



Market Research

VITA Market Developments

2021 Q2 Report
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Embedded Market Research



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Brian Arbuckle Autobiography

Brian Arbuckle is a market analyst specializing in embedded computing. Brian has an engineering degree from the University of Warwick and an MBA. His career has spanned marketing management roles in industry for electronic and mechanical components and systems and communications networks. He has worked in analyst roles for technical market research organisations, IHS Markit and Informattech and in recent years has authored an annual market research report on the embedded computing industry.

Forward

VITA has commissioned this market research to gather information on data related to the most popular of VITA standards. We are planning quarterly updates on trends, contracts, and products. A comprehensive research report of the market for VITA standard products is in final preparation. The report, largely based on a VITA member survey of sales in 2019 and 2020, will shortly be available to order directly from VITA.

This paper reviews highlights and developments during the second trading quarter of 2021 and the trends that are driving technology development for VITA technology boards and systems.

All dollar amounts are in USD.

Introduction

In a recent survey carried out for VITA, members were asked to identify current business risks. The COVID-19 pandemic and subsequent supply chain interruption was not surprisingly highlighted. It would now appear that disruption effects are beginning to be mitigated by prime contractors.

On 21st June 2021, Lockheed Martin announced it is finalizing a plan to stabilize F-35 Lightning II Joint Strike Fighter (JSF) deliveries over the next 4–5 years following disruptions in 2020–21 due to COVID-19. This delivery stabilization plan, called ‘production smoothing’, would level the highs and lows in future production quantities. This would bring benefits to the company’s factory, workforce, and supply chain. This and similar initiatives may well be welcomed by VITA members.

COVID-19 aside, the military embedded computing market remains healthy, judging by encouraging growth reported by the leading VITA board and system suppliers in their Securities and Exchange Commission (SEC) filings and the number of new VITA standard products released in Q2.

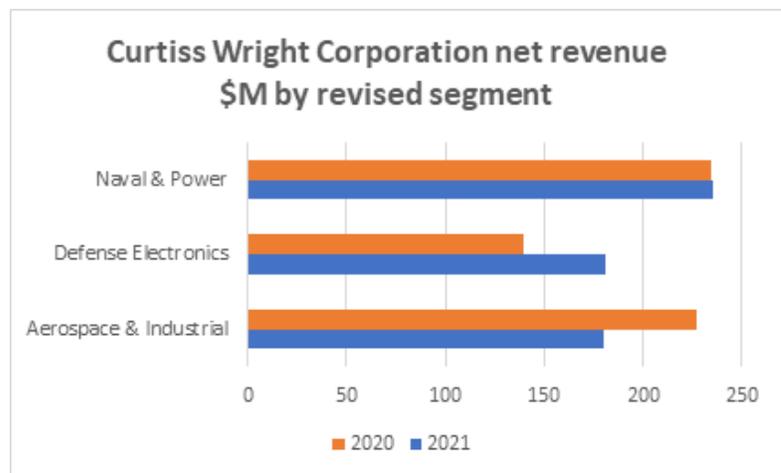
Financial Results

Results published by two of the major players in the military embedded technology market indicate that the defense market in 2020 remained buoyant while other markets have suffered.

Curtiss Wright Corporation published their Q1 SEC return on May 6th, 2021. Note that the Company’s results and guidance reflect the segment realignment announced earlier in 2021, whereby the Corporation is operating under the following three segments: Aerospace & Industrial, Defense Electronics, and Naval & Power. Sales during the three months ended March 31, 2021, for the entire corporation decreased \$4 million, or 1%, to \$597 million, compared with the prior year period.

The full-year 2021 business outlook shows an increased sales guidance to a new range of 7 to 9% growth (previously 6 to 8%).

In the Aerospace and Defense businesses, a sales increase of \$42 million from the Defense



Electronics segment offset lower sales of \$46 million from the Aerospace & Industrial segment. Sales from the Naval & Power segment were essentially flat against the prior year period.

Sales in the Defense Electronics segment are primarily to the defense markets and, to a lesser extent, the commercial aerospace market. Sales during the three months ended March 31, 2021, increased \$42 million, or 30%, to \$181 million from the prior year period.

