Advanced Science & Technology Management Course
STM303
Vers. 5, 14 January 09

Homework Assignment 1 - Personal Technology Transition Issues

All assignments are to be completed in advance. See page 3 for the 2nd and page 4 for the 3rd assignment.

Assignment 1: Each attendee is to describe, **in no more than one page**, an issue which you are now facing, or have faced in the past which loomed as an impediment to your ability to transition your technology to an acquisition program, directly to a user, or even to a larger non-acquisition program which might be integrating multiple technologies for example. Any paper format is acceptable, as well as most e-formats are supported: Microsoft Word, WordPerfect, Adobe Acrobat, PowerPoint, HTML screens, etc.

Discuss your options and actions taken to overcome this impediment. Also indicate areas where more knowledge may have helped to overcome the impediment.

If you don't have personal experience in this area, please talk to a colleague and relate the colleague's experience. Do not discuss any classified or sensitive information. This is to be a management perspective of a transition issue.

Send in this assignment one week before class, as indicated below. Individual authors may be asked to give a presentation on the final day.

Due: Please email your issue paper so as to arrive no later than the Tuesday of the week prior to the start of class:

Class	Class Dates	Due COB of	Email assignment 1 to
09-001, Ft Belvoir, VA*	17-20 Mar 09*	9 March 09	Martin.Falk@dau.mil
* Class rescheduled from	10 February 09.		
09-002, Huntsville, AL	21-24 Apr 09	14 April 09	Woody.Spring@dau.mil
09-701, Natick, MA	12-15 May 09	4 May 09	John.Markevicz@dau.mil
09-703, Ft Detrick, MD	9-12 June 09	1 June 09	Woody.Spring@dau.mil

OPTIONAL Presentation Materials: If you have additional information in a briefing package, a **short** video (less than 5 minutes) or other media, which may help the class understand the issue, type of system, etc., please bring it along, or email it to us. This is NOT a formal requirement, but many organizations have an overview briefing or short video which demonstrates the concept or issue. The class is usually a diverse group with representatives from all services, DoD agencies, industry participants and other federal employees (Coast Guard, NASA, NOAA, FAA, NSA, GAO, Homeland Security, etc.).

Media formats:

- **a.** The classroom is equipped with a full range of computer equipment and electronic projection. Microsoft Office 2000, Adobe Acrobat, QuickTime, Media player and other formats are supported.
- **b.** In-class computers support CD-ROM and DVD and will receive email attachments less than 10 Mb. DAU computers NO LONGER support ANY USB memory sticks or external hard drives.

For additional information, please contact:

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Assignment 2
Summary of Selected Technology Project Management Tools

INSTRUCTIONS: The separate downloadable attachment, "STM303-Summary-Selected-Tools.pdf", needs to be reviewed by STM303 participants for the course's 3-part case study. Part 1 of the case study will begin right after the class introduction on Tuesday morning, so there is no time to prepare during class.

This is based on the material in the course prerequisites and management concepts covered in the Intermediate Science & Technology Management Course (STM201, and its updated curriculum in the replacement STM202).

You will have limited work time as a team, so it's important to read the case background and Phoenix Critical Development Document prior to class.

As a result of the review, if you desire more background to refresh yourself, please see the following documents. Those available on the STM303 pre-course website are indicated.

- DoDD 5000.1, The Defense Acquisition System, 12 May 03**
- DoDI 5000.02, Operation of the Defense Acquisition System, 3 Dec 08**
- Defense Acquisition Guidebook, 17 October 04. Compilation of DoD acquisition best practices.
- Introduction to Defense Acquisition Management, 7th Edition, September 05, DAU Press
- "Systems Engineering Fundamentals", 2nd edition (draft), 2006, DAU Press**
- "Joint Capabilities Integration and Development System", CJCSI 3170.01F, dated 1 May 07.
- "Operation of the Joint Capabilities Integration and Development System", CJSCM 3170.01C, 1 May 07.

