

# Legacy Sustainment Magic: When OEMs and LEMs Come Together

GDCA is in the business of helping defense programs who can no longer get support for obsolete electronics circuit cards, like computer boards, graphics cards, power supply controllers and many more specialized electronics assemblies that make defense systems “smart”. These circuit card assemblies (CCAs) are often commercial products that have been discontinued by their OEMs.

Commercial-off-the-shelf (COTS) CCAs are great value for companies who make smart defense systems, because they’re ready to order and save all the time, cost and risk of developing a similar design in-house. However, like all commercially produced items, they eventually become obsolete – meaning they get discontinued.

Over our 30-year history, we’ve serviced a lot of different Defense programs by manufacturing and repairing obsolete CCAs. We’ve done this by working with all levels of the supply chain: end-users and primes, and their sub-tier suppliers.

Our most successful projects have had one thing in common: the OEM made a conscious decision to change how they traditionally dealt with part obsolescence and subsequent product discontinuation. This willingness to deviate from past practices has proven beneficial for both their customers and them.

Over the past 6 years, we’ve worked extensively with the US Navy and their OEM suppliers to provide obsolete “legacy” CCAs in support of the RIM-7 Sea Sparrow anti-missile defense system. The Sea Sparrow is used by NATO and Domestic Navy ships to defend against low-flying/high-speed incoming missiles. It’s a ship-saver and a lifesaver.

Also known as DMSMS (diminishing manufacturing sources and material shortages), obsolete CCAs proved to be a tough challenge after the Navy transitioned support for Sea Sparrow from their Prime contractor to “organic” Navy depot support.

Within 4 years, the responsible Navy program office and their internal suppliers managed to restart the production lines for 5 DMSMS CCAs, from 4 different embedded electronics OEMs. Theoretically, these successes saved >\$10M in taxpayer dollars. Pragmatically, they’ve enabled the program office to maintain readiness in the face of not being able to reliably get upgrade funding.

To enable this success, the Navy teams contracted GDCA to work with electronics OEMs so GDCA could resume production for DMSMS CCAs.

This case study explores the value that legacy equipment manufacturers (LEMs) can offer to all players in the defense supply chain. By developing new-sources-of-supply (NSOS) for obsolete electronics, Navy teams and their Primes can take control of DMSMS and rebuild broken supply chains.

## Background

### About the NATO Sea Sparrow Support Team

As with many US Navy surface systems, The NATO Sea Sparrow Missile System is supported by a complex supply chain that has evolved throughout the system’s life.

From the Acquisition phase through to full-rate production and deployment, the Navy engaged their Prime Contractor for design, manufacturing, and repair. Internally, the Navy program office, in-service engineering agent, logisticians and depots, and NAVSUP all coordinated efforts to support their Prime supplier.

At the time the Navy decided to take over primary operation and sustainment for the system c. 2018, there was a lot of electronics obsolescence, including many commercial-off-the-shelf (COTS) CCAs. This meant that the Navy could not get the spares or repairs they needed to complete their sustainment mission.

Moreover, it was often impractical for them to do technology refresh of the system configuration, because of the extensive cost of hardware replacement and resulting certification. Some of the boards had been discontinued as early as 2006. By the time they assumed support responsibility, the Navy still needed reliable CCAs until the 2030s at least.

Initially, the Navy attempted to take on the remanufacture of these obsolete cards themselves. However, after reverse engineering the first DMSMS CCA, they determined they didn't have the resources to sustainably manage multiple and simultaneous reverse-engineering projects.

## About GDCA

GDCA is a legacy equipment manufacturer (LEM) for obsolete electronics. Obsolescence is defined as "being discontinued by the OEM".

We are in business to help those customers who cannot upgrade. We are also in business to help embedded OEMs resolve a common dilemma: do they end-of-life less profitable products and leave customers in the lurch, or do they continue sustaining low-volume/non-strategic products to keep customers happy?

OEMs grow and maintain market share by introducing newer and better technology products. LEMs have a more service-oriented business model and partner with OEMs to sustain older "legacy" products. From manufacturing and engineering to sales and supply chain management, GDCA is set up to provide embedded boards that require lifecycles beyond what makes economic sense for the OEM.

LEM offers the added benefit of being OEM-authorized. This means that OEMs have qualified LEMs to take over their legacy designs: producing new, authentic boards and systems that are form, fit, and functionally the same as the products as originally manufactured by the OEM.

## An Unexpected Coincidence

Since 2007, GDCA has been providing the US Navy with an obsolete CCA, originally manufactured by Motorola Embedded Computing Group (now Penguin Computing). With support from Penguin, GDCA was able to restart the CCA's production line and had already provided nearly 500 newly manufactured units and more than 60 repairs over the years. Our primary customer at that time was NAVSUP and we had no visibility of the end-users' system.

In 2019, we learned that one of the applications using this legacy Penguin board was Sea Sparrow. Around this time, we also learned that the Navy was struggling with 2 different DMSMS CCAs for Sea Sparrow that were originally manufactured by Acromag, a Michigan-

based electronics OEM who specializes in high performance signal conditioning and embedded I/O solutions for industrial markets and defense Primes.

## Round 1: “Reverse Engineering” During the Pandemic

Initially, GDCA was simply asked to explore what it would take to reverse engineer and build a new source of supply for two DMSMS Acromag CCAs. We went through our usual process of fully examining the boards, the state of the supply chains for each component on the two boards, and eventually providing the Navy with a [Sustainment Options Report](#) (SOR). This report provided them with a detailed analysis of all their available options, with indicative costs and timelines for each option.

