

Decades-old budget lies still harming National Security

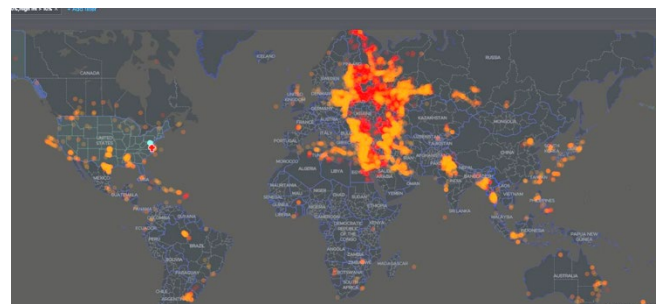
*Retired DOD, DOT, and DHS senior officials
warn about lack of GPS backup*

It's 1977 and the wild idea to build a Global Positioning System, GPS, is in trouble. The Navy is saying, "We already know where we are." The Air Force says, "We have plenty of nav aids." The Marine Corps and Army: "Don't need it." The Undersecretary for Research and Engineering at the Department of Defense is a believer, though, so the first of many sizable budget requests to build GPS is on Capitol Hill. Appropriations staff are confused by mixed messages coming from the Pentagon.

They approach a young House Intelligence Committee staffer, Martin Faga, who has just left an intelligence collection job with the CIA. What does he think? Faga observes that the same satellites will also have the nation's sensor network to detect a nuclear detonation anywhere on the planet. So "yes," definitely needed. GPS goes forward to be a roaring success for both the military and the nation's economic prosperity—not to mention being one of America's best gifts to the world.

Nearly 50 years later GPS has become an indispensable utility supporting not only transportation but invisibly underpinning virtually every technology and application with its timing and location data. It is so indispensable, a member of the National Security Council called it "a single point of failure" for America.

Over-dependency on GPS should be a grave concern to policy makers, indeed, for every American. GPS signals are weak and easily jammed. And, because we wanted GPS to be our gift to the world, we published the signal specification. This wasn't a big problem initially, but today any reasonably skilled hacker can imitate or spoof GPS signals and make you think you are somewhere you are not. Conflict zones see daily jamming and spoofing. And it's happening in the U.S. more and more.



30 days of GPS interference detectable
from space. US DOD & DOT.

None of these vulnerabilities and problems are a surprise to those involved in the early days of GPS. "We knew the weak signal would be a problem, probably sooner rather than

later. And we knew that eventually our adversaries would be able to spoof the signal,” said one prominent figure. “It was inevitable and unavoidable.”



Yet space is expensive. Especially national security space. And while winning program funding in 1977 was an important step, it by no means assured the billions of additional dollars that would be needed. At that point, though, the Pentagon was committed and closed ranks behind the program.

Shifting to ‘warrior mode,’ Defense Department and industry GPS advocates fought hard to win successful budget battles.

Regrettably, this included assertions that while GPS was expensive, there would be offsetting cost savings. These included eliminating the need for a variety of existing terrestrial navigation systems including aviation’s VORs and DMEs. The Federal Aviation Administration (FAA) enthusiastically announced plans to eliminate all these navigation aids and have aircraft rely solely on GPS.

Another that could be eliminated was Loran-C. Managed by the Coast Guard, it was primarily used by maritime and general aviation, as well as a number of financial and telecommunications companies (for timing). The Office of Management (OMB) and Budget directed the Coast Guard to begin plans to shut down this now-unnecessary system.

Yet in all the budget advocacy and push to eliminate other systems, there does not appear to have been any mention of the inherent weakness of GPS’ critical positioning, navigation, and timing (PNT) signals and the potential for trouble. These were well known by the Department of Defense and documented in numerous reports. Most of those are still classified, though numerous references to jamming and spoofing in a [1995 RAND report](#)ⁱ make it clear the problems were well known.

The first major and public government document about these problems was from the [Department of Transportation in 2001](#)ⁱⁱ. It found that jamming was a significant threat and spoofing could become one. The report recommended the FAA cancel its plans to eliminate all terrestrial navigation aids because interference with GPS was simply too easy and too likely. The report also recommended examining Loran and other technologies as complements and backups for GPS.

