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| RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)                                         |         |        |        |                                                                              |         |         | DATE<br>February 2005 |         |
|---------------------------------------------------------------------------------------------|---------|--------|--------|------------------------------------------------------------------------------|---------|---------|-----------------------|---------|
| APPROPRIATION/BUDGET ACTIVITY<br>RDT&E, Defense-wide<br>BA3 Advanced Technology Development |         |        |        | R-1 ITEM NOMENCLATURE<br>Advanced Aerospace Systems<br>PE 0603286E, R-1 # 32 |         |         |                       |         |
| COST (In Millions)                                                                          | FY 2004 | FY2005 | FY2006 | FY2007                                                                       | FY 2008 | FY 2009 | FY 2010               | FY 2011 |
| Total Program Element (PE) Cost                                                             | 0.000   | 71.420 | 75.866 | 111.029                                                                      | 120.377 | 115.923 | 90.923                | 80.923  |
| Advanced Aerospace Systems AIR-01                                                           | 0.000   | 71.420 | 75.866 | 111.029                                                                      | 120.377 | 115.923 | 90.923                | 80.923  |

**(U)    Mission Description:**

(U)    The Advanced Aerospace Systems program element is budgeted in the Advanced Technology activity because it addresses high payoff opportunities to dramatically reduce costs associated with advanced aeronautical systems and provide revolutionary new system capabilities for satisfying current and projected military mission requirements. Research and development of integrated system concepts, as well as enabling vehicle subsystems will be conducted. Studies conducted under this project include examination and evaluation of emerging aerospace threats, technologies, concepts, and applications for missiles, munitions, and vehicle systems. This program element was created in accordance with congressional intent in the FY 2005 DoD appropriations bill. Prior year funding was budgeted in PE 0603285E, Project ASP-01 and is noted as a memo entry in each program below.

**(U)    Program Accomplishments/Planned Programs:**

|      | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|------|---------|---------|---------|---------|
| A160 | (9.000) | 9.000   | 7.000   | 5.000   |

(U)    The A160 program will exploit a hingeless, rigid rotor concept operating at the optimum rotational speed to produce a vertical take-off and landing (VTOL) unmanned air vehicle (UAV) with low disk loading and rotor tip speeds resulting in an efficient low power loiter and high endurance system. This unique concept offers the potential for significant increases in VTOL UAV range (more than 2,000 nm) and/or endurance (24- 32 hours). Detailed design, fabrication and testing of this vehicle is being conducted to establish its performance, reliability, and maintainability. The A160 concept is being evaluated for surveillance and targeting, communications and data relay, lethal and non-lethal weapons delivery, assured crew recovery, resupply of forces in the field, and special operations missions in support of Army, Navy, Marine Corps, and other agency needs. The program will also conduct development tests of heavy fuel engine technology in support of, and in coordination with

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other DARPA programs that are developing highly efficient heavy fuel engine technologies to further advance current range and endurance projections as well as improve operational reliability and logistics compatibility. DARPA established an MOA with the Army for this program in April 2003. The A160 program will transition to the Army in the summer of FY 2006.

- (U) Program Plans:
- Fabricate and test low vibration rotor modifications.
  - Continue ground and flight test of A160 vehicles.
  - Perform conceptual design and trade studies of A160 variants for a variety of mission roles, including study of technology risk reduction, architecture, survivability, and command and control.
  - Flight test low vibration four-blade rotor modifications.
  - Conduct tests of advanced engines and coordinate with development of high-efficiency heavy fuel engine technologies.

|                                           | FY 2004  | FY 2005 | FY 2006 | FY 2007 |
|-------------------------------------------|----------|---------|---------|---------|
| Joint Unmanned Combat Air System (J-UCAS) | (41.385) | 0.000   | 0.000   | 0.000   |

(U) The Joint Unmanned Combat Air System (J-UCAS) program is a joint effort to develop and demonstrate unmanned combat capabilities for high-threat Suppression of Enemy Air Defense (SEAD); Information Operations/Intelligence, Electronic Attack (EA), Persistent Surveillance/Reconnaissance, and related strike missions within the emerging global command and control architecture for the warfighting community.

