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Individuals **outside your company**, including the companies listed above and other third parties, potentially including your competitors and others in your industry, may receive and/or review award submissions. All information submitted should address the program's management, leadership, and processes in a manner that you are comfortable sharing with third parties freely and without restriction, and may not include any classified or proprietary information or materials. Do not include any materials marked Confidential or Proprietary or bearing any similar legend. All responses and other submissions, whether in whole or in part ("Submissions"), shall be deemed not to be confidential, proprietary, and/or nonpublic information of any sort for any purpose.

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Nominee's Signature

June 1, 2023
Date

Nominee's Name (please print): Dr. Deanelle "Dee" Hidalgo & Dr. Dean Evans

Title (please print): Deputy Director, Air-to-Ground Missile Systems / Rapid Dragon USAF Prog Manager

Company (please print): Lockheed Martin Corporation / US Air Force Research Laboratory, Strategic Development, Planning & Experimentation Office

NOMINATION FORM

Name of Program: Rapid Dragon: Palletized Effects Experimentation Campaign

Name of Program Leader: Dr. Deanelle Hidalgo (Lockheed Martin); Dr. Dean Evans (USAF)

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☒ Customer Approved

- Date: May 31, 2023
- Customer Contact (name/title/organization/phone): Dr. Dean Evans, US Air Force Rapid Dragon Program Manager, Air Force Research Laboratory – Strategic Development, Planning & Experimentation Office

☐ 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)*
What is the vision for this program/project? What unique characteristics and properties qualify this program for consideration? (Use 12 pt. Times Roman typeface.) LIMIT YOUR NARRATIVE TO THIS PAGE.

Rapid Dragon is a fast-paced, program that developed a first-of-kind weapon system and executed a high-op tempo experimentation campaign to explore the feasibility and operational advantages of airdropping long-range palletized munitions and other effects from existing airlift platforms, such as the C-130 and C-17. This new roll-on, roll-off weapon system enables the *en masse* delivery of effects with no modifications required to the host aircraft, using standard airdrop procedures. The multi-phase program brings together over 40 stakeholders from across the DoD, Air Force Major Commands, Test and Evaluation enterprise, program acquisition offices, industry, and even foreign military partners to develop and demonstrate the capability through modeling, simulation, analysis, demonstration, and flight tests. From January 2020 to December 2022, the Rapid Dragon team took a palletized effects delivery system from clean sheet design to first system-level flight in less than 10 months; participated in 4 major DoD exercises; conducted over 30 flight tests from 4 different transport variants including three flight events using production long-range munitions. The Rapid Dragon program team conducted its first CONUS live fire test in the Gulf of Mexico less than 24 months from the program start (Dec. 2021) the first OCONUS live fire event less than 11 months later on World Freedom Day as part of the US Special Operations Command Europe operational exercise ATREUS 22-4 in the Arctic Circle (Nov. 2022) "…to deter Russian aggression, expansionist behavior, by showing enhanced capabilities of the allies." Also during ATREUS, American and Polish airmen jointly trained on the system in a Polish C-130 in Powdiz, Poland.

Rapidly deployable palletized effects provide flexible warfighting options to the combatant commanders and provide the ability to saturate the airspace with multiple weapons and effects, complicate adversary targeting solutions, help open access for critical target prosecution, and deplete an adversary's air defense munitions stockpile. Rapid Dragon is also expanding its effects to include, kinetic and non-kinetic effects; intelligence, surveillance, and reconnaissance (ISR) platforms; cargo resupply; and humanitarian assistance and disaster relief (HA/DR). The US Air Force (USAF) identifies tactical, operational, and strategic advantages of palletized deployed effects, including the ability to (1) provide overwhelming mass of both kinetic and non-kinetic effects; (2) optimize fleet utilization, allowing more precise mission employment of theater assets; and (3) integrate capability of Foreign Partners & Allies (and other US Services) and serves as a strong means of deterrence.

In addition to achieving multiple technological and operational firsts for the DoD, USAF, and foreign partners, the Rapid Dragon program has become an exemplar for successful rapid prototyping and experimentation – delivering on-budget performance on a fast-tracked schedule. In recent years, the USAF and its sister services have increasingly emphasized the use of rapid prototyping initiatives and other transactional agreements to competitively develop and accelerate the fielding of new disruptive capabilities. Rapid Dragon was lauded by the USAF, its stakeholders, and other U.S. government agencies as a prime example of a government/industry partnership that embraced a fly-often/learn-fast mindset, built a community of subject matter experts and executed an aggressive, but well-thought-out, experimentation campaign that took calculated risks. This sentiment was echoed by Maj Gen. Heather Pringle (Air Force Research Laboratory Commander) following the successful Dec. 2021 first live fire experiment, "This type of experimentation campaign, that address capability gaps and demonstrates transformative efforts, helps us shape future requirements and reduces timeline to fielding. This approach ultimately enables a rapid fielding alternative to traditional lengthy acquisition times." Furthermore, the capabilities demonstrated by the Rapid Dragon Experimentation campaign elucidate a path forward to achieve the USAF operating vision to build an elite force of multi-capable airmen and multi-role aircraft that are able to adapt beyond their primary specialty/function and execute expanded missions sets.

