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## Barriers and Motivators for Tractors ROPS Retrofitting in Iowa

### Abstract

Iowa State University Extension and Outreach conducted an assessment of Iowa farm operators' perceptions of the barriers and motivators when considering retrofitting tractors with rollover protective structures (ROPS). A statewide sample of approximately 2,000 farm operators was surveyed in the 2017 Iowa Farm and Rural Life Poll. A series of questions was asked to evaluate the importance of potential barriers to decisions to not retrofit a tractor and potential motivators that could influence the decision to retrofit or purchase a tractor with ROPS. The survey received a 48% response rate (999 responses). Among the 76% of Iowa farm operators who reported at least one pre-1985 tractor, only 18.6% reported that all of those tractors had ROPS. The remaining 81.4% had at least one tractor that did not have ROPS. Iowa farm operators' perceptions of the barriers and motivators when considering retrofitting tractors with ROPS are shared. The results of Iowa farm operators' perceptions will be used as Iowa State University Extension and Outreach prepares to align efforts with the National Tractor Safety Coalition and participate in the National ROPS Rebate Program, with the goal of reducing tractor fatalities.

### Keywords

Agricultural fatalities, Farm safety, Farmer-attitudes, Retrofit, Rollover protective structures, Safety, Tractor overturns, Tractor safety

### Disciplines

Agriculture | Bioresource and Agricultural Engineering | Rural Sociology | University Extension

### Comments

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# Barriers and Motivators for Tractor ROPS Retrofitting in Iowa



C. V. Schwab, J. G. Arbuckle, H. M. Hanna

**ABSTRACT.** *Iowa State University Extension and Outreach conducted an assessment of Iowa farm operators' perceptions of the barriers and motivators when considering retrofitting tractors with rollover protective structures (ROPS). A statewide sample of approximately 2,000 farm operators was surveyed in the 2017 Iowa Farm and Rural Life Poll. A series of questions was asked to evaluate the importance of potential barriers to decisions to not retrofit a tractor and potential motivators that could influence the decision to retrofit or purchase a tractor with ROPS. The survey received a 48% response rate (999 responses). Among the 76% of Iowa farm operators who reported at least one pre-1985 tractor, only 18.6% reported that all of those tractors had ROPS. The remaining 81.4% had at least one tractor that did not have ROPS. Iowa farm operators' perceptions of the barriers and motivators when considering retrofitting tractors with ROPS are shared. The results of Iowa farm operators' perceptions will be used as Iowa State University Extension and Outreach prepares to align efforts with the National Tractor Safety Coalition and participate in the National ROPS Rebate Program, with the goal of reducing tractor fatalities.*

**Keywords.** *Agricultural fatalities, Farm safety, Farmer-attitudes, Retrofit, Rollover protective structures, Safety, Tractor overturns, Tractor safety.*

The dangerous nature of any industry can be characterized by the death rate per 100,000 workers. Agriculture is one of three industries with the highest worker death rates and has been for decades (NSC, 1961, 1971, 1981, 1991). The highest death rate among industries in recent years is more likely to be reported for agriculture. The National Safety Council (NSC, 2017) currently lists agriculture as the most dangerous industry, with 22.6 deaths per 100,000 workers, which is 7.5 times the all-industry average of 3.0 deaths per 100,000 workers.

The source of agriculture deaths is as diverse as the variation found in agricultural operations across the U.S. Farm tractors were identified as the top source of deaths in agriculture using the National Traumatic Occupational Fatalities (NTOF) and Census of Fatal Occupational Injuries (CFOI) databases (Hard et al., 1999). Hard et al. (1999) also identified non-highway overturns of tractors as the most prevalent cause of fatal injury events. Myers et al. (1998) reported that tractor overturn-related fatalities consistently accounted for over 50% of all tractor-related deaths and have been identified as a major concern for

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agriculture. Lehtola et al. (1994) reported that rollovers accounted for more than half of tractor-related fatalities in Iowa during a five-year study. With recent data, the National Safety Council (NSC, 2017) has documented that vehicle-related fatalities remain a primary source of fatalities in agriculture.