** STM303 pre-course website, http://www.dau.mil/registrar/_pre-courses.asp.

All others are available from the DoD "AT&L Knowledge Support System", https://akss.dau.mil/default.aspx or the DAU Acquisition Community Connection, https://acc.dau.mil/CommunityBrowser.aspx?id=18479 .

Assignment 3 – Case Study Preparation

The Phoenix Unmanned Aerial System

INSTRUCTIONS: The following pages need to be reviewed by all STM303 participants in preparation for the in-class 3-part case study. The first part will begin right after the class introduction on Tuesday morning, so there is no time to prepare during class.

References and material is based on the course prerequisites and management concepts covered in the Intermediate Science & Technology Management Course (STM202).

You will have limited work time as a team, so it is important to fully read the background and the Phoenix Capability Development Document prior to class.

Case Background

I. BACKGROUND:

a. The time now is November FY0. The DoD is operating in a fiscally constrained environment. The newly elected President and his transition staff revised the former administration's Federal Budget Submission. On a wave of bipartisanship, the budget was overwhelmingly approved by Congress and signed last month, but the Air Force Phoenix Unmanned Aerial System (UAS) was not funded within the Joint UAS acquisition program (JUAS, or "Juice"), of which Phoenix was one element.

During budget hearings earlier in the year, Congressional staffers were not supportive of the program. Although acknowledging the need for a mid-altitude, long-endurance reconnaissance aircraft with high value target immediate strike capability, the Phoenix development and procurement cost just did not fit the Air Force budget.

b. INDEPENDENT ASSESSMENT: An independent assessment conducted in preparation for a Milestone B decision found the UAS would have to be much larger (and more expensive) than anticipated during the initial pre-Milestone A studies to meet the approved acquisition Capability Development Document (CDD) requirements.

1. Crew manning did not meet future Air Force manning allowances.
2. Streaming of raw sensor data from multiple sensors threatened to cause local clogging of the Global Information Grid (GIG).

3. The OSD Independent Cost Estimate came in above what was programmed in the budget.

4. The House Armed Services Committee noted that requirements for the aircraft were not well defined, while the Senate Armed Services Committee was not convinced that the technology needed to build the aircraft was sufficiently mature to justify beginning the program.

Unable to proceed to Milestone B, the Phoenix was officially canceled by the Air Force.

c. Although canceling the program, the Air Force put together a small team to explore alternate options for continuing development of the technology necessary to develop a medium size UAS at a future time when financial resources would be available. The team first contacted their Army and Navy counterparts, who both expressed interest in developing UAS technologies within a joint UAS technology demonstrator, provided that the demonstration achieved clear transition paths for at least some of the technologies to their own UAS programs. Initial contact with the Office of the Secretary of Defense resulted in a favorable response for supporting a joint UAS program with the Air Force as lead. The three services signed an MOA and agreed to provide personnel to stand up the Joint Unmanned Aerial System (JUAS or "juice") Technology Project Office. You have been assigned by your service as a member of this office. You and your fellow team members must put together your program plan which will be briefed to the Air Force Research Laboratory Chief Technology Officer.

Initial guidance is to produce a demonstration program that awards contracts in the second quarter of FY1 and completes a 3 month flight demonstration to be concluded within 36 months of contract award. The program must not exceed $150M (FY1 base year dollars) and the cost of the UAS and flight demonstration is $30M.

Based on earlier discussions, the services agreed to use the Phoenix CDD as the basis for requirements and to demonstrate technologies in six areas. These include:

1. Endurance – more efficient propulsion will be required to meet the endurance requirements while minimizing the size of the airframe for affordability.

2. Command and Control – reduced operational expense through fewer crewmen. Current UAS require a pilot and sensor operator throughout the flight requiring 6 people for each 24 hours of operations.

3. Sensors – better sensors are required to find camouflaged and low observable targets.

4. Weapons – a rapid reaction, lightweight, precision strike weapon capable of destroying hardened targets while minimizing collateral damage.

