20 YEARS

AVIATION WEEK

PROGRAM EXCELLENCE AWARDS

INTELLECTUAL PROPERTY

(This section must be signed)

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.

Without limiting the foregoing, you hereby grant to Aviation Week Network, an Informa business, a perpetual, irrevocable, royalty-free, full paid-up, worldwide license to copy, reproduce, distribute, display, publicly perform, publish, republish, post, transmit, disseminate, edit, modify, and create compilations and/or derivative works of the Submissions (or any portion or excerpt thereof) in connection with its or any of its affiliates' business(es). Aviation Week Network agrees not to edit the Submissions in any way that materially alters their overall substantive meaning. Aviation Week Network may freely assign, license, transfer, and/or otherwise convey any or all of the rights and licenses granted hereunder.

Thank you for participating,

Gregory Hamilton
President
Aviation Week Network

Acknowledged, agreed, and submitted by

John J Malaney:A0109B30000017AEA1BCAC600000252 Digitally signed by John J Malaney:A0109B30000017AEA1BCAC600000252 Date: 2024.07.19 09:29:11 -07'00'

Nominee's Signature

7/19/2024

Date

Nominee's Name (please print): John J. Malaney

Title (please print): Sr. Manager, UCAV Programs

Company (please print): General Atomics Aeronautical Systems (GA-ASI) ____________________________

NOMINATION FORM

Name of Program: XQ-67A Demonstrator ____________________________

Name of Program Leader: John Malaney____________________________

Phone Number: (858) 524-8804 ____________________________

Email: John.Malaney@ga-asi.com____________________________

Postal Address: 14200 Kirkham Way____________________________

____

☒ Customer Approved

- Date: 19 July 2024____________________________
- Customer Contact (name/title/organization/phone): Trenton White, AFRL/RQ, 937-245-1380

☐ 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.

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?

General Atomics Aeronautical Systems, Inc. (GA-ASI) flew the XQ-67A Off-Board Sensing Station (OBSS) for the first time on Feb. 28, 2024. OBSS is an Air Force Research Laboratory (AFRL) program and GA-ASI was selected in 2021 to design, build and fly the new aircraft.

With the completed flight test program of the AFRL-funded XQ-67A, GA-ASI has validated the "genus/species" concept first developed with AFRL as part of the Low-Cost Attritable Aircraft Platform Sharing (LCAAPS) program focused on building several aircraft variants from a common core chassis. Under LCAAPS, AFRL and GA-ASI explored development of a chassis, termed a "genus", as the foundational core architecture from which several "species" of aircraft can be built.

For AFRL, XQ-67A is as a crucial stepping stone to an alternative acquisition approach for military aircraft that enables faster development, lower costs, and more opportunities for frequent technology refresh. XQ-67A is the first "species" to be designed and built from this shared platform. The successful flight demonstration of this system is a major first step toward showing the ability to produce affordable combat mass.

The program was also unique with respect to the tight degree of collaboration between General Atomics and AFRL. From direct access to developmental files to an unprecedented level of on-demand visitation, the rapid schedule necessitated by the very concept of faster aircraft species development was only possible when traditional customer-corporation relationships were reimagined.

Distribution Statement A: Approved for Public Release; Distribution is Unlimited. PA# AFRL-2024-3943

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**

General Atomics Aeronautical Systems Inc. (GA-ASI) has led the air-to-ground ISR revolution over the last 30 years. GA-ASI has over 9,000,000 flight hours with 90% of those hours in combat with a 90% availability rate. GA-ASI has continually been at the forefront of unmanned aviation in support of the war fighter.

In the same way, GA-ASI is committed to revolutionize the air-to-air UAS market. The successful completion of the XQ-67A flight test program is a crucial step to validate concepts which will underscore future generations of high production rate, collaborative, mission-focused, and cost-imposing autonomous unmanned aircraft capable of operating alongside the most potent human-crewed fighters of today and tomorrow.

The achievement of putting into practice technologies such XQ-67A's shared-platform design (which facilitates building several aircraft variants from a common core chassis) or accelerated construction methodologies (which will allow for efficient, affordable production at scalable production volume) cannot be understated, perhaps the most valuable aspect of the program is the experience gained by carrying through the program as a whole. Beginning with a defined "genus" as the chassis of the vehicle, the General Atomics team has now fully completed the "speciation" of that genus into a flight-proven aircraft which meets the key performance parameters defined separately from (and subsequent to) the development of that genus. What has been achieved in this process is not only a successful flight test program, but the development of a team structure which makes rapid development of such vehicles feasible and repeatable on the extremely aggressive timescale that is likely to be crucial as future requirements are created to meet emerging needs.

