FALCON

*F*orce *A*pplication and *L*aunch from *CON*US

Broad Agency Announcement

(BAA)

PHASE I

Proposer Information Pamphlet

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1.0 INTRODUCTION

1.1 Vision

DARPA and the Air Force share a vision of a new transformational capability that would provide a means of delivering a substantial payload from within the continental United States (CONUS) to anywhere on Earth in less than two hours. This capability would free the U.S. military from reliance on forward basing to enable it to react promptly and decisively to destabilizing or threatening actions by hostile countries and terrorist organizations.

The Government's vision of an ultimate prompt global reach capability (circa 2025 and beyond) is engendered in a reusable Hypersonic Cruise Vehicle (HCV). It is envisioned that this autonomous aircraft would be capable of taking off from a conventional military runway and striking targets 9,000 nautical miles distant in less than two hours. It could carry a 12,000-pound payload consisting of Common Aero Vehicles (CAVs), cruise missiles, Small Diameter Bombs (SDB) or other munitions. HCVs as part of the future U.S. force structure will provide the country dominant capability to wage a sustained campaign from CONUS on an array of time-critical targets that are both large in number and diverse in nature while providing aircraft-like operability and mission recall capability. The Government is interested in innovative HCV concepts utilizing novel technologies that mitigate heat load and extend range. Such innovative concepts could enable effective prompt global reach missions and potentially provide a reusable first stage of a two-stage-to-orbit (TSTO) access to space vehicle. This vision is consistent with the goals of the DoD/NASA National Aerospace Initiative.

The United States, however, needs a prompt global reach operational capability in the much nearer term (see AF Space Command Operationally Responsive Spacelift and Prompt Global Strike Mission Need Statements). This near-term operational capability is embodied in the CAV munitions delivery system integrated with a low-cost, operationally responsive, rocket booster. Essentially, CAV is an unpowered, maneuverable, hypersonic glide vehicle capable of carrying approximately 1,000 pounds in munitions or other payload. This concept has been studied since the mid-nineties and conceptual designs utilizing existing technologies have been developed that offer substantial capability. CAV designs based on existing technologies are predicted to have a downrange glide on the order of 3,000 nautical miles. Advanced CAV designs have also been developed that offer substantially greater downrange (approximately 9,000 nautical miles) and improved maneuverability (approximately 3,000 nautical miles cross-range). This enhanced performance CAV, henceforth referred to as the Enhanced CAV, requires significant technology development particularly in the areas of thermal protection and guidance, navigation, and control.

In the far-term, the HCV itself could deliver CAVs to multiple targets. In the near-term, CAV requires a launch vehicle or other means of attaining its pierce point conditions in terms of geo-location, altitude, attitude and velocity. Expendable rocket boosters offer

adequate near-term capability. However, existing booster systems are costly and in limited supply. As a consequence, the government intends to develop a low-cost, responsive launch vehicle called the Small Launch Vehicle (SLV) under the FALCON program. The program envisions the SLV design being integrated and developed in parallel with the Enhanced CAV design. The SLV should serve a two-fold function in that it will also provide a low-cost, responsive launch capability for placing small satellites into low Earth orbit (LEO). A total cost per launch (not including payload specific costs) of five million dollars or less is desired. Taken together, the two objectives satisfied by the SLV are a significant spiral in the development of an Operationally Responsive Spacelift (ORS) capability currently being pursued by the Air Force.

Substantial commonality exists between the key technologies that will enable the Enhanced CAV in the near-term and the HCV in the far-term. As a consequence, CAV (using available technologies), Enhanced CAV, and HCV are viewed to lie on a common evolutionary design and technology maturation path. Therefore, the FALCON program will be an incremental program in that as key capabilities are matured and demonstrated in flight, opportunities will be generated to spiral them into Systems Development and Demonstration (SDD) programs that will provide successive enhancements to the country's capability to perform prompt global strike missions from CONUS (or equivalent reach from alternative US basing).

1.2 Motivation

Recent military engagements in Bosnia, Afghanistan, and Iraq have underscored both the capabilities and limitations of United States air forces in terms of placing ordnance on military targets. While advancements in target identification and precision strike have been abundantly demonstrated, deficiencies in engaging and defeating time-critical and high value, hard and deeply buried targets (HDBT) have also been revealed. Moreover, the current and future international political environment severely constrains this country's ability to conduct long-range strike missions on high-value, time critical targets from outside CONUS (OCONUS). This restriction coupled with the subsonic cruise speed limitations of the current bomber fleet translates to greatly extended mission times. Consequences include failure to successfully engage and destroy a large subset of high value, time-critical targets, severe reduction in the tonnage of ordnance that can be placed on targets within a given timeframe, and excessive physical and emotional fatigue levied upon bomber crews.

The US Strategic Command has a critical need for responsive, effective, and affordable conventional strike to provide deterrence, power projection and coercion, delivering munitions in minutes to hours globally from CONUS (or equivalent reach from alternative US basing). The intent is to hold adversary vital interests at risk at all times, counter anti-access threats, serve as a halt phase shock force and conduct suppression of enemy air defense and lethal strike missions as part of integrated strategic campaigns in the Twenty-First Century. During the high-threat early phases of an engagement, critical mission objectives include the rollback of enemy Integrated Air Defenses (IADs) and the

prosecution of high-value targets. Throughout the remainder of the campaign, a continuous vigilance and immediate lethal strike capability are required to effectively prosecute real-time and time-critical targets and to maintain persistent suppression of enemy IADs. A system capable of responsively and effectively performing these mission objectives would provide a "no win" tactical deterrence against which an enemy's defenses would be ineffective.

1.3 Program Philosophy

The Government acknowledges the differences between past research and development programs, and the FALCON vision. However, the importance of leveraging the lessons learned from past programs should not be minimized. The Government expects the Offeror to utilize to the maximum extent possible the knowledge base gained from past programs. This leveraging of capabilities can be accomplished, in part, through teaming with partners that possess expertise in critical technology areas.

One important deviation from past approaches will be the major emphasis upon incremental flight-testing in the FALCON program. The government desires technologies be developed in the context of a "building block" flight test approach and that the FALCON program remain demonstration-focused.

The Government seeks to open up the design space and provide a catalyst for exploring "clean sheet of paper" system design philosophies and global strike mission scenarios especially for far-term approaches. Creative integration of the latest advances across a broad suite of component technologies, and innovative CONOPS will enable a revolutionary advance in global strike capabilities. The Offeror is encouraged to "think out of the box" and propose unique collaborative design methodologies, analysis tools, processes, capabilities, concepts, innovative teaming arrangements and business practices to reduce the cost of product development.

2.0 PROGRAM DESCRIPTION

2.1 Program Goal and System Operational Capabilities

The goal of the joint DARPA/Air Force FALCON program is to develop and validate, in-flight, technologies that will enable both near-term and far-term capability to execute time-critical, prompt global reach missions while at the same time, demonstrate affordable and responsive space lift. The fundamental underpinnings of the technical approach to be taken in the FALCON program is the recognition that a common set of technologies can be matured in an evolutionary manner that will provide a near-term (~2010) operational capability for prompt global strike from CONUS (or equivalent reach from alternative US basing) while also enabling future development of a reusable HCV for the far-term (~2025). This common set of key technologies includes: efficient aerodynamic shaping for high lift to drag, lightweight and durable high temperature materials, thermal management techniques including active cooling and trajectory shaping (such as periodic flight), target update and autonomous flight control. It is

envisioned that these technologies will be matured to flight readiness, integrated into a system design and demonstrated in a series of flight-tests.

2.1.1 SLV System Operational Capabilities

The Government desires the capability to place small satellites into a diverse family of low Earth orbits (including Sun synchronous orbits) using a dedicated, low-cost, responsive SLV. For this application, the SLV should be at least an order of magnitude more responsive than existing satellite launch systems and must have a low launch cost. The Government envisions that new/novel technologies and/or technical approaches incorporated into an innovative SLV design are key to achieving a sustained, low-cost, responsive, small satellite launch capability for the foreseeable future. The FALCON program will pursue development of an innovative SLV concept possessing these attributes and demonstrate critical and enabling performance characteristics in a sub-orbital flight demonstration. The program will also seek to develop a unique CONOPS that will support and enable both the responsiveness and low-cost system objectives for small satellite launch.

The following system operational performance objectives are established to aid in driving the desired technology and development activity for the SLV in concert with those specific to the CAV/SLV prompt global strike operational objectives identified in Section 2.1.2:

- Capability to place a small satellite or other payload weighing approximately 1,000 pounds into a Reference Orbit which is defined as circular, 100 nautical mile altitude, due east, launched from 28.5^{o} north latitude for a total launch cost of less than five million dollars ($5,000,000 CY2003) (excluding payload and payload integration costs).
- Provide insertion accuracy of +/-13.5 nm (25 km), +/-0.1^{o}
- Accommodate a minimum 24 inch x 24 inch x 30 inch payload
- Flexibility to satisfy a wide range of small satellite launch missions including payload sizes ranging from as little as 220 pounds (100 kilograms) to 2,200 pounds (1000 kilograms) for no more than $7,500 (CY2003$) per pound total launch cost (excluding payload and payload integration costs)
- Launch after authorization from an alert status within 24 hours

It is left to the Offeror's innovativeness to propose a flexible SLV concept that is capable of accommodating as broad a range of payload sizes as practical. The Government has established no formal launch cost objectives with respect to CAV missions. However, the Government desires to minimize launch costs for these missions and anticipates that low-cost characteristics of the Offeror's proposed SLV concept will translate to CAV launch missions.

2.1.2 CAV/SLV System Operational Capabilities

The Government desires to accomplish near-term conventional global strike capability via development of a rocket boosted munitions delivery system that delivers its payload to the target by executing unpowered glide maneuvers at hypersonic speed. This concept notionally would integrate a CAV with an SLV design that is capable of boosting a CAV weighing approximately 2,000 pounds (including munition) to its requisite pierce point conditions (e.g. geo-location, altitude, velocity, and attitude). The Government believes that the SLV design for this mission would possess a high degree of commonality with the SLV design for launch of small satellites that was addressed in Section 2.1.1 above. The FALCON program will pursue the development, integration, and demonstration of the critical and enabling technologies and system attributes leading to an operational CAV/SLV system. Operational objectives derived from related Joint Requirements Oversight Council (JROC) validated Mission Need Statements (MNS) for a future CAV/ ORS (Operationally Responsive Spacelift) system can be found in Appendix I.

The following CAV/SLV system objectives are derived from the future CAV/ORS system operational objectives and are established to aid in driving the desired technology development and demonstration activity for the CAV/SLV Operational System.

- Defeat hard and deeply buried targets
  - Approximately 1,000 pound fuzed penetrator payload (CAV munition)
  - Impact speeds of approximately 4,000 feet per second
- Strike throughout the depth of an adversary's territory
  - Global range
- Mobile/relocatable targets
  - 3000 nautical mile cross-range
  - Linkage to complete, timely Intelligence, Surveillance, and Reconnaissance (ISR)
- Time sensitive targets
  - Less than one hour from launch to target
  - Launch on-demand consistent with mission requirements
- Accurate weapons delivery
  - Three meter Circular Error Probable (CEP)
- High-speed munitions/payload release {Small Diameter Bomb (SDB), Wide Area Autonomous Search Munitions (WAASM), etc.}
- Flexible SLV
  - Approximately 2,000 pound CAV (1,000 pound payload) at global ranges
- Responsive and economical SLV
  - Ready to launch (alert status) in less than 24 hours
  - Launch in less than 2 hours from alert status once execution order received
  - Surge rate of 16 launches in 24 hours

In addition to global range, there is also interest within the government to provide inter/intra-theater CAV delivery capability.

