

# An Engineer's Conscience

By Jacob Freake



A Predator Drone flying over Eastern Afghanistan during a training exercise.

I find myself taking a prompt from a man I rarely have anything in common with, Rand Paul. It's worth noting any time a politician actually filibusters rather than just talking about it. I'm glad he did, but not to block the President's CIA nomination. I was glad to see him bring drones to the forefront of our political discussion. Eric Holder's claim that it would be legal to assassinate an American Citizen in the United States using a drone is nothing short of terrifying. This isn't a use I could have ever imagined for drones, and it relates back to a troubling realization I've had. As engineers, we can't control what is done with what we make. If I had been the one to have designed the Predator drone, this would put me in no more of a position than a general citizen to decide what it should be used for. That's why I don't design Predator drones.

There's a designer behind every Predator drone, assault rifle, grenade and any other weapon of destruction. Why some weapons were developed is fairly easy to determine, the atomic bomb, for example, was built in a race against Germany. For others, it is less clear: a landmine? Engineers have reasons to build what they do, and I don't suppose I could convince all of them to reconsider them, and I won't try. I appeal to Engineers who want to choose their work as something that doesn't do moral harm. I appeal to Engineers who would take a moral stand, but can't see how their designs have anything to do with it. For the most part Engineers build and design for others, for companies, for governments, for the powerful. Engineers need to recognize that sometimes what we design is used for applications we don't agree with, and decide whether or not those negative uses outweigh the positive. Our brilliance is used to accomplish the goals of these powerful entities. That must end. I choose to build, to advance, and never to destroy, never to harm, to construct peace. The work I do is based on those principals. Your principals likely are not the same as mine, and that is fine. I merely implore you to consider whether the work you do is in line with your principals.

Working as an engineer today is complicated. Thousands of years of human development have given us a solid set of tools from which to build. We have more gadgets and toys now than ever before. I carry a cell phone in my pocket with more computing power than the space shuttle that

landed on the moon in 1969. Since the dropping of atomic bombs on Hiroshima and Nagasaki, Japan, nuclear weapons technology has continued (although perhaps quietly) to advance. We have been able to build great power, and with all of the possibilities, we come to an important question. We have to decide what we should be building.

It is easy to agree that not all technological development is “good” or, rather, has a positive effect on humankind, even if we disagree on what might constitute good or bad technology. Given the current state of technology, and the historical precedent, it is becoming clear that engineers have a role to play in the ethical consideration of technological development, particularly related to weapons. Engineers develop technology, but we don’t control its use. We are then in a position where we need to make ethical decisions about what we make. We need to ask: What could this be used for? Is it worth the risk of it being used for something other than what it is intended?

The Manhattan Project is a useful example. Albert Einstein famously wrote a letter to president Roosevelt encouraging the development of the Atomic Bomb, citing concerns that if the Americans did not build it, the Germans would. After the bombing of Hiroshima and Nagasaki, he regretted his action, saying that if Roosevelt had still been president, those bombings never would have happened. He said he never would have sent the letter if he knew the Germans would fail in their development. Subsequently, many others have questioned whether or not they were necessary to the surrender of Japan, whether use of the Atomic Bomb was justified. Today we live in a nuclear world, only too aware of what we can do with nuclear weapons. We are afraid of the weapon we created.

Oppenheimer, who directed the Manhattan project, never regretted his role, but once said:

*“We have made a thing, a most terrible weapon, that has altered abruptly and profoundly the nature of the world... a thing that by all the standards of the world we grew up in is an evil thing. And by so doing... we have raised again the question of whether science is good for man [...] Mr. President, I feel I have blood on my hands.”*

Whether or not the engineers involved in this project, or the scientists who did the work leading to it agreed with the final use of the project, this was not an uncommon sentiment. They were unable to escape the moral implications of what they had done, and that is an idea that continues now and needs to be considered when considering technological development. The difference between Einstein and Oppenheimer’s sentiment is important. It is not possible for any person to make the right decision every time, but instead be willing to recognize and make your decision based on every possible impact is important. Einstein made his recommendation without considering what would happen if he was wrong. Oppenheimer made his decision willing to accept the negative consequences that could come along with it. That is essential because it keeps engineers honest. It is necessary because the best shot we have at making technology that will make the world a better place is considering the negative consequences, and only proceeding if we are willing to face those consequences.

Not all of the scientists involved in the Manhattan Project wanted to be. Charlie Prewitt was recruited to the project as a chemist. When he became disillusioned, and tried to leave, he was told he would be drafted and brought right back to work on the bomb. After the war, he became

a peace activist, and a teacher. As chance has it, he still teaches in the small town I grew up in, and I know his story well. Scientists and Engineers are not often in positions to determine their work. Once you start a project, it is not easy to stop, particularly in a time of war. Ideally, as soon as a technology proves too dangerous to control, we could stop developing it, but this isn't always the case. This is a tremendous problem, and we can hope to make progress on it. We can also use this as a warning. Engineers have to decide what work we want to do and analyze the consequences carefully, and hopefully by doing so avoid working on projects that we later would disagree with and could do great harm.

The Atomic bomb and subsequent nuclear technology remains controversial to this day. Other technologies, such as landmines, were developed and later widely determined to be inhuman, and illegal. Landmines have a long history, but first appeared close to the current form in the 19<sup>th</sup> century as floating explosives made by the United States Navy. In the subsequent years, mines went through many iterations and the underground mine was built. Landmines were initially developed as a military technology, but are now against the Geneva Convention and their use is banned by most of the world. Despite the ban and dismantling of existing weapons, there are 500 people every week killed by landmines left over from old conflicts. Landmines will not be gone for a long time, and whatever the original intended use, innocent bystanders are being killed in large numbers. In many ways, this was a foreseeable consequence with a technology that was easily hidden and had a significant chance of causing damage to bystanders. Now, instead of their intended use, they cause tremendous harm. This is important to remember when designing new technology. The potential for adverse consequence needs to be weighed against the benefit of that technology.

As engineers, our legacies will be the technology we create and the effect that it has on the world. It would be presumptuous to say that some technologies are never necessary, or that some are inherently bad. However, as no one can ever predict completely what a technology will be used for or whose hands it will fall into. This necessitates engineers to consider the potential implications of the technology they make, and consider the ethical implications. This will be different for each person, and each person may come to a different conclusion. As more and more has become possible, we must ask ourselves, not what can I make, but rather, what should I make. Engineers need to be clear on what kind of work they morally agree with, and what work they do not, so they can choose projects based on it. Though greater consideration, Engineers will be able to do the least harm and most good for the world. Instead of blindly making weapons that someone else gets to control, we can make technology that leaves the world a better place than when we started.