5. Airframe – improved materials allowing development of lighter, less costly structures.

6. Information Distribution – improved onboard processing to reduce bandwidth requirements for sensor data distribution.

d. COMMERCE BUSINESS DAILY: The program placed an announcement in the Commerce Business Daily (CBD) requesting that any company interested in participating with a candidate technology in any of the six areas, contact the program office. Based on initial responses from 72 companies, 48 were sent an official Request For Information (RFI) asking that each company provide the category the technology supported, projected benefit from the technology, current status, work to be accomplished during the demonstration, transition potential, estimated cost and schedule to accomplish the work, and a company point of contact.

II. *PRELIMINARY* INSTRUCTIONS FOR ADVANCE READING

BEFORE CLASS:

a. Read the attached Phoenix CDD to get an understanding of the previously required capabilities that the technologies will be supporting.

b. For this exercise, each student will be assigned, in class, to evaluate two technologies in one of the six areas listed above. Your assigned area and responsibilities will be identified at the beginning of the exercise.

DURING CLASS:

Once in-class, you will be assigned to a team, a technology area and your responsibilities.

Each team member will develop a timeline and total cost by fiscal year for their assigned technology. One member will be designated team leader to organize the team, manage the combined effort and lead the initial analysis presentation.

a. Using a structured approach of your choice, each student will score each technology against the requirements and constraints of the program.

b. Estimate the Technical Readiness Level (TRL), Manufacturing Readiness Level (MRL) and potential integration issues at the beginning and end of the demonstration effort. Identify risks with the technology and develop transition alternatives.

c. Each team member will provide their evaluation and recommendations to the rest of their team early in the work session.

d. Subsequently, based on the inputs of each team member, the team will put together a technology demonstration plan that will include:

- Identification of all technologies to be carried forward to demonstration
- Develop a technology transition roadmap (TRM) for each selected technology to include primary <u>and secondary transition strategies</u>
- A budget estimate. You may assume the cost of the work is spread evenly over the estimated time to complete each task.
- A contracting strategy
- A Systems Engineering approach (show phases and technical reviews you plan to hold)
- Demonstration schedule (show timeline for each technology leading through the flight demonstration and identify the critical path).
- Entry and Exit criteria thru the 6.2, 6.3 and 6.4 maturation process utilizing Technology Readiness Levels (TRLs), Manufacturing Readiness Levels (MRLs), and integration issues for the 6 selected technologies.
- Risk assessment and technology transition issues
- Identify any external coordination which should be required

Notes:
1. To make this a realistic exercise, all of the candidate technologies are real. However, only limited information is provided for each. You may assume the information provided is correct.

2. Use only the information provided in the advance material and during class ! Do NOT research the technology prior to or during class or bring additional data into the problem.

Appendix 1 to the STM303 Advanced Work Case Background (Requirement 3)

C A N C E L L E D

Capability Development Document
Phoenix Unmanned Air System

Developed for the US Department of Defense Acquisition University (DAU) Advanced Science & Technology Management Course, STM303. Although based on actual information, this is an academic exercise and contains no sensitive or classified information, but is part of the certification process in compliance with the Defense Acquisition Workforce Improvement Act of 1990.

UNCLASSIFIED

CAPABILITY DEVELOPMENT DOCUMENT (version 1.5)

FOR

Phoenix Unmanned Air System (Increment 1)

Validation Authority: JROC
Approval Authority: JROC
Milestone Decision Authority: USD(AT&L)
Designation: JROC Interest
Prepared for Milestone B
15 January FY00

C A N C E L L E D

Executive Summary. The United States Air Force requires an all-weather, medium class unmanned air vehicle capable of providing persistent reconnaissance over select target areas and rapid reaction strike capability. The United States currently lacks a UAS that can monitor a target area for multiple days from a medium altitude loiter to provide long term surveillance of high interest areas. Current UAS in this class also lack a multi-weapon carriage capability to immediately respond tactical situations and effectively deny the use of these areas to adversaries. Additionally, adversaries are increasing using civilian populations and structures such as mosques and hospitals to shield their operations from attack. The system must be capable of providing precision strike to effectively destroy targets while producing minimal collateral damage to surrounding structures and people in the area. The system must provide day/night, all-weather reconnaissance capability against both open targets and those concealed by camouflage or other denial and deception techniques. Sensor imagery must be provided across the global information grid.