(U) The J-UCAS program combines and expands the efforts that were previously conducted under the DARPA/Air Force Unmanned Combat Air Vehicle (UCAV) program and the DARPA/Navy Naval UCAV (UCAV-N) program. Although these efforts were targeted towards Service-specific needs, the Department recognized the potential for significant synergy by combining the programs. The accomplishments and ongoing efforts of the X-45A technology demonstrator, as well as the development of the X-47A demonstrator, are reducing the risk of the “operationalized” demonstration system being developed for a joint operational assessment (OA) planned for the FY07-10 timeframe. The J-UCAS concept incorporates the next generation family of air vehicles, together with common subsystems (e.g. sensors, payloads, communications), and a Common Operating System to achieve the system’s diverse mission functionality. These common system elements will

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maximize mission flexibility and operational versatility, while reducing overall costs and maintaining schedule toward a joint operational assessment.

(U) In 2003, the Department established a joint service J-UCAS Office that includes DARPA, Air Force, and Navy personnel, operating in close coordination with Service users and other components. Service and DARPA funding for the J-UCAS in FY 2005 has been consolidated in two new program elements (PE 0603400D8Z and PE 0604400D8Z). In FY 2005, OSD directed that the program be transitioned to the Air force beginning in FY 2006.

(U) Program Plans:

- Continued development of J-UCAS systems, specifically the Boeing and Northrop Grumman demonstrator programs as well as the common operating system and sensors.
- Prepared for joint operational assessment (OA).

|                                         | FY 2004  | FY 2005 | FY 2006 | FY 2007 |
|-----------------------------------------|----------|---------|---------|---------|
| Unmanned Combat Armed Rotorcraft (UCAR) | (35.432) | 10.000  | 0.000   | 0.000   |

(U) The goal of the Unmanned Combat Armed Rotorcraft (UCAR) program was to design, develop, integrate and demonstrate the enabling technologies and system capabilities required to perform armed reconnaissance and attack missions within the Army's Future Force system-of-systems environment. The enabling technologies were survivability, autonomous operations, command and control, and targeting/weapons delivery. A highly survivable UCAR system would be able to prosecute enemy high value targets with relative impunity without placing a pilot in harm's way. UCAR's autonomous capabilities could have enabled effective teaming with manned systems and could have eliminated the requirement for a dedicated ground control station. The UCAR capabilities could have provided the Future Force with the mobility, responsiveness, lethality, survivability, and sustainability required to ensure mission success. Specific objectives of the UCAR program included: development and demonstration of an effective, low total ownership cost design for the system; an air and ground-based command and control architecture for UCAR operations that did not require a dedicated ground control station; autonomous multi-ship cooperation and collaboration; autonomous low altitude flight; and system survivability. In recognition of the Army's decision to terminate their support of the program, DARPA's efforts complete at the end of Phase II.

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- (U) Program Plans:
- Completed system trades, effectiveness, and affordability analyses through modeling and simulation.
  - Develop sufficient system concept fidelity to validate program goals and objectives.

|                           | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---------------------------|---------|---------|---------|---------|
| Quiet Supersonic Platform | (3.370) | 0.000   | 0.000   | 0.000   |