The options evaluation included system upgrade; however, while there were newer versions of the CCAs available, these upgrades were not form-fit-functionally identical to the current configuration. Upgrading their systems was also expensive, potentially requiring software or even hardware changes that the Navy determined they could not afford.

Following completion of the SOR, the Navy decided to proceed with the option of restarting the production lines for the Acromag cards, proceeding with a new-source-of-supply (NSOS) in January of 2020.

Soon after GDCA and Acromag started to gather all of the necessary information for GDCA to resume production, the COVID pandemic quite literally shut down the entire world. Indeed, the documentation that was needed was so old that it had not been digitized yet and was still stored in hard copy. During this time, our OEM relations team coordinated with Acromag’s team to get the documentation out of the office and into our Manufacturing team’s hands.

From there, GDCA’s manufacturing and engineering teams had a lot of work on their hands. While we now had the necessary documentation, it needed to be digitized and examined. They also had to entirely rebuild the testing capabilities to ensure that the boards functioned properly.

In the end, with solid collaboration between all parties, both units were accepted by the Navy in early 2021. This acceptance process resulted in GDCA being qualified as a new supplier of record. At the time of this writing, GDCA has delivered 59 new production units to the Navy.

## From Busy to Behind and Back Again

Around the same time as we heard about their problems with the Acromag boards, we also learned of a problem the Navy team was having with an Abaco CCA which was discontinued nearly 14 years earlier in 2006. Abaco is a provider of high performance and rugged embedded computers for many industries, including defense.

As with the previous card, the OEM advised an upgrade path for the CCA, but the Navy didn’t have the funding or time to pursue this option. In response, GDCA reached out directly to the OEM and secured their agreement to support us in restarting the production line on the Navy’s behalf.

After a nearly 18-month effort to secure funding and the exploration and solicitation of other possible solutions, the Navy awarded GDCA the contract to restart production – featuring delivery of 2 first articles to verify that the cards were form-fit-functionally identical.

Due to the length of time the product had been discontinued, there was no test procedure available from the OEM; this meant that GDCA engineers had to develop a sufficient functional test. Furthermore, the OEM had no test gear parts to share with us, so we procured and assembled parts: test chassis, backplane, power supply, connectors and internal computer boards.

Beyond recreation of the test capability, GDCA's Legacy engineering and procurement teams encountered 2 obsolete components; meaning they could not find a reliable source of supply for these 2 discontinued components. To resolve this, GDCA component engineers analyzed the parts' functionality and identified parts from alternate suppliers.

As the new supplier of record, GDCA has delivered 98 new production units to the Navy at the time of this writing.

## What's a Pandemic Between Partners

Not long after acceptance of the first articles for the Acromag CCAs, GDCA learned in 2020 of another obsolete design whose OEM was Mercury Systems. As with the previous DMSMS designs, GDCA began negotiations with the OEM to partner up to enable GDCA to restart production and repair.

Unfortunately, this was still within the height of the pandemic lock-down. Nevertheless, the OEM demonstrated solid commitment to supporting the project. As part of the agreement, the OEM re-developed a test procedure and test stand for delivery to GDCA. After they completed this work, they handed the test capability off to GDCA's Legacy Engineering team.

Beyond re-creation of the test capability, GDCA Legacy engineering and procurement teams resolved solutions for 11 obsolete components.

As the new supplier of record, following the Navy's first article acceptance and GDCA's subsequent qualification as a supplier, we have delivered 25 new production units to the Navy at the time of this writing.

## Loving it When a Plan Comes Together

Following on from these previous successes, GDCA began to restart the line for a separate discontinued CCA design, this one from Penguin Computing. Based on our longstanding OEM/LEM partnership with Penguin and our familiarity with a related family of products, GDCA was able to restart the production line for these CCAs in less than 10 months.

In this case, GDCA's engineering teams encountered a potentially show-stopping issue: the exact configuration of 15 different programmable devices used on the CCA were not apparent. To remedy this, the team tracked down correct configurations and found solutions to program the needed parts.

First articles were delivered in April 2024. Soon after, GDCA became a qualified supplier for this previously DMSM part, and we will continue to sustain this part for as long as the Navy needs it.

## Conclusion

To deliver effective life cycle sustainment solutions, GDCA works with everyone in the supply chain. This approach considers the unique relationship and interdependency between all the supply chain parties involved. Only through these relationships can GDCA succeed in undertaking efforts needed to produce identical units that perform exactly as did OEMs' original designs.

The success of these efforts delivered several benefits:

First, the Navy was able to secure the boards they needed for as long as they will be required. This allowed them to succeed in their mission to support the warfighter with timely parts and support.

Secondly, OEMs could enable support for legacy products without having to spend valuable resources. This allowed them to maintain customer satisfaction while simultaneously focusing on newer strategic products – essential to their success.

When it comes to electronics obsolescence, you never know what types of issues you'll have to deal with. That's why working with an LEM is so important. LEMs are organized to deal with all the issues associated with legacy electronics projects.

Often, the scope of work required to support legacy designs is so far outside of normal manufacturing processes the risks of project over-run and ultimate failure create a downward spiral of issues and resolution that can last years, with no end in sight. Working with an LEM is not only more productive, but also can save a lot of time, money, and headaches.

Finally, GDCA enjoys this work. For us, it's incredibly satisfying to pull together a solution for a difficult problem that satisfies everyone. This is why we're in business: acting as a shock absorber between OEMs who must move on to stay competitive and program offices who must stay put to sustain legacy systems. This is a win-win-win.