FALCON (Force Application and Launch from CONUS)
Technology Demonstration Program
Fact Sheet

Program Goal

The goal of the joint DARPA/Air Force FALCON program is to develop and validate, in-flight, technologies that will enable both a near-term and far-term capability to execute time-critical, prompt global reach missions while at the same time, demonstrating 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 (circa 2010) operational capability for prompt global strike from the continental U.S. (CONUS) (or equivalent reach from alternative U.S. basing) while also enabling future development of a reusable Hypersonic Cruise Vehicle (HCV) for the far-term (circa 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. These technologies will be matured to flight readiness, integrated into a system design and demonstrated in a series of flight-tests.

Program 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 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)**. 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 or other munitions. This HCV will provide the country dominant capability to wage a sustained campaign from CONUS on an array of time-critical targets while providing aircraft-like operability and mission recall capability.

The U.S., however, needs a prompt global reach operational capability in the much nearer term. This near-term operational capability is embodied in the **Common Aero Vehicle (CAV)** munitions delivery system integrated with a low-cost, operationally responsive, rocket booster.

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CAV would be an unpowered, maneuverable, hypersonic glide vehicle capable of carrying approximately 1,000 pounds in munitions or other payload. CAV designs based on existing technologies are predicted to have a downrange on the order of 3,000 nautical miles.

Advanced CAV designs that offer substantially greater downrange (approximately 9,000 nautical miles) and improved maneuverability (approximately 3,000 nautical miles cross-range) are known as **Enhanced CAV (ECAV)**. ECAV would require 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 altitude, attitude, velocity and geo-position. Expendable rocket boosters offer adequate near-term capability. However, existing booster systems are costly and in limited supply. Conventional weapons need less expensive launchers. As a consequence, the Government intends to develop a low-cost, responsive launch vehicle called the **Small Launch Vehicle (SLV)**. This SLV design will be integrated and developed in parallel with the ECAV design. The SLV will 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. The primary objective is to develop the 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). Flexibility to place payloads weighing as little as 200 pounds or as much as 2,000 pounds into this same reference orbit is also desired. Taken together, the CAV and small satellite launch 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 ECAV in the near-term and the HCV in the far-term. As a consequence, CAV (using available technologies), ECAV, and HCV are viewed to lie on a common evolutionary design and technology maturation path. Therefore, the FALCON program will be incremental 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 U.S. basing).

Program Motivation

Recent military engagements in Bosnia, Afghanistan, and Iraq have underscored both the capabilities and limitations of U.S. 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 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. 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 U.S. 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 U.S. 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.

Program Schedule

The FALCON program is divided into three phases:

- Phase I (System Definition). Six months long. Funding planned - approx. $10M. Organized into to two "tasks."
    - The first task is focused on Small Launch Vehicle (SLV); nine contractors will develop conceptual designs, performance predictions, cost objectives, and development and demonstration plans for a SLV.
    - In the second task, four contractors will develop conceptual designs, concept of operations, a demonstration plan and identify critical technologies for the Hypersonic Weapon Systems (HWS), which includes CAV, ECAV, and HCV.
- Phase II (Design and Development). 36 months long. Also separated into two tasks. Contractors selected in an open competition.
    - For the SLV Task, up to two contractors will demonstrate and flight-test the SLV.
    - For the HWS Task, up to two contractors will flight-test a CAV design, and develop designs for the ECAV and HCV demonstration systems.
- Phase III (Weapon System Demonstration). 30 months long. Contractors will conduct flight-tests of an integrated ECAV and SLV system and an HCV technology demonstration vehicle. Details of the phase to be defined in the future.

Program Management

The FALCON program will be managed by DARPA as Program Manager, with an Air Force Deputy Program Manager.

Additional Resources

- The source for the information in this fact sheet is the FALCON Phase I program solicitation (http://www.darpa.mil/tto/falcon/FALCON_PIP_FINAL.pdf).
- Other solicitation-related information – http://www.darpa.mil/tto/solicitations.html - scroll down and look for FALCON listing on the right-hand side.
- Program web site – http://www.darpa.mil/tto/programs/falcon.html.
- Media point of contact: Jan Walker, DARPA, (703) 696-2404, jwalker@darpa.mil.

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