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**

Alignment to the Lockheed Martin Mission. At the forefront of its mission, Lockheed Martin (LM) is committed to partnering with its customers to rapidly bring first-of-kind systems and disruptive capabilities to fruition. Today, our customers are not only seeking game-changing solutions, but increasingly looking at solutions that leverage fielded systems to accelerate new capabilities to the warfighter. Rapid Dragon is a great example of how LM is teamed with the USAF, DoD, and international stakeholders to do just that.

Establishing High-Performing Diverse, Inclusive and Collaborative Environments. Faced with the challenge of putting overwhelming mass on target, the U.S. Air Force conceived of launching palletized effects from its fleet of air mobility aircraft to augment the strike capacity of tactical fighters and strategic bombers. As one OEM of long-range strike munitions, mobility aircraft, and tactical fighters – LM welcomed the opportunity to leverage expertise from across its enterprise and a broad government community to develop the world's first palletized effects delivery system and execute the first end-to-end palletized strike mission using inventory long-range munitions. Lockheed Martin partnered with AFRL SDPE to build an agile, collaborative development team comprising of government airdrop, mobility, and special operations subject matter experts; a Navy Battle Management Command and Control System team; test range and safety organizations and operational/development test leads. The team also included non-traditional industry partners that were OEMs in modular effector launch systems Special Operations mobility aircraft and experts in the design, performance modelling, and manufacturing of standard and non-traditional airdrop equipment. The many successes achieved by this cross-disciplinary government and contractor team are a testament to the importance of diversity, equity, and inclusion to the program leadership team, USAF sponsors and government stakeholders. The diversity of the Rapid Dragon team nurtured a foundation of trust, mutual respect, and psychological safety that valued partners' ideas, perspectives and contributions. This built a cohesive diverse dream team that was able to hurdle challenges brought on by VUCA, as well as foster a family-like culture that empowered and celebrated its people.

Adaptive Business/Program Processes to Meet Aggressive Timelines. Rapid Dragon program serves as a successful example of tailoring traditionally "bureaucratic" business, program management and engineering processes to meet customer needs in shortened development and fielding timelines. In addition to "doing business differently," the team leveraged business transformation tools to streamline and standardize workflows; developed automated dashboards to cost-effectively monitor program health and leveraged tailored engineering and change management processes to enable compressed schedules. The team combined reviews to satisfy overlapping internal and government engineering, test and safety boards/processes. This team also partnered with the USAF to optimize proposal/contracting activity to reduce negotiation/awards timelines (i.e., 6 months to < 1 month), while including rapidly-executable contingency options to further burn-down technical risk.

Developing Systems to Adapt with Evolving Threat Environments. The Rapid Dragon system employs a modular and open system architecture (architected in CAMEO), that enables future migration to emerging USAF OSA/WOSA standards. The team intentionally implemented a system design and architecture that is aircraft and effector agnostic. As the team developed the palletized delivery system, deliberate features were built into the system architecture, interfaces and modelling and simulation infrastructure to integrate of other existing effects, as well as provide growth paths for the integration of emerging digitally-designed munitions. The contractor team worked along-side its Rapid Dragon government sponsor, user community, and acquisition branches to provide a government-owned design that offers maximum capability, lifecycle affordability and flexibility to address ever-evolving threats.

Knowledge Transfer to Share Best Practices & Inspire the Next Generation. The largely unclassified nature of this program enables the ability to share best practices and lessons learned to promote a growth/experimentation mindset and agile program execution across the LM enterprise, industry, and the US government. Knowledge transfer events that highlight the team's disciplined focus and fast-paced execution serve to inspire the next generation of defense engineers, operators and leaders to embrace their inner "Skunk" and innovate solutions that address our nation's most challenging and time-sensitive security challenges.

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

Flexible Warfighting Options to Deliver Mass and Project Firepower Worldwide. In future conflict scenarios against strategic competitors, the ability to cost-effectively deliver Palletized Effects en masse from non-traditional platforms expands warfighting flexibility, introduces new deterrence options, and provides combatant commanders greater flexibility to respond in dynamic operational environments. For example, "Rapidly deployable palletized munitions can saturate the airspace with multiple weapons and effects, complicate adversary targeting solutions, help open access for critical target prosecution, and deplete an adversary's air defense munitions stockpile" as described by the Air Force Research Laboratory on the warfighting advantages of fielding the Rapid Dragon capability.

