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(This section must be signed)

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Thank you for participating,

Gregory Hamilton
President
Aviation Week Network

Acknowledged, agreed, and submitted by
Bret Tinkey

5 June 2023

Nominee’s Signature _____

Date _____

Nominee’s Name (please print): Bret Tinkey/Bob Hess/Vadim Neimark _____

Title (please print): Program Director / Program Director / Program Director _____

Company (please print): Collins Aerospace – Elbit Systems _____

NOMINATION FORM

Name of Program: Zero-G HMDS+ _____

Name of Program Leader: Bret Tinkey / Bob Hess / Vadim Neimark _____

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Customer Approved

- Date: _____
- Customer Contact (name/title/organization/phone): Bradley Schieferdecker/Integrated Product Team Lead/ PMA202 _____

Supplier Approved (if named in this nomination form)

- Date: _____
- Supplier Contact (name/title/organization/phone): _____

**PLEASE REFER TO PROGRAM EXCELLENCE DIRECTIONS
AS YOU COMPLETE THIS FORM.**

EXECUTIVE SUMMARY: Make the Case for Excellence

Value: 10 points

Use 12 pt. Times Roman typeface.

What is the vision for this program/project? What unique characteristics and properties qualify this program for consideration? [LIMIT YOUR NARRATIVE TO THIS PAGE.]

Launched in Q3 2019, the Zero-G HMDS+™ team set out to develop the next generation of Helmet Mounted Displays (HMD), taking a giant step forward in improving the aircrew safety and health, bringing advanced capabilities to the war fighter in a low-cost, easy to integrate solution. The Zero-G HMDS+ team is breaking a long-held paradigm of weight, performance, maturity, and cost – creating an unprecedented value proposition that is a win-win for the Warfighter and the OEM.

Collins Aerospace and Elbit Systems are in partnership under the joint venture, Collins Elbit Vision Systems (CEVS), to provide Helmet Mounted Display Systems (HMDS) for military and paramilitary fixed-wing applications. The Zero-G HMDS+ team has successfully collaborated with the user community to identify a need, utilize iterative design cycles with timely feedback and program management best practices to provide a revolutionary product that will enhance and provide evolutionary warfighter effectiveness.

The Zero-G HMDS+ team conducted several test flight technology evaluation feedback sessions early on with the fighter pilot community to identify and prioritize the needs and capabilities for the next generation of HMDS. A common message received was the need for a low weight HMD that reduced the burden placed on the aircrews' head, neck, and spine combined with the newest technologies that affects pilot's workload performance. Along with the need for a low weight HMD with advanced capabilities, the feedback sessions identified high TRL maturity and Open System Architecture as the Most Important Requirements (MIRs) for existing and future advanced warfighters. Those MIRs were quickly validated in 2020 with the receipt of seven RFI's for a lightweight, advanced HMD.

The Zero-G HMDS+ team's approach is to develop a low weight, low cost, and highly capable HMD system solution that can be leveraged to easily update the Joint Helmet Mounted Cueing System (JHMCS) and support 6th Generation capabilities. The team is executing this approach by collaborating with end users and customers through maturing technologies demonstrations and by pulling the real-time feedback back to the design team. By leveraging Commercial Off-the-Shelf (COTS) technology to reduce cost and advance product maturity, by partnering with OEMs to define expectations and supporting Open Mission System (OMS) goals via SOSA-aligned solutions, and by aligning development timelines and company investments to meet customer needs, the team was able to accelerate development with rapid technology insertion. Successful execution of this approach is evident with the recent sole source position to update 600 F/A-18's and EA-18's with the Zero-G HMDS+ for the United States Navy.

The Zero-G HMDS+ design is a modular, comfortable CG - balanced, super lightweight helmet, greater than 25% lighter than any HMD on the market today. The Zero-G HMDS+ provides the most advanced modular digital night solution supported by advanced algorithms with seamless transition from day to night operation. Symbology and video are projected on a high-resolution, binocular, color displays incorporating high tracking accuracy and near to zero latency to support advanced capabilities such as augmented and virtual reality, while meeting aggressive price targets. Fully qualified systems are anticipated to be available starting in 2025 to meet market needs for both domestic and international programs. The Zero-G HMDS+ team has successfully identified a market need, collaborated with the user community to define requirements, and are executing to a well thought out strategy. The Zero-G HMDS+ Team is bringing forward the safest, lowest-cost, integrated night, color HMD system to the segment – a win-win!