2.1.3 HCV System Operational Capabilities

Far-term conventional prompt global strike capability is envisioned as a CONUS-based, reusable, HCV. Reusability and aircraft-like operations are critical to far-term affordable and flexible prompt global strike capability. In order to achieve this capability, the FALCON program will pursue the design, development, integration, and demonstration of critical and enabling technologies and system attributes pertaining to a reusable, operational HCV.

The following system operational performance objectives are established to aid in driving the desired technology development and demonstration activity for the HCV Operational System.

- 9,000 nautical mile strike capability
- 12,000 pound payload capacity
- Flight time of two hours or less (take-off to target strike)
- Launch on-demand consistent with mission requirements
- Reusability consistent with airplane-like operation
- Logistically suitable for CONUS-based military operations
- High speed munitions release
- Engage multiple, diverse and widely dispersed targets
- Retargetable
- Recallable

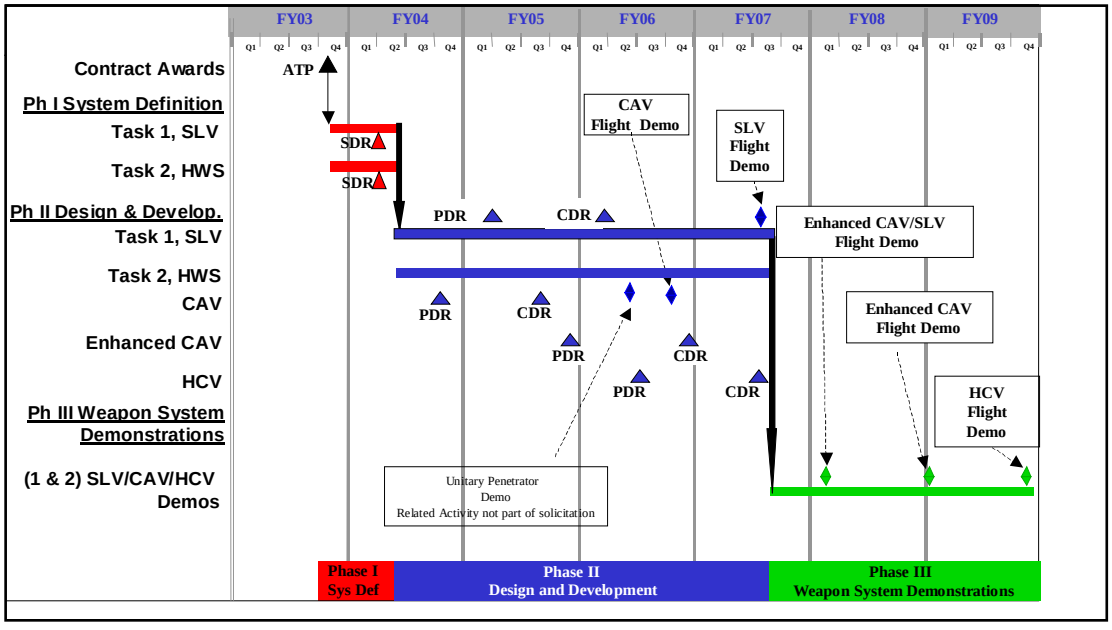

Figure 2.1 Notional Program Plan

2.2 Program Plan

A government reference program plan and schedule for the FALCON program is illustrated in Figure 2.1. This is only a notional plan and Offerors are encouraged to propose a plan that is optimized for their proposed concept and provides maximum benefit to the Government. The program has been divided into three phases as defined below:

- Phase I – System Definition
- Phase II – Design and Development
- Phase III – Weapon System Demonstrations

The FALCON program is split into two separate tasks identified as Task 1, Small Launch Vehicle (SLV), and Task 2, Hypersonic Weapon Systems (HWS). The Offeror is given the opportunity to respond to one or both tasks.

One goal of this program strategy is to provide information at key program milestones to enable decision-makers to determine whether it is technically and fiscally prudent to continue the proposed program approach.

Phase I, System Definition, will consist of two tasks that will be conducted in parallel over a six-month period of performance.

Up to five awards are envisioned for **Task 1, SLV.** The Phase I objective of the SLV Task is to provide SLV design(s) suitable for launching either a global range Enhanced CAV with an approximate 1,000 pound munitions payload (2,000 pound total CAV weight) or inserting a small satellite into a specified low Earth orbit. The Government desires low-cost, responsive booster designs. Phase I products will include conceptual booster designs, performance predictions, and CONOPS and ROM costs for development and operation.

Up to four awards are envisioned for **Task 2, HWS.** The Phase I objective of the HWS Task is to develop conceptual designs for the CAV, Enhanced CAV, and HCV that optimize Air Force warfighting requirements and operational capabilities; performance requirements; munitions weight, volume and high speed dispense requirements; and launch alternatives. Phase I products will include an integrated demonstration plan including ROM costs to execute, critical technology identification and maturation plan, and conceptual demonstrator designs for the hypersonic weapon systems.

Near the conclusion of Phase I, the Government intends to release a separate solicitation for Advanced Technologies to address specific technical risk areas associated with the Hypersonic Weapon Systems defined in Phase I. Those technologies common among Task 2 performer maturation plans are likely to be of particular interest. The Advanced Technologies solicitation will seek out new and innovative ideas from all interested sources that may not have found a suitable means to participate in Phase I of this

solicitation. This will allow for the development and demonstration of innovative technologies in conjunction with concept development.

The Government's decision to progress from Phase I to Phase II will, in part, be based on the delivered Phase I products from both tasks that best address the below combination of information or events to meet the stated objectives:

1. Conceptual design and CONOPS for a low-cost, responsive SLV to deliver an operational, global range Enhanced CAV while reducing current launch preparation times to less than two hours.
2. Conceptual design and CONOPS for a low-cost, responsive SLV capable of placing a payload weighing 1,000 pounds into the Reference Orbit (circular, 100 nautical mile altitude, due east orbit, launched from 28.5^{o} north latitude) for a total launch cost (excluding payload and payload integration) of less than five million dollars and within 24 hours following authorization to launch.
3. SLV conceptual design capable of satisfying a wide range of small satellite missions for payloads from 220 pounds (100 kilograms) to 2,200 pounds (1,000 kilograms) for a total launch cost of less than $7,500 per pound across the payload size range of interest.
4. CAV designs, technologies suite and capability demonstration plan to validate a 3,000 nautical mile, approximately 800-second mission and a 9,000 nautical mile, approximately 3000-second mission.
5. A "closed" concept design and CONOPS for the HCV that achieves 9,000 nautical mile strike distance, 12,000 pound payload, and flight time of two hours consistent with scramjet performance and thermal protection systems (TPS) projected by 2012.
6. Completion of HCV trajectory optimization trades that compare the instantaneous and integrated aerothermal loads for constant altitude and periodic trajectory flight paths.
7. Identification of a common technologies suite and demonstration plan for CAV, Enhanced CAV and HCV that provides an evolutionary development of HCV enabling technologies

Phase II, Design and Development, will continue the two, Phase I tasks and is currently planned for a period of performance of approximately 36 months.

The **Task 1, SLV**, Phase II objective is to demonstrate and flight-test all significant characteristics of the operational Small Launch Vehicle. Up to two SLV awards are envisioned for Phase II which will result from full and open competition. Phase II will develop a low cost, responsive SLV design in parallel with CAV (and Enhanced CAV) development. Deliverables will include refinement of CONOPS for each SLV approach, a detailed flight demonstration plan for each booster system, and flight-test of at least one SLV system.

The **Task 2, HWS,** Phase II objective is to flight-test a CAV and develop critical designs for Enhanced CAV and HCV demonstration systems incorporating flight-ready

hypersonic technologies. It is envisioned that up to two HWS awards will be granted for Phase II as the result of a full and open competition. Phase II will execute an integrated plan to evolve CAV, Enhanced CAV and HCV designs and mature associated critical technologies. Extensive analytical and experimental effort will be conducted to bring a suite of these technologies to flight-readiness (TRL = 6). The HCV operational system design will be evolved further and performance predictions made for major design revisions. The CAV, Enhanced CAV, and HCV demonstrator preliminary and critical designs will be developed, and risk mitigation plans executed. A flight demonstration of a CAV launched from Vandenberg AFB or Kodiak Launch Range to Kwajalein Atoll using currently available, "800-second" TPS technology is envisioned. Advanced GN&C, range safety, in-flight target updating, periodic trajectories, terminal guidance, and functionality against HDBT will be demonstrated. The Government desires that this flight demonstration occur in fiscal year 2006 and no later than by the end of fiscal year 2007.

The government's decision to progress from Phase II to Phase III will, in part, be based on the delivered Phase II products which best address the below combination of information or events to meet the stated objectives:

1. Successful flight demonstration of an affordable, responsive booster SLV.
2. Successful 3,000 nautical mile, 800-second flight-test of the CAV demonstration system with a simulated unitary penetrator payload.
3. An Enhanced CAV critical design that will demonstrate a 9,000 nautical mile range (including approximately 3,000 nautical mile cross range), 3000 second mission capability.
4. A HCV demonstrator critical design that incorporates at least three hypersonic technologies identified in Phase I; these three technologies will be developed to at least TRL = 6.

Phase III, Weapon System Demonstrations, will consist of a single task identified as Weapon System Demonstrations. The objectives are to flight-test an Enhanced CAV, an integrated Enhanced CAV/SLV system, and multiple HCV technology demonstration vehicles to validate system and technology performance. The Phase III award selection process, number of awards and scope of each will be defined during later in the program. Phase III is planned to be conducted over approximately 30 months. Upon completion of the Enhanced CAV and integrated Enhanced CAV/SLV flight demonstrations, the balance of the Phase III effort will focus on demonstration of reusable technologies that are considered key to enabling future development of an HCV operational system. Many of these same reusable technologies are expected to benefit Enhanced CAV designs as well. Key technologies will be integrated into an HCV demonstrator and flight-tested using a similar test approach taken in demonstrating CAV and Enhanced CAV designs. Powered as well as unpowered versions of the HCV demonstrator may be tested to permit technology validation for longer duration flights and/or assessment of the implications of integrating propulsion systems with the vehicle design.

2.3 Interface Management

The Government's objectives of developing an SLV capable of boosting an Enhanced CAV to its requisite penetration point conditions and conducting an integrated Enhanced CAV/SLV flight demonstration in Phase III will require a mechanism for managing the Enhanced CAV/SLV interface. Since multiple performers are expected to participate in both Task 1 and Task 2 during Phase I, it would be impractical to attempt to develop specific interface controls between each CAV and SLV design team. Moreover, since only conceptual designs will be developed in Phase I, this level of interface control is deemed premature. Instead, the Government will create a single set of generic interface requirements that will satisfy the needs of both the CAV and SLV designers in Phase I. Preliminary interface information was presented at the FALCON Industry Day. This information will be refined and provided to Performers by the ATP. A final update for Phase I will be provided by the end of the second month of Phase I.

The Government anticipates that management of CAV/SLV interfaces will involve the direct participation of Performers beginning in Phase II and will develop and coordinate processes and mechanisms to ensure that adequate interface controls are established and maintained. Coordination and information exchange between SLV and HWS Performers will be required early in Phase II in order to develop interface control requirements for the physical and functional characteristics of the SLV and Enhanced CAV in preparation for an integrated SLV/Enhanced CAV flight test in Phase III

2.4 Management Approach

DARPA is responsible for overall program management of the FALCON program, including technical direction, acquisition, and security. DARPA will provide the Program Manager (PM) and the Air Force will provide the Deputy Program Manager (DPM). DARPA and the Air Force will use a diverse government team to evaluate proposals and conduct milestone reviews.

Program performer participants are expected to implement a streamlined approach to program management that includes team member cooperation, small staffs, abbreviated oversight, face-to-face communications, real-time decision-making and problem solving, and short, direct lines of authority. Program performer participants should be prepared for the formal exchange of technical information with applicable Phase I or Phase II participants, subject to signed non-disclosure agreements.

