The Department of Defense Performance-Based Logistics Awards Program
for
Excellence in Performance-Based Logistics
in
Life-Cycle Product Support

Section 2

Summary of Criteria Accomplishments

Warfighter-Based Capabilities and Outcomes

Mission Success: The Army's Tactical Unmanned Aircraft System (TUAS), AKA Shadow, is currently in service with DoD and Foreign Military Sales customers worldwide and is the most utilized Unmanned aviation system in the world today. The TUAS (Shadow) is a System of systems, major shadow components are Ground Control Station, Launcher, Tactical Automated landing Systems, and the aircraft, (Figure 1). As of May 2010 the Shadow System has flown 500,000 operational hours of which over 90% have been flown in combat. The Government-Contractor Team responsible for managing and performing the Shadow PBL contract has achieved exceptionally high readiness (highest operational availability of any aviation asset in Operation Iraqi Freedom (OIF) / Operation Enduring Freedom (OEF)), while simultaneously reducing system costs and improving reliability. In the PBL Construct the contractor, AAI Corp, assumes financial accountability for all aspects of Shadow TUAS operations to include: field maintenance, spares, modifications, upgrades, depot level repairs, preset/reset, transportation, training, and Field Service Representative (FSR) support (Figure 2). Overall TUAS performance is assessed through the use of four PBL contract metrics that include: System Status Readiness (SSR), Depot Mean Down Time (DMDT), Reliability Growth Rate (RGR) and Tactical UAS Field Notice (TFN) Execution Performance (TEP). Subsequently, the AAI Corp. Product Support Integrator (PSI) fee is determined by their support of the warfighter through combined performance of these metrics and the Shadow PBL team has consistently achieved maximum performance scores every year. Operational results have been outstanding and have also contributed to reduced UAS sustainment costs with the system

achieving an **average SSR / Availability of over 97% against a PBL contract objective of 85% derived from the system's Operational Requirements Document (ORD) (Figure 3).** When U.S. Special Forces needed a TUAS capability quickly and couldn't afford the time to train operators and technicians, the UAS Program Management Office (PMO) and AAI responded immediately with a Government-Owned, Contractor-Operated (GOCO) TUAS capability. The GOCO Program formed two teams to operate government-owned Shadow systems. Each team deployed to Iraq in less than 90 days. In the months that followed the first GOCO team flew more than 7,650 combat flight hours, exceeding a previous Army unit record of 6,600 hours. Since then, the Shadow GOCO Program is credited with the safe, successful training and operational support of the U.S. Special Operations Command accumulating more than 18,000 combat flight hours in their initial 15 month deployment—nearly twice as many as any other organic unit! Result: The Warfighters are extremely pleased with GOCO performance and awarded a contract for two more GOCO teams! The successes of the Shadow System are demonstrated by the mission requirements and demand placed on the system by Combat Commanders and proven by the increased OPTEMO of the system (Figure 4).

Materiel Availability: The primary objective of AAI's Shadow TUAS PBL Team is outstanding warfighter support balanced with continuing reduction in the system's cost of readiness. Even with the number of delivered Shadow Systems increasing over 25% in FY10 and the aggressive fleet insertion planning that was developed for fielding of the Shadow system's modifications and improvements, the PBL team has continued to reduce sustainment cost while maintaining a superb System Status Readiness (SSR) rating. The PBL Team's sustainment support activity is now achieving the UAS PMO's 5% target cost of ownership and continuously strives to drive rapid repairs – not added spares inventory. The PBL Team supports field sites in compliance with the Army's two-level maintenance concept (e.g., Field and Sustainment) and Supply Chain Management (SCM). Assets that are determined to be un-repairable forward at the Field level are returned to the AAI PBL Depot or designated supplier. The Team ensures spares / Repair of Repairables (RoR) requirements are accurately projected, planned and executed by

working closely with reliability engineering and using approved modeling tools. Performance is tracked at the component level and is routinely reviewed and adjusted to consistently achieve optimum results. AAI monitors depot repair usage on 1,620+ Line Replaceable Units (LRU) and consumables for the TUAS and provides performance feedback to suppliers. Spares management, ROR execution, and management of the supply chain has positively impacted all four program performance metrics – DMDT, SSR, RGR, and TEP (Figure 5), in spite of increasingly challenging transportation issues in OIF and OEF.

Materiel Reliability: Shadow system materiel reliability is evaluated and incentivized using the RGR metric (Figure 6) which accounts for both materiel and induced failures (human or software-related) that result in mishaps. The PBL Team has successfully fielded and continues to field several reliability improvements, which in effect reduces cost associated with declining loss rates while at the same time improving serviceability of the assets. It should be noted that previous years' performance indicated nearly all mishaps were caused by materiel failures whereas recent performance indicates mishaps are more evenly divided between materiel and induced failures.

