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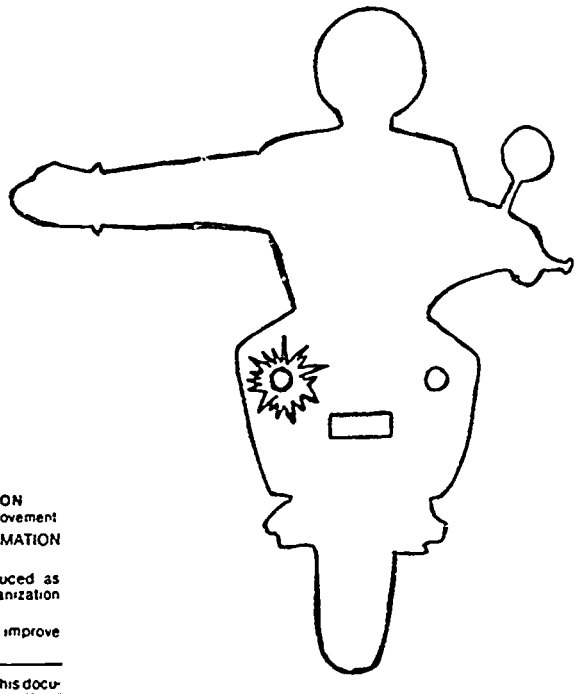
ABSTRACT

This booklet provides information on safe motorcycle operation and accident prevention. Its special focus is on Peace Corps volunteers who operate motorcycles in West Africa. A discussion of how a motorcyclist can minimize risks focuses on the "invisible motorcycle" and basic safety precautions. A section with riding tips is divided into: (1) tips for maintenance and upkeep of the motorcycle; (2) protective gear and insurance for the rider; and (3) tips for road riding, including signaling, lights, visibility, scanning, hazards, and special conditions. Protective gear to be worn by the motorcyclist is then discussed. The helmet, eye protection, footwear, gloves, and clothing are covered. A section entitled Special Considerations is a summary of the driving hazards of West Africa that were mentioned by volunteers. The booklet concludes with a section on motorcycle maintenance that addresses lubrication, ignition tune-up, electrical systems, carburetors, and general troubleshooting. (YLB)

PC Rider

A Training Manual



Peace Corps
INFORMATION COLLECTION & EXCHANGE
TRAINING MANUAL NO. T-36

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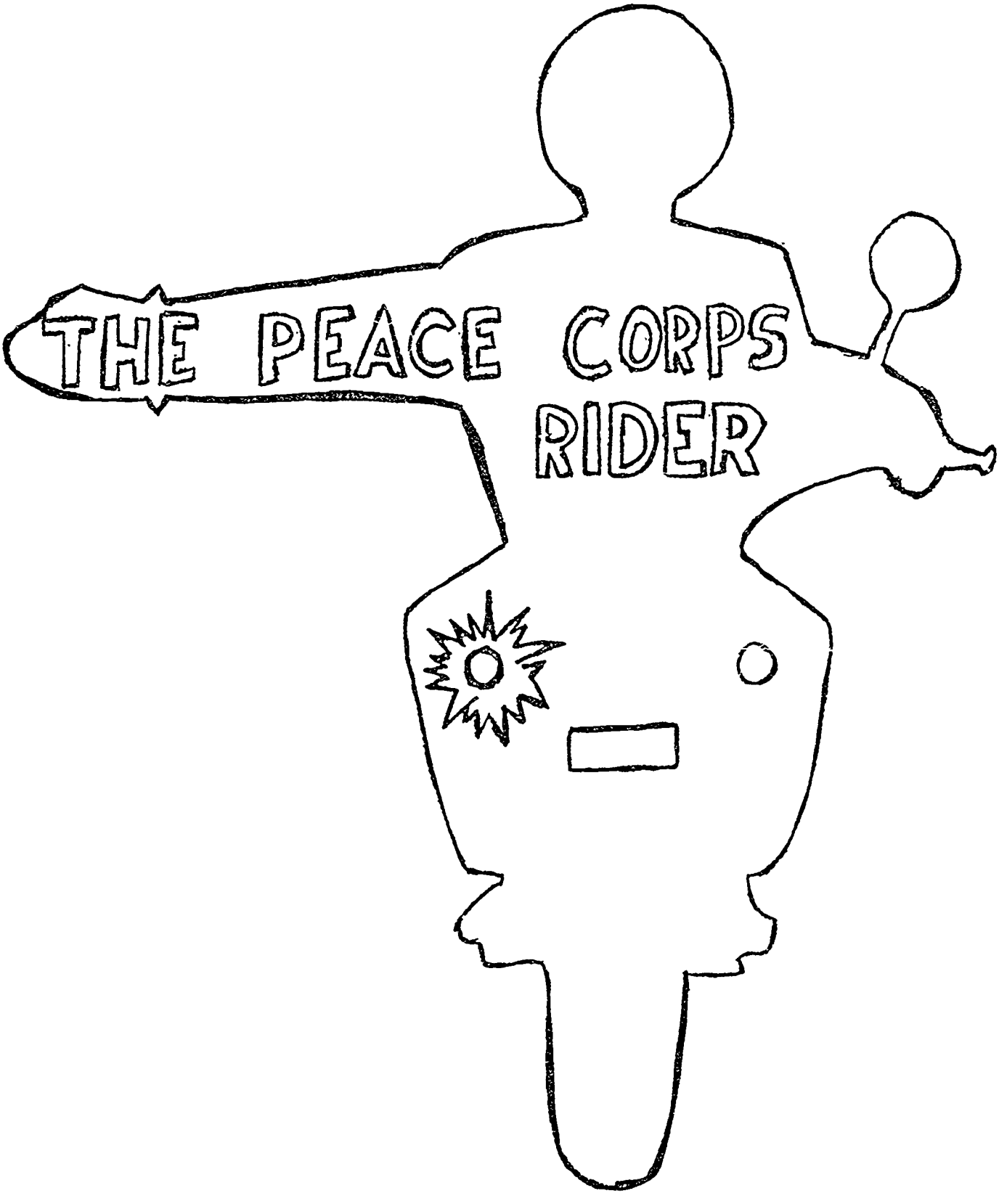
THE PEACE CORPS
RIDER

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PEACE CORPS
Information Collection and Exchange
Training Manual T-36
May 1985

This booklet, compiled by Peace Corps Ghana, is an outgrowth of suggestions made at the 1975 Peace Corps Ghana Mid-Service Conferences.

Staying alive and avoiding any serious motorcycle mishaps while operating a motorcycle in West Africa is the objective of the booklet.

Credits: Eighty percent of the Peace Corps Volunteers in Ghana who ride motorcycles responded to our request for information to be included in this booklet. This information appears in "Special Considerations" edited by Ken Gontarz and summarizes the hazards which volunteers mentioned in their responses.

The Introduction is an extract and modification of an article which appeared in the 1973 Consumer Report. "Riding Tips" and "Get Into Gear --- Get It On" are taken from pamphlets produced by the Motorcycle Safety Foundation. The section on "Motorcycle Maintenance" was compiled by John Spring of the University of Ghana, Legon, with assistance from Jim Jurkowski and Randy Houtz.

The booklet is dedicated to those who reduce accidents, become better riders and junior mechanics as a result of reading this booklet.

CONTENTS

INTRODUCTION

Motorcycles inherently are hazardous vehicles. According to the National Safety Council, the death rate for all types of vehicles for 1971 was 4.7 per million miles. For motorcycles, it was 20 per 100 million miles - more than for times as high. Statistics from West Africa Countries are not available. Taking into account the fact that eight out of 10 motorcycle accidents results in injury or death, as compared to only about one out of 10 automobile accidents, the chances of being injured or killed may be as much as 15 times greater on a motorcycle than in an automobile.

These figures may come as a suprise to you, especially when you consider the enormous number of wrecked automobiles and lorries alligning the African Highways. Even the smallest and flimsiest of automobiles surrounds its occupants with some sort of protective structure. But the motorcycles rider's unrestrained body usually bears the burnt of the impact.

Furthermore, the stability of any two-wheeled vehicle is easily upset. If the tires of an automobile or lorry lose traction, the vehicle may simply spin or skid. If the tires of a motorcycle slip beyond certain critical limits, the motorcycle usually goes down, along with its rider.

Motorcycles suffer from still another safety problem: Although they are becoming more and more popular each year, they still are outnumbered by four wheel vehicles by about 50 to one. Automobile and lorry drivers quite naturally direct their attention to spotting and avoiding other large vehicles on the road, to such drivers, a motorcycle - especially when approaching head-on - can be surprisingly invisible. The risks can't be eliminated; but fortunately for those determined to ride a motorcycle, the risks can be minimized.

IMPROVING THE ODDS

The Consumers Union recently conducted tests which concluded that a motorcyclist can improve his chances of survival if he shops for his machine wisely, if he uses available safely equipment and, most important, if he rides defensively - always expecting the worst from drivers, pedestrains and animals around him. Even so, a motorcycle is at a considerable disadvantage when sharing the road with autos and other large vehicles. No matter what safety precautions a motorcyclist takes, his chances of avoiding injury or worse will never approach those of the average automobile driver.

Any vehicle that travels substantially faster or slower than the surrounding traffic is much more likely to get into an accident than a vehicle that keeps up with traffic flow. The speed and acceleration capabilities of motorcycle vary considerably. Some motorcycles have engines as small as 50 cc.

A motorcycle with an engine capacity of 90 to 125 cc could keep up with most bush road or city traffic; and the motorcycle would not be too heavy to push or hard to maneuver on bush paths and at low speeds. The large size bikes which are capable of maintaining highway type speeds are normally not available in West Africa. If you are travelling a long way on good roads, it is always best to take public transport.

Generally the larger the wheels and tires, the more stable the machine and the less likely it is to be upset or to be knocked of course severely by road irregularities. Small wheel motorcycles are a lot less stable than the larger ones.

THE "INVISIBLE" MOTORCYCLE

The inability of car and lorry drivers to see motorcycles, as we stated earlier, appears to be an important contributing factor in motorcycle accidents. One way a motorcyclist can make himself more visible to others is to ride with his headlight on even in daylight hours.

Even if you ride with your headlight on, you and your motorcycle can be remarkably hard for other motorist to see. Warning bright colored, reflective clothes, especially at night, helps make you more visible. Reflectorized tape applied to the rear and sides of the helmet also helps other drivers to see you at night. If you are unsure whether a driver sees you, use your horn or rapidly switch your headlight beam up and down. Even where passing on the right is permitted, avoid doing it when on a motorcycle. And do not squeeze in between two lanes of traffic. Someone in either lane could edge out, leaving you no escape path.

Be extra cautious at intersections. The most common type of accident involves an automobile making a left turn across the path of an oncoming motorcycle.

Ruts, potholes, rocks and patches of sand, water or oil that would not affect a car could cause a motorcycle to spill. Besides watching traffic all round, a defensive rider must watch the pavement ahead. Animals also can cause accidents. If a dog chases your motorcycle, shouting an angry command may scare him off. If you cannot avoid a rock or other small obstacle in the road, hit straight-on, not on an angle. The same holds true for rail-roads tracks. At night, obstacles in the road are hard to see, so reduce speed.

On a multilane roadway, do not move to the extreme right of the lane. That may seem the polite and prudent thing to do, but sharing a lane with a car invites disaster. When you are in the right lane of a multilane roadway, stay toward the left of your lane. And when you are in the left stay to the right of your lane. That helps keep cars from squeezing into your lane. The center lane is especially dangerous for motorcyclists because a car could squeeze in from either right or left. Try to stay off the center of any lane; oil drippings from cars make the

center slippery. Also, rocks, old car parts and other debris tend to collect at the center of the lane, where cars' wheels can straddle them.

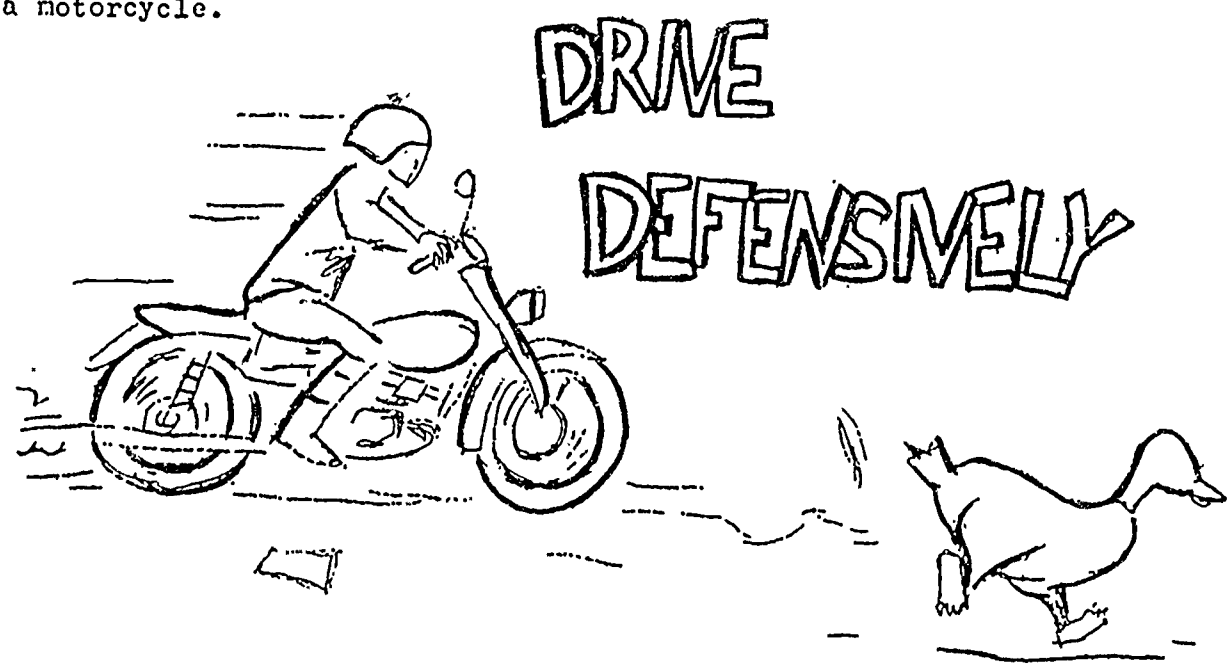
In a dispute with an automobile driver over right of way, don't push your weight around; you don't have much weight to work with.

Metal bridge surfaces are especially dangerous in bad weather. Their polished metal surfaces become extremely slippery when wet.