Revision History. (*Not provided as part of this exercise)*

Table of Contents. (*Not provided as part of this exercise)*

Points of Contact. (*Not provided as part of this exercise)*

1. <u>Capability Discussion</u>. The joint functional areas affected for this system are precision strike. The basis for the need is established in the Tactical Future Unmanned Aerial Vehicle Initial Capabilities Document and is summarized below. The mission of the contemplated system is to provide commanders with persistent surveillance capability over selected areas of interest along with a rapid response strike capability. System elements must be self sufficient conducting their mission without external airborne refueling support. Phoenix will also provide targeting to other strike assets including precision coordinates for GPS-guided weapons and laser target designation. The system shall use a modular, open system design to accommodate additional capabilities in future increments. The Phoenix will be capable of accommodating an electronic warfare capability mission package with both broadband electronic surveillance of the RF spectrum and the capability to jam signals within the spectrum (increment 2). The U.S. Navy is interested in a shore-based variant capable of conducting anti-surface and anti-submarine warfare (increment 3).

2. <u>Analysis Summary</u>. Currently available UAS do not provide a medium size, medium altitude reconnaissance platform with multi-day target persistence. The Predator is a small UAS providing low to medium altitude surveillance with an endurance of 40 hours. The Predator B has a maximum weight of 10,000 lbs with a cost of $18M. The system can carry a limited number of weapons while multiple weapons decrease loiter time. The Global Hawk provides a large, high altitude surveillance platform with an endurance of 42 hours. The system does not carry weapons. The Global Hawk has a maximum gross weight of 32,000 lbs with a procurement cost of $125M per system. This leaves a gap in that a more capable reconnaissance platform with Global Hawk-like capabilities at medium altitude (25,000 – 35,000 ft MSL) that can carry and employ precision strike weapons and can be procured at an intermediate cost of $35M - $40M.

3. Concept of Operations Summary. The Phoenix is envisioned to provide proactive surveillance and reconnaissance with precision strike engagement over high interest areas for up to four days. The success of many of our current operations against terrorists requires the United States to be able to constantly monitor and conduct rapid reaction strike operations within large areas we wish to deny our adversaries from using. These include border areas, training camps, resupply points, ingress and egress routes. The Phoenix will operate within theater and will be capable of operating from non-prepared airfields such as roads. The system can be controlled worldwide via satellite link. Sensor data will be available in near real time and will be provided across the Global Information Grid to forces deployed within the local area. If adversary targets are found, the Phoenix will provide a rapid strike capability to engage and destroy a broad variety of target types. These include armored vehicles, buildings, convoys, individuals and groups of people. Strike operations shall provide precision engagement against targets in close proximity to civilians while minimizing collateral damage to both people and structures.

4. Threat Summary. The primary threats to the Phoenix are small arms, vehicle-mounted, unguided anti-aircraft fire, and man portable surface to air infrared guided missiles. This threat will be mitigated through the operational profile of the Phoenix by operating at altitudes above the range of the threat. Increment 1 requires no countermeasure systems. Increments 2 and 3 are envisioned to require countermeasure systems and will be defined in a CDD update at the time of increment initiation.

5. Program Summary. (*Not provided as part of this exercise)*

6. System Capabilities Required for the Current Increment.

a. General. The capability for unprecedented, proactive surveillance and reconnaissance coupled with persistent and responsive precision engagement shall be required. The system, as a minimum, shall consist of unmanned aerial vehicles capable of operations from unprepared airfields and command and control units capable of controlling the vehicle and displaying the information gathered by the sensors in near real time. Data dissemination shall be via the global information grid so as to provide the widest possible support to operating units in the area. The system shall carry multiple, precision strike weapons capable of rapid reaction strikes against time sensitive mobile or stationary targets. UAS shall be equipped with sensors allowing day/night all weather operations. Sensors shall be capable of operations above the threat envelope described above. Sensors shall allow system operators to discriminate between hostile or illegal activity (arms movement, drug smuggling, military training, etc.) and legitimate civil activities (commercial trade, civilian assembly, construction work, etc.). Sensors shall allow the operators to locate objects which have been hidden or otherwise concealed using denial and deception techniques such as camouflage covers.

b. Attributes

(1) Unmanned Aerial Vehicle (UAS).

