



## WebEd: Professional Development & ADA National Network



January 31, 2018

3:00pm ET/2:00pmCT/1:00pmMT/12:00pmPT



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## Listening to the Webinar, *continued*



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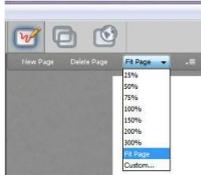
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## CUSTOM ASSISTIVE TECHNOLOGY SOLUTIONS FOR EMPLOYMENT

Ray Grott, MA, ATP, RET  
Director: The RET Project

© 2018

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## Rehabilitation Engineering & Assistive Technology (RET) Project at SF State University

- Providing technology solutions for people with disabilities since 1992 throughout the Greater SF Bay Area
- Work with public & private agencies and companies, and individuals
- Primarily with adults through the California Dept. of Rehabilitation

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## WHY IS THE WORKPLACE DIFFERENT?

- Multiple primary stakeholders – employee and employer
- Co-workers are part of the dynamics
- Productivity is the priority
- High stakes in both the short & long term
- Need is often immediate/short timeframe
- Cost IS a concern

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## KEY STEPS TO A SUCCESSFUL WORKPLACE ACCOMMODATION

- Set the stage for positive collaboration
- Approach problem solving systematically
- Be creative and flexible in implementation

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### ► Setting the stage for collaboration

- Acknowledge the disability
- Communicate needs
- Collaborate
- Be positive
- Don't fear change



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## ▶▶ Acknowledge the disability & Communicate Needs

- Employee has right to accommodation
- Employee has to take the initiative—disability issues are not always obvious
- Employer is responsible for creating a positive, responsive, & supportive environment



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## ▶▶ Collaborate

- Employee will know a lot about accommodating her disability and may have solutions to offer
- Employer knows the needs, systems and resources of the company
- Avoid dictating solutions
  - Increases likelihood of success
  - Improves acceptance of chosen accommodations

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## PROBLEM SOLVING METHODOLOGY

- Define the problem
- Analyze and clarify the problem
- Establish goals and criteria for a solution
- Generate solution ideas
- Evaluate & select the best solution
- Implement solution
- Follow up, refine, and evaluate

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Problem Solving Methodology:  
▶ Problem Analysis

- Job tasks, tools, materials, methods
- Employee's abilities and limitations
- Productivity goals
- Environment
- Personal preferences
- Anticipated changes
- Interpersonal issues (motivation, frustration, bias, etc.)

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Problem Solving Methodology:  
▶ Generate, Evaluate & Select Solutions

- Prioritize need
- More clearly define the problem
- Establish design criteria
- Generate ideas
- Evaluate (Cost and time to implement?)
- Select solution to pursue

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Problem Solving Methodology:  
▶ Implement Solutions

- Acquire items
  - Purchase
  - Custom modify or custom design
- Install and test with employee
- Modify as needed
- Provide training
- Follow-up

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## CUSTOM DESIGN AND FABRICATION OF AT

- Cost hierarchy of technology solutions
- Why is custom work needed?
- Guidelines for success



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## ► Hierarchy of Technology Solutions

1. Existing general-use product
2. Existing "disability-specific" product
3. Custom modification of existing product
4. Custom design and fabricate from scratch



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## ► Hierarchy of Technology Solutions

- Not just a question of lowest cost
- Consider durability, repairability & replaceability
- Initial cost is less important than what works best for the employee over the longer term

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## ► Why is custom work needed?

- Off-the-shelf products often do not meet all the criteria
- Individuality is the nature of disability
- World is designed for able-bodied
  - Built environments
  - Tools and Equipment
  - Inflexible methods



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## Guidelines for Success: ► *User-Centered Design*

- Understand users, task, and environment
- Involve users throughout design and development
- Iterative design process
- Consider the whole user experience
- Design team includes various perspectives

(from ISO Standard on Human-centered design for interactive systems)

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## Guidelines for Success:

- Don't assume that how something *has* been done is how something *must* be done



With one functional hand, she couldn't tie up the trash bags as has been the practice. Talked to trash pickup folks—learned that she didn't need the bags tied up, just closed.