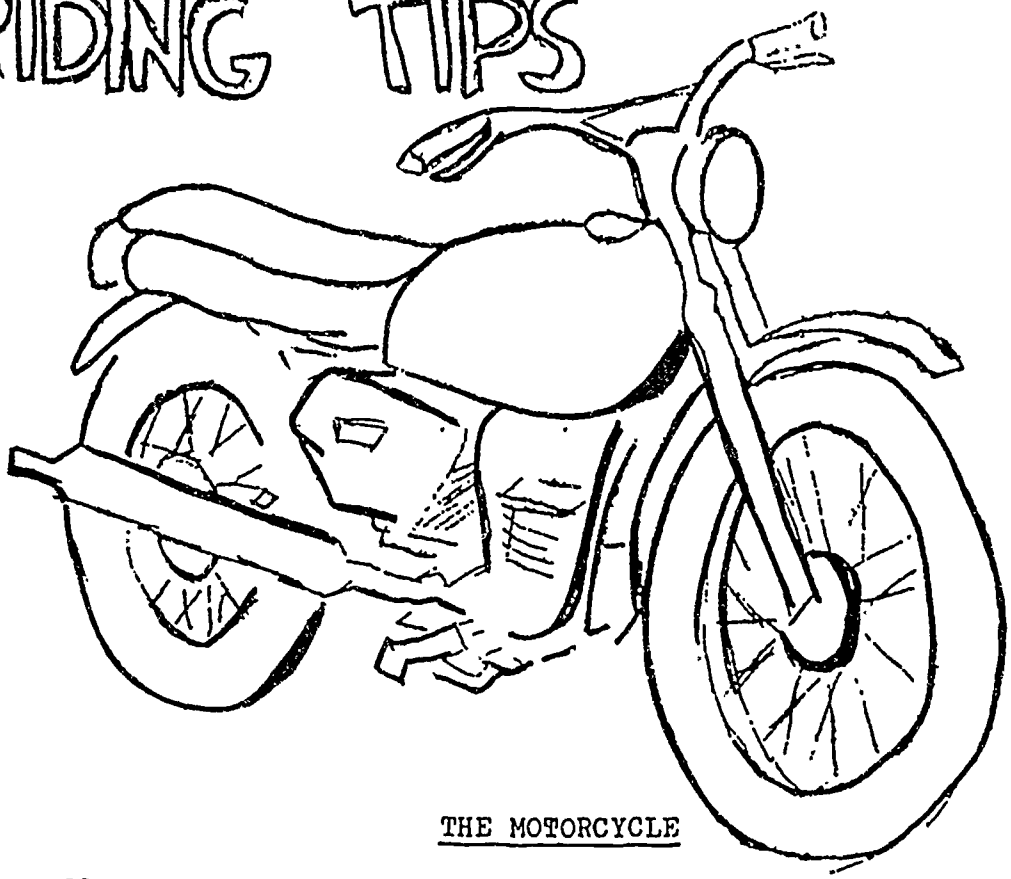
The rear brake on a motorcycle is more forgiving than the front. If you inadvertantly lock the rear wheel, usually you can keep your balance. Looking the front wheel will result in a practically uncontrollable skid and can cause a spill. That does not mean you should avoid using the front brake. Practice modulating the brakes to avoid wheel lockup. Wheel lockup occurs particularly easily on wet or loose surface; apply the brakes care fully under such conditions. Try to brake before entering a turn. If you must slow down further while in the turn brake gently.

Do not carry a passenger on a motorcycle designed for just one rider. Ride extra carefully if your passenger is not an experienced rider. He may panic in a turn and lean in the wrong direction, knocking you off balance. Generally the lighter the motorcycle, the worse the effects of a passenger on weight distribution and performance. Never carry a passenger who has been drinking (much less drink yourself before riding).

Keep your machine in safe machanical condition. Proper tire pressures are more critical on a motorcycle than on car. And above all, do not show off on a motorcycle.



RIDNG TIPS



THE MOTORCYCLE

Knowing all you can about the motorcycle you ride or intend to ride is good preparation for safe and enjoyable motorcycle riding.

The motorcycle is different from other vehicles - only two wheels, more demand on the operator for balance and coordination, greater maneuverability less visible, generally greater economy of operation, more restricted by severe weather.

Remeber: Riding a motorcycle on the road requires special skills and knowledge beyond that required for driving a car.

Controls - Familiarize yourself with the design, controls, and handling Characteristics of the motorcycle you will be riding. You must learn how to find and use the controls and devices so thoroughly that you can operate them by touch alone. You will not have time to look for controls when riding!

Inspections - Pre-ride inspections are a must for safe, worry-free riding. You do not have to be a mechanic, but a careful check of equipment may seve you trouble when you ride.

THE MOTORCYCLE (CONT'D)

Each time before you ride, check:

1. Brakes and steering control for responsiveness;
2. Tires for inflation pressure and presence of cuts and abrasions;
3. Power chain for tension and proper lubrication;
4. Cables for fraying or crimping;
5. Oil and fuel levels;
6. Lights and horn for good working condition;
7. The kickstand for good support and clearance when stowed.

Safety Checks - A well-lubricated chain will prevent wear and result in smoother operation. When the cycle is off the stand and a rider is on the machine, a chain should ahve about three-quarters of an inch of free play.

Check your tires for proper inflation and wear. Note any ruts or holes and measure the tread depth. The deeper the tread the greater the traction. Uneven wear may be a sign of an improperly balanced wheel.

Nuts and bolts wull loosen up as will other connections. Periodically check all mechanical and electrical connections, tighten or adject when necessary.

Look for leaks on pavement, parking areas and wheels. Find the source of leakage.

Maintenance - Maintenance is a rider's responsibility, especially routine maintenance. Most corrective maintenance should be handled by a machanic; but you can take care of inspecting, adjusting, and cleaning parts. Good maintenance means a safe machine condition.

Carry the owner's manual with you when riding. The manuals is filled with useful time - and money-saving advice.

The tool kit should be complete since the tools carried on the cycle may mean the difference between walking or riding in case of a breakdown.

Carry spare parts such as spark plugs, electrical fuses, and tire repair kits.

Know the maintenance schedule of the machine you ride and be familiar with the regular intervals between needed maintenance.

Remember your battery and keep the level of battery solution up.

Lubricate properly: pedals, throttle and chain, especially after washing the motorcycle.

More frequent servicing as necessary if your machine is operated under sustained high speeds or adverse conditions. If the motorcycle is turned over or involved in a collision, you will want your dealer to inspect your motorcycle for damage.

THE MOTORCYCLE (CONT'D)

Recognize symptoms of trouble when riding. Correct any problems as soon as possible after detection. Take time to note and describe these symptoms so you can explain them to service people.

Starting - Keep your knuckles up on the throttle and use a good hand grip. The best position is to keep the wrist down and wrap the fingers around the handlebar grip. Allow warm-up time when starting to permit oil to circulate to all moving parts.

Use the choke to start a cold engine. Once the engine is warm, you must return the choke to its normal or off position. Failure to do so will waste fuel and foul spark plugs.

The fuel supply valve should be turned off when the motorcycle is not in use to eliminate the possibility of gasoline leaking from the tank.

The tachometer will tell you how fast the engine is turning in terms of revolution per minute (RPM's). Do not operate your machine over tachometer redline since serious damage to the engine and transmission is likely to occur.

Brakes. A word about brakes: motorcycles have two independent braking systems. The rear break control is pedal operated by the right foot with a gradual but firm pressure. The front wheel brake is applied with the right hand by squeezing the brake lever toward the hand grip.

Remember the rear brake should be applied slightly before the front brake. The rear brake will begin to slow you down. The front brake will supply most of the force necessary to bring you to stop.

Seventy percent of total backing power is supplied by the front brake, but if the front brake is applied too hard, the front wheel may lock resulting in a loss of balance and steering control.

Trouble Shooting - A trouble shooter's checklist will help you in the event of trouble:

1. If the engine does not start: Check fuel levels, fuel valve, ignition switch shut-off switch, spark plugs.
2. If engine fails to develop power: Check for clogged muffler, spark plugs; examine head gasket area (compression leak indicated by oily area) and tighten head nuts.
3. If engine stops suddenly: Check fuel level, fuel valve, oil level, spark plugs, shut-off switch; examine fuel tank cap air vent to see if it is clogged
4. If stability and steering are poor: Check tire pressure, tread design and condition; make sure there is no play in the front fork assembly and that front and rear wheels are perfectly aligned.

THE RIDER

Protective Gear - A motorcycle rider has less protection than an automobile driver in an enclosed structure. So, a primary tip for motorcycle riders is learn the what, how and why of wearing protective equipment.

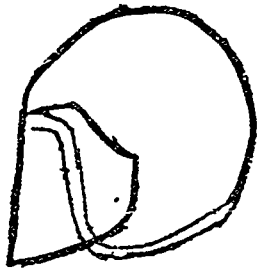
Learn to use protective gear properly: knowing what to wear and how to wear it provides good protection against injury.

Know what the law requires you to wear when you ride.

Good protection is provided by

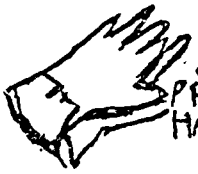
1. an approved safety helmet;
2. eye protection equipment;
3. gloves;
4. boots or heavy footwear;
5. jacket and pants.

GOGGLES OR FACE SHIELD REDUCE GLARE AND PROJECT EYES FROM DUST AND DIRT

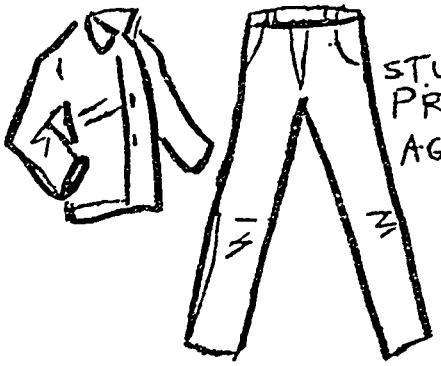


HELMETS PREVENT CONCUSSIONS AND FRACTURES

BOOTS OR STURDY SHOES CUT DOWN FOOT INJURIES



GLOVES PROTECT YOUR HANDS



STURDY CLOTHES PROVIDE PROTECTION AGAINST ABRASIONS

THE RIDER (CONT'D)

Helmets - The most important piece of personal equipment for safe riding is the helmet. With an approved helmet, you have protection against serious head injury.

Both you and your passenger must wear a helmet.

Prices, styles, and types of helmets vary widely; so select the helmet that offers the most protection. Buy only helmets which meet U.S. Department of transportation standards and which bear a Safety Helmet Council of America sticker.

Helmets should be securely fastened, fit the head snugly, and provide maximum peripheral vision.

You must be albe to see clearly to ride safely. The importanoe of eye protection is emphasized by the many states that require some type of eye protection such as a face shield, goggles, or a windshield that rises high enopgh over the handle bars to shield the face.

Be sure your face shield and goggles are:

1. securely fastened;
2. shatter-proof and free from scratches;
3. well-ventilated to prevent fogging;
4. protection from dirt, insects, water, other objects;
5. equipped with clear lenses (tinted lenses can substantially reduce vision at night).

Clothing - Leather gloves offer good protection for ahnds but should not be so heavy that they interfere with your grip or cause blisters. Good gloves will prevent your hands from getting sore, tired or cold as well as offering protection.

Strong over-the-ankle boots are the best footwear for riding. Good quality leather boots with heels offer protection to the ankles plus the added factor of the heel which helps prevent your feet from slipping off the pegs. Rubber-soled boots are often recommended because they grip the pavement better than the leather-soled boots.

Experienced riders prefer leather clothing for maximum protection when riding. Long-sleeved jacket and long pants are minimal requirements for rider protection.

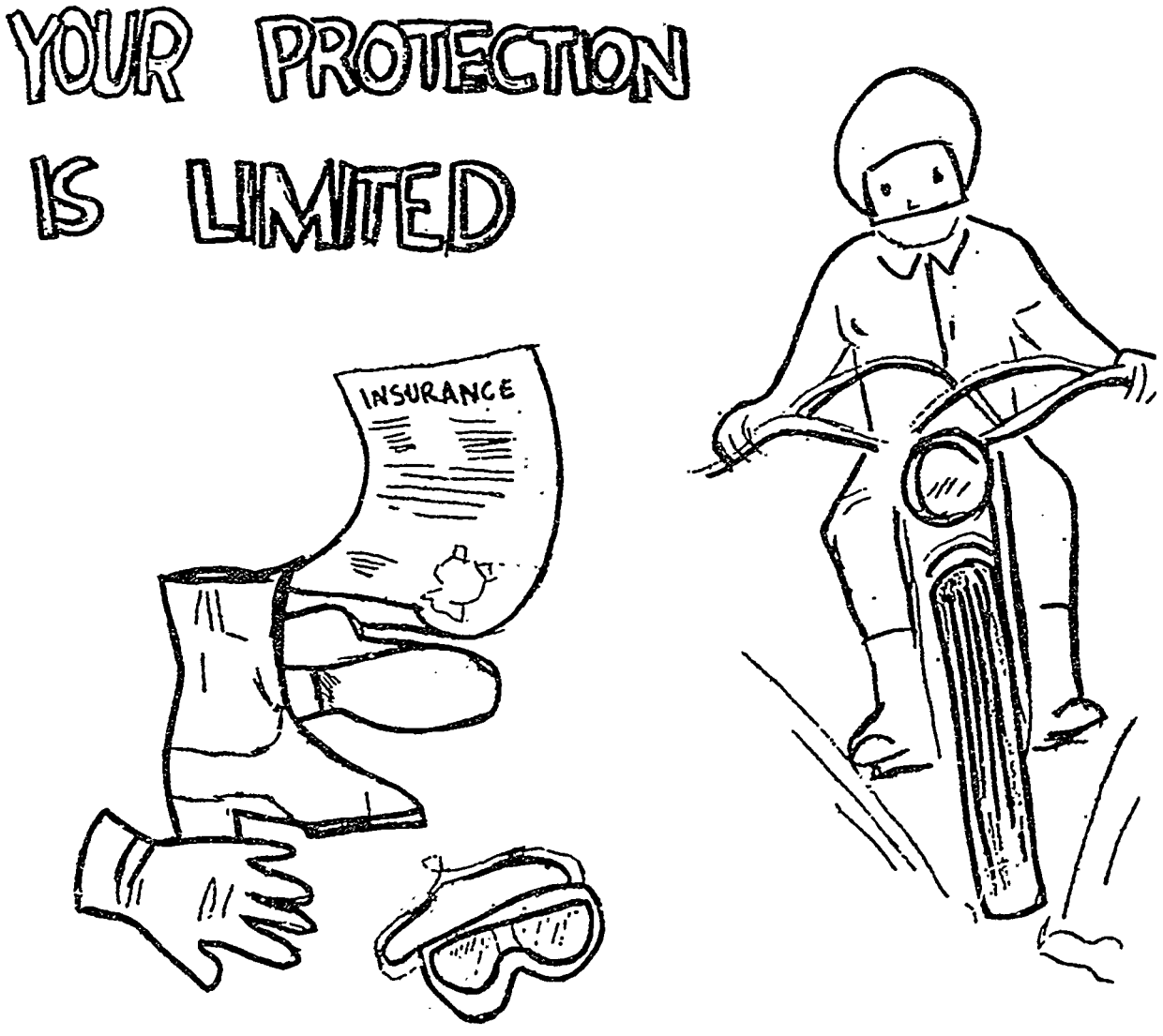
Increase your visibility to others by wearing bright-coloured clothing and clothing with reflectorized tape striping. This is oapecially important at night.

