

HARRISON HALL,
Colonel, Adjutant General's Department
Adjutant

APPENDIX 3

STOCK ASSEMBLED AT FT. LEONARD WOOD, MARYLAND, 1928

Cargo and towing	Max.Speed	H.P.	No. drive wheels	Tires
Liberty Class "B" 5 ton	16	50	2	S
Liberty Class "B" 3 ton	14	49	2	S
Liberty Class "B" 6 wheel (6 x 4) 7½ ton	15	40	4	S
Liberty Class "B" 6 ton	20	40	2	S
Special converted Class "B" tank carrier	30	110	4	S
Mack 6 ton	12	45	2	S S
FWD 3 ton	12	45	4	S S
FWD 3 ton (modified)	14	45	4	P P
FWD 3 ton (utility)	19	85	4	P P
FWD 1½ ton	12	36.1	4	P P
Coleman 3 ton	35	60	4	P P
Coleman 1½ ton	35	51	4	P P
Walter 5 ton	25	100	4	P P
Indiana "Big Steve" 7 ton	25	?	2	S S
International 1.1 ton	35	25	2	P P
GMC ¾ ton	35	35	2	P P
Coleman - GMC 1 ton	35	37	4	P P
Dodge Graham 2½ ton	35	36.2	2	P P
White 1½ ton	25	30	2	S S
White 1½ ton	25	24	2	P P
White 51 "A" 2½ ton	24.6	54	2	P P
Indiana ¾ ton	35	25.6	2	P P
Garford 1½ ton	18	29	2	S S
Relay 1½ ton	34.5	31.2	2	P P
Federal 1½ ton	45.5	31.7	2	P P
Maccar 1½ ton	30	27.3	2	P P
Corbitt 1½ ton	30	27.3	2	P P
Reo 1½ ton	45	50	2	P P
Willys-Knight 1¼ ton	24.3	50	2	P P
Acme 1½ ton	30	47	2	P P
Autocar 2½ ton	-	-	2	P P
Rugby ¾ ton	35	47	2	P P
Ford Truck Model "A"	15.91	40	2	P P
Dodge Light repair ¾ ton	35	22	2	P P
Class "B" 750 gal. tank 6 ton	10	49	2	S S
FWD 525 gal. tanker 2 ton	12	36.1	4	S S
Versare tanker	-	125	4	P S
Class "B" machine shop	16	50	2	S S
FWD wrecker 3 ton	12	45	4	S
Passenger (4 x 2)				
Dodge touring	45	25		
Chevrolet touring	35	22		
Chrysler "62" sedan	62	54		
Studebaker "Dictator" sedan	50	50		
Chevrolet Ambulance	19.7	22		
Converted ¾ ton GMC ambulance	35	35		
Messenger (all 2 x 1 -- pneumatic)				
Indian motorcycle	40	5		
Indian w/sc	40	9		
Harley Davidson solo	40	6.1		
Harley Davidson w/sc	40	9.5		
Reconnaissance Cars (pneumatic)				
Cross country car	35	18	2	
Ford Cross country truck	25	20	2	
Chevrolet cross country truck	30	25	4	
Chevrolet cross country truck	23	30	6 x 4	

APPENDIX 3 - Cont'd.

Prime Movers	Max. Speed	H.P.
Motor carriage Mark VII for 75 mm.	10	70
Motor carriage Mark VIII for 155 mm	10	225
Power Cart Model 1924 E	4	10
Light Cargo Carrier TIEL	20	90
Caterpillar Tractor 30	4.7	20
Caterpillar Tractor 30	4.8	30
Caterpillar Tractor	4.5	60
Cletrac Tractor 30	4.7	45
Linn tractor (half track)	8.5	100
5 ton tractor Model 1917	7.4	55
Coleman truck (4 wheel steering)	30.6	70
Tanks		
Mark VIII	8.0	330
6 ton	6.0	-
Medium M-1921	10.1	200
Light TIEL	20	90
Medium 23 ton TI	10.5	200
Medium Christie	13	80
Armored Cars		
Light T1 (Two .30 cal. MGs)	40	40
Medium T2 (One .30 cal. MG)	45	60

This list is complete.

s - solid tires

p - pneumatic tires

APPENDIX 4

Excerpts culled from the "Report of the Test of Mechanized Force 1928" - (Chassis Section, Tank School) No effort is made toward continuity; comments are taken at random.

That mechanized material be divided into classes of mechanized and motorized.

.

It brought out much newspaper comment on the antiquated equipment of the army.

.

It emphasized the necessity for a constructive program of replacement of obsolete equipment by modern equipment.

.

It proved conclusively that existing types of motor vehicles can be purchased in the open market for the motorization of the entire army. This applies to vehicles ready for service as is.

.

That in order that the benefits of the training of the 1928 Experimental Mechanized Force may not be lost, a mechanized force be assembled in 1929. that Fort Leonard Wood does not have adequate facilities for such a force.

.

That as far as possible, standard commercial vehicles be used to the exclusion of special types which are expensive, difficult to produce and take great time in production.

.

That the so-called cross country car be discontinued. The commercial touring car, Ford, Chevrolet, Whippet or other light cheap car is superior in every way for the purposes for which the cross country car is intended, and two of the former can be bought for one of the latter.