Sales in the ground defense market increased \$33 million primarily due to the incremental impact of the PacStar acquisition. In the aerospace defense market, sales increased \$10 million primarily due to higher demand for embedded computing equipment on various helicopter and Unmanned Aerial Vehicle (UAV) platforms, including the Blackhawk and Global Hawk.

Mercury Systems filed a SEC quarterly return on May 11, 2021 effectively for the January – March 2021 period (the third quarter of their reporting year.)

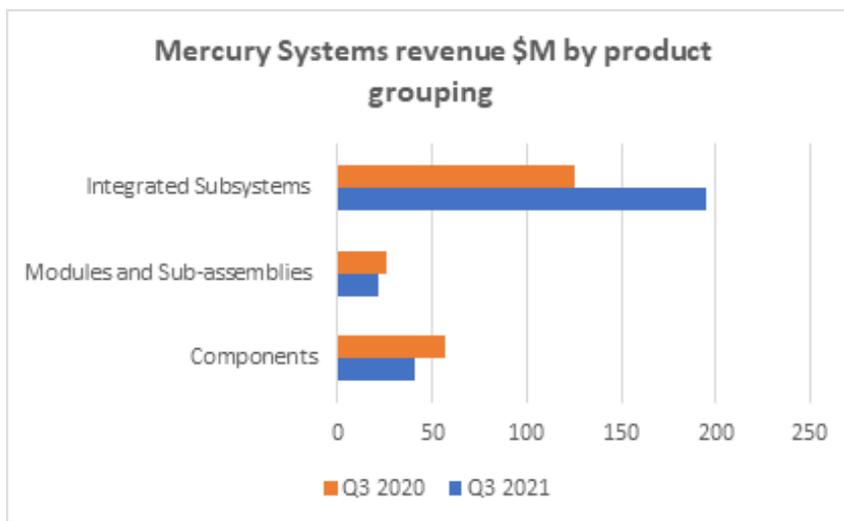
Mercury Systems delivered a strong financial performance in its third quarter with record revenues exceeded guidance. Revenues were \$256.9 million, compared to \$208.0 million in the third quarter of fiscal 2020. The third quarter fiscal 2021 results included an aggregate of approximately \$38.5 million of revenue attributable to the Physical Optics Corporation acquired business.