DIRECTIONS

- **Do not exceed 10 pages in responding to the following four descriptions.**
 - Allocate these 10 pages as you deem appropriate, but it is important that you respond to all four sections.
- DO NOT REMOVE THE GUIDANCE PROVIDED FOR EACH SECTION.
- Use 12 pt. Times Roman typeface throughout.
- Include graphics and photos if appropriate; do not change margins.

VALUE CREATION

Value: 15 points

Please respond to the following prompt:

- **Clearly define the value of this program/project for the corporation; quantify appropriately**

The Zero-G HMDS+ program provides value for the CEVS partnership and our respective companies by setting us apart as technology leaders. The Zero-G HMDS+ required development and integration of new technologies to provide the capabilities required for the fighter pilot. Bringing together digital night sensors, complex optics, advanced lightweight displays, real-time graphics, and high-end graphics processing into a highly capable helmet mounted display system unlike any other sets us apart as technology leaders in the fighter helmet mounted display segment.

The CEVS Zero-G HMDS+ program provides value to the JV and its parent companies by providing and maintaining a strong solution for the market. CEVS continues to be fully committed to the development of the new technologies that benefit future versions of HMDS. Our team has more than 27 years of shared knowledge base that includes HMDs development for almost every fixed wing and dual role fighters in the U.S. and many international systems. The Zero-G HMDS+ is a result of this commitment and years of knowledge. The CEVS position in the marketplace is sound and remains one of the few companies with the tools, technology, and know how to provide future competitive solutions. To remain competitive, CEVS has invested tens of millions in key technologies. These investments not only helped bring the Zero-G HMDS+ to the marketplace, but they have also yielded billions in sales over the 27 years of CEVS existence.

- **Clearly define the value of this program/project to your customer**

The Zero-G HMDS+ program provides value to our end users through unsurpassed survivability and lethality to our Armed forces and those of our key allies. The HMD is the eyes and ears of the fighter pilot avionics, providing the pilot with all the necessary data required to complete the mission with eyes out capability. Zero-G is the lightest weight, most capable, and safest helmet mounted display ever developed. It is the first HMD designed from the ground-up to improve short-term pilot survival and tactical success in a high-threat environment while addressing the long-term pilot health and safety impacts. Zero-G represents a generational shift in HMD technology leveraging the latest displays, night vision sensor, and Open System Architecture (OSA) processing technologies.

Helmet size and weight are critical considerations for pilot comfort and safety. The Zero-G helmet is similar in size to the existing Joint Helmet Mounted Cueing System (JHMCS) flight helmet while delivering advanced capabilities in a lighter weight solution significantly improving pilot comfort and safety. The complete Zero-G helmet package weighs less than 3.5 lbs. and its comparable size and quick

disconnect cable allow rapid egress in emergency situations. The human cost of flying with heavy weight and a center of gravity (CG) unbalanced HMD is well documented. While damage to the neck and upper back comes with the application of high G loads, the impact of fatigue is also significant and can lead to substantial performance degradation over time. Our research led us to conclude that tactical platforms require long-duration missions in theater. This increased likelihood of long-duration missions and subsequent impact of fatigue on performance contributed to our design approach of ensuring a lightweight and CG balanced solution. The Zero-G HMDS mitigates the physiological risk of early HMD designs that did not account for negative impacts of helmet weight and CG on human performance.

The Zero-G OSA design is the key enabler to providing a “simple” upgrade path from the CEVS legacy JHMCS installed systems to Zero-G which is why the system was selected by the US Navy for their F/A-18 aircraft. The installation of Zero-G does not impact any of the aircraft wiring already in place and leverages equipment already installed on the aircraft making the upgrade to the Zero-G HMDS+ a very affordable upgrade while replacing a legacy system with the most advanced HMDS on the market.