(U) The Quiet Supersonic Platform (QSP) program was directed towards development and validation of critical technology for long-range advanced supersonic aircraft with substantially reduced sonic boom, and increased efficiency relative to current-technology supersonic aircraft. Improved capabilities include supersonic flight over land without adverse sonic boom consequences with boom overpressure rise less than 0.3 pounds per square foot, increased unrefueled range approaching 6,000 nmi, gross take-off weight approaching 100,000 pounds, increased area coverage and lower overall operational cost. Highly integrated vehicle concepts were explored to simultaneously meet the cruise range and noise level goals. Advanced airframe technologies including optimized configuration shaping and laminar flow control were explored and shown to be viable to minimizing sonic boom and vehicle drag. Accomplishments include subscale model wind tunnel testing of low drag technology in a simulated flight environment and computational fluid dynamics calculations. In an effort to demonstrate configuration-shaping technology, plans were completed for a modified F-5 using a wing glove design. Once the flight test vehicle design was deemed suitable, parts fabrication and installation were completed. Flight tests successfully validated that optimized vehicle configurations produce shaped sonic boom signatures through the atmosphere to the ground. These flight tests demonstrated a low noise signature for supersonic aircraft. Advances in sonic boom reduction have transitioned to industry.

- (U) Program Plans:
- Conducted high fidelity wind tunnel test of large-scale semi span wing design to simulate actual supersonic flight conditions.
  - Initiated preliminary design of laminar flow control technology integrated into flight test vehicle.
  - Performed computational fluid dynamics calculations and conducted low and high speed wind tunnel tests of flight test vehicle to assess safety of flight.
  - Conducted flight-testing to validate low drag technology in real flight environment.

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|                                    | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|------------------------------------|---------|---------|---------|---------|
| Advanced Aeronautics Demonstration | (7.523) | 14.519  | 20.000  | 25.000  |

(U) The Advanced Aeronautics Demonstration program will develop novel aircraft concepts to enable the Services to perform wide-ranging and mixed missions outside the current flight envelope using advanced propulsion and aerodynamic technologies. The program consists of three projects, the Canard Rotor/Wing (CRW), Heliplane, and Oblique Wing concepts.

(U) The Army, Navy, Air Force, Marine Corps and Special Operations Command Forces have a need for affordable, survivable, vertical take-off and landing (VTOL) air vehicles to support dispersed units. CRW aircraft offer the potential for a high-speed, rapid response capability from a VTOL air vehicle with significant range and stealth improvements as compared to other VTOL concepts. Design, fabrication, ground and flight test of a scaled vehicle demonstrator will validate the stability and control system and aerodynamic performance required for vertical take-off, landing and hover via a rotating center wing that stops and locks in place for efficient high speed cruise. Following demonstration of the small scale vehicle, the program will proceed with design, development and demonstration of more operationally representative vehicles including manned aircraft. Completion of current flight testing will determine whether a follow-on program is warranted.

(U) The Heliplane, an alternative VTOL concept, is an air vehicle which offers a factor of two improvement in speed and range over conventional helicopters. Such improvements support a diverse mission set including Search and Rescue (SAR), fleet logistical supply, ship to shore sea basing, and future force requirements for tactical maneuver. Fabrication and flight testing of scaled vehicle demonstrators will validate the aerodynamic performance and stability and control system required for VTOL operation and efficient high speed cruise.

(U) The Oblique Wing aircraft is a flying wing which flies "end-on" to improve high speed characteristics. Building from the oblique wing and formation flying concepts, the program will integrate additional technologies, such as laminar flow and articulated propulsion to develop and fly two or more scaled demonstrator vehicles. The program will also identify key design requirements for the objective system, allowing the services to evaluate the technology for implementation in future operational systems.

(U) Program Plans:

- Upgrade second CRW air vehicle and complete demonstrator flight tests.
- Continue design studies of follow-on CRW manned and unmanned vehicles.

