Market Research

VITA Market Developments

May 2022

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Embedded Market Research

Contents

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 Informatech 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. This report reviews highlights and developments during the first trading quarter of 2022 and the trends that are driving technology development for VITA technology boards and systems.

World Events and Defense Spending

The invasion of Ukraine will push the global defense spend above $2.2 trillion by 2026. Reaction to Russia's invasion of Ukraine helped push defense budgets back into expansion in 2022 and will see them grow at a rate of 1.6% annually in the coming five years, according to Janes open-source defense intelligence.

Recovering from a pandemic-induced contraction of 0.7% last year, total world defense spending grew to a new high of $2.08 trillion in 2022, boosted by recent spending increases across Europe. Spending growth of 1.6% this year is the fastest seen in three years.

Global defense spending has rebounded from 2021's contraction, driven to a large degree by a resurgence in rates of funding expansion in Europe. Acceleration of European spending has been building for several years. Europe added the most funding to its armed forces' budgets this year; $30.7 billion, although 80% of this increase is accounted for by Germany's dramatic rise.

While this year's spike in European growth was brought about in large part in reaction to Russia's recent invasion of Ukraine, defense budgets on the continent have been expanding even quicker since Russia first began supporting the secession regions of Donetsk and Luhansk and annexed Crimea in 2014.

In the 10 years prior to 2015, Europe's defense spend was almost totally static in real terms. In the 10 years that follow it's on course to have grown at an average annual rate of 3.2%, or just over 45% across the entire period. As such, defense spending in Europe is expected to reach $414.2 billion in 2025, from $373.4 billion in 2022 and $284.7 billion in 2015.

Although European budgets saw the fastest growth in 2022, North America and Asia remain the highest-spending regions by a large margin, each responsible for $810 billion and $610 billion respectively this year.

Asia exhibited an uncharacteristic slowdown in defense expansion this year, but this was thanks almost solely to Japan's return to normal spending levels follow an extremely large supplemental spend in 2021. The region's expansion is forecast to resume at 4% in 2023, taking it above that of North America by 2030.

However, North American budgets are not set to stagnate, particularly in the wake of the Russian invasion of Ukraine. The United States Congress has passed a supplemental Ukrainian budget with $6.5 billion for defense and the effects of the conflict could also extend into the medium-term. For the Fiscal Year 2023 request released on March 28, and several years beyond, we expect heightened domestic political incentives above those that drove Congress to boost the $765 billion Fiscal Year 2022 budget by 3.5%. This will lead to further expansion of the record $813.3 billion Fiscal Year 2023 request and the following years before growth slows in the long-term amid wider fiscal pressures.[1]

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1   https://www.janes.com/defence-news/news-detail/invasion-of-ukraine-to-push-global-defence-spend

Open Systems News and Events

The Tri-Service Open Architecture Interoperability Demonstration (TSOA-ID) is a collaboration between the NAVAIR Air Combat Electronics program office PMA-209, U.S. Army PEO Aviation, and DEVCOM – U.S. Army Combat Capabilities Development Command C5ISR Center, Air Force Life Cycle Management Center (AFLCMC), Industry Partners, and Academia which is driving business and technology development of Open Systems/Open Architectures.

TSOA-ID 2022, held on March 15, was a single-day Technical Interchange Meeting and Expo focusing on Modular Open Systems Approach (MOSA) principles and innovations. This included the Future Airborne Capability Environment (FACE™), Hardware Open Systems Technologies (HOST), Sensor Open Systems Architecture (SOSA™), and CMOSS (C4ISR/ EW Modular Open Suite of Standards) initiatives. Influential keynotes and speakers plus live product demonstrations delivered a first-hand experience on advancements and solutions in the rapidly growing open market ecosystem. TSOA-ID highlights Open Standards interoperability, reusability, and portability to accomplish faster transition and incorporation of innovation and quicker delivery of new capabilities (or replacement technology) to the warfighter. Presentation slides are available. (https://tsoa-id.net/resources/)

At TSOA-ID 2022, SOSA announced the establishment of the SOSA Consortium Advisory Board, bringing key government and business leaders together to provide strategic guidance to market needs. The role of the Advisory Group will be to help the Consortium anticipate and address strategic issues as it works to refine the technical quality and promote adoption of the SOSA technical standard. Mercury Systems is co-chairing the Advisory Group.[2]

New Collaborations and Partnerships

Suppliers often form collaborative partnerships to bring added-value products to market. Often these relate to application software, for example system security. Announcements made in Q1 2022 follow:

❑ ADLINK and Pixus Technologies are building a strategic partnership to develop highly integrated, SOSA-aligned OpenVPX system solutions for aerospace and defense applications. System developers can capitalize on the non-proprietary, open-architecture embedded computing capabilities to deliver ruggedness in harsh operating environments and speed time-to-market while achieving cost-effectiveness. The two companies will build proof-of-concept (PoC) demonstration units of their integrated offerings in the coming months and engage with global system integrators to develop advanced C4ISR applications. ADLINK's SOSA-aligned OpenVPX building blocks include one of the industry's first Intel® Tiger Lake processor-based 3U VPX blades, the VPX3-TL.[3]

❑ Curtiss-Wright's Defense Solutions division announced that it is collaborating with Northrop Grumman to bring Real-time Virtualization and Modernized Protection (ReVAMP) technology to the embedded avionics market. Northrop Grumman's ReVAMP software brings the advantages of enterprise virtualization and layers of cyber hardening to embedded systems to decouple software from specific hardware configurations and combat obsolescence. Using ReVAMP, programs can move trusted and proven applications from legacy CompactPCI, VXS, or similar form factors, to a contemporary

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2   https://www.opengroup.org/open-group-sensor-open-system-architecture%EF%B8%8F-sosa-consortium-establishes-advisory-board-independent

3   https://www.adlinktech.com/en/news/adlink-pixus-build-strategic-openVPX-partnership

VME, OpenVPX, or XMC module from Curtiss-Wright, to both improve the performance of avionics systems and drastically reduce sustainment costs.[4]

Financial Results

Results published by Curtiss-Wright Defense Systems and Mercury Systems in the last quarter provide an insight into the general health of the VITA market.

