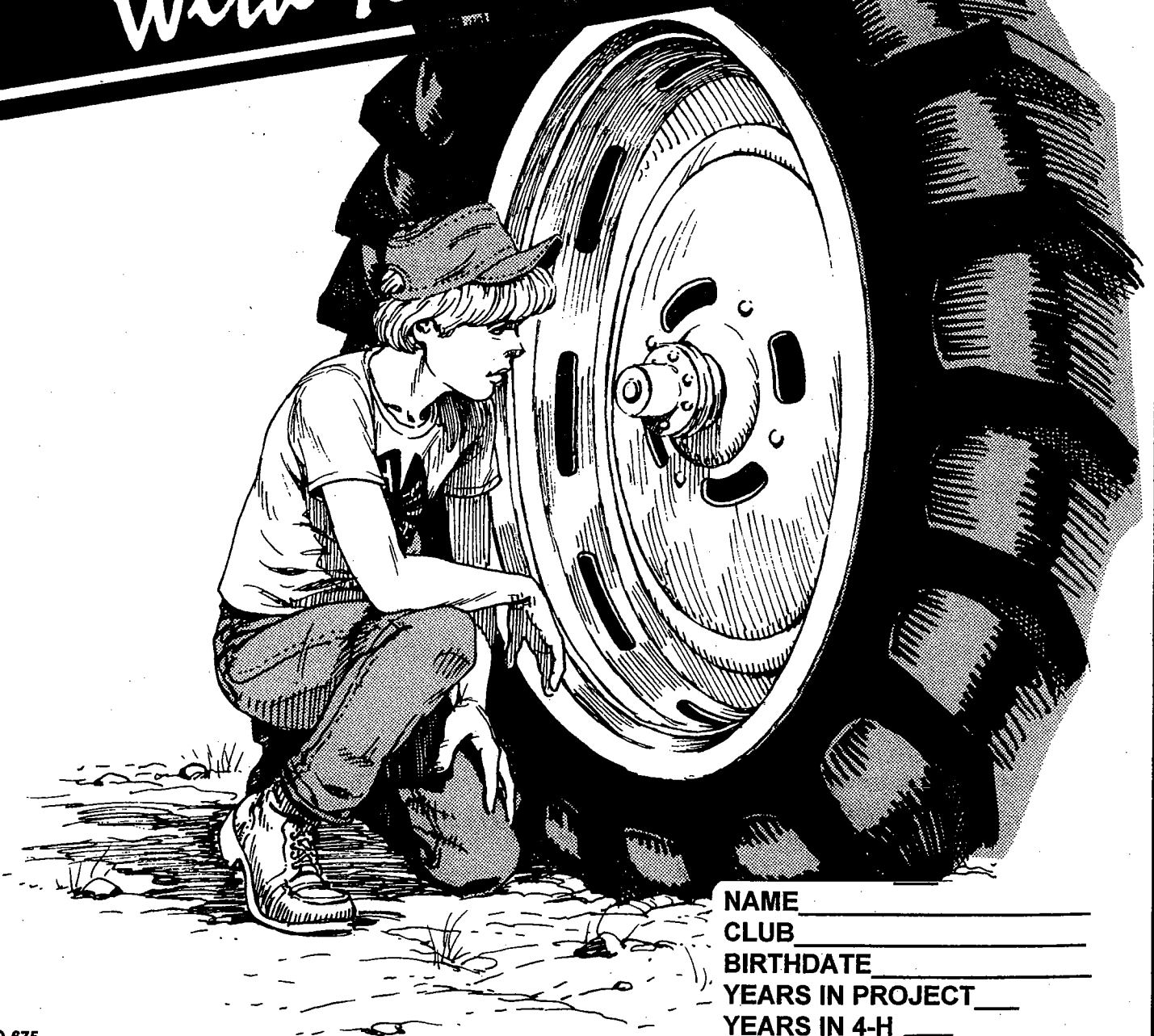




Petroleum Power Program  
**TRACTOR PROJECT**

*Getting Acquainted  
With Your Tractor*



NAME \_\_\_\_\_  
CLUB \_\_\_\_\_  
BIRTHDATE \_\_\_\_\_  
YEARS IN PROJECT \_\_\_\_\_  
YEARS IN 4-H \_\_\_\_\_

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## Acknowledgements

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# 4-H TRACTOR PROJECT

First Year

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## Getting Acquainted With Your Tractor

