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Thank you for participating,



Gregory Hamilton
President
Aviation Week Network

Acknowledged, agreed, and submitted by

Nominee's Signature

25 June 2020
Date

Nominee's Name (please print): Cliff Pearce

Title (please print): LITENING Program Manager

Company (please print): Northrop Grumman Systems Corporation

NOMINATION FORM

Name of Program: LITENING 3.X

Name of Program Leader: Cliff Pearce

Phone Number: 224-625-6933

Email: Cliff.Pearce@ngc.com

Postal Address: 1421 W. Shure Drive, Arlington Heights IL, 60004

Customer Approved

o Date: 02 June 2020

o Contact (name/title/organization/phone): Michelle Smith, LITENING Sub-IPT Logistics Manager, Common Avionics Program Office, AFLCMC/WNY, 478-926-5954

Supplier Approved (if named in this nomination form)

o Date: _____

o Contact (name/title/organization/phone): _____

CATEGORY ENTERED

Refer to definitions in the document "2020 Program Excellence Directions." You must choose one category that most accurately reflects the work described in this application. **The Evaluation Team reserves the right to move this program to a different category if your program better fits a different category.**

Check one

Special Projects

OEM/Prime Contractor Sustainment

OEM/Prime Contractor Systems Design and Development

Supplier System Design and Development

OEM/Prime Contractor Production

Supplier System Production

Supplier System Sustainment

Point Distribution

Executive Summary: Make the Case for Excellence (15 pts)		
Metrics 10 pts Predictive Metrics (10)	Program Volatility/ Uncertainty/Complexity/ Ambiguity 25 pts Describe overall VUCA (10) Cite examples of team response (15)	Organizational Best Practices & Team Leadership 40 pts Innovative Tools and Systems (15) Unique Innovative Processes for People Development/Knowledge Transfer (15) Unique Practices for Customer Engagement (10)
Value Creation (10 pts)		

Abstract

In 150 words or less, why is this program excellent in terms of execution?
(12 pt. Times Roman)

The LITENING Advanced Targeting Pod provides precision targeting, surveillance and communication capabilities to multiple airborne platforms for the United States and international partners. LITENING 3.X transformed the engineering development of this product line into a flexible and responsive program that consistently delivers value. Using Agile principles, the program integrates multiple disciplines, as well as program and functional leadership, into a successful team of over 30 engineers and supporting staff. Integrated Agile scrum teams of Systems, Software, and Integration and Test Engineers investigate, develop and deliver solutions to a wide variety of high-priority customer requests, improving product performance and customer satisfaction. Using a single coherent backlog and insightful metrics, this unified, tightly-knit team of developers services multiple programs and continuously refines execution. Insight from metrics and close coordination with leadership enable the merging of cost, schedule, and performance. Thanks to these innovations, LITENING 3.X consistently meets aggressive customer demands.

Purpose

Provide a 150-word description of the purpose of this program, spelling out all acronyms and correct acronyms
(12 pt. Times Roman)

The LITENING Advanced Targeting Pod provides precision tracking, targeting, coordinate generation, navigation, surveillance and communications to multiple airborne platforms for the United States military and international partners. An established multi-generation product with over 800 fielded systems, the LITENING pod is a system of systems with a highly interactive Pilot Vehicle Interface (PVI) for video display and control. The purpose of the LITENING 3.X program is to address customer requests for enhancements, fixes, new capabilities and concept investigations for United States Air Force (USAF) A-10s, B-52s, F-15s and F-16s. The program generates software suites and supports frequent customer test events at system integration laboratories and flight tests, while continuously developing, integrating and testing spiral upgrades. With predictable structure and organization, LITENING 3.X simultaneously executes a myriad of often disparate and complex customer requests while delivering quality and performance on time and on budget.

Executive Summary: Make the Case for Excellence (Value: 15 pts)

What is the vision for this program/project? What unique characteristics and properties qualify this program for consideration?

(12 pt. Times New Roman)



Around the clock, on any given day, a LITENING pod is in operation. Whether enabling precision targeting, surveillance, search and rescue, or humanitarian relief missions, LITENING has become an indispensable asset in military aviation. Flying on platforms as diverse as fighters, bombers and airlifters, the pod has achieved more than three million operational hours over more than 20 years – and a third of those hours were earned under combat conditions.

