AVIATION WEEK
20 YEARS
PROGRAM EXCELLENCE AWARDS

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Thank you for participating,

Gregory Hamilton
President
Aviation Week Network

Acknowledged, agreed, and submitted by

Nominee's Signature:______________________________________ Date 7/15/2024

Nominee's Name (please print): Kent Grimsrud ____

Title (please print): Senior Program Manager ____

Company (please print): HONEYWELL AEROSPACE

NOMINATION FORM

Name of Program: HALAS III

Name of Program Leader: Kent Grimsrud

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☑ Customer Approved

- Date: 7/15/24
- Customer Contact (name/title/organization/phone): Tyler Neale, Executing Agent, TRMC T&E/S&T HSST

☐ Supplier Approved (if named in this nomination form)

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

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

SECTION 1: 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.]

Weather impacts every person, company, and government across the planet. Weather observations and forecasting have a broad range of impacts across aviation, national infrastructure, safety, travel, space exploration, and defense. Better knowledge of atmospheric conditions and patterns allows for advanced planning and preparedness, better real-time decision making, and improved understanding of conditions for historical analysis. The current method of launching balloons (radiosondes) has been used extensively for measuring the atmosphere for over 85 years, but this method has limitations and cannot provide relevant readings at the frequency needed for modern forecasting.

HALAS (High Altitude LiDAR Atmospheric Sensing) is Honeywell's innovative new technology that can provide continuous, near real-time, high accuracy, spatially resolved atmospheric measurements. This technology uses lasers to measure the atmosphere nearly instantaneously. These systems can be networked to develop a continuous global source of high-altitude weather observations.

Test Resource Management Center's (TRMC) *SkyRange* program, funded by TRMC's T&E/S&T High Speed Systems Test (HSST) portfolio, is integrating HALAS technology into a fleet of Uncrewed Aircraft Systems (UAS) that can rapidly be deployed in support of hypersonic flight testing. These SkyRange systems, when integrated with a HALAS payload, will support the advancement of the U.S. military's hypersonic capability by providing real time high-altitude weather observations.

The vision of this program is to take all of the capabilities of the 24,000-pound HALAS ground system and redesign it to fit within the size, weight, and power (SWAP) limitations of a UAS. This program included a significant design effort spanning multiple suppliers, engineering and sourcing hundreds of highly technical laser and optics components, hardware and software reengineering for fully remote operations, accommodations for long duration flights under extreme environmental conditions, and the integration and interfacing of the HALAS payload onto the aircraft.

Honeywell employed a number of innovative program management strategies and technologies to execute this demanding, complex and pioneering program. The following sections review these strategies, including close supplier teaming and innovation, responsive requirements management, tight customer engagement and use of technology to foster collaboration. Together, these have made this program a success for Honeywell Aerospace and TRMC's SkyRange.

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.

SECTION 2: VALUE CREATION

Value: 15 points

Please respond to the following prompt:

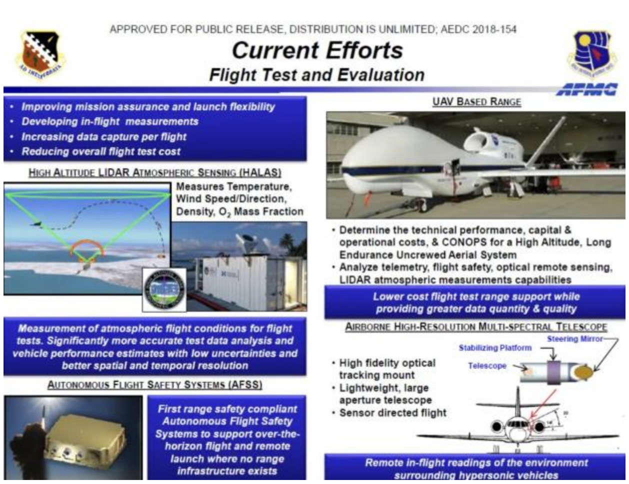
➢ **Clearly define the value of this program/project for the corporation; quantify appropriately**

Honeywell is investing in core HALAS technology to bring this critical remote sensing capability to several markets. This program is of strategic importance to develop new capability for the DoD, and HALAS is critical for the growth of Honeywell's Aerospace business in new markets. This technology development has spurred innovative sensor designs that seek to measure parameters at accuracy levels not achieved with traditional methods in the government and commercial markets. Campaigns with NOAA and the US Space Force are currently being conducted to explore the beneficial utility for weather forecasting, space launch commit criteria and tactical responsive launch. HALAS is also being utilized to assist the meteorology and mission planning teams for launch and recovery of High-Altitude Pseudo Satellites (HAPS).

