THE UNIVERSITY OF IOWA
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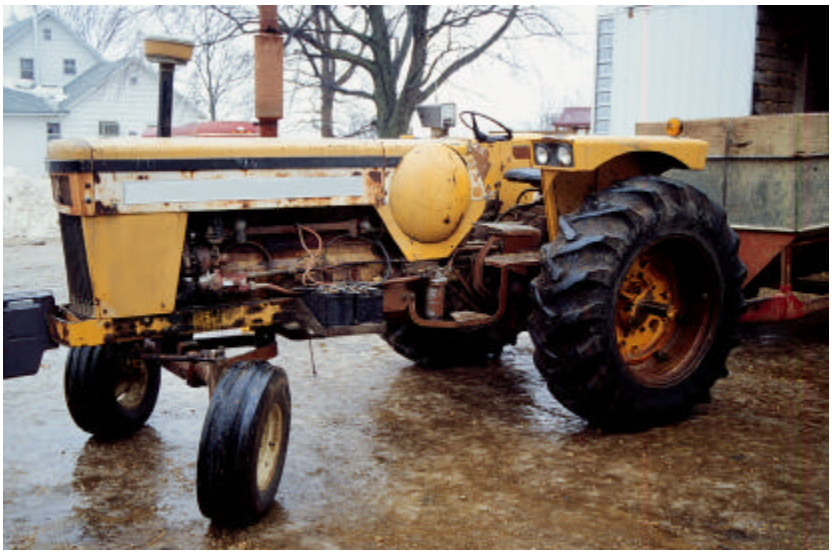
TO: Director, National Institute for Occupational Safety and Health

FROM: Iowa FACE Program **Date of Report____Sept. 1999_____**

SUBJECT: Farmer is run over by a tractor while starting it when not in the operator's seat.

SUMMARY

During the fall of 1998 a 60-year-old Iowa farmer was killed when he started his tractor. The propane-powered tractor was parked in a machine shed, which had a dirt floor. The farmer was working alone and evidently assumed the tractor transmission was in neutral, then started the engine while standing on the ground to the left of the tractor or while standing on the side step of the tractor. The ignition switch was easily reachable from the ground on the left side. The tractor started and lurched forward, smashing equipment in front of it and partially crashing through the tin wall of the shed. There were no witnesses to the event, but it appears that the farmer was standing on the ground, holding in the clutch with his left hand, starting the tractor with his other hand, then letting out the clutch assuming the transmission was in neutral. The tractor moved ahead about 3 m (10 ft), stalled, and stopped when it hit a corner post of the machine shed. The farmer was found trapped partially under the left rear wheel of the tractor, dead at the scene. The tractor engine was cold, with the ignition key in the on position. The tractor originally had a safety switch built-in to the transmission, but it had been bypassed by the previous owner of the tractor. This enabled starting the tractor in gear when the clutch was pressed down.



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RECOMMENDATIONS based on our investigation are as follows:

#1 *Farmers and tractor operators should not bypass factory-installed safety devices.*

#2 *Tractor operators should not attempt to start their machines from any position other than sitting in the operator's station.*

INTRODUCTION

During the late fall of 1998, a 60-year-old Iowa cattle farmer was killed when his tractor ran over him. The Iowa FACE program became aware of the incident through a newspaper article and began to gather information. Sources include the County Sheriff, the State Medical Examiner, implement dealers, and the victim's son, who acquired the tractor and was using it on his farm on a daily basis. Two FACE investigators conducted a site visit to the son's farm later that winter and examined and photographed the tractor. Photographs of the accident scene were obtained from the County Sheriff.

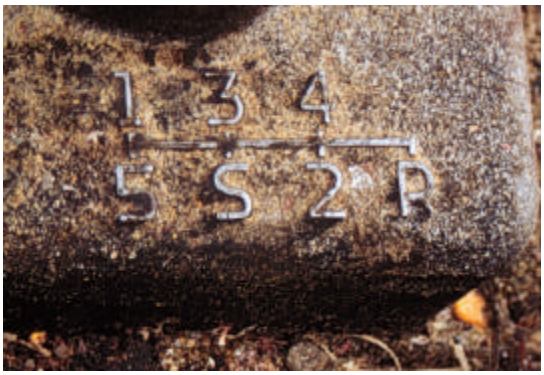
The victim had been in the cattle farming business for the past 25 years on his 51 ha (125 acre) farm, producing beef cattle, grain, and hay. It was a typical family farm and the farmer normally worked alone with occasional help from his wife. There was no safety program at the farm. The farmer purchased this propane-powered tractor 15 years ago in a private sale, and it was one of two identical tractors on the farm. He used it on a regular basis and was very familiar with its operation. The tractor was manufactured in the late 1960's, weighed about 4,755 kg (10,500 lb), and had about 75 kW power (100 hp).

INVESTIGATION

The farm had about 60 head of beef cattle. The farmer had fed the cattle early in the morning and continued chores in the farmyard. He was moving equipment and was starting the tractor in an open shed, which had pole-type construction, a dirt floor, and tin siding. Another tractor was found after the incident idling in the farmyard and it appears the farmer was trying to move the propane tractor from the shed to reach equipment stored in front of it. The accident occurred about 7-8 am and the victim was found several hours after his death, about 1:00pm.

From photographs it was determined that the tractor moved about 3 m (10 ft) forward before hitting the corner post of the shed. The farmer was found trapped under the front edge of the left rear tractor tire. He was not completely run over, but pinned in front of the tire. Photographs indicated the left rear tire was spinning for a moment in the dirt after it crashed into the shed wall. Rescue personnel found bird droppings on the seat of the tractor, suggesting the victim had not been sitting down on the operator seat that morning. He may have been standing on the ground or on the side step when he started the machine.

