REPORT
OF THE
DEFENSE SCIENCE BOARD
TASK FORCE
ON
DEFENSE ACQUISITION REFORM
(PHASE III)

A STREAMLINED APPROACH TO WEAPONS SYSTEMS RESEARCH, DEVELOPMENT AND ACQUISITION

THE APPLICATION OF COMMERCIAL PRACTICES

MAY 1996

This report is a product of the Defense Science Board (DSB). The DSB is a Federal Advisory Committee established to provide independent advice to the Secretary of Defense. Statements, opinions, conclusions and recommendations in this report do not necessarily represent the official position of the Department of Defense.

OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301-3140

DEFENSE SCIENCE BOARD

May 6, 1996

Memorandum for: Under Secretary of Defense (Acquisition and Technology)

Subject: Report of the Defense Science Board (DSB) Task Force on Defense Acquisition Reform Phase III)

I am pleased to forward the final report of the DSB Task Force on Defense Acquisition Reform (Phase III), which was chaired by Dr. Bob Hermann. In Phase I, submitted on July 16, 1993, we acknowledged the need to replace the current practices of conducting the acquisition of DoD products and services with world class or best of class commercial practices. In Phase II the Task Force examined specific industry segments for commercialization, identified specific combatant commands for increased responsibility in the requirements process, and further defined the barriers to the adoption of commercial practices within DoD acquisition.

In Phase III the Task Force has concentrated on evaluating the possibility of extending best-of-class practices to the research and development phase of a system's acquisition. The principal effort has been a study by a subgroup led by Mr. Bob Fuhrman, and ably complemented by the contribution of Dr. Jacques Gansler, Mr. Page Hoeper, Mr. Bob Everett, and others. The Task Force concluded that:

The current acquisition process is outmoded, too expensive, too lengthy, and should be replaced; instead, the research and development phase of military systems should adopt best commercial practices;

- The CINCs, OJCS, OSD, and the Services must change the process of determining military needs to include increased user participation, balancing these needs against affordability constraints; and

he DoD acquisition system must provide a continual competitive environment whereby military hardware and software are developed and procured using world-class processes.

In February 1996 we briefed you on the progress of the Task Force. You recommended we consider some specific programs and what might be accomplished by applying the Task Force recommendations to these programs. Task Force members have worked with the offices of the three Service Acquisition Executives (SAEs). Together with the SAEs and program managers, and within the spirit and letter of the new 5000-series regulations, we have jointly developed a list and propose to further study and define a plan to implement Task Force recommendations within the programs that are listed below:

- JAST/Joint Strike Fighter (Air Force SAE)
- EELV
- Arsenal Ship (Navy SAE)
- Comanche (Army SAE)

These programs represent a good cross section of near term efforts within which carefully crafted commercialized projects could be conducted. We will report progress to you before the end of the year. I recommend issuing these programs a special designation for the implementation of the Task Force recommendations. This will provide the basis for instituting a new process for acquiring adequate, affordable defense capabilities in the future. Please review Dr. Hermann's letter, the executive summary, and the recommendations on pages 2 and 3, and forward the report to the Secretary of Defense.

Craig I. Fields
Chairman

OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301-3 140

DEFENSE SCIENCE
BOARD

May 6, 1996

Memorandum for: Craig I. Fields, Chairman, Defense Science Board

Subject: Report of the Defense Science Board (DSB) Task Force on Defense Acquisition Reform (Phase III)

Attached is the final report of the Task Force on Acquisition Reform (Phase III). This study concentrated on the performance of major R&D and Logistics activities for the Department of Defense using the best of commercial and government practices. The result is a thorough analysis of the consequences of our current inadequate practices and a strong set of recommendations for moving to a new approach.

The major credit for leading this effort must go to Bob Fuhrman and Jacques Gansler who led the sub-group on R&D and produced this report with major contributions from Page Hoeper and Bob Everett. I believe they have created an important new approach for creating and supporting military systems from an integrated industrial base. It emphasizes a flexible process for acquiring value for price rather than "required" capability for an intensely monitored cost. The determination of value necessarily requires more participation by the using commands in deciding what to acquire.

I recommend that you forward the report to the Under Secretary of Defense (Acquisition and Technology).

Robert J. Hermann
Chairman

Executive Summary

A Streamlined Approach to Weapon Systems Research, Development & Acquisition

The Application of Commercial Practices

America's warfighters have entered an era of new geo-political and economic realities in which they must identify and react to emerging or new missions under the constraints of a much reduced defense budget. This means that the DoD must develop and acquire weapons systems faster and better at lower cost.

The present DoD process for developing and buying major military systems has serious failings. The process is generally acknowledged to be expensive and lengthy, averaging 16 to 18 years to field a system. Commercial products are often better, more reliable, and less expensive than comparable military-specific products. However, DoD does not have effective access to the best-practices commercial market. Costly and inefficient oversight processes isolate the defense industrial base from the general commercial industrial base. If current practices continue, DoD will be forced to depend on an isolated defense industrial base that has been greatly reduced, both in overall size and in number of competing firms. As a result, there is a risk that the Department will be slow to respond, inefficient, and-most important-less than state-of-the-art.

The Task Force recommends that DoD model systems research, development and acquisition on the American free-market system that has open access to world class suppliers. The approach we propose will (1) improve the decision process on how best to satisfy military needs, (2) lower the barriers to competition that presently preclude the full participation of the commercial industrial base, (3) streamline the actual execution of research and development programs, significantly reducing time to field, and (4) provide improved safeguards for expenditures of public funds.

The Task Force recommends that R&D programs be conducted through a phased approach or model that will give the DoD access to the best resources of the combined industrial base and reduce the average time to field a usable major system to seven to ten years (or less), essentially halving the current cycle time. The new model stands in contrast to the existing system which emphasizes fixed specifications, determined by firm product requirements, at the expense of increased costs and delayed schedules. The recommended model focuses competition among suppliers on meeting user needs. This should lead to increased flexibility in seeking the best combination of time, cost, and performance, as determined by the users. We believe that this focus will result in substantially faster developments and lower costs- with higher performance in fielded military equipment.

Our model calls for maintaining effective competition throughout the acquisition process. Within a mission area, integrated product teams of contractors, users, and

supplier agencies will compete to provide the best solutions within specific schedule and price constraints. We recommend maintaining alternate solutions to mission needs among the supplier agencies as well as among contractors, with continuing participation and evaluation by users. It must be emphasized that we are proposing a broader form of competition than two firms building the same product. Competition could be among different solutions to the same problem (including current system upgrades versus next generation systems). Decisions to buy should not be made until need, performance, costs and schedule are clear.

The Task Force believes that the Government's interests will be well protected through:

- A broader understanding and implementation of effective and continuous competition;
- Carefully structured, relatively short, fixed price/flexible performance contracts;
- A rigorous risk-reduction phase before full system development;
- Including contractor past performance on commercial and military programs and on process maturity as significant factors in source selection;
- The participation of government representatives on the integrated product teams;
- Curtailing efforts early when performance fails or cost objectives are not achieved;
- Buying in quantity only after system demonstration and user buy-off.

These measures will promote public confidence in the acquisition system better than the present method of cost-based contracting and regulatory oversight.

We have found strong evidence that the model we propose will work well. Our approach extends and refines a number of successful initiatives on programs underway at DoD These include the Joint Direct Attack Munition (JDAM), the Tier 2+ and 3- surveillance vehicles, the Naval Ship Solid State Power Units and various Advanced Concept Technology Demonstrations (ACTD). The model is similar in concept to the approach commercial companies use to develop aircraft (e.g. the Boeing 777) and space systems (e.g. Iridium).

We recommend that the Vice Chairman of the Joint Chiefs of Staff (VCJCS) and the Under Secretary of Defense for Acquisition and Technology (USD[A&T]) work together to determine the best approach to satisfying mission needs within available resources. The VCJCS should represent the Military Commanders in Chief (CINCs) as users and be responsible for maintaining up-to-date descriptions of mission needs. The USD(A&T), representing the supplier agencies, should be responsible for maintaining competitive alternatives. The VCJCS/USD(A&T) together will be responsible for continuing evaluation of competitive alternatives. They will jointly make the buy decision when they find that a satisfactory match of value, performance, schedule, and cost exists.

The Task Force recommends that the proposed streamlined approach to weapons systems R&D be implemented on applicable current efforts, including selected ACTDs, and on all new R&D efforts, including major modifications. We further recommend that the Office of the Under Secretary of Defense for Acquisition and Technology establish an organizational mechanism to institutionalize and implement this approach, including necessary revisions of the DoD 5000.1 series and full explanations to the congress.

The approach and recommendations are amplified in the following figures.

Objective

Satisfy mission needs faster and better at lower cost

- Must get the most value from reduced defense acquisition budgets
- Must access all sources of technological excellence
- Must access the best practices of the commercial world

Solution

Model defense R&D on the American economic system

- Rely on market forces and the continuous presence of alternatives
- Commercial practices yield faster time to market, lower prices, and higher performance
- Relying on competitive forces and price-based . contracting (vs. regulations and cost-based contracting) will bring in commercial firms

Changing the Requirements and Solution Process

- The solution must be stated in *mission* performance, time, and resource terms
- The operating CINCs as "users" must be *directly involved* in the solution of their needs
  - Requires strengthened analytic and technical capability
- The VCJCS must have the responsibility and the capability to analyze and prioritize the requirements / solution selection process
- The USD(A&T), representing the suppliers, will team with the VCJCS in the solution selection and execution process

New Weapon System Development Model

Phase 1 Risk Reduction	Phase 2 System Demonstration	Phase 3 Build
Technical Demonstration	*Operational Utility Demonstration*	
Operational Concepts Exploration	*Detailed Affordability Analyses and Simulations*	
Initial Affordability		

Decision I (System Demonstration)

Decision 2 (Build)

<2.5 Years | <4 Years | <3 Years

IOC

*Maximum 9.5 Years (if Phase I required)

*Maximum 7 Years (System Demonstration start to IOC)

An Example Approach to Maintaining a Continuous Competitive Alternative

New System			
Phase 1: "Risk Reduction" Team A Team B Team C	Phase 2: "Sys. Demo." Team A Team C	Phase3: "Build" Team C	Phase 4: "Product Improv." Team C
Going on in Parallel			
Phase 3: Team X(B or D)	Phase 4: Team X(B or D)	Phase 1: Team A (or D)	Phase 2: Team A (or D)
Current System Production	Upgrade of current system	Next-generation system	Next-generation prototype

Summary

- Maintain and evaluate *competitive solutions to mission needs at affordable prices*
  - Provide mission resource constraints
  - Provide continuous visibility into options
  - Broaden understanding of competition
  - Assure credibility of option to terminate a program
- Utilize commercial practices for acquisition
  - Continuous user evaluation of mission satisfaction
  - Reduce risk before committing to weapon system development
  - Short schedule for development and deployment
  - Fixed-price, variable performance, multiphase contracts

Implementation

- Institutionalize decision making based on competitive solutions to mission needs within mission area resource constraints:
  - A "user/supplier" decision group
    - VCJCS as focal point for users (CINCs)
    - USD (A&T) as representative of suppliers (Services)
- Institutionalize execution of the new process:
  - USD (A&T) must assure continuous mission alternative solutions
  - USD (A&T) must define and SAEs must implement the specifics
    - "Fixed price, variable performance" development
    - Risk-reduction, system demonstation, and build
    - Design to affordable production and support prices
    - Source selection on best value, to quality sources

Table of Contents

List of Figures

Summary and Recommendations

A new model approach for conducting Research, Development, Production, and Support of defense systems is proposed to meet the new realities faced by America's warfighters. The model will permit DoD to develop and acquire weapons systems faster, better and at lower cost. This approach is based on coupling the best elements of practices from commercial and defense-unique activities. It is proposed that the model be adopted as the standard means of bringing DoD systems and major modifications into existence in an environment of greatly reduced resources and diffuse, unpredictable threats. A parallel intent is to adjust DoD practices so that traditionally non-defense industrial organizations are encouraged to compete for defense business. This will bring state of the art, efficient, but hitherto unavailable segments of the industrial base into the process of defense systems development. It will permit the DoD to model weapons research, development and acquisition on the American economic system. In addition, it will help offset the shrinkage of the defense-unique industrial base, and open the market to commercially-oriented companies who could participate in the competitions for DoD business.

The phased, competitive model incorporates the following features:

- risk reduction in contracts before development;
- descriptions of requirements in terms of military mission needs (specifying what to do instead of how to do it);
- specifying affordable prices;
- a multi-phase, multi-team competitive development process with downselects at specific stages;
- carefully structured fixed-price, flexible capability contracts;
- flexible approaches to generating "best value" to the military based on combinations of performance, producibility, schedule, and the price of manufacture/logistics and support;
- always maintaining viable alternatives;
- deletion of the requirement for cost and pricing data;
- evaluation and decision making done in parallel with systems development;
- participation of the military users as active team members seeking the best overall value to meet their mission need.

In selecting sources to compete, heavy emphasis will be placed on past performance and contractor process maturity. In this way, contractors who have excellent records in supporting customers and programs will be the preferred participants in future competitions.

The model will reduce the average time for bringing affordable, fieldable defense systems into existence to 7-10 years (or less), efficiently produced, even in limited quantities. Current DoD procedures typically produce timespans of 16-18 years. This

reduced time frame adds credibility to the major feature of continuous competitive alternatives.

The early product of the approach in a given application will be the development of a fieldable, affordable, logistically supportable system referred to as an Advanced Concept Technology and Affordability Demonstration (ACTAD). The system will be producible in limited numbers. It will be immediately usable by the military and will meet the mission need. System state of development will be such that it could then be placed into full scale production, if desired.

The model builds upon several features from existing DoD Acquisition Reform initiatives, as well as drawing heavily on the Advanced Concept Technology Demonstration (ACTD) program. However, the new model goes further. It is intended to be the standard method of acquiring defense goods in the future. Thus the model treats the developed systems as being destined for full use by the military in the field, including the mechanisms and costs of supporting them there.

The model is further proposed for use in acquiring spares using the same process of continuous mission-need-based and technology competitions. This will facilitate control of spares costs and permit ongoing force modernization on a component basis.

Acceptance and use of the model will require education and training within the DoD and the defense industrial base. Congress, too, may need some explanation and understanding to become familiar with it. However, it is expected that the commercial industrial base will readily recognize that its normal manner of conducting business can be applied to the new approach and participate accordingly.

Recommendations

1) Solution Selection:

The Deputy Secretary of Defense (DepSecDef) should direct that the Vice Chairman of the Joint Chiefs of Staff (VCJCS) and the Under Secretary of Defense for Acquisition and Technology, USD(A&T) work together to determine the best approach to satisfying mission needs, continuously evaluate competitive alternatives and jointly make the buy decision when a satisfactory combination of value, performance, schedule and price exists. The VCJCS Will represent the military Commanders in Chief (CINCs) as the users and the USD(A&T) will represent the supplier agencies (Services).

2) Implementation:

The USD (A&T) should:

- Utilize the model for any applicable current efforts, including selected ACTDs and all new R&D efforts including major modifications.
- Establish an organizational mechanism to institutionalize and implement this approach, including necessary revision of the dOd 5000.1 series.

Introduction

The current defense environment is such that acquisition budgets are low and likely to remain so, weapons system costs are high and rising, the traditional defense industrial base is steadily shrinking in both size and number of participants and military threats around the world are unpredictable and varied. Nevertheless, there are still compelling reasons to invest in force modernization and in affordable defense systems featuring technological superiority. In order to make this possible, more efficient use must be made of acquisition resources. A new weapons research and development process is required, able to supply effective hardware in small quantities, producible and supportable at affordable cost, with reduced cycle times. As an integral feature of the new process use must be made of world-class commercial suppliers. The advanced technology and efficiencies typical of commercial operations must be incorporated into the development process. In changing to and implementing the new system, the public trust must be retained throughout. Figures 1 and 2 illustrate this background to the DoD acquisition reform effort.

