2013 Program Excellence Initiative

Phase 2 Nomination
June 24, 2013

Northrop Grumman
Aerospace Systems

HALE Enterprise
RQ-4 Global Hawk UAS
Sustainment Program

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I. PROGRAM OVERVIEW

<table>
<thead>
<tr>
<th>Organization Name/Program Name</th>
<th>Northrop Grumman Aerospace Systems, HALE Enterprise, RQ-4 Global Hawk UAS Sustainment Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Leader Name/Position/Contact information – E-mail, Phone</td>
<td>Avis Anderson, HALE Fleet Manager <a href="mailto:avis.anderson@ngc.com">avis.anderson@ngc.com</a> 858-618-4350</td>
</tr>
<tr>
<td>Program Category</td>
<td>System Level Sustainment</td>
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Program Background: What is this program all about? (No more than one page). Describe:
- The overarching need for this program
- History of the program
- The product that is created by this program
- Scope of work – original & updated
- Expected deliverables
- Current status of the program

Initial Global Hawk sustainment was accelerated as a result of being pressed into service prematurely after the attacks of 9-11. At that time, Block 0 advanced concept demonstrator aircraft were deployed for the first time. The first Global Hawk was in theater providing real-world intelligence by Nov. 20, 2001. Five years later, Block 10 aircraft deployed in 2006 to replace the Block 0 aircraft with production pedigree models.

In 2010, the program began to field the larger, more capable RQ-4B aircraft to the current forward operating location (FOL) in the Middle East. However, at that time the program also stood up two new operating locations, one each in Italy and Guam. The two new operating locations were pressed into service by real-world events concurrently and months before operations were planned to commence.

In Guam at Andersen AFB, Global Hawk supported Operation Tomadachi (Japanese tsunami humanitarian assistance disaster relief mission) prior to the planned first operational mission and/or declaration of initial operational capability (IOC) by COMACC. Global Hawk was the first platform and most persistent source of imagery over the damaged nuclear reactor, providing vital situational awareness for the Japanese government, first responders, PACOM and the White House. During that time, Operation Unified Protector (Libya) also started with Global Hawks playing an instrumental role in the success of the mission.

II. VALUE CREATION = 20 POINTS

Value: What is the value, competitive positioning, advantage, and return created by this program to your:
- Customers – National interests, war fighter
- Company – Strength, bottom line, and shareholders
- Scientific/technical

Global Hawk provides the nation and America’s warfighters the first high-altitude, long-endurance (HALE) intelligence, surveillance and reconnaissance (ISR) unmanned aircraft system (UAS) capable of extraordinary operating ranges and endurance – more than 9,000 nautical miles and in excess of 30 hours. This unique capability proved decisive in a number of operational missions since 2010. Global Hawk was the first US reconnaissance platform over Japan’s damaged nuclear reactor following the tsunami. It not only provided pinpoint details of
value (particularly for R&D programs)

**Excellence and Uniqueness:**
What makes this program unique? Why should this program be awarded the Program Excellence Award?

the damage and corresponding risk, it also surveyed thousands of square miles of surrounding roads, cities and transportation infrastructure, assisting rescue forces to support a distressed population. Global Hawk’s endurance allowed it to provide a continuous presence over the disaster area.

During the same time, Global Hawk was the first HALE reconnaissance platform into contested Libyan airspace during the US and NATO military operations in that country. Its versatile sensor payload allowed it to provide nearly 100 percent of all coalition target photos for the air campaign. Global Hawk’s ability to provide day or night, all-weather images plus its moving target indicator capability combined to allow it to find, fix and track the country’s dictator leadership and other targets of interest.

On a daily basis, Global Hawk’s versatile payload contributes to the nation’s warfighters. While flying the equivalent number of operational hours as legacy manned HALE aircraft, Global Hawk provides three-quarters of all imagery to the nation’s joint team. With one-third fewer operational aircraft, Global Hawk’s endurance and operational reach allowed it to support all six theater commanders – the only operational and strategic air-breathing ISR platform to do so.

Global Hawk’s operating envelope allows it to contribute vital scientific research as well. It supports NASA and the National Oceanic and Atmospheric Administration’s exploration of weather and troposphere phenomenon. From high above the North Pole to the middle of the Pacific Ocean at the equator to over numerous tropical storms and hurricanes, Global Hawk provides vital research and decisive weather data critical for forecasters to predict and warn the American public of pending dangers.