Remember to check your state law for specific rider protection requirements. Almost all states require approved protective head gear and eye protection.

THE RIDER (CONT'D)

Insurance - Insurance coverage is necessary for you, your passenger, and you motorcycle because of possible damage you might cause to other motorcyclists, motorcycles, or property. Insurance policies vary from state to state so contact a licensed insurance agent.

Be familiar with various types of insurance. Make sure you covered adequately both in terms of state law and in terms of the kind of riding you plan to undertake. A litte study and planning will help you determine your choices.



THE ROADWAY

Road Riding - Five simple tips for road riding:

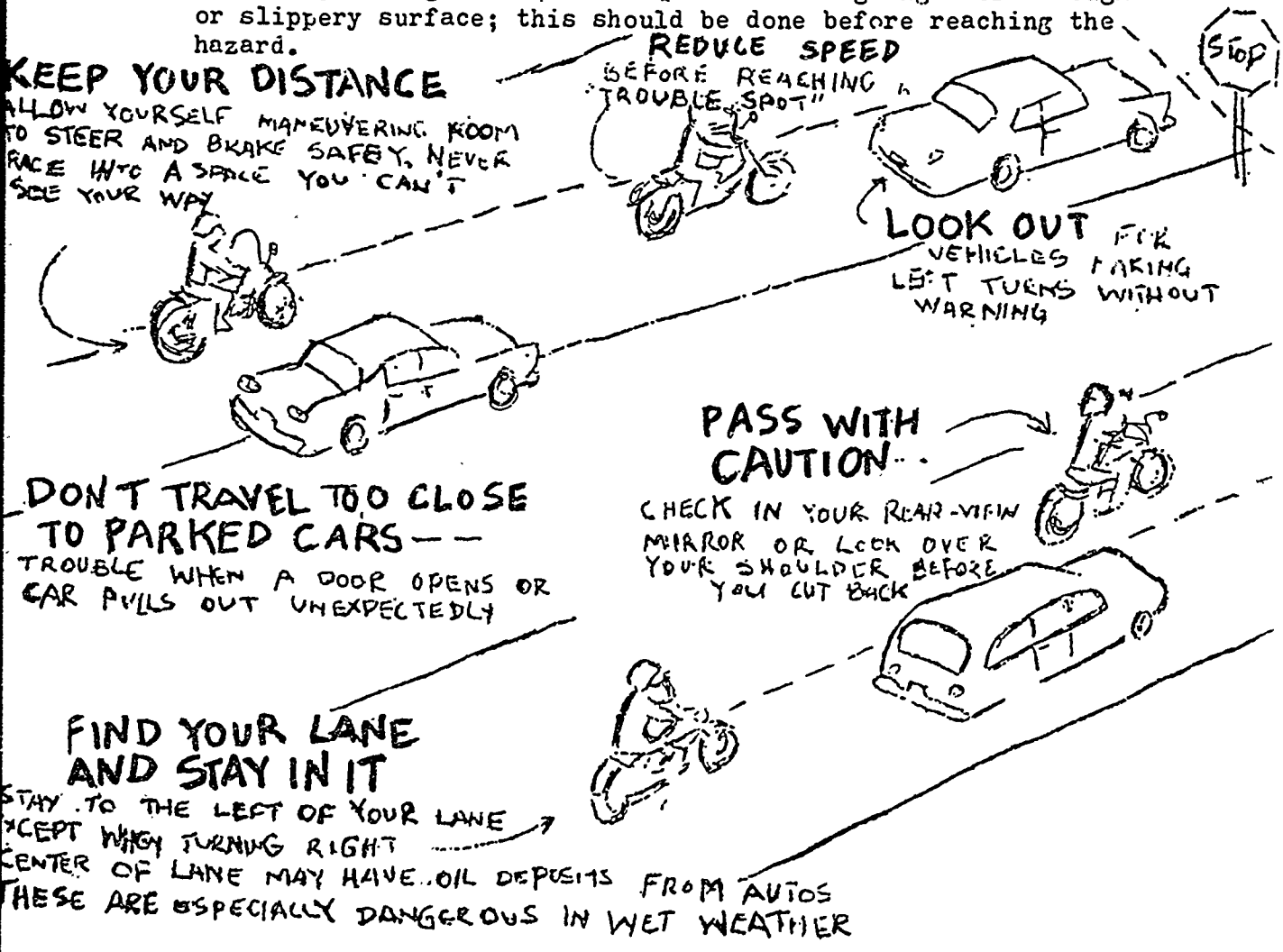
1. Consider every road a potential obstacle course and remember that you are riding on two wheels, not four.

2. Keep your head up and your eyes moving so you can anticipate hazards ahead of time.

3. Take the path of least resistance and go around (rather than over) an abstacle if you can.

4. Slow down before you reach an obstacle by either applying and releasing the brakes or down-shifting.

5. Avoid depressing the clutch or brake while going over a rough or slippery surface; this should be done before reaching the hazard.



THE ROADWAY (CONT'D)

Signalling - Motorcycle riders are required to signal their intentions as are motorists. Signalling is the best way for you to communicate with other highway users including pedestrains.

Signal well in advance of an intended maneuver. You can use hand signals, electric turn signals, headlight and taillight, brake-light or combinations of these. There is no excuse for failure to signal!

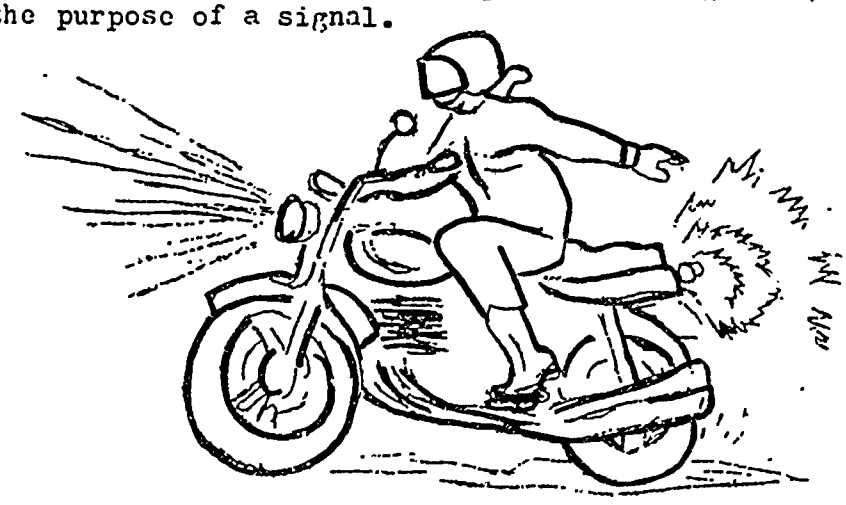
Hand signals requires practice since you use your left hand, removing it from the handlebar for a short time. You lose some steering control so you will need practice in one-handed riding.

A signal is not a guarantee of clear passage so check over your shoulder before committing youself to a maneuver.

Electirc turn signals are not self-canceling like those of an automobile so you will have to remeber to manually cancel them after a turn or lane change. An uncancelled signal will confuse other motorists.

Lights - Use your headlight and taillight both day and night. Stay visible and make sure others see you.

Use the brakeslight to communicate to the rear by flashing the light on and off to indicate a slowing or stopping maneuver. Avoid "riding the brake" which will keep the brakelight on, defeating the purpose of a signal.



THE ROADWAY (CONT'D)

Visibility - Visibility in traffic is the name of the game for riders. Motorcycles are smaller, more difficult to see.

Install reflectors on your motorcycle if it does not come so equipped. Reflectorized tape can also be used.

Wear bright, light-reflecting clothing to help others see you better.

Position your motorcycle so others can see you. This usually means the left wheel track of the lane.

Establish a safe two-second following distance. As the vehicle ahead passes a fixed object, count two seconds. After you complete the count, the fixed point should be just ahead of you. The distance increases automatically as speed increases.

Make sure others see you by using headlights, horn and signals.

Scanning - Keep your eyes moving to look for potential trouble spo ts. Avoid fixing your gaze on any one object for more than two seconds.

Be sure other motorists see you. If you think other motorists do not see you, slow down or stop.

Keep checking the rear view mirrors.

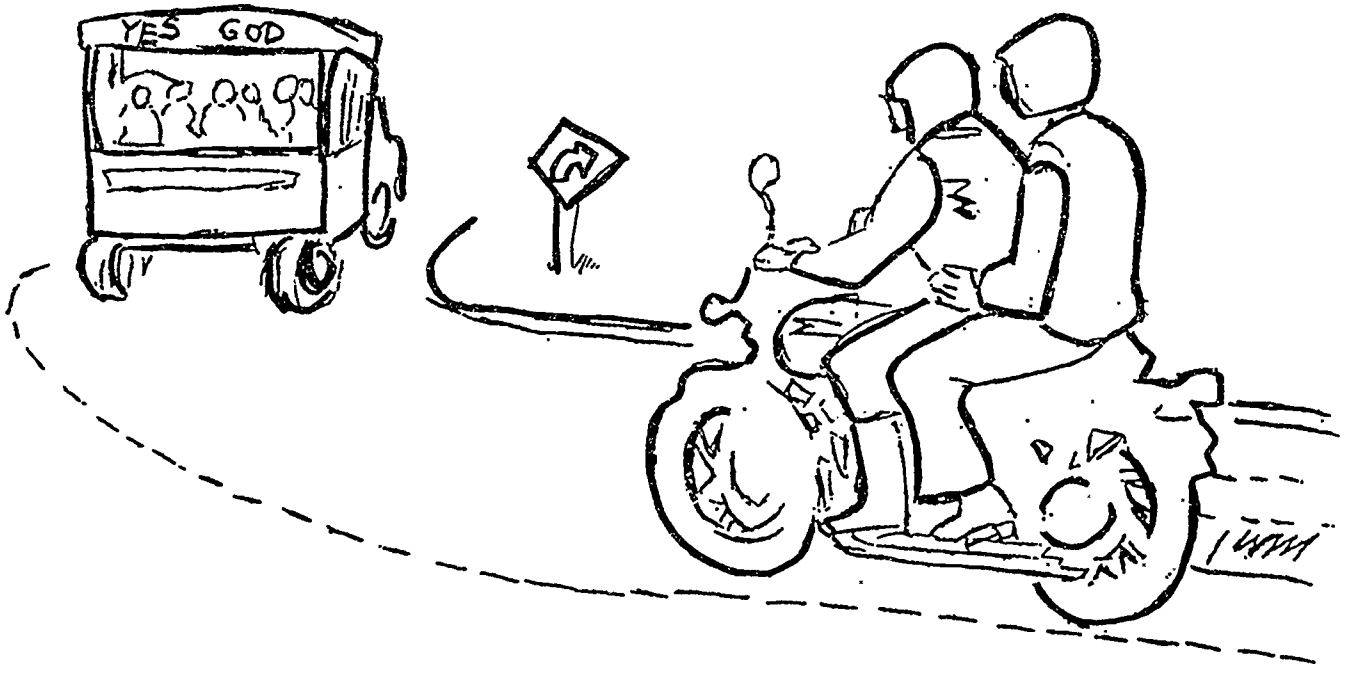
Use head checks to keep track of traffic to your side and rear. Checking the mirrors is not enough.

Hazards - Know how and where to look for hazards. Hazards can be divided into three groups: other vehicles, pedestrians and animals and immovable objects such as bridges, trees, and guard rails.

Intersecting traffic is especially hazardous for motorcyclists. Identify approaching traffic from the left and right as well as oncoming traffic which might be turning left.

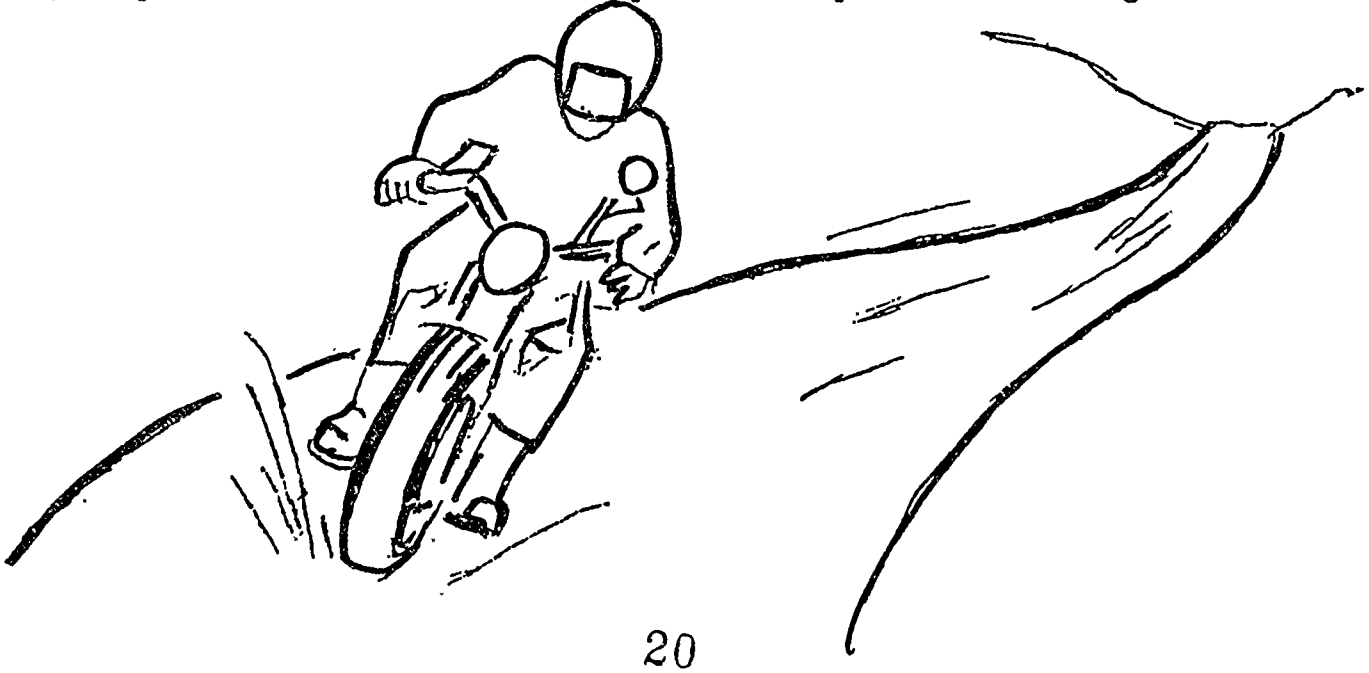
Hazards (Cont'd)

Be careful at intersections with limited vision and near home driveways. Anticipate the possible actions of others so you can be prepared to react in any situation.



Riding At Higher Speeds - When you ride at higher speeds:

1. Turn and brake gradually rather than abruptly to maintain control.
2. Look far ahead to allow more time to avoid obstacles.
3. Plan and execute stops sooner than at lower speeds.
4. Accelerate smoothly and gradually to avoid sudden jerks and possible loss of control.
5. Upshift with the manufacturer-prescribed speeds and RPM ranges.