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- Conduct risk-reduction ground tests on key heliplane system components.
- Complete detailed design of heliplane vehicle demonstrator.
- Fabricate heliplane demonstrator aircraft.
- Conduct flight tests to validate heliplane performance.
- Develop oblique wing concept design.
- Define, develop and demonstrate key oblique wing component technologies.
- Begin system design for an objective oblique wing system and a flight demonstrator.

|                                      | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|--------------------------------------|---------|---------|---------|---------|
| Cormorant Unmanned Air Vehicle (UAV) | (2.149) | 6.984   | 9.600   | 5.100   |

(U) The Cormorant Unmanned Air Vehicle (UAV) program will examine the feasibility of a UAV that may be deployed from the sea without carrier support. The program will explore concepts that launch from both the sea surface and submarines. Technical challenges include aircraft dynamics at the air/sea interface, engine technology to survive periodic immersion in salt water, and development of advanced composite materials to withstand sea-surface operations. The Cormorant UAV is envisioned to provide close air support for vessels such as the Littoral Combat ship (LCS) and SSGN. Pending the outcome of demonstration results, transition of the Cormorant UAV to the Navy is planned after the completion of phase III in FY 2010.

- (U) Program Plans:
- Initiate feasibility studies; conduct modeling and simulation vehicle behaviors in the air/sea interface.
  - Explore novel composite materials.
  - Perform concept design studies.
  - Perform risk reduction experiments for materials and subsystems.
  - Prepare preliminary design and conduct preliminary design review.

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|                            | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|----------------------------|---------|---------|---------|---------|
| Heavy Fuel Engine for A160 | (4.426) | 6.687   | 6.612   | 2.729   |

(U) The Heavy Fuel Engine for A160 program will develop and demonstrate a heavy-fuel, lightweight, and efficient engine for the A160 air vehicle. In the future, heavy fuel (diesel or JP-8) will be the only logistic fuel for the battlefield. Conventional heavy-fuel engines are too heavy for air vehicles and, at the desired size, not efficient enough. Innovative and advanced diesel engine concepts will be developed to achieve both efficiency and a significant reduction in weight. The engine to be developed will enable the A160 to achieve maximum range and endurance while operating on diesel fuel. The A160 Engine Development technology is planned for transition to the Army at the conclusion of Phase III, which is anticipated to be completed by FY 2007.

- (U) Program Plans:
- Detail design of the engine.
  - Demonstrate performance goals of a prototype engine at 33% efficiency and a power to weight ratio of 0.83 hp/lb.
  - Demonstrate performance and reliability of optimized engines at 39% efficiency and a power to weight ratio of 1.0 hp/lb.

|        | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|--------|---------|---------|---------|---------|
| Walrus | (0.000) | 0.000   | 0.000   | 20.000  |

(U) This work focuses on system application of technologies and concepts being developed and reported under PE 0602702E, Tactical Technology Project TT-07, Aeronautics Technology. The Walrus program will develop and evaluate a very large airlift vehicle concept that is designed to control lift in all stages of air or ground operations including off-loading of payload without taking onboard ballast other than air. Unlike earlier generation airships it will generate lift through a combination of aerodynamics, thrust vectoring and gas buoyancy generation and management and for much of the time, it will fly heavier than air. The program will develop an operational vehicle concept and will conduct risk reduction demonstrations notably including a Walrus Advanced Technology Demonstration (ATD) air vehicle. The ATD vehicle will demonstrate scalable aircraft technology, is anticipated to achieve comparable C-130 airlift capability, and will explore, develop, and demonstrate the system concepts of operation. The Walrus objective vehicle will have a primary mission to deploy composite loads of personnel and equipment (for

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example, the components of a Unit of Action) ready to fight as they disembark from the aircraft within 6 hours after landing. Walrus will operate without significant infrastructure and from unimproved landing sites, ostensibly flat but over rough ground to tolerate 5 foot high obstacles. It will carry a useful payload >500 tons over global distances (12,000nm in less than 7 days) at a competitive cost. Additionally, Walrus will be capable of performing theater lift, support of Sea Basing and persistence missions to meet a range of multi-agency needs. Advanced breakthrough technologies will be investigated in the first phase to support the development of lift and buoyancy concepts. The program's first phase will include system studies and development of a notional concept of the objective vehicle. Based on these studies and concept viability, the competitive second phase will lead to the development of an objective air vehicle design, fabrication and initial flight test of the ATD risk reduction vehicle. The Walrus technology is being coordinated with the Army, Navy, and Air Force for possible transition. Transition to selected organization(s) is planned to occur after FY 2008.