Global Hawk provides a cornerstone for Northrop Grumman, showcasing the company’s ability to design, develop and manufacture all aspects of unmanned systems – from ground stations to control the aircraft and payload to the airframe with diverse payloads to exploiting and disseminating the data to meet a localized need or across a global network.

### III. ORGANIZATIONAL PROCESSES/BEST PRACTICES: (HOW DO YOU DO THINGS) = 30 POINTS

**Strategic:**
Opportunity Management - Describe how your program Synergy and affordability have become the cornerstones of supporting and maintaining the Global Hawk system throughout its lifecycle. With austere defense budgets, yet persistent...
has identified its operational and business opportunity, and manages this opportunity throughout the program’s life cycle.

worldwide threats, each driving element of the sustainment procurement and supply support chain processes have been evaluated and numerous affordability initiatives are underway to streamline sustainment efforts and provide affordable end products to the customers. Key equipment reliability and maintainability, repair turnaround time, training, and MRO initiatives are all being addressed. A streamlined pricing and contracting strategy for sustainment/support contracts was beta tested on a Global Hawk contractor logistics support (CLS) offer in 2012, and successful elements are being incorporated into current Global Hawk delivery orders and contracts.

In 2012, the prime contractor realigned their team to provide optimal synergy and efficiency across the entire fleet of HALE aircraft. This permits each USAF, USN, NATO, and other customers to reap the benefit of obtaining support from the most experienced personnel while ensuring maximum process efficiency. The result is up to a 30 percent labor reduction across the programs, while maintaining funded operational support capabilities and goals.

**Strategic:**

**Strategic Supply Chain Integration and Cost Effectiveness Management:**

- Describe how your program is integrating its supply chain to assure visibility and adapting long-term cost effectiveness up and down the supply chain.

To provide optimal cost-effectiveness and efficiency, the Global Hawk support strategy has been to optimize excellence by obtaining support from the best suppliers in their respective fields. Concepts from the USAF’s contractor supported weapon systems guide have been implemented and expanded upon.

- Northrop Grumman, the Global Hawk prime contractor, is the contractor inventory supply point for system peculiar support items and equipment. Assets are owned by the government, but purchased and allocated by the contractor.
- To obtain cost efficiencies, parts commonly used on multiple systems are purchased and managed by USAF depots or DLA.
- Base level maintenance is performed by USAF base level personnel at O-CONUS locations with contractor technical and maintenance assistance where needed.
- Depot level maintenance is performed primarily at the original equipment manufacturer sites, but initial efforts have begun to move appropriate workload to leverage skills and infrastructure available at government facilities.
- Major airframe repair is done at the Palmdale manufacturing facility where the aircraft were built.

**Strategic:**

**Operational Integration and Systems Engineering –**

- Describe the challenges faced by your program in terms of the path to accrediting the shelters and associated elements of the system are very challenging on an unmanned system. System engineering personnel from the company and government community worked tirelessly to first understand the
integrating the system into its operational environment and its impact on systems engineering planning and management.

Operational: Planning, Monitoring, and Controlling -
Describe your planning and resource allocation processes. How do you monitor and review your program’s progress and make corrections to keep the program on track? How have you worked with your customer to assure Quality and communication without creating non-value reviews and audits that do not “fit” your program effort?

As with any DOD program, planning begins with submitting justified requirements to the program office and operational users to develop their five-year planning POM inputs. For CLS operations and maintenance budgets, CLS brochures are developed by the program for submission into the overall budget process. Ultimately, a Defense Authorization Act authorizes expenditures by DOD, which is allocated to departments, then to commands, then to programs to negotiate contracts.

Operational: Supply Chain and Logistics Management -- What processes, tools and relationship-building methods have you used to develop, refine and improve supply chain and stakeholder integration? Please indicate also methods used to analyze/fact-find regarding supplier proposals. This is one of the most imperative needs of our industry – please provide specific details and data that assisted you in gauging the effectiveness.