One commonly held belief by agricultural safety professionals is that a farm tractor equipped with a rollover protective structure (ROPS) has less probability to be the source of a tractor overturn fatality. Surprisingly, a study conducted by Myers and Snyder (1995) concluded that 62% of tractors were in need of ROPS. Myers and Snyder (1995) estimated the cost to retrofit 44% of those tractors with ROPS as \$1.22 billion. Hard and Myers (2011) conducted an examination of ROPS prevalence rates by states for two periods (1993-1995 and 2001-2004). They found that 34 of the 50 U.S. states had a statistically significant increase in the percentage of ROPS-equipped tractors from 1993-1995 to 2001-2004. However, only eight states had ROPS prevalence rates over 60% during 2001-2004. Hard and Myers (2011) concluded that the low ROPS prevalence rates in many states are connected to high tractor overturn fatalities in those states.

Murphy et al. (2010) summarized tractor overturn fatalities in the U.S., shared various initiatives, interventions, and educational efforts for reducing overturn deaths, and concluded by stating that other countries have solved this issue and that there is no nationally organized program within the U.S. Conway (2010) reported that there are programs making progress in retrofitting tractors. Just a few years later, Tinc et al. (2015) outlined the components of a national ROPS program and concluded that extensive and collaborative partnerships are necessary to build a sustainable ROPS program to reduce tractor-related deaths. Today, the National Tractor Safety Coalition, which was formed in May 2014, has a voluntary National ROPS Rebate Program to eliminate this source of agricultural fatalities (National ROPS Rebate Program, 2017).

The National ROPS Rebate Program is an important and perhaps long-overdue advance in reducing tractor overturn fatalities in agriculture. However, launching this national program without understanding the perceptions of farm operators in a state could affect its success. States that plan to become active in the national program should explore farm operators' perceptions about retrofitting tractors with ROPS. The purpose of this study is to report on Iowa farm operators' perceptions of barriers and motivators for tractor ROPS retrofitting and other related conditions.

## **Methodology**

The Iowa Farm and Rural Life Poll was used to assess Iowa farm operators' perceptions of the motivators and barriers when considering retrofitting tractors with ROPS. This mail survey is conducted annually through a partnership of Iowa State University Extension and Outreach, the Iowa Agriculture and Home Experiment Station, the Iowa Department of Agriculture and Land Stewardship, and Iowa Agricultural Statistical Services. The Iowa Farm and Rural Life Poll is the longest-running survey of its kind in the U.S.

A statewide sample of approximately 2,000 Iowa farm operators was included in the 2017 survey. A series of questions was asked to evaluate the importance that a number of potential barriers may have on decisions to not retrofit a tractor with ROPS. A second set of questions examined potential motivators for decisions to retrofit or purchase a tractor with ROPS. The barrier and motivator questions were adapted from studies conducted in

New York, Pennsylvania, and Vermont (Jenkins et al., 2012; Sorensen et al., 2006). Respondents were asked how important the barriers may have been in their decision to not retrofit a tractor with ROPS. They were also asked how important the motivators were in their decision to retrofit or purchase a tractor with ROPS. The respondents had four choices to select from: not at all important, somewhat important, important, and very important.

Additional questions were included to understand the number of tractors, tractor age, tractor ROPS status, and if the respondents' tractors without ROPS are used for certain tasks that span the spectrum of overturn risk from low to high. The questions about how tractors without ROPS are used required a yes or no response.

Sample survey questions were tested for clarity with a small group of Iowa farm operators. Minor adjustments were made to the questions, motivators, and barriers based on feedback from the group. The survey was mailed out to a representative sample of Iowa farm operators in the spring of 2017.

## Results

The survey received a 48% response rate, with 999 surveys returned. This response rate is within the range for previous years and was considered acceptable. Individual questions elicited different response rates, with sample sizes ranging from 976 for questions that applied to all respondents to 588 for questions that applied to subsets of respondents (e.g., those with non-ROPS tractors). These sample sizes are given when appropriate.

### Barriers

Farmers were asked if they had at least one tractor without ROPS. If they answered affirmatively, the survey provided a list of 15 potential barriers and asked them to "rate how important the following factors may have been in your decision to not retrofit a tractor(s) with ROPS." A bar graph listing the Iowa farm operators' perceptions of the barriers identified as "very important" when considering retrofitting tractors with ROPS is shown in figure 1. The barrier with the highest percentage of "very important" responses was "*I don't have children operating tractors*" (don't have children) at 29.9%. The other two barriers with the highest percentages of farmers selecting "very important" also focused on tractor operators, including hired help and the farm operator. "*I have enough experience to avoid tractor overturn injury*" (enough experience) and "*I don't have hired help operating tractors*" (don't have hired help) had the second highest (26.5%) and third highest (24.4%) percentages of farmers rating them as very important.