➤ **Clearly define the value of this program/project to members of your team; quantify if possible**

The CEVS Zero-G HMDS+ program provides value for our employees by fostering an innovative, inclusive, and winning spirit making it a great place to work. Both companies have received numerous awards for ethics and having positive work environments. CEVS offers employees not only the unique opportunity to work on difficult but rewarding programs, but also partake in cultural exchanges. For example, an Elbit Israel employee is located on site in the Collins facility to help foster communication and directly support system level development and integration activities. Likewise, we rotate activities across business sites to encourage experiences beyond execution, allowing relationships to grow and creating a “one-team” environment. Learning and respecting these cultural differences as well as working across multiple timezones has made the international team strong and lasting.

Our employees began work on the Joint-Helmet Mounted Cueing System (JHMCS) in the mid-1990s, which was the first HMD delivered to the U.S. market and is currently installed on the Navy F/A-18. Since then, we have successfully developed and fielded multiple generations of HMDs due to robust research and development programs. Today, we are offering JHMCS in addition to the tech refreshed Digital JHMCS, JHMCS-II and the F-35 HMDS. Each offering provides the advanced HMDS capability our warfighters require at an affordable price. Our employees take tremendous pride in designing, producing, integrating, and sustaining the most advanced and reliable HMDs to the world’s finest pilots. The helmet programs are recognized across the business as leading-edge technology programs. Not only do team members remain on the programs long-term due to their ability to participate in such an advanced tech program, other Collins business areas also engage with the program for the opportunity to integrate their advanced technology solutions.

➤ **Clearly define the contribution of this program/project to the greater good (society, security, etc.)**

The CEVS Zero-G HMDS+ program brings the US and our closest Allies increased lethality, survivability, and effectiveness by providing superior information management to the pilot in a fluid and complex future fight. The complexity of aerial warfare has changed remarkably in the last decade and will continue to change rapidly in the years to follow. The longstanding motto “speed is life” used to describe the requirement for victory in aerial battles in times past, may not guarantee victory in future battles.

Future battles will present a new level of ‘fog and friction’ challenges to our warfighters. CEVS has carefully studied these changes and subsequent challenges for years and have taken time to strategically invest in disruptive technologies. Our objective is to enable a generational shift for pilot information management capability.

The Zero-G HMDS+™, brings a game-changing level of information management capability that will reimagine how we use the HMDS and result in superior task prioritization and faster decision making, or more simply “information is life.” Optimizing the lethality, survivability and effectiveness of future platforms hinges on equipping pilots with reliable technologies that enhance information management capability and reduce decision speed. The Zero-G HMDS+™ is the only solution capable of delivering this level of performance at a cost-effective price with a low-risk path to integration and fielding.

ORGANIZATIONAL BEST PRACTICES AND TEAM LEADERSHIP

Value: 35 points

Use 12 pt. Times Roman typeface

Please respond to the following prompts:

- **15 points: Describe the innovative tools and systems used by your team, how they contributed to performance and why**

In today’s environment it is very important to have collaboration tools in place for the team to share information. These tools range from shared network drives, virtual meetings such as Webex or Zoom, using tools for risk management, action item tracking, and requirements tracking databases such as DOORS. The key is that the entire team has access to these tools online so they have the most current information to use for their activities as well as for other teams who depend on the information. Without clean concise communication across the team, the team itself will not be successful which is why this is the first step that is performed for all successful project teams.

On the Zero-G HMDS+ program one of the key qualification risks for any helmet program is Safe Escape testing which is done late in the program after a mass model is fully mature. The Zero-G HMDS+ team recognized this risk early in the project so has developed an innovative emulation tool that is used to provide early feedback on the expected outcome of an escape test. An escape test uses a sled that rides on rails and can reach speeds up to 600 Knot of Equivalent Air Speed (KEAS) and is a very expensive test to execute. The emulation output is early in the process of being compared against actual test results to refine the emulation tool. Simulations have been developed to model display performance, expected night vision performance, and system interface performance to mitigate risks of issues being identified during the HW integration phase. To date the simulations tools used have been very effective with very few issues being identified during HW integration.

- **10 points: Define the **unique** practices and process you used to develop, lead and manage people?**

At CEVS, a key focus is ensuring that everyone feels valued for their contributions and has the chance to be heard throughout the organization. One of the ways we do this is by including all team members in our weekly meetings where the team discusses current program status and the challenges the team is facing to meet the overall program objectives. The team leaders encourage all team members to participate in the discussion and welcome all ideas to ensure program execution excellence.