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

While the rest of the military industrial complex was focused on the war on terror for the first 15 years of this century, AFRL was focused on a future conflict. AFRL realized that affordable combat mass was critical to achieving victory against a peer adversary. As a result, AFRL started the Low

Cost Attritable Aircraft Technology (LCAAT) initiative in 2014 to explore the art of the possible with attritable aircraft.

The first AFRL effort was the Low-Cost Aircraft Strike Demonstrator (LCASD) program resulting in the XQ-58A Valkyrie. LCASD was a design and manufacturing benchmark, and showed that an air vehicle in this class could be designed against a notional set of requirements for limited life, built to achieve low cost targets, and flown in a short period of time.

AFRL took inspiration from another industry that produces incredibly high rates of complex systems on a daily basis: the automotive industry.

Car companies manufacture multiple vehicle variants using the same chassis. This chassis is the backbone for a small SUV, a medium sized SUV, two sedans, and even a luxury sedan. Using a single chassis enables the car company to create a highly automated, low-cost manufacturing line because the quantity of chassis will be four times or more the quantity of any single car model.

In 2017, AFRL created the Low-Cost Attritable Aircraft Platform Sharing Program—LCAAPS. AFRL wanted to know what the art of the possible for aircraft platforms sharing to develop multiple aircraft types (species) from a single core chassis (the genus). Two unique mission sets and design objectives describing Off-Board Weapons Station (OBWS) and Off-Board Sensing Station (OBSS) concepts were identified. The objectives for OBWS and OBSS were different enough that one aircraft could not satisfy both missions. The core goal for LCAAPS was for a production (non-missionized) cost on the lower end of the "$2M-$20M" range that the Mitchell Institute and others have published as the sweet spot for this class of aircraft, with the caveat that this cost is for the aircraft only, no mission systems.

It's a unique problem because optimizing for low-cost requires the genus to be as much of the aircraft as possible. The variety of current and future unknown mission sets want maximum flexibility and thus the genus to be as little of the aircraft as possible to provide maximum future mission capability.

Multiple companies explored this design space in the base period of the program with GA-ASI being one of two companies that advanced into the option period to further mature the design and reduce risk through testing. In mid-2021, GA-ASI built and tested the LCAAPS genus including structural load testing and genus fuel system testing.

OBSS was the logical next step after the LCAAPS program, being the first aircraft to be built from the LCAAPS genus. The LCAAPS cost target was slightly modified to be based on the empty aircraft weight not including mission systems. GA-ASI was awarded the contract in Q4 2021 for the design and awarded the option in Q3 2022 to build and fly the aircraft.

OBSS's ultimate program objective was to quantify the cost and time savings for using the genus-species method. By building and flying the XQ-67A, AFRL and GA-ASI are quantifying the outcome of the assumptions, requirements, and intelligent risk that the program accepted to quickly build an autonomous collaborative platform (ACP) at the lowest costs timeline.

Additionally, XQ-67A signifies a path to tactically relevant, affordable mass that can be acquired in reduced timespans in comparison to traditional acquisition programs.

OBSS's lessons learned offer the opportunity to reduce cost for acquisition programs by leveraging the platform sharing concept. This will assist the Air Force in achieving affordable mass for a peer advisory engagement.

- **Clearly define the value of this program/project to members of your team; quantify if possible**
  For the General Atomics team who dedicated themselves to the success of the XQ-67A program, perhaps one of the most thrilling and inspirational values of the project can be found in the first letter of the aircraft designation. The dedication the team showed to developing technologies and techniques above and beyond the state of that art was wholly deserving of the "X-plane" title, and the skills developed by individuals and functional groups have already shown great applicability to other challenges at the company.

  Solving the problems of a technology demonstrator such as this one is a unique task. While all the traditional considerations required to make a platform airworthy still apply, the questions often far outnumber the answers, and each member of the team must be willing to take the personal responsibility for making challenging decisions, accepting appropriate levels of risk, and making what may be the most difficult engineering choice of all: To move forward even when more analysis is desired.

  Along the way, each functional group was forced to complete detailed design on systems even when interrelated systems were still incomplete, to return and make appropriate adjustments, and to always consider the broader context of the full aircraft system in operation. The communication, organization, and responsibility learned during this process will be paramount in designing similar systems with even more challenging requirement sets and timelines.

- **Clearly define the contribution of this program/project to the greater good (society, security, etc.)**
  This program contributes to USAF objectives in many different ways.

  First, XQ-67A validates the cost and schedule savings of the genus/species concept. In a world where acquisition and development cycles continue to stretch out while increasing the cost to the taxpayer, XQ-67A swings the pendulum in the opposite direction. XQ-67A validated that platform sharing provides significant cost and schedule savings for future unmanned aircraft development.

