Proposer Information Package (PIP)

Autonomous Real-time Ground Ubiquitous Surveillance-Imaging System

ARGUS-IS

BAA 07-23

February 20, 2007

A TABLE OF CONTENTS

A TABLE OF CONTENTS 2

B PIP ROADMAP 5

B.1 PROBLEM STATEMENT (SECTION C) 5

B.2 PROGRAM STRUCTURE (SECTION D) 5

B.3 TECHNICAL OBJECTIVES (SECTION E) 5

B.4 PROPOSAL MANAGEMENT (SECTION F) 5

B.5 PROPOSAL EVALUATION (SECTION G) 6

C PROBLEM STATEMENT 7

C.1 WIDE AREA PERSISTENT SURVEILLANCE 7

C.2 EMERGING TECHNOLOGY FOR WIDE AREA PERSISTENT SURVEILLANCE 10

D PROGRAM STRUCTURE 13

D.1 SYSTEM CONCEPT 13

D.1.1 ARGUS-IS Gigapixel Sensor 13

D.1.2 ARGUS-IS Airborne Processing 15

D.1.3 ARGUS-IS Ground Processing 16

D.2 MANAGEMENT CONCEPT 16

D.2.1 Program Elements 17

D.2.2 Program Phases 18

D.2.3 Technology Transition 18

D.3 PROGRAM METRICS 19

E TECHNICAL OBJECTIVES 20

E.1 ARGUS-IS GIGAPIXEL SENSOR 20

E.1.1 Scope 20

E.1.2 Technical Challenges 20

E.1.3 Gigapixel Sensor Metrics and Evaluation Method 21

E.2 ARGUS-IS AIRBORNE PROCESSING AND SYSTEM INTEGRATION 22

E.2.1 Airborne Processing Subsystem 22

E.2.2 System Design and Integration 24

E.3 GROUND PROCESSING 25

E.3.1 Scope 25

E.3.2 Technical Challenges 25

E.3.3 Metrics and Evaluation Method 26

F PROPOSAL MANAGEMENT 27

F.1 GENERAL INFORMATION 27

F.1.1 Definition of BAA 27

F.1.2 BAA Correspondence *27*
F.1.3 Frequently Asked Questions *27*
F.1.4 Industry Day *27*
F.1.5 Multiple Proposals *27*
F.1.6 Proposer Registration *27*
F.1.7 Contract Types *28*
F.2 SUMMARY OF IMPORTANT DATES 28
F.3 PERIOD OF SOLICITATION 28
F.4 SUBMISSION GUIDELINES 29
F.5 TFIMS REPORTING REQUIREMENTS 29
F.6 SECURITY 29
F.7 HUMAN USE 30
G PROPOSAL EVALUATION 32
G.1 GENERAL CONSIDERATIONS 32
G.2 CRITERIA FOR AWARDS 32
G.2.1 Technical Innovation and Depth *33*
G.2.2 Relevance to ARGUS-IS Mission Objectives and Consistency with ARGUS-IS Program Concepts *33*
G.2.3 Cost Realism and Reasonableness *34*
G.2.4 Realism of Proposed Schedule *35*
G.2.5 Personnel and Corporate Capabilities and Experience *35*
H PROPOSAL CONTENT 36
H.1 GENERAL INFORMATION 36
H.2 TECHNICAL PROPOSAL 36
H.2.1 Cover Page *38*
H.2.2 Section A: Table of Contents *38*
H.2.3 Section B: Proposal Roadmap *38*
H.2.4 Section C: Problem Statement *39*
H.2.5 Section D: Program Concept *39*
H.2.6 Section E: Technical Approach *39*
H.2.7 Section F: Program Management Approach *40*
H.2.8 Section G: Evaluation Factors *44*
H.3 COST PROPOSAL 45
H.3.1 Cover Page *45*
H.3.2 Detailed Cost Breakdown *46*
H.3.3 Supporting Cost and Pricing Information *47*
I PROCUREMENT INTEGRITY, STANDARDS OF CONDUCT, ETHICAL CONSIDERATIONS, AND ORGANIZATIONAL CONFLICTS OF INTEREST (OCIS) 48

J AWARD ADMINISTRATION INFORMATION 48
K EXPORT LICENSES..... 49
L (ACRONYMS) 50

B PIP ROADMAP

B.1 PROBLEM STATEMENT (SECTION C)

- Providing persistent wide area surveillance to support to tactical users with limited assets
- Current Unmanned Aerial Systems (UAS) lack a robust and responsive wide area persistent surveillance capability
- Volatile Battlespace and constantly changing environment
- Fielding large numbers of UAVs complicates bandwidth and airspace deconfliction requirements
- Optimize efficiency and reduce OPTEMPO of currently deployed UAV platforms, operators and support
- Military users have an increased demand for full motion video

B.2 PROGRAM STRUCTURE (SECTION D)

Three program elements:

1. Gigapixel Sensor
2. Airborne Processing and System Integration
3. Ground Processing

B.3 TECHNICAL OBJECTIVES (SECTION E)

- Develop a Gigapixel Sensor capability for Unmanned Aerial Vehicles (UAVs) that simultaneously produces video imagery over a wide field of view.
- Develop an Airborne Processing subsystem to manage data produced by the gigapixel sensor. Integrate airborne subsystems together and the airborne and ground subsystems together.
- Develop a Ground Processing subsystem to receive and display imagery and information products
- Design and integrate a system that can be fully integrated into an Extended Range/Multi Purpose (ER/MP) UAV, or an Aerostat, or an A-160 (Hummingbird) class UAV.

B.4 PROPOSAL MANAGEMENT (SECTION F)

- Industry Day held Thursday, 8 February 2007
- Proposals due to DARPA 1300 EST, Monday, 9 April 2007

B.5 PROPOSAL EVALUATION (SECTION G)

ARGUS–IS Evaluation Criteria:

- First: Technical Innovation and Depth
- Second: Relevance to ARGUS-IS Mission Objectives and Consistency with ARGUS-IS Program Concepts
- Third: Cost Realism and Reasonableness
- Fourth: Realism of Proposed Schedule
- Fifth: Personnel and Corporate Capabilities and Experience

C PROBLEM STATEMENT

Long-duration, complex operations involving the U.S. military, other government agencies and international partners will be waged simultaneously in multiple countries around the world…Above all, they will require persistent surveillance and vastly better intelligence to locate enemy capabilities and personnel.
(Quadrennial Defense Report)
6 January 2006

... the enemy in the long war is very easy to kill but I can't find him."

Gen. John Abizaid
Commander, United States Central Command

C.1 WIDE AREA PERSISTENT SURVEILLANCE

Finding, tracking and monitoring events and activities of interest on a continuous basis remains one of our highest Intelligence Surveillance and Reconnaissance (ISR) requirements. Unmanned Aerial Systems (UAS) including the Predator Unmanned Air Vehicle (UAV) serve as one of the warfighter's primary and most responsive means for surveillance and gathering intelligence information and are becoming vital assets in military operations. This is demonstrated by their significant use in Afghanistan during Operation Enduring Freedom (OEF) and in Iraq as part of Operation Iraqi Freedom (OIF). Lessons learned from these operations indicate that UAVs provide critical capabilities for enhancing situational awareness, intelligence gathering and force protection for our military forces. Current UAS high resolution electro-optics (EO) offer a small high resolution field of view (FOV). This narrow FOV is a limiting factor on the utility of the EO system. The UAS that are available offer persistence; however, the effectiveness of the EO system is limited by the sensors and available processing.

As a result of their versatile utility and effectiveness, UAS are permanent fixtures in our armed services and will continue to serve important roles in the battlefields of the future. It is anticipated that the operations tempo (OPTEMPO) of UAS will increase as part of efforts to ensure tactical warfighters receive sufficient and relevant detailed information to conduct military operations. Tactical Commanders are becoming increasingly dependent on UAS to conduct day-to-day operations, allowing it to become a workhorse to conduct ISR missions as well as "combat killer".

There is currently a high demand and short supply for Predator type UAS. To satisfy requirements, the DoD plans to increase the acquisition and procurement for Predator type UAS to meet the current and future persistent surveillance needs. The intent is to nearly double the capacity we have today. The addition of a high-resolution wide area EO sensor capability can dramatically increase the utility achievable from the system.

Today UAS experiences the following:

- **Volatile battlespace - narrow beams "soda straw":** The Commanders typically have a large Area of Responsibility (AOR) that is constantly changing. Competing requirements and operational constraints limit the Tactical Commander's ability to effectively and efficiently monitor activities of interest within the AOR. The current system has a very narrow beam that limits the amount of information collected in a pass. For greater situational awareness users must switch between narrow and wide field of view at the cost of time, potential loss of image resolution, and critical information. The high resolution beam can enable observing dismounts entering and leaving a building of interest; however, if a dismount leaves the building, the UAS surveillance team is forced to decide if they wish to follow him or continue watching the building. If multiple dismounts leave the building, the choice becomes more difficult. This set of undesirable trade-offs is a fundamental result of the sensors not being able to simultaneously observe a wide are at high resolution.
- **Increased OPTEMPO:** The demand for Predator, Global Hawk, Hunter, and other UAS continues to increase. Predators are currently flying more than 6,000 flight hours per month. UAS are extraordinarily valuable assets that demand a lot of time and energy to operate. This has resulted in unexpected maintenance and support costs.
- **High Resolution:** Predator generally flies at altitudes of 15 – 25k feet. For detailed high-resolution video it often flies at 10k feet which increase the chances of being engaged by anti-aircraft attacks.
- **Increased demand for UAV video and imagery products:** Commander's are becoming increasingly dependent on current and reliable data for the conduct of day-to-day operations. This includes monitoring, tracking, and targeting information. The services have a high demand for Predator full-motion video. In CENTCOM the services request more than 300 hours of video a day. However, only 110 hours of those requests are filled creating a significant shortfall.

The objective of the ARGUS-IS program is to develop a system that provides a real-time, high-resolution, wide area video persistent surveillance capability and transition this capability to the military. This capability will provide joint forces a means to keep critical areas of interest under constant surveillance with a high degree of target location accuracy. ARGUS will provide a minimum of 50 "Predator- like" steerable beams, which will enable real-time tracking and monitoring. ARGUS-IS will provide an efficient and effective means to augment the ISR missions performed by Predator and other UAV platforms. This capability offers the potential of being able to provide ground units with a "Predator-like" beam under their control to provide real-time situational awareness. It can help to eliminate undesirable choices that surveillance teams currently must make when observing activity at a given location. Figure 1 provides a conceptual view of the ARGUS-IS.