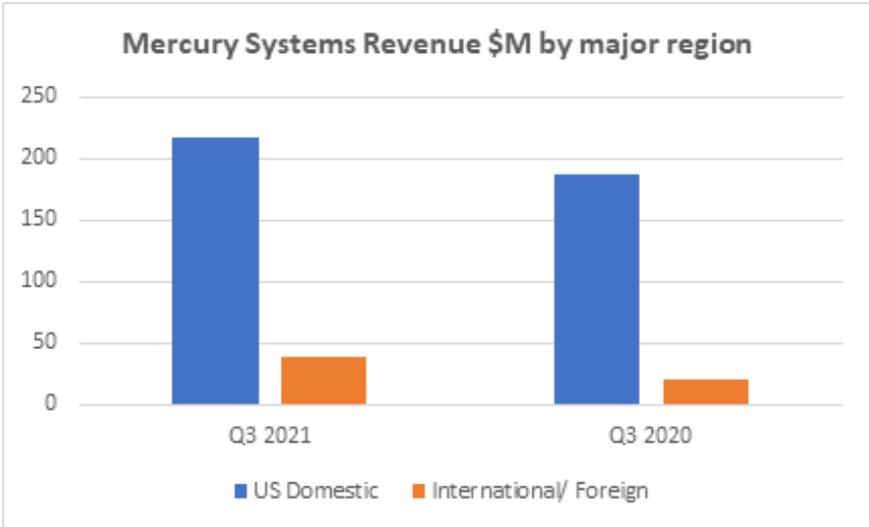
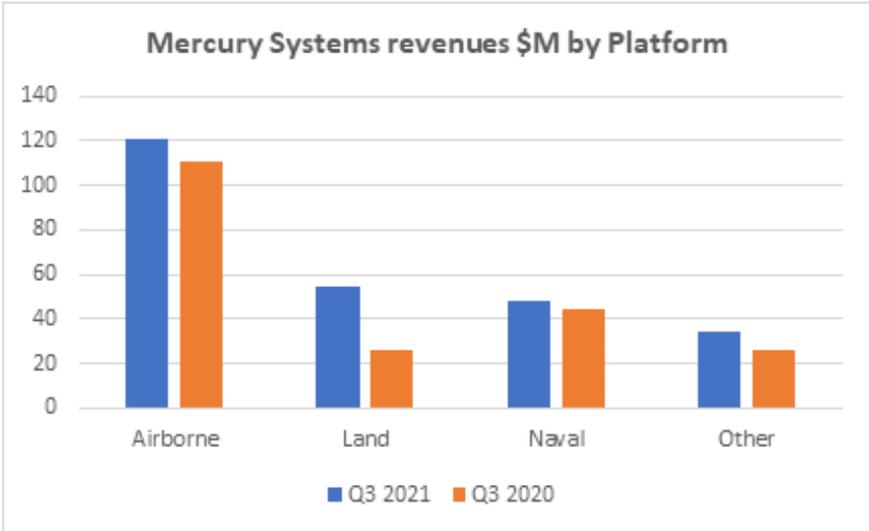
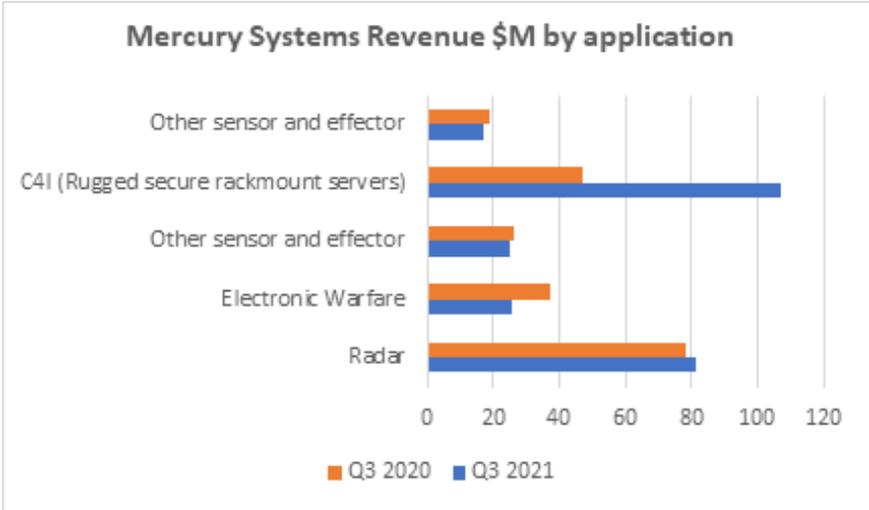
For the fourth quarter of fiscal 2021, revenues are forecast to be in the range of \$236.5 million to \$246.5 million and for the full fiscal year 2021, revenues are forecast to be in the range of \$910.0 million to \$920.0 million.

It is interesting to note that Mercury Systems’ direct business with the U.S. navy has increased from under 10% of total revenues last quarter to 16% in Q3. An indication perhaps of Mercury Systems taking on more of a prime contractor role.

The following tables and charts are compiled from analysis of the SEC data reported:

Customers, % of revenues	Q3 2021	Q3 2020
Raytheon Technologies	18%	17%
U.S. Navy	16%	<10%
Lockheed Martin Corporation	14%	17%
L3Harris Technologies	<10%	<10%





Contract and Design Win Announcements

Not all defense contracts are announced publicly and for those that are, not all identify details of embedded computing technology on board. VITA management encourages members to be as explicit as they can in their news releases to reinforce customer confidence in the standards through highlighting examples of deployments. Only contract wins that specifically mention VITA standards are reported .

Airborne Systems

April 7, 2021 – Curtiss-Wright Corporation announced that it had been awarded a contract by Lockheed Martin Aeronautics to provide its rugged commercial-off-the-shelf (COTS) processor module technology to upgrade the F-22 Raptor. Curtiss-Wright processing modules feature 3U/6U VPX, 6U VME and XMC VITA standards.

May 19, 2021 – Abaco Systems announced a design win with an initial value of \$211K and a lifetime potential of \$20 million as part of an electronics intelligence (ELINT) and signal intelligence (SIGINT) capabilities upgrade for radio frequency data intelligence gathering over a distributed fleet of US Air Force aircraft. This win includes their VP460 6U VPX Direct RF Processing System and the SBC627 6U OpenVPX rugged single board computer.