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- Clamp the bag to the janitor cart.
- Give the bag a spin and toss in trash.

University of Wisconsin-Stout Vocational Rehabilitation Institute

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University of Wisconsin-Stout Vocational Rehabilitation Institute

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### Guidelines for Success:

#### ► KISS

- Avoid over-engineering or experimenting
- Chose the simplest path (Not everything needs to be 3D printed just because you bought one.)
- Simplifies modifications, repairs, replacement parts, & labor



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## Guidelines for Success:

### ► *Design for shifting needs*

- Abilities, needs, and preferences can shift over time, even from day to day
- Job tasks, materials, and methods can change
- Build to fit AND make it adjustable  
"Make it adjustable or make it again"



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Keyboard stand with height and angle adjusted by relocating bolts in available holes

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## LOW TECH / LOW COST SOLUTIONS

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How to open drawers or pull out files without good hand use?



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Simple rubber loops added to desk drawer for low effort hand pull



Flexible loops added to hanging file folders for those without pinch grip—also to cabinet drawer

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How could I...

Enable a wheelchair rider to pick up stray video tapes/DVDs from the floor?

- Only has use of 1 hand, with grasping ability but no fine motor control

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Attached a suction cup to the end of a dowel covered with pipe insulation for better grip



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Release suction cup by bending the rod down, thereby pulling on the string connected to the cup edge

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How could I...

Help a part-time social service provider with back pain (and a low budget) assist people while avoiding twisting?



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Provided better chair

Writing surface placed on open desk drawer created an L-shaped desk for facing the client

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How could I...

Manage a mop, broom, or similar pole-type tool without good grip or hand control?

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OFF-THE-SHELF OPTIONS

Motus Hand Grips  
[www.motus.ca](http://www.motus.ca)

**BACK SAVER GRIP**

Stout's BackSaver Grip  
[www.backsavergrip.com](http://www.backsavergrip.com)

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Patti Barrett, ATP, RET

Custom grip with hand loop using PVC pipe

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Modified forearm crutch with flat mop system

University of Wisconsin-Stout Vocational Rehabilitation Institute

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How could I...

Accommodate clerical workers with one functional hand or poor hand control?



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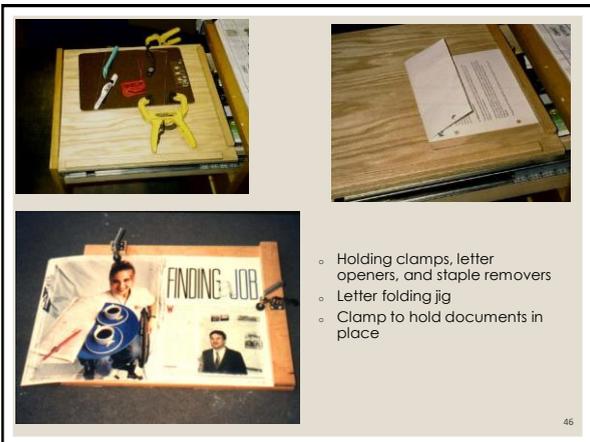
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- o Holding clamps, letter openers, and staple removers
- o Letter folding jig
- o Clamp to hold documents in place

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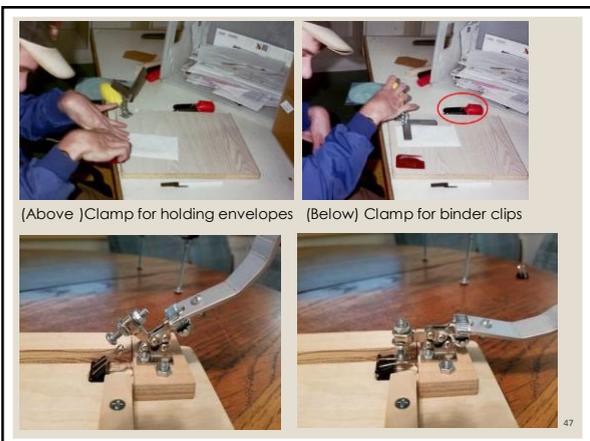
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(Above )Clamp for holding envelopes