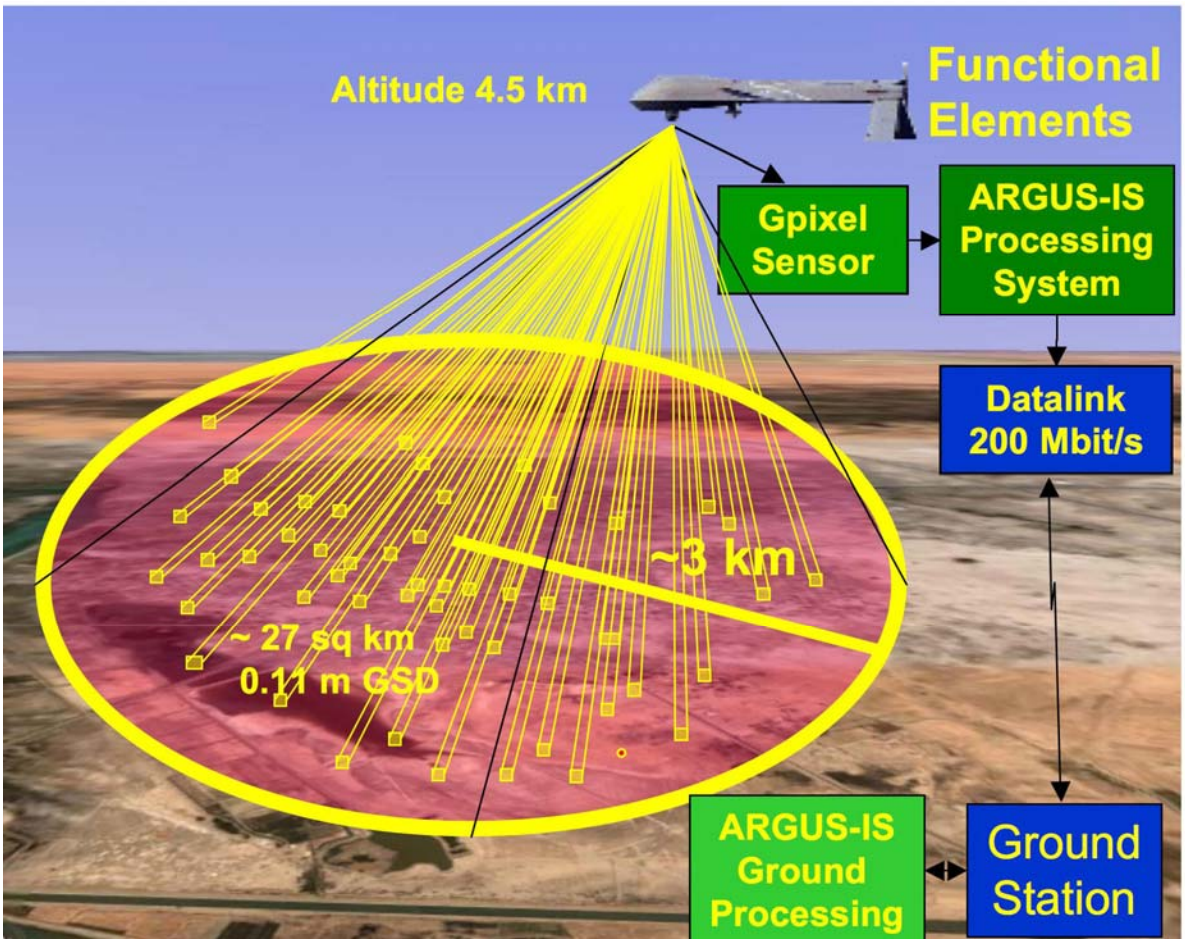

Figure 1

Figure 1 illustrates the major elements of the ARGUS-IS program. ARGUS-IS will increase the service area by more than three orders of magnitude while maintaining high resolution and high image quality.

C.2 EMERGING TECHNOLOGY FOR WIDE AREA PERSISTENT SURVEILLANCE

There are a significant number of technology advances that have been made over the last several years that are enabling the development and deployment of wide area persistent surveillance systems.

- **Data Acquisition – Converting Photons to Bits:** the development of high density focal plane arrays (FPA) has been aggressively pursued by the commercial semiconductor industry as well as by DARPA. This has resulted in a variety of high density FPAs with aggressive pixel spacing. Advances in CMOS sensors have resulted in commercial devices being developed with pixel sizes (spacing) as small as 2.2 x 2.2 microns and 1.75 x 1.75 microns. The CMOS sensors have integrated micro lens arrays on top of the focal plane array to increase the "fill factor," i.e., increase the percentage of photons that strike the active area of the pixel. The quantum efficiency of CMOS sensors is also very high. If a 90 mm diameter area were fully populated with pixels of sizes 2.2 x 2.2 microns or 1.75 x 1.75 microns, the corresponding total number of pixels would be 1,314,406,017 or 2,077,297,999 respectively.
- **Composite Focal Plane Array (CFPA):** for the purpose of this discussion a composite focal plane array is a focal plane array that is composed of a number of discrete focal plane arrays. The individual focal planes could be any given type of focal plane, e.g., CMOS sensors or Charge Coupled Device (CCD) sensors. A composite focal plane array is formed when placing multiple focal plane arrays under a single set of optics or lenses. Composite focal plane arrays may be used to form a mosaic image that may or may not have seams, i.e., areas within the mosaic image where there are no pixels. A CFPA might look something like figure 2. The signals from the FPAs that make up the CFPA are routed to the exterior of the CFPA. The signals are buffered as required and sent to electronics that then consolidate the signals. MIT Lincoln Laboratories has successfully prototyped this type of CFPA.
- **Data Distribution:** the total amount of data produced by an electro-optical (EO) sensor with $2x10^9$ pixels running at frame rates of 10 Hz with 12 bits per pixel is greater than $240x10^9$ bits/sec. Moving this data from a sensor to a sensor processing system is enabled by photonics and fiber optics. The development of Vertical Cavity Semiconductor Emitting Lasers (VCSELs) by DARPA has enabled the fiber optic transceivers operating at multiple Gbits/second over extended temperature ranges. Fiber optics can readily be utilized to distribute sensor data throughout a sensor processing system.

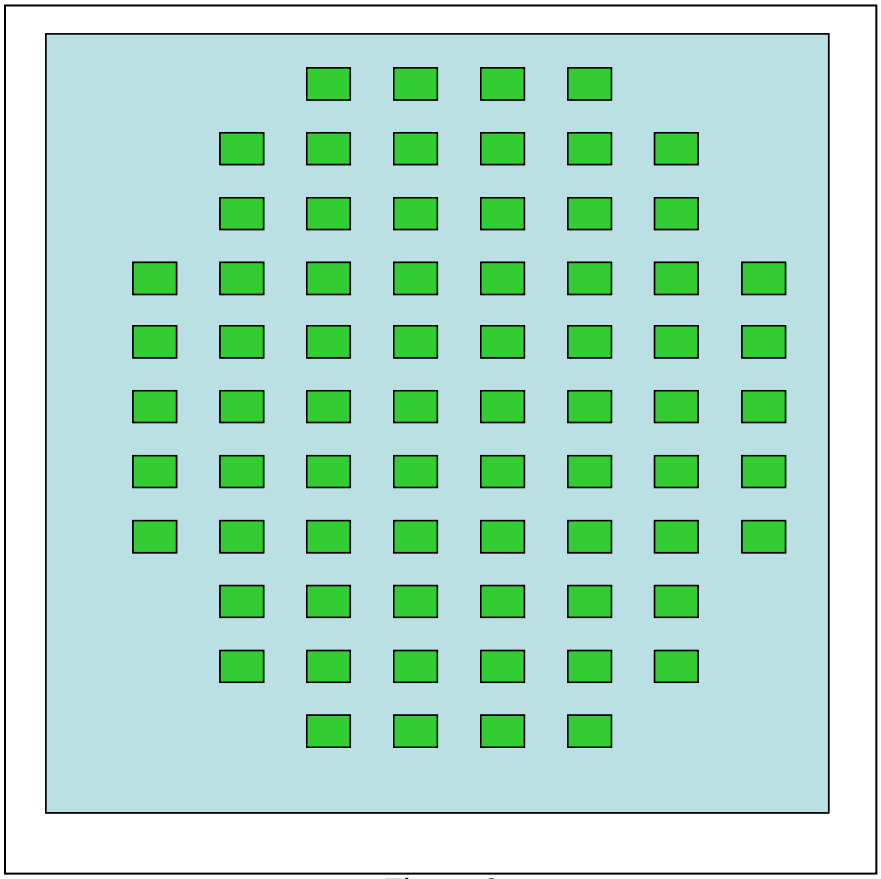

Figure 2

Figure 2 is an example floor plan for a CFPA. Each green rectangle represents the active area of an individual focal plane array. Four of these CFPAs form a mosaic that populates the full area. Each CFPA has an identical set of optics. In this example each CFPA has 72 FPAs. The mosaic would utilize 288 FPAs.

- **High Performance Computing:** the demand for high performance in many areas has resulted in the creation and development of a wide variety of methods for satisfying this demand. These include processors such as the Cell Processor, programmable solutions including field programmable gate arrays (FPGA) and field programmable operational arrays (FPOAs), as well as other high performance alternatives. The fundamental elements to derive and build high performance systems have been continuing to evolve at a rapid pace.
- **Long Duration Platforms:** a wide variety of UAV (unmanned aerial vehicle) platforms that are capable of being on station for long periods of time are a key enabler for wide area persistent surveillance. Examples of such platforms include the DARPA developed Hummingbird (A-160), the Warrior - Extended Range / Multi-Purpose (ER/MP) UAV, aerostats, etc. Given different mission scenarios, various types of UAV platforms provide different advantages. For

example, platforms that are capable of pseudo-stationary station keeping dramatically reduce/eliminate the need for parallax related processing that may be otherwise necessary in applications such as vehicle or dismount tracking.

- **Image Processing:** tremendous progress has been made in a wide variety of image processing applications. These include vehicle tracking, dismount tracking, segmentation (separation of image foreground from the image background), parallax processing, background modeling, super resolution as well as many other key-enabling image processing applications.

It is DARPA's goal to leverage these as well as other technologies into a single system concept referred to as ARGUS-IS. Such a system would unite the capabilities enabled by the development of a wide area high resolution video sensor with the processing necessary to provide information to the user. If successful, the resulting capabilities (system/technology) will be transitioned to the military.

D PROGRAM STRUCTURE

D.1 SYSTEM CONCEPT

Figure 3 shows the major system elements. DARPA is interested in developing a gigapixel sensor subsystem, airborne processing subsystem and ground processing subsystem. The airborne elements will be demonstrated utilizing a flight-worthy pod on a UAV surrogate. The packaging of the airborne subsystems should be compatible with a variety of UAS including Extended Range/Multiple Purpose (ER/MP), Aerostat, A-160 (Hummingbird). This section describes each of these functional program segments.

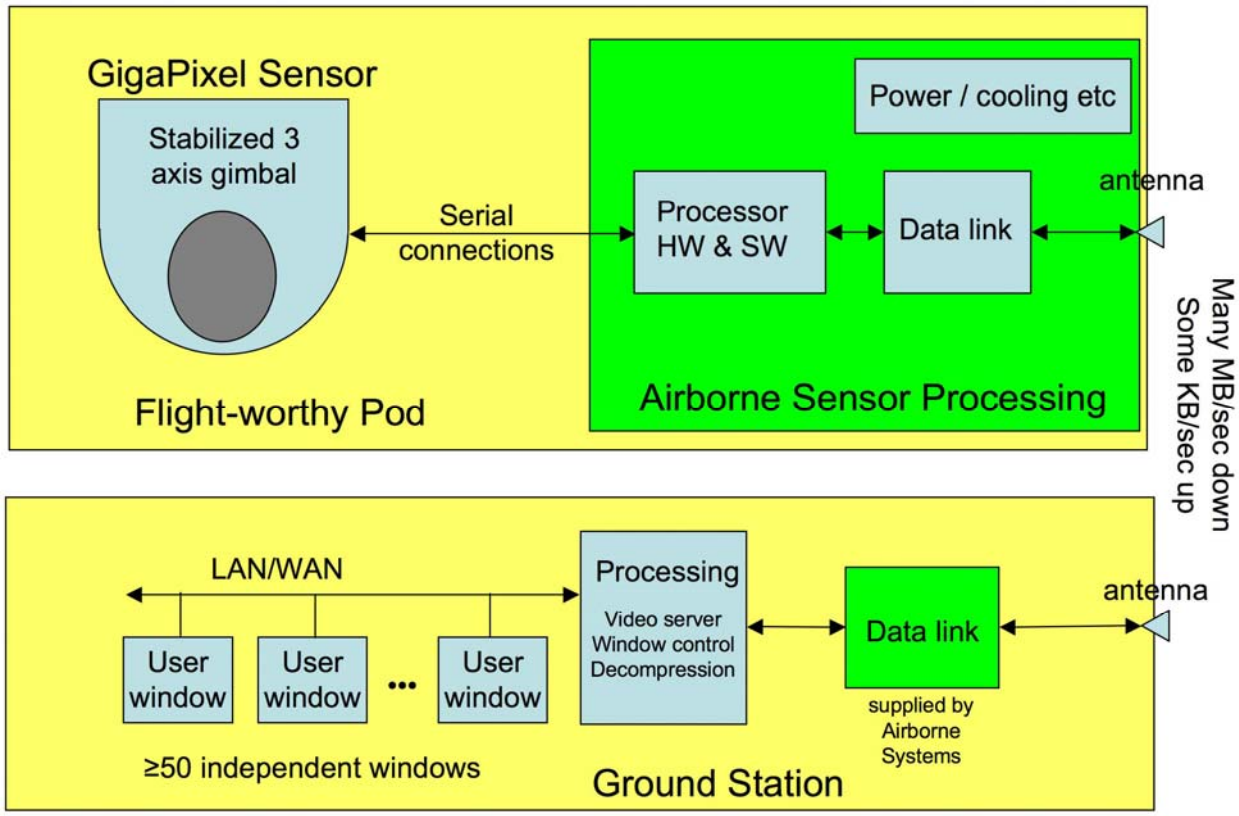

Figure 3 - ARGUS-IS functional elements include both air and ground processing systems.