  Additionally, on a much larger scale, the cost savings enables the US military to generate the affordable combat mass that is necessary to maintain air dominance against any future adversary.

  From both a cost and schedule perspective, the genus/species concept allows for aircraft to be developed extremely quickly to mission needs that war planners do not even know exist today. Previously, new mission needs would require a new aircraft development program to fulfill a mission or exploit a newly developed payload. This program enables a core genus to be produced at a very low cost with mission kits to be developed within months as needed to support changing warfighter needs ensuring USAF always has the most capable air force in the world.

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**

Opportunities for unique tool development and usage were frequent during a program as atypical as the XQ-67A, and the interrelation between our Flight Technologies, Software, and Systems Test and Qualification teams serves as an excellent example.

In order to save schedule and program cost, GA-ASI and AFRL agreed to forego traditional risk reduction testing. Key development steps that have been critical in the past were foregone and the associated risk was mitigated to the extent possible, but ultimately was accepted in the interest of getting to a flying prototype faster.

In alignment with the rapid development paradigm, the initial flight testing program for the platform was not intended to exceed five flights, making efficiency and effectiveness during the test program of utmost importance if key performance parameters were to be validated. To enable the fastest possible progression through the complete flight envelope while managing risk, a variety of real-time analysis tools were developed to assess flight controller gains automatically, providing rapid clearance of flight conditions as autonomous maneuvers were executed. Other newly developed tools provided enhanced situational awareness of monitored aircraft states, measured sensors, and internal processing in format easily actionable by human test monitors.

All of this test execution was backed by the confidence provided by extensive hardware-in-the-loop testing simulated beforehand using actual flight hardware. Extensive simulation, as representative as possible of actual flight conditions, was a critical tool for developing flight controllers, software, and test procedures simultaneously, all of which was done using a mixture of traditional and improved GA processes supported by evolving auto-coding techniques to alleviate human workload.

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

First, cost was a design requirement. Cost was king on this military aircraft development and demonstration program. That alone made this development process highly unique. Military aircraft are typically designed for performance and mission system objectives first, and cost typically falls out. On this program, production recurring cost for parts and assemblies was a primary driver of design decisions moreso than structural, functional, or performance requirements. This pushed the envelope of attritable technologies.

Second, AFRL and GA-ASI formed a highly collaborative team that was opposite of the typical vendor/customer relationship. AFRL and GA-ASI were on the same side of the table working together to tackle the program's known and unknown challenges. Both sides trusted that all involved had the program's best interests at heart throughout the development, build, and testing of the aircraft.

Third, due to the extreme low-cost and aggressive schedule programmatic objectives, AFRL and GA-ASI attacked unnecessary system requirements, ensuring that only absolutely critical requirements remained. The team knew that this focus on system requirements would pay dividends later in the program.

Fourth, the team streamlined and tailored all engineering processes, drawing release processes, manufacturing processes, and testing processes to maximize efficiency. The team questioned all processes to ensure only the absolute necessary processes were used to prevent losing schedule or budget to unnecessary but "accepted" processes.

Finally, AFRL and GA-ASI agreed to funneled critical communications through key Program Management (PM) POC's and Engineering POC's. While this sounds counter-intuitive, it enabled the PM and engineering teams to ensure no new direction was given unless all parties agreed that a change was necessary. This prevented unnecessary churn due to nebulous requirements or good idea fairies. All changes in direction were documented and agreed upon in writing by all parties to ensure everyone agreed to a decision "eyes wide open."

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

  GA-ASI is a vertically integrated company. This provided significant benefit because GA-ASI controlled our own destiny. GA-ASI started build on a complete set of production aircraft avionics at risk to ensure that avionics would be waiting for the aircraft if GA were awarded the contract. Most structural components were built in house. There were a few structural components fabricated by suppliers where industry leading low-cost and high TRL/MRL technologies accelerated the program and reduced risk.

  While GA-ASI is a vertically integrated company, we had critical suppliers for our engine, unique tooling methodologies, woven composites, vacuum assisted resin transfer molding, and other items. The team focused on high TRL/MRL technologies and components from highly experienced, trusted, and industry leading vendors. This ensured cost targets and schedule objectives would be achieved.

  For our engine, we selected a highly reliable FAR33 engine used on commercial business jets to reduce risk. For complex tool geometries, we selected an industry leading tooling company that has proven itself over and over again on multiple aircraft programs. For light weight, complex tail structures, we selected a company that GA-ASI has used for over a decade that excels in this area.

