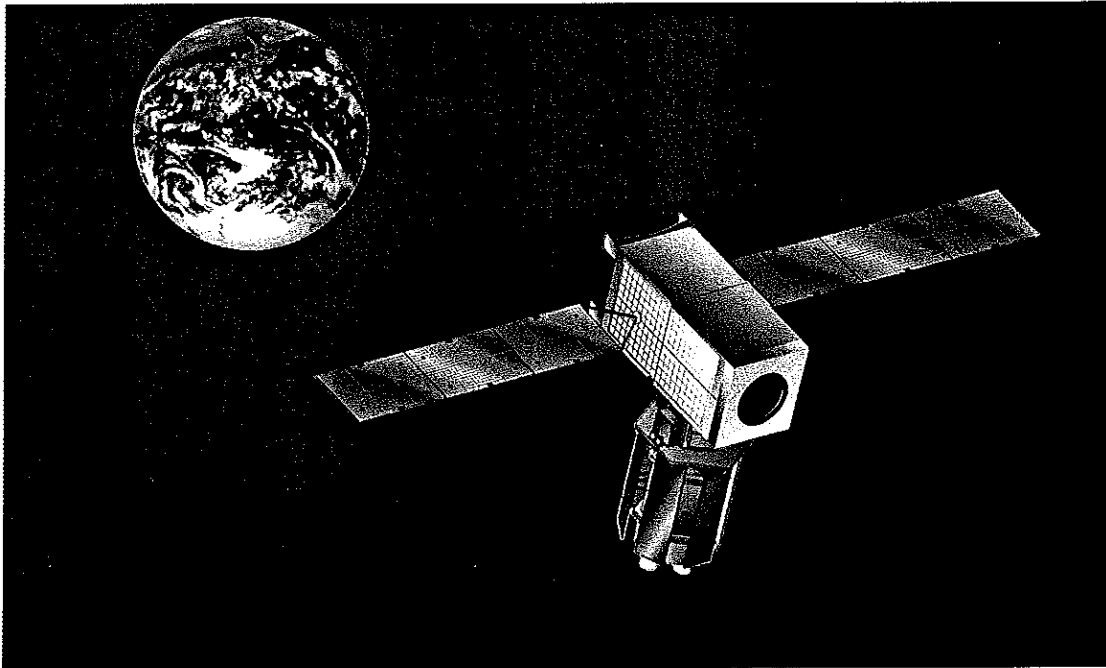


**ORBITAL EXPRESS
ADVANCED TECHNOLOGY DEMONSTRATION
(OE ATD)**

PHASE II

**SELECTION PROCESS DOCUMENT
("SOLICITATION")
PS02-03**



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**Defense Advanced Research Projects Agency
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Appendix A - JPL Sensors

List of Acronyms

AFSCN	Air Force Satellite Control Network
AGN&C	Autonomous Guidance, Navigation and Control
ASTRO	Autonomous Space Transfer and Robotic Orbiter
ATD	Advanced Technology Demonstration
BAA	Broad Agency Announcement
BAC	Budget At Completion
BMDO	Ballistic Missile Defense Organization
C&DH	Command and Data Handling
CAIV	Cost as an Independent Variable
CAS	Cost Accounting Standards
CDR	Critical Design Review
CMS	Configuration Management System
CONOPS	Concept of Operations
DARPA	Defense Advanced Research Projects Agency
DoD	Department of Defense
DSMC	Defense Systems Management College
FCCM	Facilities Capital Cost of Money
FDO	Fee Determining Official
FDR	Final Design Review
FFRDC	Federally Funded Research and Development Center
FOM	Figure of Merit
FOT&E	Follow-On Test and Evaluation
FOUO	For Official Use Only
FOV	Field Of View
FRR	Flight Readiness Review
G&A	General and Administrative
GFE	Government Furnished Equipment
GFF	Government Furnished Facilities
GFI	Government Furnished Information
GFP	Government Furnished Property
GFS	Government Furnished Services
GFY	Government Fiscal Year
IAW	In Accordance With
ICD	Interface Control Document
IFX	Integrated Flight Experiment
IMP	Integrated Master Plan
IMS	Integrated Master Schedule
IPPD	Integrated Product and Process Development
IRAD	Internal Research and Development
IV&V	Independent Verification and Validation
JPL	Jet Propulsion Laboratory
LCCE	Life-Cycle Cost Estimate
LOS	Line Of Sight
LRE	Latest Revised Estimate

MSFC	Marshall Space Flight Center
MSR	Mars Sample Return
NDA	Nondisclosure Agreements
NEXTSats	Next Generation of Satellites
OCI	Organizational Conflict of Interest
ODC	Other Direct Cost
ODP	On-Orbit Demonstration Plan
OE	Orbital Express
OEDS	Orbital Express Demonstration System
OEOS	Orbital Express Operational System
OOS	On-Orbit Servicing
ORU	Orbital Replacement Unit
OSC	Operational System Concept
OTA	Other Transactions Authority
PC	Probable Cost
PDR	Preliminary Design Review
PM	Program Manager
R&D	Research and Development
RAMP	Risk Assessment and Mitigation Plan
RDF	Radio Direction Finder
ROMS	Reference Operational Mission Selection
SBIR	Small Business Innovation Research
SBL	Space Based Laser
SCD	System Capability Document
SCI	Sensitive Compartmented Information
SDD	System Definition Document
SETA	System Engineering and Technical Assistance
SIS	Servicing Interface Specification
SLOC	Source Lines of Code
SRD	System Requirements Document
TDD	Task Description Document
TDP	Technology Development Plan
TP	Transition Plan
TPM	Technical Performance Measure
UHF	Ultra High Frequency
WO	Work Outline

1. Introduction

The Defense Advanced Research Projects Agency (DARPA) is pleased to offer you the opportunity to respond to the Orbital Express (OE) Advanced Technology Demonstration (ATD) Phase II solicitation.¹ As you explore this solicitation we believe you will appreciate this unique opportunity to work in partnership with the U.S. Government to demonstrate the operational utility, cost effectiveness, affordability, and technical feasibility of a new architecture for on-orbit satellite servicing. This architecture will enable autonomous, preplanned, on-orbit electronics upgrade, refueling and reconfiguration of satellites that will be capable of supporting a broad range of future U.S. national security, civil and commercial space programs.

1.1. Vision

The Orbital Express program is envisioned to set the stage for the establishment of an on-orbit satellite servicing infrastructure for routine, cost-effective, autonomous capability for resupply and reconfiguration of on-orbit spacecraft in the post-2010 timeframe. We believe an Orbital Express-derived satellite servicing architecture will usher in a revolution in space operations, enabling new and enhanced satellite capabilities supporting not only national security missions, but civil and commercial space activities as well.

DARPA strongly believes that routine, autonomous satellite servicing will provide spacecraft with unprecedented freedom of maneuver, allowing satellite coverage to be adjusted or optimized at will, or enabling spacecraft to employ unpredictable maneuvers to counter possible threats or adversary activity scheduling. We also anticipate that routine, autonomous, preplanned upgrades or reconfiguration of spacecraft components will dramatically reduce the "time to market" of new technology into operational satellites, increasing mission performance more efficiently than through block replacements of satellite constellations.

DARPA's vision of post-2010 space operations foresees satellites designed and equipped with Orbital Express-derived standardized mechanical and electrical interfaces enabling their automated receipt of fluid consumables (fuel and cryogenics) and upgraded electronic components via an unmanned servicing spacecraft (we're calling it an Autonomous Space Transfer and Robotic Orbiter vehicle, or ASTRO). DARPA also envisions that

¹ Advanced Technology Demonstrations (ATDs) are used by the Department of Defense to develop, demonstrate, and evaluate emerging technologies, and are typically integrated demonstrations conducted to assess the feasibility and maturity of an emerging technology. They provide a relatively low-cost approach for assessing the technical risks and uncertainties associated with critical technologies prior to their possible incorporation into a system entering the formal acquisition process. If successful, an ATD can lead to a distinct acquisition program, or its demonstrated technologies can be integrated into another, larger acquisition program.

the ASTRO spacecraft will be capable of carrying and independently operating microsattellites as functioning ASTRO payloads.

In order to take advantage of an on-orbit servicing infrastructure, the next generation of satellites (or "NEXTSats") will have to be designed to enable routine, autonomous on-orbit servicing. A non-proprietary, "open" industry standard for satellite-to-satellite servicing interfaces must be adopted to ensure on-orbit servicing compatibility among ASTROs and NEXTSats designed and produced by different manufacturers. NEXTSats must also be designed such that fluid transfer interfaces and Orbital Replacement Unit (ORU) installation ports are unobstructed and readily accessible by an autonomous servicing spacecraft.

DARPA believes the success of the Orbital Express ATD program will facilitate the realization of our vision of routine, autonomous on-orbit satellite servicing, and in so doing will prompt a revolution in both system acquisition and in the flexibility with which national security, civil and commercial space systems are employed.

Each contractor team's Orbital Express Operational System (OEOS) designs have been developed to effectively and affordably perform the on-orbit servicing missions in the post-2010 timeframe. Each contractor team has also developed a preliminary design for an Orbital Express Demonstration System (OEDS) based on each team's Operational System Concept (OSC) vision and the Phase II ATD objectives. The Government will evaluate both your OEOS and OEDS designs as part of the Phase II source selection process.

You are now being asked to provide a response for the Orbital Express ATD Phase II solicitation that defines your approach for conducting the Phase II ATD. This ATD encompasses an on-orbit demonstration, potentially incorporating several optional payloads/experiments, as well as Follow-On Test and Evaluation (FOT&E) activities. This response should represent your assessment of the most cost effective and efficient manner to address the specific objectives of each of these activities while reducing the risks and promoting confidence in adopting on-orbit servicing in post-2010 satellite systems.

Each of your OEOS designs has unique risk reduction requirements; therefore the Government will not provide a detailed list of critical and enabling technologies and processes or system performance specifications that must be demonstrated during Phase II or the FOT&E activities. Your response should define what you believe to be the optimal path based on a compilation of the individual risk mitigation plans associated with each of your technologies and processes and the Government's technical and programmatic objectives. The specific activities proposed in your response will therefore be unique to your operational design and its system demonstration, and its risk reduction requirements.

It is up to you to identify an appropriate process for defining the technical and programmatic risks associated with your Orbital Express operational vision and for

laying out a program plan that will address them. You should construct an overall program that addresses all critical and enabling technologies associated with your operational system and that will provide the data required for the Government to adopt your system for use on future satellite systems. Your Phase II activities must convincingly demonstrate that your OE vision is technically feasible, sufficiently mature, and will provide the mission utility and operational value that the DoD space architecture requires.

In your response you will provide separate, but integrated, Phase II & FOT&E Program Plans and OEDS System Definitions. The Phase II portions of your Task Description Document (TDD) and Integrated Master Plan (IMP), along with your Phase II Program Plan and Milestone Review & Award Fee Plan form the basis for your proposed Phase II agreement. You are also being asked to provide information on optional tasks for your proposed FOT&E activities. In addition, the government is contemplating other optional tasks which may be negotiated at a later date.

Your Phase II challenge is to complete the design, development, fabrication and demonstration of your OEDS within constrained funding. Your OEDS must address all the Orbital Express Phase II ATD non-tradable objectives, meet all your Phase II demonstration requirements, be compatible with your overall risk mitigation plans, and provide a residual test asset that supports your proposed FOT&E activities.

You must use your best judgment in developing a proposal that will maximize the amount of technology demonstration and risk reduction to provide the best value to the Government. To successfully meet this challenge, you will have to use lean business practices, leverage Government and industry research programs, facilities, and technical expertise and define an innovative combination of simulation, ground, and on-orbit test activities. DARPA looks forward to working together with you to demonstrate that on-orbit servicing can be an effective and affordable asset to the DoD space architecture and to make your Orbital Express Operational System a reality.

1.2. Program Philosophy

DARPA believes the Orbital Express ATD will redefine how we design and operate spacecraft in the future. You have further refined the details of that philosophy during the Orbital Express Phase I program. The Operational System Concept developed in Phase I illustrates a vision of routine, autonomous resupply and reconfiguration of Earth-orbiting spacecraft in the post-2010 timeframe. This solicitation asks you to advance your ideas and concepts to achieve an imaginative and innovative demonstration of these ideas and to "push the envelope" both technically and operationally. DARPA will not provide traditional specifications or a statement of work. The ideas and concepts developed during Phase I will bound your objectives in this solicitation and provide guidance on preparing your response. Phase I has set the bounds of the problem, and you, the offeror, will translate your Operational System Concept (OSC) into a conceptual design for a post-2010 Orbital Express Operational System (OEOS), and a design for an Orbital Express Demonstration System (OEDS) that will provide a best value solution to our ATD objectives.

The products of the Orbital Express ATD must enable decision makers to determine whether on-orbit satellite servicing is sufficiently useful, cost effective, affordable, and technically feasible to implement the Orbital Express architecture after completion of the ATD's on-orbit demonstration and FOT&E activities. The following elements are key to the success of the Orbital Express ATD, and should be emphasized during Phase II:

- Cost effectiveness and affordability of satellite servicing
- Development and demonstration of a standardized satellite-to-satellite servicing interface
- Development and demonstration of autonomous satellite servicing operations
- Exploitation of autonomous robotics

1.2.1. Cost Effectiveness, Life-Cycle Cost and Affordability

Estimating the Orbital Express Operational System cost effectiveness and life-cycle cost is critical to establishing the viability of routine satellite servicing. Therefore, the offeror must ensure that the ultimate Operational System and Demonstration System design requirements reflect a balance between capability and affordability, and recognize that the cost-effectiveness of both the Demonstration System and the envisioned Operational System will be critical to the success of the Orbital Express ATD program.

For the Operational System, cost-effectiveness should be optimized using scenarios and mission benchmarks representative of missions in the post-2010 timeframe. For the Demonstration System, emphasis should be placed on providing maximum capability to the Government for a pre-determined level of Phase II funding. Accordingly, we expect the offeror to conduct continuous cost/performance trade-offs throughout the course of the Orbital Express program to arrive at the best solution and to perform the most meaningful demonstration of critical portions of the Operational System with their proposed Demonstration System. Thus, for the Demonstration System, the offeror shall utilize extensive Cost as an Independent Variable (CAIV) parameters and processes to support Orbital Express "design-to-cost" objectives.

1.2.2. Non-Proprietary Satellite Servicing Interface Specification

Central to the realization of DARPA's vision for future space operations is the availability of a non-proprietary specification for satellite-to-satellite servicing interfaces for use on satellites designed and produced by different manufacturers. To facilitate the emergence and acceptance of a standard servicing interface, the contractor shall develop an Interface Control Document (ICD) for each of the specified Non-Proprietary Interfaces. These ICDs shall be compiled into a satellite Servicing Interface Specification (SIS), which will serve as a single source for definition of all Non-Proprietary Interfaces. Non-Proprietary Interfaces are defined as those features that relate to the areas where the ASTRO touches the NEXTSat, Commodity Payload, ORU or microsatellite.

The ICDs will contain all interface dimensions and performance requirements necessary to meet the objective of the system. DARPA is not interested in a classified satellite-to-

satellite interface design, a proprietary design, or an interface design lacking legacy beyond the Orbital Express on-orbit demonstration.

A specific DARPA objective in the Orbital Express ATD program will be to take delivery of the final Servicing Interface Specification (SIS). The SIS must be delivered to the Government free of restriction for their use, including further distribution. The interfaces which must be defined as non-proprietary are illustrated in Figure 1-1. The interfaces between the ORU and the Depot/Serviceable Satellite into which the ORU is connected are permitted to be defined as proprietary.

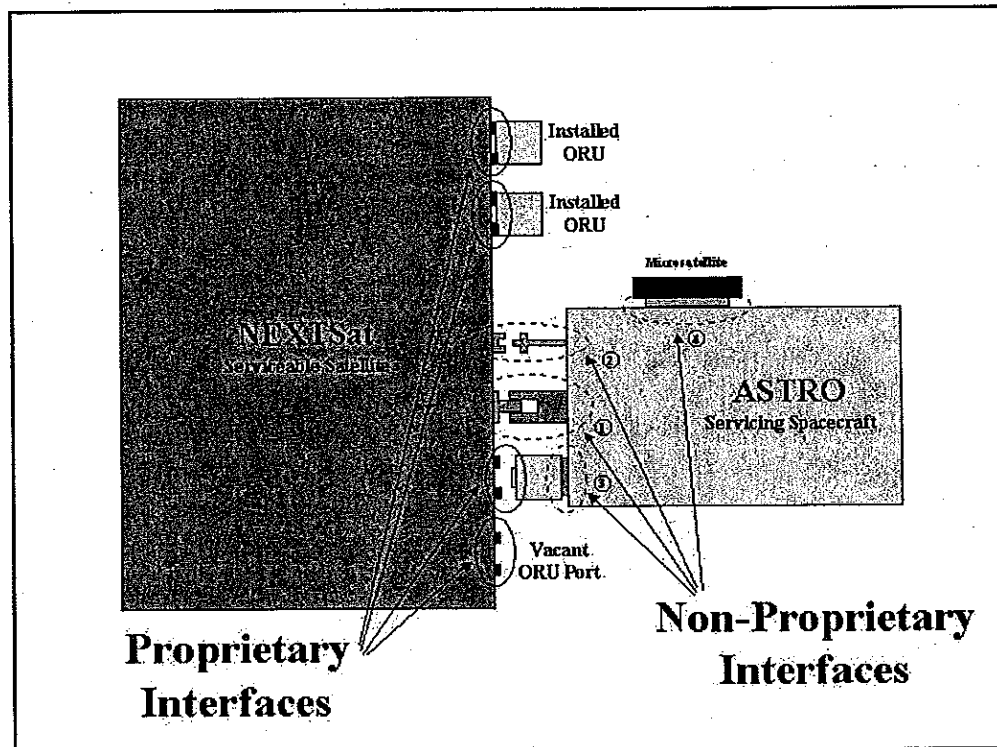


Figure 1-1: Non-Proprietary and Proprietary Interfaces

1.2.3. Design and Manufacture of Demonstration System

To ensure maximum credibility in demonstrating the Orbital Express satellite servicing interface, and to substantiate that the Demonstration System interface can serve as a de facto initial industry standard, the prototype ASTRO servicing spacecraft and the spacecraft functionally emulating the prototype NEXISat serviceable satellite and a space commodity payload must be manufactured by different team members.