**T**he 4-H Tractor Project gives you an opportunity to "Learn by Doing." The project consists of units designed to be used over a three-year period. By the time you complete all of the units, including the various "hands-on" activities, you should be a competent and safe tractor operator. How skilled you become will depend upon the amount of practice you get as you progress through each lesson in the tractor manuals. Even if you are not able to practice

operating a tractor frequently, you will still acquire the necessary knowledge to understand how one functions efficiently and safely.

The Tractor Project has three overall objectives that you must understand and accomplish. The facts and skills to meet them are not contained in any one unit but are present throughout the project. Know your objectives so that you are constantly aware of what you are trying to learn as you work through this project.

## Objectives

**Safety.** You must learn to be safe around a tractor, whether it is running or not. You must learn to distinguish between safe and unsafe conditions and practices. And, you must help others who work around tractors to understand the need for safety as well as you do.

**Care and maintenance.** You will need to become familiar with the various parts and systems of the tractor, how they function together, and how to know when they are operating properly. When you understand this, you will then be better prepared to actually operate a tractor and use it as it was designed to function.

**The value of a tractor as a farm production machine.** You will need to understand that the tractor is really a business asset, that is, a machine one uses to make work easier, produce goods and, it is hoped, earn a profit. The older you get and the longer you continue in the tractor project, you will appreciate how important it is to make sure the tractor is operated safely and efficiently and is properly maintained.

The objectives above are what the 4-H Tractor Project is all about. Good Luck! And remember, in 4-H we "Learn by Doing."

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## What To Do

**Y**our 4-H Tractor Project has three parts. This set of lessons for the first unit acquaints you with your tractor and teaches the importance of tractor safety. Even if you think you are familiar with tractors, carefully study the materials in this manual because you might become aware of something you hadn't thought about before.

In most of the lessons there are activities

called "Learn by Doing," "Making Safety Work," and "Digging Deeper." Try to complete as many of the activities as possible, either alone or with other members of your club or group, depending upon the type of activity. If you need help, be sure to call upon someone else for their ideas. Remember, the activities will help increase your knowledge and skills.



# Let's Begin

## Accidents and Young People

**A**lmost two million people die in the United States each year. More than twenty thousand of them are aged 14 or younger. Figure 1-1 shows the causes of death among persons aged 14 and under. As you can see, accidents cause almost half those deaths.

What about tractor accidents? About one out of every four farm accidents involves tractors and farm machinery. Look at Table 1-1 which shows work-related tractor and farm machinery accidents according to the age of the injured person. You can see that persons aged 14 years old and younger (just like yourself) and those in the next age group, when combined, have about the same number of tractor accidents as persons in each of the next two groups. These accidents happen even though younger people are working fewer hours on the farm than persons in the older groups.

**O**perating a tractor is serious business and a full-time job. Make up your mind that you are going to be a safe tractor operator—starting now! Here are important safety rules that you must always follow:

The operator must be the only person on the tractor. No extra riders!

Keep young children off tractors and away from areas where machinery is working.

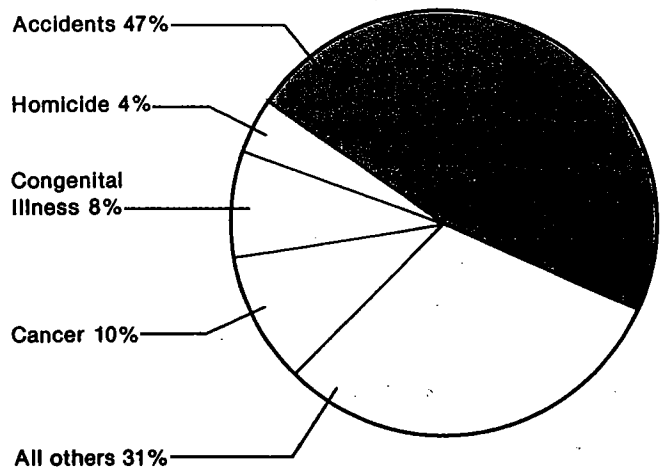
Use caution when getting on or off the tractor.