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

The SkyRange mission is to reduce the cost and complexity of hypersonic vehicle development by increasing the cadence of real-world testing via a responsive set of UASs deployed for measurements during tests. SkyRange, including HALAS capability, is projected to support increasing the cadence of flight tests from 4-6 tests per year to over 50 tests per year. SkyRange assets can be ready to support a flight test in a matter of hours in the Pacific or Atlantic; ships and marine assets that can take 21 days to be positioned and ready for a test can't be flexibly deployed.

Current test range infrastructure depends on deploying aircraft, ships, and balloons that take months of planning and asset repositioning along with weeks of operations. This comes with an extremely high cost per test and extended time on station is an operational security concern. To improve upon this situation and satisfy the purpose of SkyRange program, TRMC is outfitting RQ-4 aircraft with advanced sensors such as HALAS for atmospheric observations. The RQ-4 aircraft can be rapidly deployed with a variety of sensors to quickly set up a mobile test range whenever and wherever it is needed.



(left) Overview of sensing capabilities planned on SkyRange assets, taken from https://www.twz.com/how-repurposed-global-hawks-will-hugely-accelerate-hypersonic-testing (right) TRMC Director George Rumford discussing SkyRange at Grand Sky facility in ND, in front of one of the first Range Hawks.

Honeywell's airborne variant of HALAS was developed to meet two critical requirements; mobility and locality. Its purpose is to provide the atmospheric measurements in an area and time of interest, then return results for post-analysis review. Multiple HALAS instruments could be used to provide full atmospheric profiles along the flight path before, during and after test. These unique capabilities provide highly accurate and location specific readings not achievable with current measurement techniques.

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

Honeywell has been investing in HALAS and related atmospheric measurement technologies over the past decade, including capital investments in facilities and building a team of focused technologists. This program represents the largest external investment in this technology to date and has resulted in the hiring of more than a dozen new core team members and an expansion of supplier teams. New positions include a Program Manager, Principal Investigator and key technical resources in software, hardware and system engineering. As a result of this program, technology team members have gained expertise in autonomous system development, flight readiness and safety analyses, working with government stakeholders and approvers, fault tolerant design and core sensor design. Several members of the team have been promoted as their job duties have increased substantially and more leadership has been required.

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

SkyRange is a "game-changer" for our nation's effort to develop and test the next generation of hypersonic missiles, enabling our nation to begin testing in a more flexible and cost-effective manner than our current ship-based approach, and give the United States a competitive advantage over adversaries. In addition to national security benefits via increased hypersonic test cadence, core HALAS technology can provide improved weather measurements that increase forecast accuracy and by extension improve the lives of those that depend on them. Honeywell is working with other commercial and government partners, including NOAA, to realize these benefits across aviation, national infrastructure, safety, travel, space exploration domains.

SECTION 3: 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**

All of Honeywell Aerospace employs the proven Integrated Product Delivery & Support (IPDS) process as a cornerstone for managing development programs. While the IPDS framework provides overarching program oversight including definition of the Management Operating System (MOS), use of a detailed Integrated Master Schedule (IMS), Earned Value (EV) tracking, and use of the Aero Risk Register (ARR) tools; The newly selected HALAS III leadership team recognized that this program would need significant modifications from a standard technology program management system to be successful due to the unique start-up nature of this program. At its outset, this team worked hand-in-hand with TRMC and HSST organizations to define in detail the necessary requirements for this new sensor. The HALAS III leadership team used this information to tailor the program approach to align with its unique needs - creation and integration of a first of its kind prototype sensor. We employed an aggressive timeline but with a series of tiered key milestones to ensure it was ready for RQ-4 test flights and operations as soon as possible in order to get critical on-mission performance feedback.

