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NMD SYSTEM INNOVATION AND AFFORDABILITY

Mr. Clifford Reeves
Senior Systems Analyst, SAIC
CSF, Suite 750, 1901 N. Moore Street
Arlington, VA 22209 USA
(t) 703-558-2009
(f) 703-247-1060

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Mr. Donald Keith, C.P.L., Fellow, SOLE
Chief Logistics Engineer, SAIC
CSF, Suite 750, 1901 N. Moore Street
Arlington, VA 22209 USA
(t) 703-358-2722
(f) 703-358-2714

DIRECTORATE FOR FREEDOM OF INFORMATION
AND SECURITY REVIEW (OASD-PA)
DEPARTMENT OF DEFENSE

And

Colonel Thomas Humpherys
Ballistic Missile Defense Organization
7100 Defense, Pentagon
Washington DC 203017100

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Abstract

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Clifford E. Reeves, SAIC

Donald Keith, SAIC

Colonel Thomas Humpherys, USAF PhD

Money spent on Weapon systems always has another use alternative. The United States procures weapons system to provide for National Security, from which every citizen benefits. All weapons systems have affordability choices. Weapon system affordability always conjures up an old debate of "cost effectiveness at the margin." Defense, "at the lowest cost, always applies to all DOD acquisition and technology programs. From DoD's perspective, the ballistic missile defense network has to deal with the offensive weapon's major advantage of surprise. The question of how few ABM defensive locations are necessary to defeat the adversary's threat, is an affordability tradeoff issue balanced by engineering and system technology capabilities. These tradeoffs stress the DOD Acquisition Reform initiative's underlying impetus on affordability. NMD Program Management implemented DOD acquisition reform initiatives and strategies to manage for acquisition excellence and program balance during NMD's capability development and deployment planning phase. This includes measurable (affordable) characteristics of key enabling technologies for cost breaking improvements in production, procurement, support, and operations. The DOD Program Manager should have latitude for initiatives in the way the defense capability is built so that it appears as a cost-effective and affordable technology solution to a given threat. There is no affordable solution to developing an ABM defense capability unless technology can develop one.

On a regional basis law enforcement officers enforce laws designed to protect citizens.

OVERVIEW

At the personal level, "Affordability" is usually tied to some sacrifice or choice between alternatives. Money spent on Weapon systems always has another use alternative. Some of these are National health care, better roads, and other tangibles providing selective benefit to a segment of society. The United States procures weapons system to provide for the National Security, which every citizen benefits from.

To some degree, each household and individual has their personal security measures. All have their own affordability choices. The issue is with making the wrong choice, exposing a security lapse, and the logic that the expensive consequences make the affordability issue a non-choice. People who find and use excuses for not having life or health insurance fall into the same situation. We cannot buy it when needed. Military weapon systems are developed and produced because they are needed for protection or to gain an offensive advantage if attacked. More than once US

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weapon has deterred aggression. Yet critics say those weapons never were needed.

TELL ME MORE ABOUT WEAPON SYSTEM AFFORDABILITY

Problem Statement

Without a valid threat, the cost of deploying a United States based Anti-ballistic missile system is probably the easiest and most convenient argument to reject its production and deployment. On the other hand, the investment to warn of a ballistic missile threat, in terms of an intelligence network and a deployed ground- and space-based sensor, is not an affordability issue. Is it not logical and affordable to have a weapon in this equation?

Weapon system affordability always conjures up an old debate of "cost effectiveness at the margin." This debate centers on "How much more does it cost to field an ABM weapon system capable of destroying a less expensive Ballistic Missile and its associated reentry vehicles carrying massive destructive power"? Defense, "at the lowest cost, always applies to all DOD acquisition and technology programs. The parameter missing from the cost effectiveness question is how to evaluate the affordability of a "no damage" alternative.

What does Affordability Really Mean?

The taxpaying public views a \$100,000, rocket destroying a multi-million dollar airplane as a cost-effective weapon. They do not fully appreciate the fact this system may not be affordable if the operations plan is to issue one to every soldier. The military's defensive

affordability alternative is to issue the weapon to a specialized unit operating in a "threatened" area. The consequence of not having the defensive system in place has a full range of potential negative consequences.