Think and practice safety..

**W**hy is safety so important? Because people can be injured or killed if safety is not practiced. Let's look at some accident statistics. Maybe then you can appreciate the extreme need for safety.

Figure 1.1

**ACCIDENTS CAUSE NEARLY AS MANY DEATHS AMONG PERSONS 14 YEARS AND YOUNGER AS ALL OTHER CAUSES TOGETHER.**



# with SAFETY

Looking at the 5-14 year old statistics alone, five percent may seem like a small number. However, this number used to be extremely high. Persons in this age group (and other age groups) were frequently being injured. Therefore, the federal government passed workman safety laws, and farm machinery and tractor manufacturers added safety devices and decals to equipment and started educational safety programs which have helped reduce the number of injuries in all age groupings. This is why you should be extremely careful and obey all tractor safety rules—so that accident rates, injuries and death rates will continue to decline. Obeying the rules could keep **you** from hurting or killing yourself, a family member or a friend.

Table 1-1

### Work-related tractor and farm machinery accidents.

Age of operator	Number of injuries (%)
5 - 14 years	5%
15 - 24	24%
25 - 44	33%
45 - 64	32%
over 65	6%
	100%

Many tractor-related deaths occur among children younger than ten who are probably too young to operate a tractor. How do you suppose so many accidents happen to them? The National Safety Council reports that most of these were "extra riders" on the tractor or implement being pulled. (Look at the numbers in Table 1-2.) Most likely, the child fell off the

Table 1-2

### "Extra rider" fatalities.

Age group	Fatalities (%)
1 - 5 years	35%
6 - 10 years	33%
11 - 15 years	21%
All other ages	11%

tractor or implement. Generally, a tractor has only one seat. Don't you think then that

designers and safety experts planned that only one person at a time should ever be on a tractor? That person should be the tractor operator and should ride only in the operator's seat. Remember the rules given at the beginning: *Keep young children off tractors.* In general, *No extra riders!*

One more thing. Look at the numbers in Table 1-3. Many tractor and machinery accidents occur when equipment is not running. Many of these accidents involve falls. *Use caution when mounting or dismounting from a tractor.* Use steps and handholds provided and watch your step. And, be sure to keep work areas clear of items that can cause you to trip and fall.

Table 1-3

### Tractor and machine use at time of accident.

	Percent
<b>Tractor</b>	
Parked	34.1%
Traveling	9.8%
Stationary/with PTO	7.3%
Planting/sowing	7.3%
Loading/unloading	7.3%
Harvesting/tillage	4.9%
Runaway, no driver	2.4%
Other	26.8%
	100.0%
<b>Machine/Implement</b>	
Parked, not running	27.5%
Parked, running	20.0%
Harvesting	10.0%
In-transit	6.3%
Loading	6.3%
Tillage	6.3%
Planting	5.0%
Other	18.7%
	100.0%

## Learn to "Think" Safety

**B**ecause you cannot predict exactly when an accident will happen, you must learn to think about safety at all times. If you know someone who has been injured in a farm

accident, ask them if they knew beforehand that they might be in danger. Chances are that if they had taken a few moments to think about what they were doing, they could have avoided the accident. As you work through the tractor project, learn to anticipate dangerous situations.

Thinking and practicing safety are up to you and all others who work around tractors and implements. Machinery manufacturers have made the job easier by providing alert signs to warn you of dangerous situations. These signs, usually in the form of decals on tractors and implements, help you know how to protect yourself and others. Take the time *now* to learn what the *Safety Alert Signs* mean (shown in Figure 1-2). Operator's manuals also feature these and other alert messages.

As you progress through the 4-H Tractor manuals, you will become familiar with many safety signs, warnings and tips. Learn what they mean and practice applying them. Remember, safety cannot be acquired just by knowing the rules. You have to practice safety!