Northrop Grumman maintains strong ties and relationships with all of the major suppliers of the airframe, sensors, equipment and ground stations. Strategy and program review sessions with key suppliers and end customers are held at least quarterly. Operational goals, challenges, quality requirements, risks and opportunities flow down through the supplier contracts to ensure buy-in and excellent performance at all levels. Asset visibility tracking tools have been paramount in enabling effective management of this concept. Global Hawk has one of the most integrated spares asset visibility processes for a CLS program today. Northrop Grumman supply asset management system is a third-generation government on-line data type system that permits interfaces with USAF CAMS (base level) and wholesale supply level systems as well as DAAS and FLSC. This provides consistent asset visibility and status throughout the supply and maintenance processes.

Operational: System Integration, Testing & Reviews -
Describe the activities and processes used to succeed in your system integration, and testing. How did you conduct system design and technical reviews? What innovations in processes or tools were used

Operational tests were expedited through innovative incorporation into the launch or flight sequence. Sensor checkout processes are routinely completed at the mission starting point during an aircraft launch vice in the hanger. This saves time by reducing the number of link checks with the mission control element which also saves associated costs. In addition, when an operational check flight is required post-maintenance, we combine with an operational mission. Once the aircraft is in the
to further evolve this capability?

**Operational:**
**Risk / Opportunity Management**
Describe the processes used to identify both risks and opportunity and to assure potential for both is addressed effectively. Please indicate any forward-leaning processes to support.

The program used the joint asset allocation board (JAAB) process to coordinate risks and opportunities for repairing fielded aircraft. The JAAB involved meeting with all the customer stakeholders as a means for initializing the limited assets on the program. This allowed for the government and contractor team to assess impacts, risks and opportunities surrounding the usage of the limited spare components on the program. The team identified the area of lowest programmatic impact as the source for components supporting the fielded aircraft.

**Team Leadership:**
**Team Culture and Motivation**
Describe how you created your team spirit and culture, and accomplished entire team integration and individual team member motivation. Given the economic environment and changes in the global marketplace, how did you assure your team changed swiftly and with agility?

There is no greater motivation than protecting our nation’s freedom. We believe that and it is reflected in our motivation and subsequent performance. When called to action, we never lose sight of what is on the line. Real-world events such as Operation Tomadachi, the Libyan conflict and Operation Enduring Freedom are simply opportunities to demonstrate the patriotism that resides within this team. When duty calls, this is where this group draws motivation.

**Team Leadership:**
**Lessons Learned and Knowledge Management**
Describe how you collect lessons learned and best practices, and how they are shared with your team and company to improve performance. Also how are you capturing expertise and knowledge to assure availability over the life of the program?

The program has dedicated knowledge management personnel. A database was used to input lessons learned as a means for knowledge management. This database is accessible to all parts of the company and can be leveraged by all programs. Items such as a site survey checklist and operational checklist reside within this database. We also held interviews with individuals just after concluding a base activation to capture all the lessons learned in this database. The key was gathering this data just after the event while fresh in the minds of those involved.

**Team Leadership:**
**Leadership Development**
How do you develop team’s skills and build future leaders?

The program has created a knowledge management database to capture lessons learned from fielded operations. This enables not only future Global Hawk leaders but other programs to build on existing knowledge. At the FOLs, leaders are built through an onsite mentoring process, after serving as the duty to the current lead. They assume command once his/her tour ends. Current and future leaders are also rotated around the enterprise to see the operations firsthand at various sites to see best practices in action and to provide their insight to those locations.

**Best (& Next) Practices:**
Identify your program’s specific Best Practices that you believe are unique, and could be shared with others.

The establishment of an operations support center (OSC) was a big key to Global Hawk success. The OSC is staffed 24/7 and serves as the hub for all Global Hawk operations worldwide. In fielding unmanned aircraft, it is paramount to have a location...
and become industry’s Next Practices.

pilots can call for real time information during a flight. The OSC can serve to link a pilot with the subject matter expert of the sub system he/she has questions regarding. The OSC is also utilized by maintainers around the globe supporting operations to the warfighter. Non-mission capable rates are reduced due to access to systems engineers 24/7.