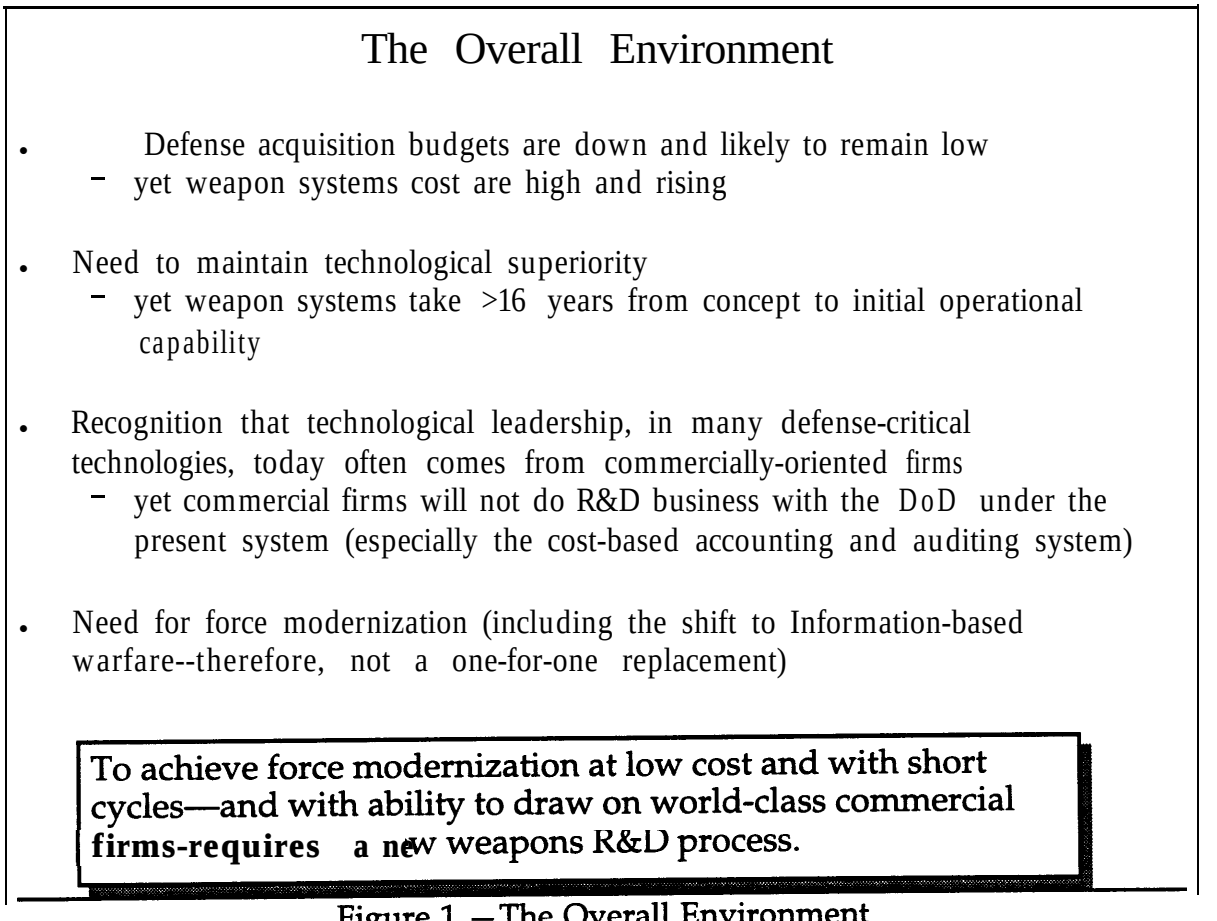


Figure 1 – The Overall Environment

The New Weapons R&D Process Must Assure:

- Low price production and support of future weapons
- Low price/low risk development
- High risk (breakthrough) technology aggressively pursued--prior to weapon system R&D
- Short cycle times for development and deployment
- Attraction of dOd R&D business to world-class commercial suppliers (to be done within an integrated operation)
- Access (as required) to critical, advanced technologies and products
- Public trust--*without* cost-based contracting and excessive government oversight

Figure 2– New Weapons Process Assurances

The Acquisition Reform Task Force was directed to proceed as follows: using the results of the Task Force on Acquisition Reform, Phase I and Phase II (see references 1 and 2), other departmental initiatives, and other work (see reference 3) as a baseline, address the conduct of large-scale R&D programs in an environment of commercial practices. A subgroup was formed to expedite this task, see Appendix A.

The subgroup adopted as its basic precept that the over-arching need in Acquisition Reform is to tackle the central issue of how to acquire defense goods and services using a more commercial approach. This approach should permit more effective use of shrinking resources while retaining the public trust by maintaining some form of effective competition. A parallel aim would be to broaden the industrial base available for defense system development to include commercial organizations not normally involved in defense work. That would require the removal/modification of those elements of Government contracting which have traditionally been an obstacle to the participation of such firms. Thus, considerations of cost allowability and detailed auditing would be removed as issues by removing all requirements on cost and pricing data. This is the first step towards a more commercial style of business. As a further step, contract requirements would be flexible enough to permit and encourage the generation of "best overall value" (military utility) within well-defined price and time constraints. This would mean the abandonment of the traditional DoD procedures where rigid solutions to performance/cost requirements are defined in the

contract. Requirements would specify what to do, not how to do it. Finally, consideration must be given to protecting the data rights of commercial organizations where dual-use military/commercial products are involved.

A basic intent would be to introduce procedures under which R&D funds are used in a commercial style to remove/reduce performance and cost risk in new weapons systems. At the same time it will be necessary to maintain the confidence of the public in the process. This will be accomplished through the use of a multi-phase development progression featuring ongoing competition among contractor/military teams with downselects based on generated "best value" (see appendix G). Downselection decision-making would proceed in parallel with the development process. The phases would systematically reduce different aspects of risk. Development could be accomplished by means of integrated product teams composed of contractors, sponsors and users (see Appendix L). The approach will be facilitated by the use of flexible requirements (mission, not product based) under which competing teams could have markedly different solutions to satisfying a military need.

During each phase, and as part of the thrust for a commercial approach, the competing teams would be encouraged to develop the system by selecting the "best of breed" from available worldwide commercial and defense products and processes. This is another way in which a commercial style approach will be encouraged. It is expected that this will lead to the optimum use of existing and/or readily modified products and processes, thus causing the processes of selection and integration to be major elements of team activity.

A feature of the envisioned R&D contracts would be well-defined limitations on resources (price and time) coupled with flexible requirements (see Appendix I). This is very similar to the approach used in commercial industry. There, companies compete against others to bring to market products at prices that consumers are willing to pay and which provide them with desired value. Sometimes this value is quite subjective, as in the case of goods for consumption. The value might be expressed in product features, price, timeliness to market, or a combination of all these. Sometimes the ultimate result is a product which "self evidently" embodies the best value, but on grounds which are unquantifiable. Companies often enlist the aid of consumers as a means of judging when the necessary value has been attained.

Following this philosophy, the competing teams would strive to generate the best overall value as defined by their ability to satisfy the military need. A central feature would be the active participation of "consumers," the military users, as active participants on the teams. The search for value described above may involve many compromises and tradeoffs between what is desired and what is possible with limited resources. It is critical that the ultimate users employ their skills and judgment of value as active participants in the entire development process. At pre-defined decision points downselects would be made based on the values produced. It is also

important to recognize that there may be instances where the team will decide to change direction radically (but that must be done within allocated resources) or even to abandon the attempt, if it becomes clear that the approach is infeasible or unaffordable.

The team (user, contractor, government program manager) must collectively make the assessments throughout development. The team should have budget control and be able to provide government insight into program price and performance (not detailed government auditing).

The drive for competition will be maintained throughout the entire multi-phase / downselect process. Even when this process produces a single survivor, competition will be maintained by having alternate potential courses such as: continue using an existing system, upgrade an existing system, acquire a foreign system, or begin development of a next-generation system utilizing more advanced technology.

The key to this new model is its use of commercial style procedures, viz,

- Expanding the government's concept of competition to match the commercial approach of maintaining a continuous alternative to do the job (vice, simply two firms competing on the identical product).
- Choosing between explicit best value alternative combinations of price and performance which are expressed as the ability to meet the mission need (not multiple suppliers bidding to develop a specific weapon).
- Basing decision-making on informed judgement, rather than focused on procedure.

The initial aim of the multi-phase process would be fielding of a limited number of systems, referred to as ACTADs. These would go beyond the more familiar ACTD approach by introducing the element of overall affordability into the process. Affordability would be assessed based on the estimated costs of development, manufacture, deployment, supportability, logistics and all other elements which could affect the ability to field and support the weapon system. Thus, the ACTAD could be viewed as an affordable, fieldable prototype to be produced in very limited quantities. Several of the ongoing ACTD programs could be expanded to fit into the new model.

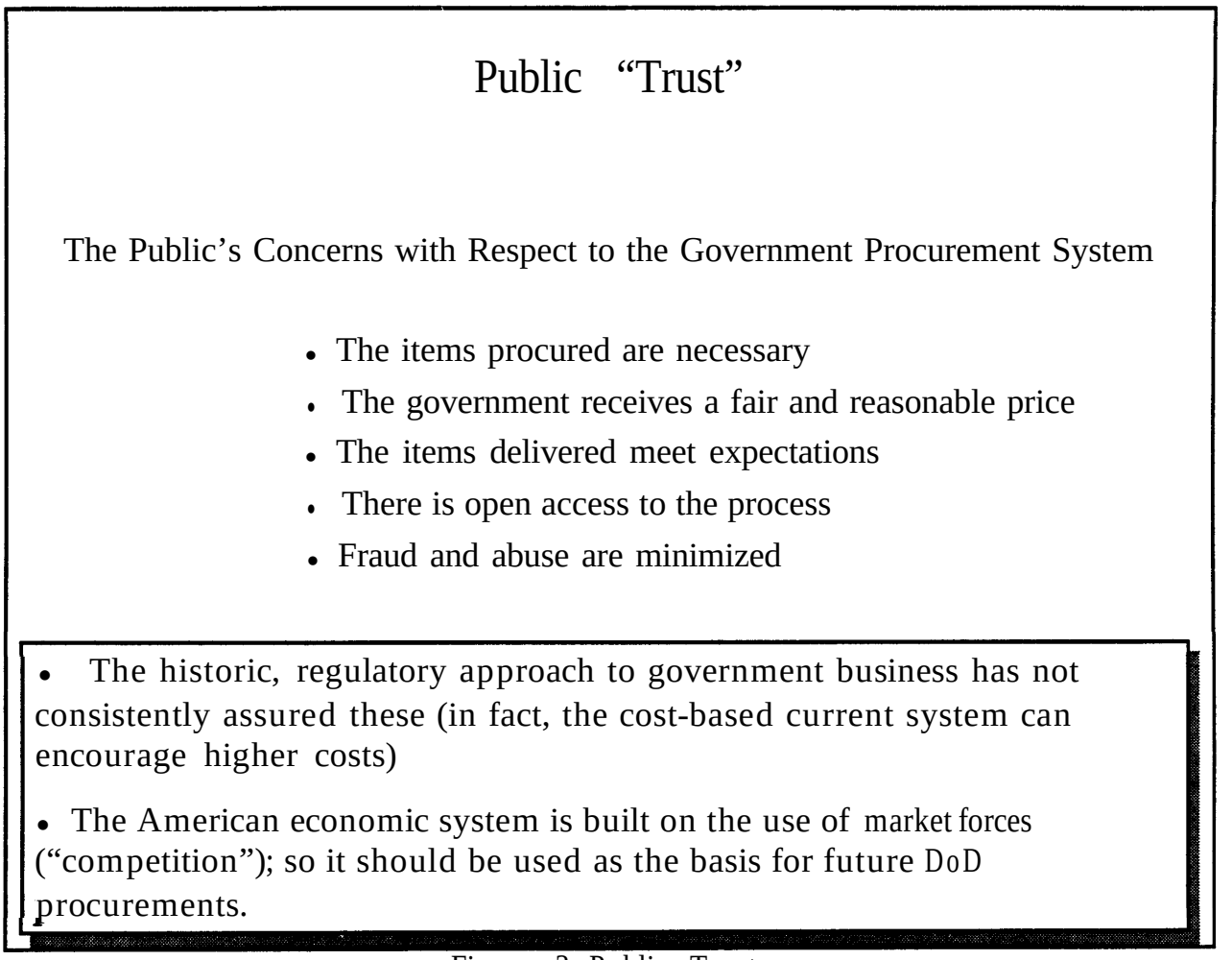


Figure 3--Public Trust

It is believed that this approach will be broadly applicable to everything from subsystems up to complete large weapons systems as well as major modifications. The output of the process will be some number of fieldable prototypes, ranging from a few articles for a new subsystem up to perhaps one or two new aircraft. Public trust will be maintained throughout by having the model reflect the American economic system, built on market forces. There will be no need for special government cost accounting, auditing, and regulations, Figure 3.

It is intended that the use of this multi-phase approach could reduce the time for development and first fielded production for a new weapon system from 16-18 years (see reference 1) to 7-10 years (or less). This would be accomplished by the flexibility of the development process, the removal of requirements for cost and pricing data, the involvement of efficient world class commercial suppliers, the use of existing products and processes (commercial and/or defense) and the ability to make decisions at each phase based on the overall value obtainable, rather than whether narrow, rigid

requirements had been met. This time reduction alone is a strong reason to pursue the approach. Given that military superiority rests upon deployed technological superiority and that potential adversaries will also be pursuing developments, the ability to field advanced weapons earlier will bring substantial advantages for U.S. and Allied forces.

Other issues addressed by the subgroup and described in the appendices, are:

- Acquisition Simulations
- Value assessments
- Source selection
- Fixed price, flexible performance development
- Test and evaluation implications
- Price, Cost, and Contract Implications
- Managing with Integrated Product Teams

In its deliberations, the subgroup held meetings devoted to information gathering and group discussions. During this process the members received a substantial number of presentations from experts in Government, the military and industry. In addition, some of the preliminary results were discussed in information exchanges within the DoD see Appendix C. Group representatives also interfaced with the Acquisition Reform Task Force and with ongoing Defense Science Board Summer Studies and other work (see reference 3) examining other aspects of acquisition reform. Particular attention was given to the practical implementation of the recommendations.

The next section will describe the multi-phase, risk reduction approach of the Commercial-Style Research and Development model.

The Commercial-Style Research and Development Model

This section describes the Commercial-Style Research and Development model proposed as the standard approach for acquisition of new and/or modified defense systems and subsystems. The model provides a comprehensive means of using the streamlined policies and procedures familiar to commercial organizations combined with a defense-unique contracting structure. This permits defense R&D to be carried out with reduced risk and time. It refocuses the process of development flexibly to generate, recognize, and reward "best value" as represented by a desirable combination of product performance, product price, time, and cost to field and support new defense systems.

The model addresses the following issues:

1. Incrementally removing/reducing the technological and cost risks associated with system/ subsystem development.
2. Removal of requirements for cost and pricing data and extensive Government oversight.
3. Maintaining a continuous competitive alternative through multi-phase contractor/user Integrated Team efforts.
4. Accomplishing "best value" assessments as the basis for downselecting amongst the teams.
5. Source selection implications.
6. Logistics and support (including spares) of the fielded products of the new R&D model.

