
## CONVENTIONAL MILITARY AND COMMERCIAL AVIONICS

*Achieving high-performance graphics and optimal energy efficiency for conventional military and commercial avionics systems with AMD Embedded Radeon™ E8860 GPUs*

AMD EMBEDDED SOLUTIONS

AMD

Leading avionics technology providers CoreAVI and Curtiss-Wright leverage AMD Embedded Radeon™ graphics and open standards to bring ultra-immersive displays and precision visualization into the cockpit.

For graphics-intensive conventional military and commercial avionics applications, every incremental gain in graphics processing performance helps unlock new potential for improving responsiveness and situational awareness for pilots and UAV operators. New advancements in synthetic vision and video overlay capabilities – made possible in part through continued innovation in GPU architectures – hold the promise to transform modern aircraft control panels and displays. Photo-realistic 3-D graphics clarity in the cockpit enhances pilots' understanding of flying environments in real time. This yields clear advantages in commercial air transport and conventional military applications while helping to provide overall safety.

To achieve these new levels of graphics performance, designers of avionics systems are increasingly transitioning away from FPGA and DSP platforms in favor of more versatile, higher-performing embedded GPUs. These are optimized to handle high-speed multimedia processing as well as the massive parallel processing required for tasks like radar processing, object recognition, 3-D mapping and video manipulation.

These high-performance avionics applications are, of course, sensitive to the acute power consumption constraints that characterize most airborne vessels. In an operating environment with a finite power budget, enabling maximum energy efficiency is critical for every onboard embedded system.

Heat dissipation is another key challenge for these systems, given the sheer density of today's cockpit electronics

and displays, the ever-narrowing airflow paths passing between the embedded subsystems, and the wide variance in operating temperature brought on by fluctuations in climate and job performance requirements. Active fan cooling isn't a viable thermal management approach for the majority of these systems, given the reliability concerns that accompany moving parts which can be subject to failure due to extreme shock and vibration, humidity, particulates and other harsh environmental conditions.

For avionics applications, setting the optimal balance between processing performance, power consumption and heat dissipation is especially crucial – any significant skewing of these properties can negatively impact the performance profile of the entire cockpit electronics system. As such, GPUs offering the ability to clock performance up or down as needed provide greater overall power scalability and thermal control.

Other important GPU attributes for avionics include support for multiple independent graphics outputs, ample dedicated video memory and H.264 MPEG4 motion video decoders. All of these features – from performance, to power, to I/O and output versatility – define the GPU requirements that designers of next-generation conventional military and commercial avionics systems will count on to heighten pilots' and UAV operators' command of the skies.

## AIMING HIGH WITH AMD EMBEDDED RADEON™ GRAPHICS

The high-performance graphics and parallel processing provided by the AMD Embedded Radeon™ E8860 GPU make it a compelling choice for graphics-intensive avionics applications such as geographic information systems, 360-degree situational awareness, diminished vision enhancement and more. Providing 768 GFLOPS of precision floating-point performance and supporting a scalable range of thermal design power ranging from 8 to 37 watts, the AMD Radeon E8860 GPU provides an outstanding performance-per-watt profile for cockpit electronics and display systems requiring the highest levels of graphics clarity and accuracy, without sacrificing energy efficiency. This is made possible in part by the massive parallel compute capability of the AMD Embedded Radeon E8860 GPU, which is designed to optimize the data processing path to help improve real-time video and graphics processing performance.

AMD Embedded Radeon E8860 GPUs also provide 2GB of dedicated onboard memory, H.264 MPEG4 decoders and multiple display outputs for supporting specialized multiscreen avionics systems. These features round out a high-performance, power-efficient processing platform enabled with the performance and power clocking capabilities available to support a diverse range of aircraft display systems.

## SAFETY-CRITICAL, LONG LIFE CYCLE SUPPORT

The vast majority of conventional military and civilian aircraft display systems operate with time and space partitioned real-time operating systems (RTOSs) and graphics drivers that are not supported by processor manufacturers themselves. And unlike drivers used in consumer markets, the graphics drivers used in high-reliability environments must be rigorously designed and tested in conformance with industry-recognized, safety-critical standards and include support for the target system's RTOS. The hard work of ruggedizing and ensuring certification conformance for processors used in safety-critical avionics applications, therefore, typically falls to third-party specialists – and the requirements in these domains are exacting.

