

# THE ACHILLES HEEL IN THE RADHARD FPGA SUPPLY CHAIN

A SHARED VISION IS CRUCIAL

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**Choke points within the MILSATCOM industrial base are semiconductor devices that rely on solder columns to connect to PC boards — and the MILSATCOM industrial base is surprisingly vulnerable, due to solder columns.**

A small number of civilians in the supply chain, primarily engineers and department managers, practice a policy that could have a harmful effect on U.S. national security. This policy creates the potential for a single point of failure in the supply chain.

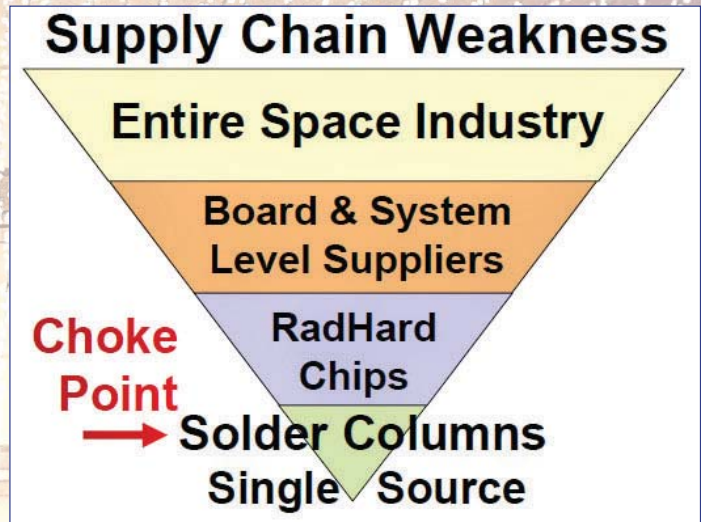
The issue is that 90% of the U.S. MILSATCOM industry rely on a single hardware subcontractor to provide a critical manufacturing service of attaching millions of solder columns, that are smaller than a grain of rice, to *Radiation Hardened Field Programmable Gate Array* (RadHard FPGA) and to certain *Application Specific Integrated Circuits* (ASIC).

These high-value semiconductor devices are key to the functioning of critical military and aerospace hardware guidance systems, for they cannot function without solder columns.

Civilian decision makers in the supply chain, with awareness of the *Department of Defense* (DoD), have established a course of action that discourages qualification of alternative suppliers for solder columns. Concerns have been voiced by the community that the market is too small to financially support more than one supplier of column attachment services. Hence, all business is channeled to just one column vendor.

To assume that the current single source subcontractor of solder columns will be capable of providing this vital service forever is quite risky.

Less than 100,000 FPGA and ASIC devices with solder columns (known as *Column Grid Array - CGA*) are produced each year. These solder columns are an integral part of the device, serving as an electrical and mechanical conduit to connect the semiconductor device package to the *printed circuit board* (PCB). Systems that rely on these ruggedized chips can not function without solder columns.



A stoppage of RadHard CGA production would cripple the MILSATCOM industry, should the current single source subcontractor be unable to meet a demand surge. In such scenario, the industry would be compromised, essentially without interference by a foreign actor and without a single shot being fired.

This would cause havoc in the MILSATCOM industry, together with a multitude of companies that support it, resulting in a massive liability to the U.S. military establishment and to our nation's allies. Surprisingly, the DoD is aware of this issue. Yet, no action has been initiated to encourage more solder column suppliers to enter the field. Plus, there is interest by some to discourage qualification for additional solder column vendors.

## INACTION IS A RECIPE FOR DISASTER

Nine out of ten of the Nation's top FPGA and ASIC makers support the decision not to qualify a second column attachment vendor. Fortunately, one maker of RadHard FPGA devices has recognized the need to pursue action to qualify a second source solder column vendor.