Military strategists view large offensive or defensive forces as deterrence or as a solution to a risk. The US had a Safeguard Anti Ballistic Missile (ABM) site and plans for several others when the ABM treaty changed the US's defensive strategy. The dis-establishment of the only authorized ABM site was partially due to the logic of "why spend several billions to have 100 ABM interceptors to defend against 10,000 warheads." The "affordability" logic was to use the ABM defense funds savings to expand the offensive strategic arsenal (to enable more defenses). In reality, developing a bigger and more technologically advanced (extremely costly) mutually assured destruction system may have not been logical. The strategy's defenders argue these systems were affordable because they served dual purposes. At the same time, US technology continued to build a world class strategic arsenal. This fact helps to understand why few people argue against the affordability of past technology and weapon system development costs. Technology delivered affordable and beneficial offensive weapons related to US defense. These weapons were dedicated to the "avoidance of the consequences."

The topic of security embraces examples of such a strategy. Fencing property and door locks was neither practical nor logical in the early 1800's. Consequently, every household had weapons for home security. As time passed, and the threat changed, the need for more passive home security came about. Fortunately, technologists were present to

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make security possible (even then, security was only affordable if it worked). Time has not changed this approach nor need it to any large degree.

Unfortunately, security used only for defensive purposes has a Life Cycle Cost (LCC) higher than for an offensive system. For example, law enforcement officers carry side arms and a variety of other defensive items. Yet, the majority of these public officials rarely need to use them. They continue to train with side arms, however, to become and remain proficient in their use. When it comes to National defense, one of the affordability issues is to quantify the terms "the door lock on the house and side arms and training for police officers."

From DOD's perspective, the ballistic missile defense network has to deal with the offensive weapon's major advantage, surprise. When an ICBM attack starts, the defender needs to know time of launch, target location, quantity of missiles and warheads and their quality, accuracy and precision. To cope with element of surprise, the US's passive defense has the expensive burden of constant readiness to detect missile launch and, hopefully, defend against potential missile reentry vehicles (RV) delivering weapons capable of mass destruction. The question of how few ABM defensive locations are necessary to defeat the adversary's threat, is an affordability tradeoff issue balanced by engineering and system technology capabilities. This question a part of DoD's challenge "to measure National Missile Defense affordability" in the face of changing requirements and the need to refresh technology to keep the system up-to-date. Such conditions are probably the wrong frame of reference to determine affordability.

The missile defense proponents viewpoint: For strategic missile defense, (weapons of mass destruction) there is only one acceptable, logical response to the question of NMD affordability. What are the consequences and cost associated with not having an appropriate defense against a RV with a nuclear or biological weapon landing on a major east or West Coast metropolitan area? Any measure, to prevent impact and avoid damage, could justify the cost of almost all investment in effective defense. Looking at this question from a business sense, we must consider two other alternatives before acquiring a NMD. One is that US missile defense affordability rests upon the premise of denying the marketplace for offensive missiles and associated technology. The second alternative is to find a political solution directed toward changing the objectives of some emerging and developing countries. Specifically those countries willing to divert national resources to achieve the misguided political goal of mass destruction.

The technical viewpoint: Technologists must consider how well they and technology can provide simultaneous innovation and affordability. In a broader context, this question is really the answer. In the future, technology must wear the mantle of change and cost attractiveness. Technology must focus on "needed" solutions where cost is a factor. This requires a shift from the broad paradigm of technology efforts being nothing more than a scientist's hobby shop. At the same time that scientists protect their pure R&D role, "real world" operators must support the researcher's position, since in the end the global community is the true benefactor of scientific achievement. However, some R&D investments in technical innovations that have the potential of a higher return and broad-based benefits may never be realized.

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Present BMDO Technology activities attempt to accomplish technical change and still be affordable, but decreased resources have caused significant reductions in high-risk R&D efforts.

The DoD benefits from the US industrial base, gaining affordability advantages as both a supplier and customer in the US's world technology leadership. Look back a few years to the 1990 DOD edition of "Critical Technologies Plan" published for the Committees on Armed Services of the United States Congress. It is interesting to note that even then, in 20 critical technologies, "affordability" was a "quality" design criterion that:

- Contributed to availability, dependability, reliability
- Enhanced weapon system affordability (lower LCC through producibility, maintainability, etc.)
- Included dual use criteria for R&D and removal of industrial innovation barriers.