2.5 Data Rights

Phase I of this program requires sufficient government rights to the technical data developed to enable the Government the ability to: 1) flexibly brief stake holders regarding technical progress/accomplishments and 2) allow validation of technical claims/accomplishment by independent technical (potentially non-government) experts. However, in future phases of this program the Government's requirement for technical data and Rights thereto will increase. For Phases II and III the Government envisions, at

a minimum, having Government Purposes Rights (GPR) to Technical Data for items such as:

- The System Design – adequate to enable third party vendors to develop technologies for insertion into the system architecture
- Technology Development – adequate to enable independent verification of the performance predictions. Examples of the types of data include test results and interface definitions
- Maintenance and Life Cycle Support Data – Sufficient data and rights thereto to enable development of life cycle support models and cost predictions based on a credible life cycle support program.

The Government also anticipates openly sharing some data such as that describe above, from time to time as part of DARPA's ongoing program transition responsibility. However, the Government will protect all competition sensitive data and other information. In addition, the Government is open to creative approaches such as "other than GPR" which converts to GPR at later specified events of dates. Although minimal data is required for Phase I, the selected Phase III Performer(s) may be required to "reach back" to include data developed in earlier phases.

3.0 PHASE I STATEMENT OF OBJECTIVES

This section describes the objectives to be addressed in Phase I of the FALCON program. The primary objectives of Phase I are to conduct system trades and generate a preferred system definition for the SLV and HWS conceptual designs, produce development plans for each and formulate flight demonstration plans. A chart describing the breakdown of activities is shown in Figure 3.1.

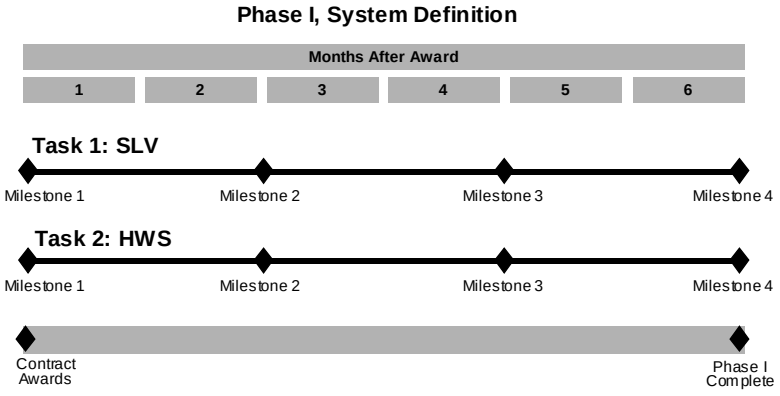

Figure 3.1 Phase I FALCON Activities

3.1 Task 1, Small Launch Vehicle (SLV), Objectives

This task accomplishes major objectives for the system definition of the SLV Operational System (SLV-OS) and the SLV Demonstration System (SLV-DS).

The Government desires a single SLV-OS design that addresses both small satellite and Enhanced CAV launch objectives defined in Sections 2.1.1 and 2.1.2. However, it is recognized that some differences in vehicle design and/or associated CONOPS specific to each payload type may be necessary and/or advantageous to enable performance and launch cost objectives to be met. In that event, the Performer is encouraged to strive to achieve the maximum degree of commonality practical between the Enhanced CAV-specific and small satellite-specific launch vehicle operational system designs, document differences between OS designs, and provide a supporting rationale.

The SLV-DS will be developed and flight-tested in Phase II and used to perform a flight-demonstration of an integrated Enhanced CAV/SLV system in Phase III. The SLV-DS should incorporate key technologies and design features of the SLV-OS and have a clear legacy to the SLV-OS.

The Performer should implement a complete systems engineering process to achieve the objectives of this task. The task should include, but is not limited to, developing and delivering the products in the following sections.

3.1.1 SLV-OS Products

1) **Conceptual Design**: Each Task 1 Performer should develop a single SLV-OS conceptual design that meets small satellite (Section 2.1.1) and Enhanced CAV (Section 2.1.2) launch requirements to the extent practical. There is also interest in the government to explore design variations (i.e., – modularity) to accommodate inter/intra-theater range CAV delivery. Physical and functional descriptions of all subsystems and major components including over-all dimensions and estimated weight for each should be developed. Design features specific to a single mission type as opposed to common to both mission types should be highlighted and discussed. Operating pressures and temperatures, materials of construction, and key dimensions including wall thickness for critical structural components should be defined. Propellant constituents including theoretical performance and estimated total weight for these and other consumables should be provided. The Performer should predict delivered performance in terms of thrust, specific impulse versus time and total delivered impulse and provide a basis for these estimates in terms of assumed efficiencies, propellant usage, historical data, etc. Aspects of the Performer's concept that have significant bearing on system safety and/or environmental impact during manufacture, transportation, storage or operation should be delineated and discussed. The Performer should describe any unique design features, manufacturing or processing techniques that potentially differentiate its concept from others in terms of enhanced performance, reduced cost, operational

flexibility, or responsiveness. Experimental demonstrations of any of these features even in subscale or simplified form are strongly encouraged in this task.

2) **Performance Predictions:** Analytical performance predictions should be generated for orbital insertion of a small satellite for multiple orbital altitudes and inclinations as a function of payload weight. At a minimum, these predictions should include the Reference Orbit and Sun synchronous orbits of potential interest. Likewise, analytical performance predictions should be generated from launch to separation of a full scale (2,000 pound) Enhanced CAV for a mission set that demonstrates the capability and flexibility of the Performer's concept. Initial penetration point requirements and physical and aerodynamic properties for a generic Enhanced CAV were defined by the Government at Industry Day and are available to potential bidder upon request. For the purposes of this task, it is estimated that these launch requirements will be finalized by the Government by around the end of month two following the ATP. Both global range and inter/intra-theater ranges should be explored and defined.

3) **CONOPS:** Each Contractor should develop Concept of Operations (CONOPS) for its conceptual SLV-OS design for both the small satellite and Enhanced CAV mission sets. CONOPS should address launch facility requirements/operations and describe the means of transporting the SLV-OS to, and within, the launch facility (both CONUS and OCONUS). SLV-OS assembly and payload integration should be delineated. Preparation for launch and associated timelines should be described in context with the responsive and flexible launch requirements of the CAV mission set. All assumptions including availability of suitable launch infrastructure and weather constraints should be defined. Flight management including contingencies for flight termination and mission abort should be described. Innovative approaches that provide enhanced responsiveness or reduced launch costs should be described and substantiated. Since CONOPS is a major factor in both responsiveness and launch cost, the Performer is encouraged to pursue definition of CONOPS that may be in part or wholly outside the Air Force's current practices. Furthermore, the Government anticipates that the CONOPS associated with each mission type could be significantly different. For example, responsive timelines associated with each mission type may require different levels of alert status.

4) **Average ROM Cost:** An average ROM, recurring, small satellite launch cost should be generated for the SLV-OS. The Government has devised a simple small satellite launch model that the Performer is expected to use in the absence of better information. This mission model assumes twenty launches per year over a ten-year period. The Performer should assume a CY 2003 constant dollar basis; that all launches consist of a single, 1,000 pound payload placed in the Reference Orbit; that launches are evenly spread over the ten-year period; and that launches are conducted from a single launch site within CONUS. Cost of payload, payload integration with the launch vehicle and amortized Design, Development Test and Evaluation (DDT&E) are not to be included in the calculation of average launch

cost. All other costs that would normally be passed to the purchaser of the small satellite launch should be included in the calculation. The Performer should include all costs associated with providing a launch vehicle fleet that meets the prescribed launch rate over the prescribed period of time. The Performer should also discuss the concept's cost sensitivity to launch rate. An average cost per launch based on the 200 launches comprising the reference launch model should be derived. Only launches of small satellites – not CAV or Enhanced CAV- are to be addressed in calculation of the average launch cost. However, the Performer should compare and discuss the ROM cost of its vehicle design required for the reference small satellite mission with the ROM cost for its vehicle design for an Enhanced CAV operational mission. Also, the Performer should assess cost per pound for insertion of a range of payload sizes into the Reference Orbit. The Performer should provide a basis for its ROM cost estimate and delineate all assumptions made.

3.1.2 SLV-DS Products

1) **Conceptual Design:** Each Task 1 Performer should develop a single SLV-DS conceptual design that enables demonstration of launch capabilities outlined in Section 2.1.1 and 2.1.2. The Government desires demonstration of this SLV-DS design during Phase II in one or more sub-orbital flight-tests. As previously discussed, the SLV-DS would subsequently be integrated with an Enhanced CAV-DS payload and flight-tested as part of Phase III. Payload physical and functional characteristics and interface requirements for this integrated Enhanced CAV/SLV flight demonstration will be further defined by the end of the second month of Phase I by the Government in consultation with both Task 1 – SLV and Task 2 – HWS Performers. However, the SLV-DS should possess at least a threshold performance capability consistent with placing a 1,000-pound payload into the Reference Orbit. Significant differences between the SLV Operational and Demonstration System designs should be identified and a rationale provided for why these differences exist.

2) **Performance Predictions:** Analytical performance predictions should be generated to predict flight trajectory characteristics for the initial SLV-DS flight demonstration in Phase II as well as the integrated Enhanced CAV/SLV flight demonstration in Phase III. In addition, predictions should be made that demonstrate the capability of the Contractor's SLV-DS concept to place a small satellite into the Reference Orbit assuming launch from Cape Canaveral Air Force Station and Sun synchronous orbit assuming launch from Vandenberg Air Force Base at a minimum. Payload weight including shroud as a function of orbital altitude and inclination should be the primary figure of merit. Differences in predicted performance capability between the SLV-OS and SLV-DS should be quantified and discussed.

3) **Development and Demonstration Plan:** A development and demonstration plan should be generated to meet Task 1 objectives. Any deviations from the SLV-OS

basic design that have been assumed in defining the SLV-DS whether required to conduct the integrated CAV/SLV flight demonstration in Phase III or simply to enhance performance or reduce cost should be defined and discussed. The Performer should ensure that the SLV-DS it proposes to develop in Phase II will satisfy all requirements to launch the Enhanced CAV-DS and meet, as a minimum, the threshold objective for small satellite launch.

3.1.3 Milestone Elements

As part of the negotiated, fixed price agreement/contract, payment will occur at four payable milestones. Figure 3.1 illustrates Phase I milestones in relation to the task. The payable milestones for the Phase I work occur at kickoff, two months, four months, and six months after award for successful completion of the effort generally described below. The Government wishes to maintain these milestone intervals and general level of accomplishment to the extent possible. A milestone review will be held in conjunction with completion of effort associated with each milestone. For purposes of developing costs for the Phase I proposal, the Offeror should assume that Milestones 2 through 4 will require a two-day meeting in Arlington, Virginia. The Phase I kick-off meeting that coincides with Milestone 1 will be held at the Performer's site. The Government's desired set of major accomplishments associated with each Phase I milestone is listed below. This list represents the minimum set of information to be provided at each milestone. The Offeror should supplement this list based on its unique Phase I program. However, proposed milestone payments shall be demonstratably consistent with proposed spending.

Milestone 1

The major element for the first payable milestone is conduct of the kickoff meeting. The kickoff meeting should include, but not be limited to an SLV Phase I Systems Definition program plan; introduction of all key personnel and responsibilities; description of design process; and an update of SLV system concepts to date.