D.1.1 ARGUS-IS Gigapixel Sensor

The Gigapixel Sensor is a complete subsystem containing the focal plane arrays, optics, gimbal, mechanical stabilization and a means of controlling where the sensor is pointed. Current state of the art design approaches for this class of sensor use multiple arrays of focal plane array sensors to achieve complete coverage of the field of view. Alternative sensor construction approaches are also possible. Figure 4 shows a possible construction using four CFPAs and the resulting mosaic. Each the CFPA provides imagery from approximately 25% of the FOV. DARPA is interested in design

approaches that can achieve > 1.4 gigapixels. Alternative approaches to the construction of the Gigapixel Sensor are also of interest.

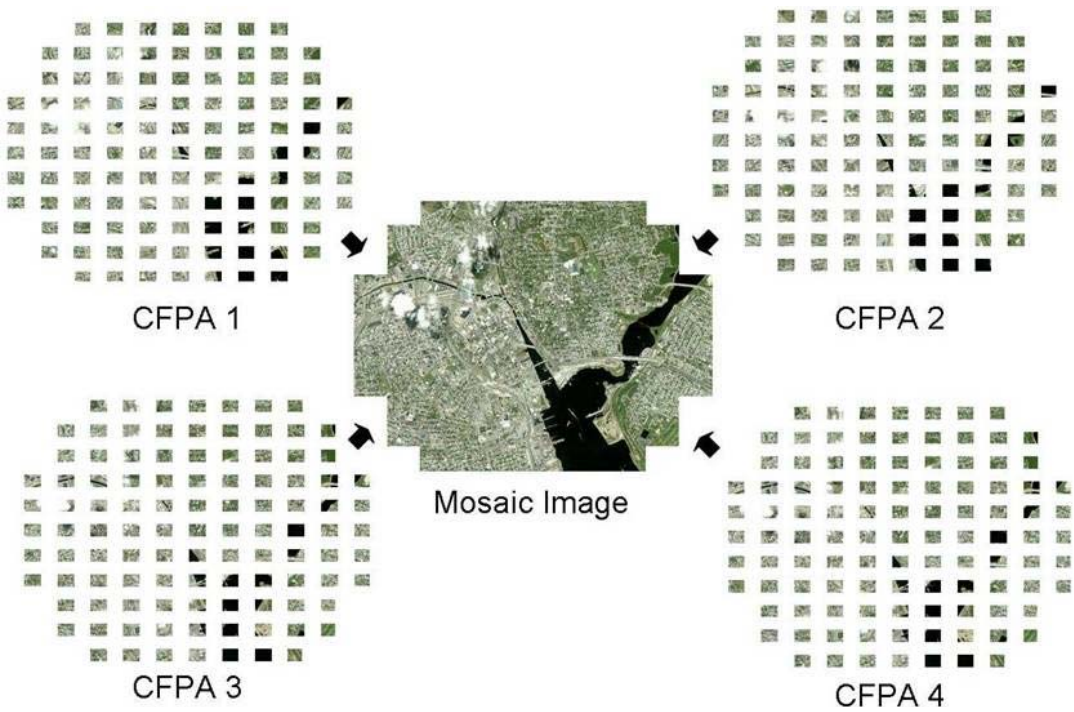

Figure 4 - Four Composite Focal Plane Arrays are used to form a mosaic of the area under surveillance.

The Gigapixel Sensor system should meet or exceed the parameters shown in Table 1.

Parameter	Value	Comment
Number of pixels	>1.4 x 10^9	> 2 x 10^9 desired
Field of view	≥ 45°	Cover the largest possible area
IFOV	≤ 25 µrad at the center of FOV	Physical pixel subtense
Dynamic range	≥12 bits	
Sensitivity	<10 lux	
Frame rate	≥ 10 Hz	This is the minimal frame rate for the "Predator like" video streams at the full sensor resolution.
Pixel integration time	< 10msec	Pixel integration should be an adjustable parameter. Nominal "daytime" lighting conditions should require less integration time. If multiple FPAs are utilized, the integration time for each FPA should be able to be set independently from a sensor perspective.

Output interface	serial	Multiple channels expected
Motion blur	≤10% of pixel area at the stabilization point within the field of view	This is the measure of movement of the pixel at the stabilization point within the field of view over the pixel integration time, i.e., the blur induced by aircraft motion that is not compensated for by the gimbal. The stabilization point within the field of view should be selectable on the ground.
Gimbal degrees of freedom	3 - yaw, pitch, roll	Maintain constant image orientation

Table 1 - Gigapixel Sensor system characteristics

Achieving these parameters will involve system design trades of focal length, f/n, detector size, readout configurations, as well as many other parameters. Concepts that use heterogeneous detector layouts will also be considered.

D.1.2 ARGUS-IS Airborne Processing

Airborne sensor processing provides for most of the ARGUS-IS functionality. It is expected that, due to the very high sensor pixel rate and fundamental limitations in the data link, the majority of system processing will be accomplished in the flight-worthy pod.

The airborne sensor processing needs to have two basic modes: Video Windowing and Moving Target Indication (MTI). These modes may be performed exclusively, but simultaneous operation is desired.

In the Video Windowing mode, the processing performs the following functions:

- Correct for sensor non-uniformity in gain and/or bias
- Convert the sensor data into a set of at least 50 independent and potentially overlapping video streams. Video streams may be at different resolutions. This includes any required alignment and/or merging into a single composite image the contributions of each composite FPA
- Perform electronic stabilization for each video stream
- Provide for unlimited pan and zoom within the field of view based on commands from the ground segment processing
- Maintain video stream position on operator-selected ground locations
- Track at least one operator-selected object within each video stream. Multiple target tracking is desired. When an operator-selected object is tracked, the intent is to keep the object within the window, i.e., the location of the window would be automatically adjusted keeping the object within the field of view of the window.
- Format and compress video for transmission over the data link
- Record entire field of view imagery for subsequent forensic analysis

In the MTI mode the processing performs the following functions:

- Correct for sensor non-uniformity in gain and/or bias
- Detect and track all moving vehicles within the entire field of view
    - Pd≥ 0.9; False Alarm Rate ≤ 5 per Megapixel - vehicles moving ≥ 0.5 meters/sec
    - due to variation in aircraft altitude, pixel GSD can vary between 10 and 36 cm
- Uniquely label each track
- Update the moving target locations at the sensor frame rate.
- Format and compress (if necessary) the MTI tracks video for transmission over the data link
- Record entire field of view imagery for subsequent forensic analysis

D.1.3 ARGUS-IS Ground Processing

The ARGUS-IS ground processing provides for the data link management system control and system information distribution. The hardware components are expected to comprise the data link and a central system server. The system software will operate in the server in conjunction with a set of distributed common clients to provide for integrated ground functionality that can be easily integrated into current and future warfighter ground station systems.

The ground processing system performs the following functions:

- Management of the data uplink for user commands to the airborne processing
- Management of the data downlink for video and MTI data
- Decompression, storage and distribution of video and MTI data to the user clients
- User interface to the real-time video streams and MTI displays that provides a Google Earth™-like experience to pan, zoom, select targets for tracking and mode switching
- Overlay of real-time video streams and MTI data on static, stored background imagery. The forensic recording process of the airborne segment may supply the background imagery; else standard overhead imagery shall be used

D.2 MANAGEMENT CONCEPT

In an effort to identify the best system solution, responses are being sought for each of 3 inter-related program elements:

1. Gigapixel Sensor
2. Airborne Processing and System Integration
3. Ground Processing

DARPA will work with credible respondents to the BAA to identify a set of integrated offerings that meet the need of the program. Standalone proposals must be provided for each element. The program elements are described in D.2.1.

D.2.1 Program Elements

D.2.1.1 ARGUS-IS Gigapixel Sensor Development

This part of the program will be responsible for the CFPA, read out electronics, interconnections between the CFPA and read out electronics, gimbal, mechanical stabilization, and Ground Based Gigapixel Sensor Control Software. The Gigapixel Sensor will be connected to the Airborne Processing Subsystem via fiber optics. Full subsystem tests and demonstrations for the Gigapixel Sensor system are also a part of the program element

D.2.1.2 Airborne Processing Subsystem and System Integration

The Airborne Processing Subsystem and System Integration program element consists of the following two items, an Airborne Processing Subsystem and the System Integration for the ARGUS-IS program.

D.2.1.2.1 Airborne Processing Subsystem

This part of the program will be responsible for the processing hardware, software, data link preprocessing, physical interconnect between the Gigapixel Sensor/Airborne Processing Subsystem, data link (airborne and ground elements), and decompression software for the video streams. Full subsystem tests and demonstrations for the Airborne Processing are also a part of the program element.

D.2.1.2.2 System Integration

This part of the program will be responsible for the integration of the Gigapixel Sensor Subsystem with the Airborne Processing Subsystem to provide the complete Airborne System. In addition to the basic pod, the pod infrastructure such as power and cooling are included. Full subsystem tests and demonstrations for the Airborne System are also a part of the program element. This part of the program will also be responsible for the complete end-to-end operation of the ARGUS-IS system. Full system tests and demonstrations are a part of the program element.

For the flight demonstration portion of the program the government will supply an A-160 pod. The center portion of the A-160 pod is nominally 30" wide by 19" tall and 50" long. The center portion pod will accept a payload of >500lbs.

D.2.1.3 Ground Processing Subsystem

This part of the program will be responsible for the processing hardware and software to interface with the data link's ground station. The Ground Processing System will utilize the Gigapixel Control Software provided by the Gigapixel Sensor Subsystem supplier and the video stream decompression software provide by the Airborne Processing Subsystem supplier. Full subsystem tests and demonstrations for the Ground Processing are also a part of the program element.

D.2.2 Program Phases

ARGUS-IS will be composed of three phases. At the discretion of the Government, the initiation of later phases (i.e., Phases 2 and 3) is contingent upon the availability of funding and the Government's determination that system-level performance goals established for earlier phases were met.

