AgrAbility
Cultivating Accessible Agriculture

New and Improved Methods of Accessing Large Off-road Machinery

Shawn G. Ehlers, PhD, ATP
Stephen J. Swain, ATP

AgrAbility Webinar Series
Thursday, October 11, 2018
3:00 p.m. ET

Basic Webinar Instructions

- Audio available through computer or phone.
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Basic Webinar Instructions

- Please let me know if more than one person is viewing at your computer
- 4 quick survey questions + opportunity to share comments
- Session recorded and archived with PowerPoint files at www.agrability.org/Online-Training
- Problems: use chat window or email jonesp@purdue.edu

AgrAbility
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AgrAbility: USDA-sponsored program that assists farmers, ranchers, and other agricultural workers with disabilities.

- Partners land-grant universities with disability services organizations. Currently 20 state projects
- National AgrAbility Project: Led by Purdue's Breaking New Ground Resource Center. Partners include:
  - Goodwill of the Finger Lakes
  - APRIL (Association of Programs for Rural Independent Living)
  - Colorado State University
  - Washington State University
- More information available at www.agrability.org

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PURDUE
UNIVERSITY

The Need

- Farm-related injuries affect 1 out of 9 farm families annually
- When an injury occurs, farm families are often unaware of services available
- Approximately 19% of active farm operators can no longer perform essentials tasks due to a disability
- Farming has one of the highest fatality rates of any industry

Homemade lift

Ag Machinery Access Lifts

- Early research
- Access style and mounting type
- Lift selection
- Key safety issues
- Recent technology improvements

AGRABILITY PLOWSHARES TECHNICAL REPORT

AgrAbility
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Agricultural Machinery Access Lifts: Design, Utilization, and Safety Issues

THIS PUBLICATION WAS MADE POSSIBLE BY USDA/NIFA SPECIAL PROJECT 2016-41590-25880

Revised June 2018:
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INTRODUCTION

Each year, an estimated 250-300 farmers and ranchers in the U.S. experience permanent spinal cord injury (Field, 1992) and hundreds more suffer strokes, loss of limbs, and other conditions that severely limit their mobility. Many of these agricultural producers are faced with the challenge of accessing the operator stations of the machinery that they use regularly to till, plant, spray, harvest, or complete many other farming/ranching tasks.

This paper discusses accessibility-related issues, including potential assistive technology options, selection criteria and safety related to mechanical lift technologies for accessing tractors, combines, or other pieces of equipment utilizing mechanical-lift technology. Having the appropriate information, the right mindset, encouragement from others, and professional advice/assistance, many producers with mobility impairments regain access to equipment that is so essential to their livelihood. Although the homemade and commercially produced access solutions discussed here apply specifically to agricultural machinery, the concepts demonstrated are relevant to various pieces of off-highway heavy equipment used in many industries.

Early Equipment-Accessibility Research

Over the years, some of the most frequent requests received by the Breaking New Ground (BNG) Resource Center at Purdue University have been related to accessing agricultural tractors and machinery by farmers/ranchers with restricted mobility. During the early 1980s, with support from Deere & Company and the National Institute of Handicapped Research (now the National Institute on Disability, Independent Living, and Rehabilitation Research) BNG began to explore various solutions that could assist these individuals in accessing their equipment following a spinal cord or other disabling injury or condition. From this early research came a set of design criteria to guide development of "person-access lifts", criteria that subsequent experience has proven useful.

BNG's first priority was to document and evaluate the designs of those access lifts that had been homemade or fabricated locally by welding or machine shops, often with the input of professional engineers. These early access lifts generally fell into three categories: sling lift, platform lift, and chair lift.

Several less conventional concepts were also studied, among them: (1) operator carried up to the machine's operator station by a second person, (2) operator elevated to the operator station via front-end loader bucket or forklift, and (3) various ramp configurations whereby operator could be wheeled, walked, or otherwise helped up to the level of the operator station. While each of these methods "worked", they presented safety concerns and/or relied heavily on a second person, thus were, not endorsed or encouraged by BNG.