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That solid tired vehicles are unsuitable off of hard roads.

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That the old tank carriers and FWD trucks are too slow. That 10 miles per hour is the most that can be counted on in a long march.

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That the column had less mechanical trouble with the old FWD trucks left out.

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That 15 miles per hour can be covered by a modern convoy, and that with training 20 miles per hour should be possible.

.

That in so far as possible the types of vehicles in a force should be standard so that uniform speed can be maintained and necessary spare parts, etc. can be reduced to a minimum.

.

The use of light cars and motorcycles to keep contact between a moving column and a moving headquarters is satisfactory.

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Excerpts from the report of Major S. E. Brett, Infantry.

Commercial equipment should be sought for in preference to developing special equipment.

Equipment should be standardized as much as possible, both as to vehicles and spare parts.

Wheeled vehicles should be geared for high speed on up grade other than on the level. A maximum speed of 35 mph should do.

No hard tires should be used on any vehicle. All vehicles should be able to leave the road, at least for short distances.

No trailers should be used.

The tendency should be toward lighter, faster trucks where the load permits.

Report of R. D. Glassford, Lt. Colonel, Artillery.

Further experimentation is essential and should be based upon modern motor equipment, principally of commercial type.

Report of John K. Christmas, Captain, Ordnance.

" VII. Wheeled Equipment.

(1) The following general specifications are recommended: (For trucks)

four wheel drive
pneumatic tires
overpowered
overbraked
small in number of types used
commercial type where possible
electric lighting and starting

(2) Four general types are recommended:

- (a) A light passenger car chassis for use as a cross country car and as a general vehicle.
- (b) A 1½ ton truck with Class A body-for general truck use and any special loads. This light truck is superior to the heavier truck for limited cross country use.
- (c) A 3-5 ton truck with Class B body-for general cargo, personnel, artillery loads and special loads.
- (d) A 7½-10 ton truck with cargo body-for primary use as a tank carrier and carrier of track-laying vehicles. Secondary use for other heavy loads and cargo.

Increase the number and quality of ratings of enlisted men operating and maintaining vehicles. That is, pay more so as to get better men for this important work.

Report of Charles A. Hunt, Lt. Col., Infantry.

-----There should be the least practicable variation from military types.

A capacity of about three tons is suitable.

Pneumatic tires are necessary for all wheeled vehicles.

No trailers of any kind should be used.

Report of J. W. ANDERSON, Major, Field Artillery.

Though the Class B truck is a vehicle far in advance of its time, a reliable, sturdy and easily maintained truck - it has not the characteristics required in the strategic transport of the Field Artillery component of a motorized force.

For such purpose a pneumatic equipped four wheel drive truck is highly desirable - - - - over powered - - - - over braked.

The useful cross-country mobility of these cars (cross country cars) is equal or superior to the like mobility of any wheeled vehicle.

On the other hand, the lack of top and curtains makes this car needlessly uncomfortable in inclement weather - its seats becoming buckets of water in heavy rain - and frying pans on a hot day. (The F.A. used Ford Model T, Model A, and Chevrolet Cross Country cars)

Probably the simplest solution of our problem of transport as a whole may be reached thru the procurement or construction of a suitable trailer.

In motor units - we must recognize the fact that some reasonable automotive knowledge and skill is essential - such ability is well paid in civil life, and to hold it - that is in times of peace - we must at least offer a material bounty over the private's pay.

----the retention of good automobile men in our motorized organizations is going to be extremely difficult unless we revise our ratings.

Almost ten years ago a board of distinguished Field Artillery officers observed an extensive maneuver of an entire brigade of motorized divisional artillery under conditions more nearly approaching those of war than can normally be had in times of peace.

The board found such merit in the motor equipment, as compared with horses, that it recommended immediate motorization.

It is true the modern pneumatic equipped four-wheel drive truck gives a wonderful performance cross country ----

At present I know of no wheeled equipment in which I have the confidence to justify its recommendation as sole transport or prime mover of light artillery.

The six wheel vehicles with drive on the two rear axles were found to be of doubtful improvement.

Report of John F. Alcure, 1st Lt., Q.M. Corps.

What is a mechanized force?

Entirely too much stress has been placed upon the upkeep of motor vehicles and field maintenance.-----The operation of mechanical transport is the same whether it be upon boulevard or upon a plowed field.

APPENDIX 4 - Cont'd.

Report of T. Dodson Stamps, Capt., C.E.

Solo motorcycles are needed for messenger service.
Side cars are needed for reconnaissance.

Report of Harold G. Holt, Capt. Cavalry.

That two wheel drive motor vehicles have very little ability off roads.
That maintenance is the secret of good transportation.

Report of Jacob J. Gerhart, Maj., Infantry.

We need:

Three to five ton trucks ----overpowered---overbraked
pneumatic-tired ----capable of sustained speed of 35 miles per hour.

Reconnaissance and staff cars: Light commercial vehicles such as Ford, Chevrolet, Pontiac, Dodge, etc. These to be equipped with balloon tires.

There can be no sharp line of demarcation drawn between a motorized and mechanized force.

Class "B" trucks are unsuitable.

Report of R. C. Montgomery, Captain, Ammunition Train.

Vehicle recommended, three ton four wheel drive truck, four speeds forward, thirty miles per hour, pneumatic tires, provided with differential lock to cut off power on either pair of wheels in case of slipping to be controlled from driver's seat.