Alignment to USAF Multi-Capable Airmen & Multi-Role Aircraft Vision. Palletized Effects delivery provides opportunities to achieve multi-mission capability within the existing mobility fleet and support dispersed and dynamic operations overseas. One advantage of the Rapid Dragon system is that it requires no special infrastructure on the ground, no modification of the aircraft, and no special training of the flight or ground crew; allowing any aircraft and crew qualified to execute heavy equipment airdrop to be capable of executing this mission. This is directly relevant to the USAF vision of cross-training multi-capable airmen that are able to flex outside of traditional specialties to execute expanded missions. Maj. Murray Ludwig (Combat Systems Officer, Rapid Dragon ATREUS) commented on the value of cross-training during ATREUS in building a multi-capable future force. "The 137th SOW actively seeks out exercises where we can demonstrate our unique capabilities and create relationships with our partners — not just within AFSOC and the total force, but across a multi-national coalition… The multi-capable Airman concept allows us to become completely self-sufficient anywhere in the world. The training our operations Airmen and Mission Sustainment Team are receiving here will be critically important to their future war-fighting potential."

New Missions for Special Forces. As the Air Force postures its force for the future fight, developing unconventional, innovative capabilities is critical. From July 2021 to November 2022, the Rapid Dragon Program conducted 4 full system-level flight tests that achieved 100% mission success with operational aircraft and crew. These included CONUS and OCONUS live fire events from an MC-130J that set the record for the longest range strike from a C-130 aircraft. Lt Col Valerie Knight (Rapid Dragon ATREUS Mission Commander) described the warfighting advantage of palletized effects delivery to the SOF mission: "This rapid roll-on, roll-off capability extends America's ability to project firepower around the globe. It doesn't require any aircraft modifications, making it incredibly easy to employ any place, any time…. An MC-130J is the perfect aircraft for this capability because we can land and operate from a 3,000-foot highways and austere landing zones whereas a bomber cannot. Additionally, a crew qualified to execute heavy equipment airdrop could employ this operationally. After the successful execution of this airdrop, we have now proven we can employ the same weapons system — creating a dilemma for our adversaries. As the only U.S. Air Force Special Operations Wing in Europe, this capability provides our allies, partners and the joint force an additional response option, strengthening our deterrence capabilities in USEUCOM [U.S. European Command]."

Enabling our Allied Partners. Within the National Defense Strategy, integrated deterrence — including increased partnerships with American allies and partners — plays a central role to defending against strategic threats posed by near-peer competitors. The ATREUS test event was significant in that it was the first time Rapid Dragon was operationally employed using cargo aircraft in the USEUCOM theater and in the Arctic Circle. This long-range

strike event and parallel Polish joint training event emphasized how precision munition capabilities for cargo aircraft allows the US and NATO a flexible rapid response option. The success during ATREUS advanced interest in the palletized effects delivery capability and opened up discussion on potential future international experimentation opportunities with additional allied partners and USAF operational wings worldwide. Lt Gen Jim Slife, then-head of AFSOC Command and now Deputy Chief of Staff Operations for HQ USAF, commented in a Nov. 2022 press release on the value palletized effects delivery brings to the future fight and multi-national coalitions: "It's really easily exportable to our partners and allies around the globe that may want to increase the utility of their air force… we have a lot of partners around the globe that don't have heavy bomber-type platforms … but they've got plenty of C-130s proliferated around the world."

Demonstrating A Non-Traditional Approach to Accelerating Capability Development. Over the last five years, there has been a cross-DoD push to institutionalize rapid prototyping & experimentation and accelerate acquisition strategies to quickly field disruptive capabilities. Experimentation helps the USAF learn and frame the realm of the possible prior to developing requirements for formal Program of Record. The Rapid Dragon experimentation campaign successfully executed major milestones every 60-90 days (during 2020-2022) to maintain progress towards a live fire event. The use of operational flight crews provided the opportunity to gather early-user input during the development process to optimize design, manufacture, training, logistics, and concepts of employment. Following the successful completion of Rapid Dragon's ATREUS test, Maj Gen Heather Pringle points to the Rapid Dragon Program as an example of accelerating the development of new capability through experimentation. She mentioned in a press release, "Now, more than ever we must take a different approach to accelerating capability to the warfighter. Rapid Dragon is a fantastic example of the speed at which technologists and warfighters can work – the design, development, prototyping and experimentation of new capabilities can get to the field on operationally relevant timelines. "

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

The Rapid Dragon Program leverages engineering, procurement, and manufacturing expertise at LM and its non-traditional industry partners. It also affords its team the unique opportunity to gain valuable experience in prototyping a clean-sheet weapon delivery system, the unconventional use of legacy weapon systems, and taking these to system-level flight test in less 12 months. The products developed under the Rapid Dragon Program provide new markets and expanded business opportunities not only for LM, but also our non-traditional team partners. Over the course of execution, the Rapid Dragon team experimented with organizational structures and communication techniques to proactively manage and grow talent, maintain cohesion, promote agility to change, and empower decision-making based on execution risk/opportunity posture. The Rapid Dragon program has become a training ground for emerging leaders and high-potential talent within LM – providing junior and mid-career talent with high-impact, high-visibility stretch assignments that pressure-test their ability to execute under aggressive timelines while growing their leadership, coaching, mentoring, and soft skills. Finally, one of the most rewarding aspects of the program echoed by the team is re-invigorating the "Why" behind what we do. Unlike many other programs, the Rapid Dragon team performs shoulder-to-shoulder with the USAF team and government stakeholders- often times executing as a hybrid, in-person contractor-government team for extended periods. When you operate in close quarters with the operators, the mission-focused mindset is galvanized and you appreciate the personal sacrifices for national security. There's a sense of patriotism/pride that comes from knowing the team's contributions are developing capabilities that provide technological advantage to help win, and even prevent, tomorrow's conflicts and keep our service members and allies safe.