The two barriers that received the most balanced responses were "*I simply have not considered retrofitting my tractor(s) with ROPS*" (simply - not considered) and "*The tractor(s) that doesn't have ROPS isn't used much*" (isn't used much). Balanced responses indicate a relatively equal distribution among the four possible responses, with percentages ranging from >20% to <30%. The response distribution for "simply - not considered" was nearly equal, with 26.2% not at all important, 22.4% somewhat important, 29.5% important, and 22.0% very important. The response distribution for "isn't used much" was also nearly equal, with 24.9% not at all important, 23.2% somewhat important, 27.6% important, and 24.2% very important.

Of the 15 barriers included in the survey, only two were rated as not at all important by more than 50% of the respondents (table 1). Those barriers were "*I wouldn't be able to fit my tractor into the barn/shed*" (fit into barn/shed) with 53.2% and "*It takes too much time to retrofit tractors with ROPS*" (takes too much time) with 50.5%. These data clearly show

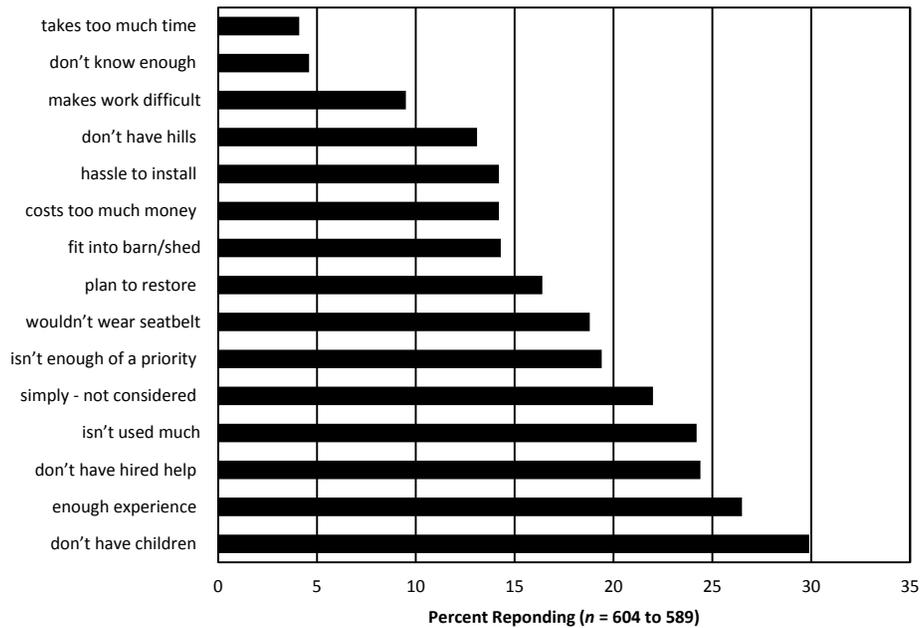


Figure 1. “Very important” barriers for Iowa farm operators with at least one tractor without ROPS.

Table 1. Percentage responses for barriers reported by Iowa farm operators with at least one tractor without ROPS and ranked in order based on “very important” response percentage.

| Barrier (and Sample Size)            | Response (%)         |                    |           |                |
|--------------------------------------|----------------------|--------------------|-----------|----------------|
|                                      | Not at all Important | Somewhat Important | Important | Very Important |
| don't have children (n = 598)        | 28                   | 15                 | 27        | 30             |
| enough experience (n = 601)          | 12                   | 20                 | 42        | 26             |
| don't have hired help (n = 599)      | 30                   | 18                 | 28        | 24             |
| isn't used much (n = 598)            | 25                   | 23                 | 28        | 24             |
| simply - not considered (n = 604)    | 26                   | 22                 | 30        | 22             |
| isn't enough of a priority (n = 597) | 24                   | 30                 | 26        | 20             |
| wouldn't wear seatbelt (n = 591)     | 26                   | 24                 | 31        | 19             |
| plan to restore (n = 591)            | 47                   | 18                 | 18        | 17             |
| fit into barn/shed (n = 596)         | 53                   | 15                 | 18        | 14             |
| costs too much money (n = 597)       | 35                   | 26                 | 25        | 14             |
| hassle to install (n = 592)          | 46                   | 22                 | 18        | 14             |
| don't have hills (n = 588)           | 27                   | 30                 | 30        | 13             |
| makes work difficult (n = 591)       | 42                   | 27                 | 21        | 10             |
| don't know enough (n = 589)          | 49                   | 27                 | 19        | 5              |
| takes too much time (n = 592)        | 51                   | 28                 | 17        | 4              |

