

THE ARMORED SCHOOL

Motorcycle Department

Fort Knox, Ky.



MOTORCYCLE MECHANICS HANDBOOK

1943

CORRECTIONS



On Page 4, Item 15 should read: "Turn counter-clockwise to apply damper; clockwise to relieve damping effect."

On Page 13, dimension .007" in first line of second paragraph under Item B, "Connecting Rods and Crank Pin" should be .0007", and dimension .001" in fourth line from bottom of page in same paragraph should be .0001".

On Page 18, dimension .20" in 8th line of last paragraph in left column should be .020".

On Page 20, dimension $\frac{3}{8}$ " in 6th line of first paragraph in left hand column should be $\frac{1}{8}$ " and last line of same paragraph should read "60 foot pounds" instead of "40 foot pounds".

On Page 52, Intake Tappet Clearance shown as .004" to .006" should read .004" to .005", and Exhaust Tappet Clearance shown as .006" to .008" should read .006" to .007".

On Page 63, first line of right hand column should read "seven turns per coil", instead of "fourteen turns per coil".

Page 87, Item 2, second paragraph in right hand column: Brake operating cam shaft does not have replaceable bushing.

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Motorcycle Department
Fort Knox, Kentucky

Motorcycle Mechanics Handbook

This text has been prepared by the Motorcycle Department of the Armored School to assemble in printed form some of the information taught on the mechanics of the motorcycle, knowledge of which is required of every graduate of this Motorcycle Mechanics Course. Although both the Indian and the Harley Davidson motorcycles are used by the United States Army, the armored units use the Harley Davidson almost exclusively. This text, therefore, while dealing generally with all models, treats particularly and in detail the 1941 and 1942 WLA model Harley Davidson, as this is the motorcycle that armored units mechanics study at present (May, 1943). A chapter has been included to discuss briefly pertinent features of the new experimental Harley Davidson XA shaft drive motorcycle.



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INTRODUCTION

At the time of the formation of motorized and mechanized forces in our Army, the need arose for a light, fast motor vehicle which could perform certain duties beyond the capabilities of any other in the Army. A vehicle was required for the rapid transportation of messengers and agents on liaison missions; for traffic control and many other tasks, administrative as well as tactical. The motorcycle adequately meets these requirements.

To man the motorcycles in an armored division requires a large number of well trained riders and mechanics. The maneuvering ability of the motorcycle is limited only by deep mud, deep stream crossings, heavy snow banks and the ability of the *Motorcyclist*. This last is the most important. In an armored unit, properly trained riders and mechanics are invaluable.

CHAPTER I

GENERAL CHARACTERISTICS OF THE MOTORCYCLE

The Motorcycle Solo is a two wheeled rubber-tired vehicle, powered by a two cylinder, air-cooled gasoline engine operating on the standard four-stroke cycle principle.

The motorcycle has many steering and handling features similar to those of a bicycle. It utilizes steering forks, and its "body" consists of a frame made of a number of sections of brazed tubular steel.

The engine operation is characteristic of all air-cooled engines in that it runs extremely hot, relying upon the movement of air over the cylinder walls and head fins and the circulation of oil to dissipate the heat. Operating temperatures of 350 to 450 degrees are average for this engine.

The WLA motorcycle engine depends upon its lubricating oil to carry away at least thirty-five percent (35%) of the heat created; hence, the oil circulating system of this engine has a very important part to play in cooling the engine as well as lubricating it. The bearings, piston rings, cylinder walls, bushings and gears are oiled by a combination force feed and splash system. Oil is circulated by a feed pump and a scavenger pump. The WLA motorcycle uses a "dry sump" engine in which the oil supply is maintained in a tank separate from the engine rather than in a pan in the crankcase, as in an automobile.

The compression ratio is low, being 5.00 to 1 (earlier models had lower compression ratios). Despite this low ratio, however, the engine develops a maximum of 23 horse power at 4600 r.p.m. Top speeds obtainable are around 85 m.p.h., and the machine can run as low as 2 or 3 m.p.h. in first gear. Bearing fittings are measured to ten thousandths of an inch, pistons are fitted at from one to two thousandths clearance and, in general, the engine is set up very precisely. It is an extremely fine piece of workmanship.

The power train consists of four sprockets,

two drive chains, a clutch and transmission. The chain drive is satisfactory, but it has certain undesirable features which are always encountered when chains are used. A shaft driven motorcycle, the XA model is now in the testing stage and if adopted will eliminate the problem of chain maintenance and sprocket wear.