Milestone 2

(1) SLV-OS Systems Performance Specification
(2) Preliminary vehicle sizing
(3) Preliminary performance prediction

Milestone 3

(1) SLV-OS Conceptual Design
(2) CONOPS
(3) SLV-OS Performance Predictions

Milestone 4

(1) SLV-DS Conceptual Design

(2) ROM launch costs with basis of estimate for SLV-OS
(3) SLV-DS performance predictions

Additional milestone elements for each milestone addressed above should be proposed in the Offeror's Phase I proposal along with a proposed milestone award value. Also, the Offeror should propose accomplishment criteria for each milestone element. These accomplishment criteria should sufficiently describe a quantitative measure or a level of detail associated with each milestone element to enable determination of success or failure. At the milestone review, emphasis should be placed on quality and credibility of information and discussion of issues, not on generation of required paperwork. Instead of written milestone reports, the Contractor should provide six (6) electronic copies of annotated briefing slides on CD-ROMs at each review. All milestone information should be in Microsoft Office 2000 compatible format.

3.2 Task 2, Hypersonic Weapon Systems (HWS), Objectives

This task accomplishes major objectives in the system definition of the CAV Operational System (CAV-OS), CAV Demonstration Systems (CAV-DS), HCV Operational System (HCV-OS) and HCV Demonstration System (HCV-DS). The CAV-OS will accurately deliver a variety of submunitions and unitary penetrators from global ranges as discussed in Section 2.1.2. The CAV-DS will be the primary means for conducting Phase II and Phase III flight demonstrations and should have legacy to the CAV-OS. The CAV-DS should consist of two air vehicles (distinguished by their approximate mission flight times of 800 and 3,000 seconds), booster interface, mission control elements, and any unique support equipment. The HCV-OS should reflect the Contractor's vision for an operational, reusable, global-reach platform capable of operating from CONUS and delivering a substantial payload. Specific operational performance objectives were defined in Section 2.1.3. The HCV-DS is the experimental test vehicle that will be flight-tested in Phase III to assess and validate technologies that are deemed key to enabling the realization of the HCV-OS.

The Performer should implement a complete systems engineering process to achieve the objectives of this Task. This task should include, but is not limited to, developing and delivering the products in the following sections.

3.2.1 CAV-OS Products

1) **Conceptual Design:** The Performer should develop a preferred CAV-OS conceptual design that is capable of delivering a nominal 1,000-pound penetrator munition and dispensing of other submunitions such as the SDB and WAASM, to global targets as specified in Section 2.1.2. Additionally, the contractors should perform a high-level scaling trade including ¼ and ½ scale concepts. The necessary modeling and simulation required to demonstrate concept effectiveness should be conducted. Key attributes of the CAV-OS are global reach, prompt/effective delivery of conventional payloads from and through space, and affordability. This task should take into consideration, mission effectiveness, platform performance, payload fraction and volume, dispense requirements,

booster integration and launch alternatives. The CAV-OS should exploit real-time data sources from the theater information network in a dynamic battlefield. As part of the conceptual design effort, the physical and functional interfaces between the CAV-OS and its launch vehicle should be defined consistent with conceptual design level of detail.

2) **CONOPS**: The Performer should define a CONOPS for the CAV-OS in a system-of-systems architecture. The Performer should produce a briefing that defines the functionalities and sequencing (including timeline) for a typical system operation. This briefing, referred to as a Day-In-The-Life (DITL) briefing, should cover all aspects of the system, including basing; infrastructure requirements; command control and communications; integration with responsive booster assets; mission planning and execution; support; integration with other battlefield systems; etc.

3.2.2 CAV-DS Products

1) **CAV Conceptual Design:** The Performer should develop a preferred conceptual design for the 3,000 nautical mile, 800 second mission duration (CAV-DS). CAV-DS will represent an interim operational capability with legacy to the CAV-OS for accurate delivery of a 1,000 pound unitary penetrator. CAV-DS should utilize currently available technologies and boosters. Designs should consider, but are not limited to, integration with the high speed penetrator munition, effective and affordable thermal protection, onboard diagnostic systems and modular experimental bays, mission control and planning functions and interfaces including integration with existing C4ISR systems, and robust command control and communications including in-flight retargeting during all flight phases. The Performer should define all physical and functional interfaces between the CAV-DS and its launch vehicle for the flight demonstration consistent with the over-all conceptual design level of detail.

2) **Enhanced CAV Conceptual Design:** The Performer should develop a conceptual design for a CAV flight demonstration vehicle that is analogous to the Enhanced CAV-OS discussed in Section 2.1.2. The Enhanced CAV-DS should be designed to achieve a 9,000 nautical mile downrange including 3,000 nautical mile cross range, 3,000 second flight. Designs should consider, but not be limited to advanced thermal and structural materials, onboard diagnostic systems and modular experimental bays, munitions dispense, mission control functions and interfaces to maintain increased target selectivity, and robust command control and communications during all flight phases. The Performer should define physical and functional interfaces between the Enhanced CAV-DS and its launch vehicle for the flight demonstration consistent with conceptual design level of detail.

3.2.3 HCV-OS Products

1) **Conceptual Design:** The HCV-OS is intended to be the Performer's operational vehicle design approach that offers the potential of accomplishing the goals and objectives established by the FALCON program as discussed in Section 2.1.3. The Performer should describe its preferred configuration, attributes, and performance of the HCV-OS and its subsystems. It is recognized that given the relative immaturity of several key enabling technologies, the eventual operational aircraft is likely to differ significantly from the HCV-OS designs generated in the FALCON program.

2) **Trade Studies:** The Performer should conduct system studies for the global reach HCV-OS to comparatively assess multiple vehicle design concepts consistent with the program performance goals. These include comprehensive trades and analyses to identify the system performance required to accomplish the program goals described in Section 2.1.3 and to identify the corresponding suite of critical and enabling technologies to achieve those goals. At a minimum, trades should be conducted in terms of mission radius, payload weight, speed, altitude, and cruise efficiency. The Performer should comparatively assess multiple mission trajectories including constant cruise altitude and periodic flight trajectory types. The relative benefits and/or disadvantages should be quantified and associated technical challenges identified. All trades should consider the unique aspects associated with the HCV-OS. The trades should fully explore innovative approaches to the concept and evaluate operational battlespace management and logistical requirements for employing the HCV-OS.

3) **CONOPS:** A high level HCV-OS CONOPS should be developed in concert with the evolution of the vehicle's conceptual design. The emphasis should focus on unique basing and logistical issues particularly those outside the norm for U.S. military air facilities. A notional mission event timeline should be developed that representative of how the HCV might be utilized in an operational context. This timeline should highlight innate capabilities and flexibility of the HCV-OS.

3.2.4 HCV-DS Conceptual Design

The Performer should develop a preferred conceptual design of a HCV-DS that incorporates technologies and design elements traceable to the HCV-OS conceptual design. The HCV-DS should be a technology demonstrator for the HCV-OS design and may be powered to extend flight duration and/or explore implications of integrating propulsion with airframe. It is anticipated that the HCV-DS will utilize launch platforms, facilities and logistics used to perform CAV demonstration flights.

3.2.5 Technology Maturation Plan

The Performer should identify all key enabling technologies required by the HCV-OS and CAV-OS to achieve their operational objectives. Technologies of interest include,

but are not limited to, innovative propulsion concepts; advanced high-temperature materials for leading edges and acreage TPS; unique thermal management approaches including active cooling; trajectory tailoring to minimize heat loads and/or increase operational range in the hypersonic flight regime; cryogenic fuel conformal tank technology; efficient light-weight materials and design approaches; high-speed munitions dispense approaches; command, control, and communication interfaces; aerodynamic boundary layer control; and high lift-to-drag vehicle shaping. The Performer should adopt NASA's Technology Readiness Level (TRL) methodology as the standard to rate the various technologies in terms of a set of objective criteria. The assessment should consider the technology effectiveness, realizability in a real system, and maturity, as well as any additional factors considered relevant. Having determined the current TRL of each key technology, the Performer should develop roadmaps to maturing all key technologies for each system to a TRL of six, implying flight-readiness. These roadmaps should include all requisite experimental and/or analytical work required, including inexpensive small-scale, flight experiments if appropriate. A top-level schedule and associated ROM cost to mature to TRL= 6 should be generated for each key technology. This information should be documented in a single Technology Maturation Plan addressing both CAV-OS and HCV-OS and submitted to the government as a Phase I product.

3.2.6 Flight Demonstration Plan

The Performer should develop a Flight Demonstration Plan for the CAV-DS, Enhanced CAV-DS and HCV-DS. This plan should include flight demonstration of the CAV-DS in Phase II by FY06 but no later than FY07. The government desires that this first CAV-DS flight be low risk which may require using an existing booster such as those provided by the Rocket System Launch Program (RSLP) launch services. The Demonstration Plan should then outline flight demonstrations of the Enhanced CAV-DS, integrated Enhanced CAV-DS/SLV, and multiple HCV-DS flight demonstrations in Phase III. The Performer should also initiate key flight test documentation for use in Phase II of the program. Documentation should consider a definitized overall approach that ensures validation of all system components and operational capability in a thermally stressing flight environment. This includes, but is not limited to demonstration of precision targeting at hypersonic speeds, quantification of aerodynamic performance and vehicle dynamics, validation of attachment concepts, validation of GN&C flight at equilibrium conditions, validation of all electronics (including GPS and all apertures), and validation of control logic needed for operational flight. Test documentation should include flight test trajectories, preferred location(s) for system flight tests, procedures and timeline for obtaining flight clearance, and a detailed schedule showing key milestones leading to flight tests.

3.2.7 Milestones Elements

As part of the fixed price, negotiated agreement/contract, payment will occur at four payable milestones. Figure 3.1 illustrates Phase I milestones in relation to the task. The payable milestones for the Phase I work occur at kickoff, two months, four months, and

six months after award for successful completion of the effort generally described below. The Government wishes to maintain these milestone intervals and general level of accomplishment to the extent possible. A milestone review will be held in conjunction with completion of effort associated with each milestone. For purposes of developing costs for the Phase I proposal, the Offeror should assume that Milestones 2 through 4 will require a two-day meeting in Arlington, Virginia. The Phase I kick-off meeting that coincides with Milestone 1 will be held at the Performer's site. The Government's desired set of major accomplishments associated with each Phase I milestone is listed below. This list represents the minimum set of information to be provided at each milestone. The Offeror should supplement this list based on its unique Phase I program.

Milestone 1

The major milestone element for the first payable milestone is conduct of the kickoff meeting. The kickoff meeting should include, but not be limited to an HWS systems definition (Phase-1) plan; introduction of all key personnel and responsibilities; description of design process; and an update of CAV and HCV system concepts to date.

Milestone 2

(1) CAV-OS conceptual design update
(2) Initial CAV-OS CONOPS
(3) Feasibility assessment of HCV-OS mission objectives
(4) Preliminary definition of one or more potential HCV-OS concepts
(5) Preliminary assessment of key enabling technologies

Milestone 3

(1) Preferred CAV-OS conceptual design and rationale
(2) CAV-OS key enabling technology TRLs
(3) CAV-DS conceptual design
(4) Enhanced CAV-DS conceptual design
(5) Preliminary assessment of multiple HCV-OS concepts
(6) Preliminary HCV-OS flight trajectory analysis
(7) Preliminary HCV-OS key enabling technologies and TRLs

Milestone 4

(1) CAV-OS DITL Brief
(2) Preferred HCV-OS design concept and CONOPS selected
(3) Final HCV-OS flight trajectory analysis
(4) HCV-OS High-Level CONOPS
(5) Integrated CAV-OS/HCV-OS Technology Maturation Plan
(6) Demonstration/Flight Test Plan and ROM Costs
(7) HCV-DS conceptual design

Additional milestone elements for each milestone addressed above should be proposed in the Offeror's Phase I proposal along with a proposed milestone award value. Also, the Offeror should propose accomplishment criteria for each milestone element. These

accomplishment criteria should sufficiently describe a quantitative measure or a level of detail associated with each milestone element to enable determination of success or failure. At the milestone review, emphasis should be placed on quality and credibility of information and discussion of issues, not on generation of required paperwork. Instead of written milestone reports, the Contractor should provide six (6) electronic copies of annotated briefing slides on CD-ROMs at each review. All milestone information should be in Microsoft Office 2000 compatible format.