Curtiss Wright Corporation

Curtiss Wright Corporation published its annual report on February 24, 2022. [5]

Results by business segment

Sales for the year increased $115 million, or 5%, to $2,506 million, compared with the prior year period. On a segment basis, sales from the Defense Electronics and Naval & Power segments increased $116 million and $18 million, respectively, with sales from the Aerospace & Industrial segment decreasing $19 million.
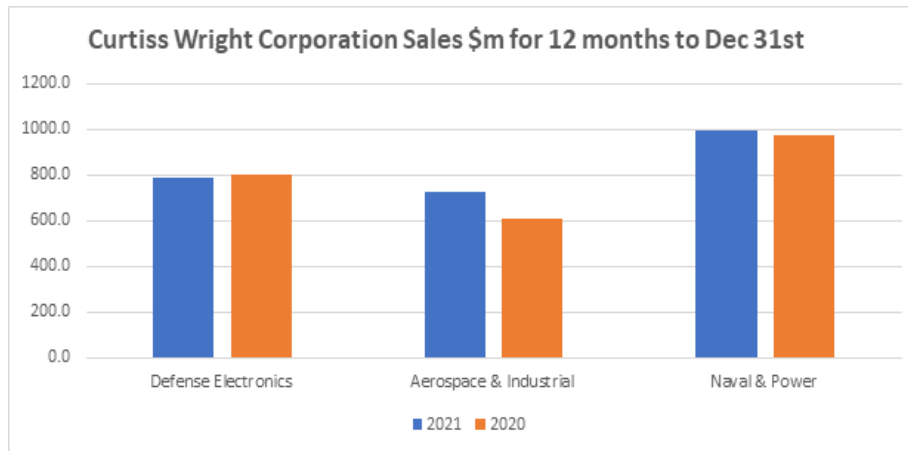
Defense Electronics segment

Sales in the Defense Electronics segment increased $116 million, or 19%, to $724 million, from the comparable prior year period, primarily due to the incremental impact of the PacStar acquisition in the ground defense market, which contributed incremental sales of $115 million. Higher sales of avionics and test equipment in the commercial aerospace market were more than offset by the timing of sales on embedded computing equipment on various programs in the aerospace defense market.

New Defense Electronics orders increased $38 million as compared to the prior year, primarily due again to the incremental impact of the PacStar acquisition. This increase was partially offset by the timing of naval defense and aerospace defense orders.

Aerospace & Industrial segment

Sales decreased $19 million, or 2%, to $786 million, from the comparable prior year period, as lower sales in the commercial aerospace market were partially offset by sales increases in the general industrial market.

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4   https://www.curtisswrightds.com/news/press-release/legacy-real-time-avionics-software-modern-hardware-breakthrough-virtualization-technology.html
5   https://d18rn0p25nwr6d.cloudfront.net/CIK-0000026324/2c879924-50a3-453f-b0a9-6e99c7da0521.pdf

Naval & Power

Sales increased $18 million, or 2%, to $995 million, from the comparable prior year period. In the naval defense market, sales increased $20 million primarily due to increased production on the CVN-81 aircraft carrier program, as well as higher foreign military and service center sales.

Sales disaggregated by end-user markets (Aerospace & Defense)

Sales increased $63 million, or 4%, to $1,651 million, as compared to the prior year period, primarily due to higher sales in the ground defense and naval defense markets. The ground defense market benefited from the impact of the PacStar acquisition. Sales in the naval defense market increased primarily due to higher sales of $27 million on the CVN-81 aircraft carrier program. These increases were partially offset by lower sales in the commercial aerospace market, primarily due to the exit of the build-to-print product line in the fourth quarter of 2020.

The following chart depicts Curtiss-Wright Corporation Aerospace and Defense sector sales disaggregated by end market.
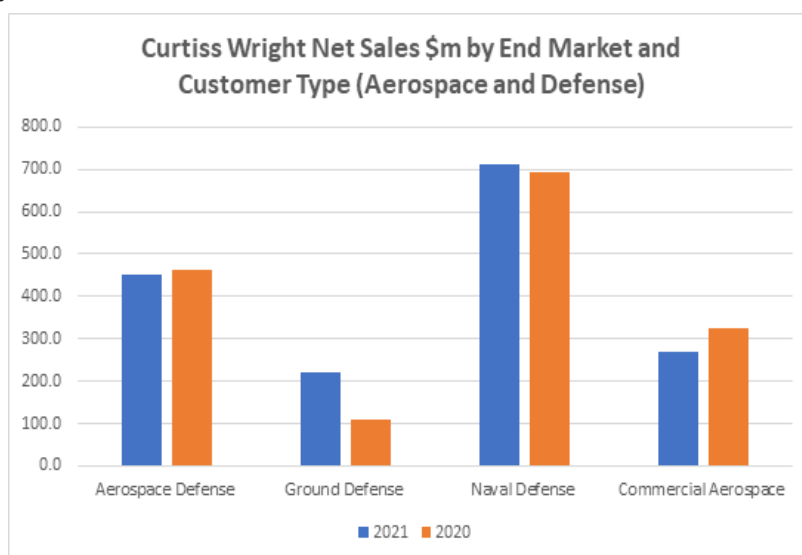
Mercury Systems