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

The Rapid Dragon palletized effects delivery capability the most cost-effective and quickest way to deliver mass effects on target, and so serves as a credible deterrence solution against near-peer adversaries. It enables large-scale power projection by foreign allies and partners who do not operate heavy bombers. With over 60 countries worldwide operating C-130s and seven allies with C-17s in their inventory, proliferation of palletized effects delivery can compound the force multiplier effect to achieve massive firepower against a strong or geographically-

widespread opponent. This new capability permits a rapid and flexible ramping up of offensive capacity whenever and wherever the tactical situation dictates. Even when a sufficient number of bombers is available in-theatre, Rapid Dragon-equipped aircraft can relieve a portion of the operational burden, allowing theatre commanders to dedicate bombers to the most demanding missions. Lt Gen Clinton Hinote, USAF Deputy Chief of Staff for Strategy, Integration, and Requirements, expressed in 2020: "What we see is that no matter how big our bomber force is, the capacity that the joint force needs is always more and more." Transport aircraft deployed in the Rapid Dragon role can match or even exceed the payload capacity of conventional long-range bombers. Following weapons/effects deployment, a Rapid Dragon-enabled cargo aircraft can immediately resume primary transport functions.

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**
- ***10 points:*** **Define the unique practices and process you used to develop, lead and manage people?**
- ***10 points:*** **How did you leverage skills and technologies of your suppliers?**

To meet the demands of developing and flying a new weapon system within a compressed timeline, the Rapid Dragon program coupled streamlined processes, business transformation tools, and new ways of doing business, with best practice leadership approaches to drive innovation, discipline, and performance excellence into every aspect of program execution.

Innovative Program Execution Tools. The Rapid Dragon industry team ramped from a part-time team of four during the Q1 2020 study phase to a full-blown rapid prototyping program in Q3 2020. Equipped with a full-time multi-disciplinary execution team of 80+ individuals across 11 LM, subcontractor and government sites. At the onset of execution and ahead of the pandemic slow-down, the team set up a digital collaboration and execution environment to take advantage of the newly launched Digital Transformation initiatives across LM. The team established scalable environments that enabled secure file sharing/archive repositories with our subcontractors and stakeholders; leveraged Confluence-based team sites to organize and streamline program information; and standardized Kanban boards, virtual whiteboarding and agile project management tools at the IPT level to help visualize workflows, shorten work-in-progress timelines, and maximize efficiencies in daily work. While this adoption was initially intended to baseline program performance and provide quantitative metrics to the Digital Transformation team, it proved invaluable during the pandemic to establish hybrid operating norms – due to these digital transformations in LM and AFRL and the dedication of this close-knit government/contractor team, ***never once did the program fall behind schedule due to COVID*** related issues. Since many members of the Rapid Dragon program team were avid practitioners of these digital collaboration tools, the team developed training material, held training classes, and developed program starter kits to share across LM teams to shorten the telework learning curve and elevate the digital environment competencies across the workforce. While the Rapid Dragon program did not require earned value management tracking, the business operations team implemented automated and visually-intuitive Tableau-based financial, net-factored risk/opportunity and program performance dashboards as a training aide for new finance leads, IPT leads and control account managers. These dashboards were created by LM and implemented at ***no cost to the program***. These dashboards became color-coded quick reference guides for program health monitoring and were an integral part of the program's regular performance, manpower, and risk/opportunity meetings, as well as data-driven decision making. These virtual dashboards were proliferated across other LM programs to enable cost-effective program management discipline in smaller programs/portfolios (<$100M).

System Design Flexibility and Modularity. In alignment with DoD trends favoring digital-engineering environments and modular, open systems architectures– the systems engineering team proactively implemented all system/subsystem architecture models in Cameo. This enables seamless migration to a model-based system

engineering environment in the future. Additionally, the Rapid Dragon program team leveraged standard mechanical, electrical, and communication interfaces/protocols to enable no hardware modifications to the effectors and support interoperability with multiple effector types. Through early operator feedback, the team developed a modular launcher design that supports the integration of different stores, flexible logistics, and variable pallet loadouts. This design flexibility also extends to the launcher controller and modeling/simulation environment. The launcher control software and logic are generalized to inherently enable the integration of homogeneous and mixed store loadouts. The 6DOF simulation environment is also generalized and is a data-validated multi-body simulation to enable high-fidelity performance modelling of the pallet extraction and store deployment sequence. The palletized delivery simulation is compatible with different weapon/effector integrated flight simulations to support detailed timing/release analysis, deconfliction analysis and range performance analyses. Similarly, the dynamic and thermal models were built modularly to quickly iterate over many design perturbations. This was useful during supply chain disruptions that required the use of surrogate material and alternate components to meet schedule.

