# Reaching New Heights

# Launching Advanced Agricultural Monitoring Drones

## Introduction

Scientific innovation in the agricultural sector typically elicits images of autonomous seeding and harvesting equipment, smart irrigation systems, or genetic engineering. However, the most impactful innovations are often those that enhance the efficiency of routine but time-consuming tasks, like crop growth monitoring, disease detection, and yield projection.

AAEON was recently presented an exciting challenge from a client seeking a drone solution capable of leveraging AI inferencing and high-resolution imaging to provide real-time data on crop health, diseases, and environmental conditions across extensive agricultural landscapes. After careful consideration, the client selected AAEON's de next-V2K8, a compact single-board computer equipped with AMD Ryzen™ Embedded V2000 Series Processors and Radeon™ Graphics.

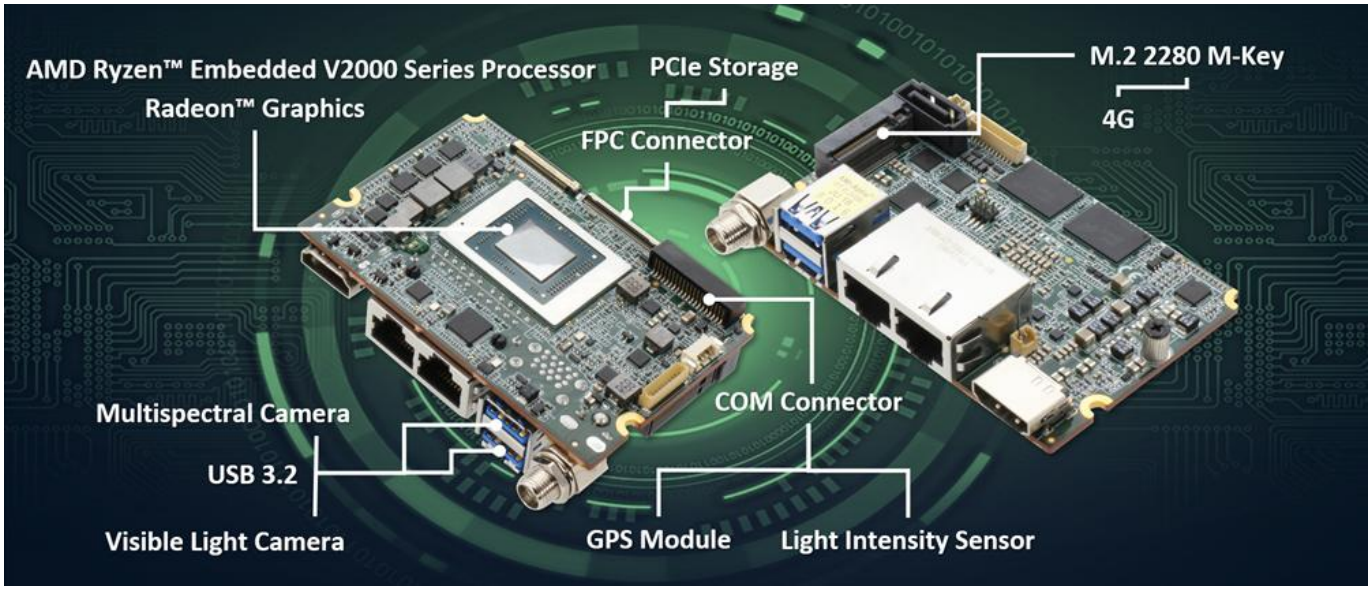
# Challenges in Getting Agricultural Drone Applications Off the Ground

The first concern the client had was the size and weight of their chosen solution, given the impact of these factors on things such as flight time, battery life, and ease of integration. That being said, the need for a system able to acquire high-resolution images, analyze vast quantities of data, and run complex AI inferencing models meant that whichever solution the client chose had to be particularly special.

Furthermore, considering the vast land area the drones had to cover, the client required a method to track and organize the data collected by area. This necessitated the integration of GPS modules to ensure precise geospatial data. Additionally, other peripheral devices like light intensity sensors were essential for monitoring environmental conditions.

Finally, the solution had to be capable of executing said tasks on the edge, while also functioning as a wireless gateway between the field and a central management hub, enabling expert interpretation of the drone's findings and facilitating actions based on any issues identified through the drone's analysis.