During that time, close collaboration between Northrop Grumman and its customers led to four major generations of evolution within the LITENING product line, with enhancements occurring with each successive version of the pod. Building on this foundation of continuous improvement, program leadership envisioned ways to use new methodologies to speed up the deployment of capabilities while also improving reliability. Northrop Grumman initiated the LITENING 3.X project to bring Agile and other methodologies to the program, making possible a more rapid response to the changing needs of the LITENING user community. Agile software and hardware development have transformed other industries, so program management saw clearly the benefits of its application to LITENING.

For the customer, the benefits of LITENING 3.X have been many. The customer's overarching request to increase reliability and performance while reducing development times for new capabilities is being met through the use of Agile techniques. Frequent communication between users and developers is one of the keys to success. Engineers now meet during development cycles with customers to coordinate, discuss issues and adapt to changing circumstances. Software suite deliveries allow customers to test and interact with the product prior to final delivery, ensuring that the system meets requirements. Demonstrations of new capabilities at customer laboratories and on flight tests yield early feedback on successes and failures, and also generate new concepts for further exploration. These concepts can be fed into the Agile process and iterated until a capability is ready for deployment. Metrics are used throughout to measure, predict and improve performance.

"NGC, in managing its software development process (LITENING 3.2 program), has consistently and efficiently addressed the myriad of requirements across the various platforms through the OFP development process. Not only are they successfully navigating the different aircraft platform requirements, they are also seamlessly working through the different SIL (software integration lab) requirements unique to each platform as well as dealing with government SIL and other contractor SIL facilities," said Gary Plaisted, LITENING Systems Engineer, Precision Attack Systems Program Office.

LITENING 3.X has brought about significant improvements in process and deliverables, but making the change from Waterfall to Agile in this well-established program was no simple task.

The challenges to improved performance began with the complexities of managing a product line with multiple customers, hundreds of fielded systems and several active variants. Given the rapidly changing environment in which military customers operate, calls for changes or new features would sometimes arrive with little notice or formal documentation. In a multi-faceted program such as LITENING, the difficulties associated with normal staffing changes were magnified. It was in this environment of volatility and uncertainty that the team began to apply Agile techniques.

Moving to Agile calls for more than technical training; it requires a change in culture. The LITENING 3.X team recognized this early in the process and used a variety of tools and practices to keep team members informed and connected with each other. Ample opportunities for training and knowledge sharing allowed Agile best practices and tips to spread throughout the organization. One example is a scaled Agile team structure with between three and six teams executing Agile Scrum, including Stand-Ups, Planning (including Release 0), Grooming, Demos and Retros. The shift also required the team to

develop mechanisms for executing Agile simultaneously with Earned Value Management, which is critical in performing on Department of Defense contracts. Team members, now well versed in Agile, have assisted other groups within Northrop Grumman in implementing these practices.

LITENING 3.X is making use of the best of Agile, Model-Based Systems Engineering and Earned Value Management methodologies to deliver new capabilities to the user community faster and more affordably than was previously possible. What was once a Waterfall program with competing priorities is now streamlined and truly agile – an example of evolving quickly to give warfighters the capabilities they need, when they need them.

(Do not exceed 10 pages in responding to the following four descriptions; allocate those 10 pages as you deem appropriate, but it is important that you respond to all four sections.)

VALUE CREATION (Value: 10 pts)

Please respond to the following prompt:

➤ **Clearly define the value of this program/project for the corporation beyond profit and revenue**

Northrop Grumman has committed to the use of Agile methodologies throughout the enterprise. Having success stories and a growing network of experienced Agile teams is an important factor in accelerating the adoption of these practices, and LITENING 3.X is a leading example of the transformation from Waterfall to Agile. The team is also developing the mechanisms, discipline and culture of executing Agile simultaneously with Earned Value Management, which is critical in performing on Department of Defense contracts. To allow for the use of Agile across a wide range of programs, LITENING 3.X has been developing program and engineering management techniques for a Scaled Agile Framework with as many as six teams.

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

LITENING 3.X has delivered tremendous value to our customer in the form of speed, performance and reliability enhancements. Open communication between engineering and end users has enabled earlier feedback and more timely decision making. In turn, this has allowed the team to reprioritize and incorporate additional customer requests with ease and quickly resolve issues from multiple programs/contracts with a consolidated backlog. Software loads are released regularly for demonstration and test from initial prototype through final release, reducing defects and resulting in a more reliable and better-performing product. As solutions are developed for one platform, they can be ported efficiently to many others. With LITENING 3.X, the team is delivering on the promises of Agile to meet evolving warfighter needs more rapidly than ever before.