4.0 PROPOSAL PREPARATION INSTRUCTIONS

This section provides the Offeror guidance for developing the FALCON Phase I proposal. The Offeror should carefully read and ensure that their proposal responds to the entire solicitation.

Both Tasks 1 and 2 as identified herein will be evaluated and awarded from this solicitation as stand alone agreements/contracts. The Offeror may propose to only one of the two tasks or to both tasks. However, the Offeror must submit a separate (stand alone) proposal for each task if proposing to more than one task. In addition, the Offeror may submit only one proposal per task.

4.1 Work Outline

The Offeror should develop a program work outline or Work Breakdown Structure (WBS) based on a common numbering system, and should use the work outline and numbering system to integrate the proposal documents, including the Statement of Work (SOW), and Integrated Management Schedule (IMS). The SOW and IMS numbering should be consistent down to a level of detail sufficient to highlight the significant points discussed throughout the proposal.

4.2 Proposal Structure

As discussed in the BAA, only the FAR-based proposals will be evaluated for purposes of award selection, all factors considered. After award selection the OT delta proposals will be opened and further discussions may be conducted for purposes of awarding an OT Agreement. The Government will evaluate selected awardees' Other Transaction proposal with the intent of selecting a Phase I program approach that offers the more beneficial program approach of the FAR and OTA instrument types considered. To conduct this evaluation, Offerors should submit three (3) separate volumes for each task. Volumes 1 and 2 will be FAR-based technical and cost proposals, respectively. These volumes will fully support award of the FAR-based model contract provided as Attachment 1. Volume 3 will be a "Delta Proposal" which fully supports award of the OT model agreement provided herein as Attachment 2. The "Delta Proposal" shall clearly identify changes to the proposed FAR-based technical and cost proposals (Volumes 1 and 2 respectively) that result from an award of an Other Transaction Agreement. Submittal of Volume 3 is required, however if the Offeror determines there are no benefits to execution of an OT agreement, it shall be so stated in Volume 3.

The Offeror should organize its task proposal(s) using the following outline:

Volume 1 – FAR Based Technical Proposal
Volume 2 – FAR Based Cost Proposal
Volume 3 – OTA Based Delta Proposal

The required format and content of each volume is discussed in the following paragraphs. The Offeror should clearly and fully address each of the specified topic areas within the identified sections of each volume. Note Volume 1 has a different format for Task 1 and Task 2. The structure for Volume 1, Task 1 is described in Section 4.3 below and the structure for Volume 1, Task 2 is described in Section 4.4 below. Volume 2 and Volume 3 have the same format for each task. The structure for these volumes is described in Sections 4.5 and 4.6 respectively.

Deviation from the objectives stated within this solicitation is acceptable provided that 1) the desired approach is acknowledged, and 2) a credible explanation of the proposed alternate approach that better meets or exceeds the program vision is provided. Credible innovative approaches, all factors considered, could be viewed favorably for purposes of evaluation.

4.3 Volume 1 FAR-Based Technical Proposal - Task 1, Small Launch Vehicle

The following outline should be used for the Task 1 FAR-Based Technical Proposal. A brief description of each section follows.

Volume 1
- 1.0 Executive Summary
- 2.0 Scientific Approach and Innovation
  - 2.1 Notional System Concept Description and Capabilities
  - 2.2 Operational Vision
  - 2.3 Technology Challenges and Maturity
- 3.0 Phase I Technical Approach
  - 3.1 Analytical Tools and Methodology
  - 3.2 Statement of Work (SOW)
  - 3.3 Integrated Master Schedule (IMS)
- 4.0 Management
  - 4.1 Program Team
  - 4.2 Key Personnel
  - 4.3 Past Performance
  - 4.4 Experimental Facilities

4.3.1 Executive Summary

The Executive Summary should provide the introduction to the proposal. It is meant to be a top-level discussion of the Offeror’s program vision and objectives. The Executive Summary should consider all phases of the program and describe how the Offeror's

vision would be implemented. As a minimum, the Executive Summary should include a brief description of the following:

- Program Vision and Objectives
- Proposed Operational System description
- Phase I Technical Approach Summary
- Top-Level Program Schedule
- Corporate commitment and its fit into the corporate structure/vision
- Description of planned or implemented streamlined/innovative business practices, if any

4.3.2 Scientific Approach and Innovation

This section of the proposal should describe the Offeror's scientific and innovative approach it proposes to develop its SLV system. This section should describe and emphasize key aspects of the Offeror's point of departure operational concept and associated CONOPS it proposes to meet the program vision, operational capabilities and Phase I Statement of Objectives. This discussion should demonstrate the Offeror's understanding of the FALCON program vision and operational objectives, employment concepts, and major technical challenges.

4.3.2.1 Notional System Concept Description and Capabilities

This section should describe the Offeror's initial vision of its Small Launch Vehicle Operational System, in terms of its conceptual design, and associated attributes. The discussion should demonstrate how the Offeror's proposed system concept meets or exceeds the overall program vision and each of the performance and operational objectives both as a small satellite launch vehicle (Section 2.1.1) and CAV booster (Section 2.1.2). The Offeror should describe how the new/novel technologies and/or technical approaches incorporated into its innovative SLV design will provide a sustained low-cost, responsive small satellite launch capability for the foreseeable future. The Offeror should discuss its experimental and/or analytical basis that substantiates its assertions that its concept will achieve or exceed program objectives related to performance, cost and responsiveness.

4.3.2.2 Operational Vision

The Offeror should describe the notional concept of employment associated with its proposed system concept and how this operational vision addresses each of the program desired operational capabilities. The Offeror should also discuss how its notional concept of employment would be integrated into the military force structure. The Offeror should discuss any unique features associated with its proposed CONOPS for the small satellite mission that enable operational launch cost objectives.

4.3.2.3 Technology Challenges and Maturity

The Offeror should identify and discuss the major technologies that must be further developed and technical challenges that must be addressed specific to its concept. The Offeror should address the maturity level of the major technologies to achieve a level of readiness necessary for successful flight demonstration in Phase II. This discussion should provide confidence that the concept can be developed, and demonstrated consistent with the overall program schedule and cost. The Offeror should describe any experimental development and demonstration effort it has performed or has been conducted elsewhere that is directly relevant to the proposed concept. Likewise, past analytical investigation that is relevant to the proposed concept should be addressed.

4.3.3 Phase I Technical Approach

This section should describe in detail those tasks the Offeror proposes to perform in Phase I toward achieving the program objectives and products as outlined in Section 3.1 Task 1, SLV, Objectives. The Offeror should explain the purpose and rationale for the approach it proposes to the extent they are not already self-evident. The Offeror should discuss in particular any differences between the desired Phase I products as delineated in Section 3.1 and those it proposes to generate. Finally, the Offeror should discuss the tools, methodologies and processes it intends to utilize in executing Phase I.

4.3.3.1 Analytical Tools and Methodology

The proposal should describe the design, performance, and cost estimating tools that will be used and how its results will be interpreted to synthesize its SLV design. The proposal should describe the Offeror's engineering methodology for conducting Phase I of the program. The proposal should describe how the Offeror will iteratively execute analyses and studies to develop an optimized Operational System conceptual design and a Demonstration System conceptual design that is traceable to the Operational System design.

The Offeror should explain how it intends to generate ROM operational launch costs associated with the SLV-OS for the small satellite mission. If analytic cost estimating relationships and/or cost models will be used, the Offeror needs to discuss how these models will be or have been validated. Likewise, if a bottoms-up component level cost estimating methodology is planned, the Offeror should provide a basis to substantiate these costs.

In addition, the Offeror should describe the methods and processes it intends to employ to develop the SLV-OS CONOPS for both the CAV-OS and Small Satellite mission types. Any special analytical tools or processes should be discussed. The Offeror should also discuss how it intends to substantiate claims it makes concerning benefits to system performance, launch cost, and/or responsiveness as a result of implementing novel and/or innovative CONOPS practices.

4.3.3.2 Statement of Work (SOW)

The SOW describes the work effort, to the individual task level, necessary to meet the milestones and Statement of Objectives for Phase I of the program as described in Section 3.1. The SOW should define work at least to a level of three to explain the details of the Offeror's approach toward meeting program objectives.

4.3.3.3 Integrated Master Schedule (IMS)

The IMS should provide a timeline for each significant Phase I task. These timelines should indicate a planned start date and completion date and identify specific events, accomplishments and milestones. The IMS should portray in a clear fashion the time-relationship of Phase I tasks and identify the Phase I critical path(s). Definitions and characteristics of the key elements of the IMS are given below.

- Tasks: Work to be completed in support of a specific significant milestone or functional accomplishment
- Calendar Schedule: Detailed schedule (specific start and end dates) of the period of performance for each work effort.
- Milestones: The Offeror should define the information to be provided at each milestone as well as associated accomplishment criteria. These accomplishment criteria should be sufficiently detailed and to the extent practical, measurable, to allow assessment of the contractor's performance.

The Offeror may implement the IMS in its own format and should maintain and update this document as needed.

4.3.4 Management

This section of the proposal should describe the approach to be used in managing the Phase I program and the program team that will execute the Phase I program. This section should describe the facilities, capabilities and experience the Offeror possesses or will employ to perform the proposed program. If the facilities and/or full set of capabilities required to execute the program are currently not in place, then the Offeror should describe its plan for obtaining them by the time of award.

4.3.4.1 Program Team

The proposal should identify the major participants of the Offeror's team including company organization and/or subcontractors, and geographic location of each. The Offeror should describe the organizational structure of the proposed program team and define the responsibilities and authority for key positions. The Offeror should summarize how the experience and interactions of the team will result in achieving the program objectives and should provide the status of the key subcontractor agreements.

4.3.4.2 Key Personnel

Key management and technical personnel including the Program Manager, Chief Engineer (or equivalent) and other technical leads should be identified and short resumes provided for each. The Offeror should describe how the experience of the proposed key personnel will enable them to perform the functions necessary for this program.

4.3.4.3 Past Performance

Each Offeror should provide information in this section that describes its team's past performance relevant to the SLV Task of the FALCON Program. Past performance information can include Government contracts or agreements, commercial/non-government contracted work or internally funded efforts. This Offeror-provided information will be evaluated, as well as data from other Government sources, in determining the Offeror's design, development, and test experience of relevant SLV technology.

4.3.4.4 Experimental Facilities

The Offeror should identify and describe the team's experimental facilities it intends to utilize in conducting this program in terms of capability, data acquisition and past use. The Offeror should discuss the availability of these facilities to support the proposed program in a manner that meets all program objectives.

4.4 Volume 1 FAR-Based Technical Proposal - Task 2, Hypersonic Weapon Systems

The following outline should be used for the Task 2 Technical Proposal. A brief description of each section follows.