To navigate the diverse challenges encountered during the program's execution, a robust yet adaptable MOS was necessary. The team identified that the MOS needed intense focus on supplier communication and integration plans. The MOS included weekly calls with suppliers and the customer that allowed for information to quickly flow between the groups as one integrated team focused on meeting the deliverables for the customer. The program management team detailed the agenda for these calls that focused on critical delivery dates, risks to the schedule and what help was needed to mitigate risk or recover schedule to hold to customer timeline. The communication and integration went beyond these meetings to include onsite visits to suppliers to understand components and get hands on training. Suppliers also then traveled to the new Honeywell facility to support installation and integration activities. This MOS also defined the pace of our agile technical standups, weekly financial Short Range Outlook (SRO) cadence, and Weekly Analysis Report (WAR) reviews to synchronize our day-to-day activities and ensure we stayed on track. The team also held internal monthly risk register reviews to drive closure of existing risks and identify and assess new ones. The weekly information was condensed and reported monthly in executive Program Management Reviews (PMR) to keep senior management informed on progress, challenges, and to request assistance with any needed escalations. At the end of each quarter, the Integrated Program Team (IPT) reviewed the MOS to ensure continuous improvement and best alignment to the changing needs of the program. This operating system has been adopted across other projects in this technology area, and lessons learned are being implemented across the program management enterprise at Honeywell.

Another key focus of the new leadership team was scrutiny of program risks and opportunities. We held several meetings using Failure Mode and Effects Analysis (FMEA) processes to capture and rank the top anticipated issues. We followed up these meetings with a series of burn-down planning sessions defining the actions we would take to test, characterize, mitigate and then close the higher risk items. The final results of this FMEA were loaded into Honeywell’s ARR along with a calculated factored risk cost to be used as a living document to track the mitigation process and overall program risk.

The HALAS III program engineering tasks were captured in a detailed IMS that was used daily and reviewed by the team weekly to track the progress of all the individual activities. From this document, we populated two indispensable tools: (1) Selected key program milestones were fed into the Honeywell Milestone Reporting (HMR) tool for tracking. (2) A series of critical path charts were generated, posted and used to track daily progress towards these key milestones.

All of the critical Program Management tools used by the team were linked and provided direct inputs to the Honeywell Aerospace Technologies PMR Scorecard, which would provide consolidated daily updates from the HMR, EV, ARR and other tools and also included an integrated Rolling Action Item Log (RAIL), Go-Green plans and critical paths to upcoming milestones. This updated PMR Scorecard could be viewed on demand by anyone on the team as well as any Honeywell Aerospace Technologies leader up to the CEO.

➢ *10 points:* **Define the unique practices and process you used to develop, lead and manage people?**
Resource development and team training was a key priority for a program of this size and complexity. The program team got ahead of these by understanding and documenting the roles and responsibilities between the Honeywell team and the suppliers and documenting key training areas to assist the team. This activity led to clear direction for the resources working the program. This evolved to detailed training that enabled the team to grow as the development evolved and also build a team that wasn't prone to single point failures during the execution phase. During early planning phases the core team was around five resources and as the development ramped up, the Honeywell resources have grown to around twenty resources working the program. This was done efficiently without impact to milestone performance or cost growth because of the detailed roles and responsibilities and training that the team put together. This training consisted of science needed to understand the technology, aircraft architecture to understand how the technology will be integrated and used, and MOS information so new resources could quickly adapt to the culture that had been built.

Another key challenge we needed to address was how to maintain a real-time, clear understanding of program status and technical performance while keeping the team on track in the presence of new learning and frequent changes. As we were building and testing the first prototype of its kind, there were always significant technical details to discuss, unknown issues to understand and next steps to plan. The cadence of communications was handled effectively with Monday, Wednesday, Friday standup meetings. We gathered the team in our newly built conference room turned War Room in which we posted up-to-date key milestone due dates and critical path timelines. To start the meeting, we communicated the high-level program status ensuring the entire team was aware of the latest changes and expectations. Second on the agenda was a round table highlighting new findings and progress towards open issues. The output of each session was an updated RAIL with assignments, priorities and due dates. This stand-up agenda was very efficient in ensuring the full team was always acutely aware of program status, deliverables and timing requirements. Our daily routine became meeting, assembly / testing / troubleshooting (always with new team members receiving hands-on training to on-board our ever-expanding team), communicating, reassessing and updating the program plan.

