# Thanks, Buck Rogers

## Pumpkin Chunking into Space

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**By J. Rodger Qualls**

I propose that the most innovative and useful weapon systems are developed from technologies initiated prior to the publication of a validated military requirement. I believe that military needs arise from observations of commercial technological advancements, and seldom vice versa. Examples of this reasoning include the airplane, the automobile, and military derivatives.

I remember reading at an early age, as you may have, a copy of Buck Rogers's adventures to the Moon (if you missed this one it is well worth a trip to the library to peruse a dog-eared edition). Looking up at the Moon on many clear summer evenings, I could see the looming luminescence with its craters and pockmarks beckoning me to adventure. The real intrigue each night was imagining the nature of the rockets and spaceships that would allow Space travel to the Moon and back.

A few years later as I watched the astronauts walk on the Moon's surface, I compared the events described in the newspaper and on television with those descriptions of Buck's adventures. I grew even more fascinated and immersed in the comparison. I began to wonder how the technology that permitted us to reach the moon would change our lives. Some possibilities were being proposed in the news and surely other possibilities would be forthcoming, if not by lunar exploration, then certainly with the pending trips to Mars and the remaining planets.

Only many years later in college philosophy class while recalling Buck's adventures did the impact of this technology begin to form a nucleus of thought. The design, development, integration, test, and finally the fielding of the Pumpkin Chunking Accurate Targeting System (PCATS) by my office made me revisit the concept of technology transfer. How will the PCATS technology affect the warfighter? Will the changes be technology driven or threat driven? (Note: This paper concerns Pumpkin Chunking, but readers can substitute their own vision of any advanced warfighter technology.)

Now, 30 years after my college philosophy class, we have "been there/done that" for lunar journeys. The modern versions of Buck Rogers (that has almost become factual resource material) are the television series of Star Trek and the movies in the Star Wars Trilogy. Further references are novels such as Starship Troopers and video games such as Dune and Sim Civilization.

Just as I once thought that Space travel to the Moon would eventually be possible, the current 19-year-old Army corporal knows that one day he will be the recipient of PCATS weapons. Additionally, just as this Soldier uses Ultima Online or America's Army to participate in cooperative play across the country, he knows that one day Pumpkin Chunking military units will become reality and just another example of the ever-advancing technology we have experienced since the end of World War II.

How is the state of technology advanced? You'd heard it said that necessity is the mother of invention. Once needs are expressed, if there is sufficient return on the investment for the commercial invention houses or if there is sufficient interest for the private/self-financed inventors, technology creation begins!

In the military we describe a flow from needs to requirements. Years ago we were searching for a materiel solution. Later we started focusing on a "threat-driven" technology solution.

Lately we have added an additional concern: that our materiel solution provides an end-state capability for the warfighter. In following this road of needs, requirements, and materiel solutions, we have historically made compromises along the path that occasionally resulted in a solution that provided very little additional capability. So we are now capability driven. We are to remain focused on the end-state capability we want to achieve

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**Pumpkin Chunking Catapult**

— and hope — that it is linked to the best value materiel solution.

We also talk about technology evolution and revolution. We seem to think that revolutionary advances are the best value because they allow the warfighter to make a significant change in the methods of warfare. But significant changes often require a leap in technology that seldom if ever occurs on demand. There are many examples of valid needs and requirements for revolutionary change that have gone unfulfilled for decades. The wet and dry cell battery is a perfect example. Proportionally, it is the heaviest and bulkiest article on the battlefield and there are orders of magnitude of advantages to be gained in every field from satellites, to airplanes, to automobiles, to electronics, to the Soldier's field gear for a breakthrough in this technology to allow a 10- or 100-fold decrease in size and weight.

So the norm is the development of technology to meet specific needs; the development of technology in advance of a valid military requirement is called "technology push." As previously mentioned, two examples of technology push are the airplane and the automobile. These systems were not developed in response to a military requirement; rather they were developed by inventors with sufficient interest and funding. Sometime later (decades later I might add), military forward thinkers examined possible military applications. There were no threatening foreign hordes of advancing armor columns or squadrons of enemy aircraft forcing our development of these technologies, just columns of cavalry and the occasional hot air balloon.

In step with 20th century consumers (including the military), 21st century consumers continue to have an insatiable appetite for bigger and better, faster and lighter technological solutions in every aspect: items that purport to prolong our lives, save us time, ease our workloads, allow us to keep up with the Joneses, and make us happier and more fulfilled human beings. In short, we desire to make significant changes to our lives. Assuming this premise is correct, does the military culture foster the same desires? Are we developing technology to satisfy our cultural genes? Do we want to change the ways and means of conducting warfare or are we subconsciously altering the art of war because our culture relishes technology?