1.2.4. Autonomous Operation

DARPA's ultimate goal for an on-orbit satellite servicing infrastructure is fully autonomous operation. As such, DARPA is not interested in an on-orbit demonstration that relies on remote control from the ground or space. Accordingly, the design and development of the ASTRO servicing spacecraft's prototype Autonomous Guidance,

Navigation and Control (AGN&C) system, and the procedures for interacting with ground control stations are key elements of the Orbital Express ATD program

1.2.5. Technology Risk Reduction

DARPA reserves the right to support separate technology risk reduction efforts in parallel with the Orbital Express system definition and design activity. Risk reduction efforts may be solicited separately in future Research Announcements, Broad Agency Announcements (BAAs), or possibly through Small Business Innovation Research (SBIR) efforts. It is the Government's intention that industry teams who are awarded Orbital Express definition and design efforts as a result of this solicitation should continuously assess whether and how parallel risk reduction performers could be added to their teams.

1.2.6. Use of Section 845 Authority

Phase I of the Orbital Express ATD program was executed as an "Other Transaction for Prototypes," using DARPA's authority under Section 845, National Defense Authorization Act for Fiscal Year 1994, as amended. The flexibility of this authority permitted wide latitude in tailoring business, organizational and technical relationships to achieve program goals, and relieved team members of expensive and burdensome Government oversight. Section 845 authority also offered the teams the flexibility to adopt alternative business and technical practices as desired, and allowed much freer exchange of information between the Government and industry team members.

The Phase II award will be an agreement modification to the existing Section 845 Agreement for the winning Phase II team, not a new agreement or new contract. Thus, the competition for Phase II will be limited to the teams selected for Phase I.

It is our intention to negotiate business issues such as intellectual property rights, foreign technology transfer, payable event schedule, deliverables, consortium agreements, costs, and any other issues associated with the model agreement, and consider the best value offered to the Government in the Phase II award decision.

1.3. Solicitation Package Overview

In response to this solicitation you are asked to submit documentation as specified in Section 2 of the solicitation. Parts of your solicitation response will be integrated into a Section 845 Agreement that will govern the relationship between you and the Government during this program. Offerors are expressly charged with knowledge of the contents of the entire solicitation. Following is an overview of each section of this solicitation and its intended use:

Program Description: This section of the solicitation describes the motivation, goal, and objectives of the entire program and provides details on the scope of your work effort. This section also provides the offeror with an overview of the contracting mechanism and financial resources available to the program.

Proposal Guidance: This section of the solicitation provides the offeror guidance for the development of a unique Task Description Document (TDD), Integrated Master Plan (IMP) and Integrated Master Schedule (IMS). This section provides administrative and format guidance for preparing and presenting proposals in response to this solicitation. This includes instructions for preparing the Executive Summary, Technical Volume, and Cost Response. Although these instructions are not intended to be all-inclusive, they should be considered by each offeror as they develop their proposed Agreement.

Evaluation Criteria: This section is intended to give the offeror a clear picture of how the Government will evaluate proposals.

DARPA Agreements Authority/Section 845: This section explains the Other Transactions Authority (OTA), Section 845, 1994 National Defense Authorization Act and how it applies to this solicitation.

Award Fee Plan Example: An example for your use in developing your proposed Milestone Review and Award Fee Plan. This is notional only.

2. Program Description

2.1. Motivation

Today's Department of Defense (DoD) space architecture has significant limitations that would be substantially mitigated – perhaps eliminated – by the adoption of on-orbit satellite servicing. The lack of an on-orbit servicing capability forces satellite designers to trade propellant (and other consumable) mass, payload mass, and bus mass to meet required satellite lifetimes or launch vehicle limitations. As a result, DoD satellites have minimal maneuverability, resulting in easily predictable orbital characteristics, allowing adversaries to schedule their activities around satellite access opportunities. The absence of maneuverability also severely limits the ability of DoD constellations to quickly respond to real world operational contingencies by modifying their orbits to optimize coverage. Finite quantities of onboard fuel and cryogenic consumables also impose absolute limits on the mission lifetime of satellites. In addition, lengthy satellite development and deployment timeframes result in obsolescent technology on-orbit, with no timely means to upgrade performance.

DARPA strongly believes that routine automated on-orbit satellite servicing, refueling and selected bus/payload equipment upgrades can extend the useful lifetime of satellites and provide spacecraft with unprecedented freedom of maneuver. This newly enabled freedom would allow satellite coverage to be adjusted or optimized at will or, alternatively, would enable spacecraft to employ unpredictable maneuvers to counter possible threats or adversary activity scheduling. DARPA also anticipates that routine autonomous preplanned upgrades or reconfiguration of spacecraft components can significantly reduce the time required to insert new technology into operational spacecraft, improving performance and providing flexibility to respond to an evolving threat environment.

The results from a successful Phase II program will convince the Government that:

1. The effectiveness, affordability and system attributes predicted for the OEOS are technically feasible;
2. The remaining technical risks can be affordably reduced to support low risk entry into future satellite systems; and
3. An Orbital Express on-orbit servicing system is the optimal choice for post-2010 satellite constellations

2.2. Goals

The top-level goals of the OE ATD Program are to demonstrate the technical feasibility and operational utility of adding an on-orbit satellite servicing infrastructure to the DoD space architecture, and to understand the affordability issues involved with a servicing

infrastructure to support continued development for eventual transition into future operational satellite systems.

2.3. Objectives

2.3.1. Orbital Express ATD Phase II

The primary objective of the OE ATD is to design, develop, integrate, and demonstrate the critical technologies, processes, and system attributes pertaining to an operational on-orbit satellite servicing system. Therefore, the derived objective of Phase II is to design, develop and fabricate two satellites and to execute the risk reduction, modeling and simulation, ground and on-orbit test, and system level demonstration activities necessary to validate the associated technologies. The Phase II contractor will conduct an innovative demonstration program to validate the technical feasibility of their OEOS vision and to address all the critical and enabling technologies associated with their unique OEOS design and Concept of Operations (CONOPS).

At a minimum, the offeror's Phase II program plan will achieve the following specific ATD objectives in such a way that they explicitly address all aspects of their OEOS design:

- Develop and demonstrate on-orbit a non-proprietary satellite servicing interface specification;
- Develop and demonstrate on-orbit an AGN&C system;
- Demonstrate on-orbit autonomous rendezvous, proximity operations, and docking;
- Demonstrate on-orbit fluid transfer between a depot/serviceable satellite and a servicing satellite (ASTRO);
- Demonstrate on-orbit ORU transfer between the two satellites (ASTRO and NEXTSat proxy) and verify operation of the ORU;
- Continue to refine conceptual operational missions that would benefit from a servicing infrastructure;
- Continue to refine mission utility analyses and OE life-cycle cost estimates to understand affordability issues; and
- Continue to develop transition plans from the OE demonstration to operational satellite systems.

The contractor's approach to meeting each of these objectives is directly dependent on their OEOS CONOPS, system design, and unique product development philosophies and processes. Focus should be placed on those technologies integral to OE objectives, and especially those unique to the contractor's OEOS which are critical to validating its mission performance capabilities. Some of these objectives may be met through careful melding of ATD and external Government and industry funded activities.

While these demonstration objectives are not tradable, DARPA recognizes that these baseline objectives could be achieved with various degrees of traceability to an operational system, with the degree of traceability constrained by program funding. Your proposal should address what you believe are the minimum levels of demonstration required (based on your Phase I analyses), as well as the potential for enhanced levels of demonstration or risk reduction that would provide for a better transition to an operational satellite servicing system.

While the Government will not specify a detailed mechanism for achieving each objective, it is anticipated that the contractor will conduct an innovative research and development program which creatively employs the best aspects of simulation, ground tests, and on-orbit tests. Each objective must be addressed in a manner that explicitly validates the technical feasibility of the most demanding aspects of the contractor's OEOS CONOPS. This level of fidelity defines a technology maturity threshold that must be captured in an unambiguous set of program completion criteria.

2.3.2. Follow-On Test and Evaluation

After the initial demonstration, DARPA will seek another Government agency to conduct FOT&E using the OE Demonstration System. One could look at the FOT&E as system qualification following technology demonstration. The objective of this (currently unfunded) optional task is to increase confidence in system reliability, repeatability, and robustness to contingencies by conducting additional servicing operations using residual capability in the OEDS.

To facilitate the transfer of the OE Demonstration System to the Government agency conducting FOT&E activities, compatibility with the AFSCN ground station network is desired. Alternate ground communications are acceptable for the OEDS Phase II demonstration period, but the communication system design should not preclude the use of the AFSCN network for FOT&E activities.

2.4. Program Approach

2.4.1. Acquisition Strategy

The Orbital Express ATD program is divided into two distinct phases, as shown in Figure 2-1. During Phase I, DARPA awarded three Section 845 agreements. Phase I teams identified, defined and analyzed the requirements for on-orbit satellite servicing; performed utility, cost effectiveness and life-cycle cost analysis; developed and refined an OSC; nominated baseline satellite servicing missions; and defined a servicing CONOPS. Teams then submitted their preliminary analyses and trade study results at Milestone 1. Following Milestone 1, DARPA conducted a Reference Operational Mission Selection (ROMS) meeting and established the reference missions.

Following the selection of the ROMS, Phase I teams initiated risk reduction Research and Development (R&D) activities; developed a conceptual design of an Operational System; and completed preliminary design of a Demonstration System.

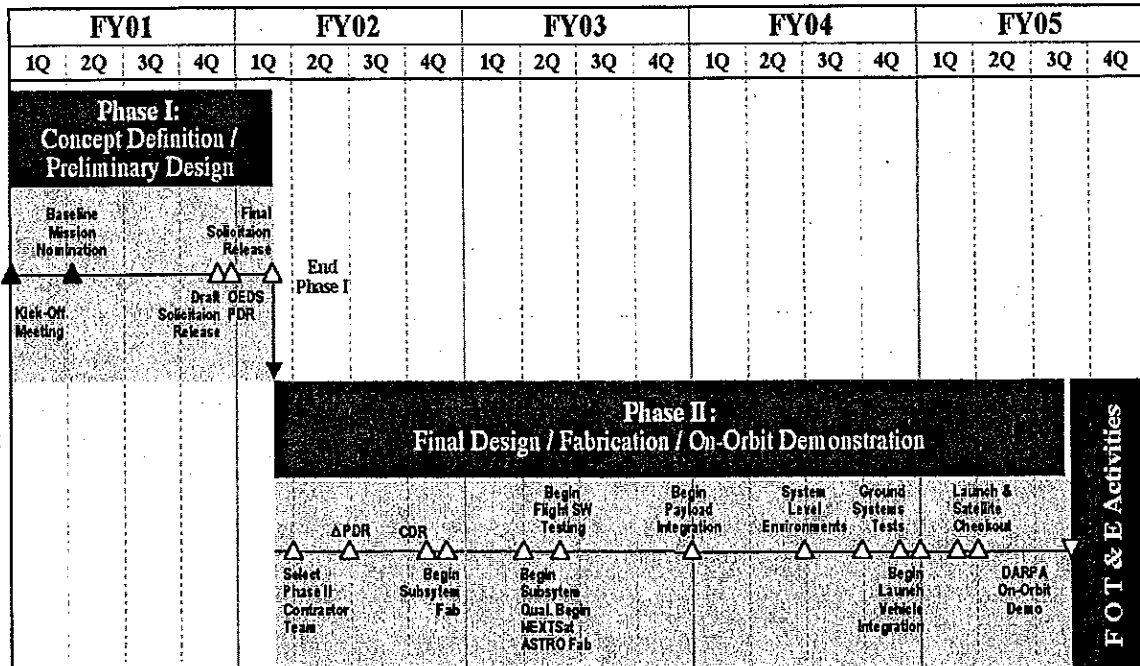


Figure 2-1: Notional Orbital Express Program Schedule

The acquisition strategy for Phase II ATD efforts will be for the Government to select at least one Phase I team to complete the Demonstration System design; continue risk reduction R&D activities; develop, fabricate, integrate and test, and space-qualify the Demonstration System; support spacecraft / launch vehicle integration; arrange ground facility support for on-orbit test operations; and conduct an on-orbit satellite servicing demonstration using the Demonstration System to perform multiple satellite servicing cycles involving automated satellite-to-satellite transfers of both fluids and hardware. Team composition for Phase II may be fluid, to allow the inclusion of parallel risk reduction performers (see Section 1.2.5), if appropriate. Team members from the two Phase I teams not selected for Phase II may be added to the Phase II team, at the discretion of the Phase II team lead, where added value to the Government would result.

2.4.2. Orbital Express Demonstration System

Phase II is anticipated to last approximately 42 months. During Phase II, the contractor will design, develop, integrate and demonstrate an OEDS that will address all the Phase II program objectives and will mature and validate the critical and enabling technologies associated with their OEOS design. Phase II activities should be prioritized so that the limited fixed resources are applied to the specific objectives of the ATD and to the most important issues associated with validating the effectiveness and affordability projections for the contractor's OEOS design. Once the ATD has successfully demonstrated the technical feasibility of an OE system, it is important to seamlessly shift the focus to the

demonstrations of mission utility and operational value and the incorporation of insights gained into refining the OEOS life-cycle cost estimates. The contractor team proposal should address all aspects of the OEOS design maturation consistent with the contractor's OEDS approach.

While the Phase II OEDS will include two separate space vehicles, one control element and associated unique support equipment and documentation, the complete system will consist of more than just these physical items. The OEDS is defined as the unique set of software and hardware systems required to accomplish all of the risk reduction, on-orbit testing, end-to-end system demonstrations, and operational evaluations necessary to achieve the objectives of the OE ATD. Thus, the Phase II Demonstration system hardware and software must not only be sufficient for addressing the Phase II program objectives, but should also provide the best possible foundation for the FOT&E activities. As such, the contractor shall have the responsibility to ensure all functions, interfaces, etc. across the various OEDS components are "integrated" in a cost-effective and timely manner.

The contractor's ground station and communications concept should address the issue of data security. Satellite uplinks and downlinks should be encrypted, as should all data transfer between the ground station and any remote satellite control centers or data processing facilities. Data should be protected as FOUO (For Official Use Only), but the selected data security approach should not preclude the possibility of upgrading the system to handle classified material.

The OEDS should be traceable to the OEOS to the maximum extent practicable; however, the government anticipates that cost and schedule constraints will preclude a demonstration with the complete functionality required for the OEOS. It is the contractor's responsibility to determine the subset of the OEOS requirements that should be included in the OEDS, to provide the greatest reduction in risk for transition to System Development and Demonstration, and to justify these choices to the Government. While technologies, manufacturing processes or hardware features that enable the low life-cycle cost predictions for the OEOS may require validation, they do not necessarily have to be incorporated on the OEDS test vehicles or systems.

It must be stressed that Mission Effectiveness and Affordability are both critical and equal attributes of the OE ATD. Assumptions regarding mission CONOPS can greatly affect the overall effectiveness and affordability predictions. To the maximum extent possible, the contractor should seek to continuously validate these assumptions and corresponding cost modeling efforts during Phase II. These rigorous mission effectiveness and cost modeling activities will help to provide confidence to the Government that the OEOS meets the effectiveness and affordability objectives as defined in Phase I.

2.4.3. OEDS Launch Services

DARPA is responsible for providing launch services for the OEDS. DARPA is exploring launch opportunities through the DoD Space Test Program and other rideshare

opportunities. In order to provide the greatest flexibility in obtaining a launch, your baseline design for the OEDS should be for the most stressing case: a total launch mass of approximately 1000 kg (including launch vehicle adapters) and a volume to fit within the shroud of an Orbital Sciences Taurus launch vehicle. Other potential launch vehicles identified at this time include rideshares on a Delta II and the Space Test Program Delta 4 (4, 0) currently scheduled for launch in FY05. In order to better use the capacity of these launch vehicles, you should identify potential growth paths for the OEDS and an estimate of the costs involved in this larger OEDS. The level of detail desired for the OEDS "Grande" option is described in Section 2.5.3.

2.5. Optional Tasks

In addition to the baseline OEDS, there are a number of optional tasks that may be undertaken if additional program funding is identified. Your proposal should respond to these areas; however, this response will not count against the page limits described in Section 3.2.1 of this solicitation. Your response to these optional activities will be considered in the technical evaluation of your proposal; however, it will be of lesser importance than your response to the "base" program. i.e., a superior (or inferior) rating of your response to the optional tasks will not significantly change the overall rating of your proposal.

Although the specific details are still evolving it is appropriate for planning purposes to obtain a ROM cost estimate through PDR and then a ROM cost estimate through implementation for the Optional Tasks. When a formal ROM cost estimate for either of these items is not possible, then at least the identification of the anticipated tasks and work-months should be provided in the proposal. Nevertheless, it is anticipated that some basic assumptions regarding the Option schedule relative to those for the Baseline schedule (IMS) would be included in the response. We fully understand that the ROMs provided would eventually be superseded by more formal firm cost quotes once the Optional Tasks are exercised.