Beyond the concise meeting cadence, the complexity of this program necessitated parallel efforts across many functions to achieve our program objectives. The tight knit HALAS III leadership team set the tone of the program, made sure there was a unified vision, and empowered the engineering staff to take ownership of their functional area and to pursue solutions independently. We insisted on excellent support between team members and encouraged each team member to lead, to advise, to assist and to train. Much of our success was due to the exceptional qualities of each team member, timely communications, early identification of issues and clear actions to the best available resources, often seeking the assistance of subject matter experts from other groups.

➢ *10 points:* **How did you leverage skills and technologies of your suppliers?**
The HALAS system is composed of components and systems from four leading suppliers. As suppliers were identified, they were selected as much for the technical expertise and quality of deliverables as they were for being good partners for this development. The HALAS III project

launched with a small internal team and was highly dependent upon the talents and commitment of the suppliers.

The mechanical design and environmental control system were delivered from a company with a history of delivering to the aerospace industry, including flight-proven instruments. They were selected based on their experience in optical design for the primary mirror for the collection optics, skills in design and modeling to meet the structural requirements of airborne systems, and general breadth of experience for developing the environmental control system. Finding a single supplier with all of these capabilities significantly reduced development time and the need to transfer designs across multiple organizations. Honeywell worked with this supplier to derive subsystem requirements, design within cost, size, weight and power requirements, and work with the flight test team to assess trade spaces for speed, schedule and cost.

The laser supplier also had a history of delivering field-proven laser systems to the aerospace industry of similar power and optical properties. A laser solution was needed to meet the dynamic structural requirements of operation in an airborne platform. This supplier produces laser systems with very low service requirements and a relatively wide operating temperature range, which has proven successful during implementation. The initial laser design was improved upon using inputs from both Honeywell and the supplier’s experience with fielding such systems, while maintaining a low risk profile.

An additional support equipment supplier was selected based on their previous experience with HALAS technology implementation. This supplier did component and subsystem testing at their facility, including build of harnesses, cabling, custom boards and electronics. This supplier had done previous design work on airborne HALAS systems and brought practical experience from fielding these systems to the design.

HALAS uses a variety of optical measurement subsystems requiring tight tolerances and high performance over changing environments. Two core instruments for extraction of atmospheric parameters from photon returns were developed and built by a local optical design firm known for high performance optical designs in stringent environments. Establishing a strategic relationship with this supplier was critical to this project and for future development work and production of these instruments. This supplier was given an incumbent design and used their expertise to improve performance while maintaining compliance with critical requirements.

SECTION 4: 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.)**

Volatility

This development program launched using resources from disparate groups and processes including various hardware component suppliers, their respective software code, integrators, and Honeywell teams. Early in the development process of the HALAS sensor, it was recognized that a highly integrated software solution was needed in order to address the unique challenges with not just controlling the system on a limited bandwidth connection to a ground control station, but also the laser control safety had to be robust and autonomous including multiple fail safes in case any aspect of the system failed or went into an uncertain state. This drove the need for a software architecture that supported reliable interface and semi-autonomous control of the various subsystems, that they could progress through the complex initialization and environmental control phase as the system transition from a 50 °C ground temperature to a –65 °C outside temperature, maintained the laser alignment, and manage the various laser deconfliction and safety controls. A software team with these skills was not readily available. At the same time, the program was faced with a 9-month delay to one of the major mechanical subsystems. This was a significant setback as any new software team would need access to the hardware to bring the new software platform to maturity. At this point the program was being executed by Honeywell's Advanced Technology Group, a group focused on bringing technology maturation pre-TRL6 (technology readiness level 6). It was determined to move the project from Advanced Technology to Honeywell's Sensors, Guidance and Navigation engineering group for better resource alignment.