Mercury Systems published its Q2 report on February 1, 2022 for the period ending December 31, 2021. [6]

Total revenues increased $9.7 million, or 4.6%, to $220.4 million during the second quarter ended December 31, 2021, as compared to $210.7 million during the second quarter ended December 31, 2021, including "acquired revenue" which represents net revenue from acquired businesses that have been part of Mercury Systems for four full quarters or less. The increase in total revenue was primarily due to an additional $37.3 million of acquired revenues, partially offset by $27.6 million less organic revenues.

Mark Aslett, Mercury's President and Chief Executive Officer commented on the Q2 results, "We continue to anticipate stronger bookings in the second half leading to substantial growth for the full fiscal year. As a result, we expect to exit the fiscal year well positioned for a return to our more normal levels of revenue growth and margin expansion in fiscal 2023."

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6   https://ir.mrcy.com/sec-filings/sec-filing/10-q/0001049521-22-000010

Revenue analysis of Q2 (to December 31, 2021) results are illustrated in the following charts and tables.

Revenue increases were driven by modules and sub-assemblies, which increased $30.3 million which was partially offset by decreases in integrated subsystems of $11.5 million and components of $9.2 million.
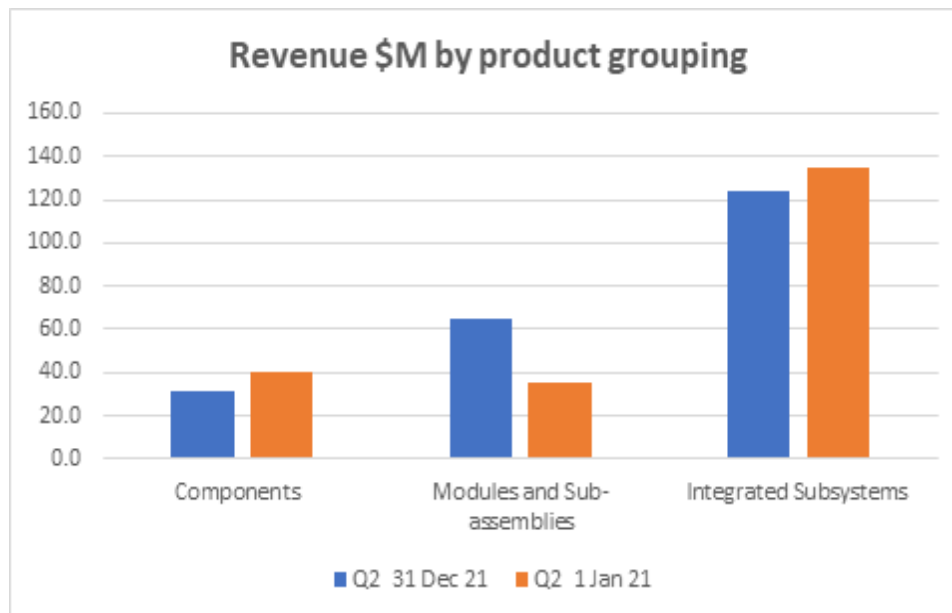
Notes:

1. *Components include technology elements typically performing a single, discrete technological function, which when physically combined with other components may be used to create a module or sub-assembly. Examples include but are not limited to power amplifiers and limiters, switches, oscillators, filters, equalizers, digital and analog converters, chips, MMICs (monolithic microwave integrated circuits), and memory and storage devices.*

2. *Modules and Sub-assemblies include combinations of multiple functional technology elements and/or components that work together to perform multiple functions but are typically resident on or within a single board or housing. Modules and sub-assemblies may in turn be combined to form an integrated subsystem. Examples of modules and sub-assemblies include but are not limited to embedded processing modules, embedded processing boards, switch fabric boards, high speed input/output boards, digital receiver boards, graphics and video processing and Ethernet and IO (input- output) boards, multi-chip modules, integrated radio frequency and microwave multi-function assemblies, tuners and transceivers.*

3. *Integrated Subsystems include multiple modules and/or sub-assemblies combined with a backplane or similar functional element and software to enable a solution. These are typically but not always integrated within a chassis and with cooling, power and other elements to address various requirements and are also often combined with additional technologies for interaction with other parts of a complete system or platform. Integrated subsystems also include spare and replacement modules and sub-assemblies sold as part of the same program for use in or with integrated subsystems sold by the Company.*

The increase in total revenue was primarily from the C4I and EW markets which increased $32.6 million and $3.7 million, respectively, and were partially offset by a decrease of $33.6 million from the radar application market.