Streamlined Engineering Processes and Reviews. The Rapid Dragon team implemented a streamlined change management process to expedite design updates, documentation, and transition to engineering builds. Instead of lengthy timelines encompassing drawing updates and ratification by a formal Change Control Board, Rapid Dragon empowered the design engineers to "redline" design changes and receive release authority with a simplified review process from the chief engineer, IPT lead, and quality manager. The streamlined approach was implemented to provide the agility needed to meet compressed schedules, quickly react to supply chain volatility, and implement design optimization between tests. To further streamline engineering processes, the Rapid Dragon program team collaborated with the USAF and government stakeholders to identify overlapping test, safety, and airworthiness data artifacts and requirements. This allowed the joint team to synergize the development of test/safety plans, leverage the same technical data packages across USAF airworthiness authorities, and conduct joint reviews (whenever possible) to satisfy internal Lockheed and external government process requirements. This served to eliminate redundancy in process, maintained alignment across multiple stakeholder and execution teams, and enabled full team participation in assessing risk and readiness for flight.

Leadership and Team Development. Four key tenets that enabled a high-performing team were: (1) a nurturing leadership team; (2) clarity, alignment and overcommunication of the program objectives; (3) a culture that empowers, grows and celebrates its people, and (4) a continuous improvement mindset that supports experimenting with innovative ways of doing things better. During Rapid Dragon, the program manager partnered with the talent management and functional managers to identify and recruit team leads with demonstrated functional expertise and proven track records of building high-performing teams. The program leadership team balanced energy, expertise and experience; and served as the senior ambassadors of the program, technical advisors to our government counterparts and mentors to the rising talent pool. To grow program bench strength, the program leadership met bi-weekly for manpower and talent reviews. During these reviews, they would discuss program personnel needs and cross-training opportunities to build breadth of expertise. The team leads would discuss transition planning- proactively managing personnel turnover timelines to preserve knowledge continuity and mitigate execution risks to the program. Additionally, team leads would meet with individuals on the program to understand their development plans and career aspirations. This allowed leaders to identify and communicate opportunities to expand an individual's network, leadership skills and experience base. On program, the leadership team developed a robust succession plan that cross-trained emerging leaders/junior talent in "Deputy" roles and across leadership competencies. The program leads partnered with functional managers to establish cross-functional training opportunities for off-program engineering, finance, planning, supply chain safety and integration/test personnel to take on stretch assignments on Rapid Dragon. These on-the-job training activities provided additional surge support from the high-potential talent pool, while building bench strength across functional departments. They also provided rising technical talent with valuable flight test planning and execution experience. Such initiatives promoted program awareness and established a natural recruitment stream of talent for future execution phases.

The government program leadership team collaborated with its sponsor to clearly define the program objectives, team charter and mission/vision statements that would be used to communicate the program's "Why" and success criteria to the government and contactor team, as well as its stakeholders. These communication and messaging strategies were documented and updated on the team Confluence page, and used at the beginning of major reviews, program town halls, government stakeholder IPT meetings and new team member onboarding events to promote a shared understanding of the mission and accountability toward the program goals.

Rapid Dragon's development and demonstration plan employs a high-frequency experimentation cadence that completes critical-path first-time events every 60-90 days. These experimentation sprints kept the team focused on what is most important at any given time on the program. In order to maintain alignment and accountability toward the sprint milestones, the team's business rhythm held joint industry-government IPT, subcontractor IPT, and test planning working groups once a week. The program team provided program updates to the broader DoD stakeholder community once a month.

Under Rapid Dragon, the LM and USAF/DoD leadership teams emphasized and embraced the timeless military adage – "mission first, people always." Dr. Dean Evans, USAF Rapid Dragon Program Manager, attributed the program's success to its learning culture, collaborative environment and transition-focused mentality: "Rapid Dragon was able to accelerate development by building a broad and strong team. We were committed to a 'test often/learn-fast' culture, dedicated to experimenting frequently and taking calculated risks. Collaboration from the onset streamlined the process and accelerated development, involving groups from the program inception that are not normally included at the very early stages, and that has made all the difference. "

The emphasis on the program's people promotes quality of leadership; supports collaboration and inclusivity; promotes constructive feedback; and celebrates the contributions of each team member. At the core, relationships and connections are vital to the success of any team by establishing empathy, compassion, trust, candor, transparency, and better communication across organizations. Despite COVID challenges, the program leadership team collaborated with the USAF customer to facilitate frequent in-person working meetings anchored around key program integration and test events. During these events, the program leads planned team bonding events to facilitate relationship building, forge authentic connections, and establish team traditions. Some of these traditions included "family" dinners; late-night pizza planning sessions; supporting local charity events; lunch and learns to develop a shared understanding of government/industry processes; coffee/food runs during shift changes during 24/7 operations; debriefs following every milestone; and, when the program takes us to remote places across the US/globe – we take the time to visit new places, experience new cultures, try new foods and share new life experiences together (i.e. Shipwreck tours in Alpena, MI, Learning to left-hand drive together in England, Punting in Cambridge, Arctic plunges, Northern Lights and Christmas markets in Norway).