Uncertainty

Honeywell's LiDAR based atmospheric sensing systems are very complex combining the precisely timed sampled Rayleigh scattering, Raman scattering, interferometry, and position signals to measure temperature, humidity, density, and wind velocity over a range of 30 km. The ground systems are a mobile laboratory filled with delicate science equipment and are large, often the size of a 20-foot shipping container weighing 24,000 pounds. In moving to a mobile aircraft variant these precision science instruments need to operate over wide temperature range from 50 °C for testing on the ground to –65 °C in flight. There is so little light returned that the system must count the individual photons over minutes to meet the signal to noise targets. The unmanned aircraft system needs to continuously calculate its precise location and aim point so that the powerful laser can be turned off when encountering other aerial assets. Most of these problems had been solved before in other applications that allow for a significant amount of human involvement for control and maintenance, but not in remote controlled package the size of a baby grand piano weighing only 650 lbs. These challenges presented uncertainty with new vendors, control processes, predictive modeling, and implementation.

Complexity

Most development projects in this industry have at least a moderate level of technical complexity and HALAS III is no different. There are certainly challenges with taking an ensemble of sophisticated science instruments designed for predominantly ground applications and preparing them to function effectively handsfree in an airborne environment. That complexity becomes amplified when one of the components is a Class IV laser which creates operational and testing hazards. There are a variety of government organizations that are involved including the Federal Aviation Administration (FAA), and Laser Clearing house (LCH) in charge of satellite deconfliction. There are local controls including the corporate Health, Safety and Environmental (HSE) and the local NASA Laser Safety Officer (LSO). Safety plans need to be provided and approved by each organization prior to any testing. In the case of this instrument, where the bulk of the system is dedicated to detecting various aspects of the return light, there is limited operational testing that can be performed without being fully integrated onto the primary airborne system. Additionally, the source is mobile, creating the need for a real time deconfliction operation to ensure that the source is disabled whenever there is the potential for an unsafe pointing direction. With all this complexity, the skillset and workload needs of the project evolved often and in unpredicted directions.

Ambiguity

As mentioned in previous paragraphs, the HALAS airborne system is similar in concept to the HALAS ground system, but SWAP, Software and Hardware complexities on the airborne system forced the team to make countless highly technical, even strategic, decisions on technologies, including vendor selections and other one-off engineering designs. A unique component to the HALAS system is the environmental control unit. The environmental control unit provides temperature control for the HALAS Laser system. Its design must keep the state-of-the-art weather sensing instrument within the tight temperature operating limits required to collect accurate and meaningful data. Moreover, flexible and robust enough to hold tight temperature thresholds across extreme cold and dry environments to hot and humid environments that may be encountered during a mission. One of the main focal points and enablers of the environmental control system is a finned heat exchanger. The complexity of the finned heat exchanger became an ambiguous, single point failure item that went through multiple iterations of design, modeling, and engineering efforts. Six separate hardware designs were modeled and considered, and multiple mechanical engineers consulted prior to a final design. Once we changed our mindset to an iterative process, we gained an understanding of the component complexities and were able to reduce the ambiguity of the design.

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

Teams excel or fail based on their ability to face dynamic product development challenges. This is especially true in a start-up environment producing a first-of-its-kind, complex sensor. The success of the Honeywell team came from recognizing issues early and having the leadership and agility to address them with a swift response.

To address the challenges outlined above, a decision was made to regroup and transition to a focused engineering team under Honeywell's Sensor-Guidance-Navigation Group. A new facility was planned and construction began. The incomplete HALAS III hardware was moved to a Honeywell location to begin the software development and testing and to limit the schedule delays by maturing the code as much as possible prior to the arrival of all the final components and subsystems. Many of the previous technical contributors transitioned to the new organization to maintain continuity, but it was recognized that a focused and dedicated program leadership team would be needed. Over a 3-month period, the new leadership team was formed and consisted of the Program Manager, the Principal Investigator, and Lead Project Engineer.

The new leadership team embarked upon a two-month bottoms-up program re-baseline. There was an IMS re-build, a fresh look into resource requirements, a deep dive FMEA into technical and programmatic risks and opportunities, and the creation of a customized MOS. With a much better understanding of the challenges in front of us we began the process of expanding the technical team to fill the key skillsets for system integration, optimization, and test. From the time of the construction of the new leadership team until the HALAS sensor passed all of its ground capability performance metrics was a total of 5 months. An outstanding accomplishment!