Ownership Cost Reduction: The total ownership cost for the Shadow PBL program has decreased by 30% over the period from FY08 – FY10 with a consistently lower annual cost of readiness assessed at $791,800 per system (Figure 7 &8). This was achieved during a period when the number of fielded units also increased by 31%! These costs avoidances are directly attributed year-after-year through improvements in design, decreased spares requirements, reduced transportation costs, and implementation of Lean Six Sigma methodologies. The Shadow PBL model captures the total cost of the system from total contract cost management to cost of replacement parts (Figure 9).

Sustainment Strategy Effectiveness

Public-Private Partnering: The Shadow TUAS Program is setting the standard for Public-Private Partnering with DoD depots. The original equipment manufacturer (OEM), AAI Corporation, has developed a synergistic partnership with both Letterkenny Army Depot (LEAD) and Tobyhanna Army

Depot (TYAD) in Pennsylvania. Under this arrangement, each depot performs reset of Shadow Ground Control Stations (GCS), support equipment, vehicles and support trailers. These partnerships provide AAI access to the necessary infrastructure and skilled labor required at an affordable rate and enables the company to expand their research, development, engineering and manufacturing operations at their primary facility. Furthermore, AAI Corp. is fully accountable to the UAS PMO for workload schedule management, reset spares, and budget management. This incentivizes free exchange of industry and depot information to include Lean Six Sigma initiatives and best commercial practices. Finally, this Public-Private Partnering relationship has been so successful that AAI is exploring the potential of other partnering arrangements with other Army Depots in order to accommodate future requirements.

Systems Engineering Approach: The Shadow PBL Program routinely executes systems engineering management and technical processes to effect rapid identification, analysis, design and implementation of modifications that improve reliability, reduce life cycle costs, and enhance system capability. The Shadow PBL team has implemented 7 major system modifications in the past 12 months, involving the engine, battery power, communications, payload, software and human factors improvements; some in as little as 30 days! The direct result has been enhanced operational reliability and platform capability, particularly in support of deployed US forces in OIF and OEF who have flown 30% more missions than planned in extremely challenging and austere conditions. The Shadow PBL Team holds weekly teleconference meetings and formal Quarterly Management Reviews (QMRs) to review metrics, operational trends, risk management issues, and planned system upgrades / modifications.

Footprint Reduction: The Shadow PBL Team continues to drive reduced footprint both at the system and total force levels. At the Shadow System level, our PBL Team controls footprint by:

1) Use of embedded Field Service Representative (FSR) support with each deployed unit to enhance troubleshooting and perform limited depot level repairs / modifications forward with the unit;
2) Positioning a regional Forward Repair Activity (FRA) in each operational theater that enables more rapid component turnaround and lateral resupply as necessary;

3) Emphasizing repair velocity instead of warehousing inventory of repairable components; and

4) Rapid integration of improved engineering modifications to enhance reliability

The Shadow TUAS also reduces footprint at the total force level by lowering the overall requirement for large numbers of Intelligence, Surveillance and Reconnaissance (ISR) assets in theatre as well as isolating / assessing targets requiring exposure of U.S. combat forces.

Obsolescence Management: The Shadow PBL Team convenes a Parts Obsolescence Management Integrated Product Team (IPT) as part of the Diminishing Manufacturing and Material Sources (DMSMS) program that uses best commercial practices to proactively identify obsolete components, determine the potential impact to system perform and cost, and provide possible alternatives. Changes impacting form, fit, or function are processed via an Engineering Change Proposal (ECP) with the System Configuration Control Board. Field effectivity is determined as part of the ECP process and once approved, AAI executes actions to implement in a rapid yet logical manner.

Reliability, Maintainability and Supportability Improvements: The Shadow PBL Modification and Fielding Team implemented numerous enhancements to the Shadow TUAS that improved Reliability, Maintainability, and / or Supportability over the past year. Some examples include: the Launcher Control Unit upgrade, an improved parachute, hood seals, quick release latches, lithium battery, Electronic Fuel Injected (EFI) engine, modified drilled oil pump, multiple software upgrades, and the breakaway power cable. Two reliability improvements offering the most substantial benefit to the reliability and maintainability of fielded Shadow systems were the improved parachute and the modified drilled oil pump. The improved parachute provided direct cost avoidance benefits to the Shadow Program by greatly reducing the Estimated Cost of Damage (ECOD) after an incident in which the air vehicle parachute was deployed. The average ECOD per incident involving parachute recovery was reduced 62% from $279,318 (prior to improved parachute fielding) to $104,454 after field installation. The improved parachute also dramatically reduced the number of Shadow air vehicles requiring depot-level repair by significantly limiting asset damage. This immediately increased opportunity for field-level repairs