2.5.1. FOT&E

Define additional servicing operations that would increase confidence in system reliability, repeatability and robustness to contingencies by using residual capabilities in the OEDS.

2.5.2. Operation with Microsats

In an operational system, DARPA envisions ferrying and other operations with microsattellites as a mission for the ASTRO servicing satellite. You should develop concepts for inclusion of a government-furnished microsattellite in the on-orbit demonstration and identify the scope of the effort required to integrate and operate a microsat in the OEDS. These concepts should include identification of interface requirements (mechanical, electrical, etc) between the microsattellite and the servicing satellite. For purpose of this solicitation, a microsat is defined as a satellite between 10

kg and 100 kg (wet weight), which may have limited propulsion, power, and communication systems.

As part of your response to this optional task, you should identify any constraints your OEDS design imposes on microsatellite accommodation, such as microsat mass, volume, etc. Demonstration missions involving microsats would include some or all of the following:

- Act as an independent witness to OEDS experiments, relay video from microsat to a ground station (Real time or stored)
- Host microsat on the OEDS ASTRO or NEXTSat vehicle during launch
- Deploy microsat
- Track microsat location
- Stationkeep with microsat
- Relay microsat telemetry to a ground station (Real time or stored)
- Relay ground station commands to microsat (Real time or stored)
- Grapple/Dock with microsat
- Restow microsat on ASTRO or NEXTSat

2.5.3. OEDS "Grande"

DARPA does not desire a rigorous engineering design for a "super-sized" OEDS in your proposal, but is interested in obtaining concepts, as well as the scope of the effort required to create an OEDS "Grande." Proposers should provide a ROM estimate to develop their concept to a PDR level of detail and a ROM estimate to fully exercise this option.

2.5.4. Auxiliary Payloads

Carrying auxiliary payloads on the OEDS is desirable, but not required. You should identify excess volume, mass, and power on your OEDS that could be used for an auxiliary payload on your OEDS in your proposal, and thoughts on candidate payloads. DARPA will make the final decisions whether an auxiliary payload will be manifested, relying on the Phase II contractor for technical advice on payload compatibility. The cost of integration, test, and operation of an auxiliary payload is outside the scope of this OEDS, and will be negotiated separately from this solicitation

The NASA Jet Propulsion Laboratory (JPL) will be performing autonomous rendezvous and docking as part of the Mars Sample Return (MSR) mission and, in preparation for this mission, JPL has identified several sensors that may require validation in space. In addition to identifying available capacity for generic auxiliary payloads, your proposal should address the feasibility of carrying each of these sensors as auxiliary payloads on the OEDS, as well as an estimate of the level of effort required to take this concept to a PDR level of detail. Details on these sensors are provided in Appendix A.

OEDS is being considered as an option for the JPL Mars Program technology validation tests. The current Mars Program sensor configuration could change based on on-going

trade studies, budget constraints, etc. The sensor suite JPL would choose to fly on the OEDS could be any combination of one, all, or none of the sensors chosen for the Mars Sample Return mission. Availability of sensors outside of direct JPL participation in OEDS is unlikely. Leveraging JPL sensors for the OEDS at this time should be considered a high risk prospect. JPL is working to have participation concept for OEDS finalized before Phase II contract award so that integrated design can be worked for Delta-PDR.

2.5.5. Space Based Laser Integrated Flight Experiment (SBL IFX)

The SBL IFX Program Office is evaluating implementation of on-orbit servicing on their flight experiment, and investigating participation in OE to provide a satellite servicing interface standard that could be used on their space vehicle. Goals of SBL IFX participation in OE would be a more robust demonstration system (closer to an objective system), potential tailoring of some elements of the demonstration to better suit their requirements, and to obtain technical advice for implementation of the OE satellite servicing interface on the Space Based Laser (SBL) Integrated Flight Experiment (IFX) space vehicle. (Laser reactant transfer shall not be included as part of this more robust demonstration.)

The offeror should provide a ROM for technical support. Section 2.9 of this solicitation also requests a description of a more robust demonstration program with 120% of the baseline program funding. The offeror should provide a description of a more robust OEDS in response to Section 2.9, and only provide a discussion of how this robust OEDS would better benefit SBL IFX in response to this optional task.

2.6. Program Documents

The contractor will develop and maintain a set of program documents that will contain, at a minimum, details of the planned approach for continuing to refine the OEOS design, developing the OEDS, and conducting demonstrations with the OEDS to achieve the objectives of Phase II. The following sections provide additional information regarding these documents.

2.6.1. OEDS Risk Assessment and Mitigation Plan and Technology Development Plan (RAMP/TDP)

The contractor will develop and maintain a Risk Assessment and Mitigation Plan and Technology Development Plan (RAMP/TDP) that will define their overall approach to mitigating risk and maturing their OEDS design. The RAMP/TDP should describe all risk reduction, technology and process development and maturation, and operational evaluation activities that must be conducted prior to executing the demonstration. The plan will address all activities proposed for Phase II and will specifically address the individual risk mitigation plans associated with each of the contractor's critical and enabling technologies and processes. It will provide a summary of all risk mitigation/technology development activities, indicating the proposed cost, schedule, criticality, degree of risk mitigation/technology development achieved and all

contingency or fallback plans. This plan will provide the Government with a full appreciation for the total cost of bringing the contractor's demonstration system concept to a level suitable for execution.

The contractor shall implement the Phase II portion of their RAMP/TDP and will maintain and update this document on an on-going basis based on the developments both within and outside the program. This document will be formally revised on a regular basis to incorporate all changes to date including any revisions in cost, schedule or technical content. At the completion of the Phase II ATD, the contractor will deliver a revised RAMP/TDP defining their revised plans for follow-on activities.

The RAMP/TDP will contain an overview development and execution section describing the contractor's approach for developing, maintaining and executing this plan. The RAMP/TDP will define the specific Phase II program plans and OEDS system definitions. It will also indicate any inter-relationships or leveraging of outside technology or system developments that are critical to the overall technology development approach.

The development and execution section of the RAMP/TDP will contain at a minimum:

- 1) The processes used, and the definition of each of the critical and enabling technologies and processes;
- 2) The specific hardware and software elements of the OEOS/OEDS that are being addressed;
- 3) The assessment of the risks associated with each of the technologies and processes and the corresponding risk reduction costs needed (both those in their OEDS program and from outside sources) to achieve the more mature risk levels planned;
- 4) The RAMP and all contingency or fallback plans;
- 5) The process used to define an optimal multi-phase TDP based on the overall program goals and objectives; and
- 6) How the RAMP/TDP will be maintained and executed throughout Phase II.

The RAMP/TDP should be based on the RAMP defined for each of the contractor's critical and enabling technologies and processes. This RAMP should be developed using a risk assessment for each technology and processes based on a variation of the Defense Systems Management College (DSMC) risk assessment process. Assessment of the risks will be based on appropriate definitions and calculations of the consequence and probability of failure for each critical technology and process associated with the OEDS. The RAMP will define the specific steps planned to reduce the risks for each critical technology and process to a level sufficient for OEDS execution. They will define the specific proposed risk reduction activity, when it will occur, what it will cost, how much risk reduction it will achieve and what back up or fallback approaches are planned to insure program success.

Based on the priority and cost/benefit associated with each of the critical technologies and processes, an optimized RAMP/TDP consistent with the program goals and

objectives described above will be defined. This optimized overall RAMP/TDP will address all activities to be conducted during the execution of the Phase II ATD.

2.6.2. OEDS System Requirements Document (SRD)

The OEDS System Requirements Document (SRD) shall be a living document, serving as the single source for requirements definition of the evolving OEDS configuration. The document shall be updated to provide a continuous definition of the system requirements, incorporating all changes to date. Any major changes shall be incorporated and delivered as a revision to this document at each Milestone Review.

The initial SRD delivered with the proposal will be restricted to the page limit shown in Section 3.2.1. During the execution of Phase II, the contractor shall incorporate additional information, in the contractor's format, to expand the document to the level required to fully encompass the maturing designs.

Within the document, the contractor shall also provide references to other internal drawings, specification sheets, databases or configuration control documents that supplement the information provided within the SRD to provide additional detailed requirements definition of the entire OEDS. In this way, the SRD can be kept to a manageable size and the amount of effort required to keep it current will be minimal.

The Phase II OEDS SRD shall encompass all aspects of the Phase II demonstration system (both space and ground), and through the contractor's work outline, should relate directly to the OEOS system capabilities defined in the contractor's OEOS CONOPS. Using the TDP and RAMP as a filter, there should be a one-to-one correlation between the OEOS CONOPS and the OEDS SRD. The Phase II OEDS SRD should indicate how all critical and enabling technologies and processes associated with the OEOS design are to be addressed and how robust the proposed Phase II OEDS design will be in addressing all Phase II program objectives.

2.6.3. OEDS System Definition Document

The OEDS System Definition Document (SDD) shall be a living document, serving as the single source for definition of the entire Phase II Orbital Express demonstration system, segments, major subsystems and components, both hardware and software elements. The document shall be updated to provide a continuous definition of the entire system, incorporating all changes to date. Any major changes shall be incorporated and delivered as a revision to the document at each Milestone Review.

The initial System Definition Document delivered with the proposal will be restricted to the page limit shown in Section 3.2.1. During the execution of Phase II, the contractor shall incorporate additional information, in the contractor's format, to expand the document to the level required to fully define the maturing designs.

Within the System Definition Document, the contractor shall also provide references to other internal drawings, specification sheets, databases or configuration control

documents that supplement the information provided within the SDD to provide additional detailed definition of the entire OEDS. In this way, the System Definition Document can be kept to a manageable size and the amount of effort required to keep it current will be minimal.

The SDD will provide sufficient design detail to document the OEDS hardware and software and to fully define all subsystems and major components. The System Definition Document will fully define each component's physical, functional, interface, and performance characteristics. System, segment, and subsystem architecture, interfaces, functional allocation, and software requirements from the SRD will be referenced and addressed in the SDD. The format should conform to the contractor's single common Work Outline. The contractor will be responsible for the configuration control of all specifications and drawings (i.e., control of the System Definition Document) throughout each phase.

2.6.4. Servicing Interface Specification

The OE Servicing Interface Specification (SIS) will completely describe the non-proprietary interfaces. These interfaces are the mechanical and electrical satellite-to-satellite interfaces, software and protocols enabling autonomous docking and fluid consumable transfer between the ASTRO and commodity payloads, and between the ASTRO and NEXTSat serviceable satellites; the mechanical and electrical satellite-to-satellite interfaces, software and protocols enabling the ASTRO to autonomously on-load ORUs from commodity payloads, transport ORUs to a serviceable satellite, and to transfer ORUs to a NEXTSat; and, those mechanical and electrical satellite-to-satellite interfaces, software and protocols enabling the ASTRO to autonomously dock with, on-load and off-load microsatellites, and carry and independently operate microsatellites as functioning ASTRO payloads.

Those interfaces between ORUs and NEXTSat serviceable satellites on which the functionality of ORUs are dependent may be retained as proprietary. Non-Proprietary Interfaces are defined as those features that relate to the areas where the ASTRO touches the NEXTSat, Commodity Payload, ORU or Microsatellite. Each interface will be defined in an Interface Control Document (ICD), which will be included in the SIS. The ICDs will contain all interface dimensions and performance requirements necessary to meet the objectives of the system. The final ICD shall include drawings and documentation of the satellite-to-satellite mechanical and electrical interfaces, source code and full documentation for all enabling software, and specification of associated protocols (e.g., communications, satellite states and modes, etc.) developed for the Orbital Express program. As the "systems integrator", the Phase II contractor shall ensure that the overall OEDS System Definition Document is comprehensive and complete and that the SIS and all the ICDs are compatible from a physical, functional, and performance perspective.

The Servicing Interface Specification, enabling software source code and documentation, and associated protocol specifications for the Orbital Express ATD program must be delivered to the Government free of restriction on their use or further distribution. The

interfaces, software and protocols that must be non-proprietary are those on which the autonomous functionality of the ASTRO servicing spacecraft is dependent.

2.6.5. OEDS Ground Test, Integration, and Qualification Plan

The OEDS Ground Test, Integration and Qualification Plan will describe in detail how the contractor will complete the qualification process, integration and verification testing of their OEDS during Phase II. It will describe the approach, processes, procedures and tools that the contractor will use to execute these tasks and the planned schedule of completion. The plan will supplement the IMP by providing additional details on the overall plan for achieving each stage of the OEDS development. This plan will address all major events associated with the development and verification of each segment of the overall OEDS system. These include, at a minimum, the ground control segment, the ASTRO and NEXTSat/commodity payload spacecraft segments, the servicing interface segment and the launch segment.

The OEDS Ground Test, Integration and Qualification Plan will include a description of all risk reduction activities such as component testing, subsystem verification and integration and segment and system build-ups. Details will be provided on critical activities such as software, integration and verification, and mission management. It is expected that software simulators will be used extensively to model, analyze, identify, and solve problems early in the program, before flight hardware is ready. This could range from low level modular testing to system level end-to-end testing. Major control simulations, development testing and system interface tests will be identified. Planned spacecraft development tests (and applicable prototype hardware and special support equipment) such as propulsion and flight simulation activities will also be indicated. Manufacturing approaches, assembly, hardware-in-the-loop and system/segment verification testing will be described. The OEDS Ground Test, Integration and Qualification Plan, along with the TDD and IMP, should completely document what, when and how the Phase II design, development, fabrication and verification will be conducted.

The offeror should identify all Government facilities, hardware, software, documents, or other types of support required to perform their test tasks and the associated dates each item is needed.

2.6.6. Autonomous Guidance, Navigation and Control (AGN&C) Software Development, Verification, and Validation Plan

Because of the importance of the AGN&C software for autonomous rendezvous, proximity operations, and docking in the Orbital Express concept, this segment shall be monitored as a distinct entity. The OEDS Autonomous AGN&C Software Development, Verification, and Validation Plan shall clearly describe the approach and methods to be used by the contractor during the course of maturing the AGN&C software to a level suitable for flight. The AGN&C Plan delivered with the proposal will be restricted to the page limit shown in Section 3.2.1.

2.6.7. OEDS On-Orbit Demonstration Plan (ODP)

The OEDS On-Orbit Demonstration Plan (ODP) will detail all the OEDS system, segment, subsystem or component demonstrations necessary to address the specific Phase II objectives. They will include all critical risk mitigation efforts, and all system, segment, subsystem or component verifications, demonstrations or evaluations designed to specifically address the program objectives and to demonstrate the technical feasibility and cost realism of the integrated set of technologies and processes associated with the OEOS. These activities shall include (but are not limited to) risk reduction efforts, subsystem and component verification, vehicle checkout, critical technology evaluation and assessment and system level demonstrations. Demonstrations should exploit, to the maximum extent possible, technology maturation and operational concept demonstrations that may be separately funded under other Government programs and IRAD activities.

The ODP should consider the demonstration phases of the mission, from rendezvous initiation through approach, docking, servicing, separation and back away for as many rendezvous cases as are necessary to demonstrate the system's capabilities. Demonstration goals will be defined that (1) are highly focused; (2) have legitimate effectiveness, technical, affordability and/or reliability value; and (3) are realistic given funding constraints. The types of demonstrations (e.g., approach conditions, services performed) are at the discretion of the contractor. Approaches will vary depending on the specific challenges inherent in realizing each individual offeror's OEOS. However, the overall schedule, testing events, test frequency, and manpower resources assumed to complete the On-Orbit Demonstration efforts should be clearly incorporated into the ODP.

The ODP shall explicitly address the minimal set of ATD program objectives defined in Section 2.3.1. In addressing these objectives, the contractor will define a demonstration plan that not only validates their technical feasibility but also helps validate the predicted mission effectiveness and affordability of their OEOS design. The contractor's approach to addressing each of these objectives is dependent on their assessment of the objective's technical risk and impact on achieving their unique OEOS CONOPS and system performance. Particular emphasis should be placed on the demonstration of autonomous mission planning and management.

The initial ODP delivered with the proposal shall be limited to the page count specified in Section 3.2.1. The ODP will be refined during the course of Phase II; however, the final ODP, including success criteria for the on-orbit demonstration, will be delivered no later than completion of the Flight Readiness Review (FRR).

The offeror should identify all Government facilities, hardware, software, documents, manpower, or other types of support required to perform mission operations.

2.6.8. OEDS Follow-on Test and Evaluation Plan (FOT&E)

The On-Orbit FOT&E Plan shall describe potentially beneficial follow-on missions for the OE Demonstration System after the activities outlined in the ODP have been completed. These activities will not be funded by DARPA, but offer an opportunity for further testing by other agencies, or for secondary payloads to perform their missions. The plan shall clearly identify the added benefit to the OE program associated with each potential follow-on mission, along with any impact to the OEDS design and CONOPS. As with the ODP, the overall schedule, testing events, test frequency, and manpower resources assumed to be undertaken for the FOT&E efforts should be clearly incorporated into the FOT&E Plan. This plan should include a description of the residual spacecraft capabilities available at the completion of Phase II, as well as suggestions for further testing and demonstration optional tasks to be included in the FOT&E phase.

2.6.9. OEOS Refinement Plan

A key objective throughout the program is to continue to mature and validate the operational Orbital Express servicing system's potential to effectively and affordably perform on-orbit servicing missions in the post 2010 timeframe. The OEOS Refinement Plan will describe how the Phase II contractor will continue to refine their OEOS throughout the Phase II ATD at a level consistent with the focus of that phase. The plan will describe the systems analysis, design trades, CONOPS and life cycle cost analysis required to continue to refine the operational system design. The plan will address how traceability will be maintained between the emerging OEOS design and the ongoing OEDS activities.