An accident can only happen under one or two conditions: When you do something that is unsafe, or when you allow an unsafe condition

to exist. Remember, a tractor is faster and more powerful than you are. You can be the master over the power and speed of a tractor with your ability to think. Learn to correct unsafe

Figure 1.3

**THE NO RIDERS SYMBOL SHOULD BE MOUNTED ON EVERY TRACTOR.**



conditions and guard yourself, your family and friends against potential hazards. Think ahead and avoid hazardous situations!

Figure 1-2

**SAFETY SYMBOLS AND SIGNS.**



The "Safety Alert Symbol" is commonly used on safety signs found on agricultural equipment. The symbol means **Attention!, Be alert! Your safety is involved!**

Alone it is a white exclamation point with a red triangle; when printed (in an operator's manual, for example) the triangle is black.



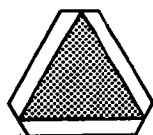
The CAUTION sign (BE CAREFUL on some machines) is a general reminder to tell the operator that certain safety practices must be observed. It also identifies some of the less serious hazards. These signs are black and yellow.



A WARNING sign alerts the operator that a greater risk is involved for a specific potential hazard. This sign is also black and yellow.



DANGER means that one of the most serious potential hazards is present. Unsafe operating techniques or bad work habits in this area could lead to serious accidents and personal injury. The DANGER sign is red and white.



The universal Slow Moving Vehicle (SMV) symbol is required to be mounted on farm machinery and other vehicles traveling at less than 25 miles per hour on public roads.



**C**areful Carl knows the importance of following tractor operation and safety rules. Take his advice and you will learn a lot about tractor safety, operation, care and maintenance.

## Learn by Doing

Along with other club members in the tractor project, or together with family members, list several ways carelessness can cause falls around the farm, especially with tractors and other machinery. (HINT: Remember to consider such factors as the weather and clothing being worn.) What should be done to prevent each of the dangerous conditions you listed?

Be sure to learn what the CAUTION, WARNING and DANGER signs mean. Don't forget their different colors. Compare decals on tractors and other machines. Compare the messages found on safety alert signs in your operator's manual. How many other messages can you find? What do they mean? Do you understand why one and not another was used in each case?

If your family owns tractors or other machinery, check to make sure all safety decals are present. The owner's or operator's manuals show where all signs are located on the equipment. If you

need to replace decals, your dealer can supply new ones. You can do the same thing for other tools and equipment such as power grinders, lawn mowers, garden tractors, etc.

## Digging Deeper

Accidents kill as many young people as all other causes together. Compare tractor injury or death rates of people aged 14 and under in your county, township or state. Make a chart and plot the statistics in ten-year intervals. Begin in the 1900's and work toward the present, noting every decade. Have injury and death rates increased or decreased? How have tractor safety features contributed? Keep your statistics for club presentations. (NOTE: Contact the National Safety Council, 444 North Michigan Avenue, Chicago, IL 60611. You can also contact law enforcement agencies and local libraries for your facts.)

### CHECKING UP ON SAFETY

1. More people over 65 are involved in tractor "extra rider" fatalities than children aged 14 and under? T F
2. More accidents are caused when machinery is stationary than when it is being operated? T F
3. When you have finished using the tractor, the quickest and safest way to get off is to jump off? T F
4. The "danger" alert sign is usually red and white? T F
5. List four safety rules that you have learned:  
A. \_\_\_\_\_  
B. \_\_\_\_\_  
C. \_\_\_\_\_  
D. \_\_\_\_\_
6. How should you mount and dismount the tractor? \_\_\_\_\_
7. More young people aged 14 and under die from: (A) homicide, (B) accidents, (C) illness?
8. What is the usual color of "warning" alert signs: (A) yellow/white, (B) red/white, (C) yellow/black, (D) red/yellow?
9. More farm accidents are caused by: (A) tractor driving, (B) falls, (C) inhaling gas fumes?
10. What is the most important thing you learned in this unit? \_\_\_\_\_