(U) Program Plans:

- Development of the objective air vehicle design, operating missions and CONOPs.
- Competitive development of potential objective vehicle system concepts and preliminary ATD vehicle design based on selected concept options.
- Selection of the preferred objective air vehicle system design concept and development to preliminary design level review.
- Risk reduction demonstrations in support of the objective vehicle including the key ATD vehicles.
- Complete detailed design of the ATD air vehicle leading to a critical design review.
- Manufacture and fabricate ATD air vehicle.
- Flight test and release to Services for evaluation testing of military utility.

|                              | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|------------------------------|---------|---------|---------|---------|
| Critical Munition Capability | (2.500) | 6.500   | 9.000   | 9.000   |

(U) The Critical Munition Capability program consists of three efforts: HyperJAM (Hypersonic Joint Attack Munition), MAULLM (Multi-target Autonomous Loitering Littoral Munition), and BEDLAM (Battlefield Electronically Disruptive Loitering Attack Missile). The goal of each of these efforts is to provide the warfighter with a range of weapons that enable effective, precise, responsive, and decisive disruption to enemy

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forces. The MAULLM and BEDLAM programs build upon developments from the NetFires program previously funded from PE 0603764E, Land Warfare Technology, Project LNW-03.

(U) HyperJAM provides the capability to deliver GPS precision guided weapons to high value, well defended, and relocatable targets with range capability in excess of 400 nm. HyperJAM uses conventional rocket technology (black brandt rocket) integrated with a modified aerodynamically enhanced Joint Direct Attack Munition (JDAM) high speed nosecone to deliver MK84 munitions to precise locations. Utilization of a zoom maneuver from a high performance aircraft (F-16, F/A-18) allows delivery of an air-to-surface weapon on a ballistic trajectory that greatly enhances its range capability with the same lethality/accuracy.

(U) MAULLM will develop and test a containerized, platform-independent multi-mission weapon concept that will provide rapid response and lethality in packages with significantly lower missile unit cost, decreased logistical support and lower life-cycle costs, while increasing flexibility compared to current Naval gun and missile systems. MAULLM will address current Naval threats such as massed, swarming suicide attack boats, and will significantly enhance operations ashore by providing a long-loiter, on-call weapon capable of engaging multiple (~10) individual targets. MAULLM builds on and extends many of the concepts developed in NetFires, will be air deployable in C-130 (and smaller) aircraft, and will enhance the situation awareness and survivability of the Navy and Marines by providing standoff target acquisition and extended-range, non-line-of-sight engagements. The program will develop and demonstrate a highly flexible, modular, multimission loitering missile that can be remotely commanded and can send target detection and battle damage information back to the controller.

(U) BEDLAM will develop critical components and technologies for detection, exploitation, and disruption of a wide variety of enemy electronic emissions and will integrate them into a mission module suitable for use on small loitering missiles. The program will develop or enhance a number of key components: extremely sensitive transceivers capable of detection of extremely low-level electronic signals; signal processing algorithms to separate signals of interest from other electronic clutter; direction finding and mapping techniques to track multiple emitters; and antenna arrays suitable for wide-frequency operation; and will integrate these elements into a mission module suitable for small loitering missiles or UAVs. If successful, this will provide improved capabilities in several areas: a single missile can detect and engage air defense assets even after they cease transmissions or begin to move; low-level emissions from cell phones and computer networks can be detected and relayed or targeted; and target-specific emissions detected by other systems (such as Wolfpack) can be acquired and correlated with other co-located emissions even while moving to establish patterns or meetings with other emitters to aid in intelligence and targeting. This program will leverage both the DARPA NetFires and Wolfpack programs.