(a) Range. The UAS shall be capable of operating from forward operating positions up 75 NM (threshold) 100 NM (objective) from the area to be monitored.

(b) Loiter. The UAS shall be capable of loitering over an area at 30,000 – 35,000 ft MSL for up to 48 hours. **[KPP]**

(c) Sensors. The UAS shall be capable of day/night all weather reconnaissance operations. **[KPP]** The system shall carry as a minimum a multi-spectral sensor, laser ranging and target designation set and Synthetic Aperture Radar (SAR). The multi-spectral sensor shall be capable of operating in the visible, near infrared and far infrared bands of the spectrum. The laser unit shall be capable of establishing an accurate slant range to the target within 0.5 inches. The laser designator shall be capable of transmitting all current pulse codes used by weapons laser guidance systems. The radar shall be capable of mapping terrain with a resolution of 5 feet. The radar shall be equipped with a Ground Moving Target Indicator (GMTI) mode capable of detecting moving targets on the ground operating at speeds from 4 to 100 kts. The SAR mode shall be capable of mapping targets with a resolution of 1 foot.

(d) Weapons. The UAS shall be capable of carrying up to 5000 lbs (threshold) 6000 lbs (objective) of weapons. The UAS shall be equipped to carry and launch not less than 10 weapons on a mission. The UAS shall be capable of carrying and launching the Hellfire missile, JDAM, MK82 and MK-83 conventional bombs equipped with laser guidance kits, and the small diameter bomb. **[KPP]**

(e) Sensor Data. The UAS shall be capable of delivering data from all sensors across the global information grid to all units in the operational area capable of receiving GIG data. The UAS shall be capable of delivering all sensor data and command/control data via SATCOM throughout the world. **[KPP]**

(f) Human system interface. The UAS shall use a qualified pilot as the operator of the UAS keeping the aircraft under positive control at all times. The UAS shall provide a color display provides a field of view of ± 60 degrees horizontally and -25 to +40 degrees vertically.

(g) Altitude. The Phoenix shall be survivable against small arms fire, vehicle-mounted anti-aircraft fire, and man portable anti-aircraft infrared missiles. Survivability shall be attained by flying above the maximum altitude of these threats. All other parameters shall be predicated on an operational altitude of 25,000 – 35,000 ft MSL. The maximum service ceiling of the aircraft shall be not less than 45,000 ft MSL (threshold) 50,000 ft MSL (objective).

(h) Operating Environment. The UAS shall be capable of operating from unprepared forward operating bases. The UAS shall be capable of operating from a standard, two lane hard-surface road. Take-off and landing shall be accomplished in not more than 2500 ft (threshold), 2000 ft (objective).

(i) Fuel. The UAS shall be capable of operating on JP-4, JP-10 military and Jet-A commercial fuels.

(j) Avionics. The UAS shall be equipped to operate within the FAA controlled airspace of the United States. The UAS shall be equipped with a multi-band UHF/VHF radio capable of communications on all military and civilian aviation frequencies. The UAS shall be equipped with an IFF transponder capable of modes 1, 2, 3, 4 and mode C operations.

(k) Reliability and Maintainability. The UAS shall have a mean time between failure (MTBF) of not less than 100 hours (threshold) 150 hours (objective). The UAS shall have a mean time to repair (MTTR) of not greater than 3 hours (threshold), 2 hours (objective).

(l) Deployment. The UAS shall be configurable for transport such that 2 vehicles can be carried in a C-130 aircraft.

(2) UAS Command/Control Units.