June 7, 2021 – Curtiss-Wright's Defense Solutions division announced that it was awarded a contract by Lockheed Martin to provide its Modular Open-Systems Approach (MOSA) computers and video processing modules to upgrade the Mission Computer and Flight Management Computer (MC/FMC) on the U.S. Navy's fleet of Sikorsky MH-60R/S Seahawk helicopters. The initial contract is valued at \$24 million. The estimated lifetime value of the contract is \$70 million. Under the multi-year contract, shipments began in December 2020. Curtiss-Wright processing modules feature 3U/6U VPX, 6U VME and XMC VITA standards.

Land-based systems

April 7, 2021 – Abaco Systems announced a multi-million dollar design win with a \$1.75M value per year, and a lifetime potential of \$3.8M including 50 units of the RM921NB and 100 units of the XVR19. The prime will integrate the SBC and switch in their design of a radio frequency system which will perform electronic warfare testing on ground-based systems to support flight line crews on multi-role fighter aircraft. Both units are of VME 6U form factor.

Product Announcements

VPX Technology

The sensor community served by the SOSA™ Technical Standard relies heavily on VPX modules, so defining a minimum set of 3U and 6U VPX slot and module profiles for the standard was a natural starting point. By defining these profiles, along with implementation rules for common utility functions such as power, control signals, and maintenance ports, the SOSA Consortium established the elements that define the basic building- blocks of SOSA systems, namely plug-in cards (PICs) and backplanes. As the initiative continues to move forward, a number of new products have been launched by the VITA community.

Abaco Systems Inc. introduced, as an individual board, the SBC314C 3U VPX single board computer, based on the NXP® QorIQ® T2081 Multicore Communications Power Architecture™ processor.

April 29, 2021 – Curtiss-Wright's Defense Solutions division introduced its first 3U OpenVPX GPGPU processor module designed in compliance with the U.S. Army CCDC C5ISR Center's

C4ISR/EW Modular Open Suite of Standards (CMOSS) and aligned with standards currently being defined by the SOSA Consortium. This variant of the VPX3-4935 is an NVIDIA Quadro® Turing™ based GPGPU processor card module. The SWaP-optimized VPX3-4935 is ideal for accelerating tensor/matrix computation used for deep learning neural network inference used in deployed artificial intelligence (AI) and machine learning (ML) applications requiring TFLOPS of accelerated processing. These applications include high-performance radar, SIGINT, EO/IR, data fusion ingest, processing and display, and autonomous vehicles.

May 11, 2021 – Curtiss-Wright’s Defense Solutions division, introduced the VPX6-1961, 11th Generation Intel Core single board computer (SBC) based on the Intel Xeon W (formerly “Tiger Lake-H”). With double the number of cores relative to previous generation quad-core processors, the 6U OpenVPX module leverages the latest Intel Core architectures to deliver the highest performance 8 core processing SBC for demanding aerospace and defense applications.

June 2, 2021 – Curtiss-Wright’s Defense Solutions division, announced the expansion of its family of DO-254 safety certifiable single board computers (SBC). The new V3-1708 3U OpenVPX processor module is the embedded industry’s first SBC to bring the high core count advantages of the NXP LX2160A Arm Cortex A72 system on chip (SoC) processor to rugged deployed DO-254 Design Assurance Level (DAL) A safety certifiable applications. This SBC is designed for use in compute-intensive applications such as flight control computers, mission control, and primary flight displays. It brings the benefits of COTS-based safety certifiable processing to airborne military platforms such as the Future Vertical Lift (FVL) program’s Future Attack Reconnaissance Aircraft (FARA) and Future Long Range Assault Aircraft (FLRAA).

June 22, 2021 – Mercury Systems Inc. announced the EnsembleSeries™ HDS6705 general purpose processing 6U OpenVPX blade server with built-in security for the most demanding aerospace and defense applications. HDS6705 blade servers are powered by artificial intelligence (AI)-enabling Second Generation Intel Xeon® Scalable processors and feature advanced ruggedization and high-speed switch fabric interconnect technologies that deliver secure multifunction processing capability. The blade servers are optimized for size, weight, power and cooling to enable the data center-class processors to operate at maximum performance while delivering the highest meantime between failure. An OpenVPX architecture makes the blades ideal building blocks for developing software-agnostic embedded AI-capable processing systems.

