**Safety and designing for the OSSM**

One of the great things about the OSSM is it can be modified by anyone. This means if you are going to use, modify or contribute to the OSSM project you need to be aware of the risks and potential hazards.

After all, an OSSM is poking around in some very intimate and soft places. There are moving belts and motors that have a surprising amount of force all of which can hurt people.

Our analysis identifies three areas of hazard; design, build and use which neatly map to groups of people. You may be a member of all three groups or only one, but most people are builders and users.

**Designers**; who contribute to the OSSM project or create their own modifications. As a designer you have a role to ensure what you design is safe. This may be a part, code or a pattern. You should also provide guidance to builders and if required users on both hazards and ways to manage them.

**Builders**; are the people that take an OSSM from an idea into a physical reality from components, printed parts and then assemble it into a working machine. As a builder you need to ensure that what you build is strong enough to for use and keep the user safe with the designed controls.

**Users**; fall into two subgroups and you can be both at once. Operators and the receptive user who is having all the fun. Good design and a quality build can provide some protection. But keep in mind, a misused OSSM can create hazards that cannot be mitigated by design.

Guidance for designers

* Think about any new hazards that your design may introduce. Some ideas cannot be made safe, but other risks can be managed with careful thought.
* Inclusive design is often safer design. Designing for people that are visually, physically or cognitively impaired is hard but there are many benefits.
* FDM/3D printed materials have some qualities you need to be aware of. Layer orientation, material choice all can have a positive (or negative) impact on safety.
* For safety critical cases Similarly be aware of the limitations of software. Programming for safety is harder than it looks and there is a considerable body of knowledge devoted to it. If you can find an alternate hazard mitigation such as a power switch that will be more reliable than a software interrupt.
* Don’t expect users and builders to “do the right thing”. A designer is often best placed to understand the potential issues. A builder may not identify risks and users are often distracted when using an OSSM.

Guidance for builders

* Get to know your 3D printer and filament. For critical parts print with thicker walls, larger layer heights and hotter temperatures than normal to maximize strength. Resin printers do not typically create strong enough prints to be used safely.
* Think about finishing and sharp edges. An OSSM is frequently used with minimal clothing and users are frequently distracted.
* Try to avoid relying on the user of the OSSM “to do the right thing” to work around build deficiencies or missing parts such as covers.

Guidance for users

* Understand the risks of using an OSSM.
* Use appropriate toys.
* Take frequent breaks.
* Perform an inspection prior to use. Don’t operate an OSSM with missing or broken parts.
* Don’t operate an OSSM while suffering temporary cognitively impairment.
* Think about over penetration risks. Being restrained and unable to move away from the machine greatly increases risk and chance of injury.
* Lube, lube, lube

Unlike many products you may be a member of all three groups or only one but most people are builders and users.

Designers