Inclusive Environment: CEVS understands the benefits of creating an inclusive and diverse environment as this is critical for program/business success. During our monthly program reviews the leadership team presents the program vision and links that to business opportunities so each member has awareness for why the work they are doing is critical to meet the business objectives. The PMRs also provide exposure to different areas of expertise within the business to help shape their Individual Development Plans. All the team members are encouraged to participate which also gives them the opportunity to present to the executive leadership team by demonstrating their expertise and knowledge of the program.

Set Individual Goals: Every team member needs to understand the program goals and how the work they are doing support those goals. It is very important that each employee understand how they contribute to the overall program. Individual goals are linked to the respective business unit goals to show a clear alignment. Each team member understands how the work they perform impacts the success of not only the program but the business.

Respect: It's important that every team member is heard and has the opportunity to be a part of change that affects the outcome of the program.

➤ **10 points: How did you leverage skills and technologies of your suppliers?**

CEVS appreciates what subcontract suppliers can offer to design and build uniquely qualified components and subsystems for a technically complex HMDS. The CEVS teams leverage subcontract skills and technologies to build the most technically advanced HMDS available on the market. Selecting the right subcontractors is critical to building a successful product that can withstand the test of time by keeping the products we procure current in a rapidly changing supply chain.

Close collaboration with the global supply base allows the Zero-G HMDS+ team to closely monitor and mitigate supply chain risks resulting from pandemic effects, geopolitical situations, electronics market perturbations and material Diminishing Manufacturing Sources (DMS). Constant communication allows CEVS to maintain regional situational awareness and take preventative actions across the broader market.

CEVS works alongside our key suppliers, pulling them into design activities at the system level early to help shape the design requirements. Pulling suppliers in early develops strong working relationships while providing the greater program vision, creating alignment on supplier performance goals that extend beyond a requirement specification. This was particularly important to help the team achieve a step function reduction in helmet weight. Close collaboration with our suppliers has shown to both improve the outcome of our products but also improves the performance and know-how of our suppliers.

**DEALING WITH PROGRAM COMPLEXITY
(VOLATILITY, UNCERTAINTY, COMPLEXITY, AMBIGUITY, or VUCA)**

Value: 25 points

Use 12 pt. Times Roman typeface

Please respond to the following prompts:

10 points: Describe UNIQUE areas of VUCA faced by your program and why. (Please avoid the issues surrounding Covid-19 pandemic, which was faced by all programs.)

Zero-G HMDS+ has been a challenging program to execute from the beginning. The technology selected pushes product limits because the performance has to be at a very high level to meet the needs of the

aviator while being the lightest weight HMD available on the market. There are significant health and safety impacts on the aviator's neck during normal flight, even more so due to the high g-forces experienced during combat flight maneuvers, and for ejection safety. When the program kicked off in late 2019, CEVS had to rely on its internal expertise to define the requirements for an advanced HMDS with no external customer input or commitment leading to uncertainty that the large investment that CEVS committed to would be selected for future programs.

- Packing all of the Zero-G performance and capability into the HMD while significantly reducing the head borne weight by 25% has been possible only due to the advanced mechanical and optical system design, use of specialty materials, and extremely tight manufacturing tolerances needed to ensure peak performance is consistently met in the finished product. The key requirement of a 3.5 pound HMDS was set very early in the program the program to address the emerging requirement for pilot health and safety.
- The unique optical design pushes the technology limits of our suppliers, requiring us to work with our suppliers at every level to ensure the optical and mechanical parts are designed and manufactured to meet demanding specifications for an advanced HMDS.
- The Zero-G modular design had several challenges to ensure it could be used to replace the Legacy installed JHMCS system while also supporting the Next Generation capabilities required for the 6th Gen fighter aircraft. The system requirement was to have a single HMD configuration that supported a seamless transition from day conditions to very dark night conditions. This single configuration was also designed to support the use of legacy AN/AVS-9 Night Vision Goggles (NVG) as well as cutting edge digital Night Vision Camera (dNVC) which outperforms the legacy NVGs. The dNVC weighs 0.4 pounds compared to the NVG which weighs 1.2 pounds.