1. **Phase I - Design and Component Build:** During Phase 1, the design of the overall system and subsystems will be performed. In addition, critical elements of the subsystems may be built. This includes both critical hardware elements as well as software elements.
2. **Phase 2- Video Window Functionality:** During Phase 2, the ARGUS-IS Subsystem build will be completed, the subsystems integrated together and the Video Window functionality will be demonstrated in a series of flight experiments. It is expected that the first flight experiment will happen midway through this phase of the program. At the end of this phase of the program, this functionality may be transitioned by DARPA to interested research, industrial, and operational military communities.
3. **Phase 3- Moving Target Indicator:** During Phase 3, the MTI functionality will be integrated into the operational software and flight tests of this capability will take place.

D.2.3 Technology Transition

The development and transition of ARGUS-IS technologies will be driven by DoD transition opportunities. The intent is to initially develop, demonstrate, and transition ARGUS-IS to ensure a relatively seamless transition of the technology into UAV fleet and minimize the processes for coordination and synchronization of operations for the warfighter. Multiple transition opportunities exist.

- The Air Force has an extensive fleet of UAS that could be utilized for transition of ARGUS-IS.
- By 2009 the Army will be able to operate the ER/MP UAV, which will provide persistent intelligence gathering capability, offering surveillance and reconnaissance (ISR).
- The Navy is conducting a Global Hawk Maritime Demonstration (GHMD). The GHMD program is a non-acquisition demonstration program to investigate providing the Navy a multi-INT, high altitude, persistent ISR capability.
- The Navy is also developing a Broad Area Maritime Surveillance (BAMS) unmanned aerial system. The Navy is developing the system to provide a persistent, maritime, worldwide access, ISR capability to conduct continuous open-ocean and littoral surveillance.

As the ARGUS-IS Program matures, dialog will take place with the various services organizations to finalize a transition approach.

D.3 PROGRAM METRICS

The ARGUS-IS Program must develop a system capable of achieving the parameters shown in Table 2. These metrics apply to all program phases. During Phase 1 they can be met by analysis or simulation. During subsequent phases, they must be met by demonstration.

Parameter	Value	Comment
Number of pixels	$>1.4 \times 10^9$	$> 2 \times 10^9$ desired
Field of view	≥ 45°	Cover the largest possible area
IFOV	≤ 25 μrad at the center of the Field of View	Physical pixel subtense
Number of independent video streams	≥50 of size 640 x 480 at ≥ 10 Hz	0 to 100% overlap full pan and zoom distributed control. The update rate of the video streams is to be selectable via the ground processing system. Size of the video frame is also to be selectable via the ground processing system.
Motion blur	≤5% of pixel area at the stabilization point within the field of view	This is the measure of movement of the pixel at the stabilization point within the field of view over the pixel integration time, i.e., the blur induced by aircraft motion that is not compensated for by the gimbal.
Frame rate	≥ 10 Hz	This is the minimal frame rate for the "Predator like" video streams at the full sensor resolution.
MTI Performance	Pd ≥ 0.9 ; False Alarm Rate ≤ 5 per Megapixel	Moving vehicles
Form factor	Flight worthy pod	Packaging is to be compatible with ER/MP, Aerostat, A-160 (Hummingbird). A pod on a surrogate UAV will be utilized for flight testing.

Table 2 - ARGUS-IS Program Metrics

E TECHNICAL OBJECTIVES

E.1 ARGUS-IS GIGAPIXEL SENSOR

The below systems approach is a notional approach which demonstrates the problems associated with the desired system elements.

E.1.1 Scope

The purpose of the Gigapixel Sensor is to provide a sensor that will be capable of producing video imagery of a wide area simultaneously. The Gigapixel Sensor is intended to provide high resolution imagery, ground space distance (GSD) of 10 cm when maintaining an altitude of 4000 meters height above ground (HAG) simultaneously covering a minimum of 13 square kilometers with an objective of covering 21 square kilometers. The highest possible frame rates are desirable with a minimum frame rate of 10 Hz.

E.1.2 Technical Challenges

The ARGUS-IS Gigapixel Sensor is intended to provide the raw imagery that will be utilized in subsequent processing. The sensor itself will produce raw pixels that will be processed by the airborne processing sub-system. The sensor consists or a set of major functional items including:

- Composite Focal Plane Array (CFPA) – It is expected that to get to the anticipated number of pixels, 1-2.5 billion, a CFPA will be utilized. The CFPA can be made from off-the-shelf high density commercial FPA such as Micron Technology Inc.'s (hereafter referred to as Micron) MT9P011D00STC 5 Mpixel CMOS sensor or MT9E001I12STC 8 Mpixel CMOS sensor. A CFPA with 72 of the 8 Mpixel FPAs would provide a total of 575 Mpixels per CFPA and a mosaic image, the image formed by combining the 4 CFPAs together of 2.3 Gpixels. Alternative methods of constructing a Gigapixel Sensor, not utilizing CFPAs, are possible and will be considered. The CMOS sensors referenced here are provided only as examples.
- CFPA Electronics – It is expected that if a CFPA is utilized, the pixels from the FPAs will be moved from the CFPA to a printed wiring board (PWB), or perhaps two PWBs where the pixels will be collected together into an FPGA and sent to the ARGUS-IS on-board processing subsystem via fiber optics. The FPGA would be responsible for the serialization of the data into a set of fiber optic lines as well as the control of the CMOS sensors.
- Optics – Each of the four CFPAs will have a set of optics associated with it. The optics includes lenses, housing for lenses, mounting materials for the lenses. The optics need to be designed to meet the overall objectives of the program with care taken in the trade off areas of the circle of confusion (point spread function), speed of optics, focal length, filed-of-view, as well as the other metrics associated with designing of lenses.

- Integration Time – If a CFPA is utilized, the integration time for each of the FPAs within the CFPA should be able to be set on an individual FPA basis. It is expected that this would be a small application that would be run in the ground station.
- Calibration/Calibration procedure – A method for calibrating the sensor, i.e., alignment and focus of the optics, to ensure proper operation that is consistent with the program goals.
- Mounting/Gimbal – The sensor will need to be mounted in a gimbal. The gimbal can serve multiple purposes, the first is to remove platform motion from the image, to the extent that this is possible, during the pixel integration time. The second function that the gimbal can assist with is to keep the orientation of the sensor fixed with respect to the area under surveillance. Keeping the orientation constant will enable the imagery from the same area on the ground collected by the sensor to be routed to the same processing elements within the processing subsystem. The size of the gimbal should be compatible with potential platforms associated with the program objectives.
- Sensor Output – The sensor will provide raw pixels via the interconnect system to the Airborne Processing Subsystem.
- Ground Based Gigapixel Sensor Control Software – any aspects of Gigapixel Sensor that are adjustable will be controlled from the ground via a software application provided by the Gigapixel Sensor provider. This includes control of where the sensor is pointed, orientation of the sensor, control of FPAs utilized, and any other controllable parameters.

Alternative constructions of the Gigapixel Sensor meeting the overall program objectives are encouraged.

E.1.3 Gigapixel Sensor Metrics and Evaluation Method

Proposers should describe a self-evaluation plan coordinated with, but extending beyond the system evaluation described in Section D. Metrics should include but not be limited to:

- Motion blur– the movement of a pixel at the ground stabilization point of the gimbal within the field of view as well as the motion blur of pixels within the field of view that are greatest distance from the field of view. The motion blur should be examined when the aircraft is directly above the center of the field of view as well as when the aircraft is on the perimeter of the field of view. The motion blur should be characterized as a function of the pixel integration time, pixel location with respect to the stabilization point within the field of view and aircraft velocity.
- Optics – a set of parameters that describe the optics that are being proposed.
- Composite Focal Plane Array (if used) – flatness, depth of field of view error budget allocation under the optics.
- CFPA electronics – power, physical characteristics, performance.

- Integration time – Required integration time as a function of the focal plane array location in the CFPA as well as lighting conditions.
- Resolution – resolution of the sensor at 4000 meters height above ground. The resolution should include the GSD of the "raw pixels" as well as the effective resolution, i.e., the ability to distinguish physical details in the area being imaged.
- Gimbal characteristics – summary characteristics of the gimbal and associated hardware being proposed.
- Total sensor size, weight and power.

Metrics must be measurable and be placed in a table format so that performance is easily seen. The table should be set up in such a way that the measured values can be judged against proposed values.

E.2 ARGUS-IS AIRBORNE PROCESSING AND SYSTEM INTEGRATION

The below systems approach is a notional approach which demonstrates the problems associated with the desired system elements.

E.2.1 Airborne Processing Subsystem

E.2.1.1 Scope

The Airborne Processing Subsystem consists of the processing hardware for processing the data produced by the Gigapixel Sensor, the interconnect for moving the data generated by the Gigapixel Sensor to the processing hardware, processing hardware, software for processing the sensor data, and hardware/software for sending the data over the data link and the data link.

E.2.1.2 Technical Challenges

- Physical Interconnect – The physical interconnect must be capable of transporting the data generated by the Gigapixel Sensor to the processing subsystem. If the mosaic image were formed with 288 Micron CMOS sensors, the peak data rate from the Gigapixel Sensor would be $325*10^9$ bits/sec. The use of fiber optics for implementing the physical interconnect is encouraged.
- Processing Elements – The processing subsystem should be based on existing processing elements, e.g., Cell processor, Field Programmable Gate Arrays (FPGAs), Field Programmable Operational Arrays (FPOAs), or other existing processing elements.
- Processing Nodes – A processing node consists of the interconnect hardware necessary to receive data from the Gigapixel Sensor, processing elements necessary perform the processing required to meet the program objectives, memory for storing sensor data, and hardware required for sending the output of the processing to the data link preprocessor.

- Data Link Preprocessor – The data link preprocessor is the hardware and/or software where all outputs from the processing subsystem are collected together for transmission to the ground. Functions such as image compression may be performed in either the data link preprocessor or in the processing nodes. The data link may simply be a processing node designated as the data link preprocessor, or it may be alternative hardware.
- Operational Software – The operational software is the software required for performing the image processing functions. Operational software may be implemented in general purpose processors, special purpose processing hardware such as FPGAs, or other types of processing elements as chosen by the proposer. The operational software must run in real-time.
- Image Storage – The Airborne Processing Subsystem contains the ARGUS-IS storage subsystem. This includes determination of what data should be kept as well as the physical storage devices and associated processing.
- Data Link – The airborne and ground elements of the data link that will be utilized for communication between the ARGUS-IS Airborne Subsystem and Ground Subsystem. The data link is for demonstration purposes only. The data link needs to have a bandwidth of $\geq$ 200 Mbits/sec.

E.2.1.3 Metrics & Evaluation Method

Proposers should describe a self-evaluation plan coordinated with, but extending beyond, the system evaluation described in Section D. Metrics should include but not be limited to:

- Interconnect System
  - Data rate, number of fibers, data rate per processing module.
- Processing Nodes
  - Size, weight, power for each module type
  - Memory type and size for each portion of each module
  - Quantity of each module type
  - Enclosure physical metrics
- Operational Software
  - Performance of the software with respect to the node or portion of a node on which the software is executing. For example, if color FPAs are utilized and a demosaicing algorithm is being executed in an FPGA on an I/O daughter module of a processing element, the performance of the demosaicing algorithm within the FPGA would be cited. If image stabilization algorithm is running on a video window, the performance of the stabilization algorithm as a function of video window size, frame rate, etc. would be potential metrics. The metrics associated with the operational software should be of sufficient detail that the overall performance of the system with respect to the ARGUS-IS system concept

can be verified. Any processing limitations must be clearly visible from the metrics within this section.