## Revenue $M by end application:
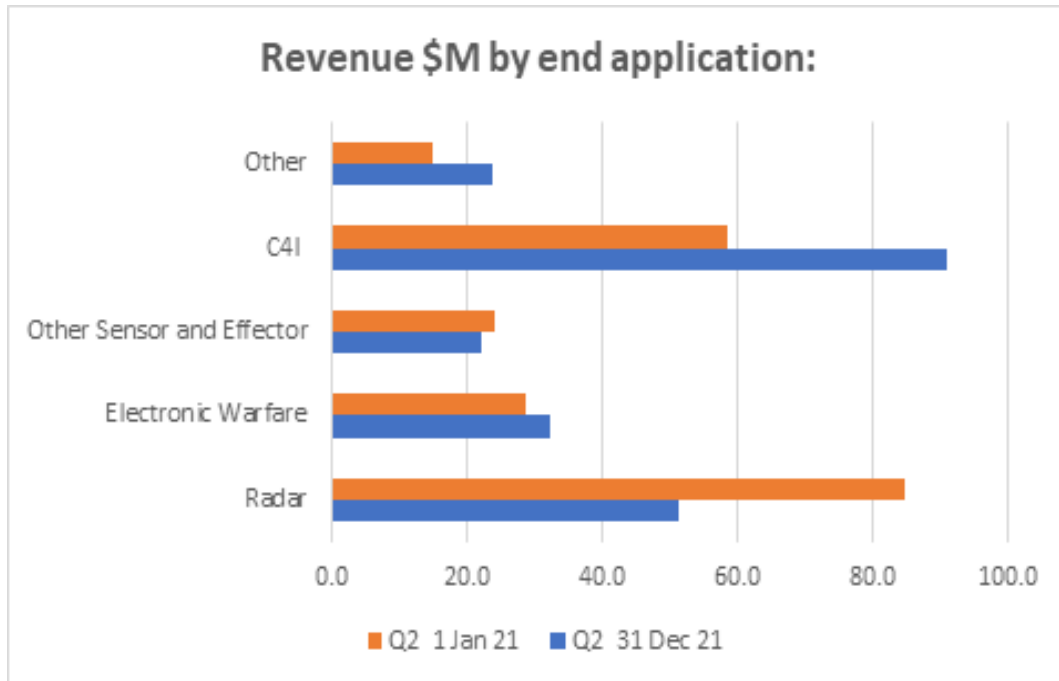
Notes:

1. *Radar includes end-use applications where radio frequency signals are utilized to detect, track, and identify objects.*

2. *Electronic Warfare includes end-use applications comprising the offensive and defensive use of the electromagnetic spectrum.*

3. *Other Sensor and Effector products include all Sensor and Effector end markets other than Radar and Electronic Warfare.*

4. *C4I includes rugged secure rackmount servers that are designed to drive the most powerful military processing applications.*

5. *Other products include all component and other sales where the end use is not specified.*

The increase in total revenue was primarily across the airborne platform which grew $19.3 million during the second quarter ended December 31, 2021. The largest program increases were related to a classified C2 program, MH-60, P8, CDS, AARGM, and F-16.


Revenue by platform $M
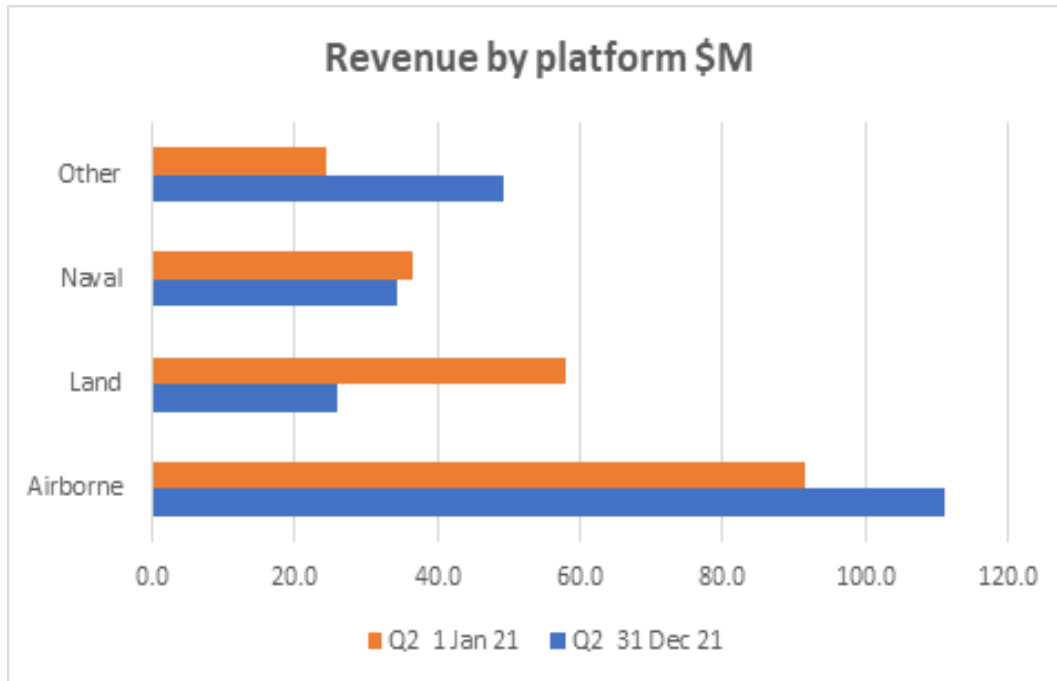
Notes:

1. *Airborne platform includes products that relate to personnel, equipment, or pieces of equipment designed for airborne applications*
2. *Land platform includes products that relate to fixed or mobile equipment, or pieces of equipment for personnel, weapon systems, vehicles and support elements operating on land*
3. *Naval platform includes products that relate to personnel, equipment, or pieces of equipment designed for naval operations*
4. *Other represents all platforms other than Airborne, Land or Naval.*

