

Problem Number	Identifying & Selecting Problem PSP 1	Analyzing Problem PSP 2	Generating Potential Solutions PSP 3	Selecting & Planning Solution PSP 4	Implementing Solution PSP 5	Evaluating Solution PSP 6
	R1	R2	R3	Y4	Y5	G6
1	No future 3D-printing access.	Future parts will have a longer lead time or cost associated with it whether it is sent to be made out of house or in the construct.	Figure in the time it takes to make a new part due to future part failure or design changes.	After reviewing time and cost constraints the future 3D-printing jobs will be scheduled at an earlier date in the construct.	Extra gears were printed ahead of time in the construct in case of part failure.	3D printing in the construct costs only 6 cents per gram of material and has a lead time of about a day making it more convenient to print future parts in house.
2	The spring manufacturer has a minimum cart cost of \$60. The two springs selected on the BOM is below this minimum.	Decide what springs and how many to purchase from what vendor.	Different springs can be selected to use them in series/parallel to meet the engineering requirement. Another option is to buy the selected springs from the same vendor that meets the specs required and select extra springs with a larger deflection or spring constant to meet minimum cart cost.	Due to the calculations for different spring characteristics and cost it was found it would be more beneficial to purchase different springs to use in parallel.	Purchased 6 springs to use in parallel for about \$15 instead of the original price of \$60.	Although we must purchase more springs to achieve desired characteristics the final price was much less than purchasing from the original spring manufacturer selected.
3	Shop machined plate incorrectly.	The failure was not due to design issues. Did not budget for extra material and there was non left over for a new part.	Ask the shop if they have any extra material that matches what was supplied or purchase more material.	The shop had extra material to replace the bad part.	The plate is to be machined correctly.	Received correctly manufactured part.
4	How should the device attach to the front of the wheelchair.	This solution must allow for multiple degrees of freedom, so it can be easily adjustable and can be attached to both the soccer and bowling unit as well as future devices.	To attach the unit to the wheelchair, telescoping PVC pipes can be used with a clamp to attach it.	TBD	TBD	TBD
5	Shop machined slotted pipe incorrectly.	The design did not leave enough clearance between the slots in the pipe. The material became too thin and sheared during the machining process.	A redesign of the slotted pipe assembly must take place to include more clearance between the two slots.	The slot was made smaller to allow for more clearance. This was possible by changing the BOM to include modified washers in order to decrease the slot size.	Remachine new material to reflect design changes.	The striker bar assembly is a success and slides through the slots as desired.
6	Cannot bend the PVC to create frame as anticipated.	It was found to be impossible to bend the pvc at right angles as anticipated. Since the original design is to be made of aluminum we should make sure this process is possible for future manufacturing processes as well.	There are a few courses of action that can be taken to create the frame without bending the pvc: 1. Purchase elbows for the prototype and attach with epoxy. 2. Cut the corners at 45 degree angles and attach with epoxy. 3. Redesign.	Test the feasibility of attaching the corners using epoxy to ensure it has enough strength.	The pvc epoxied at 45 degree angles did not have enough strength to hold the frame together reliably. Elbows were purchased and epoxy was used to connect the frame.	The frame was sturdy and rigid, an overall success.
7	The servo arms are stressing the servo horn.	Since the horn is attached at the end of the servo arm the length extending out stresses the horn. Most of the weight is only on one end of the servo horn and so the arms are hanging downward and are not perpendicular to the axis of rotation. This can be bad for the servo motor.	Can create counter balances to extend from the other side of the servo arms to balance out the stress on the horn. Create guides the servo arms can rest on to relieve stress on the servo horn.	TBD	TBD	TBD
8	Was shipped the incorrect spring from mcmaster.	Was unsure whether or not the spring exhibited the specifications claimed by mcmaster. The spring was tested and it was found that a spring with a stiffer spring constant then requested was sent.	Send back springs for the what was ordered or buy new springs then originally selected.	Pick springs from lowes with a lower spring constant and desired length.	Springs were purchased from lowes with a much smaller spring constant. These are to be tested, because the spring constant was originally determined for 30 mph which may be too fast for our application. Purchasing more springs to achieve desired result may be required.	TBD
7	Frame was not square or to the specifications designed. The plate could not mount on frame as specified.	The pvc was incorrectly cut so the ends were not square. Another cause may be the knock out that occurred when epoxing the pvc to the elbows.	Align the axis from one edge of the frame to mount the plate and on other end make up for the difference.	Create a thin platform to mount one edge of the plate to the frame and a spacer to keep the plate level to the frame surface. Assume one side of the frame is square and mark and drill precise holes from this origin with disregard to the excess pvc length that does not impact the function of the device.	Attach to the frame the plate and spacers and make sure everything aligns as required.	TBD