

Guest column: Satellites today and tomorrow

It's When Arthur C. Clarke submitted his groundbreaking satellite paper, *Extra-Terrestrial Relays — Can Rocket Stations Give Worldwide Radio Coverage* in October of 1945, the copy people at *Wireless World* tossed it. The Editor found it, took it home, worked through it, and the next day came in and to his staff's surprise announced that "this could work."

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Since then, change in the satellite business has been incremental. True, digital compression has added capacity and the same with improved antennae, but no change has disrupted the industry on the scale of Clarke's work. There is the incremental change in the satellite world which improves "what is" and then there is change and innovation which re-defines "what can be". That's where we must increasingly place our focus.

Global consumers have demanded more efficient, environmentally friendly, and smaller cars, and they are getting them. But the companies that build them often haven't changed – with the result that upstarts like Tata Motors of India now own glamorous old brands like Jaguar and Range Rover while also making the cheapest car in the world --- the Nano. Chinese car companies with names like BYD (Build Your Dreams) and Brilliance Auto are manufacturing electric cars. Together, India and China are growing global market share while GM and Chrysler have declared bankruptcy.

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Despite these setbacks, the United States remains a strong competitor in battles for global market share in most industries. But in the global fixed service satellite communications business American owned and operated companies have declined in market share - all the way down to zero. This isn't just satellite to home TV, either. We're talking about national security as well as guidance and protection of troops on the ground wherever they may need to be.

When General Electric sold its fixed service satellite business to Luxembourg-based SES in 2001 and Intelsat was sold to London-based BC partners in 2007, that was the last of the global US owned and operated satellite communications companies. While each have domestic subsidiaries that supply capacity to the US



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Department of Defense, at the end of the day, they are foreign controlled. Sometimes this is financial engineering to avoid American taxes – with palpable irony. Consider that a foreign based company gets its business revenue from the American taxpayer - while locating off shore for the purpose of avoiding the taxes that fund the same revenues.

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While defense use of commercial satellites has grown and contracting vehicles have been put in place, additional problems remain unresolved, including the abiding possibility that a foreign domiciled satellite company could refuse service to the US based on *policy disagreements*. In some cases, government entities hold “Golden shares” or substantial equity is held by state-run banks. In addition, the US government has had its own set of difficulties in maintaining schedule and budget for the complex array of advanced satellite systems.

While it is becoming painfully obvious how fiscally dangerous it is to rely heavily on foreign ownership of general US government debt, it is barely noticed that virtually 100% of our communications satellite capacity related purchases are from foreign owned or domiciled companies.

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U.S. Space LLC was created, in part, to rectify this situation. U.S. Space is, uniquely, 100% American-owned and operated and its sole customer will be the United States government. While having a reliable home based satellite communications provider is an important step, ownership is only one part of the puzzle.

The space business is a “mature industry.” It is old in nearly every respect. Satellites are aging and the engineering force upon which we rely is also aging and the industry, as stodgy as it sometimes seems, is failing to attract and excite new, young engineers. And finally, the political and bureaucratic challenges of dealing with the Federal government, when it comes to changing habits, can make the idea of turning a battleship on a dime and backing into its berth seem a snap.

For example, the General Accounting Office (GAO) reports that due to GPS replenishment delays "some military operations and civilian users could be adversely affected." While the Global Position System was created initially for military use, today's usage is much more widespread. GPS systems are used for everything from first responders who depend on them when minutes count, to people



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using them to discover backroad short cuts to the cleaners or to grandma's place.

In all likelihood, in-orbit spares will mitigate the potential problem. But the point is, if a satellite program is three years behind schedule and the typical time for conventional government satellite procurement and launch is 5-7 years, then we are facing problems in deploying new systems to meet our needs.

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One of the unique elements of U.S. Space LLC includes the creation of a smaller, nimble class of satellite which can be launched on "operationally responsive" timetables. Standardization and the "plug and play" nature of the design enables mission flexibility, reduced time to market, and economic efficiency while maintaining a high degree of reliability. Using commercial financing and commercial business practices will help lower system costs as well.

The other aspect of change for the federal Government is when change is finally seen as imminently necessary, it is wanted NOW. Hungarian scientist Theodore von Karman, who immigrated to the United States in 1930, said: "Everyone knows it takes a woman nine months to have a baby. But, you Americans think that if you can get nine women pregnant, you can have a baby in a month!"

On the road to dramatic change, at U.S. Space we are starting the process with small satellites designed to respond quickly and to augment existing US Government needs and programs. But great change is coming whether we implement it or merely observe it.

What we know is that the future will be vastly different. It is estimated that within the next 25 years, science and technology will advance by a factor of 4 – 7x beyond the advancements over the *last* 25 years. While we may *hear* this in stride - it is absolutely stunning in its business and social implications. It means that where we stand today on the technology and science scale versus where we will be in the next 25 years - is a moment equivalent to being in the year 1650.

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It has been a mere 50 years since Sputnik and today companies like Nevada's SpaceDev and the U.K's Surrey Satellite Technology are working on development of a nano satellite the size of a credit card - which would give a new meaning to Space Awareness.

Look at the development of the computer. The first commercial use of a computer was UNIVAC 1 purchased by the US government in 1951, a mere six years before Sputnik was launched. The first computers operated with 5,200 vacuum tubes and weighed 29,000 pounds (13 metric tons). It typically cost between \$1.2 and \$1.5 million in 1950 dollars. And remember that \$1.00 in 2008 had about the same buying power as \$0.11 in 1950. It also processed at 2.25 MHz per second.

We have indeed come a long way. Change beyond our imagination is a rule of nature and is central to the joy of mind as it is to scientific, social and political challenges. For engineers present and future, I paraphrase Scottish poet Robert Browning, "Ah, but an engineer's reach should exceed his (or her) grasp, or what's a heaven for?"

By Edward D. Horowitz
Co-Founder of US Space LLC



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