ID	Risk Item *Describe the risk briefly*	Risk Type *Identify the type of the risk*	Effect *What is the effect on any or all of the project deliverables if the cause actually happens?*	Cause *What are the possible cause(s) of this risk?*	Likelihood	Severity	Importance (L*s)	Action to Minimize Risk *What action(s) will you take (and by when) to prevent, reduce the impact of, or transfer the risk of this occurring?*	Owner *Who is responsible for following through on mitigation?*
2	Process Head Fall Off	Technical	Possibly damage print head or inside of printer. If protection is not sufficient, possibly damage the user.	Mechanical failure of interface. Software incorrectly releases head.	3	3	9	Head connection is active-on	M. Demm
1	Machine Acquires Wrong Head	Technical	Printer carries out the wrong process, resulting in a bad part and possibly damaging printer	Mismanagment of head placement information/head interface issue.	2	3	6	Redundant identification system for head	N. Hensel
8	Subtractive tool contacts surface other than part	Technical	Damage to internal of machine (bed/enclosure/etc.)	Tool motion/path not correct. Bad coordinate referencing	2	3	6	Limit motion with robust system feedback/ limit switches. Add hardware limiting elements. Simulate toolpaths to verify accuracy	N. Hensel
10	Operator gets hurt by machine (Burned, Blinded by Laser, UV Exposure, Cut by tooling, Inhale Powder, Caught in moving parts, etc.)	Technical	Operator requires medical attention/incurs medical costs	Insufficient safety measures	2	3	6	Safety protection components/ document needs and specs of each process	A. Chacosky
12	Failure to complete project on time	Project Management	Failure to implement any processes/address other customer requirements/receive a poor grade	Attempt to implement too many processes/Take too long with design	2	3	6	Maintain good project plan with timing considerations	C. Rossi
15	Technical Inability to develop Interface	Organizational	We fail to meet the most important customer specification	Lack necessary skills. Do not put enough resources/time into coming up with a solution.	2	3	6	Conduct sufficient research and benchmarking	Team-wide
22	Customer not satisfied with end result	External	Customer gives poor review to advisor	Chosen design fails to meet customer specifications	2	3	6	Maintain good contact with customer	C. Rossi
3	Process Head Not Aligned	Technical	Part printed incorrectly - dimensions of end result incorrect.	Mechanical registration failure or of position feedback/software control	3	2	6	Software and hardware registration used to verify. Very complex element	M. Demm
13	Inability to meet cost goals	Organizational	Printer cost out of specification - miss customer requirements	Receive innacurate cost estimates on components/insufficient BOM detail/need to acquire unaccounted for components	3	2	6	Maintain an accurage budget	C. Rossi
24	Miss deliverable deadlines	Project Management	Poor grade/ fall behind on project - might not complete entire project scope/ all nighters/ triage work	Poor time management	3	2	6	Keep/maintain a detailed project plan	C. Rossi
4	Part not secured properly	Technical	Part damaged, possibly damage internals of machine	Mechanical connection	2	2	4	Stable/consistent part connection solution	A. Chacosky
16	Supplied components out of specification	External	Must get parts reworked or order new parts	Miscommunication with supplier/supplier error	2	2	4	Maintain clear communication with suppliers	A. Chacosky
20	Next MSD team fails to understand system design	Organizational	Team has to redo all/most of the work already completed	Poor documentation of system elements/concepts. Unclear designs	2	2	4	Document system clearly and thoroughly	A. Chacosky
6	Process head overheats	Technical	Damage interface, machine could catch on fire, melt/damage drive motors	Head draws too much current, control mechanism fails	1	3	3	Inline solution to monitor power flow	J. Bennett
18	Wrong material sent to head	Technical	Damage to the process head (possibly irreversable)	Wrong physical connection made. Wrong material loaded to storage location	1	3	3	Clearly label system elements. Make material pathways only work with one head	N. Hensel
23	SVN files lost/deleted	Project Management	Team must redo lost work	System wide storage failure	1	3	3	Accept	---
28	Lose funding from Cormier	Organizational	We are unable to build system	Cormier loses grant money	1	3	3	Accept	---
5	Electrical connection fails	Technical	System component loses power	Physical connector comes lose, interface fails to provide connection, connector overloaded/burned out	3	1	3	Well designed connection mechanism	J. Bennett
7	Material Jam	Technical	Process head fails to print anything, Feed line gets jammed and has to be cleared out	Kink in the line, feed rate of process head misconfigured	3	1	3	Provide flexible+straight flow path. Routine maintenance	M. Demm
25	BOM estimated cost is innacurate	Project Management	Cannot afford all components/ system goes over budget	Failure to account for all components	3	1	3	Research reasonable costs for system components	A. Chacosky
9	Operator opens machine during operation	Technical	Operator much more likely to be injured	User does not know what machine is doing	1	2	2	Good system labelling. Training for system use (in documentation)	C. Rossi
11	FDM operates backwards	Technical	FDM process fails/damages parts	FDM tool not properly configured	1	2	2	Verify FDM head is correctly configured	A. Chacosky
14	Team member disappears	Organizational	Lose team capability. Responsibility of each team member increases	Many possible reasons for member to become absent. Sickness/drop out/etc…	1	2	2	Have an enjoyable team atmosphere.	C. Rossi
21	Pushback from Hobbyist Community	External	Printer not widely adopted. Humiliation on the internet	System poorly designed	1	2	2	Seek feedback from hobbyist community	A. Chacosky
26	Misunderstand basic customer needs	Project Management	Design a system that does not do the desired processes. Customer not satisfied.	Poor communication with customer	1	2	2	Maintain good contact with customer	C. Rossi
27	Spend too much time on enclosure design	Organizational	Other system components under-designed	Misalignment of work objectives/available time	1	2	2	Follow developed project plan	M. Demm
17	Printer Loses Power	Technical	System stops printing	Poor electrical connection. External power failure. Trips breaker by drawing too much power.	2	1	2	Effectively design power system. Consider some form of battery backup	J. Bennett
19	Better open source system produced before project completed	External	Project is less relevant	Another team has more capabilities/resources /time /etc.	1	1	1	Accept	---
							0		
							0		

Likelihood scale	Severity scale
1 - This cause is unlikely to happen	1 - The impact on the project is very minor. We will still meet deliverables on time and within budget, but it will cause extra work
2 - This cause could conceivably happen	2 - The impact on the project is noticeable. We will deliver reduced functionality, go over budget, or fail to meet some of our Engineering Specifications.
3 - This cause is very likely to happen	3 - The impact on the project is severe. We will not be able to deliver, or what we deliver will not meet the customer's needs.

"Importance Score" (Likelihood x Severity) – use this to guide your preference for a risk management strategy	
Prevent	Action will be taken to prevent the cause(s) from occurring in the first place.
Reduce	Action will be taken to reduce the likelihood of the cause and/or the severity of the effect on the project, should the cause occur
Transfer	Action will be taken to transfer the risk to something else. Insurance is an example of this. You purchase an insurance policy that contractually binds an insurance company to pay for your loss in the event of accident. This transfers the financial consequences of the accident to someone else. Your car is still a wreck, of course.
Accept	Low importance risks may not justify any action at all. If they happen, you simply accept the consequences.