- Performance should be characterized by major function.
- Types of performance metrics include:
  - execution time,
  - operations per pixel required by major function,
  - required resources – e.g., the hardware resources processors, memory, memory bandwidth and storage,
  - compression, and
  - Pd/False Alarm Rate for the MTI mode.
- From the operational software metrics any limitations on the operational software should be readily apparent. For example, if there is a limit on the number of video windows that can be processed within a processing node, the metrics should make this easily seen. Any limitations on simultaneous functions should also be apparent.

- Image Recording – metrics are determined by the proposed approach for recording imagery.

E.2.2 System Design and Integration

E.2.2.1 Scope

The system design and integration consists of developing an overall design for the ARGUS-IS system based upon the three major subsystem elements; the Gigapixel Sensor, the Airborne Processing Subsystem, and the Ground Processing Subsystem and then integrating the subsystems into an overall functional system. End-to-end functionality must be demonstrated.

E.2.2.2 Technical Challenges

1. Integration of Airborne Elements – the integration of the Gigapixel Sensor within its gimbal with the Airborne Processing Subsystem into a pod for ARGUS-IS testing. This includes determination of a pod that will be compatible with both the Airborne Processing Subsystem as well as the Gigapixel Sensor. Issues with connecting elements contained within the pod to the aircraft must also be considered. Pod ruggedness, altitude capability and power, heat, signal and interface management all will require sufficient detailed analysis and care for the program to be successful.
2. Integration of ARGUS-IS Airborne Subsystem to Ground Subsystem – the interfaces from the ARGUS-IS Airborne Subsystem to the Ground Subsystem need to be established to meet the overall objectives of the program.

Demonstrating that the ARGUS-IS system meets its system metrics will also be a challenge to perform in a cost effective fashion.

E.2.2.3 Metrics & Evaluation Method

Proposers should describe a self-evaluation plan coordinated with, but extending beyond, the system evaluation described in Section D.

- Payload weight, power, cooling
- Completeness of system level testing/evaluation

E.3 GROUND PROCESSING

E.3.1 Scope

The Ground Processing provides the user interface to the system (input and output) and the ground end of the data link and data link management.

E.3.2 Technical Challenges

While the technology associated with the ground processing is well within the state of the art, the ground processing functions are critical to system performance. The following features are key:

- Scalability - The ground processing needs to be capable of supporting at least as many independent users as there are video streams. It is desired that if commanded, some user windows could be slaved to other user windows. In this case there may be many more users than video streams actively viewing ARGUS-IS information. The system should have the server capacity and interfaces to support many 100s of users. The number of users may be different from the number of user windows. A single workstation may be a consumer of multiple video windows.
- Bandwidth Allocation – The Ground Processing is responsible for the allocation of available bandwidth.
- User Experience - The system should provide essentially a real time "Google Earth™" interface to the users. The functions of zoom, pan, track and mode selection should be both familiar and intuitive.
- Ground Station System Impact - The ground station processing should have minimal hardware and software impact on the ground station. The hardware should be COTS and limited to a relatively small amount of rack space in a military TOC environment. The server software must be cable of being remotely operated. The client software must be compatible with standard workstations. ARGUS-IS must not require special or additional workstations in the ground station.
- Recording – Keeping history of data received from and transmitted to the Airborne Subsystem.

E.3.3 Metrics and Evaluation Method

Proposers should describe a self-evaluation plan coordinated with, but extending beyond, the system evaluation described in Section D. Metrics should include but not be limited to:

- Workstation/server utilization as a function of system mode
- Storage

F PROPOSAL MANAGEMENT

F.1 GENERAL INFORMATION

F.1.1 Definition of BAA

The information provided in this Proposer Information Pamphlet (PIP), in addition to that provided in the FedBizOpps announcement, BAA 07-23 constitutes a Broad Agency Announcement as contemplated in the FAR 6.102 (d)(2)(i). The FedBizOpps announcement and this document are available online at http://dtsn.darpa.mil/ixo/solicitations.asp#0723.

F.1.2 BAA Correspondence

DARPA will use electronic mail for all technical and administrative correspondence regarding this BAA. Administrative, technical or contractual questions should be sent via e-mail to BAA07-23@darpa.mil. If e-mail is not available, please fax questions to (703) 522-7161 (Attention: Dr. Brian Leininger). All requests must include the name, address, and phone number of a point of contact. Technical and contractual questions should include the originator's full name, email, and postal address in the text.

F.1.3 Frequently Asked Questions

All questions and answers of relevance to the community will be posted to a "Frequently Asked Questions (FAQ)" accessible at: http://dtsn.darpa.mil/ixo/solicitations.asp#0723.

F.1.4 Industry Day

DARPA held an Industry Day as part of BAA 07-23 for the ARGUS-IS program on Thursday, 8 February 2007, in Arlington, VA. The purpose of this briefing was to outline the problems to potential offerors within the BAA 07-23 technical areas. Attendance was not required to propose. Similarly, attendance will have no direct bearing on proposal evaluations. All pertinent information and materials presented at the ARGUS-IS BTI are available at http://dtsn.darpa.mil/ixo/solicitations.asp#0723.

F.1.5 Multiple Proposals

Offerors responding to multiple areas of this BAA should submit a complete proposal for each program element in which they are responding. The proposed effort for each of the program elements described in paragraph D.2.1 Program Elements should stand alone, and not be predicated on the award of any other effort. A technical contributor may only be proposed for one of the three subsystems.

F.1.6 Proposer Registration

Organizations planning to submit proposals must register at https://www.tfims.darpa.mil/baa/propacctreqinit.asp. Only the lead or prime organization should register. One registration per proposal should be submitted. This means that an

organization wishing to submit to multiple technical topic areas should complete a single registration for each proposal. By registering, the Proposer has made no commitment to submit. The deadline for T-FIMS registration is 26 March 2007**. Please note: if the registration date is missed, the offeror may not be able to upload their proposal by the published proposal submission due date.**

F.1.7 Contract Types

This BAA affords Proposers the choice of submitting proposals for the award of a Procurement Contract, Technology Investment Agreement, Other Transaction for Prototype Agreement, or other such appropriate award instrument. Grant and Cooperative Agreements proposals are not requested in response to this BAA. The Government reserves the right to negotiate the type of award instrument determined appropriate under the circumstances.

F.2 SUMMARY OF IMPORTANT DATES

Table 3 provides a schedule of important events and dates associated with the ARGUS-IS BAA:

DATE	EVENT	URL
8 February 2007	DARPA Briefing to Industry on proposal process and BAA technical topics	https://www.schafertmd.com/argus/
20 February 2007	FedBizOpps Announcement and Proposer Information Package published	http://dtsn.darpa.mil/ixo/solicitations.asp#0723
26 March 2007	Proposal registrations due at DARPA	https://www.tfims.darpa.mil/baa/propacctreqinit.asp
9 April 2007 1300 EST	Proposal due date	https://www.tfims.darpa.mil/baa/baalist.asp
15 May 2007	Selections announced	
1 July 2007	Kick-Off meeting	

F.3 PERIOD OF SOLICITATION

This BAA will remain open from 20 February 2007 through 20 February 2008. The due date for proposal submission is 9 April 2007 (1300 EST) to be considered for the first round of funding. While the proposals submitted after the initial 9 April 2007 deadline will be evaluated by a Government review panel, proposers should keep in mind that the likelihood of funding such proposals is less than for those proposals submitted in connection with the initial evaluation and award schedule.

F.4 SUBMISSION GUIDELINES

Proposal abstracts ARE NOT requested in advance of full proposals. DARPA will employ an electronic upload process for proposal submissions for BAA 07-23. Performers may find guidance for proposal submission at: http://dtsn.darpa.mil/ixo/solicitations.asp#0723.

Organizations planning to submit proposals must register at https://www.tfims.darpa.mil/baa/propacctreqinit.asp**.** Only the lead or prime organization should register. One registration per proposal should be submitted. This means that an organization wishing to submit multiple proposals should complete a single registration for each proposal. The deadline for registration is 26 March 2007. By registering, the Proposer has made no commitment to submit.

F.5 TFIMS REPORTING REQUIREMENTS

The T-FIMS Interactive reporting system facilitates technical and expenditure reporting on line. Information on this system may be found at http://www.tfims.darpa.mil/. Offerors shall satisfy the T-FIMS reporting requirements presented at http://www.tfims.darpa.mil/tfimsreqdoc.asp as part of their proposed deliverables.

F.6 SECURITY

The Government anticipates that proposals submitted under ARGUS-IS BAA 07-23 will be unclassified. In the event that a proposer chooses to submit a classified proposal or submit any documentation that may be classified, the following information is applicable.

Security Classification guidance on DD Form 254 will not be provided at this time since DARPA is soliciting ideas only. After reviewing the incoming proposals, if a determination is made that the award instrument may result in access to classified information, a DD Form 254 will be issued and attached as part of the award. Proposers choosing to submit a classified proposal must first receive permission from the Original Classification Authority to use their information in applying to this BAA. An applicable classification guide should be submitted to ensure that the proposal is protected appropriately.

Classified submissions shall be in accordance with the following guidance:

Collateral Classified Data: Use classification and marking guidance provided by previously issued security classification guides, the Information Security Regulation (DoD 5200.1-R), and the National Industrial Security Program Operating Manual (DoD 5220.22-M) when marking and transmitting information previously classified by another original classification authority. Classified information at the Confidential and Secret level may only be mailed via U.S. Postal Service (USPS) Registered Mail or U.S. Postal Service Express Mail (USPS only; not DHL, UPS or FedEx). All classified information will be enclosed in opaque inner and outer covers and double wrapped. The inner envelope shall be sealed and plainly marked with the assigned classification and addresses of both sender and addressee. The inner envelope shall be addressed to:

Defense Advanced Research Projects Agency (DARPA)
ATTN: BAA 07-23, DARPA/IXO, Dr. Brian Leininger
3701 North Fairfax Drive, Suite 621
Arlington, VA 22203-1714

The outer envelope shall be sealed with no identification as to the classification of its contents and addressed to:

Defense Advanced Research Projects Agency (DARPA)
Security & Intelligence Directorate, Attn: CDR
3701 North Fairfax Drive, Suite 255
Arlington, VA 22203-1714

All Top Secret materials should be hand carried via an authorized, two-person courier team to the DARPA Classified Document Registry (CDR).

Special Access Program (SAP) Information: Contact the DARPA Special Access Program Central Office (SAPCO) at 703-526-4052 for further guidance and instructions prior to transmitting to DARPA. All Top Secret SAP, must be transmitted via approved methods for such material. Consult the DoD Overprint to the National Industrial Security Program Operating Manual for further guidance. It is strongly recommended that you coordinate the transmission of SAP material and information with the DARPA SAPCO prior to transmission.

Sensitive Compartmented Information (SCI) Data: Contact the DARPA Special Security Office at 703-812-1984/1994 for the correct SCI courier address and instructions. All SCI data must be transmitted through your servicing Special Security Officer (SSO). All SCI data must be transmitted through SCI channels only (i.e., approved SCI Facility to SCI facility via secure fax).

Proprietary Data: All proposals containing proprietary data should have the cover page and each page containing proprietary data clearly marked as containing proprietary data. It is the proposer's responsibility to clearly define to the Government what is considered proprietary in nature.

Proposers must have existing and in-place prior to execution of an award, approved capabilities (personnel and facilities) to perform research and development at the classification level they propose.