This tractor originally had a factory-installed electrical safety switch connected to the gear shift lever. This required the operator to put the gearshift in **S**, which stands for **S**tart (neutral), before the ignition switch would turn the motor. This safety switch had been bypassed prior to the purchase of the machine to this farm. Without the safety switch present, the engine could be started with the transmission in any gear, provided the clutch was pushed in. These safety switches have been bypassed in some machines to gain perceived convenience in certain work situations. It makes the operation of the tractor identical to most trucks and cars with manual transmissions. An example of a working situation would be if the tractor stalled or was stopped on an incline while in gear. Then the transmission could be used as a parking brake, similar to most automobiles with manual transmissions. However, when the operator wanted to start the tractor again, the transmission would have to be put in **S**tart (neutral). This could be difficult since the transmission has built-in hopping guards on the gears to prevent them from bouncing out of gear when in operation. Being on an incline provides sufficient gear pressure within the transmission that it is difficult to move the gearshift out of gear into neutral, without physically moving the tractor to relieve that pressure. This predicament is easily eliminated by bypassing the safety switch. Then the tractor can be started while in gear, provided the clutch is pushed in. When bypassing this safety equipment, the safety of the machine is greatly compromised.



The tractor was not known to start easily, and it is unlikely it started immediately after turning the key. A more likely chain of events was that the victim was holding in the clutch with one hand when he turned the key to start the tractor, and let the clutch out assuming the transmission was in **S**tart (neutral). The **S**tart position on the transmission plate and the **2**nd

gear mark were adjacent to one another (see photo), and it would be difficult to distinguish which position the transmission was in while standing to the left of the tractor. The other similar tractor on the farm had an operational safety switch and it may be possible that the farmer mistakenly trusted that the safety switch would prevent starting in gear in this tractor.

Many runover fatalities are caused by bypass starting, where the starter motor solenoid electrical connectors are joined with a metal tool such as a wrench. In this case the starter solenoid is on the right side of the tractor and it is not likely that bypassing occurred. The temperature at the time, about 4 C (40 F), was borderline temperature when the tractor heater should have been plugged in, and the primer may have been needed. Both the block heater plug and the primer are on the right side of the tractor. The batteries are on the left side where the injury occurred. The access to the operator station is narrow and the clutch pedal is in the middle of access space. It would be possible that the operator while stepping down could be caught from clothing into the clutch, gearshift or other protrusion. However, it is not likely that this occurred since the machine was in second gear. The likely events were that the tractor was started while standing on the ground or while standing on the side step from where the operator fell to the ground in front of the tire.

The victim was found by a friend early afternoon. He was obviously dead at the scene and no ambulance was called.

CAUSE OF DEATH

The official cause of death from the Medical Examiner was traumatic asphyxia due to farm tractor accident due to pinned under tractor rear wheel. An autopsy was performed.

RECOMMENDATIONS / DISCUSSION

Recommendation #1 *Farmers and tractor operators should not bypass factory-installed safety devices.*

Discussion: The previous tractor owner had bypassed the safety mechanism, which required that the gearshift is in S (Start) position during starting. This may be convenient for some work situations and makes the tractor operate as automobiles and trucks with manual transmission, which can be started in gear without great danger of runover. However, in a tractor, bypass starting or starting while not seated causes a great hazard. While starting from the ground, the operator is standing in front of the rear wheels and if the tractor is in gear there is no time to get out of the way if the tractor starts and lurches forward. There was another similar tractor on this farm, in which the safety device was operational. The farmer may have by mistake assumed that this tractor had the safety switch and took the risk of starting while not seated. The tractor was bought with the factory-installed safety device disabled. New owners may be reluctant to make changes that would require additional time and expense. Therefore sellers should ensure that machines have functioning safety devices.

Recommendation #2 *Tractor operators should not attempt to start their machines from any position other than sitting in the operator's station.*

Discussion: In some circumstances it is convenient to start a tractor or similar machine from the ground, rather than from the operator's seat. However, this creates a great runover hazard. Because of this hazard, manufacturers for decades have designed safety systems, which require the operator to be seated prior to starting the engine. Even if the safety devices preventing bypass starting or starting from the ground are not operational, the operator can by choice eliminate dangerous starting procedures by simply always sitting in the operator seat while starting. It is not clearly known whether the operator in this case was starting while standing on the ground, standing on the side step, or stepping down from a moving tractor. However, all of these procedures are clearly unsafe and must be avoided by all operators.

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Fatality Assessment and Control Evaluation

FACE

FACE is an occupational fatality investigation and surveillance program of the *National Institute for Occupational Safety and Health* (NIOSH). In the state of Iowa, *The University of Iowa*, in conjunction with the *Iowa Department of Public Health* carries out the FACE program. The NIOSH head office in Morgantown, West Virginia, carries out an intramural FACE program and funds state based programs in Alaska, California, Iowa, Kentucky, Maryland, Massachusetts, Minnesota, Missouri, Nebraska, New Jersey, Ohio, Oklahoma, Texas, Wisconsin, Washington, and Wyoming.

The purpose of FACE is to identify all occupational fatalities in the participating states, conduct in-depth investigations on specific types of fatalities, and make recommendations regarding prevention. NIOSH collects this information nationally and publishes reports and Alerts, which are disseminated widely to the involved industries. NIOSH FACE publications are available from the NIOSH Distribution Center (1-800-35NIOSH).

Iowa FACE publishes case reports, one page Warnings, and articles in trade journals. Most of this information is posted on our web site listed below. Copies of the reports and Warnings are available by contacting our offices in Iowa City, IA.

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Additional information regarding this report or the Iowa Face Program is available from:

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