The program leadership often invested in celebrating its people and their contributions to the program. The leaders took full advantage of the many internal and external opportunities to recognize its people, suppliers and customers for modelling personal and performance excellence. Such recognition opportunities include: leader all-hands; nomination of top performers into executive leadership programs; allocation of highly-competitive cash bonuses for outstanding performance; supplier and small business awards; team and individual program excellence awards; and external nationally-recognized leadership.

Team Communications. As mentioned previously, the Rapid Dragon program embraces open and continuous communications across all team members to promote an atmosphere of teamwork with a clear vision and purpose. This robust cascading communication approach is integral to maintaining alignment on such a fast-paced program. It supports organizational success by building employee morale, satisfaction, and engagement. The team employs a continuous feedback loop with government stakeholders to exchange insights on program execution, future capability needs, and operator feedback to optimize the system design, as well as program performance. The program team also collaborates with the USAF and government stakeholders to develop and execute integrated

communication campaigns to convey program accomplishments, articulate benefits of the capability to the general public, and to promote continued advocacy from executive champions within the DoD.

Customer Engagement/Relations. A customer-focused approach is critical to understanding the customer point of view, requirements, and challenges to drive a team-oriented relationship and enable focus on the best joint approach to meet program requirements. A joint Government/Industry Integrated Product Team (IPT) structure with continuous communication across all disciplines allowed the program to identify and resolve issues early; develop and fly a new weapons system within 10 months; realize opportunities to support additional high-priority/visibility flight events; and execute an aggressive flight campaign of over 30 flights in 28 months. In addition to joint IPTs, the program also established joint risk boards, supplier IPTs, and test planning working groups. This strong Government/Industry partnership continues to drive performance excellence and mission success.

***Leveraging Supply Chain Capabilities and Technologies*.** The Rapid Dragon program emphasizes partnership and mutual collaboration with our subcontractors to ensure program success. To facilitate collaboration and open communication, our global supply chain team established weekly supplier IPTs to meet with each supplier to track supplier status, identify issues, and jointly build recovery plans and exchange ideas on product/process improvements. Lockheed Martin was especially mindful of additional challenges and resourcing limitations imparted on our small business/non-traditional partners during COVID, and worked with the global supply chain management, government partners and the business operations teams to mitigate risks to program execution. These included identify second-sourcing of long-lead material through the LM global inventory and supplier network; sourcing of long-lead airdrop equipment through the Army's national stock inventory; identifying alternate part/material options for back-ordered launcher components; identifying additional regional machine/welding shops certified for flight hardware to parallelize launcher system builds; leverage LM's better buying power to secure environmental test facilities with no expedite/over-time costs to support accelerated schedules; and leverage LM design, integration and test expertise to provide oversight and support to augment personnel for critical design reviews and ground tests. Furthermore, LM worked with our business operations team to adapt program milestone payment schedules to mitigate stressing cash flow challenges for our small business partners.

The open communication and established relationship with our supply chain teammates has enabled us to take advantage of their expertise and technologies to execute to an aggressive timeline, specific examples include: 1) leveraging modular common launch tube technologies and architecture to accelerate the design of the Rapid Dragon launch system; 2) leveraging data-validated airdrop system and rigging design tools and ballistic performance models to mature a non-traditional rigging design and inform the 6DOF performance simulation; 3) conducting high-fidelity mechanical analyses of the Rapid Dragon launcher system; 4) conducting limited environmental testing and ground functional testing of a Rapid Dragon unit cell, and 5) design and low-volume manufacture of the Rapid Dragon launcher frame and store release module.

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

The Rapid Dragon program faced many challenges associated with Volatility, Uncertainty, Complexity and Ambiguity (VUCA) most notably with dynamic flight schedules and test objectives; learning how to effectively operate as a large geographically-dispersed team in a hybrid environment; managing supply chain disruptions; and maneuvering staffing and manpower shortages/turnover. The Rapid Dragon team leveraged the expertise and

unique capabilities/authorities across its broad industry and government team to overcome each challenge. To quickly tackle these challenges, the team leveraged transparent communications, teamwork, and trust.