June 28, 2021 – Curtiss-Wright’s Defense Solutions division, further extended its support for modular open system approach (MOSA) with the introduction of the new VPX6-SBM Storage Blade Module. This rugged 6U OpenVPX (VITA 65) data storage module greatly expands the memory capacity and data rates that can be integrated into a single slot. The module is ideal for demanding C5ISR applications deployed in harsh environments, such as Direct Attached Storage (DAS) for embedded computers, high-speed data off-load, video recording, mission data and map storage, and database and data logging.

Backplane and Chassis Technology

April 1, 2021 – Pixus Technologies announced a new 10-slot 3U OpenVPX enclosure system geared for SOSA requirements. The new chassis platform features removable sidewalls, allowing the open frame enclosure to be optionally fully enclosed. The 10-slot backplane has clocking and VITA 46.11 system management connections per SOSA requirements. It has multiple VITA 67.3c and VITA 67.3d cut-outs for RF interfaces through the backplane for 3U OpenVPX boards.

April 16, 2021 – Pixus Technologies, announced a new 3-slot 6U OpenVPX development backplane and chassis platform. The open frame development chassis features a 6U OpenVPX power and ground only backplane with 1 VPX slot and dual VITA 67.3c slots with cut-outs in the P3 and P6 sections of the board. The design allows both VITA 65 and VITA 67 boards to be plugged into the same backplane. The development backplane can also be combined with a 2nd unit for more slots or other standard VITA 65 or SOSA profiles.

June 2021 – LCR Embedded Systems released a new rugged, single slot packaging solution designed for 3U VPX and SOSA aligned payload cards supporting high-speed connectivity with RF, GbE, 10GbE and optical interfaces. Designed to maintain safe operating temperatures for high power VITA 48.2 conduction cooled payloads, the chassis combines forced air with conduction cooling to dramatically increase cooling capacity versus passive cooling, while leveraging readily available VITA 48.2 plug in modules. A small form factor 28V power supply provides MIL-STD-461 protection for 12V 3U VPX and SOSA aligned modules.

VME Technology

No new product releases in Q2.

XMC/FMC Technology

Abaco Systems introduced the RAR15XC avionics data bus communications XMC for embedded flight-certifiable applications. The RAR15XC XMC delivers high-density MIL-STD-1553 and ARINC 429 data bus communications as well as avionics discrete I/O.

April 6, 2021 – Interface Concept, introduced the IC-EM2-XMCa, a removable SSD mass storage XMC module suited for compute and storage-intensive applications of the industrial, military or aerospace markets. This XMC storage solution can be used to add mass storage capacity to any Interface Concept or third-party single board computer or any host carrier board, used in a VPX, VME or CompactPCI system.

May 20, 2021 – Abaco Systems announced the NVP2009 Graphics Output XMC as the newest product in a series of NVIDIA Pascal chip-down GPU mezzanine cards. This card delivers performance and flexibility in a small XMC form-factor offering a lower SWaP COTS graphics output solution for rugged military and aerospace markets for graphics generation/output and general-purpose computing.

June 1, 2021 – Abaco Systems announced the release of the FMC165 FPGA Mezzanine Card. The FMC FPGA is a dual channel FMC (VITA 57.1) with dual 14-bit channel input.

June 10, 2021 – Acromag launched two new XMC modules with a Xilinx Artix-7 or Kintex-7 FPGA featuring write-protected flash memory to prevent unwanted changes to configuration files. Acromag's new XMC-7AWP and XMC-7KWP COTS modules are for algorithmic acceleration, protocol conversion, simulation, HIL test, motor control, and image analysis, as well as sensor fusion applications. The versatile XMC mezzanine cards plug into host single-board computers or non-intelligent carrier cards for use in PCIe servers, VPX or CompactPCI Serial chassis, and small form factor embedded computers. The air-cooled cards operate reliably across a wide ambient temperature range. Conduction-cooled systems can also be accommodated.