THE ROADWAY (CONT'D)

Special Conditions - If you must make a fast stop, but not a panic stop:

1. Apply the rear and front brakes at the same time.
2. Close the throttle.
3. Stay seated square in the saddle.

Stand on the pegs to cushion shocks resulting from bumps or rough riding surfaces. Grip the handlebars firmly as you push up with your legs. Keep knees, wrists, accelerate and brake slowly and gradually. Remember that loose materials increase your stopping distance.

Riding In Rain - When you ride in the rain:

1. Wear proper rain gear: gloves, boots, bright rain suit.
2. If your vision blurs, slow down or better yet, stop till the rain is over.
3. Avoid riding on painted lines which become extra slick when wet.
4. Ride in the tracks made by cars or trucks for better traction.

The worst time for riding in rain is at the beginning of a shower or storm when the water combines with road film to cut traction.

You can control skids by:

1. Keeping your rolling true or straight;
2. Avoiding overbraking;
3. Slowing down;
4. Braking while upright rather than at an angle in a turn;
5. Using your feet to straighten up, but only if everything else has failed.

Riding At Night - Night riding is risky if you are heard to see so wear bright coloured clothing, make sure your cycle is fitted with reflectors, and that lights are working properly.

Remember that others may not see you. Problems of being seen by motorists are doubled at night.

Space Cushion - Avoid riding the gap of slot between lines of traffic since a sudden maneuver of another vehicle may suddenly block your path. The same is true for riding the shouldre.

Leave room when passing parked cars. A door opening suddenly may become a hazard in your path.

Courtesy - A footnote on courtesy: You are sharing the roadway with numerous other highway users. By according respect to others, you will in turn earn their respect. Avoid crowding other vehicles and demanding contested space. Signal your intentions early and note the same in others.

GET INTO GEAR ....

GET IT ON!

You may be a novice rider or an experienced motorcyclist... or just a passenger; but you know already that motorcycle riders are not as well protected as automobile drivers who are wrapped in a strong steel compartment.

You probably also know that motorcyclists are exposed to the elements - weather, dirt, road debris. For this reason, the wise motorcyclist gets into gear - protective gear for safety and comfort - by wearing clothing appropriate for motorcycle riding.

Come on, let's get going. Up through all the gears. Get it on!

First Gear:
The Helmet

Wearing a helmet when riding a motorcycle is common sense. Accident studies indicate that states not having helmets laws have higher motorcycle fatality rates due to head injuries than states having such laws. You should wear a helmet even if the law does not require it.

As the old punch-line goes, "If you have a $10 head, wear a $10 helmet." Select a helmet with as much care as buying a motorcycle. The helmet is the most important piece of personal equipment for safe riding. Helmets vary widely in style and protection.

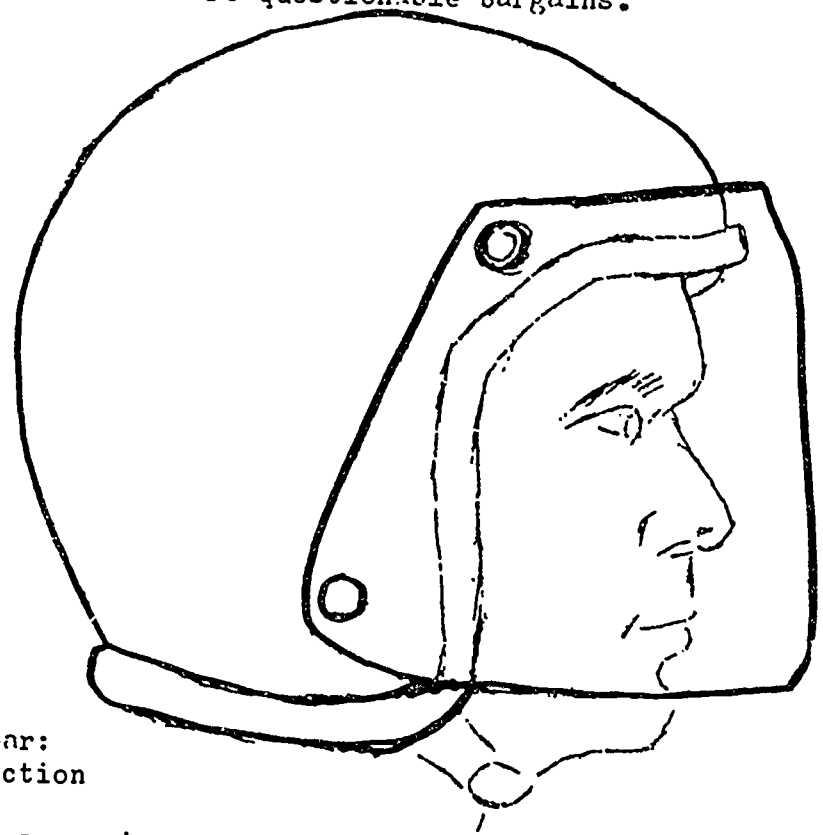
Helmets that offer the most protection will meet U.S. Department of Transportation of Safety Helmet Council of America standards.

For both comfort and protection, your helmet should fit snugly but not tightly. Avoid the helmet that fits, too loosely or that interferes with your visibility. Remember to fasten the chin strap securely loose helmet is no protection.

The helmet can also serve to make you more visible to other highway users when you affix reflectorized tape to the sides and back of the helmet. Some states require such reflectorization.

A special word about custom painting: Some helmets are made of materials which will lose their protective strength when painted. Gasoline may also break down the protective qualities of a helmet's construction when coming into contact with the inner shell.

A final word: most helmets are good for one impact only. Replace your helmet after an impact such as an accidental fall. It has done its job Secondhand helmets are questionable bargains.



Second Gear:
Eye Protection

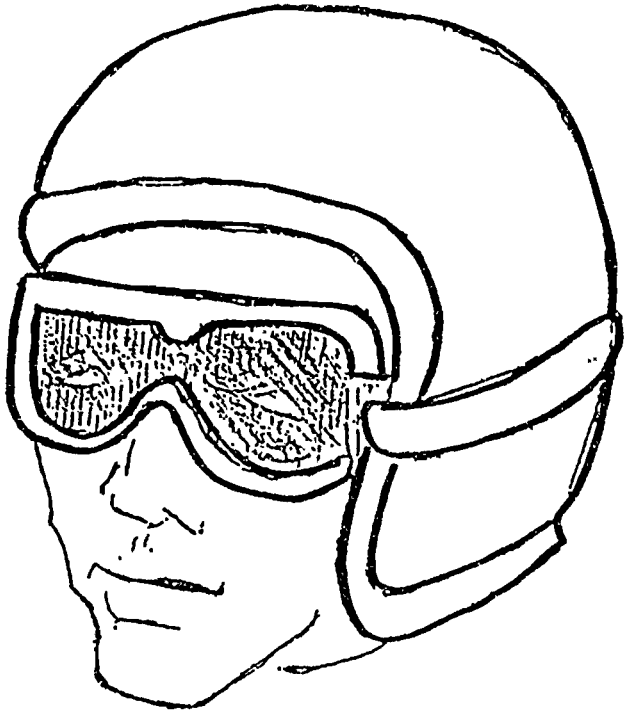
Most states require eye protection. You must be able to see clearly to ride safely. Personal preference for face shield or goggles will determine which type of eye protection you wear.

Both face shield and goggles will protect your eyes against dirt, insects, water, or small stones which might interfere with your visibility. These devices will also reduce eye fatigue due to squinting.

Be sure that the protective device for your eyes is made of shatter-proof material and is free from scratches which may distort your vision. Good ventilation is necessary to prevent fogging.

Whether you wear face shield or goggles, the lenses should be clear. Tinted lenses substantially reduce vision at night. Sun glasses can be worn under a face shield to avoid eye fatigue during daylight hours.

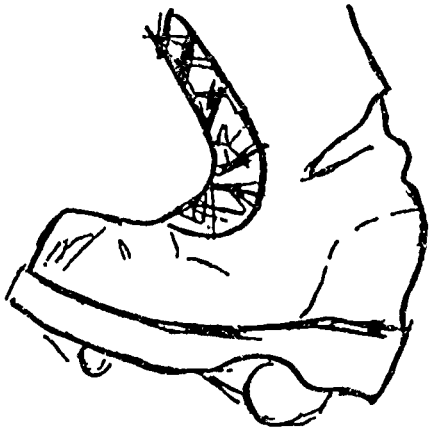
REMEMBER: regular eye glasses were never meant to be eye protection on a motorcycle!



Third Gear:
Footwear

Sturdy leather boots which rise over the ankle are the best footwear for riding Boots which have rubber soles for better grip of the pavement and heels which help keep your feet on the pegs are recommended. Lace-up boots offer substantially more ankle support than do boots with zippers or slip-ons.

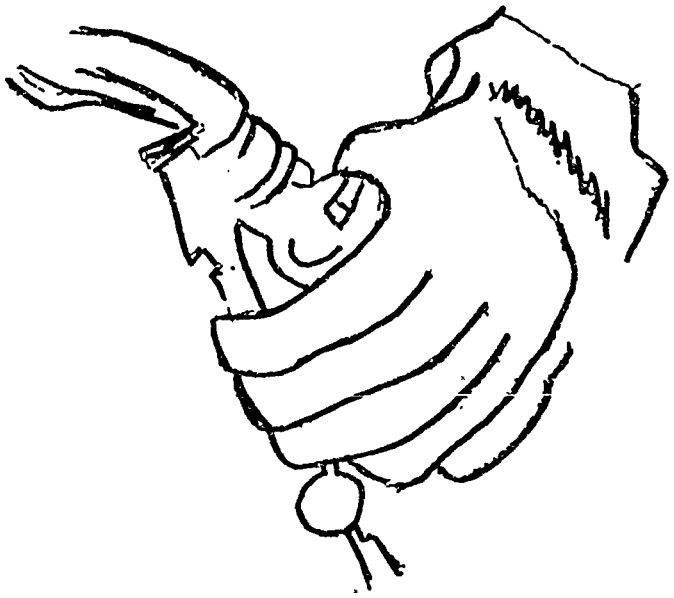
Sandals, tennis shoes, or loafers are not proper riding footwear. They provide no food and ankle protection.



Fourth Gear:
Gloves

When you wear leather gloves for riding, you are not only protecting your hands, but also improving your grip on the handlebars. Gloves will prevent your hands from growing cold, tired, and sore. Gloves should fit snugly, but not too tightly. Gloves that have too much bulk will reduce your ability to operate hand controls.

The stype of the gloves you choose to wear will have a signficant effect on your ability to operate your motorcycle. Seamless palms will help prevent blisters; gauntlets will keep cold air from going up the sleeves. By adding strips of reflectorized tape to your gloves, you will also make it easier for motorists to spot you in traffic.



Fifth Gear:
Clothing

Long sleeved jacket and long pants are minimal clothing requirements for good riding protection. For fair weather, riding apparel made of strong, durabl materials such as denim or coduroy should be selected. In cold weather, experienced riders prefer the qualities of leather clothes. You will also find clothing lines now appearing with nylon as the basic materials backed up by light padding.

Avoid loose, floopy clothing such as wide flared pants and long scarves which might become entangled in the motorcycle's machinery.

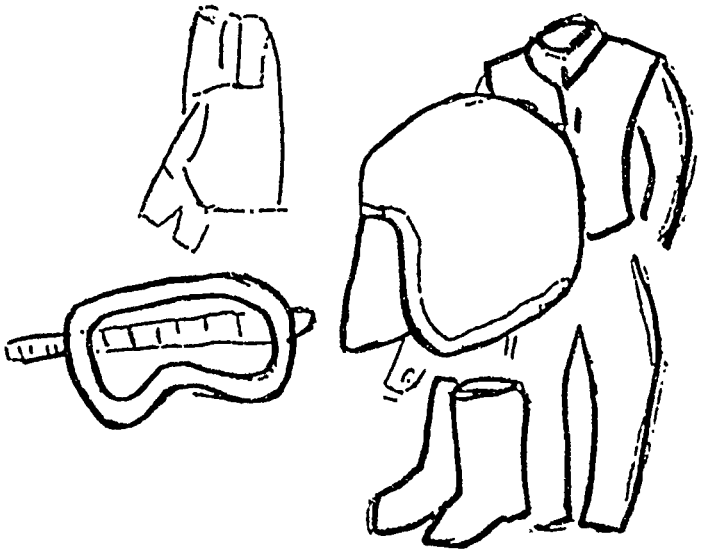
Your clothing should fit comfortably without binding. A jacket with a zippered front will be more wind resistant than a jacket with buttons or snaps. Be careful about the collar style also - a large, loose collar will flap strongly when riding and may irritate your skin or be a distraction. Jackets with snug cuffs and waist are recommended to keep wind from blown into the garment.

Remember that even in relatively warm weather, constant exposure to wind when riding may reduce body temperature. A condition known as hypothermia can cause you to lose your ability to concentrate and react to changing traffic conditions. Motorcyclists are especially susceptile to rapid chilling leading to loss of reflexes, a symptom of hypothermia. The bigger danger of the subnormal body temperature found in hypothermia is the deterioration in the ability to think clearly. Proper riding gear such as wind-proof clothing and insulated layers of clothing is essential for safe motorcycling.

As a matter of comfort, special rain gear is available for inclement weather conditions. Such rain gear has tight fitting cuffs and pant legs to keep out wind and water. You can also wear slip-in rubber boots to keep riding boots dry.

As with helmets and gloves, the clothes you wear when riding can also serve to make more visible in traffic. Choose bright colored clothing when possible. If you wear dark clothing, inexpensive reflective vests can be worn over the jacket. Also, you may choose to affix reflectorized tape striping to garments you regularly wear when riding.