➤ **Clearly define the value of this program/project to members of your team**

Northrop Grumman recognizes the value and importance of Agile methodologies to the development and production of Department of Defense programs. Having engineering and program professionals who are well versed in Agile is essential to this effort, and the LITENING 3.X team members have benefitted in several ways from their involvement. It has provided numerous career growth and leadership opportunities through extensive training and well-defined roles, including Scrum Master, Product Owner, Capability Lead, and Platform Specialist. In these roles, team members have collaborated with multiple disciplines on a daily basis in Scrum meetings, contributed periodic feedback through Sprint Retros, and received regular feedback from established leaders through Sprint Planning meetings and Backlog Grooming meetings. Team members were able to tackle stretch tasks at any time by volunteering to complete User Stories within the backlog. A significant benefit was exposure to senior program leadership at Sprint Demos, where team members had opportunities to showcase their successes and work products. The LITENING 3.X team members are well positioned for continued career growth as a result of this project.

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

(12 pt. Times Roman)

The LITENING Advanced Targeting Pod provides long-range imaging and targeting capabilities for precision strike, surveillance and humanitarian relief missions. It is an indispensable asset for safeguarding American and partner forces as they operate in conflict zones around the world. LITENING

has been in operation for more than 20 years, and with LITENING 3.X, customer requests for updates can be implemented in less time than ever before. With warfighters currently carrying out vital national security missions worldwide, this ability to respond quickly to changing requirements is essential.

The benefits of this project extend beyond LITENING itself, as the team develops cutting-edge processes for image and video processing, including quality enhancements and tracking capabilities that are applicable to a wide array of products.

METRICS (Value: 10 pts)

Please respond to the following prompt:

➤ **How do your predictive metrics drive action toward program excellence?**

(12 pt. Times Roman)

In LITENING 3.X, metrics are used at every stage to predict and measure performance. Discussion of the predictive metrics and their implications takes place at the leadership, team and functional levels to ensure thorough communication of performance and issues. The program uses earned value management techniques to provide early cost and schedule performance measures for accurate progress tracking. Agile methodologies, with Story Points at the core, allow teams to operate abstractly and execute to a budget without needing intricate financial data. They also give program leadership a tool for closing the feedback loop with developers to keep long-term plans on budget and on schedule. The teams use velocity metrics to measure the rate at which Story Points are being completed from week to week, providing immediate incentive and accountability. At the same time, program leadership uses multiple burn-down charts to monitor the backlog of Story Points that the team has committed to complete within Sprint cycles, as well as within longer release timeframes. This practice ensures that the program is on schedule to complete. Equally important, the program tracks and analyzes the cost of each Story Point, feeding efficiency information back to the developers so that plans can be adjusted early in the development lifecycle when the cost of change is reduced.

Increasing levels of granularity in Story, Epic, and Capability size estimation, combined with regular review and updates, allow the program to communicate to the customer potential overruns and underruns with sufficient time to react. Individual discipline-focused metrics that measure defects, technical performance measures, staffing volatility, requirements volatility and other activity provide daily insight into program performance. Combining the best of both Earned Value and Agile metrics with a layered management approach, LITENING 3.X establishes a modern process to improve execution while still allowing developers to focus on their technical activities. This drives program excellence through quantitative analysis, efficiency and continuous improvement.

DEALING WITH PROGRAM CHALLENGES (VOLATILITY, UNCERTAINTY, COMPLEXITY, AMBIGUITY, OR VUCA)

(Value: 25 pts)

Please respond to the following prompts:

➤ **10 pts: Describe overall VUCA faced by your project/program.**

LITENING's users operate in an ever-changing battlespace. Providing the capabilities they need, on the requested timelines, inevitably brings in elements of volatility, uncertainty, complexity and ambiguity (VUCA). Customer priorities can change quickly as new issues arise or old issues are deemed less critical in the operational environment. Requests for product improvement may arrive without Technical Performance Measures, Key Performance Parameters, or quantitative descriptions of the need.