Volume 1

- 1.0 Executive Summary
- 2.0 Scientific Approach and Innovation - CAV
  - 2.1 Notional System Concept Description and Capabilities
  - 2.2 Operational Vision
  - 2.3 Technology Challenges and Maturity
- 3.0 Scientific Approach and Innovation - HCV
  - 2.1 Notional System Concept Description and Capabilities
  - 2.2 Operational Vision
  - 2.3 Technology Challenges and Maturity
- 4.0 Phase I Technical Approach
  - 4.1 Analytical Tools and Methodology
  - 4.2 Statement of Work (SOW)
  - 4.3 Integrated Master Schedule (IMS)
- 5.0 Management
  - 5.1 Program Team

5.2 Key Personnel
5.3 Past Performance
5.4 Experimental Facilities

4.4.1 Executive Summary

The Executive Summary is meant to be an executive level description of key elements and unique features of each Offeror's operational system vision. It should address all phases of the program and describe how the proposed vision would be implemented. The Offeror should discuss the inter-relationship between its CAV, Enhanced CAV and HCV concepts and its vision of an evolutionary development path of these concepts. As a minimum, the Executive Summary should include a brief description of the following:

- Program Vision and Objectives
- Proposed Operational System description
- Technical Approach Summary
- Top-Level Program Schedule
- Corporate commitment and its fit into the corporate structure/vision
- Description of planned or implemented streamlined/innovative business practices, if any

4.4.2 Scientific Approach and Innovation - CAV

This section of the proposal provides the Offeror the opportunity to explain and substantiate the significant scientific and innovative features of its program. This section should describe in detail the Offeror's vision of the near-term hypersonic, global reach system design it proposes to develop in the Hypersonic Weapons System Task (Task 2) of the FALCON program. It is particularly important that the Offeror's proposal emphasize key aspects of the Offeror's point of departure operational concept and associated CONOPS it proposes to meet the program operational capabilities. This discussion should demonstrate the Offeror's understanding of the FALCON program vision and objectives, employment concepts and major technical challenges.

4.4.2.1 Notional System Concept Description and Capabilities

This section should describe the Offeror's initial vision of its Enhanced CAV Operational System, in terms of its conceptual design, and associated attributes, and describe how it meets the overall program performance vision and objectives. The Offeror should discuss its experimental and/or analytical basis that substantiates its assertions that its concept will achieve program objectives related to performance and responsiveness.

4.4.2.2 Operational Vision

The Offeror should describe the notional concept of employment associated with its proposed system concept and how its system would be integrated into the military force structure.

4.4.2.3 Technology Challenges and Maturity

The Offeror should identify the major technical challenges, including technical integration challenges, specific to its concept that need to be addressed by the program in order to achieve a series of successful flight demonstrations in Phases II and III. This discussion should address current technology maturity level and required risk reduction to provide confidence that the concept can be developed, and demonstrated consistent with the overall program schedule and cost.

4.4.3 Scientific Approach and Innovation - HCV

This section of the proposal provides the Offeror the opportunity to explain and substantiate the significant scientific and innovative features of its program. This section should describe in detail the Offeror's vision of the far-term hypersonic, global reach system designs it proposes to develop in the Hypersonic Weapons System Task (Task 2) of the FALCON program. It is particularly important that the Offeror's proposal emphasize key aspects of the Offeror's operational concept(s) and associated CONOPS it proposes to meet the program operational capabilities. This discussion should demonstrate the Offeror's understanding of the FALCON program vision and objectives, employment concepts and major technical challenges. The Offeror should discuss why its proposed concept offers the potential to meet or exceed each of the performance objectives described in the solicitation.

4.4.3.1 Notional System Concept Description and Capabilities

This section should describe the Offeror's initial vision of its HCV-OS in terms of its conceptual design, and associated attributes and how it meets or exceeds the overall program performance objectives and vision. The Offeror should discuss its experimental and/or analytical basis that substantiates its assertions that its concept will achieve program objectives related to performance and responsiveness.

4.4.3.2 Operational Vision

The Offeror should describe the notional concept of employment associated with its proposed system concept(s) and how this notional approach addresses the program vision and desired operational capabilities for far-term global reach.

4.4.3.3 Technology Challenges and Maturity

The Offeror should identify the major technical challenges, including system integration challenges, specific to its concept that need to be addressed by the program in order to achieve a successful flight demonstration in Phase III. This discussion should provide confidence that the concept can be developed, and demonstrated consistent with the overall program schedule and cost.

4.4.4 Phase I Technical Approach

This section should describe in detail those tasks the Offeror proposes to perform in Phase I toward achieving the program objectives and the products as outlined in Section 3.2, Task 2 Hypersonic Weapon Systems (HWS) Objectives. The Offeror should explain the purpose and rationale for the approach it proposes to the extent they are not already self-evident. The Offeror should discuss, in particular, any differences between the desired Phase I products as delineated in Section 3.2 and those it proposes to generate. Finally, the Offeror should discuss the tools, methodologies and processes it intends to utilize in executing Phase I and succeeding phases of the FALCON program.

4.4.4.1 Analytical Tools and Methodology

The proposal should describe the design and performance tools that will be used and how its results will be interpreted to synthesize its HWS designs. The proposal should describe the Offeror's engineering methodology for conducting Phase I of the program. The proposal should describe how the Offeror will iteratively execute analyses and studies to develop optimized Operational System conceptual designs and Demonstration System conceptual designs that are traceable to the Operational System designs.

The Offeror should describe how it intends to develop the CONOPS for both the CAV-OS and HCV-OS. Any special analytical tools or processes should be discussed. The Offeror should also discuss how it intends to substantiate claims it makes concerning benefits to system performance, and responsiveness as a result of implementing novel and/or innovative CONOPS practices.

4.4.4.2 Statement of Work (SOW)

The SOW describes the work effort, to the individual task level, necessary to meet the milestones and Statement of Objectives for Phase I of the program as described in Section 3.2. The SOW should define work at least to a level of three to explain the details of the Offeror’s approach toward meeting program objectives.

4.4.4.3 Integrated Master Schedule (IMS)

The IMS should provide a timeline for each significant Phase I task. These timelines should indicate a planned start date and completion date and identify specific events, accomplishments and milestones. The IMS should portray in a clear fashion the time-relationship of Phase I tasks and identify the Phase I critical path(s). Definitions and characteristics of the key elements of the IMS are given below.

- Tasks: Work to be completed in support of a specific significant milestone or functional accomplishment
- Calendar Schedule: Detailed schedule (specific start and end dates) of the period of performance for each work effort.

- Milestones: The Offeror should define the information to be provided at each milestone as well as associated accomplishment criteria. These accomplishment criteria should be sufficiently detailed and to the extent practical, measurable, to allow assessment of the contractor's performance.

The Offeror may implement the IMS in its own format and should maintain and update this document as needed.

4.4.5 Management

This section of the proposal should describe the approach to be used in managing the Phase I program and the program team that will execute the Phase I program. This section should discuss how the Offeror's team will be organized to implement the program. This section should describe the facilities, capabilities and experience the Offeror possesses to perform the proposed program.

4.4.5.1 Program Team

The proposal should identify the major participants of the Offeror's team including company organization and/or subcontractors and geographic location of each. The Offeror should describe the organizational structure of the proposed program team and define the responsibilities and authority for key positions. The Offeror should summarize how the experience and interactions of the team will result in achieving the program objectives.

4.4.5.2 Key Personnel

Key management and technical personnel including the Program Manager, Chief Engineer (or equivalent), and other technical leads should be identified and short resumes provided for each. The Offeror should describe how the experience of the proposed key personnel will enable them to perform the functions necessary for this program.

4.4.5.3 Past Performance

Each Offeror should provide information in this section that describes its team's past performance relevant to the HWS Task of the FALCON Program. Past performance information can include Government contracts or agreements, commercial/non-government contracted work or internally funded efforts. This Offeror-provided information will be evaluated, as well as data from other Government sources, in determining the Offeror's ability to design, develop, and test relevant hypersonic technology.

4.4.5.4 Experimental Facilities

The Offeror will identify and describe its team's experimental facilities available to perform the proposed program in a manner that meets all program objectives.

4.5 Volume 2 – FAR-Based Cost Proposal (same format for both task proposals)

The following outline should be used for Volume 2 of both task proposals. A brief description of each section follows.

Volume 2

1.0 FAR-Based Cost Response
2.0 FAR Contract Representations, Certifications, and other Statements by Offerors or Quoters
3.0 Data Rights

4.5.1 FAR-Based Cost Response

The cost proposal must contain a summary table as follows:

Labor ($)	
Overhead/fringe ($)	
Direct materials ($)	
Subcontracts ($)	
Consultants ($)	
Travel ($)	
Equipment ($)	
Other costs ($)	
G&A ($)	
COM ($)	
Fee ($)	
Fee (%)	
Total Labor Hours (to Level 2 of work outline)	
Prime Labor Hours	
Subcontractor/Consultant labor hours (add rows to break down by organization)	
Total Ave Cost/Labor hour	
% of effort subcontracted	

Supporting information may be provided in the offeror's format, however it should be clear how the numbers may be aggregated to obtain the values in the summary table.

The Offeror should breakdown its cost estimates by major task recognizing that the Government may elect to fund some tasks and not others. Program management and other over-reaching costs will be negotiated as part of contract negotiations based on those tasks selected for funding. Failing to breakdown costs in this way may result in the Offeror not receiving a contract award.

4.5.2 FAR Contract Representations, Certifications, and other Statements by Offerors or Quoters

Representations, Certifications, and other Statements by Offerors or Quoters are included as Section K of Attachment 1. The offeror should complete these and include them in this section, where applicable.

4.5.3 Data Rights

The Offeror should discuss its proposed approach to Data Rights and how it aligns to the Government's desires as discussed in Section 2.5.

4.6 Volume 3 – OTA Based Delta Proposal (same format for both task proposals)

The following outline should be used for Volume 3 of both task proposals. A brief introduction to the use of OTAs as well as a description of each Volume 3 proposal section follows. If the Offeror's OTA Based proposal does not differ from its FAR Based proposal, the Offeror may state this in its Volume 3.

Volume 3

1.0 OTA Based Technical Response (Delta Proposal)
2.0 OTA Based Cost Response (Delta Proposal)
3.0 Data Rights

4.6.1 Introduction to OTA

Use of Other Transactions Authority (OTA) may provide significant financial and intellectual property advantages for the Government and the Offeror. This flexible authority allows the Offeror to be creative in designing the system and in the selection of the management framework that best suits the proposed technical and management approach.

The government will allow the Offeror to use either commercial or Department of Defense (DoD) streamlined processes, reporting and management practices. The use of OTA requires compliance with applicable laws but allows the latitude to depart from acquisition-specific laws, Federal Acquisition Regulations (FARs), and DoD practices where it makes sense. The Offeror should take full advantage of this latitude to propose innovative/revolutionary approaches to team building. The resulting Offeror proposal must clearly demonstrate a robust method to assure and control costs, quality, reliability, system engineering, program schedule, system design, and test planning and execution.

Commercial, industrial, and corporate specifications and standards can 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.

4.6.1.1 Section 803

Section 803 of the National Defense Authorization Act for FY2001 (Public Law 106-398) is applicable to the FALCON Program. In summary, for Volume 3 proposals submitted in response to this solicitation (those proposals offering use of an OTA) there must be either at least one non-traditional defense contractor participating to a significant extent in the prototype project; or, if there is no nontraditional defense contractor participating to a significant extent, at least one of the following circumstances exists: at least one third of the total cost of the prototype project is to be paid with funds provided by parties to the transaction other than the Federal Government; or, the senior procurement executive determines that exceptional circumstances justify the use of a transaction that provides for innovative business arrangements or structures that would not be feasible or appropriate under a contract. The Government has discretion in determining the level of "significant extent." Some factors may include:

a) criticality of the technology being contributed
b) role of the non-traditional defense contractor(s) in the design process
c) value of the effort being proposed

If the Offeror does not have a non-traditional partner and cannot meet the cost share condition, the Offeror should provide justification to enable the senior procurement executive to waive the requirements of Section 803.

The entire amendment to the Authorization Act is available for your convenience at <http://www.darpa.mil/cmo> under "Items of Note" and includes the definition of a nontraditional defense contractor.

As detailed below, Volume 3 must clearly separate the technical and cost-share portion of the proposal from the non-cost share portion of the proposal. Cost contributions for items such as IR&D reimbursement, G&A, cost of money and fee identified separately will meet the solicitation requirement.