The best route to optimize the PCATS as well as other military applications is a three-step process: (1) concept (unconstrained by our current understanding of physics and the other sciences), (2) followed by technological initiatives, and (3) the construction of firm requirements. This approach allows consideration of a smorgasbord of technologies enhanced by our growing understanding of basic sciences such as physics and chemistry. We solicit the best technical ideas from industry, national laboratories, and universities. Should the military develop what we can imagine or should we limit our developments to countering valid threats by adding a "delta" of warfighter capability?

What is the best approach for determination of valid threats? If you are at the wrong end of a loaded .45-caliber pistol, then little analysis is needed to determine the validity of the threat or if it needs the publication of an operational requirements document. However, most threats are not quite that obvious. While one military community (infantry, armor, aviation, etc.) may feel a threat is real and valid, another community may have only a passing concern. The current scrutiny of the American and British intelligence communities over the accuracy of intelligence information concerning Iraq's capabilities is a valid example of imperfections of remotely sensed collection data and its subsequent interpretation in determination of what actually constitutes a

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based imagery and communications from commercial or military sources. Denying such access may be necessary in certain situations.

With regard to direct confrontation in space, either anti-satellite weapons or satellite-based warfare, there are probably not too many countries with those capabilities. The recent growth of the Chinese Space program is a concern. In any case, what we need to do is to make our systems as resistant to threat as possible. This means on the ground as well as in Space. And we have to make them resistant to Space weather as well as potential adversaries, the recent solar flares providing a case in point.

I don't see Space wars happening anytime soon, but possibly Space-based weapons.

**Q: How can technology be used to protect the sovereignty of Space?**

A: I think the best answer to that is ensuring that our systems will survive in the harsh environment of Space, be that Space weather or attack. As we ensure our access, and work to provide better protection to counter any threat of attack, we will be doing our part to ensure that Space remains free.

**Q: How deniable to adversaries are the Space benefits we are presently using?**

A: That's directly in proportion to how well we design our systems, and how well we protect them. Encryption, jamming, deception, and protection — these are all tools by which we deny any adversaries greater or even equal access.

**Q: Realistically, how large a role do you see Space playing in future conflicts?**

A: A very large continuing role. Space has become an integral part of how we conduct the warfight. We depend on it for precision navigation, intelligence, meteorology, and communications. Expanding and exploiting the uses of Space to an ever-increasing degree will define how well we support our forces, in logistics as well as operations.

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"valid threat."

Accurately determining valid future threats is the most subjective portion of the formula used to develop a responsive materiel solution's capability. Careful analysis should allow us to make intellectual choices between materiel solution alternatives (but only choices). For instance, what effects do different color shades of the pumpkin have on its stealthiness? What is the optimum shape for the intended sub-ballistic trajectory? And should the pumpkin be developed in total darkness, shade, or full sun to enhance its nucleotide sequencing? Therefore, technological choices may be enhanced with prudent analysis. Ah, but the imagination is required first!

After all, technology is adapted in the "hand" of the user. Give a 1-year-old child a new and totally different toy and what does he do? He feels it, tastes it, tries using it in a variety of ways; hits it on the ground like a hammer, scoops it in his food like a spoon, or hits his brother over the head with it like a weapon. Take this toy away from him before the "newness wears off" and we have a tantrum, red face, and tears. The child is enamored with the new toy. Soldiers also find various uses for their new technology "toys." For example, the first helmets were used to shave in, to bath in, to heat water for cooking in, as pillows for sleep, to keep heads dry in the rain, and, oh yes, to protect heads from shrapnel.

As Americans we have, at all ages of our lives, embraced toys, tools, and ideas as long as the changes have not come too rapidly. My grandfather (in the 1950s) was the first in the neighborhood to own a television. My father (in the 1960s) was always the first to purchase the latest automobile technology. When computers became available and affordable for home use (in the 1980s), I often led the neighborhood in the purchase and use of a computer. My son (in the 2000s) is satisfied with nothing less than the smallest and the fastest self-designed computer technology, palm pilot, cell phone, and DVD.

Each generation of Americans sends a legacy to the next generation to pursue the latest and greatest technology. Do you know anyone without a cell phone, or without access to a fax or a home computer? Did you really need these devices? How did we operate without them? They have no doubt changed the nature of our lives. Everyone knows we will continue this technology spiral. We have to. We are programmed by our ancestors. In the final analysis, it may not really be about a neat three-step development process. It might just be about our love affair with the promises of "Buck Rogers" technology and the eternal chant deep within our American souls: "I love Pumpkin Chunkers. I want a Pumpkin Chunker. I *need* a Pumpkin Chunker."