➤ **15 points: Explain how your team responded to these challenges. What changes did you make, what were the results?**

- **The initial Zero-G helmet design did not meet the key weight requirement driving the need for immediate action to revise the design to meet key performance characteristic.** With one of the key focus areas being pilot long/short term pilot health the team had to re-group with a focused tiger team to identify design changes to meet the Zero-G weight requirement. Consultants were brought in from other areas with Collins and Elbit and broke off into 5 teams to conduct trade studies on design options to reduce the HMD weight. Each of the 5 teams included a diverse group of engineers to leverage the insights of our diverse workforce. During this process all ideas were heard and acted on (no idea was considered stupid). The 5 teams came back together to present their ideas for ways to reduce head borne weight. These ideas ranged from totally new design approaches to leveraging advanced lightweight materials. The final Zero-G design leverages the best ideas from all 5 teams to make achieving our weight goal a reality. As a part of the corrective action, the team developed a weight tracking tool that we monitored weekly to ensure we were tracking to the weight requirement. With this being a key program metric, the results were reported out weekly to the key stakeholders.
- **Supporting the unique lightweight optical technology** selected for the Zero-G program pushed the boundaries of available technology to meet the Field of View, resolution, contrast, and dynamic range for brightness that must operation in very light and very dark conditions. Early in the program a supplier was selected for the program, however, was acquired early in the process so the team had to perform another round of market research to find a supplier that could meet our demanding requirements. After an exhaustive search for viable suppliers, the decision was made for CEVS to own and manage the design of the optical system vs buying a solution since the commercial market

was not able to meet the program requirements. The team responded to this challenge quickly and was able to support the program's aggressive development timeline.

METRICS

Value: 15 points:

Please respond to the following prompts, where predictive metrics indicate items that provide a view of how yesterday's actions and today's actions will affect the future timeline, cost or other requirement. Provide charts/graphs that illustrate performance to these metrics:

➤ **What are your predictive metrics?**

- Schedule Performance Index/Current Execution Index – Earned Value Management which links the program IMS (MS Project) with our financial system (Cobra)
- Design to Cost – Reporting on each LRU in the HMDS to ensure Zero-G HMDS+ is competitively priced for the target segment
- Key Product Metrics – Head borne weight, System Power, Technical Performance (Display, Night Vision Sensor, System Power, ease of aircraft integration, system configurability)
- Action Item Closure Rate – This metric is critical to ensure the program team is closing out actions in a timely matter. Action items that remain open for an extended period time presents risks to the overall program.
- Active Risk Management tools – The review focuses on mitigation steps to close out each risk as soon as possible. We treat opportunities in a similar way to ensure the team is taking action to realize every opportunity identified.

➤ **How did you perform against these metrics?**

The Zero-G program is performing well against the program metrics that were established at the start of the program. As discussed earlier, the program has had to make some program plan adjustments along the way to meet overall program objectives. Having a constant battle rhythm defined for the program where we A) Review the program metrics B) Understand what the metrics mean and C) Take action early are the keys for keeping the program on track to meet both internal and external expectations. Below are a couple examples of the way we track program metrics.

Zero-G HMDS+ program stop light chart which is reviewed monthly to hi-lite areas of concern and where help is needed to keep overall program on track. Key comments / actions are discussed at a hi-level on this chart with detailed actions to address any key element that is at risk. This information is also presented quarterly at the CEVS board meeting where the development team can request any help needed. The Zero-G team met or exceeded all the key metrics and have successfully managed through where challenges have emerged.

Key Product Metrics – Head Borne weight is an output of the CEVS weight tracking tool. Design weight versus goal weight was tracked weekly so that progress, risk and opportunity were able to be visually conceptualized. The team utilized this tool throughout development, resulting in successful iterations until the goal weight was achieved.

➤ **How do your predictive metrics drive action toward program excellence? Please provide examples.**

The key to managing a program to meet program excellence begin with defining the right key metrics at the start of the program and being willing to add more key metrics as the program matures. Each metric

must include a measurable goal and be communicated with each of the team members. Each team member must understand the overall program goals and be true to tracking each key metric. Metrics are the leading indicator of what is working well and what items need additional focus. As discussed above, if head borne weight was not a key metric the team may not have known there was a problem with meeting the weight requirement.