The OEOS Refinement Plan will also define how periodic updates to the OEOS design and mission effectiveness and affordability Figures of Merit (FOMs) will be provided based on results emerging from ongoing Phase II and other Government or contractor activities. It will describe how the contractor will continue to work with the Government throughout Phase II to conduct operational effectiveness and life cycle cost analysis on the emerging design. The plan will address how the contractor will work with the Government to incorporate changes in the customer environment into their CONOPS analysis and total system design. It will describe how the specific requirements of the SBL IFX program could be addressed and accommodated by the contractor's OEOS design and CONOPS.

2.6.10. Life-Cycle Cost Estimates (LCCE), Cost Effectiveness and Affordability Analyses Document

The contractor will address all key OEOS parameters (physical, functional, performance, CONOPS, quantity, etc.) associated with developing and updating OEOS life cycle cost estimates, cost effectiveness and affordability analyses. This includes all pertinent ground rules and assumptions, raw source data and underlying adjustments, cost estimating methodologies employed, cost models created/utilized, risk/uncertainty analyses included, and the corresponding discussion of the cost results (including any Net

Present Values calculations) and direct relevancy to meeting the OEOS objectives. Likewise, traceability to the OEDS cost estimates, if applicable, should be highlighted. The contractor shall maintain configuration management on all cost-related data to ensure completeness, consistency, reasonableness, and accuracy throughout all OEDS and OEOS documents (deliverables, presentations, etc.) that include cost considerations. To maintain credibility in any OEOS cost projections, it is also important to directly trace assumptions and results in the OEOS utility, effectiveness, and performance analyses to the OEOS LCCE. This means that the changes to cost parameters and cost results included in all updates to Phase II documents shall be clearly marked and relevant rationale provided.

2.6.11. OE Transition Plan (TP)

The Orbital Express Transition Plan (TP) will address all operational evaluations, technology and manufacturing processes, development, maturation, transition and risk reduction activities which are outside the scope of the ATD, but integral to complete the development of the contractor's OEOS. The TP should facilitate the transition of the OE program to the System Development and Demonstration Phase of acquisition for an operational system. It should identify all activities that are funded and performed outside of the ATD, including both Government and corporate research and development. The TDP, ODP and TP should be coordinated with industry and the Government to ensure maximum advantage is taken of any leverage opportunities, and scarce research and development dollars are spent to maximum effect.

The TP will also identify emerging technologies/processes and leverage opportunities that have high payoff for future OE applications. The TP shall capture the current status of all relevant ongoing and planned Government and industry programs and shall include appropriate cost and schedule information. Classified or proprietary information should be properly marked and/or maintained as a separate document if necessary.

This living document will ensure the program is maximizing the leveraging opportunities from other Government and corporate research and development activities. The TP should also identify critical decision dates for any Government actions required. The TP will be updated on a continuous basis and formally revised on an annual basis, as well as at the completion of Phase II.

2.6.12. Summary and Change Management

The Phase II Agreement will contain the Phase II TDD, IMP, the contractor's Award Fee Plan (described in the next section), Phase II Completion Criteria, Work Outline (WO) Dictionary and separately priced options for additional work exceeding the funding guidance. Similarly, the contractor's optional FOT&E Phase Agreement will incorporate their proposed FOT&E Program Plan, FOT&E portions of their TDD, IMP and their FOT&E Milestone Review and Award Fee Plan.

The OEOS refinement plan, the RAMP/TDP, software test plan, ground test integration and qualification plan, and on-orbit demonstration plan are all meant to be living

documents that are continuously updated throughout the life of the program. Based on refinements made to the OEOS design, progress made during the Phase II ATD, and outside technology developments, the contractor will continuously refine their overall RAMP/TDP. In the event that a significant change in the RAMP/TDP indicates that a modification to the Phase II Program is warranted, the contractor's change process will be used to formally modify the Agreement.

Prior to entry into the FOT&E activities it is anticipated that the contractor will be given an opportunity to provide a revised RAMP/TDP that defines in greater detail their proposed FOT&E program plan and OEDS system definition. If the Government feels there is sufficient merit and decides to proceed, the contractor's priced option will then be finalized based on this revised plan, system definition and other Agreement documents.

It is the Government's desire that these documents be used to maintain a clear, unambiguous definition of the program's planned and actual progress, both from a process and product standpoint. To facilitate this, the contractor shall define and maintain a formal Change Process as called for in the Process IMP. By using this process to define when a revision is required, both the living documents, and those documents incorporated in the Agreement, will be kept current with emerging system designs, risk reduction activities and technology developments.

It is the Government's intent that major changes be agreed to on an on-going basis, reviewed at the next formal Milestone Review and incorporated into the Agreement at that time if required. In this manner, no cumbersome contractual requirements will impact the workflow. All major changes that require Agreement modification will be formally made a part of the Agreement through the delivery of a new version of the document and written confirmation of the Agreement modifications. Major changes to documents that are not a part of the Agreement will be delivered in the contractor's standard format with all revisions clearly indicated. Figure 2-2 defines the minimum set of documents to be provided and the procedures for changes. The contractor should supplement this list with any additional documents, plans, reports or program information that they intend to provide.

Document	Agreement or Deliverable	Government Involvement in Change Process
TDD IMP Award Fee Plan Phase II Completion Criteria Work Outline Dictionary Separately Priced Options	Agreement	<ul style="list-style-type: none"> • Major changes <ul style="list-style-type: none"> ○ Consult with PM & incorporate. ○ Review @ milestones ○ Deliver revised documents as required
RAMP/TDP IMS Satellite Servicing Interface Specification OEDS Ground Test, Integration and Qualification Plan Autonomous GN&C Software Development Verification & Validation Plan OEDS On-orbit Demonstration Plan OEDS SRD OEDS SDD OEOS Life-Cycle Cost Estimates, Cost-Effectiveness and Affordability Analyses	Deliverable	<ul style="list-style-type: none"> • Major changes <ul style="list-style-type: none"> ○ Consult with PM & incorporate ○ Review @ milestones ○ Deliver revised documents as required
OEOS Refinement Plan OEDS On-orbit Follow-on T&E OE Transition Plan OEOS SCD (Including CONOPS & FOMS)	Deliverable	<ul style="list-style-type: none"> • No formal change process required <ul style="list-style-type: none"> ○ Deliver revised documents as required ○ Deliver annual revisions @ minimum

Figure 2-2: Program Document Changes/Deliverables

2.7. Management Approach

DARPA is responsible for overall management of the OE ATD, including technical direction, acquisition, and security. The DARPA Program Manager is responsible for implementing a streamlined approach to program management. Major tenets of that approach include: close cooperation between Government and teams; small staffs;

abbreviated oversight; face-to-face communication; real-time decision making; emphasis on solving problems instead of assigning blame; and short, direct lines of authority.

The NASA Marshall Space Flight Center (MSFC) will provide DARPA with a technical interface to the Alternate Access to (International Space) Station program. The SBL IFX program office will provide DARPA a technical interface, if they choose to participate. These interfaces will advise the DARPA PM on technical and management decisions and facilitate transition of technology demonstrated in the OE ATD to their respective programs.

DARPA will obtain expert technical assistance from its System Engineering and Technical Assistance (SETA) contractors, Federally Funded Research and Development Centers (FFRDCs), the national laboratories, and select contractors. Only organizations that have formally declared their intention not to compete as a Phase II team member, and have accepted Organizational Conflict of Interest (OCI) restrictions on their activities and executed appropriate Nondisclosure Agreements (NDAs) will be used.

2.7.1. Government/Industry Interaction

The Government's fundamental streamlined management approach has not changed. Major tenets of that approach include: close cooperation between Government and contractor teams, small staffs, abbreviated oversight, face-to-face communication, real-time decision making, emphasis on solving problems instead of assigning blame, and short, direct lines of authority. The PM is dedicated to the principle of open, collaborative teaming between industry and Government, and supports the principles of Integrated Product and Process Development (IPPD). The Government program management team will constantly work to maintain open channels of communication, provide value-added inputs and expertise, and work together with the industry team to ensure total program success.

All members of the Government team will be totally committed to these principles and dedicated to working together to find solutions, not create problems. The Government team will work closely with the industry team leads to provide information, technical assistance, and additional expertise as required assisting in the successful execution of the program. As in Phase I, the contractor is responsible for the management and technical direction of the program.

The contractor should commit to a similar open, collaborative, teaming relationship with the Government. Direct, sincere communications, true collaboration, forthright reporting and open sharing of all program data with Government teammates should characterize this relationship. The contractor should define a system engineering/program management approach that will foster this type of relationship and provide the highest probability for success throughout the Phase II ATD.

The contractor shall develop and administer a password protected program website. This website will facilitate appropriate levels of communication within industry teams and between the program management teams. At a minimum the website should provide the

Government with real-time insight into the technical and financial status of the program and provide an efficient mechanism for exchanging milestone materials.

The contractor shall incorporate the principles of IPPD into their systems engineering and management processes. The Government anticipates active participation on the top-level industry teams by individuals who report directly to the PM. This core management team may be supplemented by additional Government technical expertise on the working level industry teams. The composition and responsibilities of all teams are at the sole discretion of the contractor. Any Government personnel requested by the contractor to participate on any team will have roles and responsibilities similar to the industry team members. In no instances will a Government person be the team lead.

The Government and industry teams shall interact on a variety of formal and informal levels throughout the program. Interaction is required for the Government to receive the information required to meet its fiscal and management responsibilities and for the Government to provide value added feedback and insight to the industry team. The contractor will conduct a series of formal milestone reviews defined in their Milestone Review and Award Fee Plan. During these Reviews the Government will assemble a team of technical experts to review the specific areas of interest and to assist the PM with their performance assessments. It is the Government's objective to provide the most equitable and highest quality feedback possible to the contractor during these reviews.

2.7.2. Phase II Payable Milestone Reviews and Award Fee Plan

The Government intends to continue to conduct periodic formal payable Milestone Reviews throughout Phase II. The primary purposes for these payable Milestone Reviews are to review all technical and programmatic progress, to assess the need for any modifications to the overall program, and to provide dates for performance based milestone payments. The contractor shall define the dates and content of these payable Milestone Reviews consistent with their IMP. Milestone dates may be chosen to coincide with major technical or programmatic events (e.g. Critical Design Review (CDR)), by calendar date (e.g. every 6 months) or by a combination of both. Specific timing should be determined based on the need for a periodic review of all aspects of the program and the need for specific, focused meetings to cover major events such as Delta Preliminary Design Review, CDR, Environmental Test Readiness Review, and FRR.

The contractor will propose the specific dates and content for a series of payable Milestone Reviews subject to the following:

- 1) Payable Milestone Reviews shall be scheduled no more frequently than every 3 months and no less frequently than every six months.
- 2) Payable Milestone Reviews shall be scheduled to coincide with at least one delta PDR, CDR or FRR.
- 3) Delta PDR and CDR will provide a level of detail consistent with Electronic Industries Alliance (EIA)-632, "Processes for Engineering a System", for a system level delta PDR and CDR respectively.

- 4) Overall milestone planning should include early critical component demonstration through modeling and simulation, prototypes, software integration laboratory testing, environmental testing and flight like testing. Milestone planning should also include early subsystem demonstration and demonstration of multiple integrated subsystems.
- 5) Early milestones shall be structured as decision gates to assess overall program progress and probability for program success.
- 6) The final Phase II Payable Milestone Review must include a Government review and determination that all Phase II Completion Criteria have been successfully met.
- 7) Do not select Phase II kick-off meeting as a milestone.
- 8) The scheduling and amounts of Payable Milestone payments shall comply with funding guidance, by government fiscal year, described in Section 2.9.

The Government intends that some of the Milestone Reviews listed above also be used to assess the contractor's performance as part of their Phase II Award Fee Plan. The purpose of the Award Fee Plan is to track and financially motivate excellent performance by the contractor. The Government will set aside a separate pool of money to financially motivate many different facets of the contractor's performance, such as timeliness, technical excellence, and effective system engineering and program management. The contractor's Award Fee Plan should define the Award Fee Milestone Review Dates, contents, amount of financial award associated with each Award Fee Milestone event and the overall process for evaluating and awarding incentives throughout Phase II.

The Government desires that the specific areas of interest and Award Fee evaluation criteria for each Award Fee Milestone be negotiated prior to the Award Fee Milestone event. In this way, the Government and contractor management teams can work together to identify timely areas of concern and to properly motivate all parties.

The amount of the award pool earned at each Award Fee milestone will be determined by the Government's review of management and performance areas under the control of the contractor. The Government will assemble an appropriate set of technical experts for each Award Fee Milestone Event, consistent with the focus of that review, to assist them in the assessments. Based on this evaluation, the Government will decide whether to award all, or a portion of the allotted amount. Any amounts not awarded will either be removed from the Award Fee pool or rolled forward to a future period at the Government's discretion.

The contractor will define the specific dates and content for Award Fee Milestone Events, subject to the following:

- Approximately four to seven Award Fee Milestone Events.
- The following Milestone Events should include Award Fee: CDR, FRR, on-orbit test performance, and final Phase II Milestone Review to evaluate status of accomplishment of Phase II Completion Criteria. The award fee plan must define how the Phase II Completion Criteria will be used to define the satisfactory completion of all Phase II activities.

The following list of key events offers some guidance for additional events to include in your proposed award fee plan.

- Establishment of software test infrastructure, including provisions for in-the-loop testing for ground segment simulators and hardware, space segment simulators and hardware, early in Phase II.
- Early validation of the servicing subsystems hardware and software.
- End-to-end system test in a flight-like configuration prior to launch.

While a notional Phase II Award Fee Plan example is provided at Section 5, the offeror is encouraged to submit their Award Fee approach that provides their best thoughts for maintaining a win-win business arrangement. Likewise, the Phase II solicitation states the preferred business approach. DARPA will allow alternative business arrangements in proposals. The overall proposal, including the business approach, will be evaluated based upon overall best value to the government.

2.7.3. Phase II Completion Criteria

The contractor will define a definitive, unambiguous, quantitative set of Phase II Completion Criteria that defines successful completion of the Phase II ATD. At a minimum, this set of criteria must explicitly address how all non-tradable Phase II objectives will be satisfied, and how all critical and enabling technologies and processes associated with their OEOS design will be addressed.

The Completion Criteria must be submitted with the contractor's original proposal and will become a formal part of the agreement. They can only be modified through the mutual agreement of the contractor, the OE PM and Agreements Officer. These criteria should be the subject of review at each Milestone Review and should be incorporated into the criteria at appropriate Milestones. Successful completion of the individual Completion Criteria by a specific date may be used as specific criteria in the contractor's Award Fee Plan. At each Milestone, the contractor will present a review of each completed criteria and formally document successful completion.

2.8. Other Transactions for Prototypes

The joint DARPA/USAF OE ATD program will employ the Other Transactions for Prototypes Section 845/804 authority. This procurement approach allows the offeror to be creative in designing their Phase II program and in selecting a management framework that best suits the proposed technical and management approach. The Government will share information and data throughout the program. However, the data will always be advisory, not directive in nature, and offered as a way to supplement contractor data with the full range of expertise available from the Government, foster better communications on the program and achieve our mutual goals. Our intent is to provide the best possible insight into what the Government thinks while minimizing oversight. To this end, the Government will focus on accurately defining WHAT we want and letting the offeror determine HOW best to provide it. Government oversight will be provided through the same management framework proposed by the offeror.

The Government will allow the offeror to use either commercial or DoD streamlined processes, reporting and management practices. The use of Other Transaction Authority requires compliance with applicable laws but allows the latitude to depart from acquisition specific laws, Federal Acquisition Regulations, and DoD practices where it makes sense. The offeror should take full advantage of this latitude to propose innovative/revolutionary approaches to team building. Your proposal must clearly demonstrate a robust method to monitor and control costs, quality, reliability, system engineering, program schedule, system design, and test planning and execution.

Commercial, industrial, and corporate specifications and standards should be used in lieu of military specifications and standards where appropriate. Military specifications and standards, if needed, should be used as guides, with any modifications, tailoring or partial application described. A rigorous formal process should be employed to design and implement software.

2.9. Funding

The Government anticipates that a competitive award of a modified Phase 1 agreement will be awarded to one Phase 1 contractor team for a 42 month Phase II effort. The Government anticipates having \$100M available to fund the Phase II Agreement. We expect the offeror to provide a realistic proposal (including adequate risk/uncertainty margin) for best achieving the program objectives within the outlined budget and schedule. Offerors are encouraged to propose innovative, value added use of the Other Transactions Authority procurement mechanism and take maximum advantage of leveraging opportunities with the Government and within their own teams.

This agreement is a working partnership between the Government and the contractor. The Government acknowledges that any ATD program contains some element of risk, and desires to establish a strategy for managing the risk of potential cost overruns at the start of Phase II. The offerors are asked to propose a strategy as part of the Agreement. The Government anticipates managing program cost growth using a variety of tools, including reduction of fee payments, redefining content of the OEDS, and contractor cost share of overruns. The Government desires the contractor to share 50% of cost growth up to some negotiated level. Should projected costs approach this not-to-exceed level, the Government and contractor will determine the future course of action.

The maximum level of Government funding anticipated, by fiscal year, is shown in Table 2-1.

Table 2-1: Anticipated Government Funding

FY 02	FY 03	FY 04	FY 05	Total
\$43.9	\$35.0M	\$21.1M		\$100M

The offeror is asked to provide guidance on a revised program funding profile assuming mid-FY05 and 1Q FY06 launch dates. This revised profile should maintain the \$100 million program total; however, ROMS for any cost impacts due to the later launch dates should be clearly indicated.