(Below) Clamp for binder clips

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Jig to hold and tear off pay stub

Same jig used to hold letters for opening with razor cutter

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Envelope stuffer jig to slide papers into cardboard envelope



University of Wisconsin-Stout Vocational Rehabilitation Institute

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## How could I...

- Accommodate an office worker with arm weakness who rides a powered wheelchair?



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Add pull loop to keyboard tray

Loop made of extension cord wire



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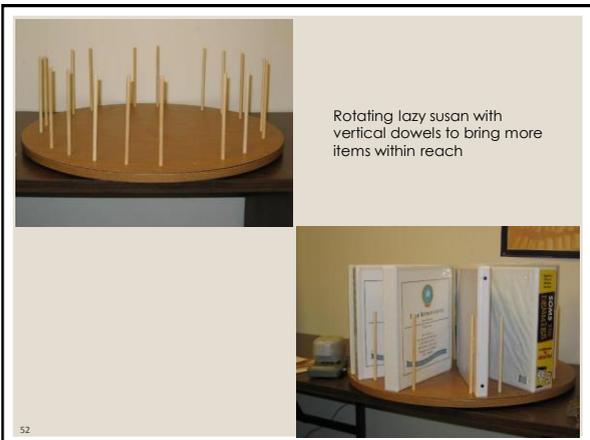
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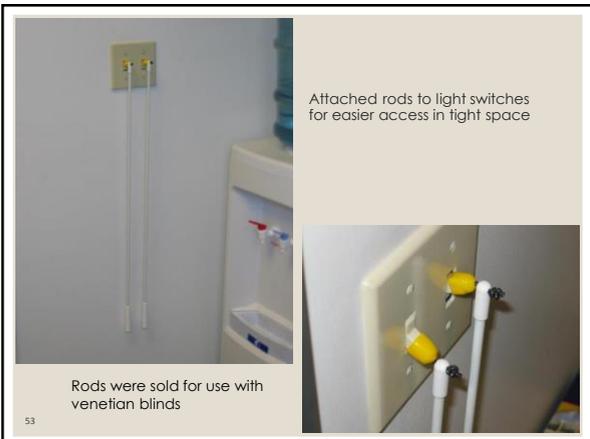
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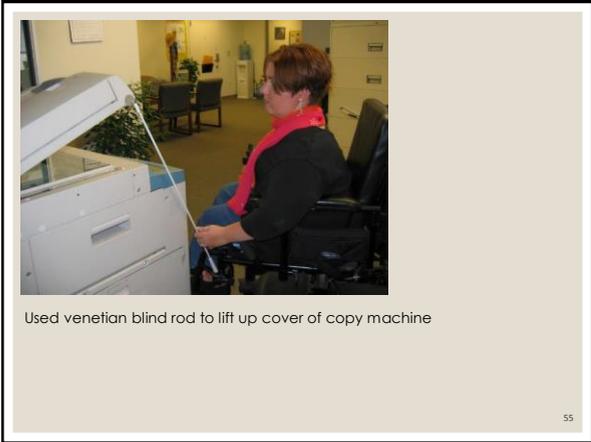
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MEDIUM TECH / MODEST  
COST SOLUTIONS

(Medium tech can also be complicated  
and costly)