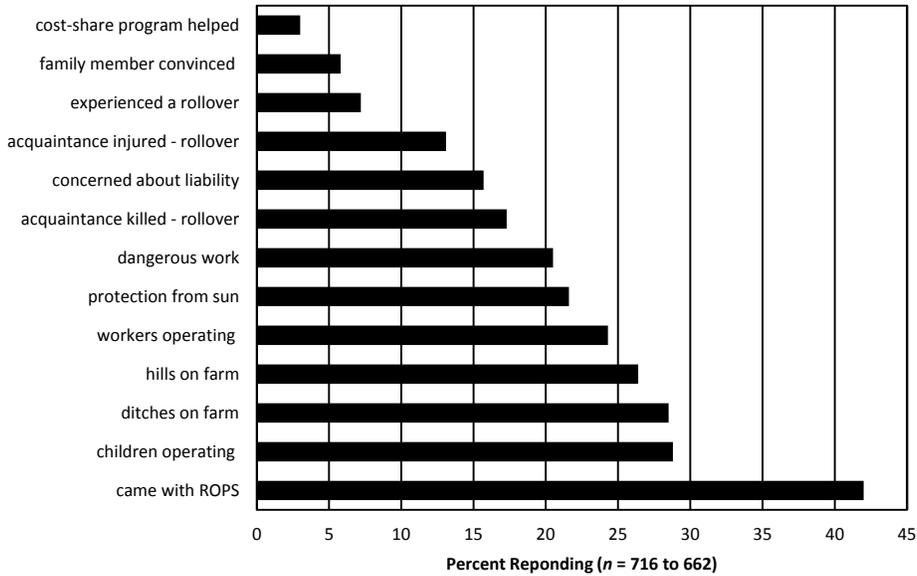
that working and storage structures are not a concern for operating tractors with ROPS for at least half of Iowa farm operators. The data also show that the time required to retrofit tractors is not a concern.

**Motivators**

Farmers who indicated that they had at least one tractor with ROPS were provided a list of 13 potential reasons for having ROPS and asked to rate the reasons using the same four-point importance scale that was used for barriers. A bar graph listing the Iowa farm operators’ perceptions of the motivators identified as “very important” when considering retrofitting tractors with ROPS or purchasing a tractor with ROPS is shown in figure 2. The motivator with the highest percentage of “very important” responses was “*The tractor(s) came with a ROPS, so it was not a choice*” (came with ROPS) at 42.0%. The motivator with the lowest percentage of “very important” responses was “*A cost-share program helped me pay for a ROPS*” (cost-share program helped) at 3.0%.

The two motivators that received relatively balanced responses were “*There are hills on the land I farm*” (hills on farm) and “*There are ditches on the land I farm*” (ditches on farm). The response distribution for “hills on farm” was nearly equal, with 26% not at all important, 22% somewhat important, 26% important, and 26% very important. The response distribution for “ditches on farm” was also nearly equal, with 22% not at all important, 20% somewhat important, 29% important, and 29% very important.