In addition to the baseline Phase II program, the offeror should describe demonstration enhancements based on a funding level of 120% of the Phase II baseline. This discussion should be limited to 5 pages, and provided with the response to the optional tasks.

3. Proposal Guidance

3.1. Scope

This section of the solicitation provides the offeror guidance for the development of a unique proposal for the OE Phase II ATD (funded) and optional tasks (currently unfunded). The offeror's TDD, IMP, Award Fee Plan, and Phase II Completion Criteria will become a part of the Agreement. Together with the additional information described below, they will form the basis for the offeror's proposal in response to the OE ATD Phase II solicitation.

In order to effectively integrate the agreement and the total program, the offeror should continue to use a common numbering system based on their Work Outline structure. This numbering system should be used throughout the program documentation and all sections of the solicitation response.

3.2. Administrative Instructions

3.2.1. Page and Print Information

The Solicitation Response should be submitted in standard three-ring, loose leaf binders with individual pages unbound and printed single-sided to facilitate page changes. Indexes, cross reference tables, and tabs will not be included in the page count. Page count will be based on the offeror's hardcopy submission. Ten (10) color paper copies and one (1) CD should be provided. Maximum proposal page limits are:

Volume 1	Phase II Overview	
	Executive Summary	10 maximum
	Technical & Management Approach	30 maximum
	Government Leveraging Agreements	10 maximum
	IMS	10 maximum
Volume 2	Proposed Changes to Agreements with Unclassified Attachments	
	Attachment 1: Changes to Phase I Agreement	(unlimited)
	Attachment 2: TDD	120 maximum
		for TDD & IMP combined
	Attachment 3: IMP	See TDD
	Attachment 4: Phase II Award Fee Plan	15 maximum
	Attachment 5: Work Outline Dictionary	20 maximum
	Attachment 6: Phase II Completion Criteria	(unlimited)
	Attachment 7: Optional Tasks	(unlimited)
Volume 3	Cost Response	

Volume 4	OE Operational System	
	OEOS SCD (Incl. CONOPS & FOMS)	65 maximum
	OEOS Refinement Plan	20 maximum
Volume 5	OE Plans	
	OEOS SRD	50 maximum
	OEOS SDD	50 maximum
	Satellite Servicing Interface Spec.	updates from MS 5 or 6 only
	RAMP/TDP	updates from MS 6 only
	OEOS Ground Test, Integration and Qualification Plan	30 maximum
	OEOS Autonomous GN&C Software Development, Verification and Validation Plan	25 maximum
	OEOS on-orbit Demonstration Plan	30 maximum
	OEOS on-orbit Follow-on Test and Evaluation Plan	30 maximum
	OE Transition Plan	updates from MS 6 only
Volume 6	Classified Annex	25 maximum
Volume 7	OEOS FDR Materials	updates from MS 4 only
Volume 8	OEOS PDR Materials	updates from MS 5 only

The Executive Summary, Technical and Management Approach, TDD, IMP, Milestone Reviews, Award Fee Plan, IMS, and Cost Response portions of your response should all be kept unclassified. Any classified materials pertaining to these sections should be provided in the Classified Annex. All materials, whether classified or unclassified, count in the page count for each section.

Authorized representatives of the offeror must sign proposal volumes.

Each page should be printed on an 8-1/2" x 11" sheet using Times New Roman 12-point font. Foldout pages are not to be used. Graphics should not include text in smaller than 10-point font, except where existing graphics use smaller font and changing the graphics would be burdensome. Graphics (including tables) may contain font styles other than Times New Roman. Pages should be prominently marked to ensure classified or proprietary information is properly controlled. Pages should be marked **SOURCE SELECTION SENSITIVE**.

Teams are also required to submit a single copy of their proposed agreement and cost response in Microsoft Office 97 compatible electronic format. PDF format is acceptable for other parts of the proposal. Documents containing imported graphics (drawings, charts, photos, etc.) should be accompanied by the originally imported graphics files. Acceptable media includes 100MB ZIP cartridges or CD-ROM. Electronic copies of the

classified annex should be submitted separately in accordance with instructions in Section 3.2.2.

3.2.2. Response Delivery Information

All responses must be received on or before 14 January 2002 at 1400 PM Eastern Standard Time. Late responses will not be accepted.

The unclassified portion of the offeror's proposal shall be mailed or hand carried to:

Defense Advanced Research Projects Agency (DARPA)
Orbital Express Program
3701 North Fairfax Drive
Arlington, VA 22203-1714
Attn: Contracts Management Office/Mr. Scott Ulrey
Solicitation Number: PS02-03

Responses and response modifications (which will only be accepted prior to the deadline for receipt of response) shall be submitted in sealed envelopes or packages to the address shown above and marked with the following information on the outer wrapping:

Offeror's name and return address
The response receipt address above
Solicitation Number: PS02-03
Hour and due date:

The classified portion of the offeror's proposal shall be submitted through the DARPA Deputy Director of Security and Intelligence using the appropriate procedures. Teams are required to contact the office of the DARPA Director of Security and Intelligence at 703-696-2385, for complete instructions prior to submitting any classified information.

3.2.3. Regulations Governing Objections to Solicitation and Award

Any objections to the terms of this solicitation must be presented in writing within fifteen (15) calendar days of the release of this solicitation. Any objections to the receipt or evaluation of proposals, or to the award of agreements under this solicitation must be presented in writing within fifteen (15) calendar days of the date the objector knows or should have known the basis for its objection. Objections must be provided in letter format, must clearly state that it is an objection to this solicitation or to the receipt or evaluation of proposals, or to the award of the agreement, and provide a clearly detailed factual statement of the basis for objection. Failure to comply with these directions is a basis for summary dismissal of the objection. Objections must be mailed to the address listed in the proposal delivery information.

All objections will be reviewed and referred to the Director, Office of Management Operations, for a decision. If circumstances are deemed to warrant, appropriate relief will be granted.

3.3. Executive Summary

This section of the proposal is meant to be an executive level description of key elements and unique features of each offeror's proposed OE ATD Phase II program. The Executive Summary should at least address the offeror's:

- System Overview;
- Acquisition Approach for Phase II ATD and optional tasks;
- Technical, performance, schedule and cost risk areas, and the methodology for mitigating risk and maturing the complete OE system; and
- Top level program schedule; Phase II, and optional task cost summaries.

3.4. Technical and Management Approach

This section of the proposal provides the offeror with the opportunity to explain and substantiate the significant features of their OEOS, OEDS, Program Plans and overall technical and management approach.

3.5. Proposed Changes to Phase I Agreement with Attachments

The current Phase I Agreement should be modified to include work for Phase II and the optional tasks. The offeror should submit their redlined Phase I Agreement reflecting proposed changes for Phase II and optional tasks. This section provides specific guidance for making changes to your Phase I Agreement. The offeror can propose any changes, additions, or deletions to the Agreement that should be considered during Agreement negotiations. Fully explain the rationale for any changes not specified in the solicitation. Document this rationale in an addendum to the Agreement. Rationale located in other areas of the solicitation response may be cross-referenced. It is the Government's intent to negotiate Phase II Agreements with all offerors prior to selection of one contractor team for award.

3.5.1. Task Description Document (TDD)

Based on the guidance in this section, the offeror should prepare a Task Description Document (TDD) that defines the tasks and work effort they will perform to complete their program. The TDD describes the work effort necessary to meet the program objectives described in Section 2.3 and is linked to the IMP and IMS. The TDD should address all proposed work efforts for both the Phase II ATD and optional tasks. The proposal should clearly differentiate between those tasks that are part of the Phase II ATD and those that are part of the optional tasks. All tasks must be defined against the offeror's common Work Outline. The TDD must identify work effort to two levels below the segment level of the offeror's Work Outline. The offeror may choose to define work at lower levels to better explain their approach toward meeting program objectives. TDD format should follow the example contained in Table 3-1.

This guidance is not intended to be all-inclusive. Overall milestone planning should include early critical component demonstration through modeling and simulation, prototypes, software integration laboratory testing, environmental testing and flight like testing. Milestone planning should also include early subsystem demonstration and demonstration of multiple integrated subsystems. This guidance represents minimum tasks that must be included in your program and format guidance information for consideration as each offeror develops their proposed Agreement.

Table 3-1: Task Description Document Format

00000 OE DEMONSTRATION SYSTEM	
PHASE II	
00000 OE Demonstration System	(Phase II Level 1 Task Description provided here.)
01000 Level 2 Title	(Phase II Level 2 Task Description provided here.)
01100 Level 3 Title	(Phase II Level 3 Task Description provided here.)
01110 Level 4 Title	(Phase II Level 4 Task Description provided here.)
01111 Level X Title	(Continue Phase II Level 5 and lower Task Descriptions as required to adequately describe the tasks to be performed.)
FOT&E Optional Task	(Continue same format as shown for Phase II)
10000 ASTRO	
PHASE II	
	(Continue same format as shown for Phase II WO 00000 OE Demonstration System Task Description shown above. Offeror must show tasks to a level commensurate with the importance of the task.)
FOT&E Optional Task	Continue same format as shown for Phase II 00000 OE Demonstration System Task Description shown above. Offeror must show tasks to a level commensurate with the importance of the task.)
20000 - X0000	
	(Continue same format for the remainder of the Work Outline tasks. Offeror must show tasks to a level commensurate with the importance of the task.)

3.5.1.1. OE Demonstration System

During Phase II, the offeror will complete the design, development, manufacture and demonstration of a fully integrated OE Demonstration System (OEDS). The offeror should prepare for and conduct the system development, validation, and testing required to verify full functionality of the OEDS. The offeror should conduct tests and demonstrations as defined in their OEDS On-Orbit Demonstration Plan (ODP) to meet the Phase II ATD program objectives. The OEDS design should continue to be documented in an OEDS System Definition Document (SDD) that provides a detailed description of all segments, major subsystems and components of the system, and in other drawings and specifications required by the offeror to produce the OEDS and prepare for subsequent optional tasks.

The studies, analysis, demonstrations and simulations performed during this phase should be documented in, and the program accomplished in accordance with, the Integrated Master Plan (IMP). All program documentation, specifications, blueprints and other materials should be provided to the Government upon request in the contractor's format.

The FOT&E optional task will consist of the additional subsystem, segment, and integrated system on-orbit demonstrations necessary to further reduce risk and validate operational utility to the level required to enter a low risk System Development and Demonstration. Efforts may include ground and on-orbit testing to demonstrate and evaluate the OEDS per the offeror's proposed OEDS CONOPS.

3.5.1.2. ASTRO

During this phase the offeror will complete the design, development, integration, and manufacture of the OEDS ASTRO Vehicle. The offeror will deliver for test an ASTRO vehicle completely integrated with propulsion, payload, and avionics subsystems. The offeror will conduct their Phase II ODP to demonstrate technical capability of this vehicle. The offeror will perform spacecraft level, subsystem and component hardware and software tests to ensure that the performance of this spacecraft will meet its system specification requirements. Special attention should be paid to the software development process.

Final spacecraft performance should be documented in a set of revised OEDS system requirements and description documents, interface control documents and other specifications and drawings that the offeror deems necessary for the continued use of the spacecraft and its subsystems in the FOT&E optional tasks. This evolving series of drawings and specifications should be one of the principal subjects of the Phase II reviews and should be delivered to the Government prior to completion of this phase.

The offeror will continue to demonstrate the OEDS ASTRO during the FOT&E optional tasks part of the program. Additional on-orbit testing of the OE ASTRO will be conducted to further demonstrate the performance of the OE system and to demonstrate increasing levels of confidence and operational value. The offeror's proposal should

define the specific tasks required to meet their overall program requirements and the FOT&E optional tasks.

3.5.1.3. NEXTSat/Commodity Payload

During this phase the offeror should complete the design, development, integration, and manufacture of the NEXTSat/Commodity Payload. The offeror should deliver for test a spacecraft completely integrated with propulsion, payload, and avionics subsystems. The offeror should conduct their Phase II ODP to demonstrate technical feasibility of this program component. The offeror should perform spacecraft level, subsystem and component hardware and software tests to ensure that the performance of this segment should meet their system specification requirements.

Final spacecraft performance should be documented in a set of revised OEDS system requirements and description documents, interface control documents and other specifications and drawings that the offeror deems necessary for the continued use of the spacecraft in the FOT&E optional tasks. This evolving series of drawings and specifications should be one of the principal subjects of the Phase II reviews and will be delivered to the Government prior to completion of this phase.

The offeror should continue to develop and demonstrate the OEDS NEXTSat/Commodity Payload during this phase of the program. Additional on-orbit testing of the OE Spacecrafts will be conducted to further demonstrate the performance of the OE system and to demonstrate increasing levels of confidence and operational value. The offeror's proposal should define the specific tasks required to meet their overall program requirements and FOT&E optional tasks in their ODP.

3.5.1.4. Docking Interface

During this phase the offeror should complete the design, development, integration, and manufacture of the OEDS Docking Interface. The offeror will deliver for test a Docking Interface system completely integrated the ASTRO and NEXTSat/Commodity Payload spacecrafts. The offeror should perform system, subsystem and component hardware and software tests to ensure that the performance of this Interface will meet its system specification requirements.

Final Docking Interface performance should be documented in a set of revised OEDS system specifications and description documents, interface control documents and other specifications and drawings that the offeror deems necessary for the continued use of the air vehicle and its subsystems in the FOT&E optional tasks. This evolving series of drawings and specifications should be one of the principal subjects of the Phase II reviews and will be delivered to the Government prior to completion of this phase.

The offeror should continue to demonstrate the OEDS Docking Interface during this phase of the program. Additional on-orbit testing of the OE Docking Interface will be conducted to further define their performance envelope and to demonstrate increasing levels of confidence and operational value. The offeror's proposal should define the

specific tasks required to meet their overall program requirements and FOT&E optional tasks in their ODP.

3.5.1.5. AGN&C

During this phase the offeror should complete the design, development, integration, and manufacture of the OEDS AGN&C. The offeror will deliver for test an AGN&C system completely integrated with the ASTRO and NEXTSat/Commodity Payload spacecrafts. The offeror should conduct their Phase II ODP to demonstrate technical feasibility of this system. The offeror should perform system, subsystem and component hardware and software tests to ensure that the performance of this system will meet its specification requirements. Special attention should be paid to the software development process.

Final AGN&C performance should be documented in a revised OEDS system specification, description documents, interface control documents and other specifications and drawings that the offeror deems necessary for the continued use of the AGN&C FOT&E optional tasks. This evolving series of drawings and specifications should be one of the principal subjects of the Phase II reviews and will be delivered to the Government prior to completion of this phase.

The offeror should continue to demonstrate the OEDS AGN&C during these optional tasks. Additional on-orbit testing of the AGN&C should be conducted to further define their performance envelope and to demonstrate increasing levels of confidence and operational value. The offeror's proposal should define the specific tasks required to meet their overall program requirements and FOT&E optional tasks in their ODP.

3.5.1.6. Ground Segment

During this phase the offeror should complete the design, development, integration and manufacture of the OEDS Ground Segment. External system interfaces should be defined and the mission control system designed to facilitate on-orbit testing of the spacecraft verify mission performance in accordance with the Phase II program objectives. The offeror should conduct their Phase II ODP to demonstrate technical feasibility of this segment. The offeror should perform Mission Control Segment, subsystem, and component hardware and software tests to ensure that the performance of this segment will meet their system specification requirements. Special attention should be paid to the software development process.

Final ground segment performance should be documented in a set of revised OEDS system requirements and description documents, interface control documents, and other specifications and drawings that the offeror deems necessary for the continued use of the mission control segment and its subsystems in the FOT&E optional tasks. This evolving series of drawings and specifications should be one of the principal subjects of the Phase II reviews and will be delivered to the Government prior to completion of this phase.

The offeror should continue to develop and demonstrate the OEDS Ground Segment during this phase of the program. Additional testing of the ground segment should be

conducted to further refine the operational systems and to demonstrate increasing levels of confidence and operational value. The offeror's proposal should define the specific tasks required to meet their overall program requirements and FOT&E optional tasks in their ODP.

3.5.1.7. Launch Segment

During this phase the offeror should complete the design, development, integration and manufacture of any hardware required to interface with the OEDS launch vehicle. Launch system interfaces should be defined and testing should be conducted to ensure OEDS compatibility with the launch vehicle in accordance with Phase II program objectives. The offeror should perform any necessary spacecraft system, subsystem, and component hardware and software tests to ensure that the performance of the spacecraft during launch vehicle integration, launch, and deployment will meet their system specification requirements.

Final launch segment spacecraft performance should be documented in a set of revised OEDS system requirements and description documents, interface control documents, and other specifications and drawings that the offeror deems necessary for the OEDS and its subsystems to meet the launch segment requirements. This evolving series of drawings and specifications should be one of the subjects of the Phase II reviews and will be delivered to the Government prior to FRR.

3.5.1.8. Supportability

During this phase, the offeror should provide supportability items to the Government consistent with their OEOS design and required for the OEDS. The offeror should complete the design, development, integration and manufacture of those OEDS supportability segment items. Key supportability items include training, ground station design, fabrication, testing and documentation, and fabrication of all secondary items – spares, repair parts, replacement assemblies, etc. necessary for OEDS system support. Special attention should be paid to trade-offs, economic analyses and life-cycle cost decisions that are consistent with the logistics posture of the OEOS.

3.5.1.9. Systems Engineering/Program Management

During Phase II, the offeror should conduct systems engineering processes that lead to a complete and balanced system design and demonstration, apply their program management processes, and refine those processes. The results of system level trades should be reflected in requirements and architecture flow-down into the System and Segment Specifications with clear definitions of interfaces. Specialty engineering disciplines (e.g., software engineering, systems safety, reliability and fault tolerance, etc.) should be applied across the system. Emphasis should be placed on incremental demonstration of a complete, integrated, balanced system.