(a) Range. Command/Control units shall be capable of controlling the UAS from anywhere in the world via SATCOM. **[KPP]**

(b) Human Interface. Command/Control units shall have three positions for each unit: pilot and two sensor operators. Each station shall have a read out of all critical flight data to include as a minimum pressure altitude, radar altitude, airspeed, fuel, heading, attitude, rate of climb, G-force, landing gear position, flap position, engine temperature, engine fuel flow, engine oil pressure, and engine RPM.

(i) Pilot Station. The pilot station will be equipped with a minimum 18 inch by 18 inch color display with resolution of 720 dpi for the forward looking camera described in 1(e) above. The pilot shall also be equipped with a color moving map display with a minimum size of 12 inches by 12 inches. The aircraft shall be located in the center of the display with the map rotating relative to the aircraft heading. The console shall provide a text message at the bottom of the screen if any emergency or abnormal condition is present. The pilot station shall be equipped with the weapons selection, arming and release controls.

(ii) Sensor Operator Stations. Sensor operator stations shall have two multi-functional color displays of a minimum size of 18 inches by 18 inches and resolution of 720 dpi. Each display shall be capable of displaying outputs from any of the onboard sensors.

(c) Local Operation. Command/control consoles shall be deployable to operate within theater. The consoles shall mount within a standard HUMVEE shelter.

(d) Weight. The total weight of a command/control console shall not exceed 500 lbs (threshold) 400 lbs (objective).

(e) Reliability and Maintainability. The command/control console shall have a mean time between failure (MTBF) of not less than 500 hours (threshold) 750 hours (objective). The command/control console shall have a mean time to repair (MTTR) of not greater than 1 hour (threshold), 30 minutes (objective).

(f) Power. Command/control consoles shall be capable of operating on 12V DC and 120 VAC power.

(3) Mission Scenarios.

(a) Reconnaissance Operations. The Phoenix shall be capable of rapid deployment to any part of the world on short notice. Aircraft may be air transported or may fly to the deployment area. Aircraft will operate from rear areas in a low threat environment. Although airfields are preferred, the Phoenix shall be capable of operating from hard surface roadways. The system shall provide a persistent surveillance capability over areas of high interest such as border areas, supply convoy routes, suspected terrorist training sites, etc. The operating altitude of the Phoenix will make it very difficult for anyone on the ground to either see or hear the UAS. The sensor operators shall use the onboard sensors to locate ground targets or activities. Target information shall be provided to operating units over the global information grid. Near real time video from the sensors may also be streamed across the GIG.

(b) Strike Operations. Should a target be located, the Phoenix shall be capable of rapid reaction strike operations. The Phoenix shall be capable of carrying a mix of precision guided weapons. The system shall be capable of launching any weapon in any order. The Phoenix shall be capable of self laser designating a target, either to deliver its own weapons or to spot for another delivery system. The Phoenix shall be capable of providing precision target location to other units across the GIG.

(c) Summary Tables

Key Performance Parameter	***Development Threshold***	***Development Objective***
Loiter	48 hours	48 hours
Sensors	day/night all weather reconnaissance operations	day/night all weather reconnaissance operations
Weapons	Hellfire missile, JDAM, MK82 and MK-83 conventional bombs equipped with laser guidance kits, and the small diameter bomb	Hellfire missile, JDAM, MK82 and MK-83 conventional bombs equipped with laser guidance kits, and the small diameter bomb
Command/Control	Worldwide	Worldwide

Other Attributes	***Development Threshold***	***Development Objective***
Range (command/control to field units)	75 NM	100 NM
Total Carry Weight	5000 lbs	6000 lbs
Service ceiling	45,000 ft MSL	50,000 ft MSL
Camera FOV	±60 H, -25 to 40 V	±60 H, -25 to 40 V
Takeoff/Land Distance	2500 ft	2000 ft
Fuel	JP-4, 10, Jet A	JP-4, 10, Jet A
MTBF	100 hrs	150 hrs
MTTR	3 hours	2 hours
Console weight	500 lbs	400 lbs
Console MTBF	500 hours	750 hours
Console MTTR	1 hour	30 minutes
Interoperability	GIG compliant	GIG compliant

7. Family of System and System of System Synchronization. N/A

8. National Security System and Information Technology System (NSS and ITS) Supportability. (*Not provided as part of this exercise)*