Uncertainty enters the picture as the team pushes boundaries in response to evolving requirements, developing new and yet-unproven algorithms for core targeting pod functions. Adding complexity is the fact that LITENING is operating on several platforms, so there are multiple simultaneous efforts under development at any given time, serving multiple platforms at once, and executing multiple programs within the same team. Each improvement needs to be evaluated for its applicability to each platform, implemented in parallel, and field tested with each customer. While each development item progresses through its execution lifecycle, the team is balancing the prioritization of tens to hundreds of such items, often resulting in changing direction, conflicting requirements and unexpected challenges. In spite of the use of sophisticated simulation and test facilities, it is also not always possible to replicate the end-use environment in the lab, requiring creative solutions to guarantee performance and quality while reducing risk and cost. The team has taken a number of novel approaches to address VUCA.

➤ **15 pts: Cite specific example(s) and how your team responded.**

(12 pt. Times Roman)

Mitigating VUCA has been a critical component of the LITENING 3.X effort, and the team uses a range of tools and techniques to keep the program on track. Model Based Engineering was used to decompose problems into constituent pieces, each of which could be independently simulated, refined, tested and delivered prior to validation in the end-user environment, reducing cost and cycle time. The cross-discipline expertise of mixed-skillset teams brought the perspectives of Systems Engineering, Software Engineering, and Integration & Test Engineering to the table early and often, resulting in innovative solutions. Whereas prior programs had organized around functional disciplines and expertise, the integrated LITENING 3.X teams created an environment where all skillsets are present for critical discussions. Regular customer communication and the flexible planning mechanisms built into Agile helped capture and prioritize tasks in the backlog. Knowledge sharing through regular collaboration and thorough documentation of the design, test procedures, results, conclusions and thought processes helps overcome staffing variability and onboard new engineers quickly.

A specific example is the refinement of a target tracking algorithm. The team was tasked by the customer with improving the pod's ability to maintain a particular tracking capability, but no additional specifications were given. In response, the team broke the system down into Detection, Association, and Discrimination phases. Each phase was modeled and simulated with metrics for probability of success, performance measurements and a quantifiable scoring system for objective evaluation. The developers created tools to visualize the tracker for the team, and developed a database of sample inputs to test the system against a variety of scenarios. As a result, a new tracker algorithm was tested live in flight in record time, significantly reducing the timeline from concept to delivery.

ORGANIZATIONAL BEST PRACTICES AND TEAM LEADERSHIP (Value: 40 pts)

Please respond to the following prompts:

- **15 pts: In executing the program, what unique and innovative practices, tools and systems frame your program and help you achieve program excellence?**

The LITENING 3.X team has fully incorporated Agile into its culture, using a variety of tools and practices to keep team members connected and the project moving forward. One example is a scaled Agile team structure with between three and six teams executing Agile Scrum, including Stand-Ups, Planning (including Release 0), Grooming, Demos and Retros. These meetings provide the team with a structured approach to organizing the work and decomposing it into smaller pieces that are more easily executed, using the planning and backlog grooming sessions. They also provide regular opportunities for communication between team members at daily meetings to ensure that work is progressing smoothly and without obstacles. The discussions at these meetings can uncover issues that the team as a whole was not aware of, and would not have uncovered until much later in the design without this coordination. Periodic Demonstration meetings provide both an outlet for individual and team recognition, as well as planned checkpoints for experts, reviewers and program leadership to ensure product performance and quality. In addition, developers regularly meet separately at Retrospectives to discuss what has or has not been working well, provide recognition to each other for jobs well done, and identify suggestions for program execution improvements to flow up the management chain. Building on the Agile meetings, LITENING 3.X maintains vertical and horizontal program integration using daily leadership synchronization meetings (syncs), weekly scrum master syncs, weekly product owner syncs and weekly I&T syncs. Sync meetings provide opportunities for leaders and developers that share a common role or engineering discipline to communicate and standardize across multiple teams. These practices have led to an atmosphere in which morale remains high, even under challenging expectations and deadlines.

Beyond the meeting cadence, LITENING 3.X also facilitates efficiency and communication using clear, documented procedures and an integrated and seamless suite of collaboration tools. The LITENING 3.X approach includes a clear Definition of Done, which sets out work product and quality expectations. Process templates and program guidelines cover a broad range of practical topics, including the design process to follow for various issue types, how to triage and direct defects and bugs to appropriate team members, roles and responsibilities, timelines and milestones. The included how-to guides are an important resource for both new and experienced team members.