To address the software development gap we hired a seasoned software architect, a team was formed under his leadership and incrementally trained in the appropriate skills. An Agile development process enabled starting simple and building the complexity as it was needed at a pace that, through mentorship and robust peer reviews, skills could be developed. Part of the solution was to employ an internal Honeywell software team at a Puerto Rico location.

In parallel with the new software team, a new hardware integration and test team was formed. This was filled with a combination of new hires and drawing upon local resources. Engineers were selected for their technical skills, their innovation, self-direction, and leadership. All traits needed for this dynamic start-up project.

One challenge with our growing team is that they had much to learn about our new systems and they were located all over the campus. To improve collaboration and communication efficiency, the team was collocated in the new purpose-built facility. This had a huge impact on reducing time to troubleshoot issues and make the most efficient use of the hardware for training, testing, and optimization. In our new facility, we converted the conference room into a HALAS III War Room with postings of the new critical path charts and key milestone requirements. The new facility also allowed us room to incorporate prototyping into the development process.

As part of the restructuring, agility was incorporated into the system development process. Standups three times a week were incorporated to maintain communication among the expanded team and respond dynamically to issues and opportunities that occur during system integration. Each week would start with setting the goals for the week, have a mid-week check in to raise attention to obstacles, and close with a summary of accomplishments and new opportunities. There was a constant pairing of these opportunities to ensure the performance and schedule objectives were met. Specifications were updated as the design solutions evolved.

One additional team challenge involved the industry movement towards improved work-life balance. We had to take a hard look at properly resourcing a project, cross training technologists in other areas of the project, and sharing resources across multiple projects. Cross training highly specialized skills can be a challenge. In the case of HALAS III, several members were trained in system operation. This had the added benefit of providing multiple sources of feedback during system optimization and improving the system's autonomy. For specialized skills, we had to look at other groups in Honeywell to leverage resources for short term projects.

SECTION 5: METRICS

Value: 15 points
Use 12 pt. Times Roman typeface

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.

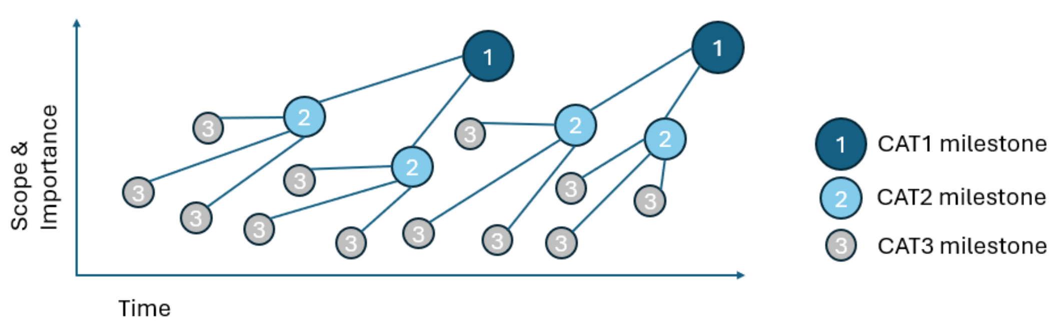
Provide charts/graphs that illustrate performance to these metrics:

- **What are your predictive metrics?**

The HALAS III program utilizes two fundamental predictive metrics to project program performance and ensure our tasks were on schedule and spend on budget. The first of these metrics focuses on spend versus budget via earned value monitoring. The second metric tracks schedule performance via a formal tiered milestone accomplishments tool.

To project earned value, we use both a long-range toolset Estimate to Completion (ETC) Manager to plan the program from beginning to end, and a near-term SRO tool to track and predict our program spend. From the program re-baseline and new Integrated Master Schedule, we populated the Honeywell toolset ETC Manager to project program spend over the duration of the program. This long-range plan which includes all program spend (labor, materials, travel, etc.) is reviewed and updated monthly to reflect any new changes. To predict the next 30 days of program spend, we utilize Honeywell's SRO tool on a weekly cadence to view current fill rates and project the next 30 days of spend. Utilizing both a long term and short-term view we are best able to map out the program spend and predict any potential overruns.