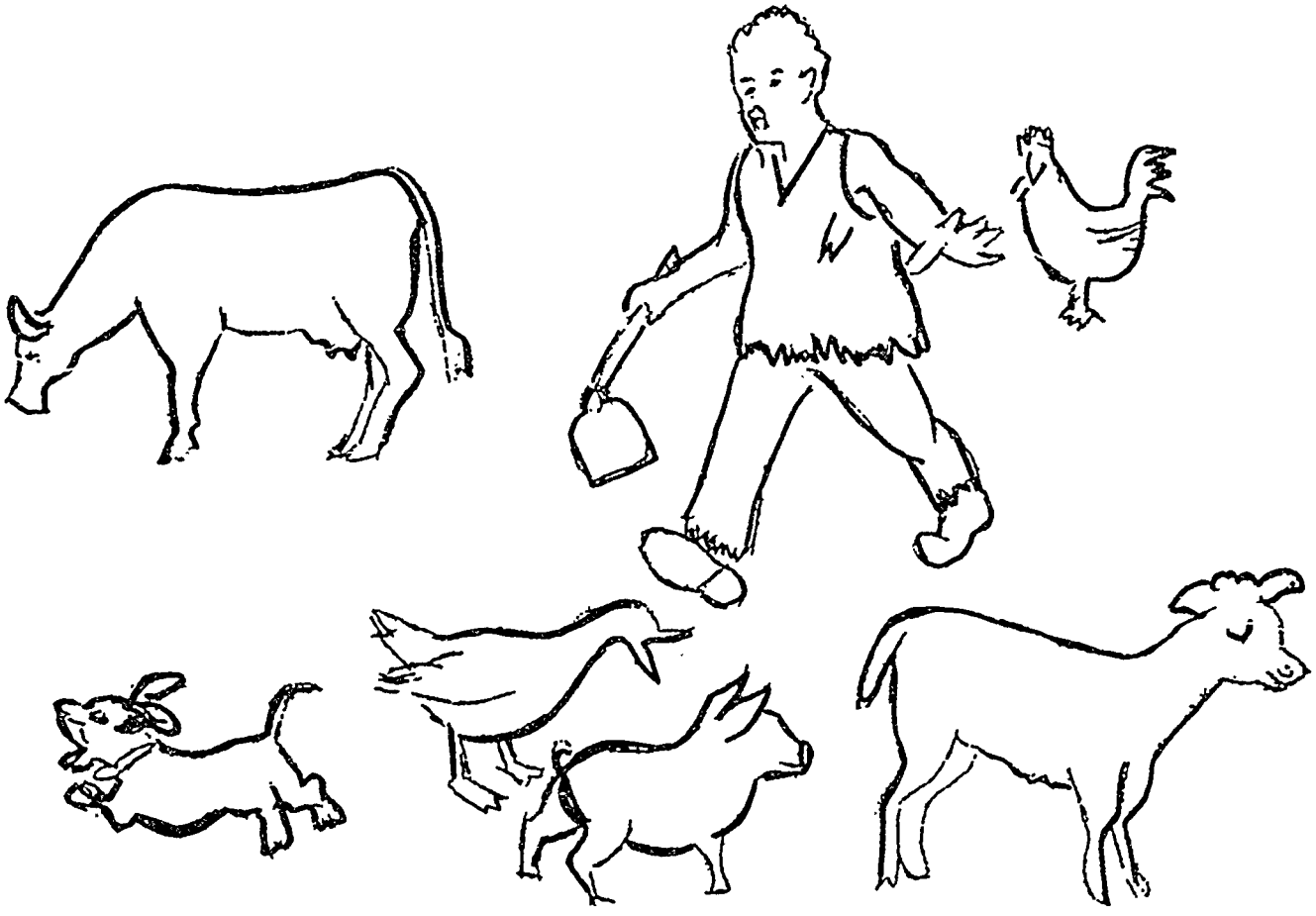
By getting into gear - protective riding gear - before you ride, you are demonstrating a responsible attitude toward safe motorcycling. For comfort and protection be sure your helmet and other gear meet the characterist of good, protective, personal equipment outlined in this pamplet. Good riding gear is essential to safe motorcycle operation.



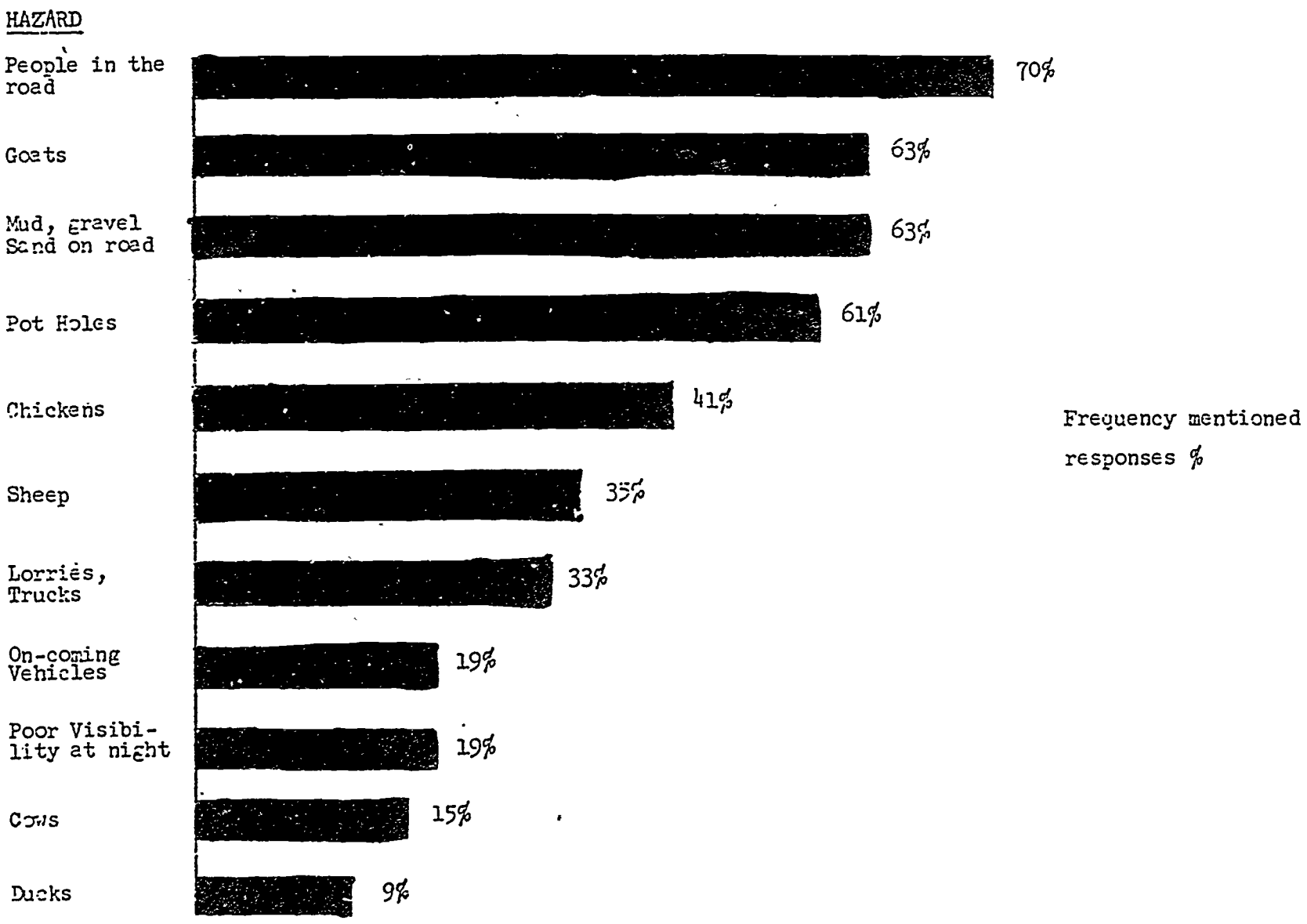
Special Considerations

Staying alive avoiding any serious motorcycle mishaps while operating a motorcycle in West Africa is the objective. The whole idea of this chapter is to make both the experienced and the not so experienced rider aware of the inherent dangers of cycling here in West Africa and by doing so making him more immune from these dangers. If you are not already aware of the fact, there has been an alarming increase in the number of serious accidents encountered by PCV cyclists, resulting in paralysis, disfigurement and even death. Because of this, Peace Corps Ghana has launched a "motorcycle safety" campaign - a campaign which will hopefully reduce the number of such mishaps.

Driving any "two wheeled" vehicle has its own special problems (especially when it is being operated in Africa). Recently (December 1975) the PCV's in Ghana who own motorcycles were asked what they thought were the leading causes of motorcycle accidents. Listed below in accordance with the frequency they were mentioned are the "most mentioned driving hazards of West Africa". It may be noted that even though these statistics were compiled solely from PCV's in Ghana, that many of these people have traveled extensively on their bikes all over West Africa. Thus a fairly indicative sample of hazards was gathered.

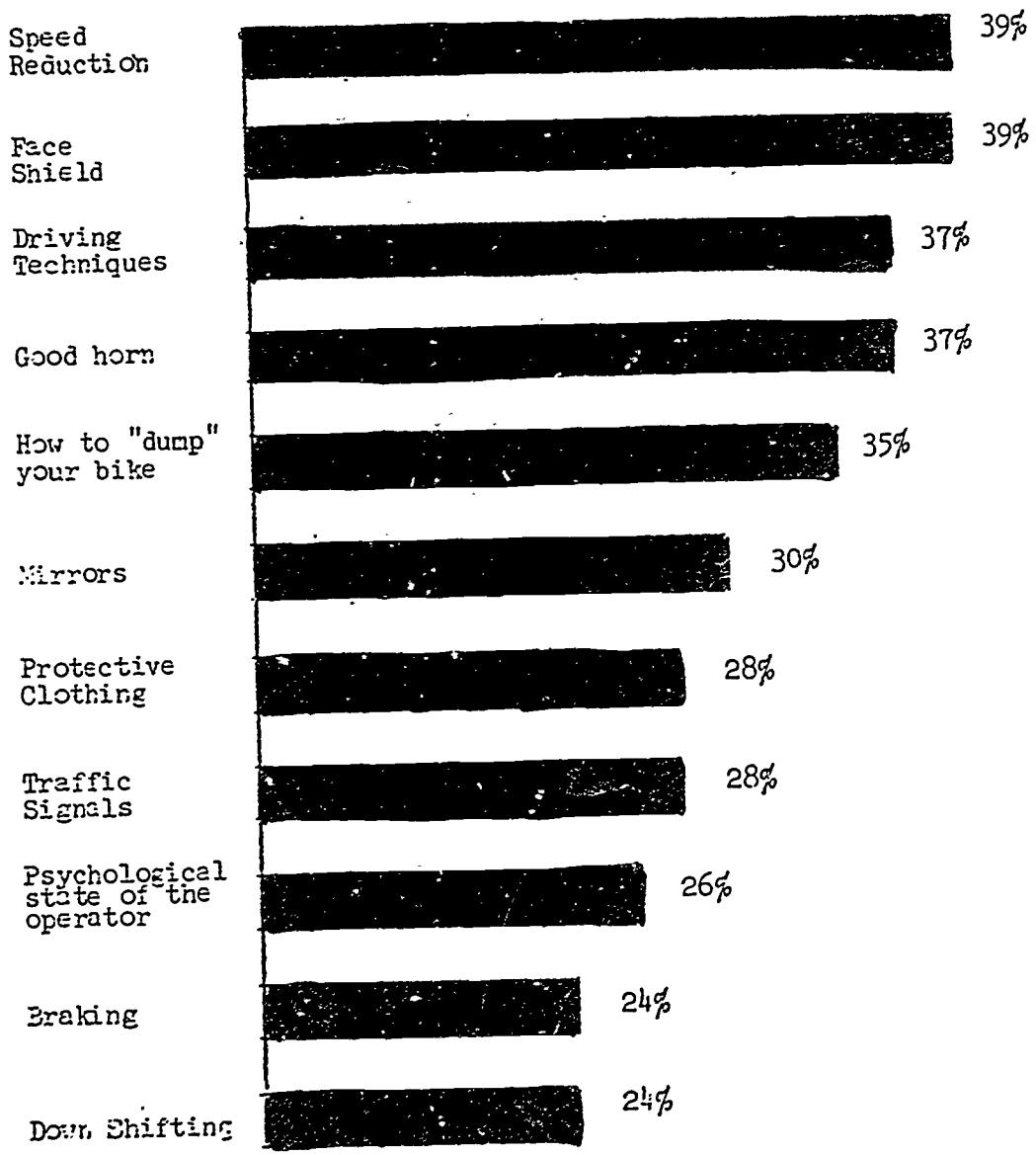


MOST MENTIONED "OUT OF CITY DRIVING" HAZARDS



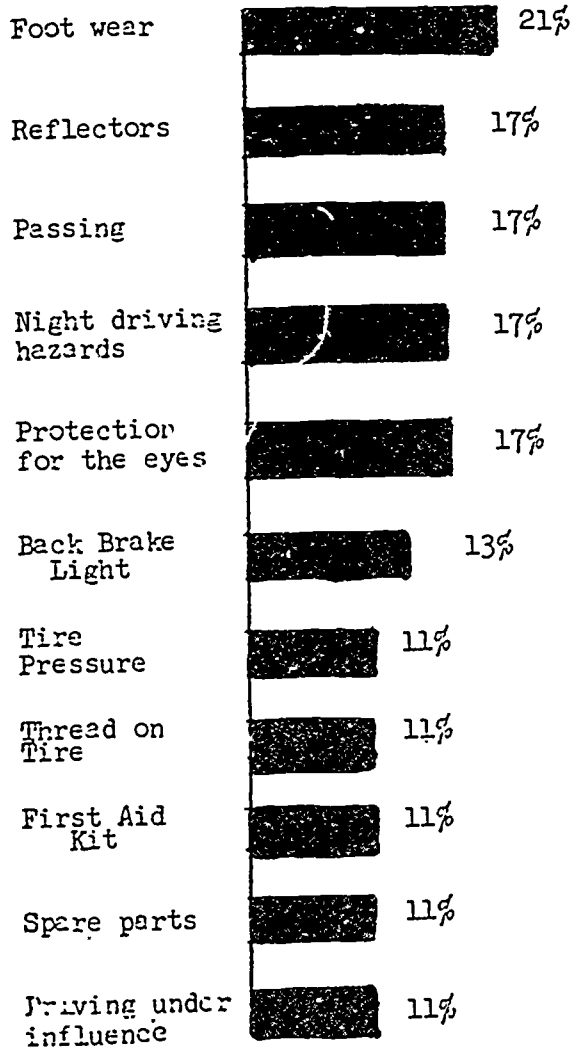
MOST MENTIONED SAFETY RELATED TOPICS

#1



The per cent figure represents the percentage of Peace Corps Ghana Volunteers who thought the particular safety related item was serious enough to write about in response to our request for Volunteer information for our 1975 Peace Corps Motorcycle safety rally. This information provided base information for the 1975 Safety Rally.

MOST MENTIONED SAFETY RELATED TOPICS #2



The per cent figure represents the percentage of Peace Corps Ghana Volunteers who thought the particular safety related item was serious enough to write about in response to our request for Volunteer information for our 1975 Peace Corps Motorcycle Safety Rally. This information provided base information for the 1975 Safety Rally.

1. People In The Road

By far, the single most mentioned danger facing a cyclist in West Africa is people in the road. Especially "old" women and men whose sense may not be as sharp and as alert as a younger persons. Frequently, due to the element of surprise of seeing a fast approaching cycle, a person will react with panic thus making his "next move" unpredictable. As a result, due to the miscalculations of both the pedestrain and the cyclist a potentially serious situation has developed. This situation is especially prevalent when passing through small "market villages" where traffic isn't heavy and people cross the road seemingly unconsciously. Beware! For you own safety and well-being - SLOW DOWN. Never take for granted that just because there is a road, you, the driver, has the right away on it or that everybody is aware of the presence of you and your machine. Oh no!! when seeing a person in the road, don't assume he automatically sees you! Because many times he doesn't think - if you observe any doubt in a pedestrain's movement, don't wait for him to correct the situation! Take the lead - slow your machine down! You'll both be glad you did!