## Application Architecture

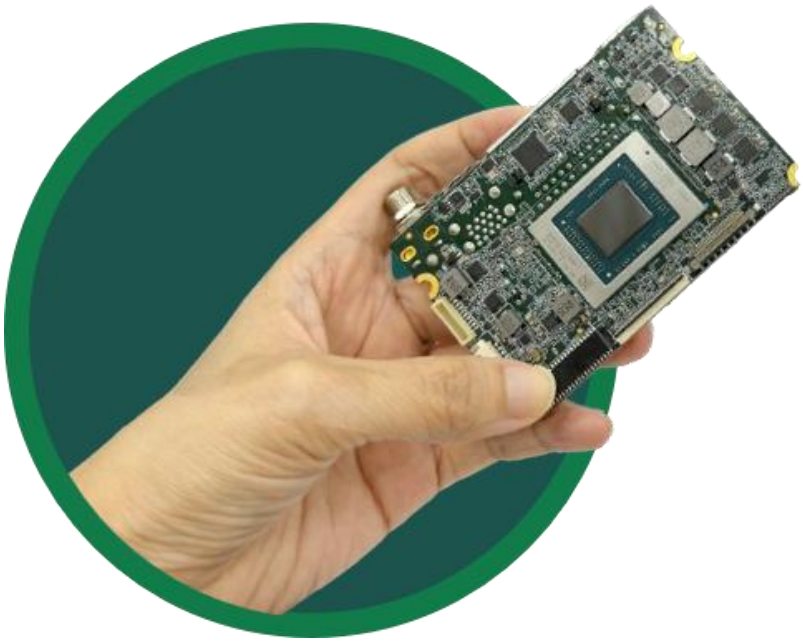



## The de next-V2K8 Takes Flight

After careful consideration of the project's requirements, the client determined AAEON's de next-V2K8 to be the ideal solution to get the application off the ground. While not the sole reason for choosing it, given the complexity of the project, the de next-V2K8's extremely small 86mm x 55mm form factor was a very attractive feature, allowing the client to minimize the overall load on the drone, enabling better flight dynamics and extending flight time. In addition, the minimal space taken up by the board meant the client was able to allocate more of their payload capacity to sensors, cameras, and other necessary equipment.

Powered by the AMD Ryzen™ Embedded V2718 with Radeon™ Graphics, the de next-V2K8 leveraged 8 cores and 16 threads of processing power. This level of performance, along with the board's 16GB of onboard LPDDR4x system memory, enabled fast high-resolution image processing. Its integrated Radeon™ Graphics also meant the board supported enhanced data visualization, adding to its capacity to handle large visual datasets from peripheral cameras.

To obtain high-quality visual data, the client installed both a multispectral camera and a visible light camera using the board's two USB 3.2 Gen 2 Type-A ports. For GPS module and light intensity sensor integration, the client utilized the de next-V2K8's dual COM pin headers. By connecting the GPS module and sensors, the drone accurately determined its geolocation and monitored the environment of the surveyed landscapes.



The board also included USB 2.0 pin connectors and GPIO interfaces, enabling additional sensor integration such as temperature and humidity sensors. This extensive internal I/O capability allowed the drone to collect a wide range of environmental data, enhancing its monitoring capabilities without the need for physical ports that would otherwise have occupied space.

Being a highly expandable single-board, the de next-V2K8 granted ample options for AI acceleration modules to translate and run inference models. AAEON's customer had developed algorithms to identify crucial factors like signs of disease, pest infestations, and crop growth rates. The role of the de next-V2K8 was to perform inference on the data collected from the board's peripheral cameras and sensors, process and analyze the data on the edge, and provide insights on each measured factor.

To achieve this, the client had several options. One option was to install an AI acceleration module either via the board's M.2 2280 M-Key slot or to utilize the PCIe x4 interface provided by the board's FPC connector. Alternatively, the board could rely on its integrated Radeon Graphics, the GPU architecture of which was well-suited for the parallel processing needed for AI inference models.

Given the additional space needed for and mechanical vulnerability of the former options, the client chose to utilize the board's integrated graphics for inferencing. This decision freed up the board's M.2 2280 M-Key slot for a 4G module, enabling remote data transmission to a central management hub. As a result, the client gained real-time data access and the ability to remotely oversee the drone's monitoring operations.

## Reaping the Benefits

The integration of AAEON's de next-V2K8 as a central component of the client's agricultural drone system yielded several benefits for their overall operation. Firstly, the client could gather more accurate data on their crop health across a wider area than would be possible with human workers.

This led to decreased labor expenses and increased crop yield by enabling early intervention upon the early detection of problems like pests or diseases.

Aside from its suitability for powering the drone, the de next-V2K8 had other tangible benefits over similar small form factor single-board computers. It included a reduction in power consumption. By utilizing its integrated graphics for inferencing, the board was able to achieve the same results more power-efficiently. This approach also eliminated the problem of excess heat generation typically associated with AI acceleration module usage.

Meanwhile, the mechanical design of the de next-V2K8 also played a crucial role in enhancing the efficiency and effectiveness of the drone application. Its onboard system memory, utilization of USB cameras, and compact size made it a robust and easily integrated solution. This design reduced the likelihood of requiring frequent maintenance, as it minimized issues such as DIMM modules or pin connectors coming loose.

As AI continues to be adopted by organizations across different sectors, the example set by the de next-V2K8 illustrates AAEON's capability to streamline and improve how the foundational processes of key industries are handled. AAEON has established itself as a leader in bringing quality solutions to the market, but it is important to gain greater insight into how these solutions tangibly affect vital parts of the economic ecosystem, and there are few examples more vital than agriculture.

# About AAEON

Established in 1992, AAEON is one of the leading designers and manufacturers of industrial IoT and AI Edge solutions. With continual innovation as a core value, AAEON provides reliable, high-quality computing platforms including industrial motherboards and systems, rugged tablets, embedded AI Edge systems, uCPE network appliances, and LoRaWAN/WWAN solutions. AAEON also provides industry-leading experience and knowledge to provide OEM/ODM services worldwide. AAEON works closely with premier chip designers to deliver stable, reliable platforms. For an introduction to AAEON's expansive line of products and services, visit www.aaeon.com.