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- (U) Program Plans:
- HyperJam
    - Completed simulation studies to determine range capability and control requirements for potential Army, Navy and Air Force customers.
    - Develop system level requirements for air and gun delivered munitions.
    - Develop integrated missile/munition concepts with greater range and lethality.
    - Initiate preliminary system design.
    - Conduct technology risk reduction effort of solid fuel ramjet or rocket engine development/integration.
    - Conduct technology risk reduction effort on adaptive inlet concepts.
    - Evaluate preliminary designs and downselect for development of HyperJam prototype.
    - Conduct ground experiments to evaluate engine performance on munition in unguided flight tests.
    - Conduct flight demo experiments in simulated military mission.
  - MAULLM
    - Develop and demonstrate critical technologies including next-generation Automatic / Assisted Target Recognition and novel low-cost reduced-signature airframe concepts.
    - Evaluate communication and command and control technologies and select best option(s).
    - Evaluate preliminary designs and downselect to best design(s).
    - Develop brassboard seekers and submunitions and perform flight tests against a variety of targets.
    - Downselect or modify design based on flight test data and develop form factored MAULLM prototype.
    - Perform flight tests with loitering missile in simulated military mission.
  - BEDLAM
    - Initiate competitive contracts for system preliminary design.
    - Obtain and present data from representative emitters to determine performance boundaries.
    - Evaluate emerging antenna concepts and select best option(s).
    - Evaluate preliminary designs and downselect to best design(s).
    - Develop brassboard module and perform flight tests against a variety of emitters.
    - Downselect or modify designs based on flight test data and develop form factored module for loitering missile.

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-- Perform flight tests with loitering missile in simulated military mission.

|                                                          | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|----------------------------------------------------------|---------|---------|---------|---------|
| Modular Blended Wing Body Multi-Role Aircraft (MBWB MRA) | (0.000) | 6.420   | 0.000   | 0.000   |

(U) The goal of the MBWB MRA program is to develop and demonstrate a system that can efficiently and affordably meet the Joint Service needs for a bomber, tanker, and transport. The inherently high lift-to-drag ratio and payload fraction of the MBWB MRA will enable weapons, fuel, materiel, and personnel to be transported 25-50 % more efficiently than is possible with current aircraft. The MBWB MRA will be reconfigurable on the flight line to a bomber, tanker, or transport in less than 24 hours. Commercial derivatives of the MBWB MRA will carry freight at a cost per air ton mile that is 20-40 % below that of existing aircraft.

(U) This program will develop and demonstrate technology to enable large scale composite manufacturing, advanced flight controls, modular payloads, and separation of stores. Structural characteristics will be validated through destructive testing of panels. Aerodynamic control, store separation, and aerodynamic performance will be demonstrated through wind tunnel models. A 40-50 % scale aircraft will be designed, fabricated, and demonstrated.

(U) Program Plans:

- Perform system trades and develop conceptual designs.
- Develop large scale composite manufacturing technology.
- Develop modular mission modules.
- Develop aerodynamic control technologies.
- Develop store separation technology.
- Fabricate a 40-50 % scale model of a MBWB MRA.
- Demonstrate capability to reconfigure as a bomber, tanker, and transport.
- Demonstrate efficiency and affordability.

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| Advanced Aerospace System Concepts | (3.281) | 3.310   | 3.254   | 2.200   |

(U) Studies conducted under this project examine and evaluate emerging aerospace technologies and system concepts for applicability to military use. This includes the degree and scope of potential impact/improvements to military operations, mission utility, and war fighter capability. Studies are also conducted to analyze emerging aerospace threats along with possible methods and technologies to counter them. The feasibility of achieving potential improvements, in terms of resources, schedule, and technological risk, is also evaluated. The results from these studies are used, in part, to formulate future programs or refocus ongoing work. Topics of consideration include: methods of defeating enemy anti-aircraft attacks; methods to intercept and defeat enemy unmanned air vehicles (UAVs); munition technologies to increase precision, range, endurance and lethality of weapons for a variety of mission sets; novel launch systems; and air vehicle control, power, propulsion, materials, and architectures.