2. Goats

People in the road are dangerous, but goats, due to their totally unpredictable nature, pose a very special threat to cyclists. Often, PCV's have complained of how they've just missed getting nailed by the sudden, unprovoked change in direction of a goat. To the experienced rider, a goat which suddenly darts across the path of his bike is a nightmarish experience. The fact that there is little that can be done in such cases makes the goat an especially dangerous adversary to the motorcyclist.
Proventive measure which can be taken to safeguard youself against these nuisances is the reduction your cruising speed. If you do not exceed 40 M.P.H., chances are that even if you do experience an encounter with a goat you'll be able to further reduce your speed to a point where total avoidance is possible. Once again, if goats are observed either in the road or to the side of it - for your own good - please reduce your speed!

3. Mud, Gravel, Sand

Here is a danger which could be sucessfully dealt with if basic precautionary measures were followed and if a little common sense was employed. Driving on anything which causes poor tire traction means one thing - reduce speed. However, another problem seems to be not just driving on "loose surfaces", but all of a sudden finding yourself riding in either mud, sand, or gravel. This seems to be not just driving on unfamiliar roads. The cyclists will be driving on a solid surface at one moment when at the next he'll find himself trying with all his skills to maintain his balance because of newly laid gravel or sand which was recently used to fill in a pot hole. Especially at night will you find this particularly hazardous. Remember, when traveling on an unfamiliar road - you'll never know when a loose surface will be upon you! Your best bet is to maintain a reasonable speed! Also remember this - during the rainy season is when you'll most often run into this situation - if possible avoid traveling unknown road during this time.

4. Potholes and Poor Road Surfaces

Remember, you are no longer driving your bike in the United States where roads are usually kept in the best conditions and where the observance of a hole in the road's surface is seldom. No, here in West Africa this is a major hazard. Often, pot holes, ruts and depressions in the road will lead to potentially dangerous situations and if not carefully dealt with, the riders safety will be severely jeopardized. Excessive speed poses the greatest threat! Often, the operator, if traveling at a moderate speed, will be able to avoid such dangers. This situation is particularly difficult to cope with while operating at night since being able to detect such a hazard at that time is not easy. Preventative measures include the following: should you see a pothole or a rut immediately infront of you, brace yourself firmly and drive right through it. By doing so, you have eliminated the dangerous situation of over-reaction which often results in not being able to balance your machine due to swerving. And once again - drive at a reasonable speed.

5. Chickens and Fowl

From the information which was gathered in this survey, chickens and fowls seem to be more of a menace than a hazard. However, they do and they will pose special threats to the safety of a cyclist. It was often remarked that especially chickens upon "seeing" or "sensing" an on-coming motorcycle became confused and thus out if its survival instincts would dart across the bike's path. Like the goat's behavior the chicken's is perhaps even more unpredictable. A chicken's sense appear to be confined to their immediate surroundings and as a result any quick or violent change which would cause startlement to the bird (such as an oncoming motorcycle) would cause him to panic and thus provoke him to run across a cyclist's path. In turn, the cyclist also panics! Seeing anything run out in front of him immediately prompts ones reflexes to react and it is because of a possible over-reaction that a serious accident may occur. In this situation it is adviseable to merely run over the bird. Braking or trying to avoid hitting it may cause a dangerous off-balance situation which may lead to an uncontrollable swerve or skid. Run right through it !!

6. Sheep

From this author's view anything which you consider more scatter-brained or more down right stupid than a sheep should be presented to Ripley's Believe It or Not. Without doubt, the sheep's brain throughout its evolution has steadily regressed to the size of a molecule. This [illegible] observed by its behavior. Unlike the goat which has some brain power the sheep's brain thrust is nil thus making it another dangerous hazard of the road. Similar to the goat in its unpredictableness, it also, without warning, will cross a cyclist's path causing serious havoc. Beware of sheep - they are deadly - stupid - and easily confused. When seeing one either on the road or off to the side - for your own well being - SLOW DOWN.

7. Lorries, Trucks and Oncoming Vehicles

Let's face it, when riding a motorcycle anyhere in any country, the presence of other vehicles is bound to present problems. Here in West Africa these problems seem to occur at a greater frequency due to existing conditions of the roads, of the driver and even of the economy! From information collected by this survey, PCV's upon PCV's have often quoted experiences which they themselves were personally involved in of how they were nearly run off the road by a lorry or how a big truck barreled down upon them from behind and scared the ever-loving balony out of them. It's no joke!! Beware of lorries coming from behind - use your mirrors frequently - and if he wants to pass help him by giving signals!

Also, due to a poor surface on one side of the road an oncoming vehicle may be seen driving in your lane. This at night can be especially dangerous and what better way is there to avoid a possible mishap than to REDUCE YOUR SPEED and if necessary even stop. It's surprising to read of how many Volunteers just kept cruising. Use a little common-sense and don't depend upon the skills of the other driver. Lorries, trucks and oncoming vehicles are here to stay - let's hope the same can be said about you.

8. Poor Visibility At Night

Driving during the day in West Africa is in itself dangerous but operating at night is twice as hazardous. Not being able to see oncoming potholes loose road surfaces and other obstructions reduces to almost zero the time you have to react to such situations.

Not only is there the problem of the cyclist not being able to see but also of him not being seen. Statistics prove beyond a doubt that for some reason motorcycles both at night and during the day are difficult to spot. So what do you do? It's adviseable notto drive at night but if it is necessary and if you know you'll have to be doing alot of night-time driving then cover both you and your machine with specially reflective decals. Make yourself easily recognizable to other drivers and be realistic in this sense - at night the total field of vision can be reduced by as much as 70% - travel at reduced speeds and live.

9. Cows

Another obstacle which seems to plague the cyclist here in West Africa is the cow. Never take for granted that just because he seems to be passively chewing some grass off the side of the road that he isn't easily startled. No!! A cow is a very timid animal and if provoked or if disturbed will also become very unpredictable. Due to its size an accident involving a cow and a cyclist can be extremely serious. Once again - your best defense is a reduction in speed for if you hit a cow whilecruising you'll be in for a bruising.

10. Ducks

And so, we have come to our last special hazard of driving in West Africa - the duck. Unlike hens and fowls, the duck appears to have some brains about it. But like his counterparts if startled or provoked will also run across a cycle's path. A duck isn't as easily disturbed as a fowl but as was mentioned before, if surprised will, out of instinct turn to a very unpredictable behavior. As in the case of the hen and fowl - should a duck cross your path - do not try to avoid it - run it over.

MOTORCYCLE MAINTENANCE

I. LUBRICATION

Engine Oil - Use one of the multi-grade oils (i.e., 20W-40) and stick to the same brand.

Drain and re-fill every 500 miles. Honda 125 takes 1 U.S. quart. Yamaha 125 takes 1½.

Buy one quart for measuring, and a gallon or two for refills. A plastic funnel is handy. The oil filture on Hondas (actually a centrifuge) can be cleaned every 1,000 miles or so, but it's not very crucial except at the first 1,000 miles or after buying a used bike. Here's a few hints on oil-changing:

1. Clean the drainplug area when the engine is cool, and loosen the drainplug a little. A properly fitting spanner (wrench) is essential. Make sure you turn the plug counterclockwise (looking at it as if you were lying on your back). The typical fitter over-tightens the plug; if your tool-kit opened spanner can't do the job, then borrow the correct socket spanner. If it has been so badly rounded off that no spanner can get a good grip, then vice-grip pliers must be used. It's better not to change your oil for a while to enable you to get some place where they have the proper tools, than to allow a fitter to use hammer and chisel, as they are so fond of doing.

2. Run the engine till it's hot, shut it off, and drain the oil into a pan. (If you dump it into your cesspool, it helps control mosquitoes breeding there. A good dran pan is made by cutting out one side of a rectangular gallon oil can with heavy old scissors or tin snips. You can buy such cans in the market or scrounge around for an old hubcap or something.) Rock the bike on its center stand to get all the old oil out.

3. Clean the plug and washer; if there was any leakage of oil, make a new washer of leather (from the market). Re-fit the plug and washer after cleaning any dirt from around the plug hole. Don't use much force in tightening it, just get it nice and little snug with your spanner. In general, screws and bolts threaded into aluminum require very little torque to make them stay put. Too much torque will virtually weld aluminum parts together.

YAMAHA LUBRICATION - Since the Yamaha is a 2-stroke engine, the crankshaft, bearings, piston, rings and cylinder walls are all lubricated by the oil mixed with the petrol. The oil in the crankcase is merely transmission oil, so 2,000 miles is often enough to change that, though more often can't hurt except in the wallet. The 125 transmission, incidentally, is notoriously weak, so change gears with gentle pressure, not stomping. If changing gears or finding neutral is difficult, your clutch is probably not fully disengaged when you pull on the handle. Adjust it.

MOTORCYCLE MAINTENANCE (CONT'D)

I LUBRICATION (CONT'D)
YAMAHA LUBRICATION (CONT'D)

For the "Autolube" you should use 2-stroke oil (e.g., Shell 2T or Mobilmix), but at times you can't get this so you have to use engine oil. Trouble is, engine oil just ain't right for 2-strokes and you might have an unpleasant piston seizure, due to poor lubrication. One remedy is to add engine oil to the petrol - about a cup of it to a full tank of petrol. For a new or rebuilt 2-stroke engine, it's a good idea to put oil in the petrol if you have regular 2-stroke oil. In fact, racing 2-strokers often do this just to be on the safe side in case the rather temperamental oil injector ("Aytolube") fails. Too much oil, on the other hand, can reduce engine efficiency.

One other tip on "Autolube" - it is operated by one of the cables connected to the throttle twist-grip, and this cable should not be allowed to be loose. When it is loose, it can slip off the little pulley located near the carburetor, thus causing failure of the oil injector. Result: piston seizure.

CHAIN - Jim says the Yamaha workshop manual recommends 10W-30SD oil (SD is Severe Duty, equipvalent to MS. Most Severe, or SE, Severe Engine - note HD means Harley Davidson as well as High Detergency, but not Heavy Duty). Keep it well juiced with engine oil, gear lubricant, or the heaviest oil you can find, but not grease nor very light oil. Put the bike on its centerstand, remove the plastic cover from the chain guard, and soak each and every link. You can't apply too much. Some handy oilers are: a PhisoHex bottle, a Vaseline Shampoo bottle, a Handy Oil can (with a long spout), or a small paint brush. Chains streech no matter how well-oiled they are, but the amount of stretch and wear is reduced considerably by frequent oiling, especially on long trips. Touring bikes (500 cc. and up) typically have automatic chain oilers, but these small machines were not designed for touring. Keep the chain properly adjusted - not too loose and not too tight; about ¾" or down of say at center of chain. The rear wheel should spin freely with no binding. If your chain is too loose but the axle is back as far as it can be adjusted, then a link can be removed by a local fitter. They know how to do that. A new chain on old, worn sprockets will wear out very soon, so if your sprockets and chain are hopeless, then do your best to get all three new: the two sprockets and the chain.

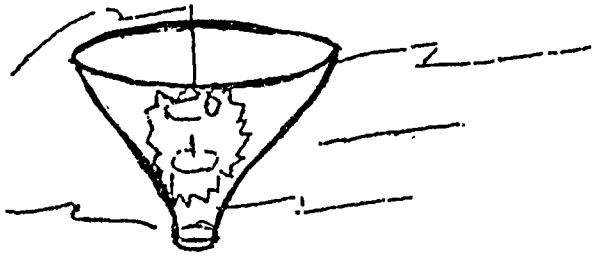
If you ride on dirt roads, the chain should be removed, cleaned and re-oiled as frequently as you can stand it. Remove the front sprocket cover and the chain guards. Reroval of the master link (use pliers on the clip) will "break" the chain, which should be thoroughly washed in kerosene. First, coil the chain and soak it in kerosene and use an old toothbrush to remove the grit. Your oil drain pan will serve nicely. Knead each link until it is free. Wash the chain with kerosene until you hear no more grinding noises upon flexing. Hang it up to drip-dry. To lubricate the clean, dry chain you can use gear lubricant, or, better yet, a hot mixture of 1 qt. 40 wt. (or 30) oil plus one large jar of vaseline. You dip the chain into the hot, well-stirred mixture, holding one end of the chain by a wire or string, and remove it to cool. Upon cooling, the oil will congeal after having penetrated every little crack and crevice of the chain. Keep the mixture covered for use at the next cleaning. I've round a small-size powdered milk tin works well; it and be used for heating and mixing, dipping, and storage. After cleaning, he next regular lubrication is done again with gear lubricant.

MOTORCYCLE MAINTENANCE (CONT'D)

I LUBRICATION (CONT'D)

SPEEDOMETER CABLE - It's not crucial to lubricate this, unless it's making noise, but if you are trying to be thorough, unscrew (or unclip) the cable at the wheel end, remove the inner cable without dropping it in the dirt, and smear it graphite grease (e.g., Mobilgrease). Put the cable back in the way it came out, and spin it with your fingers until you are sure the upper squared end has slipped into its socket in the speedometer. Then insert the lower squared end into the frontwheel housing; tighten it up while spinning the front wheel (let somebody sit on the back of the bike with it on the centerstand). Now, spinning the wheel fast should make the speedometer move a little.

CABLES - The clutch and front brake cables should be kept lubricated with engine oil. Sometimes a dry cable can be freed by disconnecting it from the handle, and running penetrating oil down the wire. Another trick is to tie the cable up with a string to a branch or your garage ceiling, fix a paper funnel tightly around the upper cable sheath with a sting, and pour oil into the funnel, allowing it to seep down overnight.



If yourclutch handle is difficult to pull, first try lubricating the cable as shown above and checkthe cable sheath to be sure it hasn't been pinched or bent somewhere. If the cable is ok, then the clutch release mechanism is probably rusted up or poorly lubricated. On Hondas there is a grease nipple on the left side of the engine; find a fitter with a grease gun and pump some in while pulling the clutch handle. If it's still too stiff, the cover into which the lower end of the clutch cable fits must be removed and disassembled to clean all the parts (especially the single ball bearing and the steel shaft, which pulls out) before regreasing and reassembly. A fitter who has worked on Hondas before can do this easily, but it's a good idea to be there so you can hide his hammer and chisel: bring your tools for him to use.

FRONT SHOCK ABSOBBERS - The oil in these should be changed at least once every year, and more often if you ride rough dirt roads. If the action is too stiff, causing your teeth to chatter on every road ripple, use your multi-grade engine oil. If the action is too soft, and small pot-holes cause the shocks to "bottom out", use straight 30 weight or even 40 weight. In general, the rougher the roads you ride, the stiffer your shocks should be. For Hondas, remove the chromed cap at the top of each shock, then the small bolt or screw at the bottom and allow the oil to flow out. Reverse your steps, adding the correct amount of oil very slowly. Do not overfill; Hondas use 135 ml. per shock. If your shocks leak oil, the only remedy is to have a competent fitter install new seals (which aren't available in Ghana).