Incremental Development (New Model)

Phase l-" Risk reduction phase"--*if required*

- General statement of mission need
- Addresses next-generation technology applied to a weapon system
- Focus is on the high-risk subsystems
- Explores broad operational concept alternatives (via simulation)
- Initial affordability addressed (cost targets established)
- For government initiated efforts, competitively run (when appropriate, maintain at least two alternatives, i.e., a "competition of ideas")
- For unsolicited ideas, sole-source-acceptable (no commitment to buy)
- Fixed price, "flexible performance" contracting (often done as "other transactions"--no FAR or CAS)
- Initial budgeting from reprogramming (but may later need significant dollars)

Figure 4 --Incremental Development, Phase 1

The proposed sequence of events leading to a new or modified system is as follows. A real military need is identified and is described by means of a very general mission need statement (what is to be done). In the new approach, at least two teams are selected to compete under Government funding, determining solutions to the need. First, a determination will be made if a risk reduction phase is necessary. If so, then during this phase 1, see Figure 4, the aim will be to make use of already-developed next-generation technology and concentrate on evaluations of existing subsystems as the building blocks for the concepts selected to meet the need. The intent would be to remove performance and cost risks at the subsystem level while exploring broad operational concepts through simulations. It is anticipated that the processes of technology and subsystem selection, modeling and initial integration will be major features of this phase. At the end of phase 1, a downselect decision may be made among the competing teams. However; here as in all phases, downselection decision making will proceed in parallel with the development work. Phase 1 also represents an opportunity for a team to present an unsolicited sole-source concept for consideration.

Incremental Development (New Model)

Phase 2- "System demonstration phase"

- Weapon system "requirements" stated in mission-need terms, affordable prices, and timeliness needs (all stated with sufficient flexibility)
- A schedule-driven effort
- Utilize previously-demonstrated technology; risk is primarily systems integration-- assume there will be future product improvements (as newer technology is demonstrated)
- Assure transparency to future technology evolution, through: open systems and architectures; form, fit, and function interchangeability; etc.
- Competitively run (two options desired-- at least through weapon's design)
- Operational utility demonstrated (with fieldable prototypes and extensive simulations)
- Detailed system affordability analyzed (production and support)
- Fixed price, "flexible performance" contract (no commitment for production-- milestone monitoring with ability to terminate)
- Initial budgets may come from reprogramming (but still need significant funds, e.g., Tier II+)

Figure 5 – Incremental Development, Phase 2

Phase 2 of the model, see Figure 5, will emphasize system demonstration in terms of performance, cost, producibility, and military value. Requirements here will be stated as before in terms of mission need. However firm requirements will be imposed in terms of prices and schedules. The systems proposed could be new designs, existing designs, modified existing designs, integrations of existing subsystems into new designs, or other means of satisfying the military need. The winning systems will be affordable prototypes, fielded and supported in the hands of the users. They will be fully usable. Ideally, the designs should feature transparency to technological advances so that these can be readily incorporated in future upgrades. This will be a schedule-driven phase. It is the key to the timely fielding of fully-usable systems in the hands of the military. These systems could be called fielded prototypes or ACTADs. At the completion of this phase, the military will possess fully capable, affordable, supportable initial designs ready for field use. Phase 2 could be entered without passing through phase 1, if performance and cost are judged acceptable in systems already available and which could meet the need.

Incremental Development (New Model)

Phase 3--"Build phase"

- After: (1) reevaluation of military requirement; (2) user validation of operational utility demonstration; and (3) detailed affordability analyses (production and support)
- Single award, to a performance specification (after "effective" competition evaluation of Phase 2 sources--and any other potential alternatives)
- Fixed-price contract, payments based on milestone achievements--with incentive awards based on weapon system performance and delivery schedule
- Contractor maintenance-intermediate and/or depot level (with warranty)
- On reorders, or major changes, evaluate "value" (based on effective competition-- with open access of alternatives)
- On reorders, or major changes, create incentives for industry to lower prices
- Assure that there is an "effective" alternative (in the event of termination)

Figure 6 - Incremental Development, Phase 3

Phase 3, see Figure 6, will see the system built by a single contractor, and deployed in limited numbers. This phase will also supply all support and logistics services. The intent will be to have as much support as possible supplied by the contractor, much of it under warranty. The fixed price contract will be awarded based on a performance specification. An incentive structure will be used based on performance and deliveries.

Incremental Development (New Model)

Phase 4 -- "Product improvement phase"

- Assumed as a critical part of the plan for all products
- Plan for, and implement, backward and forward transparency to new technology
- Some form of credible competition must be present (i.e., a viable alternative)
- Incentives must be provided to weapon system contractor to make price-reducing, quality-and-performance-enhancing changes (always evaluating the benefits and costs of the change against the current system and any other available options)
- Prime contractor (through warranties and other means) must be encouraged to compete spares suppliers *if* their prices increase or their quality declines
- May (or may not) involve retrofits
- Plan to be done industrially

Figure 7--Incremental Development, Phase 4

Phase 4, see Figure 7, will capitalize upon designed-in system flexibility and transparency to new technology such that upgrades may be readily incorporated, where desirable. This product improvement capability will be treated from the outset as a critical element of overall value. The development will be expected to include planning to maintain some form of credible competition if and when phase 4 is reached.

Multi-Phase Risk Reduction Process
Path to Limited Production of New, Fieldable Systems

Phase	Characteristic	Activities	Output
1	Risk Reduction for subsequent system development	Explore operational concepts. Address high risk technologies. "Best-of-breed" selections. Integration of components, subsystems. Address initial affordability.	System concepts embodying value to meet military need at affordable cost. Initial designs. Candidates for downselection.
2*	System demonstration of performance, cost, producibility, value (e.g. ACTADs)	Demonstrate military utility via fieldable prototypes. Address detailed affordability (production, support, logistics).	Producible, affordable early designs, demonstrated cost, performance, supportability. Candidates for downselection.
3*	Build	Produce and deploy all-up system. Supply all supportability/logistics services (could be in limited quantities).	Military capability meeting need. Ability to enter large scale production if necessary.
4	Product improvement	Upgrade to latest proven technologies (system, subsystems). Control costs, times.	Replenishment, force modernization on basis of spares, control of spares costs. Retain military advantage.

*** Major Commitment /Decision Points**

Figure 8 -- Multi-Phase Risk Reduction Process

The four phases are summarized in Figure 8 above.

The current ACTD program is a preliminary example of Phase 2. ACTDs involve users early and continuously. They use short-time scales. ACTD establish affordability at the beginning of development and assess value on an ongoing basis. However, ACTDs are typically viewed as experiments and do not contemplate support and logistics costs. Unlike the current model they are not considered key elements of the acquisition process. Several ongoing ACTD programs could be expanded to fit the new model.

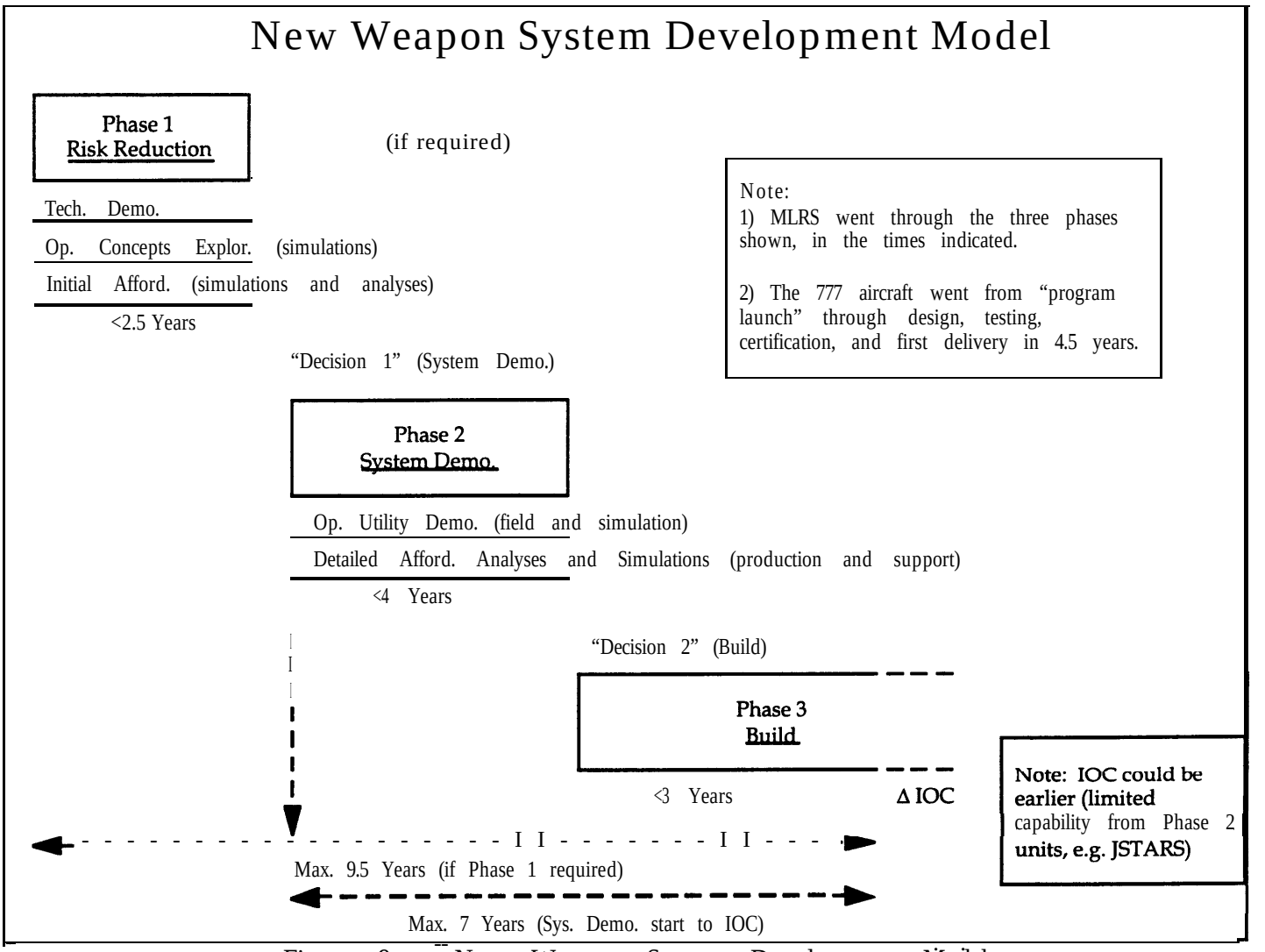


Figure 9 -- New Weapon System Development Model

Another view of the new process is shown in Figure 9. Here the influence on development time is indicated. Data are shown from systems which have been developed under a similar structure, one military and one commercial. The chart indicates that Initial Operational Capability (IOC) could be declared at the end of phase 2, i.e. after about 7 years (with limited quantities).

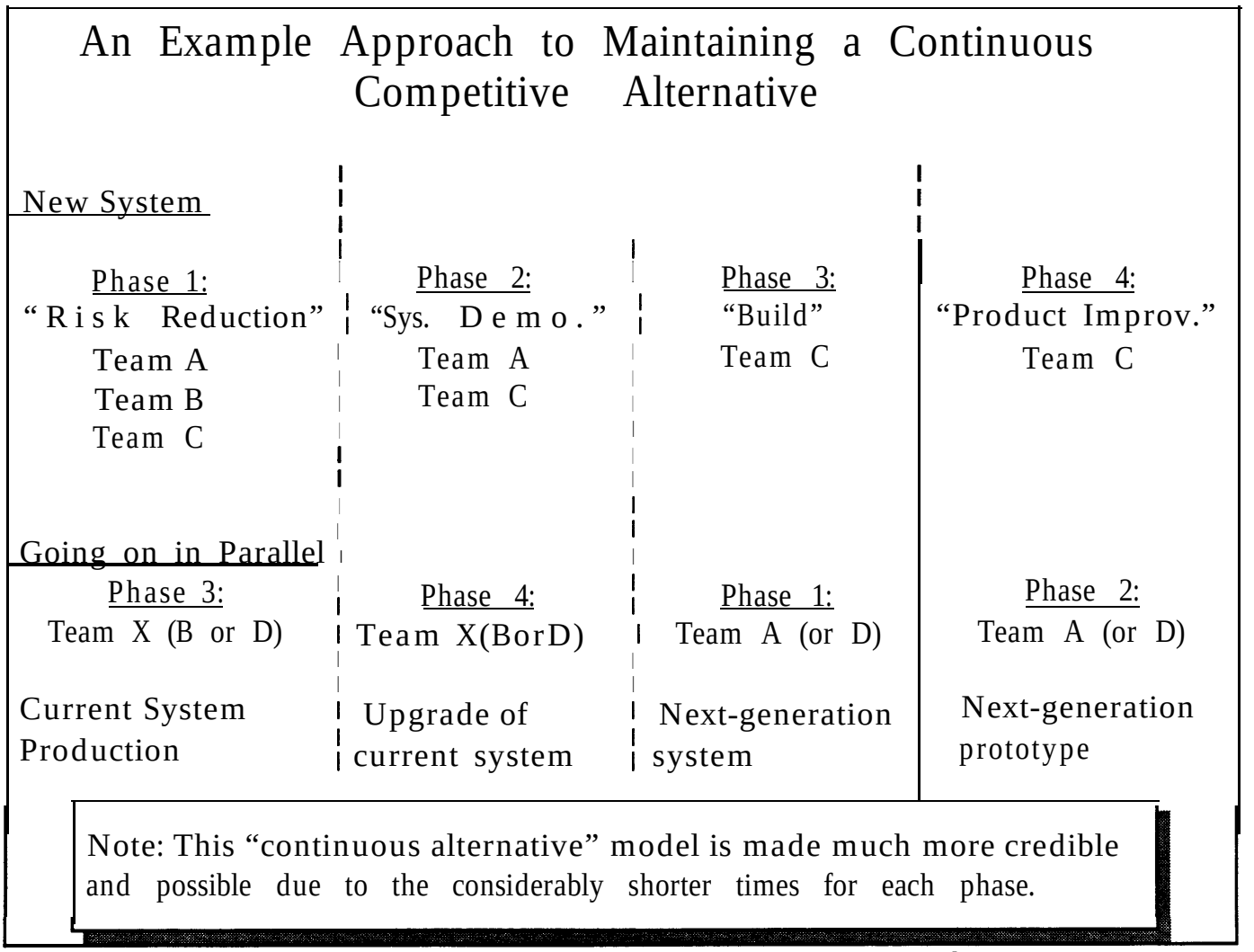


Figure 10 -- Maintaining a Continuous Competitive Alternative

Maintaining a continuous competitive alternative is a central feature in retaining the public trust. This alternative could take several forms. The basic multi-team approach may be complemented by other work going on in parallel which supplies a real alternative, even when a single survivor is continuing development. This is shown in Figure 10. It will be seen that competition from a current system (domestic or foreign) or an upgrade can be invoked at each stage as an alternative to the main line of work. This continuing alternative is an important element of the model and ensures that at no stage will any team have an open field to the business. The competing teams may be active in both the main and parallel lines of activity. The continuous competition alternative is summarized in Figure 11.