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[2] Dr. Field is Director of the National AgrAbility Project, headquartered at Purdue University, and a faculty member of the Department of Agricultural and Biological Engineering.

[3] Dr. Yoder is an Assistant Professor in the Department of Environmental, Agricultural and Occupational Health College of Public Health at University of Nebraska Medical Center.

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http://www.agrability.org/resources/technical/

Early Research

- Began in early 1980's, with support of Deere & Co. and NIHR, BNG began to explore various solutions
- Early designs were operator and machine specific
- Standardized designs were later adopted and evolved to the lifts of today

Ideal Lift Characteristics

All lifts discusses in this presentation possessed the following attributes:

1) Provided safe method of “handling” the operator

2) Allowed for successful access of the operator station

3) Were reliable and robust in design

4) Allowed for independent use of the operator

Lift Style and Mounting Type

Styles

- Chair Lift
- Platform Lift
- Sling Lift

Mounting Types

- Dedicated
- Independent

Style: Chair

- Most common lift type
- User transfers from wheelchair or vehicle on ground level, and again to the operators station seat

(exceptions apply where seat doubles as operator seat)

Style: Platform

- Accommodates operator in standing position, flip down seat or in wheelchair
- Best for situations where operator can navigate on level ground, but has difficulty using traditional stairs/steps

Lift Style: Platform Cont.

Style: Sling

- Transports operator in a mesh, fabric, or woven sling suspended from a specialized hanger
- Used when space is limited our transfer is difficult (equine, zero-turn-mowers, Skid steer loaders)

Mounting Type: Dedicated

- Mounts directly on and used to access only one piece of equipment
- Powered by host machine
- Allows user to enter/exit machine at any time
- Universal design mast with machine specific brackets directly attaches to machine frame

Mounting Type: Independent

- Mounts to pickup or trailer
- Allows access to multiple pieces of equipment
- Beyond access to machine, operator can perform maintenance from lift seat
- Telescopic arm positions operator for near transfer

Independent Trailer Lift

- Trailer style lifts can be used for temporary assistance (broken leg, surgery/incident recovery)
- Must be mounted to vehicle or stationary object for operation

Recommendations for Selecting a Lift

- Seat, Platform, or sling to lift user from ground level in to the cab that will facilitate an easy transfer to operator's seat
- Minimal alterations to original equipment