The transmission is of the constant mesh, progressive type, with three forward speeds and a neutral position. High gear ratio for army solo motorcycles is 4.59 to 1. This can be changed, of course, by installing sprockets of other sizes, but this ratio is common for all solo army models. The motorcycle transmission has proven itself to be a very satisfactory unit in the power train, providing it is well lubricated. Oil from the engine does not lubricate the transmission; oil must be inserted through a goose neck filler hole in the right side of the transmission itself. This is a fact often overlooked by new riders and mechanics alike and must be emphasized.

The clutch is of the multiple-disc, dry type. It gives very little trouble providing the three adjustments are maintained. The plates, of course, must be kept dry, free from oil, and fairly rough to provide friction.

Brakes are located on both the front and rear wheels of the motorcycle. The front brake is controlled by a lever and cable from the left handlebar. The rear brake is controlled by a foot pedal and linkage from the right foot board. Both brakes are of the simple internal expanding, two-shoe, fixed pivot mechanical type.

Wire-wheels are used on the motorcycle. Rims are of drop center construction and are usually 18 inches in diameter. Tires are deeply treaded, 4 ply, and 4 inches in width. These smaller 4 inch tires are preferred for Army use, which usually involves considerable work in mud and loose gravel.

The motorcycle employs a circuit-breaker ignition system, utilizing a high voltage induction coil for spark. In the electrical system are such common items as: Two-beam headlights, "Black-out" or tactical lights, tail lights, stoplights, and horn. The generator easily carries the electrical load besides charging the battery.

The WLA Harley Davidson Army model has several features not found on civilian machines. Some of those are: "Black-out" lights, oil bath air cleaner, a carburetor with a fixed high speed jet, skid plate, military type fenders, and lusterless paint. Improvements will be added to army motorcycles as they are developed. Further specifications of the H.D. Army Solo Motorcycle (WLA):

Armament — varies between .45 caliber sub-machine gun, .45 caliber pistol, and .30 caliber carbine.

Climbing ability — minimum required, low gear, 55% slope.

Climbing ability — minimum required, high gear, 15% slope.

Cruising range — minimum 100 miles—3 1/3 gallon tank, engine averages approximately 35 miles per gallon.

Fordability — 18 inches of water.

Payload—250 to 300 pounds.

Road Clearance—4 inches (vehicle can safely negotiate obstacles much higher than 4 inches due to the excellent skid plate and with proper handling by rider).

Speed—maximum required, 65 m.p.h.

Speed—minimum required, 5 m.p.h.

Weight—approximately 560 pounds, without equipment.

Wheel Base—57 1/2 inches.

The following illustrations show three views of the WLA motorcycle in the order: Top View, Left Side View, and Right Side View. Note that these illustrations do *not* show the various items of extra equipment normally carried on an Army motorcycle when it is outfitted for field service. These additional items and their location on the motorcycle are as follows:

1. AMMUNITION BOX—Carried on a bracket running down beside the left steering forks, and supported by this bracket and by additional brackets to the front fender and to the rocker plate on the left side of the front wheel. Box designed to hold a maximum of 10 clips (300 rounds) and 1 drum (50 rounds) of .45 caliber sub-machine gun ammunition, but normally carries only 6 clips (180 rounds) in the field. (See Stowage List for Motorcycles, Chapter XIII, for more detailed information).

2. BRACKETS FOR SUB-MACHINE GUN SCABBARD—Carried on a bracket running down beside the right steering forks, and supported by this bracket and by additional brackets to the front fender and to the rocker plate on the right side of the front wheel.

3. FRONT WINDSHIELD — Placed in front of handlebars, between handlebars and horn. Windshield extends down to the top of the front fender only, and does not seriously impair engine cooling. Use of this item should be avoided in the field, however, as it is highly unnecessary.

4. LEG GUARDS—Placed vertically in front of right and left foot boards. These guards are *not recommended* for general use. They seriously impair proper engine cooling by blocking oncoming air.

5. SADDLE BAGS—Carried on either side of the luggage carrier at the rear wheel.

WLA TOP VIEW DESCRIPTION

(See Figure 1)

1. THROTTLE CONTROL GRIP—Turn *inward* to *open* throttle; turn *outward* to *close* throttle.

2. SPARK CONTROL GRIP—Turn *inward* to *advance*, turn *outward* to *retard* spark. Under normal operation, carry spark full advance.

3. CLUTCH FOOTPEDAL—*Toe down* to *engage*; *heel down* to *disengage* clutch.

4. GEAR SHIFTER LEVER—Gear positions are indicated on tank shifter gate.

5. REAR BRAKE FOOTPEDAL—Apply *gradually* to brake the speed of the machine. Do not "slam" brake on and hold.