Volatility: A common theme of volatility involved sudden changes to flight events, including new requirements, new schedules and/or new test sites. One example occurred six weeks prior to INDOPACOM's Northern Edge (May '21) operational exercise. The original test objectives for Northern Edge '21 were to: (1) demonstrate the system C2 and retargeting and (2) conduct the first system-level jettison flight test from two aircraft variants at the Joint Pacific Alaska Range Complex (JPARC) military training range. Since JPARC was a training facility, it lacked organic test and telemetry infrastructure to measure the performance data needed to meet our mission success criteria. Solutions to overcome these test infrastructure challenges at JPARC proved cost-prohibitive. Instead, LM collaborated with our USAF program manager and operational experimentation partners to develop an alternate course of action that achieved the same test objectives, maintained schedule towards the live fire event in Dec '21 and added no additional cost to the program. The plan split the original objectives of the Northern Edge exercise into three separate flight events: (1) Demonstration of the targeting and left-of-launch capability from a C-130 via remote participation in Northern Edge (from the Hurlburt Field/Eglin AFB airspace); (2) demonstration of the targeting and left-of-launch capability from a C-17 aircraft as part of Mobility Guardian '21 flagship exercise in mid-May, and (3) Conduct a joint jettison test event at White Sands Missile Range from both aircraft in July '21. The new path forward provided a win-win scenario for all stakeholders, enabling the program to still synergize resources with major exercises and receive valuable feedback from the operational community through dedicated test events. Splitting the test into three sequential test events, enabled additional flight tests to evaluate command and control and retargeting cycles in operationally-relevant scenarios while providing additional schedule margin to incorporate design refinements and update airworthiness packages/configurations ahead of the July '21 jettison test event. Despite all these changes, the program remained on schedule.

During the July '21 jettison test, an anomalous behavior of the system was found which revealed required design optimizations to improve system reliability in flight before the next planned event (Nov '21 separation test). Again, the team met with the USAF sponsors and stakeholder team to articulate the required changes; presenting the data substantiating the performance gains/decrease in operating risk position and an executable path to incorporating a mechanical design change into the system. The anomalous behavior was addressed with a Failure Review Board, which identified the cause of the anomalous behavior, identified a corrective action plan, implemented the solution in a design change, and ground-tested the redesign over 50 times – ***all within 30 days from the July '21 Jettison test***. The AFRL/SDPE agreed to an additional jettison flight test as gating events for the November '21 separation test. During the upfront planning of the experimentation campaign, the team had the foresight to propose multiple options that provided additional risk reduction flight tests. This allowed the government to quickly execute one of the options to cover this additional scope under the existing contract. Additionally, the team benefited from accelerated deliveries of spare flight hardware from the suppliers to provide a low-risk path to executing this pop-up flight. The Rapid Dragon team executed a second Jettison test from a C-130 on Nov. 2nd, and with success, it transitioned to the Separation test on Nov. 3rd, allowing the program to remain on schedule for its culminating flight test in Dec. '21 – the palletized live fire event.

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Uncertainty: As mentioned previously the Rapid Dragon leadership team employed various proactive planning and contingency management approaches to overcome uncertainty, such as disruptions in the supply chain and the unpredictable and long-lead times for electronic hardware and raw material. Similar to addressing and planning for volatility, the team met uncertainty with understanding – understanding of the operational constraints and dependencies faced by our suppliers and collaborating with them to find creative solutions to quickly resolve these issues. To address the impacts of supply chain disruptions, the program leadership team held weekly supplier meetings to identify critical long-lead material and components that could negatively impact schedule. To mitigate supply chain risks, LM worked with our small business and non-traditional suppliers to identify second sourcing options for material (electronics and stock metal) and additional manufacturing capabilities through the LM global supply chain network. Lockheed Martin also implemented a streamlined change board process that facilitated the

use of alternate readily-available components and materials that would not impact the performance of the system. These design modifications also informed future design optimizations that favored non-exotic materials, readily-available commercial hardware and simple tooling for fabrication. To further mitigate flight hardware shortages, LM worked with our government sponsors, safety boards, supplier teams, quality leads and airworthiness authorities to develop inspection, analysis and performance criteria to successfully refurbish and reuse flight hardware. This provided additional opportunities to shore up spare hardware inventories to mitigate risk and execute future pop-up flight tests. Furthermore, the current operational prototype was constructed with a different material that reduced supply chain delays by 45% and allowed for increased fabrication rates by a factor of ten, all while reducing the both the overall weight and production cost of the system by 50%.

Complexity: One example of overcoming complexity is the successful execution of the first Rapid Dragon OCONUS operational event at the Andoya Space Test Range, Norway. In late July '22, U.S. SOCOM resourced the program to execute an unplanned live fire test as part of the ATREUS exercise in the European theater. The success of this quick, four-month effort hinged on multiple first-time events (new range, new operational crew, new range safety/security environment, etc.) and the ability to bring together new stakeholders across the globe. The team conducted an in-person one-week site survey at the Andoya Space Range and Andoya Air Station in mid-September, just two months from flight execution. This meeting served as an introduction to all the participating organizations, including in-region and in-country coordination leads. During the site survey, the team familiarized themselves with the test concept of operations, range safety requirements, logistics capabilities, and range infrastructure capabilities. The team developed an understanding the security environment and required security and export licensing authorizations required to operate across the multi-national sites. At the site-visit, the team also identified the government mission commander, outlined a team charter, and mapped team roles and responsibilities. Finally, the team established a daily inch-stone schedule and a daily cadence for coordination leading up to flight. This meeting was crucial since it was the only in-person opportunity to build cohesion within a new team and rally them around new/redefined mission objectives before the flight event. The Rapid Dragon program established a separate test planning working group for ATREUS, a weekly security meeting with the stakeholder team, and a weekly integrated communications meeting with SOCEUR and the USAF to coordinate/develop a strategic messaging campaign surrounding this operational event. Continuous communications enabled the team to refine all requirements, flight test plan implementation, and drive the daily schedule leading up to the flight. Close coordination with the Andoya Space Range personnel and safety officer allowed the program to adapt our Telemetry and Flight Termination System (TM/FTS) qualification approach to meet their range requirements. The program team coordinated with the USAF and SOCEUR to develop a robust security plan and refine the test concept of operations to maximize mission success.