Maintaining a Continuous "Competitive Alternative"

Competitive procedures can be based on any of the following:

- Different firms (including commercial and foreign firms) on similar (or identical) products
- Alternative ways to do the same job
  - Among different products (e.g., an upgraded old system vs. a new design)
  - Different technological approaches
  - Different weapons to do a similar mission (e.g., a bomber vs. a ballistic or cruise missile)
- In all cases (from "requirements" through "test and evaluation" of the of new or modified systems) the value of the current system must be explicitly compared to the *value* of the proposed alternative

Figure 11 -- Maintaining a Continuous "Competitive Alternative"

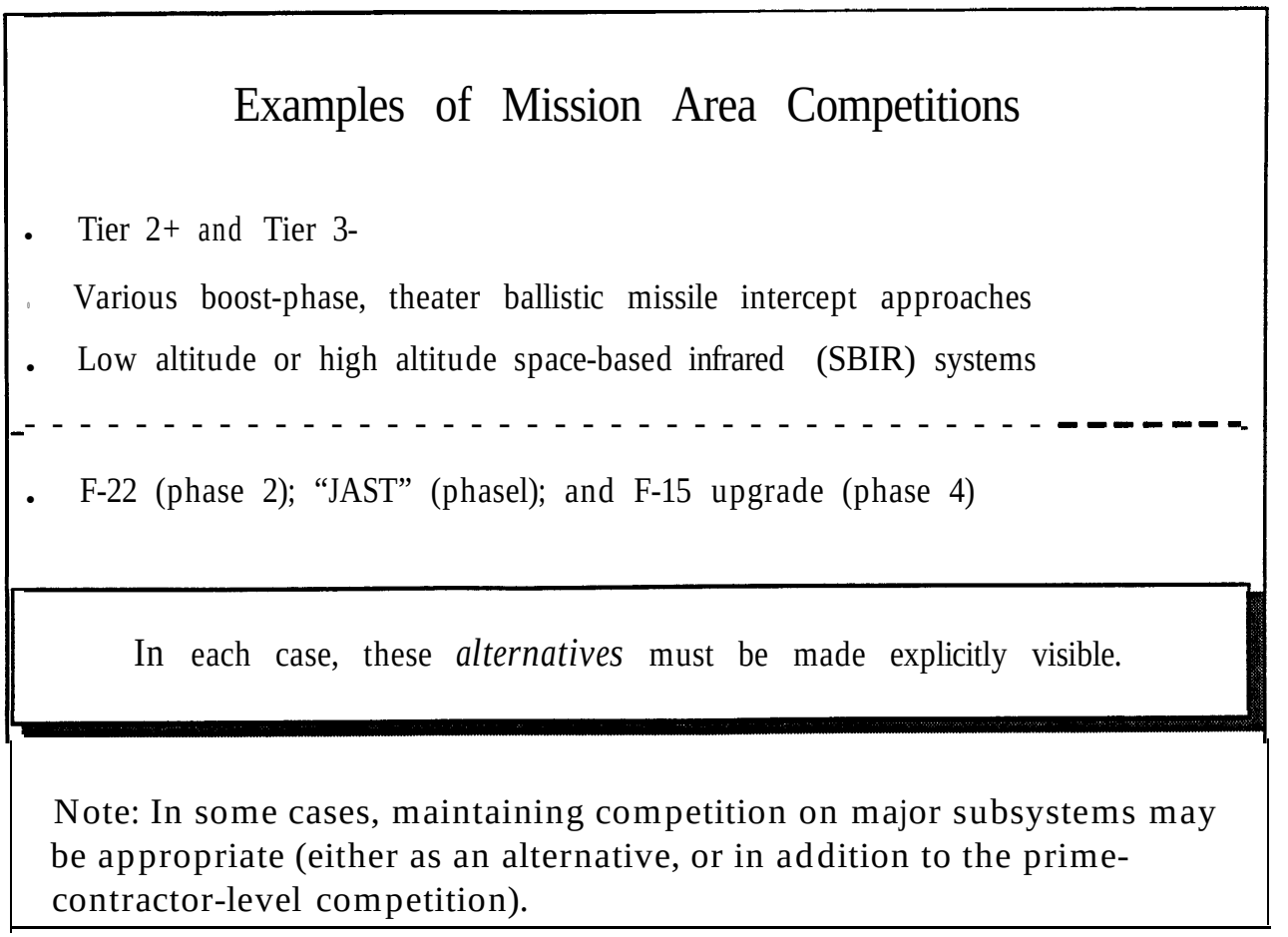


Figure 12 -Examples of Mission Area Competitions

Examples of mission area competitions are illustrated in Figure 12. Conceptually, for example, the competition to satisfy an air superiority mission could lie between a modified existing aircraft (F15), an accelerated new development (F22), and an accelerated new initiative (Joint Advanced Strike Technology [JAST]) Each is a possible alternative.

Ways to Establish that Government is Getting a "Fair and Reasonable" Price for a Quality Product:

- Audit costs and quality
- Competition for identical product

- Competition for broadly similar products
- Comparison of market prices for broadly similar products
- Parametric price data for broadly similar products
- Confidential visibility into contractor's basis for prices bid (to establish credibility)
- Independent estimate of required costs to do the job (based on history, comparability, etc.)
- Tracking of design-to-price activities of contractor
- Comparison of price bid to alternate ways to do the job

Under the Truth in Negotiation Act (TINA), Items below the line can support a waiver of cost or pricing data requirements--but the procurement system is not set up to enable this.

Figure 13 -- Establishing a "Fair and Reasonable" Price

Currently, the contracting officer establishes fair and reasonable pricing through competition for the same or similar products or through extensive auditing of the contractors cost or pricing data. The October 1, 1995 revision to the FAR states that, as a matter of policy, the contracting officer shall not require submission of cost or pricing data where price reasonableness can be determined through adequate price competition, established market prices for commercial items, or *where the price can be determined to be reasonable without submission of cost* or *pricing data.* Figure 13 summarizes administrative options available for determining price reasonableness.

Please see Appendix K for a more thorough discussion of issues related to pricing, TINA, cost accounting standards, cost principles and contract changes.

The New Model and the DoD Requirements Process

The new model contemplates flexible solution (product) requirements anchored firmly in mission needs and satisfied within resource and time constraints. This means that changes will be necessary, not only in the ways requirements are expressed in the weapon development process, but also in the way the users participate in the identification and solution of needs.

The Weapon Development Process

Requirements will be anchored in mission needs and solution affordability. Solution specification will be expressed flexibly at all phases of development. This flexibility is a central feature of the new model and takes different forms depending on the stage of development.

For Phase 1, the risk reduction stage, a general statement of mission need and resource constraints is envisaged, e.g., for the JAST program, "demonstrate next-generation technologies that will assure a superior strike capability at affordable prices well into the 21st century."

For Phase 2, the system demonstration stage, a weapon need "requirement" stated in flexible (draft) mission need terms and "ball-park" resource constraints will be appropriate, e.g., for Tier III-, "an operationally-useful and supportable remotely-piloted vehicle, capable of adequate payloads and survivable endurance, for $10M each in relatively small quantities."

For Phase 3, the "build" stage, it will be necessary to confirm that the mission need still exists, that the operational utility has been demonstrated and that the system can be produced and supported in the quantities required, at affordable prices.

User Participation

At present, the selection of solutions to meet mission needs is dominated by the Services, the USD(A&T) and the Office of Secretary of Defense Staff. The ultimate users, the military CINCs participate but only late in the process and with limited intensity. We propose that the operating CINCs, working through the Vice Chairman of the Joint Chiefs of Staff (VCJCS), be given responsibility to participate in solution selection for short, medium and long-term mission needs. We propose further that the CINCs be provided strengthened analytic and technical means to address future mission needs and potential solution capabilities.

Adoption of these proposals will provide the CINCs an effective means for defining mission needs and then helping to assure that they are met. In addition, the VCJCS must have the capability to monitor, analyze and prioritize those needs and, with the

USD(A&T) providing feasible and affordable alternative solutions, help to promote wide competition to meet the prioritized needs. This joint effort between the VCJCS and the USD(A&T) would be the primary agent of change implementing the new approach.

We believe this would be a very effective and desirable way to obtain new systems and upgrades. The active involvement of the ultimate weapons users (the CINCs) working through the VCJCS, with the USD (A&T) representing the suppliers (Services) would ensure that mission needs are correctly identified, met at affordable prices while maintaining alternatives (competition); and all users have a major role in the final outcome.

Logistics, Spares and Data Rights

These interrelated topics must be addressed in terms of the new model and approach. They must be taken into account right from the start in planning and practice.

Logistics

The competing teams must design for supportability/minimum life-cycle-prices/high readiness. During Phase 2, detailed supportability and support cost planning and analyses must be performed as part of system demonstrations. In addition, the teams must plan for warranties, contractor support and contractor configuration management during design. Interfaces must utilize "form-fit-function" specifications for subsystems to assure future competition and demonstrate integration prior to insertion. For defense-unique items, the prime contractor must motivate lower-tier suppliers to improve the product continuously and lower the prices. The commercial-style approach must be used for major (block) upgrades and modifications. The Task Force recommends that an organization be given responsibility to implement the approach.

Spares

The model may be used to substantial effect in the procurement of spare parts, especially where the parts are being modified to incorporate technological advances. As part of the generation of best value, system designs should feature transparency to future technology and permit seamless incorporation of upgrades. Thus, by employing the model elements of competition, inclusion of advanced, available technology, plus price and schedule discipline, spares procurement could be made to bring the following advantages:

1. A means of providing continual upgrades to the latest technology, with accompanying military advantages. Upgrades could be done on the basis of complete systems or subsystems.
2. Control of prices for spares/upgrades.
3. Timely incorporation of upgrades.
4. Optimization of technical/military advantage.

In short, use of the model for spares procurement could be a path to continuing force modernization on a timely affordable basis.

Data Rights

Spare parts and/or competitive reprocurement should no longer be major issues with the new model-utilizing warranties and maintaining continuous improvement. The Federal Acquisition Streamlining Act of 1994 provides relief for "commercial items" and could help if the rules intended for prime contractors are not flowed down to

lower tiers. A new rule for products that have received contractor funding went into effect on September 1, 1995. The major remaining issue is for defense-unique products (with embedded dual-use technology) that have been government funded. Here:

- The contractor and its subcontractors should retain the rights to all technical data and software (the government retaining limited rights).
- The contractor should be responsible for the maintenance of contract drawings and be the data repository.
- The contractor and the government should negotiate, during Phase 2, a spare parts plan that will ensure the parts can be obtained at reasonable prices for the life of the program.
- The contractor and its subcontractors should agree to provide a complete technical data package with full rights if the product or firm is withdrawn from the market.

Recommendations for Implementing the New Approach

To implement and institutionalize the new model and approach, the DepSecDef should designate the VCJCS and the USD (A&T) to lead the change. The former will represent the military CINCs (as customers), the latter will represent the suppliers (the Services). These officials will provide visibility into and assess competitive/ alternative solutions to mission needs, within mission area constraints. Together they will make buy decisions when the value generated is judged to be satisfactory in terms of capabilities available at affordable price.

The USD (A&T) will further ensure that acquisition actions are consistent with the streamlined procedures described: the requirement for cost and pricing data will be removed; contract requirements will be stated in terms of mission needs; source selection will place strong emphasis on past performance and process maturity; value generated by the competing teams will be the basis for downselection decisions; data rights will be protected for dual use and commercial items. The Task Force recommends that the USD (A&T) be given responsibility to implement the approach.

The Task Force recommends that the proposed streamlining approach be implemented on all current applicable efforts, including selected ACTDs and on all new R&D efforts including major modifications.

APPENDICES

Defense Science Board Task Force on Acquisition Reform- Phase III

Dr. Robert J. Hermann	Mr. John V. Ello	Mr. Jay Dutcher
Chairman	DSB Secretariat	Executive Secretary

Task Force Members/Consultants

Dr. Anthony F. Bronzo
Mr. Robert L. Cattoi †
Mr. George Donovan
Admiral Leon A. Edney, USN (Ret.)
Mr. Robert R. Everett †
Mr. Robert A. Fuhrman †
Dr. Jacques S. Gansler *
Mrs. Joan E. Habermann *
Dr. George H. Heilmeier *
Mr. Page Hoeper
GEN Edward C. Meyer, USA (Ret.)
Mr. Ralph C. Nash, Jr.
Mr. Philip A. Odeen *
Gen Bernard P. Randolph, USAF (Ret.) *

Subgroup on R&D in an Environment of Commercial Practices

DSB Members/Consultants	Government Advisors	support
Mr. R. A. Fuhrman (Chairman) †	Col. D. Abbott, USA	Mr. A. J. Beauregard
Mr. R. L. Cattoi †	Col. Jeanne Sutton, USAF	Mr. E. J. Burke
Mr. R. R. Everett †	Mr. W. Mounts, OSD	Mr. G. McVeigh
Mr. J. E. Fidler	Mr. D. Rossi, USN	
Dr. J. S. Gansler *	Mr. J. E. Smith, OSD	
Mrs. Joan Habermann *		
Mr. P. Hoeper		
Mr. R. C. Nash		
Gen. B. P. Randolph, USAF (Ret.) *		

* DSB member
† DSB Consultant and Past Member

References

1. "Defense Acquisition Reform." Defense Science Board Acquisition Streamlining Task Force, 1993

2. "Defense Acquisition Reform, Phase II." Defense Science Board Acquisition Streamlining Task Force, 1994

3. Battershell, A. Lee. "Technology Approached: DoD versus Boeing (A Comparative Study). Research Fellow Report. Industrial College of the Armed Forces, Fort McNair, DC. Undated

Briefings Received and Information Exchanges

Information Exchanges

Mr. John M. Bachkosky, DUSD(AT)
Mr. Irv N. Blickstein (API)
RADM Bill Bowes (DASN/RDA)
Mr. John A. Burt (DT&E)
Mr. Phil Coyle III, (OT&E)
Mr. John Douglass ASN/RDA
Maj Gen Bob Drewes (DCMC)
Mrs. Darleen A. Druyun, (SAF/AQ)
Hon Joshua Gotbaum, ASD (ES)
Dr. Anita K. Jones (DDR&E)
Mr. Steve Kelman (OFPP)
Mr. V. Larry Lynn (ARPA)
Hon R. Noel Longuemare, PDUSD(A&T)
Mr. Art Money, (SAF/AQ Designate)
Lt Gen George Muellnor (SAF/AQ)
Dr. Ken Oscar, Dep ASA for Procurement
Mrs. Colleen A. Preston (AR)
Gen Joe Ralston (VCJCS, Requested)
Mr. Bill Reed (DCAA)
Dr. George R. Schneiter (S&TS)
Ms. Eleanor Spector, (Procurement)
RADM Craig Steidle (JAST)
Mr. Tony Valleta, DASD (C3IA)
Mr. Derek Vander Schaaf (DoDIG)

Briefings Received

Name/Organization:	Briefing:
Mr. Frank Abbott, DuPont Mr. Bill Morris, Consultant	A View of Commercial R&D Practices from the Integrated Dual-Use Commercial Companies
Mr. Charlie Cape, Dept. of the Treasury	Condor (Globalstar)
Mr. Gordon England, GRE Consultants, Inc.	Commercial R&D from the Perspective of a Pilot Program
Dr. Jacques Gansler, TASC	Commercial R&D Practices
Mr. Page Hoeper, Fortune Financial	The Value Propositions
Maj Kim Hurd, SAF/AQXA	USAF Pilot & Lead Program Initiatives Joint Direct Attack Munition (JDAM)
Dr. Taylor Lawrence, DARO	R&D Commercial Practices
Dr. Vernon Lee, Lockheed Martin-Ft. Worth Mr. Charlie Anderson, Consultant	FSX and the International R&D Experience
Dr. Don McErlean, JAST/PM	Joint Advanced (Affordable) Strike Technology

Name/Organization:	Briefing:
Dr. Dave Moran, Office of Naval Research Mr. Dave Rossi, Office of Naval Research	Naval Pilot and Lead Programs
Mr. Bill Mounts, ODUSD (AR)	An Update from OSD's Acquisition Reform Office
Mr. Ron Mutzelburg, Dep. Dir. for Air Warfare, OUSD (A&T)/S&TS	Commercial Practices in DoD R&D
Mr. Dave Neuer, Motorola	Motorola's Experience on Govt. and Commercial R&D Practices
Dr. Kenneth Oscar, Asst. Sec. Army (Procurement)	Could the Commercial Model Be Applied to the DoD.. . Soon?
Mr. Tom Perdue, Asst. DUSD (AT)	Applying the Group's Commercial R&D Model in Conjunction with ARPA and DUSD (AT) ACTD Process ACTD and Other Advanced Technology Issues
Gen B. Randolph, USAF (Ret.)	Space-Based Infra-Red System
Mr. Mike Richey, Commanche Systems Engineer	Commanche R&D Program (Could DoD Use Commercial Practices?)
Mr. John Smith, Def. Acq. Board	Process Streamlining: DABs, Milestones, and Other OSD Activities
Mr. Tom Tadano, Lockheed Martin	CRSS
Mr. Ron Taylor, Motorola Mr. Phil Surra, Lockheed Martin	Iridium
Dr. Dick Van Atta, Dual Use Tech. and Int'l Programs	Expanded Competition and Other Industrial Base Issues

Model Application on Current Programs

Although the Commercial-Style Research and Development Model is new, elements of the underlying concepts have been applied in some current defense programs seeking more efficient methods of system development. These programs include:

The FSX (F16 derivative) aircraft under development for the Japanese Defense forces. This was a fixed price effort with flexible requirements. Once the program was restructured, it has been remarkably successful with performance and price very close to those originally desired.