To collect and distribute this information, employees are making use of a wide range of collaboration tools. These include a central Program Asset Library, backlog management tools for visualizing and managing the Agile user story collections and execution, and a virtual team coordination and knowledge sharing platform. These tools facilitate rapid and effective communication across the team using Kanban boards, Portfolios, Team Boards, dashboards, shared backlogs and an integrated rich communication platform. The structure and tools available to the team create an environment that empowers their creativity and drives superior productivity.

- **15 pts: What unique and innovative processes and practices are you using to develop people and transfer knowledge and how do you know they are working?**

Because LITENING 3.X is a leading example of the application of Agile to a full product line, developing employees and propagating the team's knowledge and practices widely are top priorities for the leadership team. The scope of the effort can be divided into three categories: Integrating the team, sharing best practices, and creating growth opportunities.

Traditional Waterfall roles, including Program Manager, Engineering Lead, engineering and sub-discipline leads, have been incorporated into the Agile structure as Scrum Masters, taking advantage of their leadership experience to guide the teams and provide accountability for product performance. Functional managers have been integrated into the Agile structure as Product Owners, leveraging their focus on process rigor, work product quality, obstacle clearing and team building.

The sharing of best practices has taken several forms, beginning with close collaboration with technical experts during periodic planning sessions. These experts are also mentoring and training developers on best practices and engineering techniques. Bi-weekly team-wide demonstrations allow for timely feedback from the developer community, program leadership and subject matter experts. The co-location of our cross-functional teams has brought together a diverse talent pool to share different perspectives, cross-train, improve cohesiveness and speed communication within the team. To capture the team's accumulated knowledge, we document training resources, best practices, templates, process improvements and tips & tricks.

Team members have opportunities to develop their leadership abilities, in addition to technical skills. Developers can take on roles as Platform Specialists, which include significant autonomy, authority and customer interaction, or as Capability Leads, taking responsibility for planning and delivering major functions. The team also provides opportunities for visibility, influence, and responsibility for developers as "Cabinet" members, taking on extra responsibilities to assist with program execution in a variety of roles that meet administrative, process and quality needs.

These practices are yielding results within and beyond LITENING 3.X. What was once a challenged Waterfall program grew into a transitioning Agile program, and now is widely regarded as a high-functioning Agile success. The team receives requests regularly to share tips, tricks, lessons learned, program structure, management tools and techniques with other programs throughout the company. The ultimate measure of success may be that LITENING 3.X has become a preferred destination for engineers looking for exciting work and an opportunity to grow.

➤ **10 pts: What unique practices are you using to engage customers and how do you know?**
(12 pt. Times Roman)

Regular communication with the customer has been one of the hallmarks of LITENING, and a key contributor to the success of the pod. Connecting end users directly with engineers has eliminated delays and bottlenecks in communication, allowing issues to be identified and addressed quickly. These frequent, informal calls give developers a better sense of the missions and needs of end users, allowing them to anticipate evolving customer needs. The team also holds teleconferences at least once weekly with customers to coordinate, discuss issues and adapt to changing circumstances. Bi-monthly software suite deliveries allow customers to test and interact with the product prior to final delivery, ensuring that the system meets requirements. Frequent demonstrations of new capabilities at customer laboratories and on customer flight tests yield early feedback on successes and failures, and also generate new concepts for further exploration. At semi-annual meetings between the LITENING program and the customer base, prioritization sessions allow competing demands to be discussed and balanced, resulting in consensus agreement on the activities needing urgent attention. In between these large customer gatherings, face-to-face meetings at both customer and company facilities are held to share progress, discuss goals and brainstorm improvements. The team also distributes whitepapers on the research and testing of requested capabilities. These papers are provided prior to the commitment of significant resources, allowing the customer to make informed decisions and direct scarce resources where they can have the greatest impact.

In addition to the communication between users and developers, the logistics team receives critical information via the 24/7 global support network. These operational stories give developers real-time data for use in their planning.

As a result of this customer engagement, multiple follow-on contracts have been awarded to build on the success of this approach. Additional user platforms have been added to the program over time, and new capabilities have been added to the teams' integrated backlog and executed in parallel. The customer is enthusiastic to work with Northrop Grumman to continue finding more agile and efficient means to deliver on our quality and performance commitment, enabling the success of their mission through the hard work and dedication of the LITENING 3.X team.