9. Intelligence Supportability. (*Not provided as part of this exercise)*

10. Electromagnetic Environmental Effects (E3) and Spectrum Supportability. (*Not provided as part of this exercise)*

11. Assets Required to Achieve Initial Operational Capability. (*Not provided as part of this exercise)*

12. <u>Schedule and IOC/Full Operational Capability (FOC) Definitions</u>. (*Not provided as part of this exercise)*

13. <u>Other Doctrine, Organization, Training, Materiel, Leadership and education, Personnel, and Facilities (DOTMLPF) Considerations</u>. This concept will require the synergistic development of doctrine, training methods, organizational designs, unit structure and groupings of individual and unit skills. Reconnaissance and strike simulations will be required to test and refine the doctrine developed to fully exploit this capability.

14. <u>Other System Attributes</u>.

a. Infrastructure Support. Command/control console units shall be capable of installation in operational command centers and mobile command/control vehicles.

b. Manpower and Personnel. A primary goal of the Department of Defense is to reduce the number of personnel involved in logistic supportability of systems. Maintenance of the Phoenix shall require no skills not already in existence within Air Force personnel structures.

c. Training. A complete training support package, including appropriate training methods, devices and simulators shall be available concurrent with system fielding for both institutional training and units in the field.

d. Environmental. All parts of the system shall comply with all U.S. environmental regulations and with all international environmental protocols and treaties to which the U.S. is a signatory.

e. Command, Control Communications and Intelligence (C3I).

(1) Compatibility and interoperability with existing and planned C3I systems are the key to the success. The Phoenix system shall fully comply with the Global Information Grid (GIG) Capstone Requirements Document (CRD).

(2) The system shall utilize a distributed network control-communication architecture which allows for flexible integration and operation of multiple remote sensor systems and control stations and provides flexibility in future integration with evolving military digital radio networks. Interoperability with the evolving implementation of Sense and Respond Logistic Support systems which include vehicle health monitoring and prognostic failure prediction is desired.

f. Storage. Phoenix UAS shall be designed for open air storage without requirements for hangars. Command/control units shall be designed for installation and operations in HUMVEE shelters. Units shall be designed to survive the environment of off road operations.

g. Transportation. The Phoenix shall be capable of transportation to the area in C-130 aircraft.

h. Supportability. The Phoenix shall be designed for a minimum service life of 20 years.

i. Maintenance and Operations. The Phoenix shall have two categories of maintenance: organization level and depot level repair. Organizational repair shall consist of simple replacement of components such as avionics boxes, displays, etc. while all other repairs are depot level repairs.

j. Diagnostic/Prognostic System Status. Each element of the Phoenix shall have a built-in test (BIT) that provides system status (threshold). Automatic status reporting, prognostic system health and participation in Sense and Respond logistics support is desired (objective).

k. Readiness/Operational Availability Measures. Fully mission capable (FMC) and mission capable (MC) rates will be the measures employed to assess system readiness/operational availability. FMC is the percentage of time during which the system is capable of performing all assigned missions defined as voice/data communications between all participating units with each individual piece of equipment having the threshold capabilities of this document; MC is the percentage of time during which the system is capable of performing the mission but with one or more assigned units not able to communicate or one or more command/control units missing one or more functions because of equipment malfunctions. The Phoenix shall have an FMC of 0.82 (threshold) 0.88 (objective). The Phoenix shall have an MC of 0.94 (threshold) 0.98 (objective).

l. Field Support Requirements. The Phoenix shall be capable of damage repair in the field with no special tools required for organizational repairs.

15. Program Affordability. (*Not provided as part of this exercise)*

Mandatory Appendices. (*Not provided as part of this exercise)*

Appendix A. CRD/CDD/CPD Crosswalk (*Not provided as part of this exercise)*

Appendix B . Integrated Architecture Products (*Not provided as part of this exercise)*

Appendix C. References (*Not provided as part of this exercise)*

Appendix D. Acronyms (*Not provided as part of this exercise)*

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