Few other nations are as well organized and have as many resources to take on the exploration and possible development of as many different concurrent technologies as does the United States. The question today is that in view of diminishing technology funding, are we (the US) taking on too much. Unfortunately, many observers in the public sector perceive that technology solutions beget more technology requirements. Some times, they confuse pure technology with purposes of other DoD programs such as Advanced Concept Development, Scientific and Technology, Research and Development, and ManTech, not to mention the various technology initiatives ongoing in other agencies. Who is it that defines a cost-effective way to use this technology

breeding ground? Who is the customer? Is the DOD or Commercial market place ready to use the newly developed technology or are is the US taxpayer paying for technology development for other countries to use? Taxpayers are all too familiar with our national technology being exploited by other countries because private sector lacked capital or foresight to make the changes. The result was the US lost market share, jobs, and the competitive technology edge. Examples of this abound. A good one is in the television industry; the US led the world in the basic development and perfection of the technology. Now the rest of the world builds all the products for the US consumer market. Another is in automobile production where the Japanese capitalized on American advances in the quality arena and shook the US automakers to their very core with losses in market share. This translated into tens of thousand of jobs being exported overseas. Repeats of such occurrences are definitely not affordable in the public's eye.

Initiatives and Methodology to Incorporate Affordability

The charter for the National Missile Defense Program Manager is to deliver a System designed to specific critical performance parameters and life cycle cost objectives. The definition below applies to one of his responsibilities which all DOD program managers share.

Affordability is the ongoing assessment of a program to assure that it is being executed within DOD planning and funding guidelines, has sufficient resources identified and approved in the Future Years Defense Program (FYDP) and is managed based on accurate cost and work force data.

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The DOD Acquisition Reform initiative's underlying impetus is on affordability. Virtually all acquisition reform initiatives have affordability emphasis and emphasize terms like "Cost as an Independent Variable" and "Best Value." However, the terms alone only address management considerations and do not include or recognize the trade-off necessary to achieve mission affordability.

NMD Program Management implemented DOD acquisition reform initiatives and strategies to manage for acquisition excellence during NMD's capability development and deployment planning phase. Consequently, innovations for mission and management affordability impacts were established for all phases of system development and for all system functions. Performance, support, manufacturing, continuing system upgrades and technology insertion are all subject to affordability scrutiny.

The oversight is achieved through use of NMD Integrated Product Teams (IPT), in specialty areas like Cost, Technology and Deployment. NMD technology transition, technical requirement tradeoffs and review of impacts on LCC are in place. Affordability innovations include:

- Technology recommendations that identify cost drivers to assure affordability justifies transition to a new technical solution.
- Operations and Support affordability factors that consider the limited quantity of NMD equipment, a fixed-base geographical location, and a need for maximum use of commercial sources for system support. Lessons learned from the Safe-guard era include operational control by military operators and

supplies and services procured from a commercial support system to assure an adequate flow of essential parts and equipment. Sustaining the military planner's requirements for system performance with commercial supplier and vendors is an appropriate, logical way to satisfy affordability objectives. The NMD affordability objective for this phase is to avoid using a service-controlled O&S support infrastructure unless it provides the "best value" to the NMD System.

- Use of a broad supplier base, including a Lead System Integrator contract to obtain and expand on the database of affordability initiatives.
- Considerations of preplanned product improvements and NMD mid-life conversion using technology upgrades as an acceptable means to achieve LCC and CAIV objectives (affordability) and enhance performance. An example of this strategy coupled with a specific technology is in commercial electronic products, since their "next generation" turns over every three to four years. In the DoD, 10 years is probably the norm for a similar turnover. The impact of following DoD's business-as-usual practices is for the DoD to remain almost three generations behind in electronic technology upgrades. The US Navy recognized this and programmed commercial electronic technology replacement every 18 months in its

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development of the new class of submarines to be launched in the next century. This allows DoD to take advantage of private sector research to gain or keep a competitive edge. To accomplish this task, DoD should:

- Maximize use of commercial off-the-shelf equipment where possible.
- Use the "open system" specification strategy to capitalize on commercial suppliers' inherent motivation to make their products more affordable and competitive.
- Manage deployment and supportability requirements from the Operational Suitability (user driven requirements) perspective instead of by individual logistics elements. The objective is to produce a lean and streamlined infrastructure to reduce the Operating Support costs.