Report of a Board of Officers.

The truck test showed conclusively the superiority of the four wheel drive pneumatic tired truck for military use.

A cross country car is unnecessary, the commercial touring car taking its place.

Report of Headquarters of the Experimental Force.

Types of Vehicles Required for use in a Motorized Force.

- a. A command car (any standard light touring car)
- b. An armored car
- c. A heavy truck 7½ tons
- d. A medium truck 3-5 tons
- e. A light truck 1½ tons
- f. An ambulance (same chassis as ¾ ton truck)
- g. A kitchen truck (" " " light ")
- h. A water truck (" " " " ")
- i. A gasoline truck(" " " medium ")
- j. A salvage truck(" " " " ")
- k. A motor repair truck(" " " heavy ")
- l. A motorcycle, solo
- m. A motorcycle, with side car.

APPENDIX 4 - Cont'd.

Commercial pneumatic tired vehicles exist, which could satisfy every military need. It is suggested that it would prove more satisfactory to buy vehicles on a basis of performance, than on lowest price bid for a type.

It is suggested that trailers be done away with.

The procurement of vehicles for a motorized force would be simply a question of determining what commercial vehicles are suitable. (1)

APPENDIX 5

Letter: Partial Report of Test of Cross Country Carriers
for Infantry. Feb. 7, 1938 Dept of Experiment.

	Weight	Engine	H.P.	Cost
Half track truck T-9	8540	V-8 Ford	85	?
Pilot Cargo Carrier T-2	11570	Continental	257	?
Tractor TA-20	4820	V-8	60	\$2950
Tractor TA-30	6000	V-8	85	3950
Tractor T3F4	8200	Hercules	106	10,200
Truck, $\frac{1}{2}$ ton, 4x4	3580	V-8	85	1700
Truck, $\frac{1}{2}$ ton, 4x2	3500	Dodge	60	\$507.44
Truck, $1\frac{1}{2}$ ton, 4x4	5875	Chevrolet	72	1271
Howie Carrier	1085	Austin	13.2	600
Trailer, M. H.	810			?
Trailer, Q.M.	1040			?

Conclusion: "That, of the vehicles tested, the Marmon
Herrington $\frac{1}{2}$ ton truck with 4-wheel drive represents the soundest
basis for procurement in question." (1)

APPENDIX 6

On February 25, 1937 the War Department approved the following vehicles to be carried in Tables of Basic Allowances as adopted type.

1. Motor cycle, solo
2. Motorcycle, with sidecar
3. Car, light, 5 passenger
Phaeton
Sedan
4. Car, medium, 5-passenger
Sedan
5. Car, heavy, 7 passenger
Sedan
Limousine
6. Ambulance, field
7. Ambulance, metropolitan
8. Truck, $\frac{1}{2}$ ton, 4x2
Reconnaissance
Panel Delivery
Pickup
Pigeon Loft
Telephone Maintenance
9. Truck, $1\frac{1}{2}$ ton (LC) 4x2 (2dt)
Cargo
Light repair
Canopy express
Dump
Combination Cargo and Dump
Panel Delivery
10. Truck, $1\frac{1}{2}$ ton (HC) 4x2 (2dt)
Reconnaissance (12 passenger)
Cargo
Dump
11. Truck, $2\frac{1}{2}$ ton, (LC) 4x2 (2dt)
Cargo
Dump
12. Truck, $2\frac{1}{2}$ ton (HC) 4x2 (2dt)
Tank (500 gal.)
13. Truck, 5 ton 4x2 (2dt)
Cargo
Dump
Shop, mobile maintenance
Combination Cargo and Dump
14. Truck, $1\frac{1}{2}$ ton (LC) 4x4 (2dt)
Cargo
Dump
Field Lighting
15. Truck, $1\frac{1}{2}$ ton (HC) 4x4 (2dt)
Cargo
Dump
16. Truck, $2\frac{1}{2}$ ton (LC) 4x4 (2dt)
17. Truck, $2\frac{1}{2}$ ton (HC) 4x4 (2dt)
Tank (500 gal.)
Cargo
18. Truck, 5 ton 4x4 (2dt)
Wrecking
19. Truck, 4 ton (HC) 6x6 (4dt)
Prime mover
Wrecking
20. Truck, 5 ton 6x6 (4dt)
Wrecking
Field Service
Cargo
21. Truck, $7\frac{1}{2}$ ton 6x6 (4dt)
Wrecking
Prime Mover

APPENDIX 6 - Cont'd.