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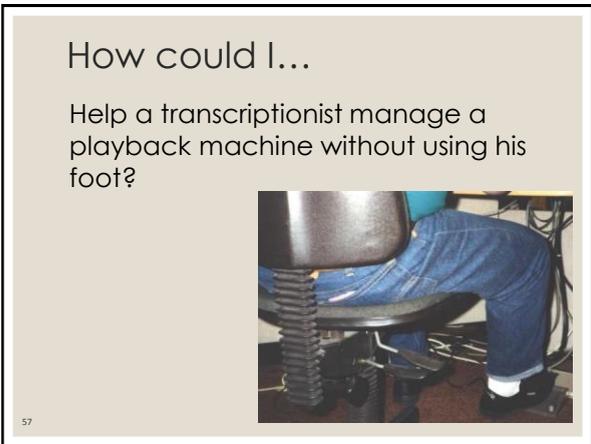
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How could I...

Accommodate a movie theater ticket-taker with one functional hand?

--Need to cut the ticket in half and retain one half for later

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Battery operated scissors with external D-cell battery pack and rotary switch

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This ticket cutter uses commercial rotary cutter with photo-electric sensor to trigger switch

Tom Rybak, RE  
Dept of Rehab Services, Richmond, VA  
<http://atwiki.assistivetech.net>

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Simple solution? One-handed scissors

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## How could I...

Accommodate a short-statured employee with muscle weakness at a store check-out counter? (Had the opportunity to move up from being a bagger)



University of Illinois at Chicago (UIC) Assistive Technology Unit 64

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Cart with handrails rolled into place as needed



University of Illinois at Chicago (UIC) Assistive Technology Unit 65

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Padded surface to lean on for stability



University of Illinois at Chicago (UIC) Assistive Technology Unit 66

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## Addressing balance and stability



- Young man with cerebral palsy
- Opportunity for job promotion accessing files
- Unstable on a cart with steps

University of Illinois at Chicago (UIC) Assistive Technology

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Frame attached to drop steps on a rolling cart



Steps

University of Illinois at Chicago (UIC) Assistive Technology Unit

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- Handrail system used for high shelves
- Consumer can lean against rails
- Arms free for filing

University of Illinois at Chicago (UIC) Assistive Technology Unit

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## How could I...

- Accommodate a medical records clerk with limited use of one hand?

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Crowded shelves in medical records department before they went electronic

Thick files are hard to separate and keep upright for insertion or removal with one hand



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Telescoping, spring-loaded clamp hooks on to top and bottom of the shelf and flat bar holds the files in place

Internal spring made out of bungee cord (very high-tech)



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Used in pairs to hold files apart

Co-workers wanted to use these as well...



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### Cueing/Counting Jig



Put one item in each top slot. Tip the lever to funnel into box.

Gary M. McFadyen, Ph.D.  
Mississippi State University  
<http://atwiki.assistivetech.net>

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### How could I...

Accommodate a technician in a hospital tissue lab with significant repetitive strain injuries?

- Engages in multiple tasks requiring the manipulation of small tools and objects
- Required frequent and prolonged fine motor activities

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Reducing the force required for pipetting



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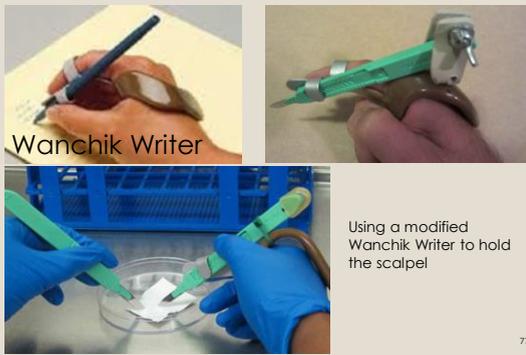
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Reducing the effort of tissue slicing



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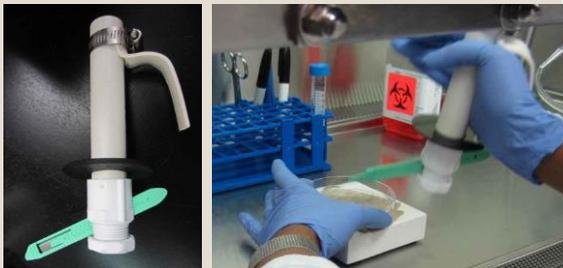
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Further reducing the effort of tissue slicing



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### Reducing the effort of manipulating a syringe

Stand holds syringe in place while arm activates the plunger to dispense fluid

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### How could I...