Customers comprising 10% or more of the Mercury Systems revenue for the periods shown are as follows:

Key Customers, (> 10% of revenues	Q2 2021	Q2 2020
U.S. Navy	14%	0%
Raytheon Technologies	15%	25%
Northrup Grumman	10%	0%
Lockheed Martin Corporation	0%	12%
Total	**39%**	**37%**

While the Mercury Systems typically has customers from which it derives 10% or more of its revenue, the sales to each of these customers are spread across multiple programs and platforms.
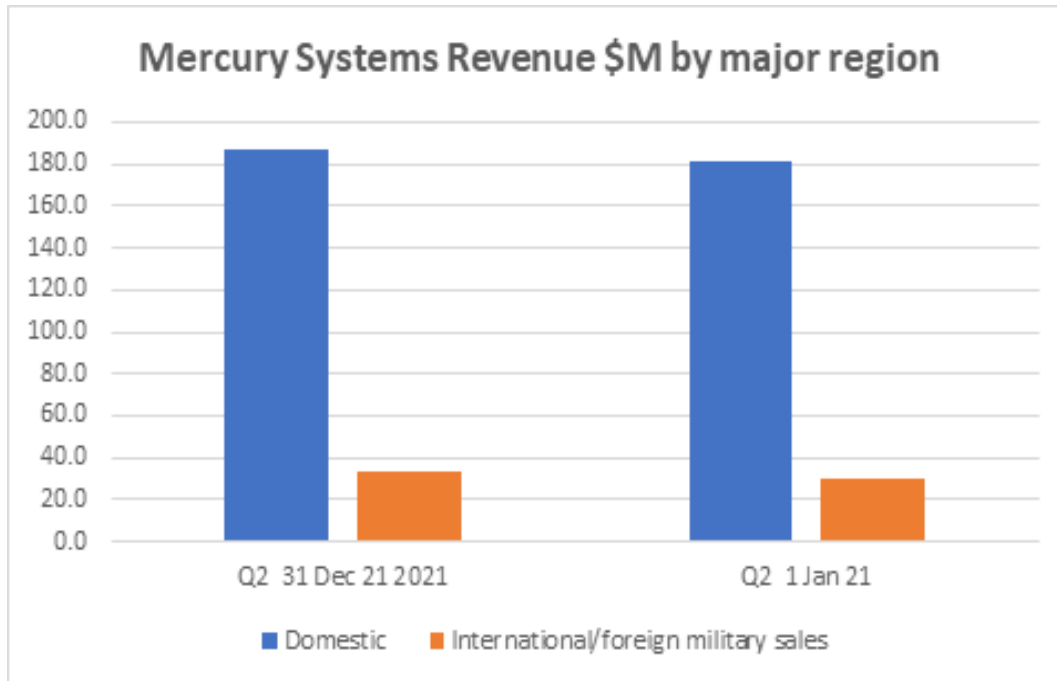
Notes:

1. *Domestic revenues consist of sales where the end user is within the U.S., as well as sales to prime defense contractor customers where the ultimate end user location is not defined.*

2. *International/Foreign Military Sales consist of sales to U.S. prime defense contractor customers where the end user is outside the U.S., foreign military sales through the U.S. government, and direct sales to non-U.S. based customers intended for end use outside of the U.S.*

Mercury Systems Outlook

Further commentary was provided on the earnings conference call.[7] Mercury Systems expects total company revenues to continue growing faster than overall defense spending as the company targets and participates in larger, faster-growing defense market segments. This aligns with U.S. national defense strategy, specifically the need for modernization,

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7   https://ir.mrcy.com/static-files/c0314513-af4b-4345-aa85-bb5d4d0e5390

speed, and affordability. The company is seeking to address larger customer opportunities through outsourced subsystem content expansion and expects its secure processing, trusted microelectronics, and open mission systems to continue to drive growth.

Contract and Design Win Announcements

New contracts and design wins are good indicators of future revenue and growth potential. Not all contracts are announced publicly and for those that are, not all identify details of embedded computing technology utilized in the design. Only contract wins that specifically mention VITA standards are reported in this section.

❑ A leading semiconductor capital equipment manufacturer awarded Abaco Systems a $100 million+ design win to supply Intel VME-based single board computers (SBC). A customized version of Abaco's XVB603 6U VME SBC designed with an Intel 7th gen i7 processor is serving as the company's new process module. The customized XVB603 design is being used as the CPU for the company's next generation process module that helps carve out the microchip features. The SBC helps the manufacturer's customers build smaller, faster, more powerful electronic devices. Abaco shipped several thousand units in 2021 and expects to deliver more than double that in 2022. [8]

❑ Concurrent Technologies announced in March that it had been awarded a $2 million contract by a major European defense prime contractor to supply its recently launched I/O Intensive 3U VPX Plug in Card. The contract is to be delivered over multiple years and the customer is expected to use the product as the controller in an electronic vision system for its next generation land-based vehicles. [9]

❑ Curtiss-Wright's Defense Solutions division, announced in February that it has been selected by a leading defense system integrator to provide its embedded Security IP module technology. Under the contract, Curtiss-Wright will supply its recently introduced XMC-528 Mezzanine Card for use in multiple sensor system programs. The value of the contract is $4 million, and the lifetime value is estimated at $25 million. [10]