**CoreAVI** goes to extreme lengths to achieve the highest possible levels of integrity by providing European Aviation Safety Agency (EASA) and Federal Aviation Administration (FAA) certification packages that enable products like the AMD Embedded Radeon E8860 GPUs and other AMD Radeon discrete GPUs to be used in safety-critical applications. In addition, CoreAVI makes these processors available over an extended life span – up to 20 years – far beyond the standard commercial processor life cycle. CoreAVI assigns every processor it handles with a unique serial ID with lot and date information and tracks each processor from manufacturing to use, conducting extended temperature screening and maintaining 24/7 security and control of environmental storage conditions for the length of production.

Packaged with specialized software drivers and conformant with applicable certification requirements, these processors are provided to customers that are developing some of the world's most advanced graphics applications, and may ultimately be called upon to power an entire generation of critical avionics systems.

**Curtiss-Wright** works closely with CoreAVI to develop COTS hardware for conventional military and commercial avionics markets, while also providing robust technical support services to customers. It specializes in designing ruggedized modules and, like CoreAVI, it embraces open standards as a means to promote greater overall system interoperability across the avionics technology domain.

Curtiss-Wright's VPX3-716 ruggedized OpenVPX multihead graphics display card – the first of its kind based on the AMD Embedded Radeon E8860 GPU – is designed for use on deployed airborne platforms. It meets the long life cycle availability required for conventional military programs through the use of CoreAVI embedded software drivers, supported via CoreAVI's aforementioned 20-year component supply program. For applications that require safety certification, CoreAVI's software suite includes FAA RTCA DO-178C and DO-254 certification packages that simplify and speed time to market.

## BLUE SKIES FOR OPEN STANDARDS

In order for designers of graphics-driven avionics systems to most effectively take advantage of the outstanding processing power provided by platforms like the AMD Embedded Radeon E8860 GPU, their programs must be written in a scalable fashion so as to run on the widest possible range of systems without coding modification. Open development tools like OpenGL® and its variants are playing a major role in this effort.

OpenGL®, the cross-platform open API for hardware-accelerated rendering of 2-D and 3-D computer graphics, introduces the ability to run sophisticated, massively parallelized algorithms to render stunningly crisp graphics and video for high-performance visualization applications like primary flight displays and mission computer systems.

The OpenGL SC (Safety Critical) profile is specifically defined to meet the unique needs of safety-critical markets like avionics. It simplifies certification processes, ensures a deterministic approach, enables a small footprint for real-time environments and can facilitate the porting of legacy safety-critical applications. OpenGL SC accommodates the FAA mandated DO-178C certification process for ensuring reliable graphics drivers for instrumentation, navigation and controls.

The accelerating adoption of OpenGL and its variants reflects a growing interest among the developer community in promoting the advancement of open standards for avionics systems. The Future Airborne Capability Environment (FACE™) Consortium, managed by The Open Group and promoted by the U.S. Naval Air Systems Command (NAVAIR), is indicative of this trend. The FACE™ technical standard is designed to standardize approaches for using open technologies and interfaces within avionics systems, and promotes software portability, interoperability and reuse. Like OpenGL, FACE ultimately aims to speed the delivery of technical innovation into the field and lower implementation costs via a highly flexible, open standard model. CoreAVI and Curtiss-Wright are active participants in the FACE initiative.

## ONWARD AND UPWARD

Achieving high-performance conventional military and civilian avionics capabilities hinges on a host of factors, spanning the underlying processing platform, open standard support, vendor ecosystem and beyond. Established leaders in this domain like CoreAVI and Curtiss-Wright are working together today to leverage the processing speed and power efficiency of AMD Embedded Radeon E8860 GPUs and open standard initiatives like OpenGL® and FACE™ to break new barriers in cockpit electronics and display performance.

## ABOUT AMD

AMD (NYSE: AMD) designs and integrates technology that powers millions of intelligent devices, including personal computers, tablets, game consoles and cloud servers that define the new era of surround computing. AMD solutions enable people everywhere to realize the full potential of their favorite devices and applications to push the boundaries of what is possible. ***www.amd.com/embedded***

## ABOUT COREAVI

Core Avionics & Industrial Inc. ("CoreAVI"), a Channel One company, is the world's leading supplier of "program ready" embedded graphics and video processors to mil-aero and high reliability embedded systems manufacturers. ***www.coreavi.com***

## ABOUT CURTISS-WRIGHT

Curtiss-Wright Corporation (NYSE:CW) is a global innovative company that delivers highly engineered, critical function products and services to the commercial, industrial, defense and energy markets. Building on the heritage of Glenn Curtiss and the Wright brothers, Curtiss-Wright has a long tradition of providing reliable solutions through trusted customer relationships. ***www.cwdefense.com***