22. Truck, 9 ton 6x6 (4dt)
Field Servicing
23. Truck-tractor, 1½ ton (LC) 4x2 (2dt)
with semi-trailer (4-ton)
Tank (500 gal.)
Cargo
Dump
Stake
Van
24. Trailer (1-ton) 4-wheel Convertible
25. Trailer 4 wheel
Tank (250 gal.)
26. Trailer, 1½ ton 2 wheel
Mobile Meteorological
Signal Communication
Mobile pigeon loft
27. Trailer, (command post) (2-wheel)

The following vehicles are Development Type

1. Truck, 3 ton (LC) 4x2 (2dt)
2. Truck, 4 ton (HC) 4x2 (2dt)
Prime Mover for gas shovel
Prime mover for pontoon bridge
Tank (750 gal.)
Cargo
3. Truck, 1½-ton (ELC) 4x4 (2dt)
Cargo
4. Truck, 2-ton (LC) 4x4 (2dt)
Telephone construction with pole-derrick and
earth boring machine
Winch
5. Truck, 3 ton (HC) 4x4 (2dt)
6. Truck, 2½ ton (LC) 6x6 (4dt)
Balloon tender
7. Truck-tractor, 4 ton (HC) (2dt)
with semi-trailer (5-ton)
8. Trailer (2-ton) 2-wheel kitchen
9. Trailer, Sound and Flash Ranging (2-Wheel)
10. Motor tricycle

(From a letter, QM 451 T-M, from the Quartermaster
General to the Adjutant General)

This gives the complete picture of Use, and Type of govern-
ment motor vehicles of Quartermaster Design.

APPENDIX 7

A Plea for Standardization of Military Motor Transport.

A resume' of the ideas of Colonel Brainerd Taylor, Holabird Q. M. Motor School, presented through a series of excerpts from his writings. The ideas of Col. Taylor have had so much influence on the author's preparation of Appendix 8, that this entire section (Appendix 7) is devoted to an acknowledgement of his research. Whereas these arranged quotations may not have the smooth continuity that is desired, as they were culled from treatises written over a period of eight years, it was thought better to present them in an unadulterated state rather than to dilute them with the puerile remarks of the author.

"The principal transportation lessons of the war"

1. Need for coordination of all transport.
2. Centralization of motor transport management and control under command authorities, equally responsible for operation and maintenance, within the limits of their facilities.
3. Standardization of motor transport.
4. Need of cross-country motor transport in tactical and strategical operations, and in both combat and supply.
5. Combination of strategical and tactical field transport ability in the same vehicles and fleets. (1)

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In war, rapid replacement is required. Planned transport may be replaced, unit by unit, quickly and easily in the field, through standardization with interchangeability of component units and parts. Unplanned transport leaves a trail of stripped and abandoned wrecks all along the line of march for want of replacement parts. Repair shops in rear areas are thrown into confusion by the conglomeration of vehicle models to be repaired and the impossibility of handling the thousands of items of spare parts required. (2)

.

military Although the automotive industry is making fast strides in design, equipment and motors, the fundamental specifications for motors do not vary as do those of pleasure cars and commercial trucks. Modern competition in civilian life calls for high pressure salesmanship through streamlined, knee actioned, high speeded vehicles. An Army vehicle which will fill basic requirements whether a 1926 or 1936 model, will answer military purposes for a long time to come. These requirements are:

1. Speed
 - a. Good roads
 - b. Cross country
2. Cross country performance and reliability
3. Simplification of Maintenance.
4. Economical Operation.
5. Ease in handling.
6. Sturdiness and durability.

(1)

.

Standardization of mechanical equipment and practices has been a pressing need in both commerce and war. In railway transport we have a precedent for principles to be applied to motor transport as well as the illustration of errors to avoid. The existence in the Civil War of at least six different gauges in railroad tracks in the theater of military operations, with no interchangeability between the rolling stock of one road and that of another, and the postwar adoption of a standard gauge is an outstanding example. The beneficial influence of standardization upon commerce and war alike, bringing greater coordination of railway transport, needs no description here.

The Standardization of Ordnance equipment, with interchangeability of component parts and ammunition in similar models, sets up a principle in mechanics paraphrased as interchangeability lock, stock, barrel and bolt.*****Coordination without standardization is impossible.

(2)

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Reasonable reduction of items of repair parts to be carried in stock, to the extent of keeping the repair and supply problem within the bounds of practical solution. 20,000 items or less, the ideal objective. 50,000 items the maximum limit.

(3)

.

The unit manufacturing capacity of the industry is definitely limited so far as any one commercial vehicle model is concerned, thus forcing the Government to procure in war several models similar in vehicle type and size, but utterly dissimilar in component units and parts.

(4)

.

This Standard B chassis cost in quantity production \$4,050 in 1918. The Army and the Bureau of Roads, Department of Agriculture, engaged in the development of federal highways throughout the United States, have been operating this powerful vehicle ever since it was first produced in 1918. Its engine, a four cylinder model, is still serviceable.

(5)

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It has proved highly practicable and profitable to modify the Standard B by rebuilding it with pneumatic tired wheels, air brakes, and modern electrification, at a cost (irrespective of repairs) of less than \$1,000, thus retaining in service after fourteen years approximately 75% of the original investment. Also it can be modified by all these requirements plus a new six cylinder engine at a cost of \$2500, thus retaining 38% of the original investment. The new vehicle is comparable to one costing from \$10,000 to \$12,000. You have seen representatives of them in fire fighting equipment.

(6)

1 - 22	4 - 3
2 - 3	5 -13
3 - 17	6 -13

-----in Standard B experience, obviously very materially less where 38% to 75% money value of old units is retained as in our modified and modernized equipment, than it is in the case where a vehicle of special make becomes unserviceable and obsolete, requiring replacement of the entire vehicle, with consequent loss of 100% of the original investment because the special maker has changed his models and no unit-assemblies of the required dimensional standards and performance characteristics are available. (1)

.

