4 Automated Wheelchair Desk

Designers: Nick Felicetta, Stephen Morales and Tarun Dey
Supervising Professors: Dr. Lisa Muratori and Dr. Yu Zhou
Department of Mechanical Engineering
State University of New York at Stony Brook
Stony Brook, NY 11794-2300

INTRODUCTION
An automated wheelchair desk was designed and prototyped to provide convenience for students using wheelchairs to move a desk and book bag to the seating area. Students in wheelchairs have difficulty in accessing books and other school supplies. Similar products on the market are not automated, and in fact require assistance from another person to bring forward the desk or book bag. This project provides a solution that enables a wheelchair-based student to control the desk from his or her seated position using a simple toggle switch.

SUMMARY OF IMPACT
This device will benefit the large population of students that use wheelchairs, such that they can do their schoolwork in wheelchairs at their convenience. Users will have the control to bring the desk to their laps with minimal effort from a comfortable seated position. The use of this device will give them more independence throughout their daily routine. The same idea can be easily extended to benefit other wheelchair users by providing them the convenience of carrying and easily accessing stuff.

TECHNICAL DESCRIPTION
The input of the entire system involves a DC gearmotor that supplies rotational motion to the vertical drive-shaft which rotates the desk assembly from the back of the wheelchair to the front. The vertical drive shaft is fixed onto the wheelchair back through rod ends. The desk is supported by a horizontal support arm which is connected to the top of the vertical drive shaft via a shim. The transmission was
designed to rotate the desk from its initial to final upright position (270 degrees of rotation) in three seconds.

The user controls the rotation of the desk using a switch. In the forward mode, the desk will be rotated from its homing position to its final upright position. The wheelchair user can detach the backpack from the assembly and place it on a hook, and then bring the desk to its final horizontal position for use. To put the desk back, the user will first bring it to the upright position, and switch the motor rotation to the backward mode to return the desk to its homing position.

To meet the safety and mobility standards and compactness requirement, the materials were carefully selected. While 303-Stainless steel was used most often for small components, such as shims, pins, bolts, nuts and washers, 6061-Aluminum was used for larger components, such as the horizontal support arm, rotating desk support arm, support gusset and the motor baseplate, and the desk was made of ABS Plastic with the dimensions ¾”x12”x12”.

Figure 3. CAD Drawing of the Wheelchair Desk Assembly