F.7 HUMAN USE

Proposals selected for funding are required to comply with provisions of the Common Rule (32 CFR 219) on the protection of human subjects in research (http://www.dtic.mil/biosys/downloads/32cfr219.pdf) and the Department of Defense Directive 3216.2 (http://www.dtic.mil/whs/directives/corres/html2/d32162x.htm). All proposals that involve the use of human subjects are required to include documentation of their ability to follow Federal guidelines for the protection of human subjects. This includes, but is not limited to, protocol approval mechanisms, approved Institutional Review

Boards, and Federal Wide Assurances. These requirements are based on expected human use issues sometime during the entire length of the proposed effort.

For proposals involving "greater than minimal risk" to human subjects within the first year of the project, performers must provide evidence of protocol submission to a federally approved IRB *at the time of final proposal submission to DARPA.* For proposals that are forecasted to involve "greater than minimal risk" after the first year, a discussion on how and when the proposer will comply with submission to a federally approved IRB needs to be provided in the submission. More information on applicable federal regulations can be found at the Department of Health and Human Services – Office of Human Research Protections website (http://www.dhhs.gov/ohrp/).

G PROPOSAL EVALUATION

G.1 GENERAL CONSIDERATIONS

Proposers are encouraged to submit concise, but descriptive, proposals. The Government reserves the right to select for award all, some, or none of each of the proposals received in response to BAA 07-23 and to award without discussions. All responsible sources capable of satisfying the Government's needs may submit a proposal. Historically Black Colleges and Universities (HBCUs) and Minority Institutions (MIs) are encouraged to submit proposals and join others in submitting proposals; however, no portion of this BAA will be set-aside for HBCU and MI participation due to the impracticality of reserving discrete or severable areas of technology for exclusive competition among these entities.

It is the policy of DARPA to treat all proposals as competitive information and to disclose the contents only for the purposes of evaluation. The Government may use selected support contractor personnel to assist in administrative functions only. For this solicitation, non-Government advisors from Schafer Corporation, Solers Incorporated, Science and Technology Associates, SET Associates Corporation, McNeil Technologies, and CACI International, who have signed appropriate non-disclosure and conflict of interest statements, may assist in the proposal administration when their assistance is required. However, they will not participate in the final source selection process.

Proposers are also advised that employees of commercial firms under contract to the Government may be used by DARPA agents to administratively process proposals, monitor contract performance, or perform other administrative duties requiring access to other contractors' proprietary information. These support contracts include nondisclosure agreements prohibiting their contractor employees from disclosing any information submitted by other contractors or using such information for any purpose other than that for which it was furnished. By submission of its proposal, each Proposer agrees that proposal information may be disclosed to those non-Government personnel for the limited purposes stated above.

Proposers are advised that only contracting officers are legally authorized to contractually bind or otherwise commit the Government contracting officers.

G.2 CRITERIA FOR AWARDS

The selection of one or more sources for awards will be based on an evaluation of a Proposer's response (both technical and cost aspects) to determine the overall merit of the proposal in response to the announcement. In accordance with FAR 35.016(e), and as reflected in the aforementioned proposal Evaluation Criteria, the primary basis for selecting proposals for award shall be technical, importance to agency programs, and funds availability. Cost realism and reasonableness shall also be considered to the extent appropriate as described herein. Proposals shall be evaluated against the following criteria, in descending order of importance:

G.2.1 Technical Innovation and Depth

The proposed work shall demonstrate overall technical worthiness, sufficient technical payoff to warrant the associated risk, and long-term technology impacts in order to establish the scientific and technical merit of the proposed research. Ideally, the technical aspects of the proposal shall show potential for revolutionary advances to technology and how, if successful, the proposed effort will revolutionize the relevant technology base. The approach taken shall also indicate that the Proposer has a profound understanding of the technology and a solid constructive plan of technological achievement. Also worthy are proposals that show very innovative advances to relevant technologies, indicate a solid understanding of those technologies, and show clear technological achievement.

The proposed technical approach shall be feasible, achievable, complete and supported by a proposed technical team that has the expertise and experience to accomplish the proposed tasks. Task descriptions and associated technical elements provided are complete and in a logical sequence with all proposed deliverables clearly defined such that a final product that achieves the goal can be expected as a result of award. Performance metrics must be defined that clearly lay out measurable increases in system performance throughout the program. The proposal identifies clearly-defined and feasible major technical risks and planned mitigation efforts. In particular, the following items shall be considered and evaluated:

- Understanding of the current state of the art in the area being proposed
- Capability offered to the baseline system
- Degree of innovation and potential for revolutionary advance
- Justification of design choices as compared to alternative techniques

G.2.2 Relevance to ARGUS-IS Mission Objectives and Consistency with ARGUS-IS Program Concepts

The potential contributions of the proposed effort shall demonstrate relevance to the national technology base. Specifically, DARPA's mission is to maintain the technological superiority of the U.S. military and prevent technological surprise from harming our national security by sponsoring revolutionary technology research and development. To that end, IXO will select high-payoff research that bridges the gap between fundamental discoveries and their military use. High payoff concepts provide revolutionary military capability or large increases in current capability. IXO is not interested in incremental technical advances.

The proposed work shall demonstrate an understanding of the depth and breadth of the ARGUS-IS mission and propose an innovative solution that meets the program's objectives. The Proposer shall clearly understand the ARGUS-IS program goals and metrics, show familiarity with current and previous work on related systems, and include awareness of current and projected support requirements to analysts and operational commanders. Knowledge of how the system can be extended and potential new applications. This includes plans for how the offerer will support transition efforts of the technology to military users. This includes how the technology can be integrated into

military operations and programs. The extent to which IP proposed to be delivered with less than government purpose rights, if any, creates a barrier to technology transition shall be discussed, to include how the offeror proposes to mitigate such barrier(s).

Proposals shall be as quantitative as possible in their assessments of military payoff of proposed technical concepts. The proposed system metrics shall be intuitive and straightforward to evaluate and the methodology for performing this assessment shall be presented in sufficient detail for DARPA to evaluate the credibility of the results. The proposed metrics for each of the ARGUS-IS program elements shall demonstrate completeness. The metrics are also a key indicator of the knowledge of the potential supplier.

The proposed work shall align with and provide consistency with the ARGUS-IS system concept and program plan as defined in the BAA 07-23 PIP. All Proposers shall precisely define the proposed effort's metrics and evaluation plan.

The consistency of the proposed effort will be with respect to milestones and the realism of the proposed milestones. The milestones need to demonstrate that the proposer can execute the program.

The following will be examined:

- Understanding of the depth and breadth of unmanned aerial vehicles operations and sensors
- Familiarity with current and previous work on UAS sensors and processing
- Awareness of current and projected support to military operations
- Consistency with the ARGUS-IS system and program concepts
- Depth and specificity of the proposed effort's system and program concepts
- Precision and coverage of the proposed effort's metrics
- Clearly identified and measurable milestones for the proposed effort

G.2.3 Cost Realism and Reasonableness

The objective of this criterion is to establish that the proposed costs are reasonable and realistic for the technical and management approach offered, as well as to determine the proposer's practical understanding of the effort. Cost Reasonableness will include an assessment of total costs proposed of which will be measured relative to the Government's perceived benefit in terms of achieving compelling, technological advances that are operationally feasible. Cost realism is examined in terms staffing (at multiple levels, such as senior and junior), utilization of facilities, and the cost-effective use of existing equipment and software. The evaluation criterion recognize that undue emphasis on cost may motivate proposers to offer low-risk ideas with minimum uncertainty and to staff the effort with junior personnel in order to be in a more competitive posture. DARPA discourages such cost strategies. Cost reduction approaches that will be received favorably include innovative management concepts that maximize direct funding for technology and limit diversion of funds into overhead.

Award(s) will be made to proposers whose proposals are determined to be the most advantageous to the Government, all factors considered, including the potential contributions of the proposed work to the overall research program and the availability of funding for the effort. Award(s) may be made to any proposer(s) whose proposal(s) is determined selectable regardless of its overall rating.

In particular, the following items shall be considered and evaluated:

- The total cost relative to benefit
- The realism of cost levels for facilities and staff
- The cost-effective use of existing equipment and software

G.2.4 Realism of Proposed Schedule

The objective of this criterion is to determine the extent to which the timeline of the proposed effort is reasonable, realistic, and aggressively pursues the defined performance metrics. It will also look at:

- Clearly identified and measurable milestones for the proposed effort
- Realism of proposed milestones

G.2.5 Personnel and Corporate Capabilities and Experience

Prior experience in similar efforts must clearly demonstrate an ability to deliver products that meet the proposed technical performance within the proposed budget and schedule. The proposed team has the expertise to manage the cost and schedule. Similar completed/ongoing efforts by the Proposer in this area are summarized including the identification of other Government sponsors. Proposed staff must have necessary clearances and Proposer must have the necessary accredited facilities for performing the proposed work.

The following will be examined:

- Qualifications of proposed technical personnel
- Availability of personnel for the duration of the contract
- Proposer's experience related to the proposed technology area
- Adequacy of proposed facilities
- Adequacy of security plan

NOTE: PROPOSERS ARE CAUTIONED THAT EVALUATION SCORES MAY BE LOWERED AND/OR PROPOSALS REJECTED IF SUBMITTAL INSTRUCTIONS ARE NOT FOLLOWED.

H PROPOSAL CONTENT

H.1 GENERAL INFORMATION

Technical and cost proposals must be submitted as separate volumes (Technical as Volume I, Cost as Volume II), and must be valid for 180 days.

All eligible sources may submit a proposal which shall be considered against the criteria set forth in Section G. Proposals with fewer than the maximum number of pages will not be penalized. Proposals exceeding the page limit will not be reviewed beyond the maximum page limit. Non-cost information incorporated into the unrestricted size Volume II cost proposal will not be considered. Proposers are encouraged to submit concise, but descriptive, proposals.

Proposal questions should be handled according to the process described in Section F. Proposers are advised that only contracting officers are legally authorized to contractually bind or otherwise commit the Government.

Proposers should apply the restrictive notice prescribed in the provision at FAR 52.215-12, Restriction on Disclosure and Use of Data, to trade secrets or privileged commercial and financial information contained in their proposals.

It is DARPA's policy to treat all proposals as competitive information and to disclose the contents only for the purposes of evaluation. The Government may use selected support contractor personnel to assist in administrative functions only.

H.2 TECHNICAL PROPOSAL

The following are the page count limits by program element:

a) Gigapixel Sensor – 46 pages

b) Airborne Processing and System Integration – 51 pages

c) Ground Processing – 36 pages

Page counts include cover, index, charts, figures and tables). Each proposal shall include the following sections and items and adhere to page limits as identified.

Note: This page limitation is per technology area/program element.

Program Element	Section	Page Limit	Topics
All	Cover page	1	Offer identification
All	Table of contents	2	
All	Proposal roadmap	1	
All	Problem statement	2	Understanding of Persistent Surveillance Understanding of Viewing Geometry Issues
All	Program concept	3	Parts that you are bidding and how they fit together
Gigapixel Sensor	Technical Approach Gigapixel Sensor	20	Understanding of the technical problems with the Gigapixel Sensor
Gigapixel Sensor	Gigapixel Sensor Metric Table	1	Gigapixel Sensor Metrics
Airborne Processing & System Integration	Technical Approach – Airborne Processing Subsystem	20	Understanding of the technical problems with the Gigapixel Sensor Processing
Airborne Processing & System Integration	Technical Approach – System Integration	5	Understanding of subsystem interactions and system level evaluation.
Airborne Processing and System Integration	Airborne Processing and System Integration Metrics	1	Airborne Processing and System Integration metrics
Ground Processing	Technical Approach – Ground Processing	10	Understanding of the technical problems with the Ground Processing
Ground Processing	Ground Processing Metrics Table	1	Ground Processing Metrics, Processing Subsystem.
ALL	Program Management Plan	10	SOW, WBS, milestones, security plan if required, deliverables, and other associated program management plan elements (see Section F).
ALL	Cost Summary	1	See section F.4

ALL	Personnel and Corporate Experience	5	Personnel, related experience and facilities.