The Joint Direct Attack Munition under development for the Air Force and Navy. This program uses combined Government/contractor teams, a rolling downselect process, past performance as a major selection criterion, and an emphasis on value in decision-making.

The Tier 2+ and Tier 3- UAVs. These developments use the ARPA arrangement of "other transactions," not the FAR or DAR, in their contracting structure. Firm unit cost pricetags have been set, with flexible requirements. Decisions are made on the basis of informed judgement of value, rather than on set procedure.

The Iridium Enterprise

This commercial communications enterprise incorporates organizations which have traditionally been involved only with government work. A notable example is Lockheed Martin Missiles and Space (LMMS), based in Sunnyvale, California, which is responsible for the satellite field. The LMMS campus is devoted largely to government work. The Iridium Bus Program occupies a facility which has the same overhead burden as the others on campus. The government is given enough visibility to assure it that the project carries its fair share of overhead.

However, after that, the project is run completely without government insight or oversight. Commercial practices are used, except where the management decides that government practices could be useful to the project. For example, labor is recorded on time cards but only as a proven means of tracking and allocating costs. The project outsources much of its manufacturing, but in some cases uses the same facilities as for government work. Project and government hardware can sometimes utilize similar processes and tooling. However, no government inspections are performed and costs are segregated so that appropriate allocations are made and burdens applied.

This mode of operation runs counter to the conventional wisdom that commercial and government business cannot be run in the same plant or with the same or similar processes, people and tooling. The project is managed and conducted by personnel who had previously worked mainly on government contracts. It includes many other features normally found in commercial work:

- The technology used is advanced but not necessarily state-of-the-art.
- The main drivers are schedule (to capture the market) and price.
- The project is achieving critical schedule milestones.
- The LMMS contract is fixed price-price is an independent variable.
- Suppliers were chosen to be the best in class, not necessarily lowest bidder.
- All suppliers use some form of statistical process control and monitor themselves.
- IS0 9000 is used for the basis for quality.
- Reporting and auditing are minimal.
- Contract changes require 1-2 pages.
- Design changes at LMMS require two signatures – designer and supervisor.
- Development times are significantly less than comparable government projects.
- Prices for commercial space parts are estimated to be 25% lower than for similar government projects.

The success of this project in conducting commercial business at a plant devoted mainly to government contracts indicates that this could be done elsewhere. There seem to be no insurmountable barriers.

Acquisition Simulations

A Key Element in the New Acquisition Process

Simulations have made a dramatic impact particularly in Army training. Their use first enhanced individual training (flight simulators, tank and gunnery trainers), then through the use of Simulation Network and Distributed Interactive Simulation (DIS), unit and leader training. At the same time, engineering and physical simulators have reduced testing costs. For example, the M1A1 tank had 56 line fire test shots and the M1A2 tank had 43, of which 33 were by simulation, saving $22 million. In the design centers and industry laboratories, great progress has been made in CADCAM to speed and enhance design of both mechanical and electrical systems. These systems have now added cost, schedule, and performance to engineering design which allows better tracking and trade-off of design versus cost and schedule.

Links "Requirements," "Affordability," "Designs," and Testing (Development and Operational)

Each area has made significant progress, but the big breakthrough has been the linking of the testing, training, design, and war game/analysis/affordability simulations and models. Now, for the first time, the requirement can be transmitted to the designer who can test many designs with real users before actual hardware is built. In the future, as manufacturing, affordability, and other analysis tools are developed and linked, the entire community will be able to work as a team in parallel trading-off manufacturing and factory layouts to save funds and get design and performance impacts from real customers.

A Critical Element is the Validation of the Models with Design and Test Data; and the Use of the Expanded Databases and Models on Future Programs

One of the key elements that needs work is the simultaneous validation of simulations and models as they are developed. Many weapon systems are designed by models and simulators, and unless these simulators are validated to include component testing, the new designs will not be able to go to a simulate-improve-simulate cycle, but will have to go to the old costly test-fix-test-fix cycle. Libraries on model and simulation modules need to be tested, validated, stored, and shared by all to maximize reuse and reduce costs.

Simulations Must Be at Both the Product and Force Levels (To Allow Quantity/Quality Trades Within Resource Cons train ts)

It is critical that force level war games and simulations and detailed product or weapon simulations be linked so that the performance of the weapon or product can be tested in its user environment. A plane must be tested not only for its engineering characteristics with a detailed product simulation but how it performs in dog fights

against other planes, for example. Only by linking the different levels can the design be truly influenced by the "requirement" and "tested" by the user.

There Are Inadequate Funds and Organizational Focus in this Area (Individual Programs Cannot be Expected to Carry the Full Load)

Each organization is moving forward as best it can in developing simulators for its products. There is a lack of clear vision as to why and how to link all these simulators. There is a need for published goals and objectives and for libraries of simulators. Directions are required so that one organization can develop a needed reliability model with standard interfaces while another can develop a standard manufacturing casting performance model, for example, to maximize return on investment. In addition, work is required on interfaces and terrain models, for example, that all can use.

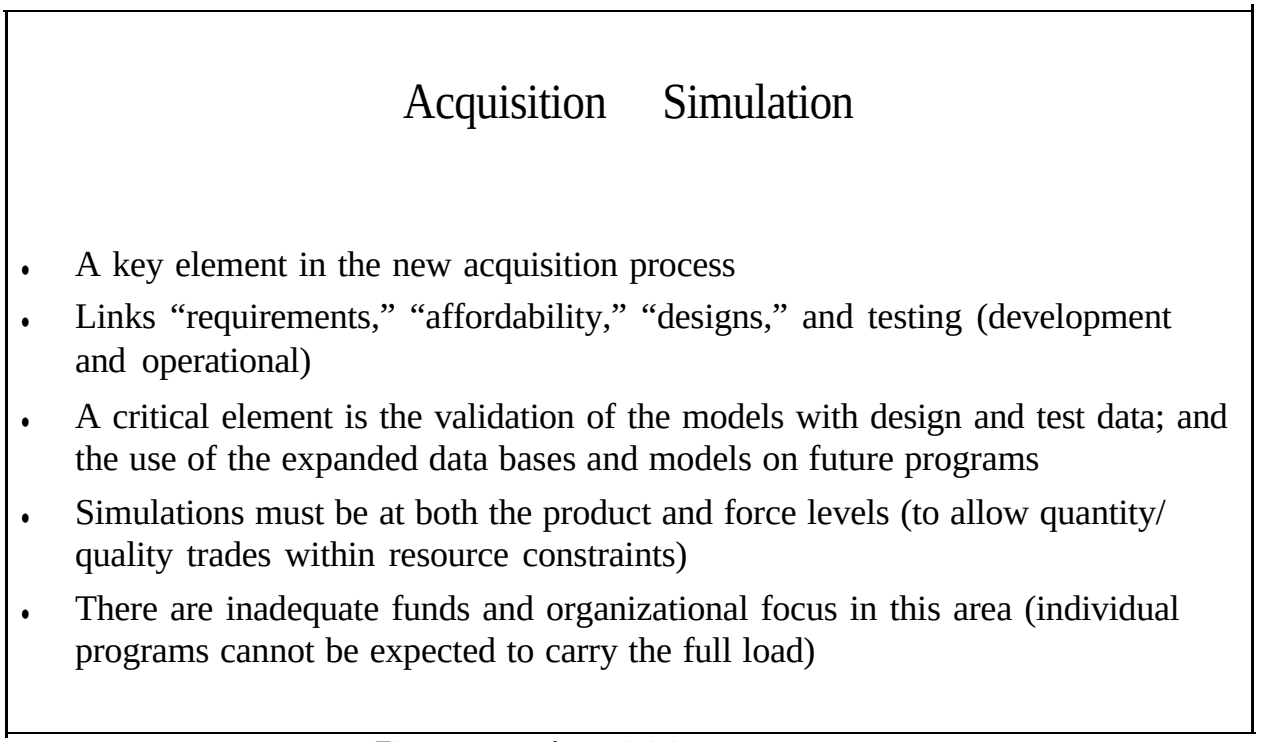


Figure F-l--Acquisition Simulation

Value Assessments

The idea of continuous effective competition among solutions to a military need depends upon the ability to assess the value of the alternatives. Defining value as the set of benefits available for a given price, will facilitate DoD obtaining full access to world-class commercial practices plus the benefits of expanded competition.

The R&D contracts we envision would couple limits on price and time with flexible requirements. This is similar to the way commercial companies operate. In the commercial marketplace, companies compete to bring to market products that provide customers with benefits they want at prices they are willing to pay. Benefits can include product features, time to market, reliability, safety, ease of maintenance, upgrade potential, reputation of the manufacturer, and other attributes. Some benefits can be subjective, as is often the case with consumer goods. Value assessments sometimes result in a choice that is a choice that "self-evidently" embodies the best value, but on grounds that are not easily quantified.

The use of judgement in assessing value is familiar in the context of everyday life. Its use in a defense context will add an essential level of flexibility to the proposed new acquisition process. The present process often focuses on a specific solution to a military need, complete with highly specific requirements, at the beginning of the process when least is known. By contrast, the model we propose calls for continuing to assess the value of alternative solutions throughout the development process, as benefits evolve and price estimates become more realistic. The decision to buy in quality would be made only when the benefits, schedule, and price of the "best value" solutions are well understood. Figures G-l and G-2 illustrate those concepts further.

The substitution of value assessments for the traditional approach may present difficulties.

1. The decision makers may have no experience of the approach in this context, although they use it in their everyday lives. This can probably be overcome through training.
2. There may be a reluctance to make the necessary decisions since the protective cover of the traditional process will have been removed. The ultimate manifestation of this could be an endless escalation of decision making. This can probably be overcome by training, policies, procedures, and by example.
3. The value selected may not be the best. This will require prevention, rather than cure. It will be one of the major tasks of program management to ensure the right outcome.

Value Assessments

- The commercial approach to settling the appropriate price of an item
- The value is assessed by comparing the benefits likely to be achievable for a certain estimated price, with the alternatives
- The buyers objective is to get the best value for the resources available
- Value assessments include quantity/quality trades, as well as comparisons across services and across programs
- Simulations can be a great aid in assessing the best value for the buyer among various price/quantity and differing performance alternatives-within the available resources.

Figure G-l --Value Assessments

Value Assessments

- Ultimately are management judgments, as in the commercial world; (and as with military performance requirements in the DoD world-that forecast the military "threat" 25 years into the future)
- To be made prior to moving ahead to each new phase (but in parallel with performance testing)
- Inputs that should be considered in arriving at a weapon system's value include:
  - Relative priority of this mission-need, given its price tag, vs. others--within the total resources available
  - Price and benefit of doing a similar mission other ways (including the current way--with, or without, upgrades)
  - Price and benefit of similar other equipment (military, commercial, foreign)

These are the types of performance/price value judgments we all make every day in our own life and in our businesses.

Figure G-2--Value Assessments

Source Selection

The procedures for selecting sources to participate in the various phases of development will also follow commercial practice using informed judgement rather than set procedures. In the commercial world, suppliers are often selected based upon established relationships without resorting to lengthy competitions. Thus, suppliers are continually motivated to perform in order to maintain the reputations upon which continuing opportunities for new business depend. This system is reasonable, in that it uses suppliers of proven effectiveness who can be expected to perform similarly in the future. It is also fair, especially to the corporate stakeholders (shareholders, employees, management) who fund and are responsible for the success of a particular venture, and have the most to gain or lose.

Thus, when selecting qualified sources (contractors) for the competing teams, the intent will be to use past performance and process maturity as major elements in deciding who will be allowed to participate. This is a departure from the traditional process. It will permit a number of efficiencies and will also bring changes to the source selection process. viz,

1. By emphasizing past performance the government will ensure that only well-qualified, high performance organizations of proven effectiveness participate in the competitions to develop defense systems. The organizations need not necessarily be experienced in defense work. This selection mechanism is a major avenue whereby the entry of traditionally non-defense companies into defense procurement can be facilitated. Of course, traditional, high-quality defense companies will also be selected.

2. The emphasis on past performance as a major criterion for selection is an effective means of ensuring high performance on future efforts. It is a major feature of the commercial environment where companies rely upon their reputations to ensure a continuing flow of new business. Thus, it will be a powerful continuing incentive for industry to produce best value for the Government within the resources available.

3. Using its own assessments of supplier process maturity will help the government become a “smart” buyer. The effectiveness and maturity of a supplier’s critical design and manufacturing processes are major drivers in generating value for the customer. The value elements of price, timeliness, and performance are those which permit decision making on the basis of informed judgement rather than set procedures. Process assessment is also an important element of risk management in source selection

4. Selection done in this way obviates the need for large, extensive, highly detailed proposals and the time and resources which have traditionally been devoted to their preparation and review. Further, although there will be a need for Requests for Proposals (RFP) they, too, can be simplified to emphasize the new selection criteria. There seems to be no reason to continue to have lengthy response times to RFPs. Proposals could even be submitted orally, with strict limits placed on presentation times.

5. Source selection done in this way can readily be understood as a reasonable approach to obtaining best value for the Government. By confining the competition to prospective competitors who have demonstrated high quality past performance and process maturity the selection process will be fair, especially to the national stakeholders (taxpayers and users) who fund and are responsible for the success of a particular development, and have the most to gain or lose. Detailed criteria used to benchmark and judge past performance and maturity could be part of the RFP and even discussed with prospective competitors before it is issued.

The Defense Manufacturing Council is currently considering an initiative to require process maturity assessments in all phases of defense procurement, from R&D through production. It is recommended that these efforts be extended to include logistics and supportability of the fielded systems.

The adoption of this approach to source selection will probably have substantial effects on the resources and numbers of personnel necessary to support the process within industry and the government. The Bid and Proposal resources necessary to support industry new business efforts may decline, with concomitant reductions in contractor costs.

Source Selection

- *Judgment* (vs. process) oriented
- Form of competition and selection weighting criteria will vary by program phase and by type of product
- Heavy consideration given to contractor *prior performance* (but need not have been on defense business)
- Contractor *processes* (e.g., design, software, production, support) will be assessed for proven quality and performance-- *low quality bidders will not be acceptable*
- The emphasis on prior performance and quality suppliers *greatly reduces government risk;* it also allows for short, simple proposals and evaluations
- The presence of a continuous alternative should significantly discourage "buy-ins"

Figure H-l -- Source Selection

Fixed Price, Flexible Performance Development

This central feature of the new approach is based on the need to retain flexibility in contracts where requirements are stated as mission needs, not as product performance. With firm requirements on price and schedule, the only remaining area permitting flexibility is performance. Flexibility must be retained on a broad basis as the competing teams search for values to meet mission needs, using, perhaps, markedly different approaches. As development proceeds the capability to satisfy mission needs with best value must be continuously assessed by the users in their roles as users and as development team participants. This capability may change or find different expression as the competition evolves. A prominent feature is the ability to change direction radically, within time and price constraints, or to terminate the effort of a team should it be concluded that the necessary value is unattainable along a particular line of enquiry. The approach also permits the Government program manager continuous visibility into all aspects of development, including performance, and production, support and spares prices. This is very different from the "fixed price-total package procurement" concept which caused substantial problems in the past.