Product Announcements

VPX Technology

VPX is a broadly defined technology utilizing the latest in a variety of switch fabric technologies in 3U and 6U format blades. OpenVPX is the architecture framework that defines system level VPX interoperability for multi-vendor, multi-module, integrated system environments. The sensor community served by the SOSA Consortium relies heavily on VPX modules. As the SOSA initiative continues to move forward, a number of new products have been launched by the VITA community, largely featuring VPX:

❑ Abaco Systems introduced the GRA116OP high-performance computer (HPC) with the latest graphics processing unit (GPU) technologies. Based on the NVIDIA® Ampere™ architecture using the NVIDIA A2000™ platform, the 3U VPX HPC is aimed at rugged defense, aerospace and industrial applications. The GRA116OP combines general-purpose computing with graphics processing units (GPGPU) computing, AI inferencing,

8   https://www.abaco.com/news/long-relationship-compatibility-and-flexibility-lead-100-million-design-win-abaco-systems
9   https://www.gocct.com/2022/03/09/concurrent-technologies-i-o-intensive-plug-in-card-chosen-for-next-generation-land-based-vehicles/
10   https://www.curtisswrightds.com/news/press-release/cost-effective-defense-grade-security-ip-module-cots-modular-open-systems.html

deep learning, sensor processing and data analytics with highly flexible graphics and video I/O configurations. [11]

❏ The HPC2812 6U VPX HPC and the SBC3612D VPX SBC are Abaco's first 100GbE computationally intensive 6U and 3U SOSA-aligned boards. Both computers provide the building blocks needed in 6U and 3U form factors for high performance, mission-ready systems. The HPC2812 and SBC3612D plug-in cards (PIC) include the Xeon® D-2700 processor to form the multi-processing compute engine core of Abaco's OpenVPX high performance and 100GbE capable product portfolio. [12]

❏ ApisSys launched the AV140 phased array radar transceiver EW-ESM – MIMO. The AV140 is part of ApisSys' range of High-Speed data conversion and signal processing solutions based on the VITA 46 VPX standard. The AV140 is SOSA aligned with RF signals on the backplane according to VITA 67.3 standard. The AV140 is fully compliant with the OpenVPX standard, accommodating various communication protocols such as PCIe, SRIO, and up to 40 Gbit Ethernet, as well as other I/O standards such as Aurora. [13]

❏ In January Concurrent Technologies announced a rugged 3U VPX Position, Navigation and Timing (PNT) Plug In Card. Designed in alignment with the SOSA Technical Standard, PR A11/61d-RCR provides resilient PNT data for sensor-based solutions that are used in Electronic Warfare and Intelligence, Surveillance and Reconnaissance applications. As a key differentiator, PR A11/61d-RCR is ITAR free and is designed and built in the UK utilising technology licensed from Racelogic, another UK company specialising in positioning data. [14]

❏ In February, Concurrent Technologies announced a 3U VPX rugged server Plug In Card (PIC) based on the recently announced Intel Xeon D-1700 processor. TR MAx/6sd-RCR has been developed to satisfy the growing need for high compute capability PICs that are aligned to the SOSA Technical Standard and that enable simple and effective technology transitions for next generation sensor-based systems in defense and aerospace applications. [15]

❏ Curtiss-Wright's Defense Solutions division introduced the CHAMP-XD3, its highest performance, security-enhanced, 3U OpenVPX digital signal processing (DSP) processing module. Based on the Intel Xeon D-1700 processor, the SOSA-aligned payload card represents a "quantum leap" for sensor data processing capability in size, weight, and power (SWaP) constrained applications. The CHAMP-XD3 combines the Intel processor with a Xilinx MPSoC FPGA, which supports Curtiss-Wright's Enhanced TCOTS framework, aligned with the compute-intensive payload profile as defined by the SOSA Technical Standard. This rugged, conduction-cooled module is designed to handle the largest processing tasks characteristic of multi-mode / synthetic aperture radars

11   https://www.abaco.com/news/great-graphics-and-video-flexibility-highlight-abaco's-new-gra116op-hp-gpgpu-designed-nvidia
12   https://www.abaco.com/news/new-sbcs-abaco-feature-latest-intel-technology-deliver-highest-performance-100gbe
13   https://www.apissys.fr/news/av140-phased-array-radar-transceiver-ew-esm-mimo-av140-high-speed-data-conversion-signal-processing-solutions
14   https://www.gocct.com/2022/01/26/concurrent-technologies-announces-a-rugged-3u-vpx-position-navigation-and-timing-pnt-board/
15   https://www.gocct.com/2022/02/25/concurrent-technologies-announce-a-100-gigabit-ethernet-capable-compute-intensive-plug-in-card/

(SAR), modern signal intelligence (SIGINT), electro-optical/infrared (EO/IR), and EW applications.[16]

❑ Interface Concept announced in March their new IC-GRA-VPX3a 3U VPX FPGA-based and AMD-Radeon E9171-based graphics processor module that provides a high-performance and low power consumption Computing Card (GPGPU), image processing and video capture (frame grabber) solution for compute-intensive applications. [17]

❑ In January, Mercury Systems announced the new RFM3202 wideband transceiver for demanding spectrum processing applications that features 3U OpenVPX™ compliance with a SOSA aligned design. With four high-bandwidth frequency-conversion channels, the new RFM3202 can achieve what previously required multiple products, enabling much-needed capabilities for smaller, lighter platforms. Unmanned vehicles, next-generation electronic attack pods and space-constrained seaborne vessels will be able to mitigate advanced electronic threats better. [18]