Of the 13 motivators included in the survey, five were rated as “not at all important” by more than 50% of the respondents (table 2). Those motivators were “*A cost-share program helped me pay for a ROPS*” (cost-share program helped) with 81.7%, “*I experienced a rollover once, and I was concerned about being hurt next time*” (experienced a rollover) with 75.9%, “*A family member convinced me to install a ROPS*” (family member convinced) with 71.8%, “*I have had a personal acquaintance who was injured by a rollover*” (acquaintance injured - rollover) with 53.4%, and “*I have a personal acquaintance who was killed by a rollover*” (acquaintance killed - rollover) with 51.1%. Several of these mo-



**Figure 2. “Very important” motivators for Iowa farm operators with at least one tractor without ROPS.**

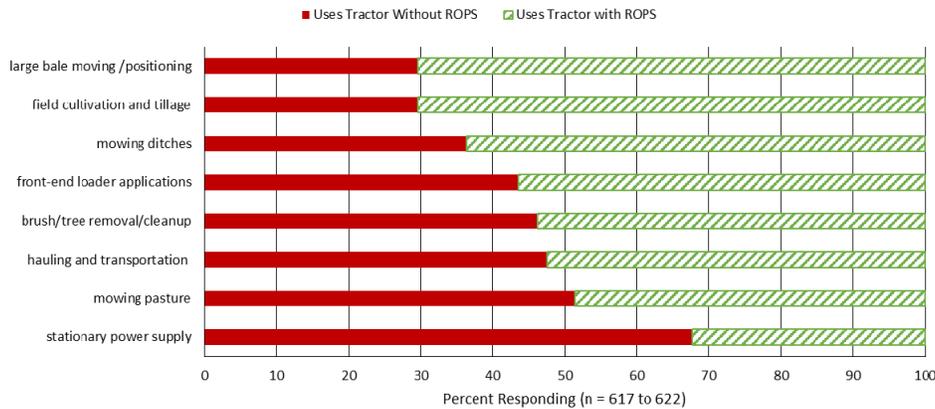
**Table 2. Percentage responses for motivators reported by Iowa farm operators with at least one tractor without ROPS and ranked in order based on “very important” response percentage.**

| Motivator (and Sample Size)                        | Response (%)         |                    |           |                |
|--|----------------------|--------------------|-----------|----------------|
|  | Not at all Important | Somewhat Important | Important | Very Important |
| came with ROPS ( <i>n</i> = 716)                   | 16                   | 11                 | 31        | 42             |
| children operating ( <i>n</i> = 690)               | 34                   | 12                 | 25        | 29             |
| ditches on farm ( <i>n</i> = 701)                  | 22                   | 20                 | 29        | 29             |
| hills on farm ( <i>n</i> = 700)                    | 26                   | 22                 | 26        | 26             |
| workers operating ( <i>n</i> = 684)                | 38                   | 12                 | 26        | 24             |
| protection from sun ( <i>n</i> = 696)              | 26                   | 21                 | 31        | 22             |
| dangerous work ( <i>n</i> = 678)                   | 32                   | 22                 | 26        | 20             |
| acquaintance killed in rollover ( <i>n</i> = 671)  | 51                   | 15                 | 17        | 17             |
| concerned about liability ( <i>n</i> = 688)        | 37                   | 23                 | 25        | 15             |
| acquaintance injured in rollover ( <i>n</i> = 671) | 54                   | 16                 | 17        | 13             |
| experienced a rollover ( <i>n</i> = 665)           | 76                   | 9                  | 8         | 7              |
| family member convinced ( <i>n</i> = 667)          | 72                   | 14                 | 8         | 6              |
| cost-share program helped ( <i>n</i> = 662)        | 82                   | 9                  | 6         | 3              |

tivators could be considered infrequent events that Iowa farm operators might not have experienced. It is important to note that the reason for the “not at all important” response may have been that the respondent did not experience the listed event.

### Non-ROPS Tractors Use

Among the 999 farmers who participated in the survey, 76% (*n* = 764) reported having at least one pre-1985 tractor. Of those 764 farmers, 81% reported at least one tractor without ROPS. Those farmers were asked if they used their non-ROPS tractors for a series of activities that spanned the spectrum of overturn risk from low to high. Figure 3 shows how the Iowa farm operators who reported non-ROPS tractors responded to the series of activities. The most common use of a non-ROPS tractor by Iowa farm operators was stationary power supply (e.g., augers, electrical power, etc.) with 67.7%. The only other activity for which more than half of the Iowa farm operators with non-ROPS tractors used those tractors was mowing pasture, with 51.4%. However, over one-third of the respondents reported



**Figure 3. Activities for which Iowa farm operators who reported having at least one non-ROPS tractor use tractors without ROPS and tractors with ROPS.**

using non-ROPS tractors for other potentially hazardous activities, such as brush/tree removal/clean-up, front-end loader applications, and mowing ditches.