Company	CAGE CODE
BAE Systems	1RU44
CAES (Aeroflex)	65342
Cypress Semiconductor Infineon Technologies	65786
Data Device Corporation	19645 / 7NV27
Honeywell International	34168
Microchip (Actel/Microsemi)	0J4Z0
Microchip (Atmel)	F7400
Teledyne Technologies	OC7V7
Texas Instruments	01295
Xilinx	68994

This situation, if left unresolved, could trigger a catastrophic chain reaction, not only for National Security, but for the multitude of workers in the MILSATCOM industrial base who would sit idle should such ruggedized FPGA and ASIC devices fail to be delivered.

It is well known by thought leaders within the Defense Industrial Base that solder columns are the "Achilles Heel" for sustainability and resiliency of ruggedized FPGA components in the supply chain. Warfighters and satellites cannot operate without solder columns attached to FPGA components.

Our Nation does not have a "Plan B" to fill the supply chain void should a demand surge exceed the capacity of the current sole source supply of solder columns.

### THE RISK OF SINGLE-SOURCE SUPPLY

Assuming that any particular subcontractor will be in business 5 years, 10 years or even 20 years from now is overly optimistic. The defense industry has ongoing programs that will require delivery of devices with columns even 30 years from now.

Most likely, a minimum of three years for the supply chain to fill the void should the current single source vendor experience an interruption in providing solder column attachment services.

There are many hurdles to becoming certified to attach solder columns on space components. Providing column attachment services is an artisan endeavor in a constrained niche market.

Any subcontractor who is interested in providing column attachment services must be willing to invest millions of dollars in specialized equipment and commit to training employees for years for them to become proficient in the art and science of making and attaching solder columns.

A great deal of havoc can occur while the Industrial Base remains vulnerable during a three year period, even as the Nation's space capability sits idle, due to a lack of FPGA components with solder columns.

### SUPPLY CHAIN SUSTAINABILITY AT RISK

Simply stated, if the current column vendor should face a production shutdown, then deliveries of defense and satellite grade FPGA and ASIC devices with columns will come to a halt. The establishment would be incapable of providing black box systems to MILSATCOM customers due to the lack of these critically needed devices. This is analogous to a situation whereby the lack of a low-cost fastener, such as a special screw, for example, brings an entire industry to its knees.

During the past three years, due to COVID-19 travel restrictions, the [Defense Logistics Agency \(DLA\)](#), an arm of the DoD, has not conducted requested field audits to certify an alternative subcontractor for column attachment.

A stoppage of production caused by the demise of a single source vendor could trigger a catastrophic chain reaction in the U.S. defense establishment and, ultimately, adversely affect our allies, who rely on a continuous supply of these products from the USA. Economically, the stoppage of a continuous supply of column interconnects could cascade into a widespread loss of jobs for American workers throughout the supply chain.

### MORE INVOLVEMENT + MORE ENCOURAGEMENT

Clearly, defense-grade FPGA and ASIC devices with solder columns are critically important. The defense establishment needs to be more involved and to encourage the industrial base to expand their reliance beyond the single source subcontractor that provides 90% of America's solder column attachment services. A Plan "B" safety net is needed to protect the defense industry in the event of the loss of such a critical supplier.

America needs to shore up its self-reliance on defense grade FPGA components, because our country cannot afford to lose her superiority in these critical devices. Stakeholders need to initiate a shared vision to ensure a robust and sustainable supply chain for FPGA devices with solder columns.

Fortunately, alternative manufacturing of copper wrapped solder columns and attachment services is already available domestically, pending certification.

Action should be taken to qualify multiple subcontractors who are ready and willing to provide the critical process of copper wrapped column attachment services for FPGA packages.

A prudent investment today can mitigate the risk of waiting for an unexpected disaster to strike, with its potentially unimaginable cost to the defense and MilSat industry.

An unplanned production stoppage of critical FPGA components could imminently severely diminish market readiness at any time.

The Defense Industrial Base has the means to act swiftly and proactively to build a solid foundation for the long term.

Hopefully, proactive thought leaders in the supply chain are listening.

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