Table 4 - Summary of required proposal contents

Format specifications include 12 pitch or larger type, single spaced, single-sided, and 8.5 by 11 inches with 1-inch margins all around the page. Each section should begin at the top of a page. All pages shall be numbered. The page limitation includes all attachments, etc. The Government will not consider pages in excess of the page count limitation, as described above. Offerors using this PIP as a template for their proposal will satisfy all format requirements. All submissions must be in English.

Offerors should include material contained in the PIP only by reference (e.g., [PIP E.2.3]), neither by verbatim quotes nor by simple paraphrasing. Specific examples of problems, approaches, or goals are preferred to qualitative generalities.

H.2.1 Cover Page

The cover page should uniquely identify the offer, including at least the following information:

- BAA number
- Assigned DARPA control number
- Proposal title
- BAA areas being addressed (Gigapixel Sensor Subsystem, Airborne Processing Subsystem, Ground Processing Subsystem, System Integration)
- Proposer's single point of contact for all correspondence and communications including name, telephone number, electronic mail address, fax (if available) and mailing address.
- Cost Summary by Government Fiscal Year see

H.2.2 Section A: Table of Contents

The Table of Contents should, at a minimum, provide an index to all primary and secondary headings in the technical proposal.

H.2.3 Section B: Proposal Roadmap

This page should summarize, preferably in bullet format, the major points and themes of the proposal, in terms of a) problem addressed, b) program structure, c) technical approach, and d) management plan.

The roadmap provides a top-level view of the content and structure of the proposal. It contains a summary for each of the roadmap areas defined below, which should be elaborated elsewhere. It is important to make the synopses as explicit and informative as possible. The roadmap must also cross-reference the proposal page number(s) where each area is elaborated.

H.2.4 Section C: Problem Statement

This section should define and delineate the problem to be addressed by the proposed effort. It should define the challenges, on a BAA element by element basis, that pose the greatest technical challenges to the offeror; identify areas where the proposed can make the greatest contribution; and describe the military payoff if the proposed effort succeeds.

H.2.5 Section D: Program Concept

This section should establish the intellectual framework for the proposed effort in three parts:

Section D.1: **Proposed enabling capabilities.** Define the capabilities to be in place at the end of the program. Explain relationships between the capabilities and recommend improvements to the ARGUS-IS system concept.

Section D.2: **Proposed capability development.** Explain how the capabilities defined in Section D.1 may evolve over time, either through a development sequence, performance enhancement, or the phased introduction of new technology. Show how this evolution supports the ARGUS-IS program-level goals, and recommend amplifications and improvements to the ARGUS-IS program concept.

Section D.3: **Proposed performance metrics.** Define the metrics by which the effort will internally assess progress towards the final set of capabilities. For subsystem development efforts, explain how these metrics relate to the program-level metrics. For each metric, project specific values that will be achieved at the end of each Phase, and the assumptions on performance required of other program elements in order for these projections to be valid.

H.2.6 Section E: Technical Approach

Explain, with specific examples relevant to wide area persistent surveillance, the key technical ideas on which the program concept is based. Include at least:

- A summary of past and current efforts on which the proposed effort builds, or which were rejected as part of the design process;
- For the program element being bid, the status of that element at the end of each of the phases of the program. For the subsystem developers, emphasize interfaces between the subsystems and the measurable status of the subsystem development at the end of each phase of the program. Clearly establish performance parameters need to be validated via test flights/experimentation and the nature of the test flights/experimentation. Clearly establish which metrics will be measured via analysis/simulation at the end of Phase 1 and composition the analysis/simulation, this includes establishing in a measurable manner what constitutes success. For the system integrator, establish the framework that the subsystem developers will be asked to fit.

- Key ideas that will form the basis for progress beyond the baseline capability. Include specific examples illustrating how the ideas address crucial factors encountered in airborne ISR operations.

It must address the specific technical approach, technical rationale and strategy for accomplishment of technical goals, and should elaborate upon (but not be redundant with) Section D. The technical rationale section must include technical arguments to substantiate claims made in Section D. Include comparisons with other ongoing research indicating both advantages and disadvantages of the proposed effort/approach. Include a discussion of design decisions made.

All proposals should include detailed descriptions of capability goals, performance goals, informal evaluations and formal evaluations for their portion of the program. These goals and evaluation plans will be reviewed and coordinated in program-wide meetings after program initiation.

H.2.7 Section F: Program Management Approach

This section should describe the tasks and resources offered to carry out the technical approach described.

Section F.1: Statement of Work. In plain English, clearly define the technical tasks/subtasks to be performed, their durations, and dependencies among them. For each task/subtask, provide:

1) A general description of the objective (for each defined task/activity);
2) A detailed description of the approach to be taken to accomplish each defined task/activity);
3) Identification of the primary organization responsible for task execution (prime, sub, team member, by name, etc.);
4) The exit criteria for each task/activity - a product, event or milestone that defines its completion.
5) Define all deliverables (reporting, data, reports, software, etc.) to be provided to the Government in support of the proposed research tasks/activities.

Note: It is recommended that the SOW should be developed so that each Phase of the program is separately defined.

Section F.2: **Program schedule.** A Gantt chart of the major activities aligned with the three phases of the ARGUS-IS Program.

Section F.3: **Cost summary.** Summarize the cost of the proposed effort as indicated by Table 5. Funding levels have not been predetermined for this program. Therefore, cost proposals must reflect accurate estimates of staffing and other costs. For costing, assume a program start date of 1 July 2007. Note that ARGUS-IS will commence as quickly as contracts can be awarded.

COST ELEMENT	GFY 07	GFY 08	GFY09	GFY 10
Technical labor[1]	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx
Administatrative labor[2]	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx
Other direct charges	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx
Indirect charges	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx
Fee	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx
Total	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx

Table 5 - Summary of funding request by cost element

ORGANIZATION	GFY 07	GFY 08	GFY 09	GFY 10
Prime	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx
Subcontractor A	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx
Subcontractor B	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx
Subcontractor C	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx
Total	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx	$x,xxx,xxx

Table 6 – Summary of funding request by performing organization

Section F.4: **Personnel.** Provide a list of key personnel, concise summary of their qualifications, and discussion of proposer's previous accomplishments and work in this or closely related research areas. Indicate the level of effort (including percentage of time allocations) to be expended by each person during each contract year and other (current and proposed) major sources of support for them and/or commitments of their efforts. DARPA expects all key personnel associated with a proposal to make substantial time commitment to the proposed activity.

At a minimum this should include the proposed Principle Investigator or Program Manager. Smaller teams of dedicated full-time developers are preferable to larger teams of part-time participants. If the expertise is resident in only 1-2 key personnel, the proposer should identify risk reduction measures in case of loss of said personnel.

Section F.5: **Related experience.** Provide short summaries of related work accomplished or in progress by any member of the offeror's team that offers technology

[1] Technical labor includes designers, software engineers, analysts, and other staff with degrees in science or engineering who contribute directly to the technical objectives of the program.

[2] Administrative labor includes contractual, financial, secretarial, and other staff with non-technical degrees who support the technical staff.

or transition potential for ARGUS-IS. Emphasize projects on which proposed staff have worked, and indicate this fact when applicable.

Section F.6: **Facilities.** Briefly describe corporate facilities that will be available to support this effort.

Section F.7: **Security plan.** Briefly describe the plan to place people into the secure experimentation facility during classified experiments and evaluations, and to process data collected and derived from those evaluations when required.

Section F.8: **Intellectual Property (IP)**

1. Procurement Contract Proposers

   A. Noncommercial Items (Technical Data and Computer Software)

   Proposers responding to this BAA requesting a procurement contract to be issued under the FAR/DFARS, shall identify all noncommercial technical data, and noncommercial computer software that it plans to generate, develop, and/or deliver under any proposed award instrument in which the Government will acquire less than unlimited rights, and to assert specific restrictions on those deliverables. Proposers shall follow the format under DFARS 252.227-7017 for this stated purpose. In the event that proposers do not submit the list, the Government will assume that it automatically has "unlimited rights" to all noncommercial technical data and noncommercial computer software generated, developed, and/or delivered under any award instrument, unless it is substantiated that development of the noncommercial technical data and noncommercial computer software occurred with mixed funding. If mixed funding is anticipated in the development of noncommercial technical data, and noncommercial computer software generated, developed, and/or delivered under any award instrument, then proposers should identify the data and software in question, as subject to Government Purpose Rights (GPR). In accordance with DFARS 252.227-7013 Rights in Technical Data – Noncommercial Items, and DFARS 252.227-7014 Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation, the Government will automatically assume that any such GPR restriction is limited to a period of five (5) years in accordance with the applicable DFARS clauses, at which time the Government will acquire "unlimited rights" unless the parties agree otherwise. Proposers are admonished that the Government will use the list during the source selection evaluation process to evaluate the impact of any identified restrictions, and may request additional information from the proposer, as may be necessary, to evaluate the proposer's assertions. If no restrictions are intended, then the proposer should state "NONE."

A sample list for complying with this request is as follows:

NONCOMMERCIAL			
Technical Data Computer Software To be Furnished With Restrictions	Basis for Assertion	Asserted Rights Category	Name of Person Asserting Restrictions
(LIST)	(LIST)	(LIST)	(LIST)

Table 7

B. Commercial Items (Technical Data and Computer Software)

Proposers responding to this BAA requesting a procurement contract to be issued under the FAR/DFARS, shall identify all commercial technical data, and commercial computer software that may be embedded in any noncommercial deliverables contemplated under the research effort, along with any applicable restrictions on the Government's use of such commercial technical data and/or commercial computer software. In the event that proposers do not submit the list, the Government will assume that there are no restrictions on the Government's use of such commercial items. The Government may use the list during the source selection evaluation process to evaluate the impact of any identified restrictions, and may request additional information from the proposer, as may be necessary, to evaluate the proposer's assertions. If no restrictions are intended, then the proposer should state "NONE."

A sample list for complying with this request is as follows:

COMMERCIAL			
Technical Data Computer Software To be Furnished With Restrictions	Basis for Assertion	Asserted Rights Category	Name of Person Asserting Restrictions
(LIST)	(LIST)	(LIST)	(LIST)

Table 8

2. NonProcurement Contract Proposers - Noncommercial and Commercial Items (Technical Data and Computer Software)

Proposers responding to this BAA requesting a Grant, Cooperative Agreement, Technology Investment Agreement, or Other Transaction for Prototype shall follow the applicable rules and regulations governing these

various award instruments, but in all cases should appropriately identify any potential restrictions on the Governments use of any Intellectual Property contemplated under those award instruments in question. This includes both Noncommercial Items and Commercial Items. Although not required, proposers may use a format similar to that described in Paragraphs 1.A and 1.B above. The Government may use the list during the source selection evaluation process to evaluate the impact of any identified restrictions, and may request additional information from the proposer, as may be necessary, to evaluate the proposer's assertions. If no restrictions are intended, then the proposer should state "NONE."

3. All Proposers – Patents

   Please include documentation proving your ownership of or possession of appropriate licensing rights to all patented inventions (or inventions for which a patent application has been filed) that will be utilized under your proposal for the DARPA program. If a patent application has been filed for an invention that your proposal utilizes, but the application has not yet been made publicly available and contains proprietary information, you may provide only the patent number, inventor name(s), assignee names (if any), filing date, filing date of any related provisional application, and a summary of the patent title, together with either: 1) a representation that you own the invention, or 2) proof of possession of appropriate licensing rights in the invention.