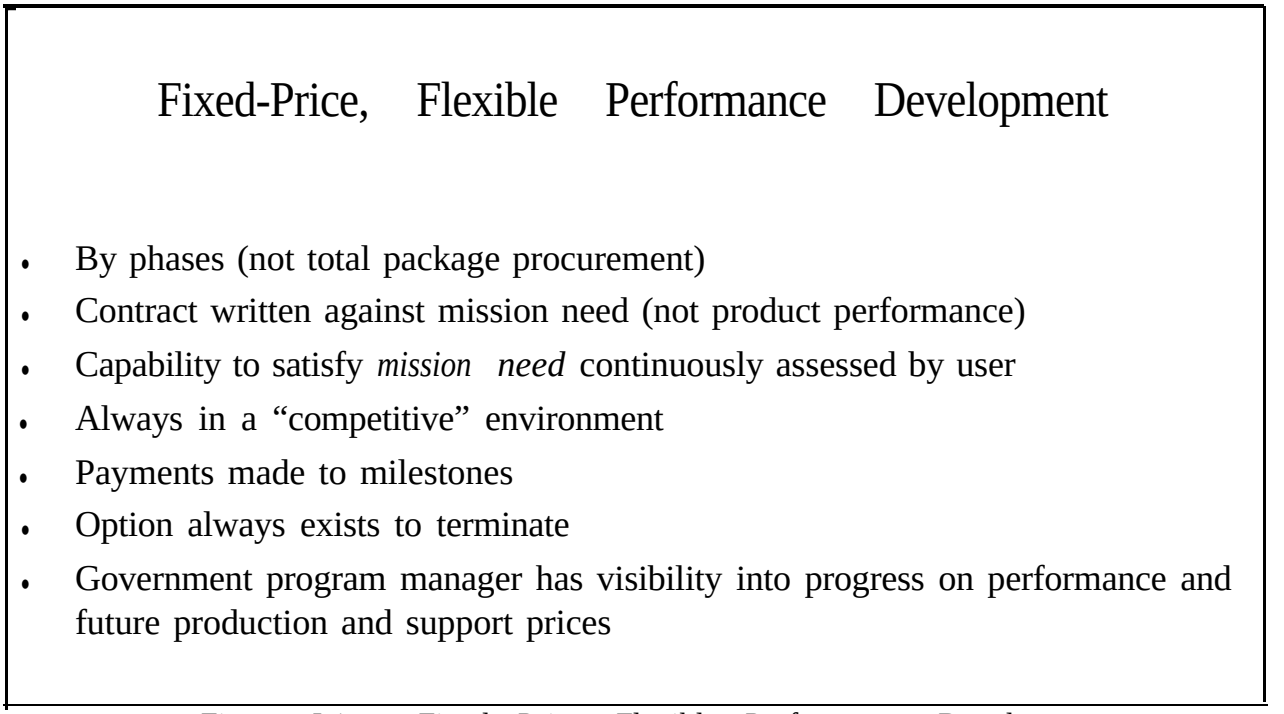


Figure I-1 -- Fixed Price, Flexible Performance Development

Test and Evaluation Implications

Test and Evaluation (T&E) must be an integral part of system development under the new model. However, it must be carried out under a philosophy that actively seeks to stress the system without trying to avoid possible areas of difficulty and failure. An effective motivator here is that this would be in the interests of the competitors to test everything thoroughly in development. The T&E process could use advanced simulations for the bulk of the testing, leaving the most stressing system tests to explore the limits of the design envelope.

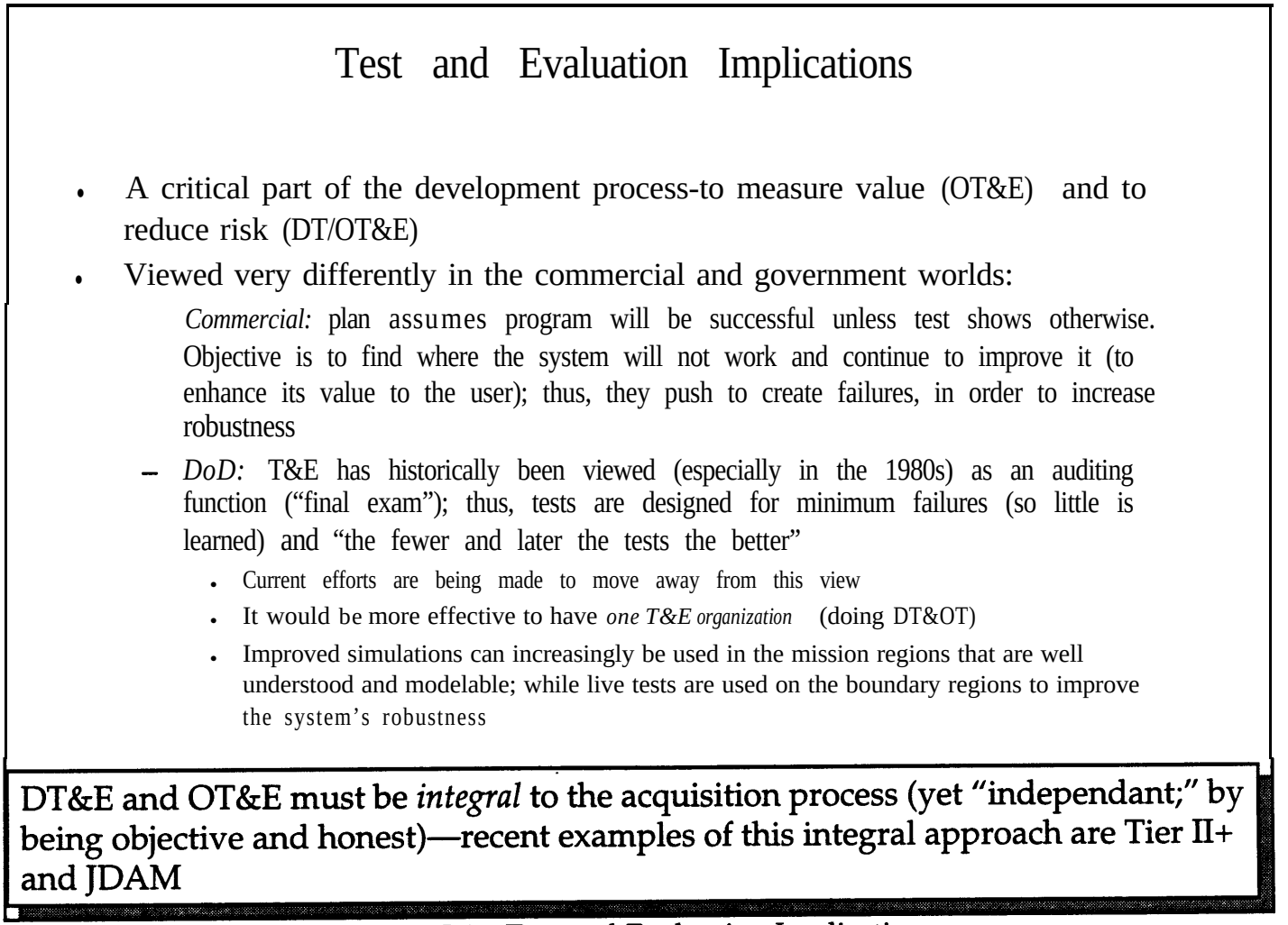


Figure J-1—Test and Evaluation Implications

Price, Cost, and Contract Implications

Pricing and Truth in Negotiations Implications. Many of the contracts in this new model will be *competitive* in the sense that two or more companies will be striving to obtain a contract for the same work in a phase. The reasonableness of the prices of these contracts will be determinable through the price competition (price analysis). Under the adequate price competition exemption of TINA, no cost or pricing data will be needed.

The prices of those that are *sole source* (primarily those for follow-on manufacturing) can also be determined to be reasonable without cost analysis using the numerous price analysis techniques that are available as well as *value analysis.* These contracts will, however, be subject to TINA as it is currently interpreted. When thorough and competent price analysis determines the reasonableness of the price of such contracts, the head of the contracting activity should waive the requirement for cost or pricing data per the following new guidance in FAR 15.804-l (b) (5) stating:

> "The head of the contracting activity may, without power of delegation, waive the requirement for submission of cost or pricing data. The authorization for the waiver and the reasons for granting it shall be in writing. A waiver may be considered if another exception does not apply but the price can be determined to be fair and reasonable without submission of cost or pricing data.. ."

Eventually, when this technique has proved to be effective, the Department should request an additional TINA exception for "contracts whose price has been determined reasonable through price analysis."

Cost Accounting Standards and Cost Principles Implications. Most of these contracts would be subject to the Cost Accounting Standards (CAS) and the cost principles as they are currently interpreted. However, the vigorous competition that is contemplated and the use of fixed price contracts make these requirements unnecessary. Further, their application would strongly discourage commercial firms from competing for this work. To avoid the application of the CAS, a waiver should be requested from the CAS Board for all cases where the head of a contracting activity has waived TINA. To avoid the application of the cost principles, prenegotiation audits would be eliminated or greatly restricted and the auditors instructed not to review the contractor's accounts to determine which costs are unallowable.

Contract Changes. There will be little need for contract changes in this model because the contracts will primarily be aimed at achieving a mission need with broadly worded statements of work. Thus, contractor will have full responsibility for configuration control and changes in design of hardware will normally be permitted without modification of the contract (or change to the contract price). However, to the

extent that changes in government requirements are identified, they should be included in the contracts through bilateral negotiations-with the fixed price determined before work is begun. Price reasonableness of these changes will be determined by price and value analysis in the same manner that the original contract prices were established.

These changes will be subject to TINA as it is currently interpreted. However, the contractors performing these contracts may not have the capability of being fully compliant with TINA. Thus, as in the case of the original contracts, such changes should be excepted from TINA when price and value analysis demonstrate that the price adjustment for the change is reasonable. At the current time, this exception should be granted by a determination by the head of the contracting activity. When the technique has proved to be effective, the Department should request an additional TINA exception for "contracts whose price has been determined reasonable through price analysis."

These changes will not be subject to the CAS if the CAS Board has granted a waiver for the contract as suggested earlier. However, they would be subject to the cost principles of the DFARS 252.243-7001 clause is included in the contract (as is required by DFARS 243.205-71). To avoid subjecting these contractors to the detailed cost allowability rules, a waiver of the DFARS should be granted for these contracts. The justification for this waiver would be that the contract modifications can be reasonably priced using price and value analysis.

Dealing with Contract Changes

- Contract is written based on mission need (not product performance), so there should be little cause for contract changes (even as product design changes)
- No unilateral changes– all must be assessed for "value" (benefits and total prices) and negotiated prior to implementation (in selected, time-urgent cases, could be initially based on not-to-exceed prices)
- Government to assess "fair and reasonable" price of the change via techniques #3-#9 of Figure 13
- Contractor responsible for maintaining configuration control
- Whenever possible, product changes should be saved up for "block changes"
- Quality and/or performance enhancement, at the same or lower price, should be encouraged -- as well as price-reducing product or process changes that don't impact quality or mission performance

Figure K-l -- Dealing with Contract Changes

Managing with Integrated Product Teams

Managing with Integrated Product Teams (IPTs) is an effective means of ensuring that all affected parties are involved in system development. By including representatives of the users, contractors, and suppliers, the search for, and assessment of "value" will be facilitated during all phases of the program.

In a May 10, 1995 memorandum, the Secretary of Defense Stated that the IPT concept for management would replace the current sequential process that produces a product at the program office level, which is then modified or rejected at higher review levels of management. IPTs will facilitate decision-making and make value assessments by simultaneously taking advantage of all members' expertise to produce an acceptable product the first time.

The program IPT must have control of its budget. Issues which cannot be resolved within the execution environment should be addressed through the PEO, if necessary. An additional feature of the team approach is that oversight and review of programs by the government is replaced by "insight" through the IPTs.

The IPT management structure should provide for continuous, up-the-line communications. It provides a forum for reasoned disagreement and competition, but does not accept a process that allows for consensus by a lowest common denominator. Finally, in an arena of competition, or where two sources for a product exist, the Government should establish an IPT for each source.

Managing with Integrated Product Teams (IPTs)

- User, prime contractor, and government program manager (who form the IPT) must collectively make the "value" assessments (within the available resources) on all critical decisions-during all phases of the program
- The IPT must have budget control (a lesson learned on "Commanche")
- There must be a designated, higher level "decision maker" to resolve the few issues the IPT cannot agree on (e.g., the PEO)
- The IPT provides *government insight* into program performance and price progress (instead of detailed government auditing)
- Where two sources for the product exist, the govememnt should establish two full IPTs (similar to JDAM)

Figure L-l -- Managing with IPTs

Acronyms

ACTAD	Advanced Concept Technology and Affordability Demonstration
ACID	Advanced Concept Technology Demonstration
ARPA	Advanced Research Projects Agency
CADCAM	Computer Aided Design/ Computer Aided Manufacturing
CAS	Cost Accounting Standards
CINC	Commander in Chief
DAB	Defense Acquisition Board
DAR	Defense Acquisition Regulations
DARO	Defense Airborne Reconnaissance Office
DepSecDef	Deputy Secretary of Defense
DIS	Distributed Interactive Simulation
DoD	Department of Defense
DSB	Defense Science Board
DUSD (AT)	Deputy Under Secretary of Defense (Acquisition and Technology)
FAR	Federal Acquisition Regulations
IOC	Initial Operational Capability
IPT	Integrated Product Teams
JAST	Joint Advanced Strike Technology
JDAM	Joint Direct Attack Munition
LMMS	Lockheed-Martin Missiles & Space
ODUSD (AR)	Office of the Deputy Under Secretary of Defense (Acquisition Reform)
OJCS	Office of the Joint Chiefs of Staff
OSD	Office of the Secretary of Defense
R&D	Research and Development
RFP	Request For Proposal
T&E	Test and Evaluation
TINA	Truth In Negotiation Act
USD(A&T)	Under Secretary of Defense for Acquisition and Technology
VCJCS	Vice Chairman of the Joint Chiefs of Staff

ATTACHMENT

Briefing Charts

STREAMLINED WEAPONS ACQUISITION

A STREAMLINED APPROACH TO WEAPON SYSTEMS RESEARCH, DEVELOPMENT AND ACQUISITION: THE APPLICATION OF COMMERCIAL PRACTICES

DSB Task Force on Acquisition Reform -- Phase III

April 30, 1996

OBJECTIVE

Satisfy mission needs faster and better at lower cost

- **Must get the most value from reduced defense acquisition budgets**
- **Must access all sources of technological excellence**
- **Must access the best practices**

SOLUTION

Model defense R&D on the American economic system

- Rely on market forces (continuous presence of a viable alternative)
- Commercial practices yield faster time to market, lower prices, and higher performance (i.e., better value)
- Relying on competitive forces and price-based contracting (vs. regulations and cost-based contracting) will bring in commercial firms -- thus, broadening the industrial base and accessing world-class parts, subsystems, facilities, and pmzbiaas

IMPLEMENTATION

- Maintain and evaluate competitive solutions to mission needs at affordable prices
  - Provide mission resource constraints
  - Provide continuous visibility into options
  - Broaden understanding of competition
  - Assure credibility of option to terminate a program
- Utilize commercial practices for acquisition
  - Continuous user evaluation of mission satisfaction
  - Reduce risk before committing to weapon system development
  - Short schedule for development and deployment
  - Fixed-price, variable performance, multiphase contracts

BRIEFINGS

- ⇒ Noel Longuemare (A&T)
- ⇒ Josh Gotbaum (ES)
- ⇒ Phil Coyle (OT&E)
- ⇒ Eleanor Spector (Procurement)
- ⇒ Larry Lynn (ARPA)
- ⇒ Colleen Preston (AR)
- ⇒ Irv Blickstein (API)
- ⇒ Anita Jones (DDR&E)
- ⇒ John Burt (DT&E)
- ⇒ George Schneiter (S&TS)
- ⇒ Tony Valleta (C^3)
- ⇒ Jack Bachkosky (ACTDs)
- ⇒ Craig Steidle (JAST P.M.)
- ⇒ John Douglass (N-SAE)
- ⇒ Bill Bowes (N-SAE)
- ⇒ Ken Oscar (A-SAE)
- ⇒ Darleen Druyun (F-SAE)
- ⇒ Art Money (F-SAE)
- ⇒ George Mullner (SAF/AQ)
- ⇒ Steve Kelman (OFPP)
- ⇒ DSB Acq. Reform Task Force
- ⇒ Bob Drewes (DCMC)
- ⇒ Bill Reed (DCCA)
- ⇒ Derek Vander Schaaf (DoDIG)
- ⇒ Paul Kaminski
- Joe Ralston (VCJCS)
- John White
- Bill Perry