❑ Mercury Systems announced the Model 5585 and Model 5586 SOSA aligned Xilinx Virtex UltraScale+™ high-bandwidth memory (HBM) FPGA 3U VPX modules. These claimed to be the first open architecture 3U products on the market to feature HBM (memory directly integrated on the FPGA chip), offering a 20x increase in memory bandwidth over traditional DDR4 memory. This design boosts signal processing speeds to support size, weight and power (SWaP)-constrained compute-intensive applications such as electronic warfare, radar, signals intelligence and big data. When applied to mission-critical applications such as electronic countermeasures, this added processing power helps transform raw data into actionable intelligence in near real-time, allowing customers to gain insights quickly and make fast decisions confidently. [19]

❑ In February Mercury Systems announced the new FIOVU-2180 and CIO10-2080 6U OpenVPX avionics modules, claimed to be the first safety-certifiable multicore modules on the market to incorporate the latest Intel Xeon D-1700 processors. Power-efficient, rugged and reliable, the new avionics modules deliver processing performance 2–3x that of previous generations and are ideally suited for mission-critical applications such as flight computing, platform management and artificial intelligence (AI). [20]

❑ VadaTech announced the VPX703 in February, a 3U VPX module based on the Freescale QorIQ T4241 or T4161 with dual GbE and PCI x8 to the backplane. The module provides 64 GB of on-board flash and up to 12 GB DDR3. Standard I/O such as SATA, USB, GPIO, RS232, etc. are routed to the P1 connector. Dual redundant (four channel) MIL-STD-1553A/B is provided via the P2 connector, based on the Data Device Corporation (DDC) DC BU-65863I8. The VPX703 is available in air- or conduction-cooled formats up to CC4/C3/V3/OS2 per ANSI/VITA 47. [21]

❑ X-ES launched a new line of rugged products based on Intel Xeon D-1700/D-2700 Processors. Xeon D-1700 and D-2700 series processors are power-efficient System-on-

16   https://www.curtisswrightds.com/news/press-release/curtiss-wright-introduces-highest-performance-3u-open-vpx-digital-signal-processing-engine.html
17   https://www.interfaceconcept.com/newsroom/details/New-3U-VPX-grahphics-card
18   https://ir.mrcy.com/news-releases/news-release-details/new-open-architecture-transceiver-brings-advanced-ew-performance
19   https://ir.mrcy.com/news-releases/news-release-details/3u-vpx-fpga-modules-first-market-high-bandwidth-memory
20   https://ir.mrcy.com/news-releases/news-release-details/mercurys-first-market-avionics-modules-provide-safe-powerful
21   https://www.vadatech.com/media/pdf_PR_-_VadaTech_Announces_a_3U_VPX,_Freescale_QorIQ_T4241_T4161_Processor_Board.pdf

Chip (SoC) packages with integrated 40 Gigabit Ethernet for high-speed connectivity. An example is the XPedite7870, a secure, high-performance, 3U VPX-REDI, single board computer.

Systems, Backplane and Chassis Technology

❑ Elma Electronic released a new 3U 12-slot backplane that aligns with SOSA Technical Standard 1.0. The backplane is an update to Elma's original CMOSS reference backplane supporting the U.S. Army's latest open-standards requirements. The new 3U OpenVPX backplane offers a mix of plug-in card (PIC) slots that enable complex, high speed signal processing and system development, supporting up to 100 Gigabit Ethernet. [22]

❑ LCR Embedded announced in March the availability of 100 Gigabit Ethernet and PCIe Gen 4 VPX backplanes. The company has designed and completed testing of a multi-slot 3U VPX backplane that has exceeded the performance levels defined by ANSI/VITA 68.1-2017. LCR plans to apply the new high-speed technology to backplanes designed for use in its rugged ATR and rack mount chassis line-up, as well as in its DK3 and DK6 VPX development platform. In conjunction with this effort, LCR has developed a backplane test system for high-speed data transmission allowing for S-parameter characterization to 26.5 GHz. This system was verified by an outside test laboratory to provide independent verification of performance. [23]

❑ Pixus Technologies has a new 6U tall 19" rackmount chassis for 3U OpenVPX and SOSA aligned boards. The chassis was designed specifically for the high-power requirements of solutions that are aligned to the SOSA technical standard. The rugged rackmount chassis supports up to 16 conduction-cooled modules per SOSA requirements and VITA 48.2 standard. A specialized card mat set diverts heat to fins which spread the heat away from the card cage. Rear MIL grade fans then pull airflow through the fins to cool in excess of 100W/slot, depending on the application specifics. [24]

❑ Pixus offers a small form factor enclosure for development and demonstration of 3U OpenVPX systems. The OpenVPX Cube Chassis from Pixus is 4U tall with bottom to top cooling and prop up feet for easy viewing/access into the enclosure. The compact chassis is only 42HP (8.4") wide and allows 4-5 OpenVPX boards in the 3U form factor to be installed along with a compact power supply. Various VITA 65 backplane profiles are available with options for VITA 66 or 67 interfaces. Pluggable VITA 62 or fixed ATX PSUs are available in the typical 3U VPX voltage rails. Card guides for air cooled or conduction cooled boards can be installed into any slot. [25]