### **ROPS Tractor Distribution**

A cluster of questions about tractor age, ROPS status, and retrofitting yielded the following results. Iowa farm operators had an average of two tractors manufactured before 1985 that were used for farm work. At least one Iowa farm operator reported having as many as 18 pre-1985 tractors used for farm work. Among Iowa farm operators who had at least one pre-1985 tractor, only 18.6% reported that all of their tractors were completely protected with retrofitted ROPS, the remaining 81.4% reported at least one tractor that did not have ROPS. Curiously, the average number of pre-1985 tractors that Iowa farm operators retrofitted themselves was only 0.1 (for practical purposes, zero). Among Iowa farmers who had at least one pre-1985 tractor, 58.6% had at least one with ROPS.

## **Discussion**

The Iowa farm operators' perceived tractor skills, of their own and of other tractor operators, are intertwined with their barrier and motivator responses, which is no surprise. Iowa farm operators clearly indicated that the absence of children or hired help operating tractors on their farms were "very important" barriers to retrofitting tractors with ROPS. Conversely, having children or hired help on their farms were among the top five "very important" motivators to retrofitting tractors. Coupling these barriers and motivators with Iowa farm operators' reported belief that they have enough experience to operate non-ROPS tractors safely strengthens the premise that individuals often perceive themselves to be safer than other people. For example, when presented with a story about an actual overturn event that included specific conditions (topography, non-ROPS tractor, operator experience, etc.), farmers hearing the story would likely indicate that they operate more safely, and therefore the overturn event would not have happened to them.

These motivators also indicate that Iowa farm operators are protective. They have great concern for others. If youth or hired help worked on their farms, these Iowa farm operators might be more motivated to improve safety by adding ROPS to their tractors because the presence of children or hired help were ranked as "very important" motivators. This follows a popular characteristic for the state, referred to as "Iowa nice."

One of the most recognizable barriers to ROPS retrofitting is cost. However, in this study, "cost too much money" was ranked 10th (of the 15 barriers) as "very important" by Iowa farm operators. This response aligns with other research which suggested that cost is not as critical as might be assumed. While cost might be one of the most recognizable barriers, it appears to have less importance in the actual decision to retrofit a tractor with ROPS. Sanderson et al. (2006) reported that a sample of Iowa farmers from a single county would not consider retrofitting a tractor even if all the cost was reimbursed. Another study in a different state drew a similar conclusion about cost (Hallman, 2005).

Perhaps the barriers where there is the most to gain are those for which a balanced response was recorded. Motivators that received a balanced response, such as the presence of hills or ditches on the farm, may also present opportunities for increasing the adoption of ROPS. Farmers with a high percentage of relatively level fields often ignore drainage ditches, road ditches, or creeks and may need to be reminded of those hazards. The "simply - not considered" barrier could offer the best opportunity for change. Helping Iowa farm operators consider ROPS might be a key tactic for increasing the adoption of ROPS.

This barrier might be simple to identify but more difficult to change. What would cause an Iowa farm operator to consider retrofitting a tractor with ROPS? For these Iowa farm operators, family members convincing them that ROPS retrofitting is necessary, having an acquaintance injured or killed by a tractor rollover, or actually experiencing a rollover did not rank in the top half of the “very important” motivators. Getting Iowa farm operators to consider retrofitting, when the motivators have been identified as ineffective by the target audience, creates a new barrier. Although convincing by other family members is not a strong motivator, it may be worthwhile to target other family members with information about the economic and personal losses incurred when a farm operator is injured or killed in a tractor rollover.

## Summary

This study builds a solid foundation for learning more about Iowa farm operators’ perceptions related to retrofitting tractors with ROPS. It also indicates that there is value in prevention activities that focus on retrofitting tractors with ROPS. This study provides assistance as Iowa State University Extension and Outreach prepares to align efforts with the National Tractor Safety Coalition and participate in the National ROPS Rebate Program, with the goal of reducing farm tractor fatalities. The data collected will help guide promotional and educational efforts directed toward reducing fatalities caused by tractor rollovers. How to motivate Iowa farm operators to consider ROPS retrofitting is the next question to address.

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