MOTORCYCLE MAINTENANCE (CONT'D)

I LUBRICATION (CONT'D)

FRONT SHOCK ABSORBERS - For Yamaha front shocks, every 4,000 miles or more often, remove the handlebars, then drain and refill with 180 cc. of engine oil. Probably one of the multi-grades will do (e.g., 20W-40), but you'll have to try it and see if it is ok for your bike and your raids. Don't neglect this job or your irreplaceable seals will go bad.

TIMING - The point gap and condition is critical, so make sure once the timing is correct, that the points are clean, non-pitted, and seating properly. The points should ave no oil on them (not even fingerprint oil) This is best cleaned with alcohol (methylated spirits) though a clean petrol-soaked rag will do if you're careful to remove the petrol residue with a dry corner of the rag. When checking the point gap, make sure the feeler gauge isn't oily. If your points are pitted, they can be filed smooth (or ground on an oil stone) as a temporary measure, but it is far better to simply install new ones. Keep several spares on hand.

Now, the timing: this procedure gets the engine to within a few degrees of perfect, but that should be ok provided you are using the right spark plug and the "Autolube" is working all right. Otherwise, even a few degrees wrong and on a long or fast trip you could burn a hole through your piston.

The timing procedure is exactly as described above for Honda, with the exception (important) that the centrifugal advance must be in the fully advanced position. The centrifugal advance is the set of weights behind the contact plate which move outwards when the engine is speeded up. You can see them easily when you start the engine with the side cover off. Hold these out with your fingers, or jam them out with a screw-driver or something, and then go through the usual timing procedure as described on page 3.

SPARK PLUGS - 2-stroke engines eat plugs faster than 4-strokes. If yours lasts 2,000 miles, you've done well. Unfortunately it's not easy to 'read' a 2-stroke plug as an indication engine efficiency as can easily be done with 4-stroke plugs. If you do only putt-putt driving, your plug may be fouling with oil and carbon because ir never gets hot enough to burn itself clean. You can get a 'hotter' plug by getting one which has a lower number. For example, take the plug series D9, D8, D7, D6. D9 is a very 'cold' plug to be used in very hot engines like a 2-stroke always driven on the highway, whereas D6 is a 'hot' plug for cold engines like a 4-stroke putt-putted around town. See the owner's manual for a good chart on this.

2 STROKE SILENCERS - the silencer should be removed from the exhaust pipe for cleaning every 1,000 miles or so. A plugged silencer quiets and engine nicely - it won't run.

2 STROKE HEAD CLEANING - (.42 of Yamaha Maunal) is easy and necessary, so don't be afriad to do it. Don't use much torque in tightening down the head bolts.

NOTE: The correct spark plug gap for Yamaha is 0.019" to 0.023".

MOTORCYCLE MAINTENANCE (CONT'D)

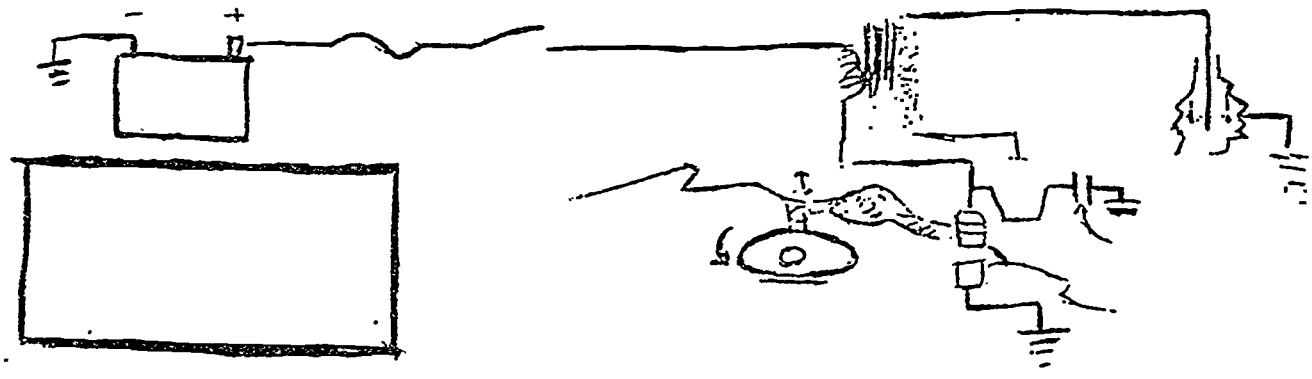
I LUBRICATION (CONT'D)

MISCELLANEOUS

(1) Sometimes the front brake return spring doesn't push hard enough to allow the brake to fully release. First, make sure the cable is well lubricated (see above). If the problem is still there, the brake mechanism in the wheel housing may need a little grease in the right places. This requires dismantling the brake hub completely to get grease on the surfaces. It's not too difficult, but if you're mechanically inept, ask a fitter to do it, but stay around to make sure he doesn't get grease on the brake shoes or drum.

(2) The side covers on a Honda go on and off easier if they are lubricated with paraffin wax.

II IGNITION TUNE-UP - It helps to have a general idea of how an ignition system works - Yamaha and Honda are essentially the same.



The spark plug fires each time the points open. When the points close, due to the rotation of the eccentric cam, current flows through the fuse, the closed ignition switch, the primary winding (P) of the ignition coil (a high tension transformer), the points, and finally to the engine block, the steal motorcycle frame, and thus back to the battery The eccentric cam, which controls the opening and closing of the points is connected either directly or by a chain in the engine (the "timing chain") to the engine crankshaft. When the points open, the current collapses to zero.

This collapse of current in the primary windings of the coil constitutes a moving electrical field which premeates the secondary winding (S) thus indicating a high voltage, low amperage current in the secondary winding circuit which is capable of jumping the spark plug gap to earth. This is the spark which occurs just before the piston arrives at top dead center on the compression stroke to begin the ignition of the combustible mixture of petrol and air enclosed above the piston. It is essential for smooth running and good power that the spark comes at just the right time. This implies that the points must open at exactly the right time relative to the crankshaft (or piston) position.

II. IGNITION TUNE-UP(CONT'D)

An ignition "tune-up" consists of checking three things: (1) the maximum distance between the points, called "the point gap"; (2) the time, relative to the crankshaft position, at which the points open, called "timing the engine"; and (3) the distance between the spark plug core electrode and the lower (bent) electrode, called the "spark plug gap".

TUNE UP OF 4-STROKE ENGINES

On Hondas it's a good idea to first adjust the timing chain tensioner. (Yamahas don't have a timing chain). To do this you need engine cover to reveal the dynamo with the timing marks. Then take off the cap nut which is on the lower engine housing almost directly below the carburetor. Under the cap nut you will see the timing chain adjusting rod, which is held in place by a bolt perpendicular to it. This bolt's head is recessed into the left cover and the recess is hidden by a rubber plug. Remove the rubber plug loosen the bolt s lock-nut with the 12mm. socket, then slacken off the bolt with the 10 mm. socket but don't remove the bolt. As soon as the bolt is screw from timing chain adjusting rod should move freely. If you remove a screw from one of the trafficator lenses and screw it into the hole tapped into the top of the adjustter rod, it will make it easier to control its motion. Now, pull up on the adjuster rod while you rotate the cranshaft (use a spanner on the dynamo bolt) in the direction of normal rotation. Stop the rotation when the adjuster rod seems to be at its highest position. While keeping tension on the adjuster rod fix its position by tightening the bolt with the 10 mm socket. Then tighten the 12 mm. lock-nut, replace the rubber plug and the cap nut over the adjuster rod. Now you've ready to do the timing.

A tune-up is easy to do, honest. The first time through will take a long time, but once you understand what you're doing, it will take only 15 minutes or so. Thickeness ("feeler") gauges are almost essential, so buy some (a set) or borrow them.

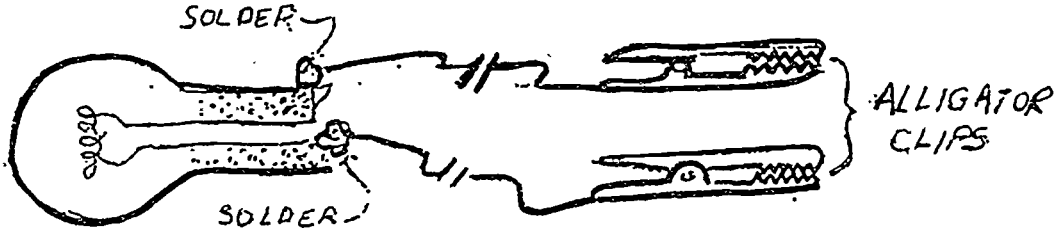
Back to the tune-up for Hondas. (1) remover the spark plug(s), the small chrome point cover (Honda) and the round cover on the left side of the engine covering the dynamo. (2) rotate the crankshaft with a spanner until you see the points are at their maximum opening. Measure this with your feeler gauge It should allow a 0.012 in gauge to slide through, but a 0.016 in gauge will have to be forced to pass through the gap. If it's not correct, adjust the gap by slacking off the two screws which hold t[illegible]ts, and open or close the gap necessary. Usually there is a slot and pin arrangement which makes this easy to do with a screw-driver without having to loosen the two screws very much. Once the gap is correct, tighten the screws, and recheck the gap (3) now find out if the points open at exactly the right time. Rotate the engine in the direction it normally runs. The points should just open (i.e. break electrical contact) when the pointer on the miving crankshaft meets the line fixed on the engine relay. For Honda, the correct moving pointer is marked F (for Fire).

MOTORCYCLE MAINTENANCE (CONT'D)

II IGNITION TUNE-UP (CONT'D)

TUNE-UP OF 4-STROKE ENGINES (CONT'D)

There are several ways to find out when the points break electrical contact: (a) eyeball it O not very accurate but ok for quick checks; (b) use a resistance (ohm) meter which might be available at your science lab. In this case you must disconnect the wire leading to the points; (c) make a test light with alligator clips. The bulb must be for the same voltage as your battery (Honda is 6V, and Yamaha is 12V). A dual-filament tail-light bulb in which one of the filaments is burned out is fine. The leads can be any insulated wire, the soldering might be done at your science lab or perhaps the local fitters or radio repair shop, and the alligator slips are available in your Science Lab or at many radio shops. Once you've got the thing made, it's easy to use. Just connect one clip to one of the engine cooling fins and the other to an exposed part of the wire leading to the points, turn on the ignition and rotate the engine crank with a spanner. When the points are open, the light glows; when closed, the light is out. So as you rotate the crankshaft, the light should glow just as the moving pointer and the stationary line meet.



(4) If the points don't open at just the right moment, then you must adjust the timing by loosening the screws which hold the plate which in turn holds the points. Inspection will reveal what I mean. Rotate the plate one way or the other until the points open at the right moment. One way of getting close to this to set the crankshaft line right in line with the fixed pointer, then rotate or move the timing plate little by little until the points just open.

(5) Go back, after tightening the timing plate screws, and check your point gap at its maximum. If you had to move the timing plate very much, the point gap probably will have changed. If so, move the timing plate back a little towards the position it had before you started fiddling with it, then check your point gap again and adjust it if necessary.

Repeat steps (4) and (5) until both the timing and the point gap are correct. Hondas can be timed with near-perfect accuracy this way. The only variance is that on many Hondas the points will open at the correct moment, but upon rotating the crankshaft 369° the timing seems to be off. Another 360° and it's on again. This means one cylinder is timed just tight, but the other isn't. The best you can do is to average out the difference and have one cylinder fire before the mark a little, and the other fire an equal amount after the mark.

MOTORCYCLE MAINTENANCE (CONT'D)

II IGNITION TUNE-UP (CONT'D)

TUNE-UP OF 4-STROKE ENGINES (CONT'D)

(6) Put a few drops of engine oil on the small piece of felt which rubs against the eccentric cam. This prevents wear of the points "rider". Don't sop it, since oil on the points can cause poor performance.

(7) Check the spark plug gap. It should be about 0.025 in. for Hondas and 0.020 in. for Yamahas. If the gap is too small, gently pry up the bent electrode but don't put any pressure on the center (core) electrode. If if the gap is too big, gently tap the bent electrode on the aluminum engine block until it is correct. The plugs should be washed with petrol, using an old toothbrush. If there are scaly deposites, remove them carefully by scraping. Cleaning the porcelain or ceramic core electrode can be done, but it's risky since they crack easily causing poor performance. Often you won't be able to see the crak or "leak" which exists in faulty spark plugs. Some filling stations have sand-blast plug cleaners which do the best, safest job. Great care must be taken when replacing the plugs so that you don't cross the threads. Aluminum plug hole threads are notorious for this. It helps if the threads are cleaned first with a petrol-laden toothbrush. You can put a little oil on the spark plug threads, too. If the carburetor is working ok, and if oil is not getting into the combustion chamber, the electrodes of the spark plug should have a tan appearance. If they are tan but very crusted maybe you have been using regular petrol instead of the premium that you should be using. If they are white and look corroded, it's likely the mixture of petrol/air is too lean. If they are black and foul-looking, the mixture is too rich and/or oil is getting into the combustion chamber past the rings or the valve guides.

(8) The condenser, which looks like a little can with either one or two wires going into it, is near the points on Yamahas but under the petrol tank near the coil on Hondas. Condensers seldom fail, but it's good to have a spare in case you might suspect it. A faulty condenser typically causes mis-firing and poor power; often they act up only when they have been heated by the engine. The ignition coil almost never fails unless it is somehow cracked open.

III. ELECTRICAL SYSTEMS

(a) The Battery: The life of a battery is about two years, often longer if it's cared for properly and kept well-charged.

1. A new battery should be filled with 33% sulfuric acid, allowed to stand for a few hours, and then charged for a day at a rate of 1 amp. Some batteries are 'dry charged' thus eliminating the need for the long, slow initialy charging. If your new battery is not supplied in a vacuum-packed container, then don't believe that it is dry charged, but charge it up for a day anyway After this charging, record the acid density (find a hydrometer) for future reference.

MOTORCYCLE MAINTENANCE (CONT'D)

III ELECTRICAL SYSTEMS (CONT'D)

The Battery: (Cont'd)

2. Always keep your battery topped up with the best distilled water you can get. Never use tap water. In an emergency, really clean rain water will do.

3. Never add more acid once your battery has been properly started as in (1), except in the case to be mentioned in (4).

4. If you do allow the level in your battery to go way down to the bottom, add distilled water to just above the plates, and charge the battery, perferably with an external charger. Keep the charging rate low, about 1 amp. and don't let the level fall below the plate After this charging, check the acid density with a hydrometer, and compare it to the reading you had before, as in (1). If it's nowhere near, indicating a dead battery, then you can add acid to the full mark to bring the density up, but plan on buying a new battery soon, if you can find one.

5. Many fitters swear they can rejuvenate an old battery simply by replacing the old acid with new. This is true to some extent but at best it may extend the useful battery life for another month or so, though it won't have much reserve power, and it won't help if your charging system is at fault or is not working properly. The best way to effect this 'fitter's miracle' is to (i) charge up the battery as well as possible, (ii) dump out the old acid (it has lots of lead dissolved in it, so don't pour it where it will get into any water supply), (iii) add fresh 33% acid.