- Help an office worker with dwarfism (but who weighs 220lbs) reach the upper drawers of lateral file cabinets?

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Little Giant Step Ladder

- 300lb weight capacity, wider and deeper steps
- **BUT** step height is 10" and employee needs 7" step
- Needs to be easily mobile and quickly deployed

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Final Product



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First 7"-high step is integrated into the platform

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View from above

View from underneath



Mobility provided by 4 retractable casters

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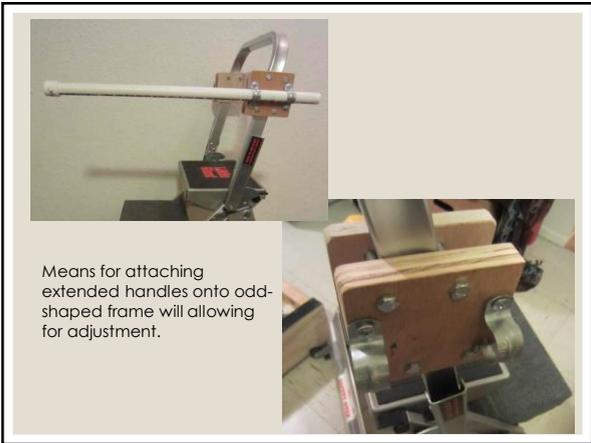
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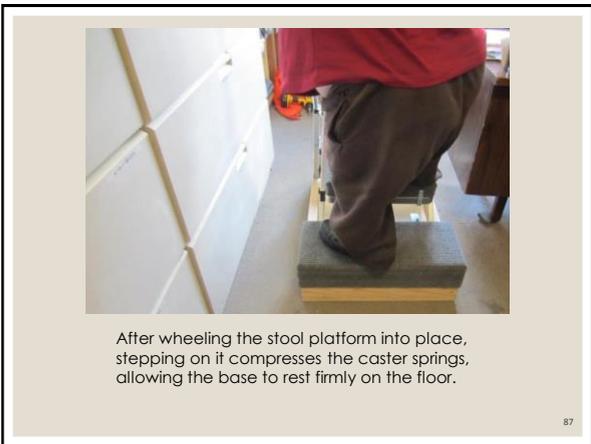
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- The horizontal extensions were not needed and were removed for easier maneuvering.
- The third step facilitated reaching items on the top of the cabinet.

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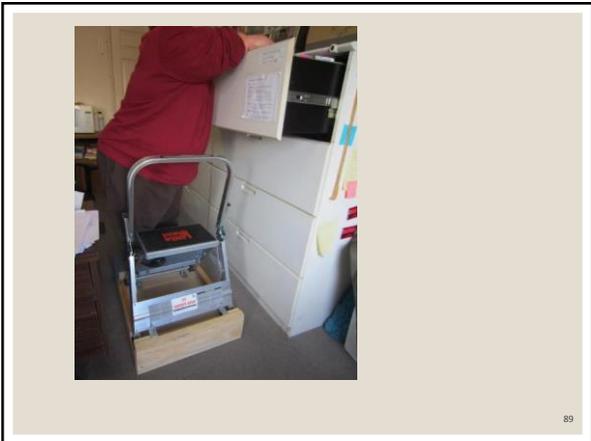
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HIGHER TECH / HIGHER COST SOLUTIONS

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## How could I...

- Give an office worker with spastic cerebral palsy independent access to papers?