The NMD Program developed a systematic affordability approach for several areas not normally discussed in terms of cost or affordability. NMD management considered the programs affordability challenge to reduce costs to LCC objectives. They initiated some of the following tasks:

- Development of nontraditional operational and support concepts
- Motivation of industry to reduce systems integration cost and apply "best value" principles

- Definition of measurable (affordable) characteristics of key enabling technologies for cost breaking improvements in production, procurement, support and operations
- Development of tools and processes for tradeoff and sensitivity analysis to support affordability and maturation of the mission capability
- Development of an affordable set of maturation, transition and demonstration plans for a high leverage of available technology.

Conclusions

1. With some differences of opinion in cost, technology, perceived needs, schedule and architectural approach, the consensus is the "NMD mission" cost is affordable, should a threat to the U.S. emerge.

Rationale: The NMD program's affordability strategy follows current National Security estimates on the probability of a Ballistic Missile delivering an RV that will impact on US territory. Present NMD planning focuses on a low probability of this scenario occurring. Thus, planning is directed toward developing an "affordable" capability to protect the United States from a limited ballistic missile attack. Notwithstanding the need for continuing to improve technology to offset future, mature adversarial capabilities, the national leadership continues to review arbitrary cost estimates.

2. The US should take advantage of the apparent lull projected by our intelligence community. NMD management is presently committed to robust planning for a rapid rollover and maturation of missile defense technology until the design reaches the objective capability.

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Rationale: Obviously, the Government cannot start off with the requirement that every technology it uses must have a "dual use," commercial application or market place when the Government's mission focus is on protecting the Nation. Most, if not all, DoD programs understand this from the outset. On the other hand, looking at the spin-offs that industry found with Strategic Defense Initiative technologies is amazing.¹

3. Affordability will become less of an issue following a deployment decision for the NMD system limited capability or during its' system life cycle.

Rationale: The fact that affordability constraints are less of a consideration during a national crisis does not detract from the requirement that the NMD procurement stay within allocated resources. An actual or high probability threat takes a national priority to field an effective countermeasure, but affordability focus to do so is not a consideration. Affordability is not in the equation when increased costs or surges in deployment expenses satisfy unfunded National defense priorities. Additionally, periodic "technology refreshment" that is relatively easy to implement and adds potential to lower cost, helps counter a new type of or more sophisticated threat. If this happens, the cost effectiveness of change is at the margin. More importantly, it nears parity because adversaries will have to build and field newer, more expensive offensive system to counter the US's increased defensive capability. Thus, the defense becomes "affordable" because in theory it simultaneously deters aggressive actions directed toward the US at the same time as it protects it.

4. Technology must focus on incremental upgrades and new defensive weapons.

Rationale: The charter for a DOD Program Manager should have latitude for initiative in the way the defense capability is built up as a cost-effective and affordable technology solution to a given threat. There is no affordable solution to developing an ABM defense capability unless technology can develop one.

5. Affordability should be measured in terms of "what the nation gets for the money" as well as what the financial, societal and emotional consequences of not having a defensive capability.

Rationale: Using the premise that defense for a threat is not affordable, not having a capability to counter the threat is less affordable. Stated another way, was the attack on Pearl Harbor affordable? Certainly not to the US, then or now. Moreover, in the end, nor was it to the Japanese after US technology shifted the balance of weapon system effectiveness and enhanced the US production capability.

Statement of Data Used to Support Conclusions

Supporting data comes from the current NMD Acquisition Strategy, Single Acquisition Management Plan, the OSD Acquisition Streamlining Internet Bulletin Board and from various sources within the Defense Acquisition Deskbook Version 1.3, December 31, 1996. Other sources are cited in the text.

1. Commercializing SDI Technologies, PRAGER Publishers, 1987.