- (U) Program Plans:
- Perform studies of candidate technologies and develop system concepts.
  - Conduct modeling and simulation of system architectures and scenarios.
  - Conduct enabling technology and sub-system feasibility experiments.

|                      | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|----------------------|---------|---------|---------|---------|
| Reusable Space Plane | (0.000) | 0.000   | 0.000   | 25.000  |

(U) The Reusable Space Plane program will develop a turbine-based combined cycle propulsion system consistent with the flight envelope of the Falcon (PE 0603287E/SPC-01) Hypersonic Cruise Vehicle concept, but subscale and of limited operational durability. To accomplish this objective, this program will further mature, integrate and flight-demonstrate propulsion technologies developed by the Hypersonic Reusable Demonstration program (budgeted under PE 0602702E, Project TT-07) and the Falcon program (PE 0603287E). A scramjet engine flow path design consistent with the Falcon Hypersonic Cruise Vehicle concept will be matured to flight readiness. This flow path will then be integrated with a Mach 4, expendable turbine engine developed under the first of these previously mentioned programs to conduct a combined cycle engine

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| <b>RDT&amp;E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)</b>                                     |                                                                                     | <b>DATE</b><br>February 2005 |
| <b>APPROPRIATION/BUDGET ACTIVITY</b><br>RDT&E, Defense-wide<br>BA3 Advanced Technology Development | <b>R-1 ITEM NOMENCLATURE</b><br>Advanced Aerospace Systems<br>PE 0603286E, R-1 # 32 |                              |

ground demonstration. Successful accomplishment of the ground demonstration will lead to a flight demonstration of these systems in both low speed (turbojet) and high speed (scramjet) flight regimes. The program will also conduct studies and analysis of reusable materials technologies and thermal management strategies for these propulsion systems to determine the utility and potential applicability of those technologies to the end system. Accomplishment of these objectives will enable a future large scale hypersonic cruise X-vehicle development and demonstration program.

- (U) Program Plans:
- Mature scramjet flow path.
  - Integrate turbine and scramjet engines.
  - Conduct ground testing of combined cycle engine.
  - Conduct flight-test demonstration.

|                                                | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|------------------------------------------------|---------|---------|---------|---------|
| High Angle Ballistic Instrumented Test (HABIT) | (0.000) | 0.000   | 14.000  | 17.000  |

(U) Information on the performance of ballistic materials is required in conditions that cannot be created in ground test facilities. A very high velocity, very high angle flight test of an inert test article is required to create these unique conditions. The test article will be instrumented to act as a “flying laboratory” to collect this information, which is needed for a variety of future hypersonics programs. The high angle ballistic instrumented test (HABIT) program will conduct analysis, design, and fabrication of the low-cost flight test article, and will culminate in a test flight.

- (U) Program Plans:
- Evaluate candidate technologies and instrumentation approaches for design and development of the test article.
  - Perform modeling and simulation of anticipated flight and instrumentation performance and fabricate test article.
  - Conduct flight test, data collection and analysis.

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| <b>RDT&amp;E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)</b>                                     |                                                                                     | <b>DATE</b><br>February 2005 |
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|          | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|----------|---------|---------|---------|---------|
| Long Gun | (3.850) | 8.000   | 6.400   | 0.000   |

(U) The Affordable Weapon System (AWS) Long Gun program was previously funded under PE 0603764E, Project LNW-03. The Long Gun program will evaluate and develop a re-useable, long endurance, low cost, joint, unmanned/armed missile system combined with a tri-mode long wave infrared/near infrared/visible (LWIR/NIR/VIS) sensor with laser spot targeting. Ducted fan propulsion will provide efficient thrust for long endurance. The missile will be launched from a canister carried on a sea or ground vehicle, will fly to a specified target area, and use a tri-mode sensor operating at visible, long, and near-infrared wavelengths to search for targets. If a qualified target is found, the missile will attack the target with a self-contained munition. If no targets are found, the missile could be commanded to return to base. The missile will include a data link back to a human controller/operator to confirm target characteristics, approve engagement, and perform battle damage assessment.