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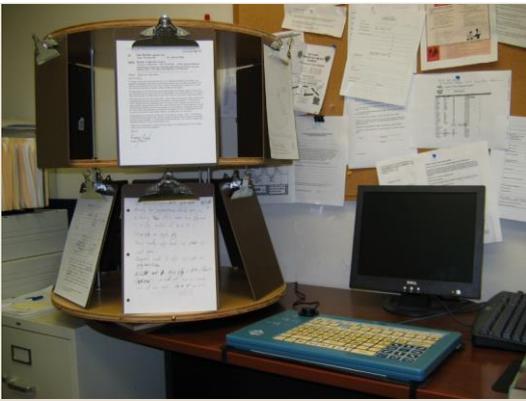
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Motorized Lazy Susan with two tiers, holding 12 clipboards with documents <sup>92</sup>

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"High-tech" cup hooks hold the clipboards <sup>93</sup>

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How do you switch operate this Clothes Tagger?

Device requires a fair amount of manual dexterity and grip strength



Woods Services, Langhorne, PA <sup>96</sup>

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- Battery-powered electric solenoids are used to pull the trigger of the clothes tagger
- Ability Switch-activates the mechanism
- Rechargeable battery pack

Woods Services, Langhorne, PA

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## How could I...

Help an engineer with high level SCI independently position a QuadJoy mouth driven mouse?

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Solution: a voice-controlled X-Y motorized mount



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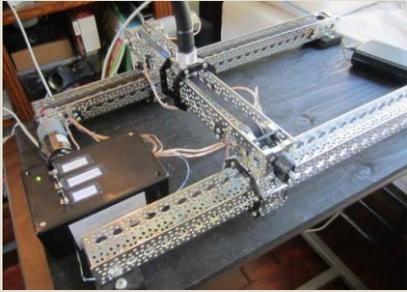
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Used two sets of motorized sliders to support and control the movement of the Quadjoy gooseneck



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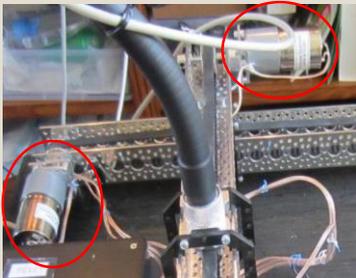
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Used two DC gearmotors with different speeds, for faster travel left and right and slower in the more critical in/out directions.



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Arduino microprocessor board controlled a set of relays determining the direction of rotation of the two motors



Arduino Uno Board



SainSmart Relay Modules

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A "slide right" voice command would send a "6" to the Arduino's software control. The Arduino code would then open or close the associated relays.

```
case '6': //RIGHT
  digitalWrite (5, LOW);
  digitalWrite (6, LOW); //Relay 6 & 7
  digitalWrite (10,HIGH);
  break;
case '7': //Move LEFT for .25 second
  digitalWrite(6,HIGH);
  digitalWrite(5,LOW);
  delay (250);
  digitalWrite(5,HIGH);
  break;
```

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Manual switch control of the motors was provided as a back-up



Lot of wires!

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It's all about the people!

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# CONTACT

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# CEUs



- The RESNA Catalyst Project will offer .1 CEUs for this webinar session. The RESNA Catalyst Project is an approved authorized provider for CEU credits by the [International Association for Continuing Education and Training \(IACET\)](#).
- You can receive 0.1 CEUs for a sixty to ninety minute webinar. There is a \$28 fee to receive credits for this webinar. An application for CEUs was included with the materials for download for the webinar and will be available after via the archive as well.
- To apply for CEUs or for information please contact: **Charlie Raphael Director of Certification and Education** at 571.257.3268 ext. 316 or via email: [craphael@resna.org](mailto:craphael@resna.org) or via fax to: 703-524-6630. There is a \$28 fee to receive credits for each webinar.or via fax to: 703-524-6630.

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Thank you for participating in today's session titled:  
Custom Assistive Technology Solutions for  
Employment

This session was recorded and the archived recording will  
be available within 24 hours at:  
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