the air vehicle to service more rapidly and minimizing the cost and time associated with acquiring and shipping replacement air vehicle assets. Maintenance repair performance data for the improved parachute indicates the air vehicle repairable rate at the unit is now 72%—this represents a more than 450% improvement from the old parachute that allowed only a 15% repairable rate at the unit! Additionally, the modified drilled oil pump was introduced to the Shadow fleet in September 2009 to address the extremely low operational flight temperature requirements in a theater of deployed operations. The addition of the modified drilled oil pump enabled increased operational tempo (OPTEMPO) for the Shadow system during the winter of 2009-2010 resulting in 1,499 additional sorties and 5,577 additional flight hours as compared to the winter of 2008 / 2009. The modified drilled oil pump also resulted in the complete elimination of oil flow related incidents for the Shadow system during the winter months of 2009-2010. Evidence of the effectiveness of the PBL Program is reflected in the last three consecutive years in which total contract price remained relatively constant while the number of Shadow systems supported increased by more than 31% *(Figure 10)*. Shadow PBL has clearly become a force multiplier and Reduction of Total Ownership Cost (RTOC) success for the Army and the warfighter!

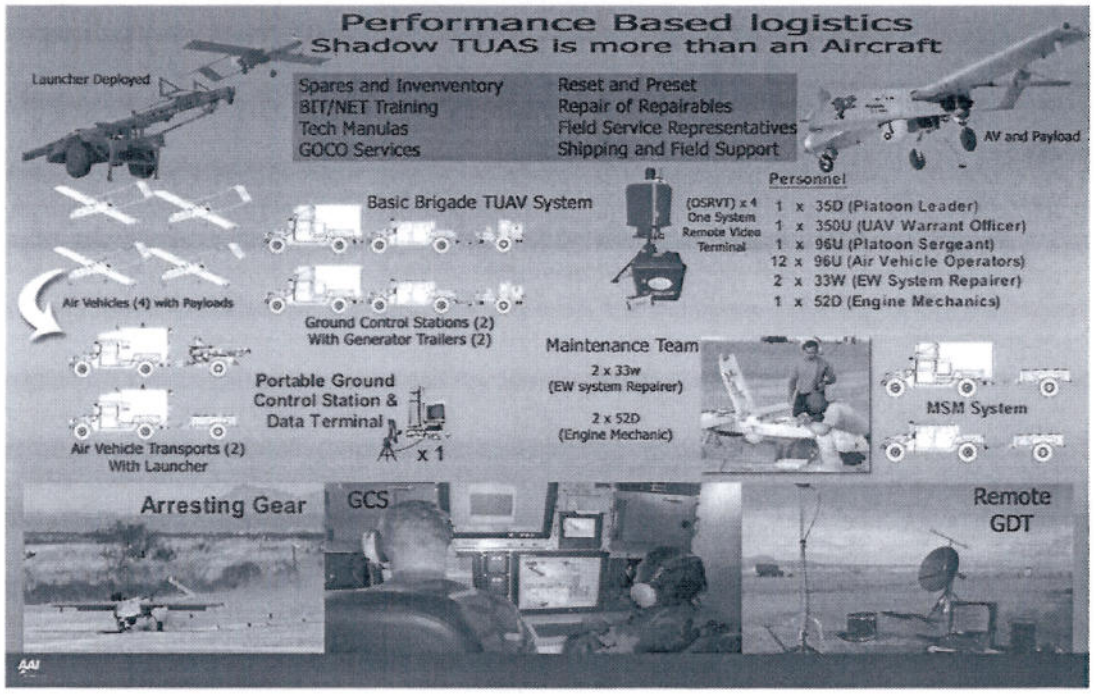

Figure 1—Shadow TUAS Major Components

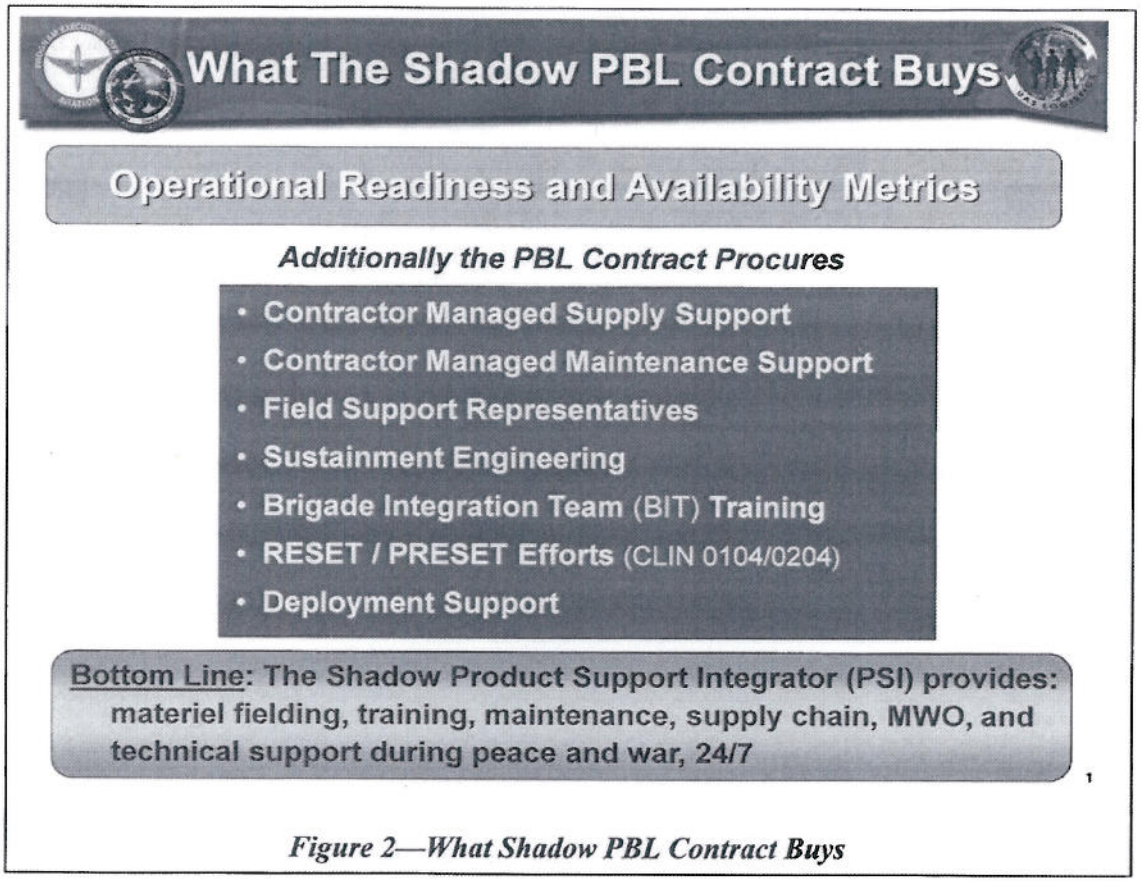

Figure 2—What Shadow PBL Contract Buys

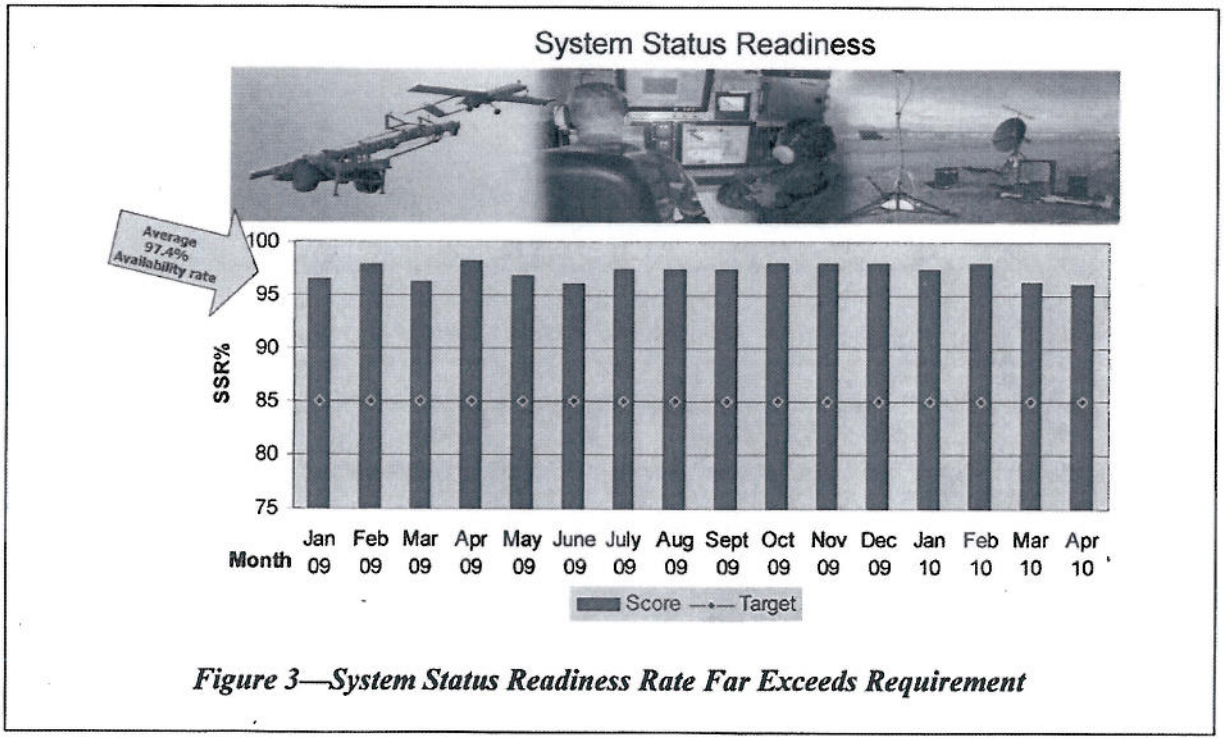

Figure 3—System Status Readiness Rate Far Exceeds Requirement

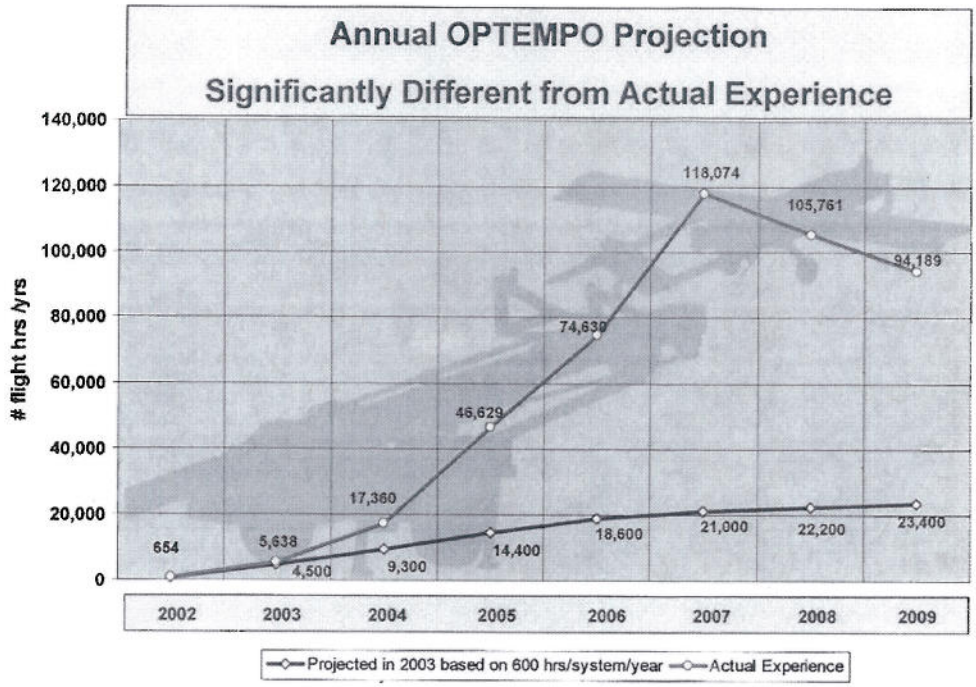