Schedule performance is tracked by Honeywell's HMR system. HMR milestones are organized into 3 tiers: CAT1, CAT2, and CAT3 (see image below). CAT1 milestones are the most important and are set to represent business critical accomplishments for the program. In order to predict our path to achieving each critical CAT1, we set lowest level CAT3 engineering checkpoints and mid-level CAT2 system level system level checkpoints that funneled up to the CAT1 milestone. These milestones are tiered such that we define 3 to 4 CAT3 engineering milestones that will predict the timely accomplishment of each CAT2 system level goal. We define 2 to 3 CAT2 system level milestones that predict the timely accomplishment of the critical business CAT1 milestone. If any of the CAT3 milestones are falling behind schedule it is an early flag that more attention needs to be directed in that area. If any of the CAT2 milestones are falling behind schedule it is an urgent signal that immediate corrective action must be taken. This predictive system allows us to recognize issues early and have time to address the problem by adding resources, consulting subject matter experts, and/or redirecting budget as necessary to ensure the subsequent CAT2s and the critical CAT1 stays on track.



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

To track milestone performance, we use a fidelity metric of milestones met vs total number of milestones. This metric is evaluated by CAT type and measured in %. Our organizational goal is to achieve CAT 1 milestone fidelity >96% and CAT 2 milestone fidelity >90%. As of current day, we achieved the following milestone fidelity:

- CAT 3 Milestone Fidelity = 85.7% (24 out of 28 on-time)
- CAT 2 Milestone Fidelity = 85.7% (6 out of 7 on-time)
- CAT 1 Milestone Fidelity = 100% (3 out of 3 on-time)

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

Our tiered milestone system provided early warning for 2 critical areas (1) The pace of software development, and (2) Deficiencies in our initially selected Inertial Navigation System (INS).
In the software development area, we missed 2 CAT3 milestones early on. It became evident that we needed a different solution: We determined an Agile development process under a seasoned software architect along with a dedicated scrum master and an expanded team was the best fit to our slower than necessary pace. Our rate of development nearly tripled with these changes, and we rapidly recovered the gap in development, testing, and implementation.

In the case of the INS system, 1 CAT3 and 1 CAT2 milestones were missed. A deep dive into the missed milestones revealed that the INS originally selected for our sensor was not DC stable and would not provide the robustness and accuracy needed for the airborne HALAS III variant. This was quite late in the game and a radical pivot was needed. We consulted the Honeywell Navigation Team and leveraged their expertise to select a new design. Integration issues between the new INS and the GPS card persisted, but with the help of the Honeywell Navigation subject matter experts we were able to close all the issues and demonstrate a viable navigation and pointing system for our sensor within 6 weeks – just barely in time for our CAT1 "Demonstration of Ground Capability" on 5/6/24.

To track our program cost performance, our team used Estimate at Completion (EAC) growth measured in dollars. The Honeywell Aerospace goal is to achieve EAC growth less than or equal to $0 to ensure there is no overspend. An initial program baseline plan aligned to our total approved budget was loaded in our long-range planning tool. Using a fully integrated Honeywell toolset combining actual hours and dollars charged through the Time Workbench (TWB) tool, the ETC Manager tool forecasts by each Cost Account Manager (CAM) and the Budgeted Cost of Work Performed (BCWP) vs the Budgeted Cost of Work Scheduled (BCWS) from the IMS, the EAC and EV metrics were calculated monthly to refresh the spend outlook. If a positive (unfavorable) variance is uncovered at any time the program team is required to determine root cause and provide a corrective action, documented in the PMR Scorecard. For our HALAS III start-up there were instances where we found ourselves in an overspend situation due to the steep learning curve of building a first prototype - The software team expansion above was one of our best examples - yet the team proactively worked opportunities to offset the areas of costs increase. Our diligence and predictive measures flagged cost challenges early and also identified potential cost saving opportunities that held the HALAS III development budget to EAC growth of $0.