XMC Technology

❑ Acromag announced the XMC633 10-Gigabit Ethernet XMC Module featuring dual 10GBASE-KX4 ports and conduction-cooling support. The XMC mezzanine card mounts on VME, VPX, PCIe and other embedded computing carrier boards. An Intel XL710 Ethernet Controller provides network connectivity with off-load and virtualization capabilities. The rear I/O model XMC633 routes two KX4 interfaces to the P16 connector and is compatible with conduction-cooling frames. Two other models are available. The previously released XMC631 model has four SFP+ front panel connectors for fiber optic or copper media transceivers, while the rear I/O model XMC632 routes two XAUI

22   https://www.elma.com/en/news-and-events/news-releases/2022/02/new-12-slot-sosa-cmoss-backplane
23   https://www.lcrembeddedsystems.com/100-gigabit-ethernet-vpx-backplanes-support-payloads/
24   https://pixustechnologies.com/assets/Press-Releases/Pixus-PR-16-slot-SOSA-OpenVPX-Chassis.pdf
25   https://pixustechnologies.com/assets/Press-Releases/Pixus-PR-OpenVPX-Development-Cube.pdf

interfaces to P16. Optional VITA 61 connectors enable PCIe Gen3 data rates across eight high-speed serial lanes on the XMC P15 connector. Designed for COTS applications, these XMC modules are aimed at defense, aerospace, industrial, and scientific research computing systems. Extended temperature operation is supported for -40 to 85°C. [26]

FMC Technology

❑ Annapolis Micro Systems announced the availability of the industry's first COTS FMC+ Mezzanine Card to feature Jariet Technologies' Electra-MA chip with 64 GS/s, 10-bit ADC and DAC capability. It is targeted at demanding applications requiring direct sampling frequency coverage anywhere from 0.1 to 36 GHz, and/or wide instantaneous bandwidths. The DME1 is available for use with 3rd party FMC+ baseboards or with Annapolis' WILDSTAR 3U OpenVPX Baseboards (one WFMC+ mezzanine site) or 6U OpenVPX Baseboards (two WFMC+ mezzanine sites). Annapolis WILDSTAR Baseboards utilize up to three high-performance FPGAs. [27]

Summary

The roll-out of VPX products continues apace with ten 3U and two 6U new product releases counted from a variety of vendors, many driven by the release of a new Intel Xeon-class processor. Backplane and chassis vendors have also released new products. The TSOA-ID 2022 event proved to be a catalyst for driving business and technology development of Open Systems/Open Architectures. New products in XMC and FMC complete the quarterly review picture.

But what of VME? Surely the news of a $100 million design win in the semiconductor process industry has been both surprising and welcome to those vendors who continue to support the standard. It raises the intriguing question of whether this is a one-off win or if not, how many similar opportunities may be available to vendors outside the defense systems industry and how these can be addressed? Further interest from industrial users together with increased spending in the defense sector offers an optimistic outlook for the VITA community.

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26   https://www.acromag.com/blog/10-gigabit-ethernet-xmc633-dual-10gbase-kx4-ports-conduction-cooling-support/
27   https://www.annapmicro.com/industrys-first-cots-mezzanine-with-64-gsps-adc-dac-sample-rates/

World Market for VITA Standards-based Board and Systems Report

M&A executives actively seeking opportunities and eager to better understand the dynamics of this industry sector may find some help in our recently published market report, 2021 Edition of World Market for VITA Standards-based Board and Systems Report.

VITA released the 2021 Edition of World Market for VITA Standards-based Board and Systems Report. The research and analysis were conducted over the past summer through data collection and discussions with companies supplying merchant products based on key VITA standards. The report was prepared by Brian Arbuckle, Principal Market Analyst at Embedded Market Research on behalf of VITA. The full report is available for purchase from the VITA website at www.vita.com/Market_Research.

Executive Summary of Report

Annual sales of VITA-standard based products (VME, VPX and PMC/XMC) to the merchant market are estimated to have increased on average 6.3% from 2019 to 2020. Boards are the highest in revenue while systems sales are the fastest growing aspect. 6U VPX systems are the fastest growing form-factor from 2019 to 2020.

The majority of VME and VPX boards and systems are sold to defense prime contractors that in turn, sell to governments. The largest customer for defense electronics is the United States with the US Department of Defense budget having the greatest impact on market growth. US Defense spending in total remains relatively steady but the budget allocation emphasizes compute-heavy technologies and has supported the increase in demand for VME and VPX boards and systems.

Market trends reported by VITA suppliers include the Open Systems DoD mandate; sensor proliferation using artificial intelligence (AI); and an increased emphasis on security by offering trusted computing solutions. The OpenVPX standard being championed by

VITA aligns well with the US Department of Defense demand for improved implementation of open standards and interoperability. VITA members are also harnessing the latest AI chip technology and developing accelerator boards for intensive data-processing applications. VITA market leading companies also offer a rigorous approach to supply chain security.

Business challenges in the reporting period include the supply chain interruption caused by COVID-19 and in particular the global semiconductor shortage. Continuing challenges include product obsolescence particularly regarding VMEbus, already in its 40th year of production. The use of COTS servers and virtualization of applications rather than using dedicated hardware is an ongoing challenge in some markets.

VITA member companies continue to grow both organically and by acquisition and there has been some M&A activity during the period which has placed a significant value on the expertise and capabilities of these VITA-standard suppliers.

The report contents are as follows:

- Executive summary
- Recent mergers and acquisitions
- Report introduction and method
- Market Analysis by VITA standard (VME, VPX, PMC/XMC)
- Trends affecting business
- Risks to business operations
- Overall Q2 summary