The offeror should refine the systems engineering process to formulate and assess design trades and capabilities trades, and provide continuous visibility of the configuration and

all specifications via their program Configuration Management System (CMS). Similarly, the program management processes established during Phase I should be refined and these two processes should continue to be integrated. This integration should ensure that the program progresses successfully to the scheduled reviews (Critical Design Review, Final Design Review and Flight Readiness Review). The program should refine the established Phase I tracking tools to include those called for in the Process IMP. This tracking system should continue to provide updated information on a real time basis and will include at a minimum: Technical Performance Measures (TPMs), the Integrated Master Schedule (IMS) and Financial Management System information.

The offeror will complete and maintain the CMS on their encrypted proprietary Orbital Express ATD program website and will provide the computer resources necessary to support this architecture. This architecture should provide visibility into all of the tracking tools defined during Phase I and Phase II and should provide connectivity for the Government and contractor team members. This information system architecture should provide all team members with access to a common program database. All data should be maintained by the offeror and provided/updated to be timely and accurate.

The offeror will define, implement and maintain an Earned Value Management System. This system and the offeror's financial tracking system accessible through the secure website will be the basis for financial management of the system. The Earned Value Management System data should be kept current and should be available (electronically or in hard copy) within [TBS] days of the close of the monthly accounting period. The contractor financial management system should provide customer visibility to contractor performance at the same time as it is available internally to the contractor.

The offeror will refine the Technical Performance Measures (TPMs) identified in Phase I to track the maturity of key program technical parameters and provide management indicators which forecast the achievement of program goals. The offeror should define a set of key TPMs for the complete Orbital Express system, the system segments and major subsystems. These TPMs should track the successful accomplishment of the overall program goal, specific Phase II objectives, the validation of the effectiveness and affordability of the proposed OEOS design, and specific performance of the OEOS and its segments.

The contractor will define a definitive, unambiguous, quantitative set of Phase II Completion Criteria that defines successful completion of the Phase II ATD. At a minimum, this set of criteria must explicitly address how all specific Phase II objectives have been satisfied, how all critical and enabling critical and enabling technologies and processes associated with their OEOS design have been addressed and how technical feasibility for an Orbital Express system to effectively and affordably perform on-orbit satellite servicing has been demonstrated. The contractor will develop and maintain a process to track the successful completion of each Phase II Completion Criteria and insure that a formal review of their successful completion is conducted and documented through written concurrence by the Orbital Express ATD PM at the appropriate Milestone Review.

The offeror will continue to maintain an Integrated Master Schedule (IMS) that complements the IMP and provides continuous status of program accomplishments against time. This tiered system should provide visibility sufficient to manage the program.

The offeror will continue to provide visibility into their current budget and spend plan. At a minimum, the offeror should update the information contained within their IMS and financial tracking systems on a monthly basis.

3.5.1.10. Software Test Plan

During Phase II, the offeror will develop and maintain a Software Test Plan to describe the integration and test of the flight software into the OEDS system. The flight software is a critical system element requiring substantial development and IV&V, and is therefore deserving of a distinct test plan separate from the overall system test plan. This plan should describe the approach and processes used to verify and validate all aspects of the flight software during ground testing as well as on-orbit testing. Particular attention should be paid to system autonomy and robustness to ensure successful execution of the on-orbit demonstration.

The offeror should implement and maintain a rigorous formal process for software development, integration, and testing that follows an established military, national, or international standard.

3.5.1.11. OEDS Ground Test, Integration, and Qualification Plan

During Phase II the offeror should update and maintain the OEDS Ground Test, Integration and Qualification Plan describing their entire Phase II test program. Test objectives should be clearly defined and tied to the offeror's Phase II RAMP/TDP. The offeror should identify all Government facilities, hardware, software, documents, or other types of support required to perform their test tasks and the associated dates each item is needed.

The offeror should conduct a series of OEDS system, segment and subsystem tests during Phase II. Critical Orbital Express operations concepts and external interfaces should be tested during this period to ensure smooth transition to the on-orbit demonstrations. These component, subsystem, hardware/software integration, and system test tasks should lead up to and include on-orbit testing of a fully functional end-to-end OEDS. Prior to the launch of the Orbital Express Demonstration System, the offeror will conduct a Flight Readiness Review (FRR). All readiness issues identified as part of the FRR will be documented and resolved prior to flight.

3.5.1.12. OEDS Follow On Test and Evaluation Plan

The offeror will provide a Follow On Test and Evaluation (FOT&E) Plan to document their concept for accommodating FOT&E optional task after the ATD mission is

complete and the Phase II objectives have been satisfied. This plan should include a description of the residual spacecraft capabilities available at the completion of Phase II, as well as suggestions for further testing and demonstration optional tasks to be included in the FOT&E phase.

3.5.2. Integrated Master Plan (IMP)

The offeror should develop a comprehensive IMP that describes both the Phase II and FOT&E optional tasks of the OE acquisition strategy shown in Figure 2-1. The IMP is divided into the Product IMP and the Process IMP and must clearly delineate between the Phase II ATD and the optional tasks.

3.5.2.1. Product IMP

The Product IMP must address specification, verification, and significant management accomplishments necessary to complete the studies, analyses, design, manufacture, test, integration, verification and demonstration of the OEDS. The offeror's Product IMP must contain, as a minimum, accomplishments/criteria sections tied to their Work Outline and the following program events:

Events

- Delta Preliminary Design Review (Delta PDR)
- Critical Design Review (CDR)
- Flight Readiness Review (FRR)
- Launch and Satellite Checkout
- Refueling demonstration
- ORU transfer demonstration

The offeror may add major events necessary to capture the program, especially with regards to their proposed Phase II options and the FOT&E optional tasks. Each task will be accompanied by specific criteria that will be used to judge the completion of the task for a given event.

The offeror should identify the Phase II and FOT&E optional tasks significant product accomplishments and accomplishment criteria. The product IMP should provide insight into your detailed plans for integrating these significant product accomplishments to complete a major program event such as, "Flight Readiness Review". The offeror should identify the specific criteria that must be satisfied for these significant accomplishments to be considered complete. The criteria must show a clear, traceable path that describes the maturity of the product by its accomplishment criteria for it to be considered ready for the major event. The offeror should ensure the criteria and accomplishment events are both "product appropriate criteria and accomplishments" and "event appropriate accomplishment measures". The Product IMP should provide an understanding of major agreement events to demonstrate that the development, test and production of product designs are successfully maturing and can be measured.

Key elements of the Product IMP and their definitions are:

Event

- The conclusion/initiation of an interval of major program activity (i.e., "final design complete").
- Decision oriented maturation events (i.e., "Flight Readiness Review").
- Events need not be sequential.
- The number of events should increase for lower levels.
- The minimum set of six events for Phase II as shown earlier in this section of the solicitation.

Significant Accomplishment

- Desired result at a specified event which indicates a level of design maturity (or progress) directly related to each product/process.
- Discrete step in the progress of the planned development.
- Describes functional interrelationships of different disciplines applied to the program (i.e., test, manufacturing, system engineering).
- Must be event related - not just time coincident.

Accomplishment Criteria

- A definitive measure/indicator that the level of maturity (or progress) has been achieved.
- Work effort completions that ensure closure of accomplishment.

The offeror should define and maintain a comprehensive Product IMP. The key elements should be provided in an easy to read table format.

3.5.2.2. Process IMP

The offeror should describe a complete systems engineering process for conducting Phase II of this program. The offeror should describe the organizational responsibilities and authority for the systems engineering effort, including control of team member engineering. Similarly a program management process based on the concepts of Integrated Product and Process Development (IPPD) should be established.

The offeror should integrate their systems engineering and program management processes to ensure the program progresses successfully through the Phase II and FOT&E optional tasks milestones. This process should establish a series of tracking tools that should be updated monthly and should include:

- **Technical Performance Measures (TPM):** The offeror should provide a series of TPMs that track the maturity of key program technical parameters and provide management indicators that forecast the achievement of program objectives. The offeror should initially develop TPMs that delineate key technical goals and objectives through Level 2 of the Work Outline. Metrics should be developed for systems engineering, program management and test and evaluation. Example TPMs are OEDS performance parameters and Phase II component test costs.
- **Phase II Completion Criteria:** The offeror will define and track a definitive, unambiguous, quantitative set of Phase II Completion Criteria that defines

successful completion of the Phase II ATD. At a minimum, this set of criteria must explicitly address how all specific Phase II objectives have been satisfied, how all critical and enabling technology and processes associated with their OEOS design have been addressed and how technical feasibility for an OE system to effectively and affordably enable satellite on-orbit servicing. The offeror will develop and maintain a process to track the successful completion of each Phase II Completion Criteria and insure that a formal review of their successful completion is conducted and documented through written concurrence.

- **Financial Management System:** The offeror will provide a financial management system that allows the Government electronic access and on-line visibility into their program budget and spend plan and is tied to their work outline. The offeror will provide regular cost reports to the Government, at least monthly, in offeror preferred format. The offeror will develop and maintain an earned value management system and coordinate the key elements of its implementation with the Government. The offeror should provide visibility into their subcontract management plan.

Additional system engineering and management processes should include:

- **System Software Development:** The offeror will implement and maintain a rigorous formal process for software development, integration, and testing that follows an established military, national, or international standard.
- **Change Management:** The offeror should implement and maintain a rigorous formal process for tracking and documenting changes to Phase II documents as described in Section 2.6. The offeror should define major and minor changes and the process for managing both types of changes. This process must include consultation with the Government OE ATD PM before any major changes are implemented.
- **Risk Assessment and Management:** The offeror should implement and maintain a rigorous formal process for risk assessment and management.
- **Security:** The offeror should implement and maintain a rigorous formal process for maintaining program security at all required levels.
- **Testing:** The offeror should implement and maintain a rigorous formal process for preparing and conducting testing. Particular attention should be paid to evaluating test results, flight readiness reviews and the on-orbit demonstration.

3.5.3. Scope Of The Agreement Article

This article should state your vision for both Phase II and the optional tasks and describe how your proposed program satisfies the program objectives. This article should summarize the scope of the work you are committing to (as described in detail in the Task Description Document) by entering into this Agreement.

3.5.4. Term Article

This Agreement commences upon the date of the last signature hereon and continues for the duration of Phases II of the OE ATD Program and optional tasks that may be funded.

For planning purposes, the baseline Phase II ATD estimated period of performance is 42 months.

During Phase II, the Government may terminate this Agreement by written notice to the Phase II contractor, provided that such written notice is preceded by consultation between the Parties. During Phase II, the Phase II contractor may request Agreement termination by giving the Government sixty (60) days written notification of their intent to do so. If the Phase II contractor decides to request termination of this Agreement in Phase II, the Government may, at its discretion, agree to terminate. The Government and the Phase II Contractor should negotiate in good faith a reasonable and timely adjustment of all outstanding issues between the Parties as a result of termination, which may include non-cancelable commitments. In the event of a termination of the Agreement, the Government shall have paid-up rights in data as described in Article VIII, Data Rights. Failure of the Parties to agree to an equitable adjustment shall be resolved pursuant to Article VI, Disputes.

3.5.5. Obligation And Payment Article

The parties will negotiate payment methods for optional tasks prior to the start of performance of the optional tasks. If the payment method agreed upon is a type of cost reimbursement, then we anticipate compliance with current Cost Accounting Standards (CAS) will be required. If the offeror's accounting system does not comply with CAS, the Government will consider other payment approaches.

A Business Status Report will be submitted monthly. The business status report should provide summarized details of the resource status of this Agreement. This report should be organized to track the contractor's Work Outline, and should include a monthly accounting of current expenditures as planned in your IMP and IMS, and should follow the Work Outline Structure at least two levels below the segment level. Any major deviations should be explained along with discussions of the adjustment actions proposed. Updates should include the status of IMS tasks (updated Gantt chart) and the status of the detailed criteria and significant accomplishments within the IMP. Any changes to the IMP or IMS other than status updated should be highlighted. Since the IMP is part of the Agreement, any changes (other than status) will require an amendment to this Agreement. IMS changes do not require an Agreement amendment.

AGREEMENT START DATE:
 AGREEMENT END DATE:
 TOTAL AGREEMENT VALUE:
 FUNDING STATUS "AS OF" DATE:

TASK ELEMENT	<u>CUMULATIVE TO DATE</u>			<u>AT COMPLETION</u>	
	PLANNED EXPEND	ACTUAL EXPEND	% COMPLETE	BAC*	LRE**
SUBTOTAL					
UNALLOCATED RESOURCES					
TOTAL					

*Budget At Completion (BAC) changes only with scope changes (not affected by underrun / overrun)

**Latest Revised Estimate (LRE)

3.5.6. Government Furnished Property Article

The following Government Furnished Property (GFP), Equipment (GFE), Information (GFI), Facilities (GFF), and Services (GFS) shall be provided upon the written approval of the cognizant contracting officers:

(Offeror will list all desired GFE, GFP, GFI, GFF, and GFS.)

3.5.7. Schedule of Payments and Accomplishment Criteria and Deliverables

3.5.7.1. Milestone Payments:

The Contractor should perform the work required by the TDD. Performance Based Milestone Payments will be based upon meeting specific, measurable accomplishments at payable milestones (see sections 2.7.2).

3.5.7.2. Accomplishment Criteria

Offerors should develop accomplishment criteria for each Payable Milestone Event IAW instructions in your updated IMP.

3.5.7.3. Deliverables

- A. Due with Proposal
 - 1) Proposal volumes 1-8

- B. Due annually at a minimum
 - 1) Updated OEOS Refinement Plan
 - 2) Updated OEOS SCD (Including CONOPS & FOMS)
 - 3) Updated on-orbit FOT&E Plan
 - 4) Updated OE Transition Plan
- C. Due at every Payable Milestone Review
 - 1) Hard and soft copy of all Milestone Review materials
 - 2) Proposed Award Fee criteria for the next Payable Milestone Review
 - 3) Revised program documents per Section 2.6, and the contractor's change process described in their IMP
- D. Due monthly
 - 1) Business status report
- E. Ongoing access through website - IMS
- F. Due at completion of Phase II
 - 1) OEDS SRD
 - 2) OEDS SDD
 - 3) Satellite Servicing Interface Specification
 - 4) RAMP/TDP
 - 5) OEOS Refinement Plan
 - 6) OEOS Life-Cycle Cost Estimates, Cost-Effectiveness and Affordability Analysis
 - 7) OEDS on-orbit FOT&E Plan
 - 8) OE Transition Plan
- G. Due at Launch
 - OEDS on-orbit FOT&E Plan
- H. Due at end of the Agreement
 - 1) All residual OE assets including all unique support equipment, data and software (source & executable)
 - 2) All the operating manuals, logs, and other documentation necessary for the Government to continue to independently operate, maintain and modify the residual OEDS assets.
 - 3) All hardware/software developed or purchased with Government funds during this agreement

The data deliverables listed above are subject to the Data Rights provisions contained in Article 8, Data Rights.

3.5.7.4. Modifications

At any time during the term of the Agreement, progress or results may indicate that a change in the TDD would be beneficial to program objectives. Recommendations for modifications will be documented in a letter and submitted by the Contractor to the DARPA Program Manager with a copy to the DARPA Agreements Officer or designee. This letter will detail the technical, chronological, and financial impact of the proposed modification to the program. Any subsequent modification is subject to mutual agreement. The Government is not obligated to pay for any proposed change until formally revised by the DARPA Agreements Officer or designee and made part of this Agreement.

The DARPA Program Manager shall be responsible for the review and verification of any recommendations to revise or otherwise modify the Agreement.

For minor or administrative Agreement modifications (e.g., changes in the paying office or appropriation data, changes to Government or Contractor personnel identified in the Agreement, etc.) no signature is required by the Contractor.

The Government will be responsible for effecting all modifications to this agreement.

3.5.8. Federal Acquisition Regulation (FAR) Clauses (new article)

This article is intended to list any desired FAR clauses.

3.5.9. Phase II Completion Definition (new attachment)

This article is intended to provide the contractor's definition of their Phase II Completion Criteria. The contractor will define a definitive, unambiguous, quantitative set of Phase II Completion Criteria that defines successful completion of the Phase II ATD. At a minimum, this set of criteria must explicitly address how all specific Phase II objectives have been satisfied, how all critical and enabling technologies and processes associated with their OEOS design have been addressed and how technical feasibility for an OE system to effectively and affordably conduct on-orbit servicing.

This agreement ends 60 days after successful accomplishment of all the Phase II Completion Criteria or upon reaching the total team costs in accordance with Section 2.9. The agreement will extend to cover any currently unfunded optional tasks as long as the Phase II agreement is still active.

3.5.10. Optional Tasks (new attachment)

The Government and the contractor may, upon bilateral agreement, exercise any optional tasks. Exercise of any optional tasks must be in writing by the DARPA Agreements Officer or designee.

3.5.11. Award Fee Plan (new attachment)

The offeror should document their unique Award Fee Plan in accordance with (IAW) the guidance provided in Section 2.7.2 and Section 5.

3.5.12. Government Acceptance (new article)

The Government will accept the OE assets (ASTRO, NEXTSat) prior to launch. The government will accept all other OE assets such as OE unique mission control stations, and unique support and maintenance equipment upon termination of all Phase II baseline optional tasks and all optional tasks that may be funded.

3.5.13. Work Outline Dictionary (new attachment)

All sections of the offeror's proposal should follow a common Work Outline (WO). To insure that this WO is fully defined, the offeror should provide a WO dictionary. This dictionary should define the offeror's WO to a level at least two (2) levels below their OE segment level to provide consistency with the TDD, IMP, IMS and Cost Response. Additional levels of definition should be provided as necessary to define each item in the WO. A notional WO is located at Table 3-2.