Figure 4—Actual Flight Hours Over 500% More Than Initial Requirements

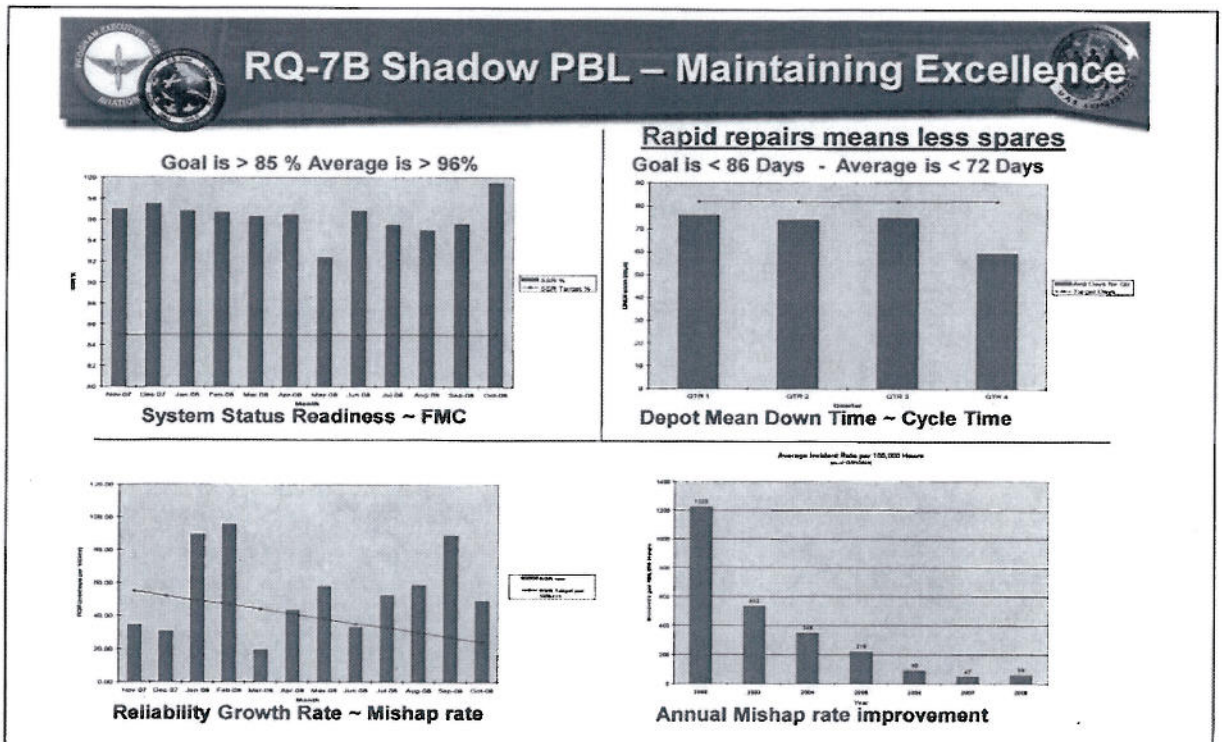

Figure 5—RQ-7B Shadow PBL – Maintaining Excellence

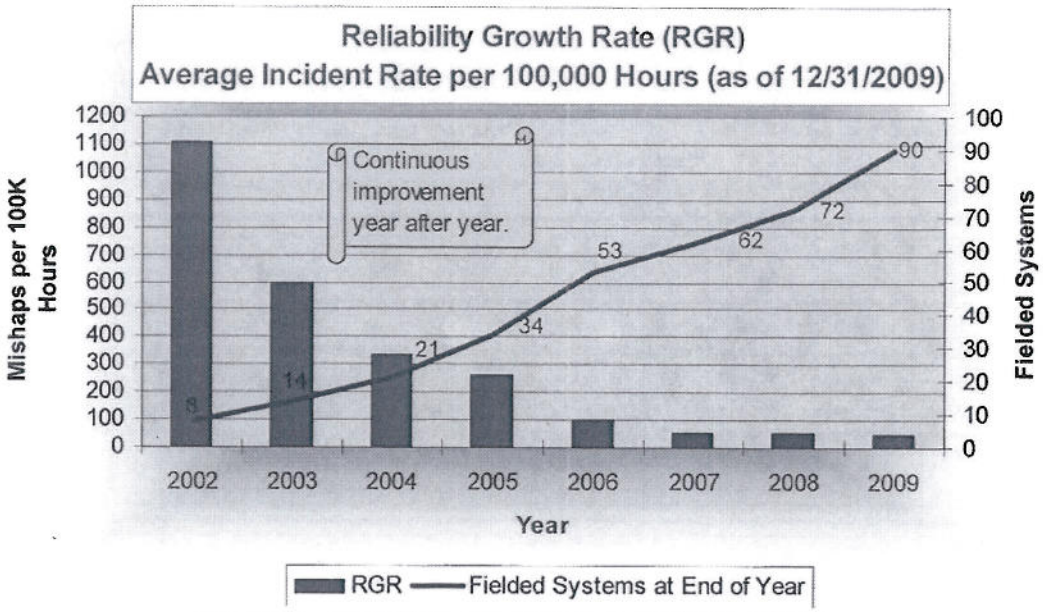

Figure 6—Reliability Growth Rate / # Fielded Systems

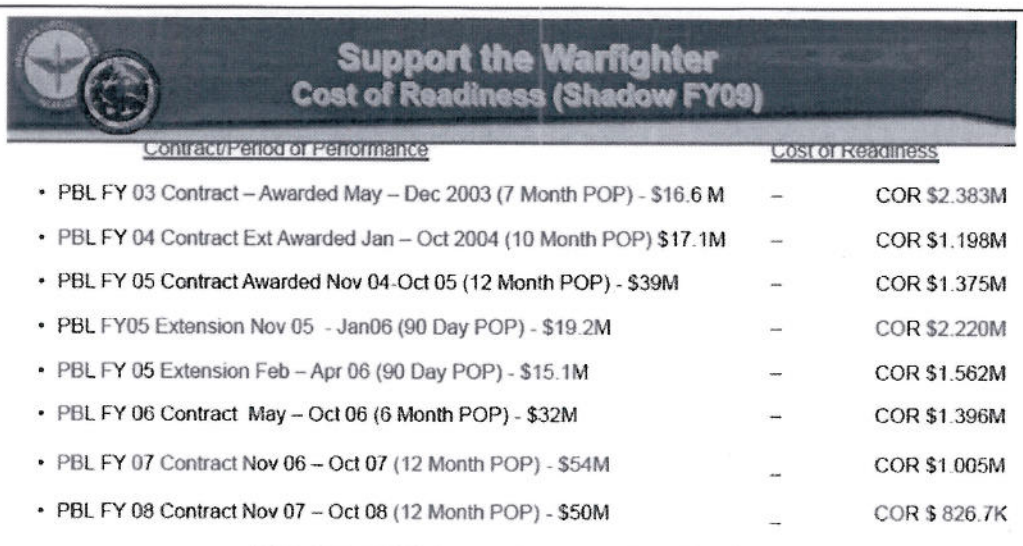

Figure 7—Shadow Cost of Readiness

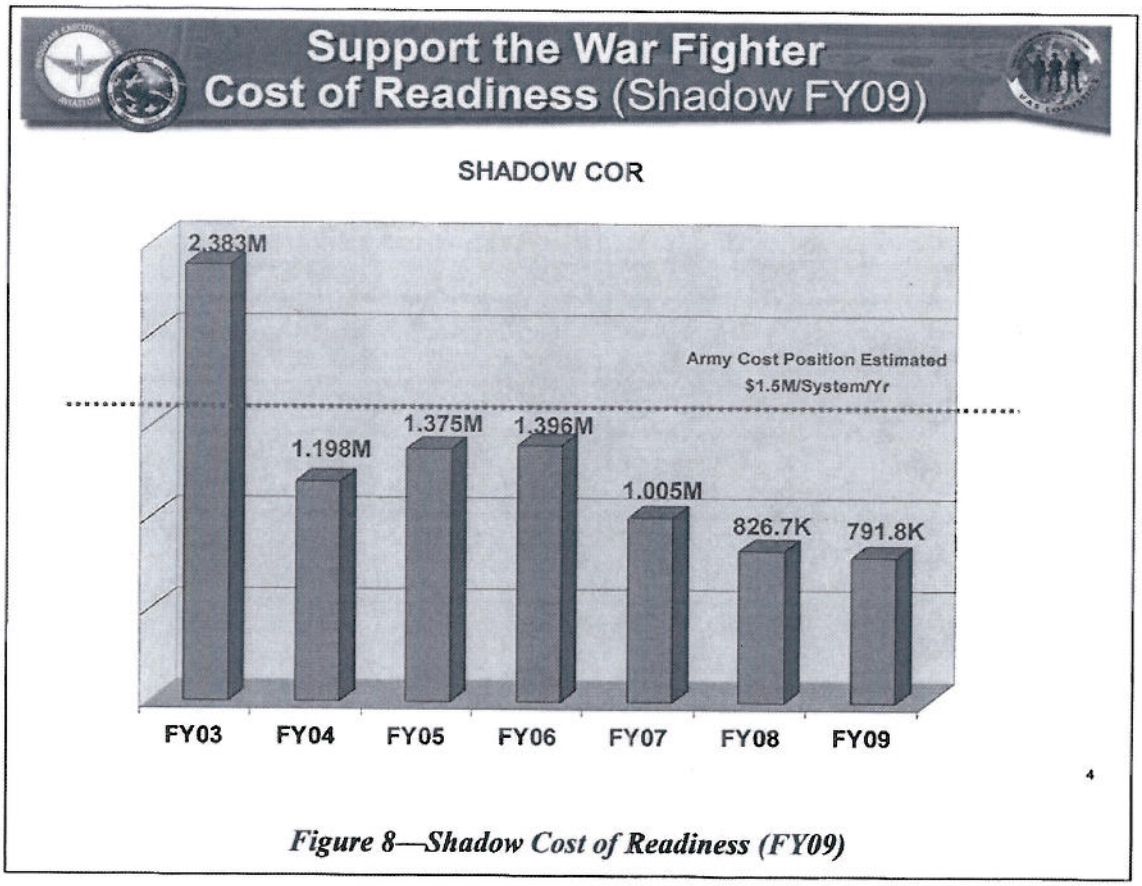

Figure 8—Shadow Cost of Readiness (FY09)