----The Army has, since the war, been forced to sell at junk prices a great number of unused unit-assemblies and parts pertaining to non-standard vehicles, now out of production. These spare parts originally cost millions of dollars. Opposed to these losses, the Army is still utilizing with great economy almost all of its stocks of units and parts pertaining to the old Standardized B truck in rebuilt "B's" of the modified and modernized classifications. (2)

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The difficulty in solving the automotive problem of the Army and of the War Department are due in part to the number of government agencies involved.

The government agencies and authorities involved with the problem of motor transport are:

- The Chief of Staff--for agencies
- The Quartermaster General--for procurement and engineering agencies.
- The Assistant Secretary of War -- industrial coordination
- The Comptroller General--legislative and legal authorities.

(3)

.

Military Motor Transport Required for the Army for War.

- 57,600 trucks 2 & 3 ton,
- 21,400 light trucks 1 ton and less
- 50-75 m. per day on good roads
- 8 mph
- 98% of commercial transportation is not suitable for military use.

Tests held not only at Holabird, but at Riley, Meade, Eustis, Benning.

Fifty engineers and QM decided 3 ton chassis would fit all needs. Later all corps and arms were called in and 4 chassis adopted. 1½, 3, 4, 6 ton. (4)

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The 'selective method', based on the principle of purchasing commercial vehicle models that came nearest to military requirements,*****was definitely held to be illegal by the Comptroller General in that it did not permit free competitive bidding.

-
- 1 - 13
 - 2 - 13
 - 3 - 3
 - 4 - 16

From a legal standpoint, there appears to be no compromise between the policies:

(1) Full responsibility on the part of the War Department for specifying in detail every vehicle model it requires in military use, regardless of commercial models produced by the industry, and (2) The surrender of all responsibility by advertising merely for trucks in such broad terms that all producers can bid in competition on their regularly produced commercial models. (1)

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Wider grows the chasm between commercial motor transport and military motor transport requirements. This chasm cannot be bridged after war is declared, unless practical plans are formulated and definite policies are adopted to guide the Army and the industry in the production of required vehicles types and models. (2)

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The public interests and national welfare are fundamental in legislation affecting transportation and the administration of regulatory laws. When there is conflict between public interests and private interests, the former is paramount and the latter must give way.

(Military Theories and Development of Motor Transport. Presented at the International Automotive Engineering Congress of the Society of Automotive Engineers at the Palmer House, Chicago, Ill.) (3)

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Performance.

As stated earlier in this paper, the Arms and Services of the Army have developed their own vehicle requirements, resulting in a description of the pay load capacity, speed, road and cross country performance and other general vehicle characteristics required. The Quartermaster Corps, through its military automotive engineering branch, has canvassed the automotive industry and selected unit assemblies of standard current production, possessing the requisite performance characteristics to develop, when assembled in a vehicle, the vehicle performance ability required by the using services. (4)

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-----However, a solution must be found so that the test of a vehicle may be completed in time for the War Department to reach a decision as to its suitability while it is still modern. (5)

.

----- If the completely assembled vehicle produced by the industry in accordance with so-called "truck manufacturers' specifications" is considered to be the manufactured product, the industry produces but a very small percentage of cross-country motor transport equipment. Cross-country vehicles that drive on front axles, a feature that is absolutely essential to successful cross-country operation, are specialized in by not over half a dozen truck producing companies. (6)

- 1 - 3
- 2 -17
- 3 -13
- 4 -13
- 5 -15
- 6 -13

-----It is possible to design a composite model that can perform the work of several models and that represents the utilization of commercially manufactured units that are in greatest current volume of production.

Thus, an ideal military vehicle model may be specified which though radically different from any commercial make or model, is composed of engines, axles, transmissions, and other units that are in current commercial manufacture and in common use in many different commercial truck fleets. (1)

.

The Army's Motor Transport Problem

CHART E

Purchasing Policies Discussed by Comptroller General in Decision dated April 19, 1938.

Assumed case: - Purchase of 8-ton, 4x2 trucks.

First Policy:

- a. Selection of a single vehicle producer's standard commercial model closely meeting military requirements.
- b. Case in point: - Attempt to purchase 18 Macks for use as prime movers for Coast Artillery.
- c. Policy illegal: - Law forbids naming any one product or describing it in specifications.
- d. This was Quartermaster Corps and War Department policy just after war - - 1919-23 - - concurred in by all Arms and Services - not generally practical, however.

Second Policy:

- a. Favor a small group of vehicle producers' "standard commercial models" to the exclusion of less favored producers' models.
- b. Case in point: - Recent attempts to purchase under P.W.A. appropriations. Disallowed by Comptroller General in his decision of April 19, 1934 and April 23, 1934.
- c. Policy tends toward illegality - Government officials subject to great embarrassment by attacks of unfavored on specifications before and after bidding.

d. Illustration:

- | | | |
|--|---|--|
| <ul style="list-style-type: none"> A - Ford specifications B - Chevrolet " C - International Harvester specifications | } | Government specifications written so as to include A, B and C and all similar models, but to exclude D, E and F and all similar models as wholly unsuitable for Military requirements. |
|--|---|--|

APPENDIX 7 - Cont'd.