IV. **Adapting to Complexity: (How do you deal with your program’s unique complexities)**

<table>
<thead>
<tr>
<th>Identify the Program’s <strong>Market Uncertainty</strong> level</th>
<th><strong>New to the World</strong> – HALE UAS Multi-Payload System</th>
</tr>
</thead>
<tbody>
<tr>
<td>– How new is your product to your market and users, based on the definitions below. Then describe how you deal and address this specific uncertainty:</td>
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<tr>
<td>- <strong>Derivative</strong> – an improvement of an existing product/system.</td>
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<td>- <strong>Platform</strong> – a new generation in an existing product line.</td>
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<tr>
<td>- <strong>New to the Market</strong> – a product or system adopted from another market</td>
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<td>- <strong>New to the World</strong> – breakthrough product, never seen before</td>
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<td>The Global Hawk brings a new capability not just to the defense ISR market, but also to a myriad of others as well. High-altitude, multi-INT reconnaissance by itself is not new, but the combination with long-endurance, missionized payloads, and end-to-end enterprise focus is. Endurance brings uncertainty to the end-to-end enterprise. Endurance drives performance, schedule and manpower requirements in the organizations that manage the payloads or the data derived from them. For example, Air Force Distributed Common Ground System (AF DCGS) must achieve three times the capacity to handle the Global Hawk’s increased on-station times. This type of pressure impacts demand. To deal with this uncertainty, the Global Hawk team has focused on the end-to-end enterprise. The team has worked to enhance the effectiveness of its entire data chain, from the tasking received from command and control elements directing its missions, to the payload data streaming down from the aircraft, to the processing and analytical elements that receive and add value to this data, to the eventual end-users of the Global Hawk’s mission. This has involved working across program boundaries and in concert with both government and industry partners. An example of this approach is the internal funding of image processing algorithms to improve imagery quality. After developing the improvements, the team provided them to relevant image processing programs of record.</td>
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<tr>
<th>Identify the Program’s <strong>Technological Uncertainty</strong> using the definitions below. Then describe how you deal and address this uncertainty:</th>
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<tr>
<td>- <strong>Low-tech</strong>: application of mature, well-established technology</td>
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<tr>
<td>- <strong>Medium Technology</strong>: existing technology modified to meet new design requirements</td>
</tr>
<tr>
<td>- <strong>High-Technology</strong>: recently developed new technology</td>
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<tr>
<td>- <strong>Super High</strong>:</td>
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</table>
| The Global Hawk is a system that employs HIGH and MEDIUM technology. This contributes to technological uncertainty in development, production, operations and sustainment. In addition to the flight control and contingency response automation algorithms, high and medium technology examples include new payloads such as the Advanced Signals Intelligence Payload (ASIP) and the Multi-Platform Radar Technology Insertion Program (MP-RTIP), new automated collection planning software, the data analysis and processing algorithms used in the end-to-end enterprise, and integration of numerous global data links to maintain safe and effective flight. These technologies are challenging to develop and integrate, but they also drive uncertainty in operations and sustainment. Operations often lead to discovering previously unseen challenges that impact reliability, spares procurement,
**Technology:** non-existing technology that needs to be developed during the program.

troubleshooting, and analysis. The Global Hawk team developed a process to address system uncertainty. The field support activity request is one example, which gives operators and maintainers at FOLs the expertise of onsite field support representatives as well as a reach-back 24-hour operational support center with on-call system engineers.

**System Complexity**

Identify the level of your System Complexity using the definitions below. Then explain how you are dealing with this level of complexity:

- **An Assembly** performing a single function.
- **A Sub-system** fitting within a larger system.
- **A System** – a collection of subsystems performing multiple functions.
- **An Array** – a “System of Systems”; a widely dispersed collection of systems serving a common mission.

The Global Hawk system is an ARRAY consisting of numerous elements dispersed globally that work together simultaneously. The aircraft itself launches and recovers at a FOL staffed with pilots and maintainers. The pilots take off using a local launch and recovery node connected to the aircraft by redundant line-of-sight and beyond-line-of-sight communication links. They hand off the mission to a CONUS main operating base. Pilots and sensor operators at the MOB use a mission control node to conduct the mission and control the payloads via beyond-line-of-sight wideband data links that employ both satellite and terrestrial communication systems. They execute the operational tasking received from theater command and control nodes, usually the air operations center for that theater. In the mission control node, operators receive payload sensor data, verify its quality, and disseminate it to intelligence analysts. These analysts are primarily in the AF DCGS, which itself is globally dispersed. They create products to provide to theater decision-makers.