Recommendations for Selecting a Lift

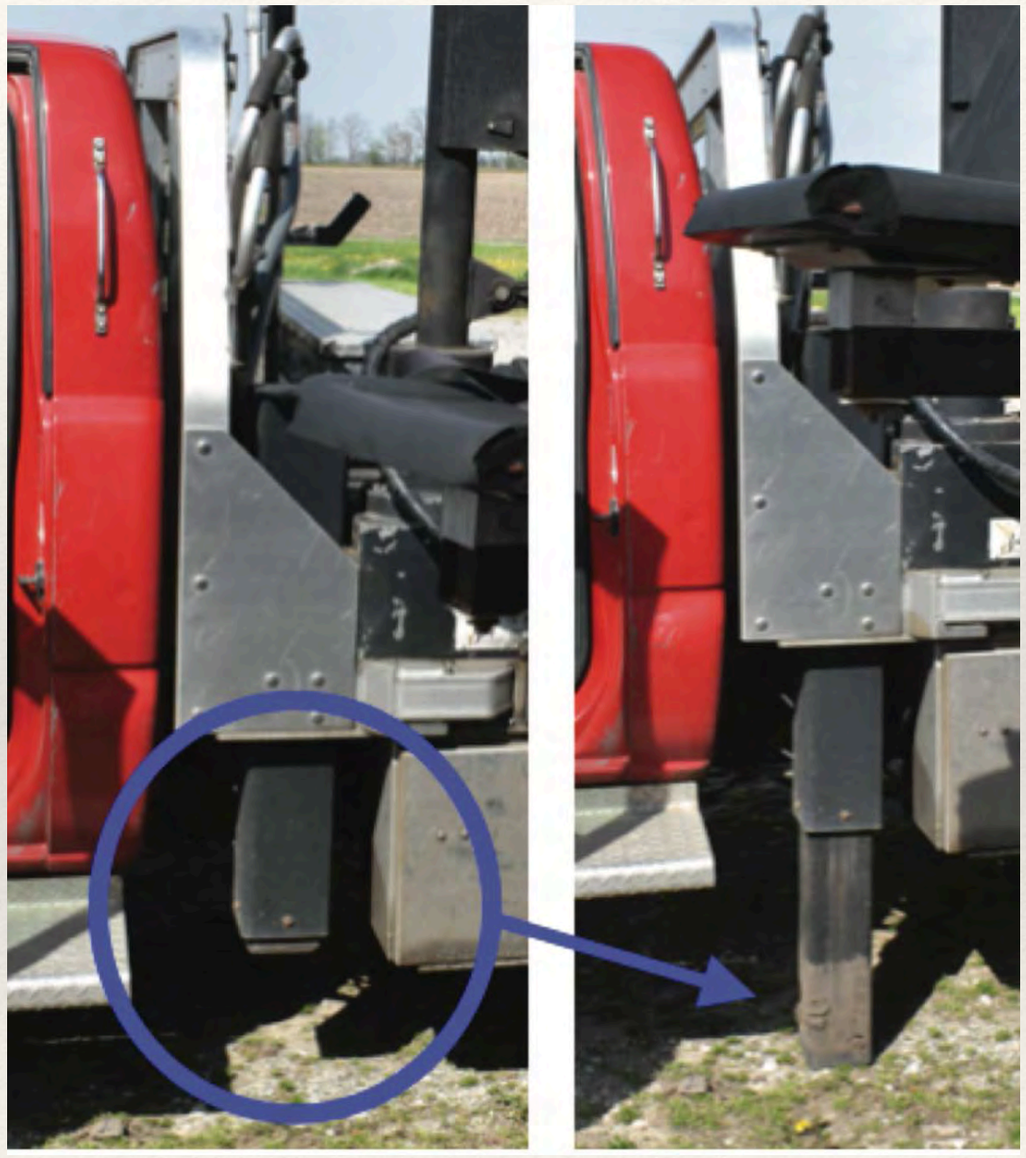
- Lift speed of 10-15 ft/min. with load capacity of at least 300 lbs.
- Fail-safe device in event of power of drive-mechanism failure
- unobstructed path to operating position

Recommendations for Selecting a Lift

- Safe exit alternatives
- Flexibility for any user
- Moderate cost

Key Safety Issues

- Approved for human lifting
- Stabilizer support(s)
- Operator seatbelt
- Power limiting clutches
- Fail-Safe



Modern Lift Advancements

- **Wireless transmitter**
- **Pre-set positions**
- **Robust drive mechanism (electric direct drive or electric powered hydraulics)**

Skid Steer Loader (SSL) / CTL

UTVs

- Ease of access around farmstead
- Fold up passenger seat for storage of walker/wheelchair
- Optional heat/AC (enclosed cab)

Modify the “right” equipment

Additional AgrAbility Resources

- AgrAbility.org
  - Archived and upcoming **webinars** addressing a wide range of topics related to disabilities in agriculture
  - **PlowShares** Technical Articles
  - The **Toolbox**
  - Beginning Farmers
  - Veterans in Agriculture
  - Annual National Training Workshops (NTW), Lincoln, Nebraska, March 2019

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Questions

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  - Your State AgrAbility Project
  - National Agrability Project - AgrAbility.org

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Publication

- Taylor & Francis Online: Assistive Technology (The Official Journal of RESNA)

Accessing and Operating Agricultural Machinery: Advancements in Assistive Technology for Users with Impaired Mobility

https://www.tandfonline.com/doi/full/10.1080/10400435.2018.1435591