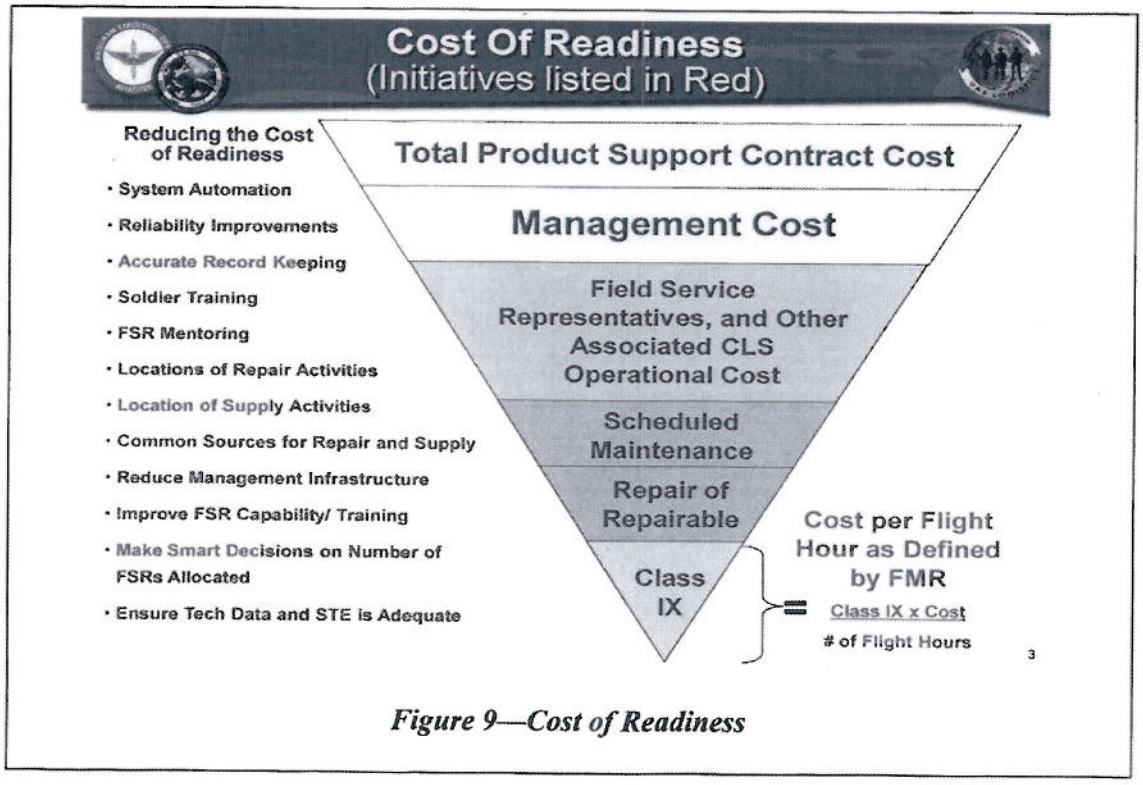

Figure 9—Cost of Readiness

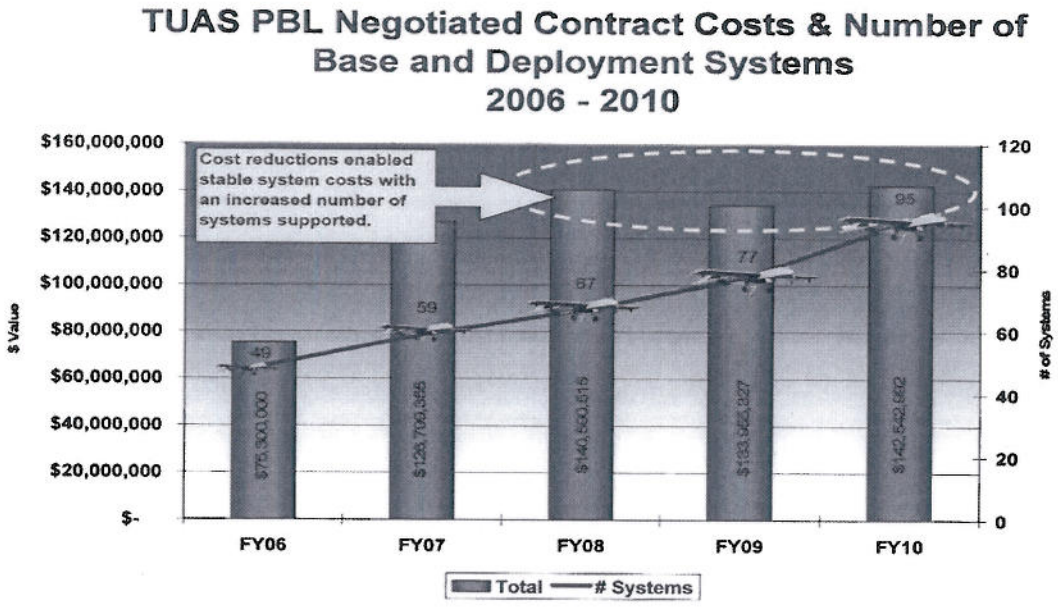

Figure 10—Ownership Cost Reduction: FY06-FY10 Support Trend

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Section 4

Achievements

The Army's Shadow Tactical Unmanned Aircraft System (TUAS) is currently in service with DoD and Foreign Military Sales (FMS) customers worldwide and is the most utilized TUAS in the world today. The Government-Contractor Team responsible for managing and performing the Shadow System-Level PBL contract has achieved exceptionally high readiness, the highest operational availability of any aviation asset in Operation Iraqi Freedom and Operation Enduring Freedom, while simultaneously reducing system costs and improving reliability, maintainability, and supportability. Operational results have been consistently outstanding and have also contributed to reduced sustainment costs with the system achieving an average readiness rate of greater than 97% against a contract objective of 85%! The Shadow PBL Program is also setting the standard for Public-Private Partnering by teaming with both Letterkenny and Tobyhanna Army Depots to perform system reset at a higher volume, in less time and at lower overall cost. Total ownership costs for the Shadow PBL Program have deceased by 30% over the period from FY08 – FY10 with a consistently lower annual costs of readiness. Evidence of the effectiveness of the Shadow PBL Program is reflected in the last three consecutive years in which total contract price remained relatively constant while the number of Shadow systems supported increased by more than 31% and the Program successfully fielded several major modifications that further enhanced performance! Shadow PBL has clearly become a cost-effective force multiplier for the Army and a combat multiplier for the warfighter!