**Identify the Pace and Urgency** of your team’s effort using the definitions below. Then describe how you deal with the program’s pace requirements:

- **Regular timing** – no specific time pressures.
- **Fast/Competitive** – time to market is important for competitiveness.
- **Time Critical** – there is an absolute and critical-to-success deadline.
- **Blitz** – there is a crisis element driving the need for immediate response.

The Global Hawk team has operated at a BLITZ pace and urgency over the last several years as the number and types of fielded aircraft has grown and the operational community has increased its reliance on the Global Hawk during and in response to events of national significance. In 2011, Global Hawk assisted in Operation TOMADACHI in Japan as well as in skies over Libya assisting in the effort against its dictator. This was well in advance of formal IOC declaration at either Guam or Sigonella. Numerous missions over Afghanistan saw the Global Hawk directly supporting ground combat operations. The Navy has used its BAMS-D over the Arabian Gulf as a key contributor to its fleet situational awareness. Operations in the Mediterranean, over Africa, in the Pacific, and in the Americas have extended theater commanders’ reach. Most recently, the Air Force began preparations to deploy the latest Global Hawk variant to respond to a CENTCOM urgent operational need. In response to the increasing pace of operations and the associate operational urgency, the Global Hawk team increased its dialogue with the operators flying missions, and began participating in user discussions aimed at identifying challenges to effectiveness and potential enhancements to the system.

**Other Complexities & Uncertainties**

Describe other complexities and unknown factors faced by this program:

With the proposed cancellation of the Block 30 program in the President’s FY13 budget came personnel challenges at the FOLs. Employees at the international locations were motivated to seek employment elsewhere to combat the uncertainty this proposed
program and how you addressed them.

budget caused. This drove both a staffing shortfall and a challenge to hire new employees as the program was dealing with the ramifications of this decision. To overcome this dynamic situation the program deployed personnel from the flight test program to the FOLs to ensure no missions were lost. The FOLs also shifted staffing schedules to maximize the coverage while maintaining the flexibility to meeting the moving flying schedule.

V. METRICS (HOW DO YOU MEASURE PROGRAM’S PERFORMANCE) = 30 POINTS

<table>
<thead>
<tr>
<th>Customer - How do you measure the impact of your program on your customer and your customer’s satisfaction? Include a description of your metrics, as well as numerical evidence.</th>
<th>Program impact on our customer is measured by various statistics, including mission capable rates, mission effectiveness rates, average time on-station, cost per flight hour, repair turnaround time, and spares fill rate. The fact that the Global Hawk, in many instances, is the only asset that can reach certain areas of interest around the globe is a measure of success to our customer. Customer satisfaction is measured through consistent informal interaction and regularly scheduled, deep-dive program reviews.</th>
</tr>
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<tbody>
<tr>
<td>Performance - How do you measure your program’s performance in traditional terms such as schedule, budget, requirements, and business results?</td>
<td>Program performance is measured by contractor performance assessment reports, contract award fees, integrated master plans and schedules, and earned value management system indicators. Performance is continually measured against the statement of work and performance work statement.</td>
</tr>
<tr>
<td>Preparing the Future - How do you measure and assess the long-term contribution of your program to the corporation/organization?</td>
<td>It is the policy of Northrop Grumman to use a formal process to establish the long- and near-term plans for the company to perform its mission and achieve its vision of the future. Each sector develops its own LRSP and AOP. The LRSPs and AOPs from the sectors are combined with the corporate office LRSP and AOP into a consolidated company LRSP/AOP. The consolidated LRSP/AOP addresses a five-year planning horizon of which the first year is time-phased monthly, and the remaining four years are time-phased annually. The purpose of the consolidated LRSP/AOP is to address complete business strategies for each line of business based on market, competitor, and internal capability assessments. As such, the consolidated LRSP/AOP encompasses technical, financial, capital assets, facility, human resource, and other resource planning efforts.</td>
</tr>
<tr>
<td>Team - How do you measure and assess the impact of your program on your team development and employee satisfaction?</td>
<td>Team development and employee satisfaction is measured by the results of regularly scheduled employee satisfaction surveys, low attrition rates, and yearend individual employee goal assessment evaluations.</td>
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<tr>
<td>Unique Metrics - Describe any unique metrics you are using to measure your program’s progress and how do you focus it for outstanding success.</td>
<td>N/A</td>
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</table>