- (U) Program Plans:
- Modify existing AWS airframe as basis for missile design.
  - Replace engine with ducted fan with rotary engine operated with heavy fuel.
  - Develop and integrate tri-mode sensor/seeker with laser spot recognition for targeting.
  - Develop avionics package to support long-endurance flight.
  - Conduct inert flight tests and demonstrate long endurance operation.
  - Demonstrate weapons dispense along rail to simulate weapon release.
  - Demonstrate multiple air vehicles controlled by a single operator.
  - Integrate sensor fused weapons into payload bay.
  - Conduct flight tests and live simulation weapon dispensing demonstration.

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|            |                                                            |                       |                       |                       |
|------------|------------------------------------------------------------|-----------------------|-----------------------|-----------------------|
| <b>(U)</b> | <b><u>Program Change Summary:</u></b> <i>(In Millions)</i> | <b><u>FY 2005</u></b> | <b><u>FY 2006</u></b> | <b><u>FY 2007</u></b> |
|            | Previous President's Budget                                | 111.847               | 147.573               | 161.512               |
|            | Current Budget                                             | 71.420                | 75.866                | 111.029               |
|            | Total Adjustments                                          | -40.427               | -71.707               | -50.483               |

Please note that this program element was established in accordance with congressional intent in FY 2005. FY 2004 and prior was funded under PE 0603285E. The Previous President's Budget amount reflects project ASP-01.

|                                  |         |
|----------------------------------|---------|
| Congressional program reductions | -40.427 |
| Congressional increases          | 0.000   |
| Reprogrammings                   | 0.000   |
| SBIR/STTR transfer               | 0.000   |

**(U)**    **Change Summary Explanation:**

FY 2005                      Decrease reflects congressional undistributed reductions and a \$10 million program reduction for Walrus.  
FY 2006 - 2007            Decrease reflects reduced funding for the Unmanned Combat Armed Rotorcraft and Walrus programs.

**(U)**    **Other Program Funding Summary Cost:**

|                                           |         |         |         |         |
|-------------------------------------------|---------|---------|---------|---------|
| Joint Unmanned Combat Air System (J-UCAS) | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
| PE 0604731F, Air Force                    | 160.551 | 0.000   | 0.000   | 0.000   |
| PE 0207256F, Air Force                    | 2.300   | 0.000   | 0.000   | 0.000   |

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|                                             |             |             |             |             |
|---------------------------------------------|-------------|-------------|-------------|-------------|
| PE 0603400F, Air Force                      | 0.000       | 0.000       | 77.800      | 0.000       |
| PE 0604400F, Air Force                      | 0.000       | 0.000       | 272.300     | 400.100     |
| PE 0603114N, Navy                           | 102.865     | 0.000       | 0.000       | 0.000       |
| PE 0603400D8Z, OSD                          | 0.000       | 354.794     | 0.000       | 0.000       |
| PE 0604400D8Z, OSD                          | 0.000       | 217.401     | 0.000       | 0.000       |
| <br>Unmanned Combat Armed Rotorcraft (UCAR) | <br>FY 2004 | <br>FY 2005 | <br>FY 2006 | <br>FY 2007 |
| PE 0602211, Project 47A, Army               | 0.000       | 0.000       | 0.000       | 0.000       |
| PE 0603003, Project 313, Army               | 4.200       | 0.000       | 0.000       | 0.000       |
| <br>A160                                    | <br>FY 2004 | <br>FY 2005 | <br>FY 2006 | <br>FY 2007 |
| Army S&T, Phase I                           | 10.000      | 15.000      | 10.000      | 15.000      |
| Army S&T, Phase II                          | 0.000       | 0.000       | 9.190       | 18.740      |