4.6.2 OTA Based Technical Response

The Offeror should provide the OTA SOW that is supported by the OTA delta cost proposal. The Offeror's submitted OTA SOW shall use the proposed FAR based SOW as the baseline and modify it utilizing the "track changes" feature of Microsoft Word. It shall be submitted in the "track changes" format.

4.6.3 OTA Based Cost Response

The cost proposal must contain a summary table as follows:

Labor ($)	
Overhead/fringe ($)	
Direct materials ($)	

Subcontracts ($)	
Consultants ($)	
Travel ($)	
Equipment ($)	
Other costs ($)	
G&A ($)	
COM ($)	
Fee ($)	
Fee (%)	
Total Labor Hours (to Level 2 of work outline)	
Prime Labor Hours	
Subcontractor/Consultant labor hours (add rows to break down by organization)	
Total Ave Cost/Labor hour	
% of effort subcontracted	
Direct Cost Share ($)	
In-Kind Contributions (list with cost)	
Complementary IRAD (list with cost)	
Non-Traditional Partners (list with cost/organization)	
List of additional tasks with cost/task and labor hours/task (add table rows as needed)	

Supporting information may be provided in the offeror's format, however it should be clear how the numbers are aggregated to obtain the values in the summary table.

The Offeror should breakdown its cost estimates by major task recognizing that the Government may elect to fund some tasks and not others. Program management and other over-reaching costs will be negotiated as part of agreement negotiations based on those tasks selected for funding. Failing to breakdown costs in this way may result in the Offeror not receiving an agreement award.

Certified cost or pricing data is not required. However, in order for the Government to determine the reasonableness, realism and completeness of your cost proposal, the following data must be provided for each team member and in a cumulative summary:

Labor: Total labor includes direct labor and all indirect expenses associated with labor, to be used for the Phase I period of performance. Provide a breakdown of labor hours and rates for each category of personnel to be used on this project.
Direct Materials: A by item/unit cost breakdown of the total direct material that will be acquired and/or consumed in the Phase I period of performance. Limit this information to only major items of material (>$1,000) and how the estimated expense was derived.
Subcontracts: Describe major efforts to be subcontracted, the source, estimated cost and the basis for this estimate. A summary cost breakdown should be provided for each subcontract proposed.

Consultants: Any proposed use of an individual not directly employed by the Offeror resulting in a cumulative Phase I cost of $10,000 or more should be detailed. The individual should be identified by name and affiliation, as well as his/her hourly rate, total number on labor hours, and any other direct costs such as materials or travel that are not accounted for elsewhere in the cost proposal.
Travel: Total proposed travel expenditures relating to the Phase I period of performance. Limit this information to the number of trips, and purpose of each cost.
Equipment: Any equipment to be acquired for the effort. Breakdown the equipment into those items required for Phase I.
Other Costs: Any direct costs not included above. List the item, the estimated cost, and basis for the estimate.

As applicable, the Offeror should provide a total estimated price for the major IR&D and cost sharing activities associated with the program. The Offeror should state whether each IR&D program is dedicated or if it is being pursued to benefit other programs as well. The cost sharing estimate should include the type of cost share, i.e. cash or in-kind. If in-kind is proposed, the Offeror should provide a discussion of how the cost share was valued.

If a teaming arrangement is proposed the above cost information should be provided for all team members.

4.6.4 Data Rights

The Offeror should discuss its proposed approach to Data Rights and how it aligns to the Government's desires as discussed in Section 2.5.

4.7 Proposal Procedures

4.7.1 Organization

The Offeror's proposal for each task should be submitted as three volumes in three separate standard three-ring, loose leaf binders (one for each volume) with individual pages unbound and printed single sided. Volume 1 of the Task 1 – Small Launch Vehicle proposal excluding title pages, table of contents, section dividers, etc. should not exceed 30 pages. The SOW and IMS are also excluded from this page limit. Volume 1 of the Task 2 – Hypersonic Weapon Systems proposal, excluding title pages, table of contents, section dividers, etc. should not exceed 50 pages. The SOW and IMS are also excluded from this page limit. There is no page limit for Volume 2 or 3 for either task. Pages beyond the prescribed page limit for Volume 1 may not be reviewed or otherwise considered during the proposal evaluation process. Pages submitted through the classified information submittal process excluding title pages, table of contents, section dividers, etc. will be counted against the Volume 1 page limit identified above.

4.7.2 Page Information

Each page should be on an 8-1/2" x 11" sheet with a Times New Roman font size of not less than 12 points; however, figures, charts, labels, headers and footers may be submitted with a font size of not less than 8 points. Margins should be at least 1 inch on all sides. Fold out pages will be counted as multiple pages. Any restrictions must be placed with a legend within the proposal on each affected sheet/page.

4.7.3 Labeling of Proprietary Data

All proposals containing proprietary data should have the cover page and each page containing proprietary data clearly marked as containing proprietary data. It is the Offeror's responsibility to clearly define to the Government what is considered proprietary data.

4.7.4 Proposal Handling

It is the policy of DARPA to treat all proposals as competitive information, and to disclose their contents only for the purpose of evaluation. Proposals will not be returned. The original of each proposal received will be retained at DARPA and all other non-required copies destroyed. A certification of destruction may be requested, provided that the formal request is received within 5 days after unsuccessful notification.

5.0 EVALUATION CRITERIA FOR AWARD

This section discusses both Task 1 and Task 2 Evaluation Criteria for Award. It is noted that each task is addressed distinctly in the following sections;

Task 1	-	Section 5.1
Task 2	-	Section 5.2

5.1 Phase I, Task 1 Evaluation Criteria

DARPA intends to award multiple contracts/agreements for Phase I, Task 1 – Small Launch Vehicle of the FALCON program. The Task 1 selection will be accomplished based on an evaluation of the proposals as described in this solicitation. There are four specific areas of evaluation that will be used: 1) Scientific Approach and Innovation, 2) Technical Approach, 3) Management and 4) Cost Realism. The first three evaluation factors have equal weighting, and the fourth is of lesser importance. The government reserves the right to award without discussion.

5.1.1 Basis for Phase I Award for Task 1

Successful Phase I proposals for Task 1 will incorporate a balanced approach that responds to all four evaluation criteria described. The Government will select for award the proposals that, overall, represent a balanced approach to program execution, program approach and risk considered.

5.1.1.1 Scientific Approach and Innovation

The objective of this criterion is to assess the extent to which the offeror has a credible scientific approach to developing a Small Launch Vehicle (SLV) system that best meets or exceeds the FALCON program vision, operational capabilities and Phase I Statement of Objectives. In particular, the Offeror's approach for an SLV system concept and operational vision will be assessed with equal emphasis placed on system performance, responsiveness, and affordability. The following areas of evaluation will be considered when assessing the offeror's overall scientific approach and innovation:

1. Notional System Concept Description and Capabilities
   <u>The extent to which:</u>
   - The Offeror demonstrates understanding of the FALCON program vision and objectives
   - The Offeror's proposed concept meets or exceeds the overall performance responsiveness and affordability objectives and vision both as a CAV booster and small satellite launch vehicle
   - The Offeror's proposed approach is supported by experimental, analytical or other reasonable basis that substantiates proposed assertions of either meeting or exceeding program objectives related to performance, cost and responsiveness

2. Operational Vision
   The extent to which:
   • The Offeror proposed notional concept of employment and proposed system concept are consistent in addressing the desired operational capabilities
   • The Offeror's proposed operational vision and accomplishment approach demonstrates understanding of Air Force missions and warfighting desires
   • The Offeror has proposed unique features that have credible potential for enabling operational launch cost and responsiveness objectives

3. Technology Challenges and Maturity
   The extent to which:
   • The Offeror has identified technical challenges and understands them
   • The Offeror's major technology maturity path is realistic, considers achieving flight demonstration in Phase II but is not risk adverse

5.1.1.2 Phase I Technical Approach

The objective of this criterion is to assess the extent to which the Offeror has a robust approach to accomplish the Phase I Statement of Objectives. The following areas of evaluation will be used to assess the Offeror's Phase I technical approach:

1. Analytical Tools and Methodologies
   The extent to which:
   • The tools and methodologies to be utilized are credible, appropriate, sufficient, validated and are applied rationally

2. Statement of Work
   The extent to which:
   • The Offeror's proposed SOW concisely and fully describes the efforts to be undertaken in Phase I
   • The Offeror's proposed SOW is consistent and traceable to other parts of the technical proposal

3. Integrated Master Schedule
   The extent to which:
   • The IMS includes all major technical events required to achieve Phase I
   • Clearly identifies the accomplishment criteria consistent with the proposed milestones

5.1.1.3 Management

The objective of this criterion is to assess the extent to which the Offeror's proposed team has the requisite experience, skills, facilities and resources necessary to perform the proposed program. The following areas will be evaluated**:**

1. Program Team
   The extent to which:
   • The proposed program team has or will have in sufficient time expertise across all relevant technical areas
   • The Offeror has or will have in sufficient time experience managing geographically/organizationally diverse team (if multiple organizations are proposed)

2. Key Personnel
   The extent to which:
   • The proposed Program Manager has experience managing system development programs of substantial scope and complexity entailing the maturation of advanced and innovative technologies
   • The proposed Program Manager possesses a good grasp of a broad range of technical disciplines and demonstrated capability to manage program cost and schedule elements
   • The proposed Chief Engineer possesses a demonstrated capability to integrate multiple and complex technical activities entailing the maturation of advanced and innovative technologies
   • Proposed key personnel have the technical expertise in the areas of systems engineering; rocket propulsion and launch vehicle technologies design, development and test; launch vehicle operations

3. Past Performance
   The extent to which:
   • The proposed team has demonstrated experience in hardware development and test of technologies relevant to small launch vehicles especially in the area of rocket propulsion
   • The proposed team has experience in flight test of rocket propulsion and/or launch vehicle systems

4. Experimental Facilities
   The extent to which:
   • The Offeror has or will have in sufficient time adequate experimental test facilities to conduct this program in terms of capability, data acquisition and past use

5.1.1.4 Cost Realism

The first objective of this criterion is to assure that proposed cost is consistent with proposed effort. The Offeror's proposed cost must be realistic and reasonable relative to the scope of the proposed program. The second objective is to evaluate the extent to which the proposal aligns with the Government's desires concerning Data Rights.

5.2 Phase I, Task 2 Evaluation Criteria

DARPA intends to award multiple contracts/agreements for Phase I, Task 2 – Hypersonic Weapon Systems of the FALCON program. The Task 2 selection will be accomplished based on a subjective evaluation of proposals as described in this solicitation. Five specific areas of evaluation will be used: 1) Scientific Approach and Innovation - CAV, 2) Scientific Approach and Innovation - HCV, 3) Phase I Technical Approach, 4) Management and 5) Cost Realism. The first four evaluation factors have equal weighting, and the fifth is of lesser importance. The government reserves the right to award without discussion.

5.2.1 Basis For Phase I Award For Task 2

Successful Phase I proposals for Task 2 will incorporate a balanced approach that responds to all five evaluation criteria described. The Government will select for award the proposals that, overall, represent a balanced approach to program execution, program approach and risk considered.