In 2004 President George W. Bush directed the Secretary of Transportation to work with the Secretaries of Defense and Homeland Security to “...develop, acquire, operate, and maintain backup position, navigation, and timing capabilities...”ⁱⁱⁱ Four years later the [Department of Homeland Security announced](#)^{iv} it would upgrade the Loran-C system to a modernized, more accurate and less expensive “enhanced” Loran, or “eLoran” network.

Yet two inexorable forces worked against this plan.

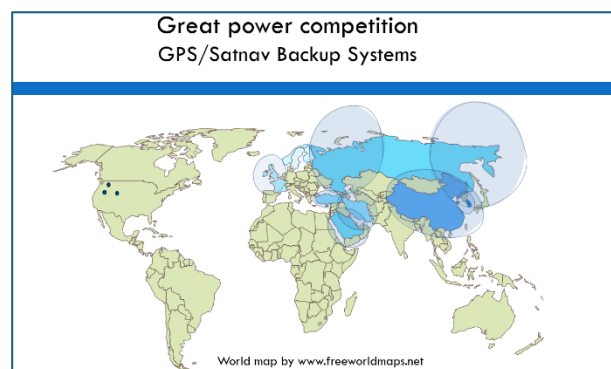
First, GPS advocates within the Department of Defense (DOD) and industry were not at all happy. For some, it was emotional. GPS was, and is, a great system. Thousands of people have spent their professional lives making it work and then making it work better. That it had vulnerabilities that could endanger people was, for some, unthinkable. For others, it was more Machiavellian. Having a tiny, \$36M/yr item in the federal budget for a system that gave the homeland similar services to the billion dollar-a-year GPS system was just too much of a risk. It could encourage Congress to delay future funding and upgrades. So, Defense and industry lobbied OMB - “shut it down!”

Secondly, irrespective of lobbying, budgeteers have long memories, especially when it comes to promises of savings, however small. For years OMB had been looking forward to eliminating a “redundant” system and pressed the Coast Guard to terminate Loran. Everything they were hearing from DOD and industry helped their confirmation bias.

So, in the earliest days of the Obama administration OMB ignored the input of dozens of senior experts and promises from officials in the previous administration. It eliminated the \$36M from the Homeland Security budget that had been used to operate Loran-C and would have funded the transition to enhanced Loran (eLoran). Despite protests from officials that this miniscule “savings” would have very negative national security consequences, OMB prevailed.

Since then, Congress has expressed its concerns in letters to the administration, numerous hearings, and even in passage of legislation that was signed into law^v requiring the Department of Transportation to establish at least a timing backup for GPS. That mandate was “subject to appropriations,” though, and OMB has successfully opposed any efforts by DOT and Congressional committees.

While the U.S. continues with GPS as a single point of failure, our adversaries and some allies have established backups to GPS. The United Kingdom and France are expanding eLoran coverage in northern Europe. The Republic of Korea has an eLoran system as does the Kingdom of Saudi Arabia. More ominously, so do Russia and China. A [paper by the Moorman Center of the National Security Space Association](#)^{vi} found this has created a dangerous “navigation warfare asymmetry” and exposed America to potential “GPS blackmail.”



Rigorous budget advocacy decades ago, despite known dangers, haunts America to this day. We lag our adversaries and allies in protecting our infrastructure by combining terrestrial signals with GPS to ensure we have resilient PNT services. Deployments of unmanned systems of all kinds are hampered and made more dangerous by the lack of a national PNT backbone. And our economy can be crippled by an adversary with the flip of a switch or by a rare but inevitable massive solar event. And the dirty secret: many resilient PNT solutions already exist—and they aren't that expensive.

The question for America going forward is how to overcome old budget sins and act to protect GPS and PNT before disaster strikes.

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ⁱ https://www.rand.org/content/dam/rand/pubs/monograph_reports/MR614/MR614.pdf

ⁱⁱ <https://rosap.ntl.bts.gov/view/dot/8435>

ⁱⁱⁱ <https://irp.fas.org/offdocs/nspd/nspd-39.htm>

^{iv} <https://rntfnd.org/wp-content/uploads/DHS-Press-Release-GPS-Backup-2008.pdf>

^v 49 USC 312

^{vi} <https://rntfnd.org/wp-content/uploads/NAWWAR-FINAL.pdf>