6. If you have to store your battery for a month or more, the best thing to do is to leave it with a friend for recharging every two weeks after cleaning the outside of the battery very well. If this is impractical, or if you don't trust your friend, then do the following: (i) charge up the battery, (ii) pour the acid into a glass bottle to be saved, (iii) rinse the inside of the battery at least three times with distilled water, but don't shake it too much (iv) allow it to dry well in the sun with the filler caps off, (v) replace the filler caps, pinch closed the vent tube, and store it away with the acid bottle, (vi) when re-starting the battery, put the acid back in equally among the cell, top up with 33% acid, and recharge if possible.

Battery Charging Systems - Yamaha: These have a d.c. (direct current generator located behind the points/contrifugal advance mechism. A generator converts engine rotation into low-voltage d.c. The faster the engine turns, the more electricity it produces. At high speeds it can produce too much (20-35V), which can damage the battery and blow off light bulbs so a 'voltage regulator' is required. On Yamahas this is a little magic box located near the battery, and I trust you will never have to worry about it. The only generator parts which will need eventual replacement are two carbon 'brushes' which are identical to these contained in the starter motor.

MOTORCYCLE MAINTENANCE (CONT'D)

Battery Charging Systems (Cont'd)

Honda: These have an A.C. (alternating current) alternator (Honda calls it a dynamo') located inside the left cover of the engine. The design of an alternator is such that it requires no voltage regulator, but a rectifier is required to change the A.C. into D.C.. The rectifier is located in the frame under the petrol tank.

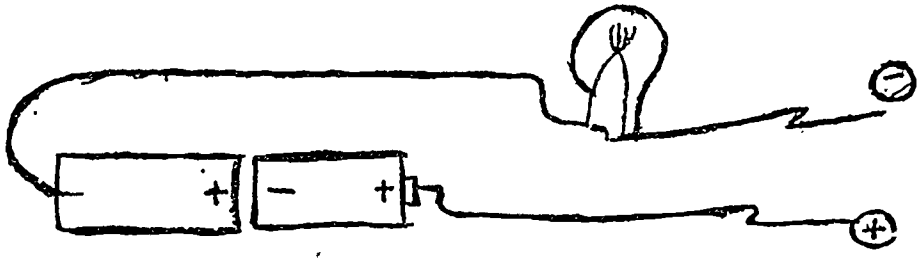
The alternator consists of 3 pairs of stationary coils of insulated copper wire which lie in a circle, surrounding a rotating circular magnet which is attached to the left end of the crankshaft. When the engine is running the magnet rotates, and a current flows through the copper coils to the retifier, the battery, and then to the ignition, lights, and horn.

(When running during the day, only one pair of the coils is used; when the headlight is switched on, the other two pairs of coils are also switched into the charging circuit to increase the available current.)

The weakest link in this system is the rectifier, which consists of four diodes, each of which allows current to pass in one direction, but no in the opposite, like a turnstile. A rectifier 'blows' when the diodes no longer function; they pass current in both directions, or not at all. Such failure is due to overheating of the diodes caused by too much current flowing (like when you have a short circuit somwhere).

When a rectifier fails, the battery will be charged only maginally or not at all. As the battery's charge decreases, the horn will fail to work, the the electric starter will grind to a halt, the trafficators will not blink or will blink only slowly, and the headlight will glow dimly. The engine may run at a fast idle, but it won't idle normally without stalling. If the battery is dead, and the rectifier blown, nothing will work.

CHECKING A RECTIFIER - (Thanks to Randy Houtz a UST for his suggestions) This is a simple task once you have a test 'instrument'. The best is an ohm-meter but pratically as good is a battery-powered test lamp which fairly easy to make:



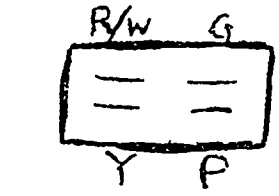
(NOTE: The battery here can be any battery 6V or less, but use a bulb made for the voltage to the battery you use.)

MOTORCYCLE MAINTENANCE (CONT'D)

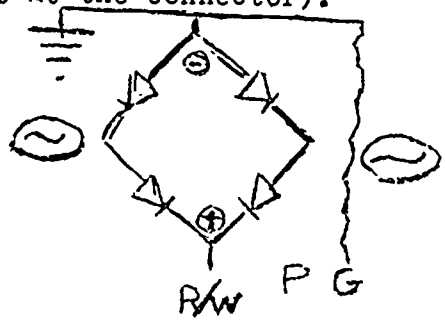
III ELECTRICAL SYSTEMS (CONT'D)

CHECKING A RECTIFIER (CONT'D)

Remove the side covers from your Honda (the ones covering the battery and the air cleaner). Above the carburetor you will find a white plastic electrical connector which connects the rectifier wires to the wires leading to the alternator and the battery. Pull the connector apart. The upper (male) half with its four metal prongs will be used for the tests to follow notice which prong is associated with which wire-yellow, re/white, pink green and associate your male plug colours with the males plug color code given in the diagram below. For the interest of some esthetes, the rectifier circuit diagram and associated color code is also given below. (NOTE: you may have to remove the petrol tank and the carburetor to get at the connector).



MALE PLUG COLOR CODE



RECTIFIER CIRCUIT DIAGRAM + COLOR CODE

Connect the positive lead of the lamp to the pin attached to the red/white (R/W) lead, and connect the negative lead to the yellow (Y) pin. The light should not glow. Reverse the leads, and the light should glow. Follow the chart below, and check all 12 combinations.

		with positive lead at:				
		R/W	Y	G	P	
with negative Lead at:	R/W	X	L	L	L	L - Light
	Y	N/L	X	L	N/L	NL - No Light
	G	N/L	N/L	X	N/L	X - Xanthropomorphic
		N/L	N/L	L	X	Irrelevent

* It lights, but is weak relative to the other L's.

If you are using an ohm-meter, interpret 'L' as being about 400 ohms and 'NL' as about 40,000 ohms. The actual values vary; what is important is that the ratio od (L) to (NL) is about 1 to 100.

If these tests show the rectifier to be faulty, then you must buy a new one. Don't install the new one until you are certain there is no short circuit in the wiring (e.g., a bare wire rubbing against the frame). This can be a frustrating job; if you aren't experienced, get some help. The Honda manual has an excellent circuit diagram. It's often difficult to find new rectifiers at a reasonable price, but you can get 6-diode automobile rectifiers which are really heavy-duty.

III ELECTRICAL SYSTEMS (CONT'D)

CHECKING THE ALTERNATOR - Alternators typically fail only rarely on very old machines and can be adapted. Checking is simple, using the same test instrument as you used for checking the rectifier. (Actually the best test instrument in this case is a test lamp as described above with the battery replaced with a 100 volt A.C. source). (caution!)

1. Pull apart the white plastic connector located in the frame just behind the carburetor. Locate the prongs in the lower half corresponding to Yellow (Y), white/yellow (W/Y), and pink (P).

2. Test for continuity: one test lead to the other should cause the light to glow. Y to W/Y; Y to P; and W/Y to P. If this test fails, it means there is a break in at least one of the coils of copper wire, and the alternator windings must be replaced.

3. Test for shorting: if the test for continuity was ok, take any of the three wires, connect it to one of the test lamp leads, and 'ground' the other test lamp lead by touching it to the engine casing. The light should not glow. If it does, then it means one of the alternator wires is shorting against the engine casing. Sometimes removal of the alternator coils and careful inspection will reveal the short, which can then be repaired, but more often a new alternator coil set, or "stator" is required.

4 Though highly unlikely, it's possible for the rotating magnet to become weak. Touch each magnet with a screwdriver; each should hold it with the same force.

CARBURETORS

General Background Info: The carburetor is supposed to mix petrol with air in the correct proportions at all engine speeds. The correct ratio is about 13 pounds of air mixed with one pound of fuel, which works out to about 140 cubic feet of air for every pint of fuel (now do you appreciate the air cleaner?)

Too little fuel (clean mixture) will give greater mileage, but causes the engine to run hotter and wear out sooner, plus it won't be as powerful. Too much fuel will waste petrol (a finite commodity, as is your cash); the resulting rich mixture will cause very incomplete combustion and coat your combustion chamber, spark plug, and exhaust pipes with carbon.

Almost all motorcycle carburetors operate so that as the throttle twist-grip is twisted, a cylindrical piston rises in the carburetor allowing more air to enter the engine. A tapered pin is attached to this piston, so that as more air enters, more petrol enters, too. The position of this tapered pin regulates the air/fuel ratio at higher engine speeds; at low engine speeds, there is a complicated arrangement for adjusting the air/fuel ratio but fortunately this is controlled by a single, simple screw on the side of the carburetor. Every carburetor has a screw to adjust the idle speed, but this in no way affects the air/fuel ratio. Thus every carburetor has three basic adjustments: (1) idle speed, (2) idle or low speed air/fuel ratio, and (3) high speed air/fuel ratio.

IV. CARBURETORS (CONT'D)

Yamaha Carburetors: The carburetor and oil injector is located behind the right-hand engine cover held on by four large screws. One of the throttle cables enters the top of the carburetor to control the piston, and the other goes to the oil injection control. At the top of the carb you'll see a brass knurled nut which is the idle speed screw. This should be adjusted to give you a nice idling speed. The idle air/fuel ratio screw is located in the side of the carburetor, and normally doesn't require adjustment., The rough setting of it is 1½ turns back out after turning it in fully. Setting it there is just fine - fiddling won't help.

To adjust the high-speed air/fuel ratio (this won't be necessary for at least a couple of years on a new Yamaha), unscrew the cap on top of the carburetor, and pull the piston-pin assembly up and out. Hold the spring (inside the piston) compressed up against the cap, and remove the pin. The circlip at the top of the pin should be moved up one groove to make the mixture more lean. This is the usual step since the pin will gradually become worn, allowing too much fuel to pass by it, thus making the mixture rich.

Honda Carburetors: The idle speed is easily adjusted by the knurled screw on the lefthand side of the carburetor. Also on the left is the 'air screw' or low speed air/fuel ratio screw, with its face slanting upwards. The rough setting for this is from 1 to 1¼ turns open from the fully closed position. To get it just right, increase the idle speed and turn the 'air screw' in a little until the engine begins to slow down. Note the screw position. Then back it out until the engine slows down. Where you get maximum RPMs is the correct position, usually half-way between the first and second positions. If turning this screw makes little or no difference, something is wrong. Read on.

If something is wrong with your carbutetor, it will probably be one or both of these two things: (1) the tapered pin is worn and the mixture is too rich, (2) there is a hole in the diaphragm located inside the carburetor. If you suspect either or both of these faults (plugs are black from rich mixture, no zap in the engine due to holy diaphragm), then I suggest the following procedure:

1. Remove your exhaust pipes to observe the colour the burning exhaust gases. If they are quite yellow with the engine running then your mixture is too rich. If they are blue with a bit of yellow mixed in, your mixture is ok. If they are blue or blue-white, your mixture is too lean.

Now you will know whether or not to adjust the position of the tapered pin, which controls the high-speed mixture ratio.

2. Remove the carburetor: (i) take off the throttle cable by completely unscrewing the cable adjustment and slipping the cable end out of its holder in the carburetor arm; (ii) turn off the petrol tap and disconnect the petrol hose; (iii) remove the left side cover and remove the two bolts holding the air cleaner to the fram; (iv) loosen the hose clamp holding the air cleaner hose to the carburetor; (v) remove the two nuts holding the carburetor to the manifold bolts; (vi) wiggle the carburetor free.

IV. CARBURETORS (CONT'D)

Honda Carburetors: (Cont'd)

3. Clean the outside of the carburetor with petrol and a brush, then open it up by removing the four screws in the top. Inside you'll see the diaphragm. Lift it up and hold it to the light to inspect for any holes. These must be sealed up, preferably with something very flexible. Randy Houts recommends using a patch cut from a condom and stuck on with contact cement (Bostik). I've used the adhesive part of plastic band-aids and even replaced the whole diaphragm with a double layer of bread-bag plastic. Fitters often discard the punctured or torn diaphragms and wire the throttle lever (inside the carb top cover) to the piston. This works, but never gives performance as good as a diaphragm.

4. If the color of your exhaust gases (see #1 above) showed the mixture too rich, remove the tapered pin from the carburetor piston. It's held there by a small set screw. Move the circlip on groove towards the top of the pin (away from the point), and replace the pin in the piston, and reassemble the carburetor making sure everything is perfectly clean.

5. Remove the carburetor bowl, held on by a spring clip. Wash it out well with petrol; if it has a lot of sediment, by all means clean out the petrol stopcock bowl and filter on the fuel tank. If that's full of sediment, you'd better drain your fuel tank and wash it out well with petrol. Just a little dirt in the wrong place inside the carburetor can cause trouble. Replace the bowl.

6. Put the carburetor back on. Make sure the black plastic piece which the front end of the carburetor rests against is on the right way. Careful inspection will show you which is right. Also make sure the carburetor fits tight against the manifold; any leaks here will cause air to be sucked in, thus making the mixture too lean.

7. Re-attach the exhaust pipes.

8. Adjust the 'air screw' and the idle speed. If you have corrected your mixture or repaired your diaphragm, you will certainly notice improved power and response.

NOTE: This should have been part of (1) above: sometimes a rich mixture is due not to too much petrol, but rather to too li[illegible] your air cleaner is not restricting the air flow. Simply disconnect it and see if it improves the color of the exhaust flames. Honda air cleaners can be removed as in (2, iii and iv) above, while Yamahas are disconnected from their air cleaner when the carburetor side cover is removed.

V. GENERAL TROUBLE - SHOOTING

Those who have suffered through reading everything so far will have some idea of how their machine works. Now to put things inperspective so that if your bike won't run you'll check the most likely faults first.

Remember that in general if your plugs spark and if fuel and air are getting to the engine, it should run. Maybe it won't be perfect, but at least it should run. So, if your bike won't run it's likely it's not getting one of the three: spark, petrol, or air.

(I) Spark: (1) remove the cover so you can see the points. Do they open and close when the engine is rotated? (2) is your fuse ok? (3) your battery dead? (4) your plug(s) working? Remove the plug, or one of them if there are two, re-attach to the plug wire and make sure the metal threaded part of the plug is touching the engine casing. Kick-start the engine with the ignition on. If you see a spark jump the plug gap, then spark isn't your problem. If no spark, try the same test with the other plug or a spare plug. If still no spark, then either your battery is dead, you are blind, or your condenser is bad, in that order of probability, check for shorts, and try a new condenser though these very seldom fail. It's even less likely for a coil to fail. Are you sure plenty of voltage is getting to the primary circuit (the points)?

(II) Petrol: (1) pull off the hose at the tank valve and make sure petrol is coming from the tank. On Hondas this can also be done by unclipping the carburetor bowl to see if petrol is reaching the carburetor freely.

(III) Air: (1) make sure your choke isn't closed; (2) make sure air cleaner isn't blocked (see the 'note' above).

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