4. All Proposers-Intellectual Property Representations

   Please provide a good faith representation that you either own or possess appropriate licensing rights to all other intellectual property that will be utilized under your proposal for the DARPA program. Additionally, offerors shall provide a short summary for each item asserted with less than unlimited rights that describes the nature of the restriction and the intended use of the intellectual property in the conduct of the proposed research.

Section F.9: Subcontracting. Pursuant to Section 8(d) of the Small Business Act (15 U.S.C.637(d)), it is the policy of the Government to enable small business and small disadvantaged business concerns to be considered fairly as subcontractors to contractors performing work or rendering services as prime contractors or subcontractors under Government contracts, and to assure that prime contractors and subcontractors carry out this policy. Each proposer who submits a contract proposal and includes subcontractors is required to submit a subcontracting plan in accordance with the FAR 19.702(a) (1) and (2) with their proposal. The plan format is outlined in FAR 19.704.

H.2.8 Section G: Evaluation Factors

This page should summarize, preferably in bullet format, the offeror's self-evaluation of the proposal against the factors defined in Section G of this PIP.

H.3 COST PROPOSAL

In general, the cost proposal should provide summary and detailed cost breakdowns for a phased program as described in the Technical Proposal. Proposers should assume a 1 July 2007 start date.

The government is currently in ongoing discussions with one or more federal agencies to possibly provide experimentation support in the form of facilities, equipment, subject matter experts, experiment and simulation operations, experiment design and control, experiment data collection and analysis, and simulation modification. For Experimentation and Integration tasks, please provide cost options with and without government support. For example, provide facility costs for experimentation at a contractor facility versus a government facility; provide computer workstations costs (hardware, software, and sys admin support) for experimentation at a contractor facility versus a government facility; etc. Please cost out as many options as possible and do the cost analysis for each year, since government support may vary by year.

Volume II of the proposal shall consist of a) a Budget Cover Page, b) a Detailed Cost Breakdown, part 1 and 2, and c) Supporting cost and pricing information.

H.3.1 Cover Page

- Must include the words “Cost Proposal” and shall otherwise be identical to the Volume I cover page as described in Section H.2.1.
- Name and address of Proposer (include zip code);
- Name, title, and telephone number of Proposer’s point of contact;
- Award instrument requested: cost-plus-fixed-fee (CPFF), cost-contract – no fee, cost sharing contract – no fee, or other type of procurement contract (specify), grant, agreement, or other award instrument;
- Place(s) and period(s) of performance;
- Funds requested from DARPA for the Base Effort, each option and the total proposed cost; and the amount of cost share (if any);
- Name, mailing address, telephone number and Point of Contact of the Proposers cognizant government administration office [i.e., Office of Naval Research (ONR) - if requesting a grant, or Defense Contract Management Agency (DCMA) - if requesting other than a grant] (if known);
- Name, mailing address, telephone number, and Point of Contact of the Proposer’s cognizant government audit agency [i.e., Department of Health and Human Services (DHHS) - if requesting a grant, or Defense Contract Audit Agency (DCAA) - if requesting other than a grant] (if known);
- Any Forward Pricing Rate Agreement, other such Approved Rate Information, or such other documentation that may assist in expediting negotiations (if available);
- Contractor and Government Entity (CAGE) Code;

- Dun and Bradstreet (DUN) Number;
- North American Industrial Classification System (NAICS) Number [NOTE: This was formerly the Standard Industrial Classification (SIC) Number];
- Taxpayer Identification Number (TIN);
- All subcontractor proposal backup documentation to include items a. through l. above, as is applicable and available. All proprietary subcontractor proposal documentation of which cannot be uploaded to TFIMS shall be made immediately available to the Government, upon request, under separate cover (i.e., mail, electronic/email, etc.), either by the Proposer or by the subcontractor organization;
- Proposal expiration date (validity period).

H.3.2 Detailed Cost Breakdown

The detailed cost breakdown is to include:

- Total program cost broken down by months within a government fiscal year (GFY) [Note: Government Fiscal Year runs from October 1st to September 30th] and Base and Options; further broken down by major cost items (direct labor by category, subcontracts, materials, travel, other direct costs, overhead charges, etc.) (see Table 9 below for an example format);
- The detailed cost breakdown shall begin with a one page standalone summary table that contains the cost of each major task within each subsystem being proposed by program phase with a total cost for each major task;
- Total program detailed by Phase as specified in Technical Proposal--??
- For estimating purposes, proposers should assume a 1 July 2007 start date;
- Costs of major program tasks (WBS) by year and month. (see Tables 9 and 10 below, also see FAR PAR 15, Table 15-2 for suggested formats/content for cost proposals exceeding the threshold for certified cost and pricing);
- An itemization of major options (labor by category, travel, materials and other direct costs) and equipment purchases by year and month;
- An itemization of major subcontracts (labor by category, travel, materials and other direct costs) and equipment purchases;
- A summary of projected funding requirements by month (see Table 10); and
- The source, nature, and amount of any industry cost sharing, if applicable (Where the effort consists of multiple phases that could reasonably be partitioned for purposes of funding, these should be identified as options with separate cost estimates for each).

H.3.3 Supporting Cost and Pricing Information

Provide supporting information in sufficient detail to substantiate the cost estimates above. Include a description of the method used to estimate costs and supporting documentation. Provide the basis of estimate for all proposed labor rates, indirect costs, overhead costs, other direct costs and materials, as applicable.

Table 9 - Example Detailed Cost Format by Fiscal Year

	GFY 07													GFY 08												
BASE	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	TOTAL	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	TOTAL
Direct Labor - Dollars																										
Direct Labor - Hours																										
Travel																										
Equipment																										
Subcontractors																										
Other ODCs																										
Overhead																										
G&A																										
Fee/Profit																										
Total																										

Note: Further breakout of cost elements (i.e. labor dollars, labor hours, travel, equipment, etc.) for each subcontractor is required.

Table 10 - Example Cost Summary Format

	GFY 07													GFY 08												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	TOTAL	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	TOTAL
BASE																										
OPTION 1																										
OPTION 2																										
Total																										

I PROCUREMENT INTEGRITY, STANDARDS OF CONDUCT, ETHICAL CONSIDERATIONS, AND ORGANIZATIONAL CONFLICTS OF INTEREST (OCIS)

Certain post-employment restrictions on former federal officers and employees may exist, including special Government employees (including but not limited to Sections 207 and 208 of Title 18, United States Code, the Procurement Integrity Act, 41 U.S.C. 423, and FAR 3.104). Accordingly, it has been confirmed that the DARPA Program Manager responsible for this BAA is not assigned under the IPA program. However, prior to the start of proposal evaluations, the Government will assess whether any potential conflict of interest exits in regards to the DARPA Program Manager as well as those individuals chosento evaluate proposals received under this BAA.

All proposers and proposed sub-contractors must affirm whether they are providing scientific, engineering, and technical assistance (SETA) or similar support to any DARPA technical office(s) through an active contract or subcontract, including those such contracts being managed by outside DARPA contracting agents. All affirmations must state which office(s) the proposer supports and identify the prime contract numbers. Affirmations shall be furnished at the time of proposal submission. All facts relevant to the existence or potential existence of organizational conflicts of interest (FAR 9.5.) must be disclosed. The disclosure shall include a description of the action the proposer has taken or proposes to take to avoid, neutralize, or mitigate such conflict (e.g., Mitigation Plan). Should the Government determine that a potential organizational conflict of interest exists of which the offeror did not provide a mitigation plan, such plan may be requested by the Government during proposal evalution(s).

If the situation cannot be mitigated by the contractor, the proposal may be returned without technical evaluation and withdrawn from consideration for award under this BAA.

J AWARD ADMINISTRATION INFORMATION

(1) Central Contractor Registration. Selected Proposers not already registered in the Central Contractor Registry (CCR) will be required to register in CCR prior to any award under this BAA. Information on CCR registration is available at http://www.ccr.gov.

(2) Representations and Certifications. In accordance with Federal Acquisition Regulation 4.1201, prospective Proposers shall complete electronic annual representations and certifications at http://orca.bpn.gov.

(3) Wide Area WorkFlow (WAWF). Unless using another approved electronic invoicing system, performers will be required to submit invoices for payment directly via the Internet/WAWAF at http://wawf.eb.mil. Registration to WAWF will be required prior to any award under this BAA.

K EXPORT LICENSES

The following provision will be incorporated into any resultant contract:

Should this project develop beyond fundamental research (basic and applied research ordinarily published and shared broadly within the scientific community) with military or dual-use applications, the following apply:

1) The contractor shall comply with all U. S. export control laws and regulations, including the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120 through 130, and the Export Administration Regulations (EAR), 15 CFR Parts 730 through 799, in the performance of this contract. In the absence of available license exemptions/exceptions, the Contractor shall be responsible for obtaining the appropriate licenses or other approvals, for obtaining the appropriate licenses or other approvals, if required, for exports of (including deemed exports) hardware, technical data, and software, or for the provision of technical assistance.

2) The Contractor shall be responsible for obtaining export licenses, if required, before utilizing foreign persons in the performance of this contract, including instances where the work is to be performed on-site at any Government installation (whether in or outside the United States), where the foreign person will have access to export-controlled technical data or software.

3) The Contractor shall be responsible for all regulatory record keeping requirements associated with the use of licenses and license exemptions/exceptions.

4) The Contractor shall be responsible for ensuring that the provisions of this clause apply to its subcontractors.

L (ACRONYMS)

ACO	Administrative Contracting Officer
AOR	Area of Responsibility
ARGUS-IS	Autonomous Real-time Ground Ubiquitous Surveillance Imaging System
BAA	Broad Agency Announcement
CBD	Commerce Business Daily
CCD	Charged Coupled Device
CENTCOM	Central Forces Command
CFPA	Composite Focal Plane Array
CMOS	Complementary Metal Oxide Semiconductor
COCOM	Combatant Commands
COTS	Commercial off-the-shelf
DARPA	Defense Advanced Research Projects Agency
DCAA	Defense Contract Audit Agency
EO	Electro-Optical
ER/MP	Extended Range/Multi-Purpose
FAR	Federal Acquisition Regulation
FedBizOps	Federal Business Opportunities
FPA	Field Programmable Arrays
FPGA	Field Programmable Gate Arrays
FPOA	Field Programmable Operational Arrays
GFD	Government furnished data
GFE	Government furnished equipment
GSD	Ground Sample Distance
Gigapixel	10^9 pixels
Gpixel	Gigapixel or 10^9 pixels
HBCU	Historically Black Colleges and Universities
HAG	Height Above Ground
HTML	HyperText Markup Language
IFOV	Instantaneous Field of View
ISR	Intelligence, Surveillance, and Reconnaissance

ITAR	International Traffic in Arms Regulations
IXO	Information Exploitation Office
JTR	Joint Travel Regulations
LOE	Level of effort
MI	Minority Institutions
Mpixel	Mega-pixel or 10^6 pixels
MTI	Moving Target Indicator
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
OPTEMPO	Operational Tempo
Pd	Probability of Detection
PIP	Proposer Information Pamphlet
PWB	Printed Wiring Board
SETA	Scientific and Engineering Technical Assistance
SOW	Statement of Work
TIN	Taxpayer Identification Number
TOC	Tactical Operations Center
UAS	Unmanned Aerial Systems
UAV	Unmanned Aerial Vehicles
VCSEL	Vertical Cavity Semiconductor Emitting Lasers

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