D - Dodge specifications		} G and H barred not because of unsuitability but because they cannot compete with others due to higher quality, etc.
E - Corbit	"	
F - Federal	"	
G - White	"	
H - Mack	"	

As soon as specifications become generally known by advertising - D, E and F will protest and attempt to change specifications to let their products in, or even shut A, B or C out.

Cases in point: - High pressure lubrication - used in Dodge and not in Chevrolet. And more recent claim by Trew relative to piston displacement versus torque discussion - Dodge versus Chevrolet.

e. Conflict of Military and Legal Requirements:

Legal requirements tend toward opening Government specifications to all at expense of military requirements. Lowest bid will win and vehicle will be unsuited to meet military requirements.

f. This is present policy of War Department. No coordination of legal military requirements yet found.

Third Policy:

- a. War Department assume all responsibility for production of required vehicle types and models - Purchase the parts and assemble in its own plants.
- b. Case in point: - Assembly at Holabird of multi-wheel drive vehicles in F.Y. 1932 - Attacked by executives of automotive industry.
- c. Legal under law governing operation of Government manufacturing plants.
- d. Policy is inadvisable in view of keeping the industry informed and interested in Government's wartime requirements.

Third Policy Modified to Meet All Requirements:

- a. Write specifications for vehicles to reflect military requirements, both operating and maintenance. Specifications of every unit-assembly to be so broadly written as to insure competitive bidding so far as military requirements will permit. Such bidding by unit-manufacturers being made to vehicle producers rather than to the Government does not come under legal requirements effecting vehicles, the article being produced, but does operate to keep bid prices on vehicles low.
- b. Cases in point: - Recent purchase from Marmom-Herrington, White and Corbitt of multi-wheel drive types and models. Bidding was surprisingly low as compared with bids in 1932 before War Department assembled its own vehicles.

APPENDIX 7 - Cont'd.

- c. Policy is legal and utilizes the entire industry. Every vehicle producer can bid and produce assembling specifications reflecting Government requirements. This policy can be better defended before Budget and Congress and from attacks originating in industry.
- d. Principle is the user's specifications versus the seller's specifications, the one to meet the user's needs versus the seller's interest in sales competition.

(1)

.

Present government policy in this country, however, appears to be based upon the belief that vehicle types and models that fully meet military requirements are not practicable of production in quantity in time of war nor legally procurable in time of peace. Therefore the nation must be satisfied with commercial vehicle types and models in its military establishment. In other words, the United States imposes its commercial practice upon its military requirements.

(2)

A MEANS OF IMPROVING THE DEVELOPMENT AND
PROCUREMENT OF ARMY MOTOR VEHICLES

When it became problematical that the United States would enter the war against the Central Powers, a group of engineers from the Automotive Industry approached the War Department with the caveat that they were in no position to meet a large demand of motor equipment should Mobilization Day arrive. The War Department took the announcement under consideration, but M day came before action was taken. Then at the invitation of the General Staff a conference with the engineers was immediately arranged.

Both bodies accepted the congruity that complete standardization of motor equipment was impossible of attainment at this time. An eristic point was whether or not any standardization at all should be attempted. The War Department, foreseeing that the supply of parts for a heterodox and variegated fleet of vehicles would assume the proportions of a chimera, asked their automotive copemates to design a standard type truck. Other types of vehicles would be taken a l'abandon from commercial stock.

In the amazingly short period of ninety days the Industry's engineers had plans for the Class A and Class B trucks. Though manufacture of the Class A was delayed until the need for it had passed, the Class B was immediately thrown into production. As specifications called for a complete new engine as well as for new standards in chassis and body the speed of production could not be made to meet the demand, and a large portion of vehicles shipped abroad were, of unfortunate necessity, commercial models.

85,000 vehicles comprising 216 different models and requiring 648,000 spare parts were shipped to France. (1) With this drain on a supply system already showing a labefaction from other acute conditions our transport was being so swiftly

strangled that authorities have posited the belief that thirty more days of war would have brought a serious stoppage.

When accounts began to be summed up after the war most of our difficulties were blamed on the Class B, more because it was a convenient target, continuing, in its ungainly obsolescence, to embarrass us for years to come, rather than for any engineering fault. But the dissatisfaction, now heartily encouraged by a booming automobile industry, became ubiquitous and finally resulted in the abandonment of Standardization and endorsement of commercial design. Except for the dissenting opinions of a few factious officers on the General Staff, the approval of Commercialization was ecumenical in the Army and was hailed with much acclaim by the Industry and Congress. Only a few iconoclasts take exception to this paragraph on p. 521 of "The Decisions of the Comptroller General of the United States July 1, 1929 to June 30, 1930" which states,

"The procurement of motor vehicles to be limited to models in commercial production by two or more competing companies and available at reasonable prices. To require the minimum deviation from standard commercial models as may be necessary to conform to the military characteristics set up by the using arm or service-----the parts or unit assemblies to be standard in the automotive industry."

I am one of those iconoclasts who take exception.

Under this law, since the retirement of Class B's in Feb. 1933, we have purchased nearly 16,000 straight commercial models of vehicles at a cost of \$9,000,000. De jure the Army can ask, "What have we bought?"

We have 360 different makes and models requiring 1,000,000 spare parts (1). This supply has given no hardship in peace with our small number of motors, but what will it mean in war?