Defense Budgets and Spending

(Source: *Janes.com*)

Attracting commentary in the media was the fiscal year (FY) 2022 budget request that the US Department of Defense unveiled on May 28 that would reduce funding for equipment modernization by 1% to \$245.6 billion. Better news for military embedded computing perhaps was that research, development, test, and evaluation (RDT&E) would grow 5.2% to a record high \$112 billion. Procurement, however, would decline 5.7% to \$133.6 billion, more than offsetting the RDT&E gain.

The DoD said the proposal reflects the pressing need to invest in new technology, such as artificial intelligence, hypersonics, microelectronics, and 5G wireless communications, and represents the “tough choices” it had to make to stay within the relatively flat top line it received from the Biden administration.

The DoD’s overall \$715 billion funding amount is \$11.3 billion or 1.6% over the FY 2021 enacted level, or slightly below the projected inflation rate. Among the military departments, the army would be hardest hit by the modernization cut. It would receive \$22.4 billion for procurement, down 9.7%, and \$12.8 billion for RDT&E, down 7.6%

At the navy department, procurement would fall 4.5% to \$58.2 billion, while RDT&E would jump 12.9% to \$22.6 billion. The air force department would receive \$47.2 billion for procurement, down 2.8%, and \$50.5 billion for RDT&E, up 8.2%.

In the defense-wide area, procurement would drop 20.7% to \$5.9 billion, while RDT&E would inch up 0.7% to \$26.1 billion. Elsewhere in the budget, the DoD would boost operation and maintenance (O&M) funding by 2.5% to \$290.4 billion.

“[Slow and Steady: Analysis of the 2022 Defense Budget Request](#)” by Travis Sharp, Fellow for the Center for Strategic and Budgetary Assessments, goes into much more detail on the latest budget request.

Mergers and acquisitions

April 27, 2021 – Italian defense and aerospace company, Leonardo, has agreed to acquire a 25.1% stake in German defense sensor manufacturer Hensoldt, saying the transaction will enhance cooperation between the two companies. Leonardo will pay \$732 million in cash to become Hensoldt’s largest shareholder alongside German state-owned development bank Kreditanstalt für Wiederaufbau (KfW), which agreed in March to buy a 25.1% stake for \$544 million. KfW and Leonardo will each get to propose two candidates to Hensoldt’s supervisory board.

May 18, 2021 – Industrial conglomerate Teledyne Technologies has completed its previously announced acquisition of sensor manufacturer FLIR Systems for \$8.2 billion, according to the two US-based businesses. The May 14 closing came a day after the shareholders of both the companies endorsed the transaction. “We appreciate the support from our stockholders, and I am delighted to welcome FLIR to the Teledyne family,” said Robert Mehrabian, Teledyne’s executive chairman. The deal also received approval from anti-trust regulators in six countries: Canada, China, Germany, Poland, South Korea, and the United States.

May 27, 2021 – Mercury Systems, Inc., announced that it had acquired Pentek Technologies, LLC and Pentek Systems, Inc. (collectively, “Pentek”). Pentek is a leading designer and manufacturer of ruggedized, high-performance, commercial off-the-shelf (“COTS”) software-defined radio and data acquisition boards, recording systems and subsystems for high-end

commercial and defense applications. Pentek's capabilities add to Mercury's existing mixed-signal product portfolio for radar, electronic warfare (EW), and signals intelligence markets. Under the terms of the purchase agreement, Mercury acquired Pentek for \$65 million. For Mercury's fiscal year ending July 1, 2022, Pentek is expected to generate revenue of approximately \$20 million.

Summary

A calendar quarter is a short time span to be certain about trends but reported financial results year-on-year would suggest that military embedded computing continues to be a healthy market to address and is making up for any pandemic-created shortfall in commercial markets.

Added to this the significantly increased spending on US DoD research into artificial intelligence, hypersonics, microelectronics, and 5G wireless communications is encouraging.

We are seeing the sector leaders emboldened by the positive outlook and acquiring other companies with key products. The review of new contract wins indicates that VITA standards-based systems can, if required, move up the value chain to win prime contracts for open systems directly with the DoD.

The efforts made in developing SOSA-aligned boards and systems is clearly opening doors and securing the future for VITA standard suppliers.



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