The Rapid Dragon team originally planned to spend a full week at Mildenhall AFB prior to test execution to conduct in-depth training, mission dry-runs and conduct system functional tests with the new operational crew and aircraft. Three days prior to the planned arrival day in the UK, TRANSCOM cancelled the ferry flight from the US that was slated to transition our equipment and crew members to Mildenhall AFB. It took 48 hours to secure another transport, causing a delay in completing system integration and functional checkouts on the test aircraft. At this time, the team was not provided the spectrum allocation to operate the telemetry system and ground station in the UK. This required the entire team to relocate countries at the last minute to complete system functional checkouts in Norway. This required rapid communication and coordination between the air crew, logistics teams, security details, industry execution teams (in the UK and Norway), test range and military organizations to ensure that all organizations had situational awareness of the change and the arriving team had the resources and support in place upon arrival. In order to not lose additional time, the industry engineers team flew with the air crew on the test aircraft directly to the Andoya airfield staging site. This pivot was executed in less than 36 hours of the decision to relocate. Despite the extreme levels of complexity, the flexibility of the team and the coordination between its members allowed us to executed a flawless operational event. The Rapid Dragon ATREUS live fire was a complete success; resulting in multiple historic first-time events, including the first

deployment of a JASSM-ER cruise missile in the European theater. These successes garnered additional interest in international collaboration/experimentation.

Ambiguity: Through the multiple program pivots, ambiguity was stamped out by clear communication and the team agility in program execution. The team was often tasked by senior USAF leadership to conduct unplanned and unbudgeted test events aligned to major DoD exercises, while adhering to rigid live fire timelines. The program team used scenario planning to understand likely outcomes and collaborated to quickly develop contingency plans to aid decision-making and identify executable courses of action within the constraints laid out by senior leaders. The team developed a course-of-action dashboard with our USAF sponsors and stakeholders to articulate benefits and schedule/cost impacts to aid decision making. In weekly IPT meetings, the program leadership ensured clear communication of program vision, updated objectives, and path forward to maintain alignment across the broad execution team. Since changes in workflow, execution timelines and organizational structures can foster ambiguity anxiety – the leadership team encouraged its members to ask clarifying questions and identify potential roadblocks before they became showstoppers. Because of the inclusive and collaborative culture promoted by the team leaders, team members were not afraid to point out issues and spark constructive dialogue. This allowed the team to identify risk and mitigation strategies early in order to avoid potential roadblocks.

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?**
- **How did you perform against these metrics?**
- **How do your predictive metrics drive action toward program excellence? Please provide examples.**

Program Performance Metrics: The Rapid Dragon program implemented an optimized set of standard metrics track program health. Although Rapid Dragon is a development program, the high-level of visibility within Air Force executive leadership promoted awareness and support from the highest levels of leadership at the business area and the corporate level. Standard performance metrics focusing on Cost, Schedule, Technical, Risk Management and Supplier Performance were tracked weekly and reported up through the Advanced Program Director and Vice President level. Additionally, the program business operations manager implemented multiple automated dashboards as previously describe to cost-effectively forecast financial/schedule performance and assess net-factored risk from program actuals. These dashboards were used to navigate weekly manpower and resource planning meetings, aid decision-making, and investigate root-cause/implement corrective action (as needed) for negative variances in program performance. Instituting a disciplined approach to program management, allowed the program to proactively manage risk and identify/resolve issues early. This enabled the fast-paced Rapid Dragon program to remain on-schedule and on-budget.

System Performance Modelling & Metrics: A high-fidelity 6DOF simulation was developed to predict system performance at any point in time from air drop to target impact for varying initial conditions and system configurations (loadouts/effects). This allowed us to explore all performance parameters in great depth and inform design and concepts of operation and employment. One of the key technical challenges on the program was demonstrating the long-range cruise missile's ability to achieve engine start and aerodynamic capture when launched nose-down and under very low airspeeds. During the Nov '21 separation test, the weapon telemetry data fell within 1% of the performance predicted by the 6DOF simulation; thereby validating the model. This built confidence in our ability to accurately predict system performance and allowed us allowed us to advance to a successful first live fire test in Dec. '21.

Note: Hyperlinks (highlighted in blue) are provided throughout this document to relevant Rapid Dragon press releases and news/government sites containing videos and photos of the system.