3.5.14. Optional tasks

The offeror should document their Phase II optional tasks and complete the FOT&E Program Plan in accordance with the guidance provided in Sections 2.3, 2.5 and 3.2.

3.6. Integrated Master Schedule (IMS)

The offeror should establish and maintain an Integrated Master Schedule (IMS) that complements the Product IMP and provides continuous status of program accomplishments against time. The IMS outlines the specific detailed tasks and the amount of time expressed in calendar schedules necessary to achieve each significant event and/or functional accomplishment. It is a tiered scheduling system corresponding to the offeror's common work outline that links all program documents and management tools together. This tiered system should provide visibility to items below the OE segment level as appropriate.

The offeror's IMS should be written to detail every task in the program. The schedule should include traceability for all key events/accomplishments/dates. The offeror may provide additional elements if deemed necessary. The IMS should also provide the basis for the earned value management system. An initial IMS should be delivered with the Phase II proposal. The offeror's submission should include a summary level hardcopy and an electronic copy of the complete schedule in a commercially available format.

3.7. Cost Response

The offeror should provide a Cost Response with sufficient cost information to substantiate that their proposed cost is realistic, reasonable, and complete for the proposed Phase II efforts. The Cost Response should provide enough information to ensure the Government can conduct a complete and fair evaluation. The offeror's Cost Response should reflect their best estimate of the costs for the entire OE acquisition strategy. The Cost Response should clearly differentiate between those costs that are part of the Phase II (Baseline Funded) and those that are part of any priced optional tasks. It should convince the Government that the Phase II baseline funded tasks described in their proposal could be reasonably accomplished within the total \$100M program funding limit.

The detailed breakdown should include:

- Total program cost broken down by major cost items (direct labor, subcontracts, materials, other direct costs, overhead charges, etc.) and further broken down by year and milestone;
- Major program tasks by year;
- An itemization of major subcontracts and equipment purchases;
- An itemization of any information technology (IT)² purchases; and
- A summary of projected funding requirements by month.

For the Government to determine the reasonableness, realism and completeness of your Cost Response, the following types of data must be provided for each of your team members and in a cumulative summary for each applicable Work Outline (WO) element:

Labor: Total labor includes direct labor and all indirect expenses associated with labor. Provide a breakdown of labor and rates for each category of personnel to be used on this project.

Direct Materials: Total direct material that will be consumed in the program and/or incorporated into the final deliverable end items. This information should address how the estimated expense was derived.

Equipment: Total equipment that will be acquired under the program. This includes any spares and/or prototypes needed to support the final deliverable end items. Equipment includes large items, such as startrackers, independent of the mechanism of purchase. This information should address how the estimated expense was derived.

Subcontracts: Describe major efforts (for specific WO areas) to be subcontracted, the source, estimated cost and the basis for this estimate. Your response should include labor hours and rates by engineering category, a bill of materials, equipment cost by item, a breakdown of major elements of ODCs, and fee or profit percentage. For this Agreement a major subcontract effort exceeds \$500,000. For subcontracts less than \$500,000, cost and pricing information can be provided in summary format to include fully-burdened direct labor rates by labor category, a bill of materials, an itemization of equipment, IT and other direct costs to include travel and fee or profit percentage. Include a description of the method used to estimate costs and supporting documentation.

² IT is defined as "any equipment, or interconnected system(s) or subsystem(s) of equipment that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by the agency. For purposes of this definition, equipment is used by an agency if the equipment is used by the agency directly or is used by a contractor under a contract with the agency which - (1) Requires the use of such equipment; or (2) Requires the use, to a significant extent, or such equipment in the performance of a service or the furnishing of a product. The term "information technology" includes computers, ancillary, software, firmware and similar procedures, services (including support services), and related resources. The term "information technology" does not include - (1) Any equipment that is acquired by a contractor incidental to a contract; or (2) Any equipment that contains imbedded information technology that is used as an integral part of the product, but the principal function of which is not the acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information

Travel: Total proposed travel expenditures relating to the program. Limit this information to the cost, number of trips, and general purpose of each cost or the basis of estimate.

Other Costs: Any direct costs not included above. List the item, the estimated cost, and basis for the estimate.

The offeror should provide a list of all Government furnished equipment/information/property required for execution of their proposal along with a cost estimate for its use. The cost of GFE/GFI/GFP should be included in the offeror's total program cost and will be subtracted from the total funding available for Phase II if required during that Phase. If you choose to use a government provided mission operations facility as part of your approach, include an estimate of the value of the government provided mission operations support including an equivalent cost if government facilities are not available and the support must be purchased commercially. If equipment is to be provided at no cost to the program, the offeror must provide a signed letter from the appropriate Government official indicating that no costs will be incurred by the OE program resulting from the acceptance of the equipment.

To facilitate the Government's evaluation and to determine the realism and completeness of your Cost Response, submit it using the formats provided in the Tables 3.2 and 3.4 as a guide. You may tailor the formats to reflect your own WO, internal business practices and accounting procedures. Tables 3.2 and 3.4 are our notional representation of the type and level of data needed to do a thorough evaluation. Where not specified, the Government assumes that the level of the data will be to the appropriate WO level for hardware items and a similar level for software.

For elements in the WO that include computer resources, show how you allocated the computer resource development tasks among the prime, team members and subcontractors. Show for both the prime and major team members separate software development and hardware design engineering hours. In Table 3-2 show the total labor separately for each WO line number. Describe how you estimated the cost of software development associated with each appropriate WO level. Cite any parametric relationships (e.g., hours per line of code, cost per pound, complexity factors, etc.) you used in estimating the hardware and software development tasks. The software cost data for each software element should include the program source, if applicable, and the cost of developing re-used, modified and new Source Lines of Code (SLOC).

3.7.1. Cost Matrix

Table 3-2 depicts the Government's notional work outline and associated level of indenture of the OE system. This notional work outline reflects the level of insight we desire concerning the number of labor hours/dollars, and material/subcontract costs proposed, by Government fiscal year, at the lowest level of indenture indicated. The offeror's unique Table 3-2 should be submitted with their Cost Response both in hard copy and as an Excel 97-spreadsheet file on magnetic media.

The offeror should modify and expand Table 3-2 to reflect their proposed systems configuration and their approach to conducting Phase II and priced optional tasks. As with all other parts of your proposal, the work outline numbers in the far left of the matrix must be consistent. After modifying the spreadsheet to reflect your unique system configuration approach, the offeror should expand the spreadsheet to the right with a set of columns for each Government fiscal year of their proposed Phase II and priced optional tasks as shown in Table 3-2. At the lowest level of indenture, enter the number of direct labor hours/dollars and material/subcontract costs for each task for each year. For each year, also enter the respective direct labor hours/dollars and materials costs for each major subcontracted effort. The Spreadsheet should breakout the data for each WO in Table 3-2 as a total and then as a design, hardware, fabrication, and test.

Software costs should be defined for each appropriate WO level. All software costs should also be broken out and detailed separately in a format of the offeror's choice. This software breakout should be organized in accordance with the offeror's Work Outline and linked to specific OE capabilities. Insight into the individual software costs associated with each segment, subsystem and major component should be provided. Insights as to what functionality is being hosted where and why should be provided.

At the bottom of the spreadsheets, include single rows for the total cost, total Other Direct Costs (ODCs), total General and Administrative (G&A) costs, Facilities Capital Cost of Money (FCCM), proposed fee/profit, and then total price.

Table 3-2: Cost Matrix

Outline Code	Level							Prime				Sub 1					
	1	2	3	4	5	6	7	Total Hrs	Labor \$	Mat/Sub \$	Total \$	Total Hrs	Labor \$	Mat \$	Total \$		
00000	Orbital Express System																
10000	Mission Analysis																
				On-Orbit Servicing Utility													
				Operational System Concepts													
				Demonstration System Concepts													
				CONOPS													
20000	Life-Cycle Cost, Cost Effectiveness, & Affordability																
				Life-Cycle Cost													
				Cost Effectiveness													
				Affordability													
30000	ASTRO Servicing Vehicle																
				Spacecraft Bus													
				Structures & Mechanisms													
				Electrical Power System (EPS)													
				Command & Data Handling (C&DH)													
				Attitude Determination & Control System (ADACS)													
				Thermal Control System (TCS)													
				Propulsion													
				Communications Systems													
				Operational Flight Software													
				Integration, Assembly & Test (IA&T)													
				SE/PM													
				On-Orbit Servicing Systems													
				Auto-GN&C													
				Hardware													
				Software													
				Docking Mechanisms													
				Fluid Transfer/Storage Mechanisms													
				ORU Transfer/Storage Mechanisms													
				Other Servicing Mission Software													
				Integration, Assembly & Test (IA&T)													
				SE/PM													
				Payloads													
				ORU(s)													
				Propellants													
				Other Fluids													
				Microsats													
				Other Payloads													
				Integration, Assembly & Test (IA&T)													
				SE/PM													
				ASTRO Spacecraft Harnesses/Cables													
				ASTRO Spacecraft Propellants													
				Final ASTRO Integration, Assembly & Test (IA&T)													
				Overall ASTRO SE/PM													
40000	Satellite Servicing Interface Concepts/Analyses																
				Mechanical Interfaces													
				Electrical Interfaces													
				Enabling Software													
				Associated Protocols													
				Tools / End Effectors													
				Longevity / Durability													
				Disposition / Disposal													
50000	NEXTSat Serviceable Satellite Architecture																
				Spacecraft Bus													
				Structures & Mechanisms													
				Electrical Power System (EPS)													
				Command & Data Handling (C&DH)													
				Attitude Determination & Control System (ADACS)													
				Thermal Control System (TCS)													
				Propulsion													
				Communications Systems													
				Operational Flight Software													
				Integration, Assembly & Test (IA&T)													
				SE/PM													
				On-Orbit Servicing Systems													
				Cooperative Servicing Aids													
				Docking Mechanisms													
				Fluid Consumables Receipt & Handling Mechanisms													
				ORU Receipt & Handling Mechanisms													
				Other Servicing Mission Software													
				Integration, Assembly & Test (IA&T)													
				SE/PM													
				Other Payloads Receipt/Handling Mechanisms													
				NEXTSat Spacecraft Harnesses/Cables													
				NEXTSat Spacecraft Propellants													
				Final NEXTSat Integration, Assembly & Test (IA&T)													
				Overall NEXTSat SE/PM													
60000	Commodity Payload																
				Spacecraft Bus													
				Structures & Mechanisms													
				Electrical Power System (EPS)													
				Command & Data Handling (C&DH)													
				Attitude Determination & Control System (ADACS)													

3.7.2. Spend Plan

The offeror should provide a spend plan which shows how all expenses will be time-phased for the program. Total program costs should be shown for each segment in "Then Year" dollars broken out by quarters of Government fiscal years. [Note: The contractor should provide insights into what inflation/escalation rates were used to generate the "Then Year" dollars shown.] This Spend Plan should cover all proposed optional tasks from FY02 through FY06. Separate lines should be provided to clearly differentiate the funded Phase II costs from any of the priced optional tasks costs. This spend plan should match up as closely as possible to the Government Phase II (Baseline) funding profile provided in Table 2-1.

Table 3-3: OE Spend Plan

	GFY 2002				GFY 2003				GFY 2004				GFY 2005				GFY 2006				Total
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
Phase II																					
Option 1																					
Option 2																					
Option ..N																					
Total Options																					
Total																					

3.7.3. Labor Category Data

The offeror should use Table 3-4 as a format guide to display total annual prime and subcontractor labor hour distribution by labor category. The labor hours should match up against the labor hours shown in Table 3-2. Provide a separate table for the prime contractor and for each sub-contractor with a subcontract value greater than \$500,000. Composite labor categories, such as Senior Engineer, Engineer and Junior Engineer may be used for subcontractors. In addition, the offeror should supply the direct, indirect, etc. rates and factors used to generate the burdens for labor and material/subcontracts costs shown in the cost response and also indicate how they relate to the most recent Defense Contract Audit Agency approved values.

Table 3-4: Annual Labor Categories and Hours per Contractor (Prime and Subs)

Labor Category	GFY 2002 Hrs	GFY 2003 Hrs	====>	20XX Hrs	Total Hrs
Lbr Cat 1					
Lbr Cat 2					
.....					
Lbr Cat n					

3.7.4. Cost Approach and Substantiation

The offeror should provide a narrative section that explains or substantiates the approach used to develop the costs included in the Cost Response, especially those reflected in the Cost Matrix (Table 3-2). In this section, the offeror should provide insight into estimate quality, estimating methodologies, and risks associated with key elements of their cost proposal. You should provide cost data and cost estimating relationships from both in-house and commercial sources to support your cost responses. You must succinctly show the data used, inputs and assumptions, adjustments made, and potential comparisons to other similar efforts. The estimating methodology narrative should include all applicable assumptions regarding size, weight, and power parameters, associated weight margins, non-recurring and recurring quantities, risk/uncertainty costs included, etc. for each hardware WO proposed. The Government is interested in all components of the offeror's Phase II and priced optional tasks. We are also interested in software development costs since the anticipated execution of the OE mission is fairly software intensive. Therefore, the offeror should provide insight into their methods for estimating source lines of code for software effort and provide a rationale for how software productivity is determined in number of source lines of code per month.

For the test and demonstration optional tasks, the offeror's cost response should identify assumptions, facilities, planning factors, etc. that may drive the Phase II (Baseline and Options) costs. Examples include number of personnel required to support the test or deployments, planning for the test or deployment (e.g., pre-test/deployment meetings for coordination, on-site support), and logistics considerations during the test/deployments. The offeror should provide sufficient detail to justify their cost for both Phase II and priced optional tasks.

3.8. Orbital Express Transition Plan

The offeror should document their Orbital Express Transition Plan in accordance with the guidance provided in Section 2.6.11. The Transition Plan is not part of the offeror's Agreement.

3.9. OEOS System Capability Document (Including CONOPS and Figures of Merit)

The offeror should provide an updated version of their OEOS System Capability Document (SCD) that captures the full capability of their proposed operational design. The OEOS SCD and OEDS SRD should follow a common format based on the common work outline that links all the proposal documents together. The OEOS SCD should provide details on the total system and system segment capabilities as well as any additional major subsystems or components required to fully define the complete OEOS. Overall system and segment performance capabilities should be defined along with all critical or enabling technologies and processes associated with the systems or segment design, operation, or support. This living document should continue to evolve during both the Phase II and FOT&E optional tasks and eventually transform into the operational system specification. The OEOS SCD is not part of the Phase II Agreement.

The offeror should provide a detailed description of their OEOS concept of operations (CONOPS) for conducting the on-orbit servicing missions defined during Phase I. Aspects of their CONOPS directly responsible for overall system effectiveness and affordability should be described in detail. Specific characteristics of the offeror's AGN&C, ASTRO, NEXTSat, ground control, and servicing interface should be defined to the level necessary to fully illustrate your approach. All Figures of Merit (FOM) for both affordability and mission effectiveness defined during Phase I should be presented here in a straightforward tabular or graphical format. These FOMs should continue to evolve during the program as lessons learned are translated into OEOS refinements. The OEOS CONOPS and FOMs are not part of the Phase II Agreement.

3.10. Classified Annex

The Phase I optional tasks used and produced information from various levels of classified information up to the Sensitive Compartmented Information (SCI) level. The Government anticipates the Phase II proposal may contain information at all these levels. The classified annex provides the offeror with an opportunity to describe the details of their proposal that require classification. Any classified material provided in this volume should be clearly linked to the appropriate sections of the rest of the proposal. All volumes other than volume 6 of the offeror's proposal should be unclassified.

3.11. OEOS Phase I FDR Materials

The offeror's OEOS FDR information will be evaluated as part of the Phase II source selection. The offeror has the option to resubmit any revised FDR materials in conjunction with their Phase II proposal. The offeror should clearly state which subset of the Milestone 4 FDR materials are still valid and which are being revised and replaced. Any unchanged FDR briefing materials will be considered by the Government as submitted and should not be resubmitted here. In the absence of any direction from the offeror to the contrary, the Government will use only the FDR materials originally presented at Milestone 4 during the source selection.

3.12. OEDS Phase I PDR Materials

The offeror's OEDS PDR information will be evaluated as part of the Phase II source selection. The offeror has the option to resubmit any revised PDR materials in conjunction with their Phase II proposal. The offeror should clearly state which subset of the Milestone 5 PDR materials are still valid and which are being revised and replaced. Any unchanged PDR briefing materials will be considered by the Government as submitted and should not be resubmitted here. In the absence of any direction from the offeror to the contrary, the Government will use only the PDR materials originally presented at Milestone 5 during the source selection.

3.13. Government Leveraging Agreements

The offeror should document all the Memorandums of Agreement/Understanding, or other instruments that leverage Government facilities, resources, and/or manpower. The offeror should incorporate signed agreements from all Government agencies that they

have negotiated support or leveraging agreements with. Each of these agreements must define the scope of the support provided by the Government, the cost, terms and conditions, and period of performance. An authorized representative of the Government agency making the commitment must sign each agreement. Signatures must be at a laboratory director level or higher. Within the offeror's proposal; all leveraging agreements should be referenced where appropriate, the dependence of the program on this agreement should be defined, and the proposed fallback or alternative approaches should be identified.

3.14. Oral Presentations

As part of the response process, offering teams may participate in oral presentations. The oral presentations will consist of answers to questions posed by government/government support personnel to each contractor team for clarification and to increase overall depth of understanding of the written proposals.