"As for any consistent plan for the maintenance of the present 360 models of vehicles now in possession of the Army, it would take the ingenuity of Ford, the wizardry of Edison, and the wisdom of Solomon to evolve even an imaginary solution." (2)

1 - 29
2 - 29

Have the years retuned our memory of when last such a chimera almost became an actuality?

At the outbreak of the next war we will require immediate delivery of 291,500 vehicles at a cost of \$343,000,000. You would think that price sufficient to entice the Industry to consider our requirements. But our M-day demands represent 10% of the nation's annual production of $\frac{1}{2}$ to $\frac{3}{4}$ ton trucks, 77% of its production of 1 to $1\frac{1}{2}$ ton trucks, 240% of the output of $2\frac{1}{2}$ ton vehicles (1) and over 2000% of heavier types. The improbability of the Industry's filling this order is a prosing matter to them, mayhaps, but an acute one to the Army.

"It is unfortunate that more automotive executives have not witnessed field maneuvers of Army motor vehicles. The possibilities of military transport and the unusual mobility required of it would certainly impress upon them the importance of closer cooperation between the automobile industry and the War Department." (2)

But where is the incentive for an automobile manufacturer to concern himself with military design when he knows the Army must buy from him if he can quote the lowest price? His interest then lies not in strengthening materials, but in cheapening them. He is apathetic of military design. Who, then, is concerned with it?

An ungainly quadruped with the legs ---- Chief of Staff, Quartermaster General, Assistant Secretary of War, and the Comptroller General ----is saddled with the responsibility. The Quartermaster has the unenviable job of trying to make as few shoes as possible to fit all four feet.

"Unfortunately, the Army as a whole, and even the Quartermaster Corps, are far from agreement as to what form the development of our motor vehicles for training and for war should take. Most of our motor experts advocate a high degree of standardization with a large interchangeability of component units in order to produce vehicles which will meet our field requirements. On the other hand, it has been suggested that the necessary vehicles can be picked up on the street at the outbreak of war. These two widely divergent opinions are each held by a considerable number of officers with valuable World War experience in France. Between these two extremes are a great many most excellent ideas expounded by competent officers after a conscientious study of the subject.

APPENDIX 8 - Cont'd.

The life of the average motor vehicle in the Army today is 7 years. In many cases vehicles are kept in active service long after they have passed the stage where they can be operated economically.

In lieu of the burden of maintenance, there are those who advocate running the vehicle as long as it will run, and then throwing it into the ditch and wasting no further time trying to repair it." (1)

To coordinate the many demands of the different arms is an onerous task, per se; but when the law compels the Quartermaster to shop among the commercial marts to meet military requirements, his job is a jerehmiad.

"By trying to completely motorize the Army under the present policy and under the heading of peace time economy, a complicated and difficult situation has already developed. In order to make the most of funds available, specifications for the vehicles to be obtained were made to fit standard types of commercial vehicles rather than have the vehicles built to specifications suitable for Army requirements.

"Most standard models of commercial vehicles are more suitable for a dress parade than for emergency usage.***With the present equipment as a standard of expansion the entire motor transportation system would inevitably collapse shortly after the outbreak of hostilities." (2)

To meet this operation the Quartermaster Corps, at the suggestion of Colonel Brainerd Taylor of Holabird, an erudite student of motorization, met with other branches of the service in an attempt to reduce the number of models required.

"The result was a fleet of 24 basic chassis models ranging from 3000 lbs. to 44,000 lbs. gross weights, allowing for average body and pay load weights, from which fleet operators in many different fields of motor transport operation can find the chassis types and models best suited to their requirements, while at the same time the maintenance problem was kept within practical and economical limits."(3)

However, after these vehicles were assembled, time had slipped by so rapidly in the commercial tempo that some of them were discontinued before orders could be placed, and no manufacturers were equipped to produce the larger vehicles in sufficient quantities for war. For, de facto, only 2% of commercial vehicles are suitable for field use. The Industry has remained contemptuous of military characteristics.

1 - Transportation Notes. Office of QM General. Wash. 1937

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In 1918 a group of officers from the demobilized Motor Transport Corps told the War Department that any vehicle to be effective in operation must drive from all axles.

In 1928 the Experimental Force at Fort Leonard Wood, Maryland without one dissenting opinion asked that all vehicles be four wheel driven.

In 1932 the second battalion Twenty-Ninth Infantry at Fort Benning, a motor test battalion, asked that all vehicles furnished subsequent to the tests of '32 be driven from all axles.

Since 1933 motor replacement in the Army has been 100%. But less than 4% of these vehicles are all wheel drive. There is small commercial demand for this type.

"The mobility of transportation in the field can only be maintained if a definite policy has been established by supplying the proper equipment to start with." (1)

That we do not have "the proper equipment to start with" is evident to the most beef-witted, because commercial and military demands are at variance on nearly every point.

The Army has kept with the swift pace of commercialization thus far only by dint of PWA funds. But after 1940, unless the coffers are replenished, our fleet will be attenuated by the enforced retirement of from 1000 to 1250 vehicles annually because of the growing costs of maintaining obsolete equipment left in the wake of Commercialization's dizzy pace. (2)

"The life of the average motor vehicle in the Army today is 7 years", but the life of the average commercial motor, receiving less assiduous attention, is 2½ years. So already the bulk of our present equipment is outmoded.