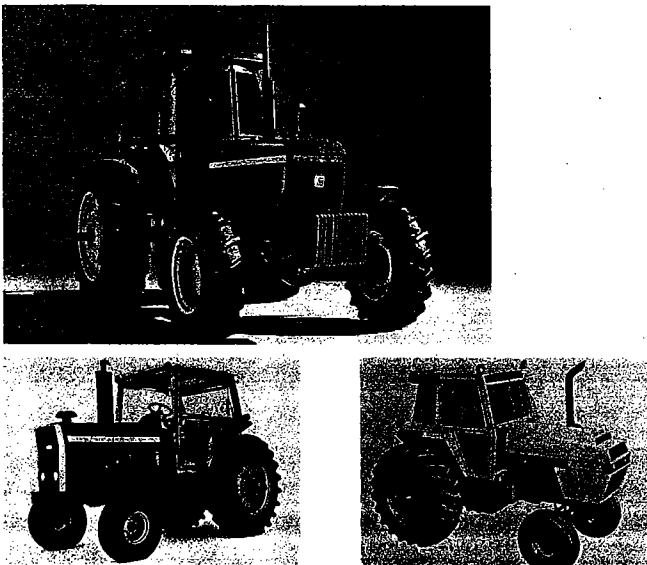
# HISTORY of The Tractor

**T**oday's modern tractors are marvelous, complex machines. Tractors are used virtually everywhere and in all seasons of the year. You don't have to be on a farm to see them operating. Drive along any highway and you can see a tractor mowing or pulling a load. Even in the biggest city they are used for cutting grass in parks and large lots or are equipped with backhoes for digging ditches or performing other chores.

Many years ago, a farmer using hand tools needed about a week to cultivate one acre of land. With a horse and plow, he could do the work in a day or so. With a small tractor and plow, he could do the same amount of work in one hour. The tractor has played a large part in helping the U.S. farmer produce enough food to feed himself and about 60 other people. Very simply, the tractor has revolutionized our society, especially in agriculture.

Figure 2-1

**MODERN TRACTORS DIFFER IN APPEARANCE BUT ALL THOSE IN ANY SIZE CLASS GENERALLY HAVE SIMILAR FEATURES. MANY OPTIONS ARE AVAILABLE TO MEET VARIOUS OPERATING CONDITIONS AND FOR OPERATOR COMFORT.**



## Historical Perspective

**T**he earliest tractors (called traction engines in the mid-1800's) burned coal, wood or straw to heat water and produce steam power. That power was then used to do some type of work

like pulling a plow. Steam tractors or engines also supplied belt power for operating threshing machines and sawmills.

In 1892, the first gasoline-powered tractor was perfected. Although this tractor did not have the features to do many things other tractors would soon be doing, it still was an important invention. From that time onward, tractors powered by gasoline (and later kerosene) could carry enough fuel to work for a day. They could be operated by a single person. Extra men with teams of horses were not needed to haul fuel and water, as had been the case with steam engines. Improvements came almost every year as engineers, designers and inventors found new and better ways to get more work from the tractor.

## A Machine To Do Work

**T**ractors do work. Whether it's a small garden tractor or a large tractor used on a huge farm—all operate on the same principles. A tractor is a power plant that converts chemical energy stored in a fuel into mechanical energy. The mechanical energy is then applied where it is needed to do work. Energy from the engine is moved or transmitted by belt drives, gears, clutches, wheels or even liquids (or some combination of these) to finally do work. Parts of the tractor involved in power transmission help make up different systems of the machine, as you will see later in lesson 4.

All the work we get from the tractor does not come cheap. The modern tractor and its implements together cost many thousands of dollars. Operating expenses (including fuel, lubricants and replaced parts such as filters) add up to many, many more dollars. If a tractor is not maintained and operated properly, costs can increase dramatically. Poor maintenance can lead to a major problem in the engine or some other critical system, and repair costs can be very high. If a breakdown causes some timely farm operation like harvesting to be postponed for even a few days, then even more money may be lost.

Owning or being responsible for maintaining and operating a tractor is a major responsibility. That's why the objectives of this project are so very important. Can you remember what they are? (1) Safety, (2) Proper care and maintenance of the tractor, and (3) Valuing the tractor as a business asset used to produce goods and profits.