4. Evaluation Criteria for Award

4.1. Introduction

DARPA plans to modify at least one existing Orbital Express Contractor Team's Phase I Agreement for execution of Phase II of the Orbital Express ATD program. Phase II selection will be accomplished based on a subjective evaluation of proposals as described in this section of the solicitation. There are three specific evaluation areas that will be used: Technical Approach and Understanding the Problem, Management Process and Tools, and Cost. Each offeror's proposal will receive an integrated evaluation by a single, multi-functional team. The Government reserves the right to award without discussions.

4.2. Basis for Phase II Award

Successful Phase II proposals will incorporate a balanced consideration of all three evaluation factors. It is our intention to negotiate business issues such as data rights, foreign technology transfer, payable event schedule, deliverables, consortium agreements, costs, and any other issues associated with the model agreement, and consider the best value offered to the Government in the Phase II award decision. Evaluation areas are listed below, but are not in priority order.

4.2.1. Technical Approach and Understanding the Problem

Orbital Express Operational System

- Was the product of a rigorous set of trades and analysis
- Demonstrates the operational utility enabled by on-orbit servicing

Orbital Express Demonstration System

- Identifies and exercises the key enabling technologies and procedures required to demonstrate the technical feasibility of robotic, autonomous on-orbit servicing
- Is traceable to operational systems requirements
- Is innovative and technically feasible

System Maturation / Operational Transition

- Identifies a clear path for transitioning on-orbit servicing to future operational systems

4.2.2. Management Process and Tools

The offeror's management processes will be evaluated to ensure that overall sound methodologies, representing good management practices, are used to complete all the Phase II activities and optional tasks. Streamlined and innovative business, teaming, and technical management practices are desired. The offeror will also be evaluated on the

reasonableness of the terms and conditions in their proposed changes to the Phase I Agreement. The evaluation will examine the offeror's proposal in the areas listed below.

Management Plan

All aspects of the proposal will be analyzed to determine if the offeror has the planning, management, systems engineering, and software development processes, security, and qualified program team to successfully accomplish the tasks defined in their TDD, IMP, IMS, and RAMP/TDP.

Agreement Terms and Conditions

All aspects of the offeror's proposed agreement will be analyzed to determine the reasonableness of the terms and conditions.

Facilities Capability

All aspects of the proposal will be analyzed to determine if the offeror has the capability to conduct all the tasks defined in their TDD, IMP, and RAMP/TDP.

Phase I Performance

All aspects of the offeror's Phase I performance will be analyzed to determine their ability to plan and successfully execute a rigorous systems engineering and program management process.

4.2.3. Cost

This evaluation factor will focus on the cost realism, reasonableness and completeness of the offeror's cost proposal to conduct all the tasks defined in their TDD, IMP and IMS. The proposals will be evaluated to ensure that the offer is fair and reasonable. While evaluating cost criteria, the competing offers will be compared to internal Government cost estimates. The results of the cost evaluation will be considered in performing an integrated assessment of the proposal leading to selection of a successful Offeror. The proposal(s) shall be evaluated at the Probable Cost (PC) for the basic requirements and any optional tasks. PC shall be measured as the Government estimate of anticipated performance costs plus Award Fee proposed. If the Contracting Officer determines that use of Government production and research property creates a competitive advantage, a rental equivalent evaluation factor will be applied per FAR 45-201. The extent of benefits, if any, included in the Phase II Proposal due to the offeror's IRAD, corporate investments, or other sources must be clearly stated and traceable.

Cost Realism

The Government will evaluate the realism of each Offeror's proposed Cost/Price proposal. Cost Realism means a review of the overall costs in an offeror's proposal to

determine if costs: 1) are realistic for the work to be performed; 2) reflect a clear understanding of the requirements; and 3) are consistent with the various elements of the offeror's technical proposal. The assessment of Cost Realism will consider any technical/management risks identified during the evaluation of the proposal and their associated costs and be considered in the probable cost (PC) analysis. In the event that the Government evaluates an offer to be unrealistically low when compared to the anticipated cost of performance, and the offeror fails to explain these underestimated costs, then the Government will consider this a lack of understanding of the technical requirements.

Cost Reasonableness

The Government will evaluate the reasonableness of each Offeror's proposed cost/price. The Offeror's price will be reviewed to determine that logical and generally accepted estimating methods, source data, ground rules and assumptions were used. Thus, the offeror's basis of estimate utilized for estimating the projected design, hardware, fabrication, and test costs for each WO element and its corresponding labor, material, subcontractor, etc. components will be reviewed in determining the overall Cost Reasonableness. This is also consistent with using one or more of the price analysis techniques defined in FAR 15.404 for the Cost Reasonableness evaluation.

Cost Completeness

The Government will evaluate the completeness of the actual data and cost estimate contained in the cost proposal and provided in response to Phase II Solicitation instructions and requirements. The Cost Completeness is evaluated by assessing the level of cost detail provided relative to the offeror's proposed scope and effort. This includes the complete traceability to the Cost/Price proposal for all the WO elements included.

5. Award Fee Plan Example

EXAMPLE

Orbital Express ATD
PHASE II

AWARD FEE PLAN

APPROVED: _____

DARPA Program Manager

OE PHASE II AWARD FEE PLAN

5.1. Introduction

The specific criteria and procedures used to assess contractor performance and determine Award Fee payments are described in this plan. Award Fee is used to motivate excellent performance by the contractor in executing the Orbital Express (OE) Phase II effort. A separate pool of money is set aside specifically for the Award Fee. The established value of the Award Fee pool is intended to motivate many different facets of contractor performance, such as timeliness, technical ingenuity, and effective management. The awarded amount is determined by the Government's review of management and performance areas under the control of the contractor.

The total available Award Fee is as shown in Table 5-1.

Table 5-1: Award Fee

FY02	FY03	FY04	FY05	Total
\$4.39M	\$3.5M	\$2.11M		\$10M

The evaluation is based upon performance at key program Award Fee Milestone Events. The contractor can earn all, part, or none of the pool which is available at each Award Fee Milestone Event. Earned award fee, that amount of the pool that the DARPA PM determines the contractor has earned based on his performance, is paid after each Award Fee milestone event.

Determination of contractor performance and award fee earned is subjective. However, the process is explicit enough to allow the contractor every opportunity to understand how the award fee amount is based on performance. The PM will assemble an appropriate set of technical experts for each Award Fee Milestone Review, consistent with the focus of that review, to assist in his assessments. Based on this evaluation, the DARPA PM will make a recommendation to the Fee Determining Official (FDO) who will decide whether to award all, or a portion of the allotted amount. Any un-awarded amounts will either be removed from the award pool or rolled-forward to a future period at the PM's discretion. The amount of the earned award fee shall not be subject to the Agreement's "Disputes" article. Every effort will be made by the Government to assure fairness of evaluation as well as prompt and consistent feedback.

5.2. Definition of Government Responsibilities

The Fee Determining Official (FDO) is responsible for approving the amount of award fee earned and payable to the contractor for each Award Fee milestone event.

The DARPA PM is responsible for:

1. Approving the award fee accomplishment criteria for each Award Fee Milestone Event.

2. Approving and assembling the members of an Award Fee Milestone Review Team appropriate for the focus and content of each event.
3. Recommending to the FDO the amount of award fee earned and payable to the contractor for each Award Fee Milestone Event.
4. Notifying the contractor of the amount of fee awarded after each Award Fee Milestone Event with a description of the items which impacted the award fee decision.

5.3. Award Fee Evaluation Requirements & Procedures

- A. See Section 2.7.2 for guidance in development of specific Award Fee milestone events.
- B. The award fee will cover six areas of emphasis that reflect the balanced approach desired in order to achieve the program objectives within cost, and on schedule. The first three areas are integrally related; a strength or improvement item in one of the three areas will potentially impact the other two. The last area emphasizes other items of concern to the Government for a specific period.

1. Overall progress towards completing the development and demonstration of the OE Demonstration System as described in the TDD, IMP, IMS and other program technical and management documents.

2. Overall progress toward meeting the OE ATD Phase II goals and objectives, as evidenced by progress towards satisfying all Technical Performance Measures (TPMs), satisfying all demonstration objectives, achieving all Phase II Completion Criteria, and achieving other program technical and management goals and objectives.

3. Overall progress towards a low risk entry into a System Development and Demonstration program as evidenced by progress towards demonstrating military utility, operational value and technical maturity of an on-orbit satellite servicing architecture according to the RAMP/TDP, Transition Plan and other program technical and management documents.

4. Overall schedule performance

5. Overall cost control

6. Other program considerations

- C. Criteria, which more specifically define/modify the government's expectations, and which are subsets of the areas of emphasis, will be chosen for each Award Fee Milestone Event. These criteria will further expand on the areas of emphasis. The criteria for the first Award Fee Milestone Event are provided in paragraph I below. The criteria for the areas of emphasis are listed in priority order, from highest to lowest.

- D. At each Award Fee Milestone Event, the contractor will submit proposed accomplishment criteria within each area of emphasis for the next Award Fee Milestone Event. Based on the Government's assessment, and the focus of the next Award Fee

Milestone Event, the PM will approve a set of specific criteria in each area of emphasis for the next Award Fee Milestone Event and transmit them to the contractor within ten (10) working days of the completed Award Fee Milestone Event.

E. Each Government/government support Award Fee Milestone Event reviewer will develop an overall adjective rating based on their evaluations of the contractor's performance at the Award Fee Milestone Event, in accordance with the definition of the ratings described below. These individual criteria ratings will be integrated to develop an overall contractor rating.

F. The overall contractor rating provided by the Government/government support review team will be used by the PM to assist in his determination of the percentage of fee the contractor will earn at the end of the period. The overall rating will be directly related to the percent of Award Fee paid as shown below:

<u>Rating</u>	<u>Percent of Award Fee</u>
Excellent	90-100%
Good	70-89%
Satisfactory	50-69%
Marginal	1-49%
Unsatisfactory	0%

G. The following definitions describe in general the types of performance associated with each adjectival rating. The specific ratings of excellent through unsatisfactory can be further defined in the briefings by using a + or - (excluding an EX+ or UNSAT-) to provide a more exact rating.

Excellent:

- A high probability exists that a quality product will be delivered and that all program goals and objectives will be met.
- Schedule is exceeded or met as planned (deviations are minor and have no impact on overall program).
- Management initiatives are extremely effective. Potential problems are aggressively identified and resolved early
- Communications are exceptionally open, timely, and meaningful

Good:

- A moderate to high probability exists that a quality product will be delivered and that all program goals and objectives will be met.
- Schedule is met as planned, with minor rescheduling required (deviations are minor and have little impact on overall program)
- Management initiatives are highly effective. Problems are proactively identified and resolved
- Communications are consistently open, timely, and meaningful

Satisfactory:

- A moderate probability exists that a quality product will be delivered and that all program goals and objectives will be met.
- Schedule is usually met as planned, with some rescheduling required
- Management initiatives are usually effective. Contractor demonstrates ability to identify and resolve problems
- Communications are usually open, timely, and meaningful

Marginal:

- A low to moderate probability exists that a quality product will be delivered and that all program goals and objectives will be met.
- Schedule deviations require replanning, and program impacts are increasing
- Management initiatives require strengthening. More aggressive actions by the contractor are needed to identify and resolve problems
- Communications are sometimes not open, timely, and meaningful

Unsatisfactory:

- A low probability exists that a quality product will be delivered and that all program goals and objectives will be met.
- Schedule control is nonexistent
- Management initiatives are ineffective or nonexistent. Inability to identify and resolve problems requires government intervention
- Communications are consistently lacking in openness, timeliness, and meaningfulness

H. The remaining portion of the fee pool available for any period, but not awarded, may be carried forward to subsequent evaluation periods at the discretion of the DARPA PM.

5.3.1. Award Fee Areas of Emphasis & Criteria for the First Award Fee Milestone Event

(To be updated for each Award Fee milestone event)

AREA OF EMPHASIS: Overall progress towards completing the development and demonstration of the OE Demonstration System as described in the TDD, IMP, IMS and other program technical and management documents:

- CRITERION U1:
- CRITERION U2:
- Etc.

AREA OF EMPHASIS: Overall progress toward meeting the OE ATD Phase II goals and objectives, as evidenced by progress towards satisfying all TPMs, satisfying all demonstration objectives, achieving all Phase II Completion Criteria and achieving other program technical and management goals and objectives.

- CRITERION A1:
- CRITERION A2:
- Etc.

AREA OF EMPHASIS: Overall progress towards a low risk entry into a System Development and Demonstration program as evidenced by progress towards demonstrating military utility, operational value and technical maturity of an on-orbit satellite servicing architecture according to the RAMP/TDP, Transition Plan and other program technical and management documents.

- CRITERION E1:
- CRITERION E2:
- Etc.

AREA OF EMPHASIS: Overall Schedule Performance:

- **CRITERION S1: Schedule Management.** This criterion evaluates the contractor's performance against planned schedules. The assessment will encompass the integration of the IMS with the Earned Value System including an assessment of the validity of the causes for schedule adjustments necessary to meet IMP criteria and the effectiveness of schedule recovery plans. The evaluation will also measure the contractor's ability to identify potential schedule problems early and project the impact of near-term schedule changes on long-term events.

AREA OF EMPHASIS: Overall Cost Control:

- **CRITERION C1: Cost Management.** This criterion evaluates the contractor's actual cost performance compared to the established IMP and IMS as expressed in the Earned Value System and the effective use of the cost control system in the day-to-day management of the program, including evaluating the impact of variances and implementing corrective action planning. The continued improvement of the Earned Value System will also be evaluated. This criterion also evaluates the cost management of subcontractor efforts and the timely and thorough development of revised cost estimates.

AREA OF EMPHASIS: Other Program Considerations:

- **CRITERION O1: Program Website.** This criterion evaluates the contractor's efforts to establish and maintain a secure program Website to facilitate robust Government/ contractor management of the program on a daily basis.

Appendix A – JPL Sensor System

Operational Concept for Optional JPL Sensor System

If an MSR sensor package is flown on the OEDS, the anticipated operations concept would be as follows:

- a) JPL transponder package is flown on the NEXTSat/commodity spacecraft, power to be supplied by the satellite, no data interface.
- b) JPL sensor package is flown on the ASTRO spacecraft with power and data provided by ASTRO.
- c) JPL sensor package has visibility toward target spacecraft along same Line Of Sight (LOS) as primary OEDS rendezvous sensors with Field of View (FOV) of $\pm 60^\circ$ from the LOS.
- d) Concurrently operate the JPL sensors with the OEDS rendezvous sensors and provide JPL with data products which correlate (in time) the OEDS flight data (sensed states, jet commands, etc.) with the JPL sensor data. It is acceptable that the JPL sensor data be stored on-board the spacecraft and downlinked during non-critical mission phases.
- e) One or more of the JPL sensors could be long range, up to 3000km. JPL desires that the long range rendezvous be designed to allow viewing of the service spacecraft at these long ranges.

JPL Sensor Interface: NEXTSat/Commodity Spacecraft

Payload Description: Navigation capable (no data) transponder unit, UHF or X-Band, with patch antenna for omni transmit (or hemispherical antenna with cooperative attitude during rendezvous).

System Allocations:

Size: 16cmx16cmx16cm

Mass: 4 kg

Power: 3.3V, 2W continuous

Data: none

JPL Sensor Interface: ASTRO Spacecraft

Payload Description: Multi-sensor package with one or more of the following sensors: Radio Direction Finder (RDF), long-range optical camera, and short-range optical camera. Package includes C&DH avionics to accept sensor commands from uplink, collect data from sensors, and send data to host servicer spacecraft for storage and downlink.

System Allocations:

Size: 25cmx25cmx60cm (with RDF antennas placed normal to the LOS in a square pattern 50cm apart)

Mass: 45kg

Appendix A – JPL Sensor System

Power: 28V, 120W peak, 60W continuous

Data: MIL-STD-1553B (one RT on the 1153 bus for the entire System)

JPL->ASTRO: Compressed digital images, relative NEXTSat/Commodity states,

JPL Sensor System Details

Pointing Requirements to operate the JPL sensor system:

Spacecraft slew rate < 6 mrad/sec during sensing (LAMP).

Long-range and short-range optical sensor capabilities:

Long-range camera – 10m to 3000+km, 1.4 deg FOV with 2 axis gimbal

Short range camera – TBD (0 to 20m desired range)

Size, Weight, Power of the system:

Size:

LAMP – 5000cc

RDF – 6300cc (host, +4 UHF antenna), 300cc (target)

Long range optical camera – 9000cc (+avionics)

Short range camera – 1000cc

Mass:

LAMP – 4kg

RDF – 3kg (host), 0.5kg (target)

Long range camera – 2kg (+avionics)

Short range camera – 0.35kg

Power:

LAMP – 25W

RDF – 10W (host), 1.5W (target)

Long range camera – 2W (+avionics)

Short range camera – 3W

RDF Details

Output signal interface is a stand-alone system which delivers elevation and azimuth of the target in the RDF FOV. The RDF target emitter is omnidirectional, 0.1W emitted power, continuous operation. RDF receiving FOV is +/-60 degrees, range of 5m to 3000km. The RDF operates in the UHF Frequency band.

Data Bandwidth on the 1553 Databus:

Telemetry - ~4kbps

Image – ~1Mbps

Baseplate Temperature Requirements: TBD

Shock and Vibe Environments: Consistence with Ariane V launch.

The JPL Sensor System is a single string system.

Appendix A – JPL Sensor System

Technology Readiness Level of each of the Components:

LAMP – TRL 3-4

Radio Direction Finder – TRL 3-4

Long Range Optical Camera – TRL 4

Short Range Optical Camera – TRL 5

Development schedule for the JPL system:

LAMP – EM Protoflight, Q1 '04

RDF – EM Protoflight, Q3 '04

Long range camera – not yet scheduled

Short range camera – not yet scheduled