When the frescent Class B's were finally derided into a condign retirement, Standardization went with them. The abandonment of standard equipment, an eristic point when undertaken, will prove a mistake growing more colossal as the years speed by sweeping our valetudinarian Commercial fleets onto the

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junk pile. That the old B weathered 15 years service is a tribute to Standardization, and that opprobrium should be cast upon it is as senseless as to berate a forty year old mule for faltering at the fast trot. At the time the Class B was designed the War Department asked for a vehicle good enough for four years. The durability of the B exhibits what ingeniousness lies in the Automobile Industry when its engineers forget the design of radiator grilles and turn to things practical.

For years after the war these paragons of motor transport, modified to meet changing requirements of military vehicles, could still use 75% of the spare parts bought for them during the war. Even the completely renovated B's, converted to fire engines and still in use, have 38% of the original investment in them. In contrast to this, millions of spare parts for all commercial vehicles bought during the war had to be sold at junk prices because the vehicles for which they were purchased had passed to the grave. (1) The labefaction of our stock of motor equipment due to the vagaries of Commercialization is a point the sententious should not overlook.

The Motor Transport School at Holabird, under Colonel Taylor's direction, found a way to obtain military requirements in vehicles and to still comply with the specious decision of the Comptroller General. Although vehicular parts suitable for military demands are the product of several competing concerns, no make of automobile is assembled with all these necessary parts. The cost is too great--and it is the low bid, under the law, that gets the contract. But Holabird, through the Quartermaster General's office, purchased the parts needed, front-drive axles from one manufacturer, springs from another, engines from yet another, and proved that a suitable vehicle could be assembled from commercial products. However, the Industry, finding a worm hole in its plum, protested to Congress, which

body sustained the objection, and Army assembly of vehicles was overruled. With a sapience born of much didactic study in this field Colonel Taylor wrote the same specifications into contracts for bid by the Industry. The result was the Marmon-Herrington $\frac{1}{2}$ ton vehicle that starred in the Infantry Board tests of 1938. So far the legal mystagogues have not disallowed this procedure because -----"the parts of unit assemblies to be standard in the automobile industry" (1) has been complied with. But the solution has a precarious standing and may be upset by a quiddity of ruling in the Comptroller's Office.

Rather than to be forced to hunt for temporary placebos I am postulant for the complete abrogation or a thorough re-daction of the present law with its costive procurement authority. Although the Army has ever eschewed bringing political ratiocination on a matter pertaining to itself, this reluctance to exert pressure will be no excuse when the next war finds commercial motor equipment throwing a half-Nelson on Army transportation. The blame will not be laid at the door of Congress, but in front of our own tent fly.

The design, development, and procurement must be made the responsibility of but one agency, pragmatic in its work. I suggest the Quartermaster be relieved of this onerousness as his interests in motorization are not sufficiently parochial for him to devote the assiduity that is required. Development of motor transport should no more be a quartermaster function than should be the development of Army aircraft. That motor transport should be dependent on commercial design is no more reasonable than that air transport should not be. And, it follows, we need to organize a body charged with the entire responsibility for this field. We need a Tank or Motor Corps!

With the establishment of such a Corps and the repeal of the present law we will quickly see a coalescence of our interests with the capabilities of engineers of the Industry who have not

perverted themselves to the creation of shiny new opuscles of tinselry and ormolu. From this healthy root will grow another Standard Army Vehicle, years ahead of its commercial contemporary butterflies, powered by a Diesel, air-cooled, rear-mounted engine, driven on all wheels and capable of traversing any terrain, including mirages.

One type of engine would suffice all requirements. For increased power in heavy duty work two or more engines, mounted in series, would serve.

With but one engine as their concern the speed and efficiency of mechanics would increase in treble proportion. Instead of the five foot shelf of shop manuals there would be only one volume to misplace. Maintenance would be simplified. With unit replacement in practice no work would be undertaken in the field that required more than a combination tool and a cuss word. The supply of parts would be reduced to a few thousand, and forward of base depots no more than a dozen assemblies would be needed. The supply of these few assemblies could be made as facile as the supply of any other Class I item.

Development, of course, would not stop with this engine creation. At periods of 7 or 8 years, or whenever existing vehicles became uneconomical, the new Army model would be introduced--a decade of improvement ahead of the Industry that must cater to the creation of brummagem for the gadget-minded. Ready to service it would be a legion of mechanics, instructed in its intricacies prior to its debut. Maintenance would suffer no hiatus.

If reorganization and redaction of our field of motor transport is not undertaken surely catastrophe is ineluctable; for the Commercial reign that has given us 360 models and 1,000,000 spare parts is not the one to ask for over a quarter of a million vehicles. Let the Industry go its way with its arcana of dash board design, but let the Army not become chrome plated under its baneful hegemony.

APPENDIX 9

Cost of Vehicles by Types

Scout cars,	\$3900.00
Half-track, T5	5134.00
Trucks, 1½ ton	1743.00
Trucks, 2½ ton	1486.00
Station wagon	584.34
Motorcycles, solo	286.50
Passenger car	572.51
TIE I (half track)	9000.00
Combat car, M1	25000.00
Armored car, M1	12500.00
Scout car	3700.00
Mortar mounts	4300.00