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.)**

  First, the fundamental genus/species concept stems from the desire to leverage high volume production while retaining the ability to pivot rapidly to meet changing requirements. This, in itself, creates a unique form of VUCA, in which teams must contend with a highly defined element in the form of the genus—avionics, fuel system, landing gear, a majority of the fuselage structure, wing interface, tail interface—and a drastically ambiguous element in terms of the species elements that will be added to it. For all teams, from methods were needed to contend with the analysis challenges this union produces, the design questions that must be answered with limited certainty, and the additional complexity which accompanies a split definition of a complete aircraft.

Second, in addition to the genus/species concept, the attritable technologies aspect of LCAAPS pushed engineering and manufacturing to think in radical ways. AFRL coined the term "intelligent risk" to ensure both GA-ASI and AFRL were pushing the limit of attritable technologies. Attritable technologies meant significant effort was spent during the systems engineering and system requirement definition to eliminate the requirements that increase cost the most. These include manned factor of safety requirements as well as fatigue life requirements. Cost was as much of a design requirement as typical structural and functional design requirements.

Third, in order to save schedule and program cost, GA-ASI and AFRL agreed to forego traditional comprehensive risk reduction testing. Key steps that have been critical in past military aircraft development programs were foregone, and the associated risks were mitigated to extent possible, but were ultimately accepted in the interest of getting to a flying demonstrator faster.

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

The genus structure and fuel system layout was designed in 2020 to a certain set of requirements within the LCAAPS program. In mid-2021, the genus was structurally tested as well as low-cost fuel sealing techniques. In October 2021, AFRL selected and awarded GA-ASI to begin designing OBSS around the already designed and tooled genus structure. GA-ASI completed the OBSS critical design review (CDR) by September of 2021 with a small team of engineers.

As discussed previously, cost was as much of a design requirement as structural and functional requirements. Cost budgets were assigned to different areas of the vehicle in addition typical structural or functional requirements. This drove the team to use low cost manufacturing methods such as infused braided/woven composites and low-temperature VARTM wherever feasible. Additionally, 3-D printed structures were used when that manufacturing approach fulfilled the programmatic objectives and requirements.

Additionally, the aircraft did not have a typical structural ultimate factor of safety (FoS), instead, the structure was designed to a lower ultimate FoS. Additionally, the aircraft was structurally testing to a lower FoS, pushing the test program close to the design limit. Additionally, fatigue analysis was waived since attritable aircraft were meant to have a limited life vs. the typical 20-30 year life of modern military systems.

Key steps that have been critical in past military aircraft development programs were foregone, and the associated risks were mitigated to extent possible, but were ultimately accepted in the interest of getting to a flying demonstrator faster. While this increased uncertainty going into flight testing, this method worked very well and GA-ASI performed real-time data monitoring during flight testing, validating its analysis techniques.

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 primary AFRL objective of the LCAAPS / OBSS lineage of programs was cost for a relevant, war-fighting ACP. All decisions were focused on reduced requirements while optimizing the design and manufacturing to minimize aircraft recurring cost.

  The secondary objective was time to ramp for an aircraft starting with only a genus and minimal additional design work.

- **How did you perform against these metrics?**
  While the final cost per pound metrics cannot be released at this time, the AFRL and GA-ASI team has demonstrated that the OBSS program cost objective for a non-missionized aircraft is achievable.

  From a program schedule perspective, GA-ASI designed OBSS in 11 months. Additionally, starting with no parts manufactured in late September of 2022, GA-ASI had a completed aircraft on the flight line for ground testing in November of 2023 with a military flight release (MFR). Between ground testing discoveries and weather delays, the aircraft first flew on February 28, 2024—17 months after option (aircraft build and flight test) award. If the program funding profile were different, GA-ASI would have started manufacturing the aircraft in May of 2022 reducing the timespan from program start to first flight from 28 months to 22 months.

  OBSS program accelerated multiple low-cost manufacturing techniques while pushing the envelope on minimal system requirements. AFRL and GA-ASI have demonstrated a path to achieving previously unrealistic cost targets for unmanned aircraft systems.

- **How do your predictive metrics drive action toward program excellence? Please provide examples.**
  The predictive cost and schedule metrics prove that autonomous collaborative platforms will enable the US military to generate affordable combat mass for future warfighting success.

  The best example we can provide is this: Secretary of the Air Force (SECAF) Frank Kendall continually speaks about needing ACP's and Collaborative Combat Aircraft (CCA's) to support future warfighters needs generating affordable combat mass at $25M to $30M per aircraft in a fully missionized configuration. AFRL and GA-ASI validated through XQ-67A that SECAF's objectives are achievable.