5.2.1.1 Scientific Approach and Innovation – CAV

The objective of this criterion is to assess the extent to which the Offeror has a credible scientific approach to developing CAV and Enhanced CAV systems that best meets or exceeds the FALCON program vision, operational capabilities and Phase I Statement of Objectives. In particular, the offeror's approach for CAV and Enhanced CAV system concepts and operational visions will be assessed with equal emphasis placed on system performance (glide range, payload capability), responsiveness, and accuracy. The following areas of evaluation will be considered when assessing the Offeror's overall scientific approach and innovation:

1. Notional System Concept Description and Capabilities
   The extent to which:
   • The Offeror demonstrates understanding of the FALCON program vision and objectives to achieve near-term, global reach capability
   • The Offeror's proposed concept meets or exceeds the overall performance objectives for the enhanced CAV
   • The Offeror's proposed concept is supported by experimental, analytical or other reasonable basis that substantiates proposed assertions of either meeting or exceeding program objectives related to performance, cost and responsiveness

2. Operational Vision
   The extent to which:
   • The Offeror's proposed notional Enhanced CAV concept of employment and proposed system concept are consistent with meeting or exceeding the desired operational capabilities

• The Offeror's proposed operational vision and accomplishment approach demonstrates understanding of Air Force missions and CONOPS

3. Technology Challenges and Maturity
   The extent to which:
   • The Offeror identified technical challenges and understands them
   • The Offeror's major technology maturity path is realistic, considers achieving flight demonstrations in Phases II and III but is not risk adverse

5.2.1.2 Scientific Approach and Innovation – HCV

The objective of this criterion is to establish that the Offeror has a creative and innovative scientific approach to developing an HCV system that is consistent with the FALCON program vision, operational capabilities and Phase I Statement of Objectives. In particular, the offeror's approach for the HCV system concept and operational vision will be assessed with equal emphasis placed on system performance (range, payload capability), responsiveness, logistics suitability, and reusability. The following areas of evaluation will be used to assess the Offeror's overall scientific approach and innovation:

1. Notional System Concept Description and Capabilities
   The extent to which:
   • The Offeror demonstrates understanding of the FALCON program vision and objectives concerning far-term, global reach capability
   • The Offeror's proposed concept meets or exceeds the overall performance objectives for the HCV
   • The Offeror's proposed concept is supported by experimental, analytical or other reasonable basis that substantiates proposed assertions of either meeting or exceeding program objective
2. Operational Vision
   The extent to which:
   • The Offeror proposed notional HCV concept of employment and proposed system concept are consistent in addressing the desired operational capabilities
   • The Offeror's proposed operational vision and accomplishment approach demonstrates understanding of Air Force missions and CONOPS

3. Technology Challenges and Maturity
   The extent to which:
   • The Offeror identified technical challenges and understands them
   • The Offeror major technology maturity path is realistic, considers achieving flight demonstration in Phase III but is not risk adverse

5.2.1.3 Phase I Technical Approach

The objective of this criterion is to assess the extent to which the Offeror has a robust approach to accomplish the Phase I Statement of Objectives. The following areas of evaluation will be used to assess the offeror's Phase I technical approach:

1. Analytical Tools and Methodology
   The extent to which:
   • The tools and methodologies to be utilized are credible, appropriate, sufficient, validated and are applied rationally

2. Statement of Work
   The extent to which:
   • The Offeror's proposed SOW concisely and fully describes the efforts to be undertaken in Phase I
   • The Offeror's proposed SOW is consistent and traceable to other parts of the technical proposal

3. Integrated Master Schedule
   The extent to which:
   • The IMS includes all major technical events required to achieve Phase I
   • Clearly identifies the accomplishment criteria consistent with the proposed milestones

5.2.1.4 Management

The objective of this criterion is to assess the extent to which the Offeror's proposed team has the requisite experience, skills, facilities and resources necessary to perform the proposed program. The following areas will be evaluated**:**

1. Program Team
   The extent to which:
   • The proposed program team has expertise across all relevant technical areas
   • The Offeror has experience managing geographically/organizationally diverse team (if multiple organizations are proposed)

2. Key Personnel
   The extent to which:
   • The proposed Program Manager has experience managing system development programs of substantial scope and complexity entailing the maturation of advanced and innovative technologies
   • The proposed Program Manager possesses a good grasp of a broad range of technical disciplines and demonstrated capability to manage program cost and schedule elements

• The proposed Chief Engineer possesses a demonstrated capability to integrate multiple and complex technical activities entailing the maturation of advanced and innovative technologies
• Proposed key personnel have the technical expertise in the areas of systems engineering; rocket propulsion and launch vehicle technologies design, development and test; launch vehicle operations

3. Past Performance
The extent to which:
• The proposed team has demonstrated experience in design, development and flight test of hypersonic re-entry/glide vehicles and supersonic/hypersonic aircraft

4. Experimental Facilities
The extent to which:
• The Offeror has or will have in sufficient time adequate experimental test facilities to conduct this program in terms of capability, data acquisition and past use

5.2.1.5 Cost Realism

The first objective of this criterion is to assure that proposed cost is consistent with proposed effort. The Offeror's proposed cost must be realistic and reasonable relative to the scope of the proposed program. The second objective is to evaluate the extent to which the proposal aligns with the Government's desires concerning Data Rights.

6.0 INSTRUCTIONS FOR SUBMITTING CLASSIFIED INFORMATION

Security classification guidance in the form of a DD Form 254 (DoD Contract Security Classification Specification) will not be provided at this time since DARPA is soliciting ideas only. After reviewing incoming proposals, if a determination is made that an agreement/contract award may result in access to classified information, a DD Form 254 will be issued upon agreement/contract award.

If the Offeror chooses to submit a classified proposal, the Offeror must first receive the permission of the Original Classification Authority to use their information in replying to this BAA. In addition, Offerors must have existing and in-place prior to execution of an award, approved capabilities (personnel and facilities) to perform research and development at the classification level it proposes.

6.1 Classified Information Submission Guidance

Classified submissions shall be in accordance with the following sections.

6.1.1 Collateral Classified Information

Use classification and marking guidance provided by previously issued security classification guides, the Information Security Regulation (DoD 5200.1-R), and the National Industrial Security Program Operating Manual (DoD 5220.22-M) when marking and transmitting information previously classified by another original classification authority. Classified information at the Confidential and Secret level may only be mailed via U.S. Postal Service (USPS) Registered Mail or U.S. Postal Service Express Mail. All classified information will be enclosed in opaque inner and outer covers and double wrapped. The inner envelope shall be sealed and plainly marked with the assigned classification and addresses of both sender and addressee. The inner envelope shall be address to:

Defense Advanced Research Projects Agency
ATTN: Tactical Technology Office
Reference: FALCON BAA 03-35
3701 North Fairfax Drive
Arlington, VA 22203-1714

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

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

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

6.1.2 Special Access Program (SAP) Information

Contact the DARPA Program Security Support Center (PSSC) at 703-812-1962/1970 for further guidance and instructions prior to transmitting SAP information to DARPA. All Top Secret SAP, must be transmitted via approved methods for such material. Consult the DoD Overprint to the National Industrial Security Program Operating Manual for further guidance. It is strongly recommended that you coordinate the transmission of SAP material and information with the DARPA PSSC *prior to transmission*.

6.1.3 Sensitive Compartmented Information (SCI) Data

Contact the DARPA Special Security Contact Office (SSCO) at 703-812-1993/1994 for the correct SCI courier address and instructions. All SCI should be transmitted through your servicing Special Security Officer (SSO) / Special Security Contact Officer

(SSCO). All SCI data must be transmitted through SCI channels only (i.e., approved SCI Facility to SCI facility via secure fax).

7.0 ACRONYMS

ATP	Authorization to Proceed
CAV	Common Aero Vehicle
CAV-DS	Common Aero Vehicle Demonstration System
CAV-OS	Common Aero Vehicle Operational System
CDR	Critical Design Review
CONOPS	Concept of Operations
CONUS	Continental United States (48 contiguous states)
DARPA	Defense Advanced Projects Agency
DITL	Day-In-The-Life
DoD	Department of Defense
DPM	Deputy Program Manager
FALCON	Force Application and Launch from CONUS
FAR	Federal Acquisition Regulations
HCV-DS	Hypersonic Cruise Vehicle Demonstration System
HCV-OS	Hypersonic Cruise Vehicle Operational System
HDBT	Hardened and Deeply Buried Targets
HWS	Hypersonic Weapons System
IAD	Integrated Air Defenses
ICD	Interface Control Document
IMS	Integrate Management Schedule
IR&D	Independent Research and Development
LEO	Low Earth Orbit
NASA	National Aeronautics and Space Administration
OCONUS	Outside Continental United States
ORS	Operationally Responsive Spacelift
OTA	Other Transaction Authority
PDR	Preliminary Design Review
PM	Program Manager
ROM	Rough Order of Magnitude
SDD	Systems Development and Demonstration
SDR	System Design Review
SLV	Small Launch Vehicle
SLV-DS	Small Launch Vehicle Demonstration System
SLV-OS	Small Launch Vehicle Operational System
SOW	Statement of Work
SPS	Systems Performance Specification
TRL	Technology Readiness Level
TSTO	Two-Stage-to-Orbit
WAASM	Wide Area Autonomous Search Munition
WBS	Work Breakdown Structure

APPENDIX I – Future CAV/ORS System Operational Objectives derived from related Joint Requirements Oversight Council (JROC) validated Mission Need Statements

CAV Operational Objectives	ORS Operational Objectives
Hold targets at risk on timelines consistent with commander's intent ▪ High payoff targets - Hard and deeply buried targets - Time sensitive targets - Mobile/relocatable targets - Chemical, biological, radiological, and nuclear production, storage, and launch facilities - Command and control nodes - Integrated air defenses ▪ Strike throughout the depth of an adversary's territory ▪ All azimuth attack ▪ Response times measured in minutes/hours <u>Flexible employment</u> ▪ Operations across the spectrum of conflict ▪ Preplanned and emergent targets ▪ Standoff strike <u>Reliable, accurate, conventional strike</u> ▪ Improved reliability and accuracy to deliver appropriate strike options to meet planned mission effectiveness criteria ▪ Minimize collateral damage ▪ Positive control <u>Linkage to accurate, complete, timely ISR</u> ▪ Rapid targeting/retargeting ▪ In-flight navigational updates ▪ In-flight retargeting ▪ Defense avoidance <u>Survivable</u> ▪ Operate effectively in the defense environment - Defeat anti-access threats - Overcome anti-access threats	<u>Responsive transport</u> ▪ Launch within hours of call-up ▪ Conduct military operations within hours of reaching orbit ▪ Responsive to dynamic threat environment ▪ Responsive to changing mission requirements ▪ Responsive to increased operational tempos/utilization rates <u>Maneuverable</u> ▪ Support the achievement of any earth-centered orbit in 24 hours or less (near-term) ▪ Maneuver from one orbit to any other orbit in less than 48 hours from call-up (far-term) <u>Operable</u> ▪ Minimize operational restrictions due to weather, ranges, and space environment ▪ Reliable, supportable, maintainable, and robust enough to generate required mission rates ▪ Capability to meet required turn-around times (reusable vehicles) <u>Economical</u> <u>Survivable</u> ▪ Overcome threats posed by adversaries ▪ Survive repeated and/or long-term exposure to the space environment <u>Interoperable</u> ▪ Components interoperable with joint and allied operations concepts, command and control concepts, equipment and facilities ▪ Interoperable with NASA and commercial space facilities and equipment ▪ Meet C4ISR Joint Technical Architecture standards

▪ Operate in man-made environments (i.e., nuclear, chemical, biological, electromagnetic) ▪ Operate in hostile information operations environment (e.g., electronic warfare, C2 warfare, information warfare) ▪ Operate effectively in various meteorological, oceanographic, and space weather conditions <u>Affordable</u> ▪ Low life cycle costs ▪ Minimal additional operations, maintenance, support, and security manpower ▪ Maximize existing DoD infrastructure <u>Robust global strike capability</u> ▪ Multi-theater ▪ Global range from CONUS ▪ Minimal over flight ▪ Rapid reload ▪ Sustainable, reliable, and maintainable	<u>Flexible</u> ▪ Possess capability to orbit a variety of payloads ▪ Support multiple theaters with possibly conflicting and simultaneous requirements