⇒ Briefed

CRITICAL IMPLICATIONS

(To Satisfy the New Weapons R&D Process)

- It is possible to assess and acceptably demonstrate the "value" of things to be bought (regarding needed performance, timeliness, and affordable price).
  - Thus, price, schedule. and performance must be combined to establish the best weapon solution for a military need ("requirement")
- Maintaining competition among alternative value propositions is the best way to advance technology, reduce costs, and maintain public trust (but it does not require maintaining two sources of the same products).
  - Thus, procedures for maintaining continuous competitive alternatives replace detailed regulations, cost-based contracting, and detailed auditing
- To achieve low price, low risk, and state-of-the-art weapon systems, maximum use must be made of commercial technology, practices, facilities, equipment, and support.
  - Thus, acquisition reform is essential.
- To achieve civil/military industrial integration, R&D must be part of the weapons acquisition transformation.
  - Thus, the current DoD weapon's R&D process must dramatically change

OTHER IMPORTANT IMPLICATIONS

- **Small quantity orders should be expected; and maximum use should be made of flexible, integrated (civil/military) production**
- **The global industrial base must be utilized; however, potential vulnerability must be explicitly addressed**
- **Planning for frequent upgrades is required, but it need not necessarily be applied to all deployed equipment**
- **To achieve an accelerated schedule, decisionmaking must be made in parallel with the development process (e.g., as in JDAM)**
- **Surge capability must be provided only for spares and expendables; all other equipment will require only a "future potential" for reconstitution of defense-unique production (with time available for such reconstitution)**

THE NEW WEAPONS R&D PROCESS MUST ASSURE:

- Low price production and support of future weapons
- Low price/low risk development
- High risk (breakthrough) technology aggressively pursued -- prior to weapon system R&D
- Short cycle times for development and deployment
- Attraction of DoD R&D business to world-class commercial suppliers (to be done within an integrated operation)
- Access (as required) to critical, advanced technologies and products
- **Public trust -- without cost-based contracting and excessive government oversight**

THE KEY TO THE NEW DEVELOPMENT MODEL

The underlying assumption, and the basic difference offered by this model, is the validity of expanding the government's concept of competition to match the commercial concept of maintaining a continuous alternative to do the job, i.e., presenting explicit, best-value choices among different performance and price alternatives that are continuously being assessed to satisfy the mission need (vs. multiple suppliers bidding to develop a specific weapon).

Program and resource visibility and planning must be done on a mission basis in order to compare various alternatives to do a given job, as well as to assess future weapons' affordability (within overall DoD resources).

A NEW, INCREMENTAL, WEAPON SYSTEM DEVELOPMENT MODEL: To be Tailored Appropriately for Each Program

Pre-Phase 1 -- “Technology Development”

- -

Phase 1 -- “Risk Reduction”

- -

*Phase 2 -- "System Demonstration”

*Phase 3 -- “Build”

- -

Phase 4 -- “Product Improvement”

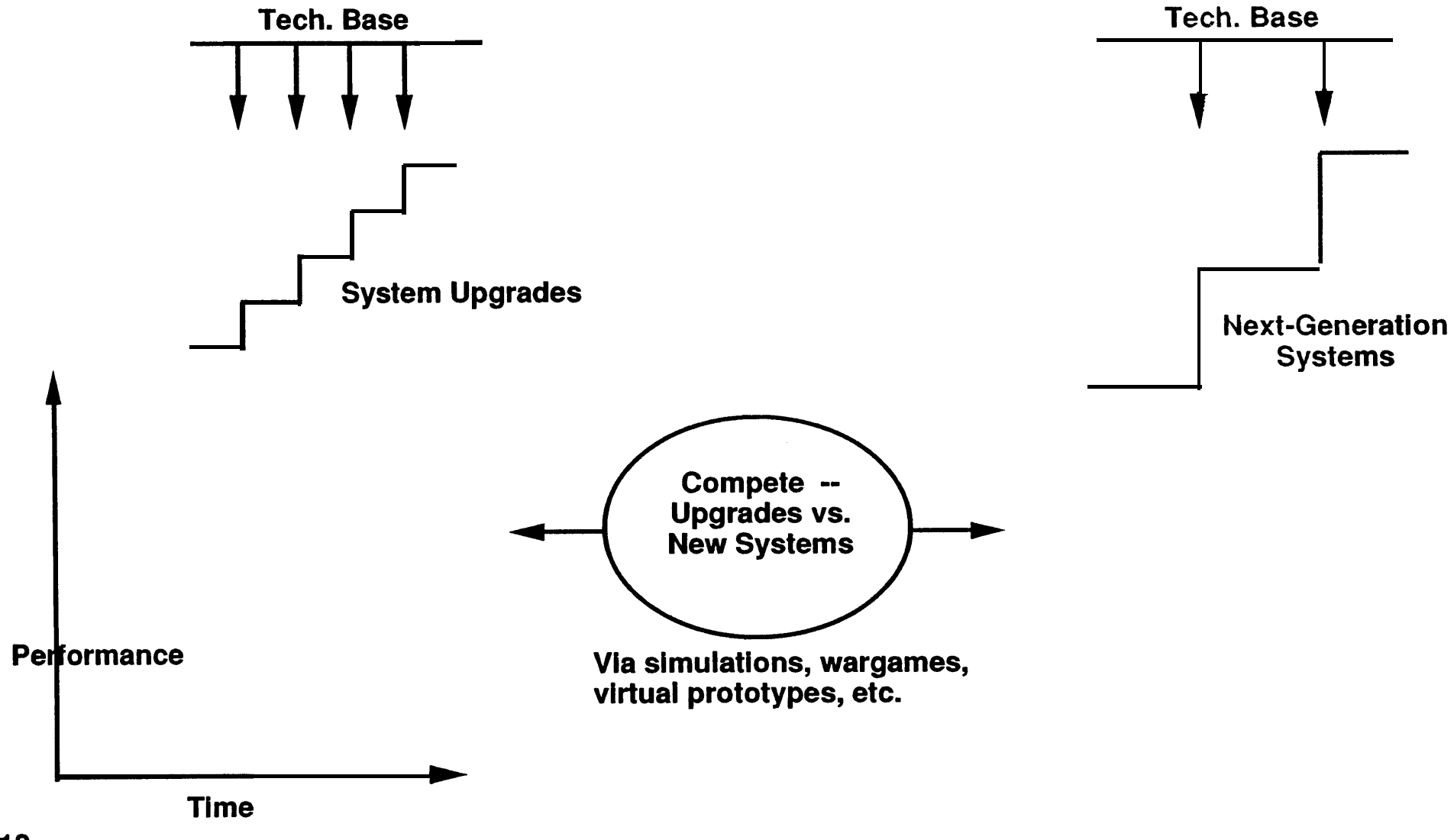
* Two critical commitment points

INCREMENTAL DEVELOPMENT (New Model)

Pre-Phase 1 -- "Technology Development"

- **Exploring new ideas**
- **Not related to a specific weapon system**
- **It is the "tech base" -- which must be maintained**
- **The technology must be proven before a weapon system begins to apply it**

RELATION OF TECHNOLOGY DEVELOPMENT AND WEAPON SYSTEM DEVELOPMENT



INCREMENTAL DEVELOPMENT (New Model) (contd.)

Phase 1 -- "'Risk reduction phase" -- if required

- General statement of mission need
- Addresses next-generation technology applied to a weapon system
- Focus is on the high-risk subsystems
- Explores broad operational concept alternatives (via simulation)
- Initial affordability addressed (cost targets established)
- For government initiated efforts, competitively run (when appropriate, maintain at least two alternatives, i.e., a "competition of ideas")
- For unsolicited ideas, sole-source-acceptable (no commitment to buy)
- Fixed price, "flexible performance" contracting (often done as "other transactions" -- no FAR or CAS)
- Initial budgeting from reprogramming (but may later need significant dollars)

(Continued)

INCREMENTAL DEVELOPMENT (New Model) (contd.)

Phase 2 -- "System demonstration phase"

- Weapon system "requirements" stated in mission-need terms, affordable prices, and timeliness needs (all stated with sufficient flexibility)
- A schedule-driven effort
- Utilize previously-demonstrated technology; risk is primarily systems integration -- assume there will be future product improvements (as newer technology is demonstrated)
- Assure transparency to future technology evolution, through: open systems and architectures; form, fit, and function interchangeability; etc.
- Competitively run (two options desired -- at least through weapon's design)
- Operational utility demonstrated (with fieldable prototypes and extensive simulations)
- Detailed system affordability analyzed (production and support)
- Fixed price, "flexible performance" contract (no commitment for production -- milestone monitoring with ability to terminate)
- Initial budgets may come from reprogramming (but still need significant funds, e.g., Tier II+)

(Continued)

Many of the current Advanced Concept Technology Demonstration (ACTD) projects are preliminary examples of the Phase 2 effort

- Based on "draft" operational requirements documents
- Bring in users early and keep continuously involved (to allow value assessments of benefits vs. prices)
- Very schedule driven (2-4 years); utilizing previously-demonstrated technology
- Affordability established at beginning and assessed during phase (e.g., Tier II+)
- Designed using concurrent engineering (with an integrated product and process team)
- Each program will have a different transition plan (into Phase 3)
  - If proven useful and affordable
- End of Phase 2 will often provide an initial (interim) operational utility (with the fieldable units, a la JSTARS)

(Continued)

APPROVED ACTDs (FY95)

- Precision SIGINT targeting
- Medium altitude endurance UAV surveillance
- Cruise missile defense phase 1 (“Mountain Top”)
- Synthetic theater of war 97
- Rapid force projection
- Precision/rapid counter-MRL (multiple rocket launcher)
- Joint countermine
- High altitude endurance UAV surveillance
- Advanced joint planning

- An additional dozen are planned for FY96

Many of these will fit into the new development model

SOME OBSERVATIONS REGARDING ACTDs AS EXAMPLES OF PHASE 2 (continued)

- **Concept is evolving (needs greater emphasis on affordability -- especially regarding support planning)**

- **Currently viewed as "an experiment", rather than as a key element of the acquisition reform process (not now coupled into this process)**

- **Was funded out of S&T, but needs to be out of 6.4 (since weapon system oriented)**

- **Should assume that, if successful and where appropriate, these will rapidly go into limited production. Thus, for a short schedule:**

  - Must do downselect process -- and other critical acquisition process decisions -- in parallel (e.g., JDAM)

  - Must fund "producibility" efforts during field tests/demos (to assure low production/support costs, rapid transition, and to keep industrial team together)

  - Revised DoDI 5000.1 process/practices should be modified to handle new (commercial-style) incremental development model -- and current practices will have to dramatically change.

- **The new process/practices will have to gain the understanding and support of Congress**

INCREMENTAL DEVELOPMENT (New Model) (contd.)

Phase 3 -- "Build phase"

- After: (1) reevaluation of military requirement; (2) user validation of operational utility demonstration; and (3) detailed affordability analyses (production and support)
- Single award, to a performance specification (after "effective" competitive evaluation of Phase 2 sources -- and any other potential alternatives)
- Fixed-priced contract, payments based on milestone achievements -- with incentive awards based on weapon system performance and delivery schedule
- Contractor maintenance -- intermediate and/or depot level(with warranty)
- On reorders, or major changes, evaluate "value" (based on effective competition -- with open access of alternatives)
- On reorders, or major changes, create incentives for industry to lower prices
- Assure that there is an "effective" alternative (in the event of termination)

(Continued)

INCREMENTAL DEVELOPMENT (New Model) (contd.)

Phase 4 -- "Product improvement phase"

- Assumed as a critical part of the plan for all products
- Plan for, and implement, backward and forward transparency to new technology
- Some form of credible competition must be present (Le., a viable alternative)
- Incentives must be provided to weapon system contractor to make price-reducing, quality-and-performance-enhancing changes (always evaluating the benefits and costs of the change against the current system and any other available options)
- Prime contractor (through warranties and other means) must be encouraged to compete spares suppliers if their prices increase or their quality declines
- May (or may not) involve retrofits
- Plan to be done industrially

WHY TIME STILL MATTERS

DEVELOPMENT TIME: Done properly, short cycle will:

- **Reduce prices (development as well as production and support)**
- **Minimize risk (by forcing use of proven technology)**
- **Maintain technological edge (militarily and economically)**

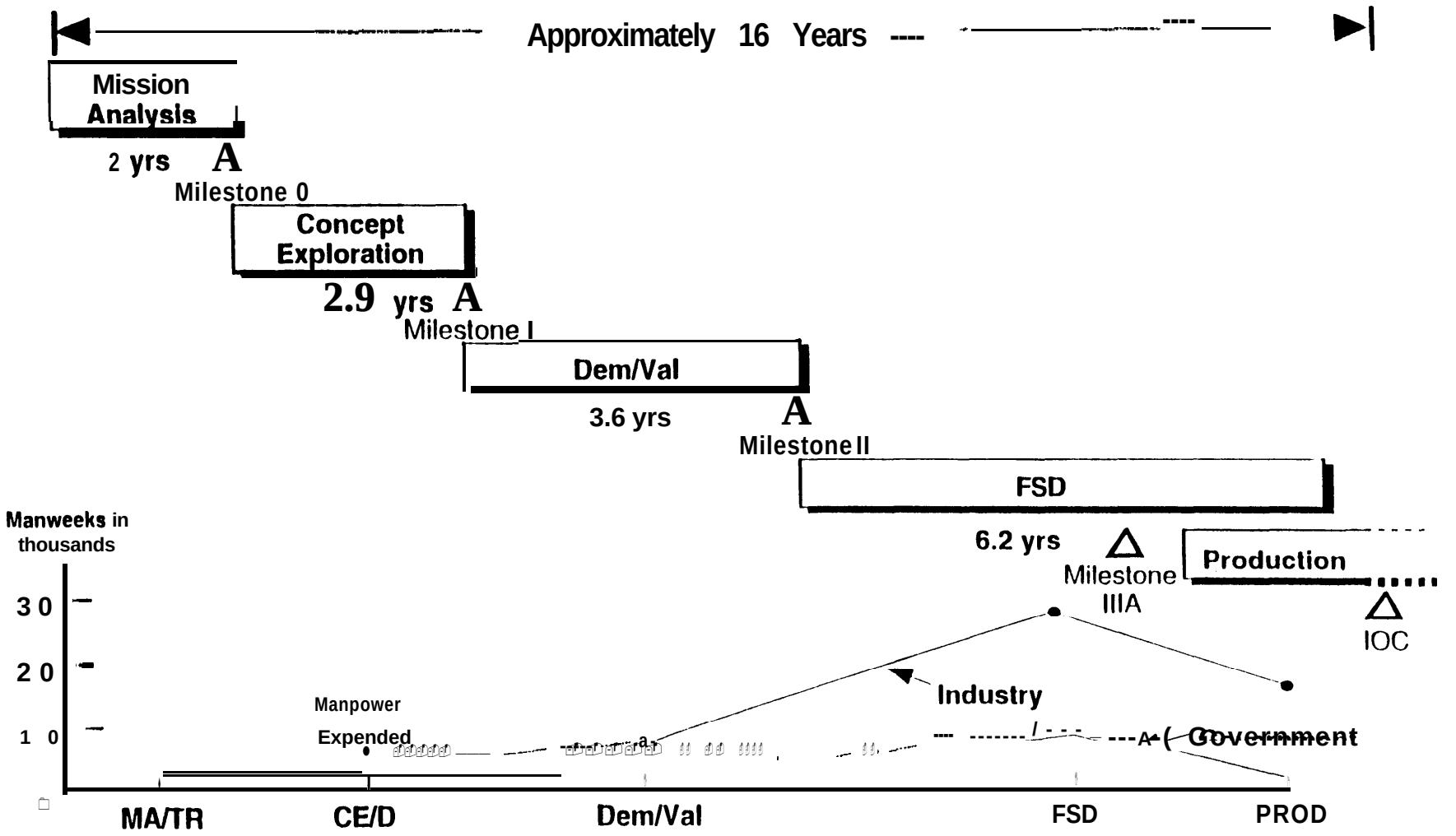
TRANSITION TO PRODUCTION TIME: After military utility and affordability demonstrations, if it is decided to produce, short time will:

- **Allow rapid fielding (at low risk and low price) of military-essential, and/or price-reducing, systems -- thus achieving technological superiority (in sufficient quantity)**
- **Allow production surge (for required items) to meet crisis needs**
- **Allow reconstitution of larger force structure if required (also serves as a deterrent to potential, long-term aggressors)**

RAPID DEPLOYMENT

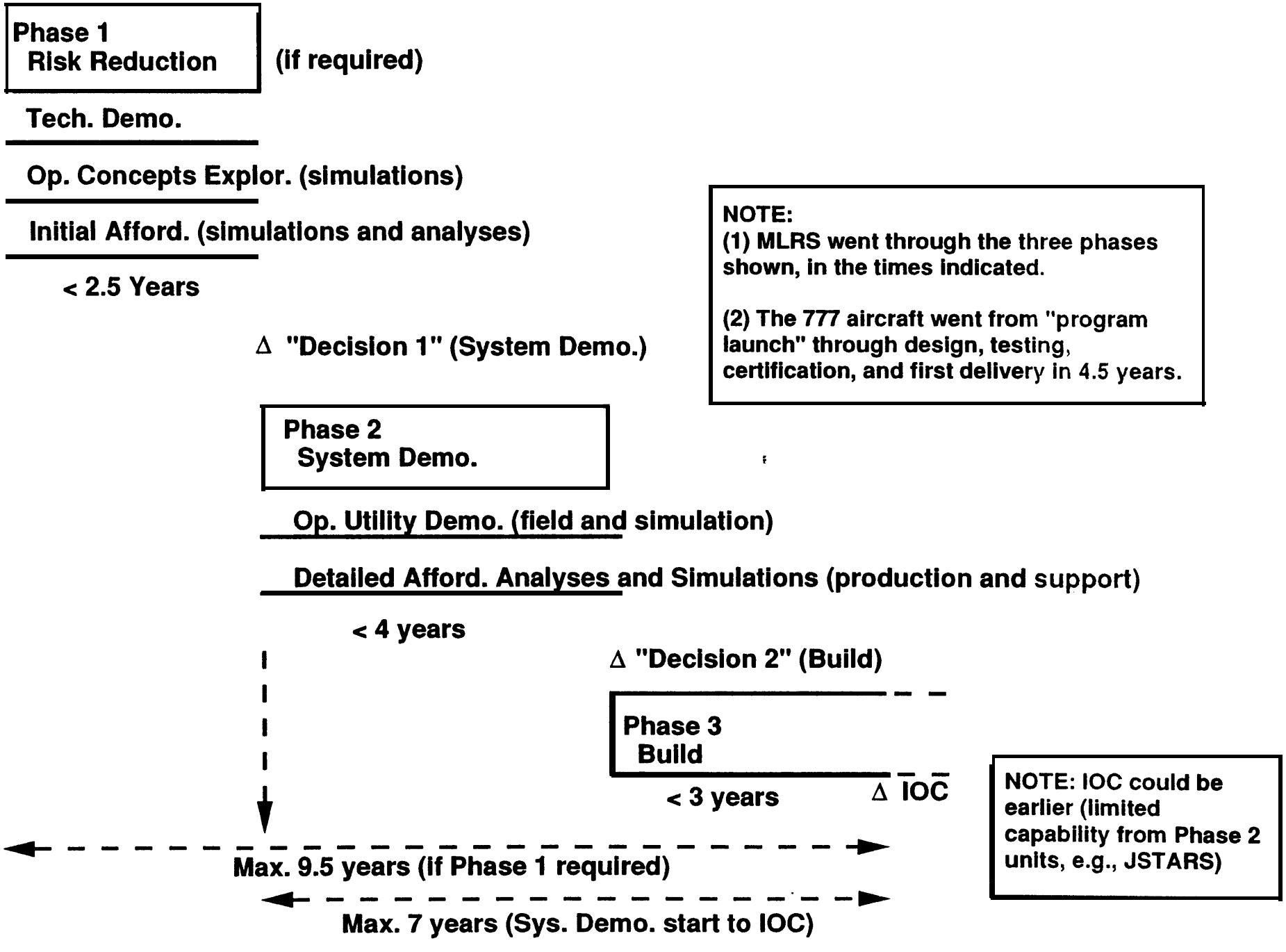
To reduce "cycle time", next-generation systems must move more rapidly from the "technology shelf" through field demonstrations to small-quantity deployment. This currently takes over 16 years. It must go down to under 7 years. The key to this is the concept of "system demonstration" (i.e., the Phase 2 effort).

Historic Acquisition Process Timeline
(All Services)*



*Source: Defense Science Board Acquisition Streamlining Task Force, 199 1 (based on 132 programs)

NEW WEAPON SYSTEM DEVELOPMENT MODEL



CHANGING THE "REQUIREMENTS" PROCESS

- **For Phase 1 "risk reduction" efforts (if required), a general statement of mission need and resource constraints, e.g., for JAST, "demonstrate next-generation technologies that will assure a superior strike capability at affordable prices well into the 21 st century".**

- **For Phase 2 "system demonstration" efforts, a weapon system "requirement" stated in flexible ("draft"), mission-need terms and ballpark resource constraints, e.g., for Tier II+ "an operationally-useful and supportable remotely-piloted vehicle, capable of adequate payloads and survivable endurance, for $10 million each in relatively small quantities".**

- **For Phase 3 "build" efforts, confirmation that the mission need still exists, that the increased operational utility has been demonstrated, and that the system is affordable to produce and support in the quantities to be ordered.**

At the beginning of each phase, the preliminary user T&E plan should be developed in order to help clarify the mission need.

THE "USERS" (THE CINCs) MUST BE INVOLVED IN THE SOLUTION DETERMINATION (i.e., SOLUTION SELECTION PROCESS)

- **Currently the solution selection is done by the Services ("suppliers"), USD(A&T), and OSD staff, and (more recently) the VCJCS and JROC (with the Service Vice Chiefs) -- but little CINC involvement**

- **The operating CINCs must be given responsibility to participate in the solution selection for short, medium, and long-term mission needs**

- **The CINCs will need a strengthened analytic and technical capability to address future mission needs and potential capabilities -- and should be provided a strong input (through the VCJCS) in the solution determination**

NOTE: The CINCs analytic role will be in assessing how various potential solutions (quality and quantity) fit into their long-term visions (it is a mission analysis role, not a weapon's design role)

PUBLIC "TRUST"

THE PUBLIC'S CONCERNS WITH RESPECT TO THE GOVERNMENT PROCUREMENT SYSTEM

- The items procured are necessary
- The government receives a fair and reasonable price
- The items delivered meet expectations
- There is open access to the process
- Fraud and abuse are minimized

- The historic, regulatory approach to government business has not consistently assured these (in fact, the cost-based current system actually encourages higher costs)
- The American economic system is built on the use of market forces ("competition"); so it should be used as the basis for future DoD procurements.

MAINTAINING A CONTINUOUS "COMPETITIVE ALTERNATIVE"

- To protect the public interest (without government cost accounting and oversight)
- To use competition to replace detailed regulation and cost auditing
- To assure product performance advances and price reductions
- To make real the threat of stopping the program (for poor performance or price growth)

MAINTAINING A CONTINUOUS "COMPETITIVE ALTERNATIVE"

Competitive procedures can be based on any of the following:

1. **Different firms (including commercial and foreign firms) on similar (or identical) products**

2. **Alternative ways to do the same job**

   - **Among different products (e.g., an upgraded old system vs. a new design)**

   - **Different technological approaches**

   - **Different weapons to do a similar mission (e.g., a bomber vs. a ballistic or cruise missile)**

3. **In all cases (from "requirements" through "test and evaluation" of new or modified systems) the value of the current system must be explicitly compared to the value of the proposed alternative**

AN EXAMPLE APPROACH TO MAINTAINING A CONTINUOUS COMPETITIVE ALTERNATIVE

New System

Phase 1: "Risk Reduction"	Phase2: "Sys. Demo."	Phase 3: "Build"	Phase 4: "Product Improv."
Team A	Team A	Team C	Team C
Team B	Team C		
Team C			

Going on in Parallel

Phase 3:	Phase 4:	Phase 1:	Phase 2:
Team X (B or D)	Team X (B or D)	Team A (or D)	Team A (or D)
Current System production	Upgrade of current system	Next-generation system	Next-generation prototype

Note: This "continuous alternative" model is made much more credible and possible due to the considerably shorter times for each phase.

EXAMPLES OF MISSION AREA COMPETITIONS

- Tier 2^+ and Tier 3^-
- Various boost-phase, theater ballistic missile intercept approaches
- Low altitude or high altitude space-based infrared (SBIR) systems

---

- F-22 (phase 2); "JAST" (phase 1); and F-15 upgrade (phase 4)

In each case, these alternatives must be made explicitly visible.

Note: In some cases, maintaining competition on major subsystems may be appropriate (either as an alternative, or in addition to the prime-contractor-level competition).

WAYS TO ESTABLISH THAT GOVERNMENT IS GETTING A "FAIR AND REASONABLE" PRICE FOR A QUALITY PRODUCT:

1. **Audit costs and quality**
2. **Competition for identical product**

---

3. **Competition for broadly similar products**
4. **Comparison of market prices and quality for broadly similar products**
5. **Parametric price data for broadly similar products**
6. **Confidential visibility into contractor's basis for prices bid (to establish credibility)**
7. **Independent estimate of required costs to do the job (based on history, comparability, etc.)**
8. **Tracking of design-to-price activities of contractor**
9. **Comparison of price bid to alternate ways to do the job**

Under the Truth in Negotiations Act (TINA), the items #3 through #9 can support a waiver of cost or pricing data requirements but the procurement system is not set up to enable this.

THE ESSENCE OF THE NEW DEVELOPMENT MODEL

For this commercial-style weapons development model to work -- in attracting commercial firms and in maintaining public confidence without unique government cost accounting, auditing, and regulations -- the concept of "competition via alternative choices offering best value to do the iob" (vs. simply two firms competing on the identical product) must be broadly accepted and institutionalized by the DoD.

Requires extending the regulatory interpretation of achieving "fair and reasonable prices" -- using the broader techniques (#3-#9) -- to be encouraged and used in establishing "adequate price competition"

MOST CRITICAL IS TO PROVIDE VISIBILITY

- **Must assure the presence of continuous alternatives (competition, in some form) in all mission areas and in all critical industrial sectors**
- **Must maximize the incentives and actions toward civil/military industrial integration (to broaden the industrial base, assure state-of-the-art, and lower costs**
- **Must assess foreign vulnerability (wherever there is a critical foreign source dependence)**
- **Must perform periodic assessments of the potential for reconstitution of a much larger defense industrial base (if it is required in the future)**

Visibility into the presence of continuous mission and industrial alternatives (and any required actions) must be institutionalized

OTHER ESSENTIAL ISSUES ADDRESSED

1. Acquisition simulations
2. Accomplishing “value” assessments
3. Source selection
4. Fixed price, flexible performance development
5. Budgeting for the new (rapid cycle) model
6. Test and evaluation implications
7. Dealing with contract changes
8. Logistics support aspects of the new R&D model
9. R&D Services (including software)
10. Data rights implications
11. Managing with Integrated Product Teams

THE INSTITUTIONAL STRUCTURES DO NOT CURRENTLY EXIST TO EFFECTIVELY IMPLEMENT THE VISIBILITY AND ACTIONS REQUIRED

Institutional options include:

- **SAEs, for service-unique mission areas**
- **OSD, Strategic and Tactical Warfare, for mission area competitive alternatives and Economic Security for industrial base considerations**
- **VCJCS/USD(A&T& a combined effort (based on Packard Commission approach) -- with CINC involvement, and with more influence on resources and a mission (vs. program) perspective**
- **Single buying agency, as is done in other countries (and organized by mission areas)**

RECOMMENDATION #1

- To institutionalize decision making:

  - Provide visibility into, and assess (for best value), competitive/alternative solutions to mission needs, within mission area resource constraints

  - A "user/supplier" decision group
    - VCJCS as representative of customers/users (CINCs)
    - USD (A&T) as representative of suppliers (Services)

THE "USERS" (THE CINCs) MUST BE INVOLVED IN THE SOLUTION DETERMINATION (i.e., SOLUTION SELECTION PROCESS)

- Currently the solution selection is done by the Services ("suppliers"), USD(A&T), and OSD staff, and (more recently) the VCJCS and JROC (with the Service Vice Chiefs) -- but little CINC involvement

- The operating CINCs must be given responsibility to participate in the solution selection for short, medium, and long-term mission needs

- The CINCs will need a strengthened analytic and technical capability to address future mission needs and potential capabilities -- and should be provided a strong input (through the VCJCS) in the solution determination

NOTE: The CINCs analytic role will be in assessing how various potential solutions (quality and quantity) fit into their long-term visions (it is a mission analysis role, not a weapon's design role)

RECOMMENDATION #2

- To institutionalize execution:
  - USD (A&T) must assure presence of continuous mission alternative solutions (in order to replace cost-based contracting)
  - USD (A&T) must define and SAEs must implement the specifics of the new process
    - "Fixed price, variable performance" development contracts with user trade-offs among capabilities that satisfy mission need and affordability constraints
    - Risk-reduction (phase 1) followed by short system demonstration (phase 2) and build (phase 3)
    - Design to affordable production and support prices
    - Source selection on best value, to quality sources

ACTIONS:

Deputy Secretary of Defense should direct USD(A&T) and VCJSC to:

- Establish the "user/supplier" decision group with mission area focus and long-term mission area resource identification
- Specify ClNCs responsibility, and provide appropriate staffs, for their role in long-term mission needs and solutions selections
- Implement the new acquisition model
- Utilize (and modify as appropriate) ACTDs as examples of the new acquisition model (rather than, as at present, "experiments" outside of the normal acquisition process)
- "Institutionalize" ACTDs, e.g., as part of the planning, budgeting, and acquisition processes
- Assess current R&D efforts in light of the new model, e.g., Tier ll+ ; JAST; etc.
- Utilize the model for any applicable current efforts and all new efforts
- Initiate some specific defense R&D projects to bring in commercial operations (as recommended by the DSB 1995 Summer Study)

<u>Current effort</u> (per direction of Paul Kaminski) assessment of selected R&D efforts in light of the new model

- [OSD and Services to supply]
-

BACKUPS

OTHER ESSENTIAL ISSUES ADDRESSED

1. Acquisition simulations
2. Accomplishing “value” assessments
3. Source selection
4. Fixed price, flexible performance development
5. Budgeting for the new (rapid cycle) model
6. Test and evaluation implications
7. Dealing with contract changes
8. Logistics support aspects of the new R&D model
9. R&D Services (including software)
10. Data rights implications
11. Managing with Integrated Product Teams

ACQUISITION SIMULATIONS

- A key element in the new acquisition process
- Links "requirements", "affordability", "designs", and testing (development and operational)
- A critical element is the validation of the models with design and test data; and the use of the expanded data bases and models on future programs
- Simulations must be at both the product and force levels (to allow quantity/quality trades within resource constraints)
- There are inadequate funds and organizational focus in this area (individual programs cannot be expected to carry the full load)

"VALUE" ASSESSMENTS

- **The commercial approach to setting the appropriate price** of an **item**
- **The "value" is assessed by comparing the benefits likely to be achievable, for a certain estimated price, with the alternatives**
- **The buyers objective is to get the best value for the resources available**
- **Value assessments include quantity/quality trades, as well as comparisons across services and across programs**
- **Simulations can be a great aid in assessing the best value for the buyer among various price/quantity and differing performance alternatives -- within the available resources.**

(continued)

"VALUE" ASSESSMENTS (continued)

- Ultimately are "management judgments," as in the commercial world; (and as with military performance "requirements" in the DoD world -- that forecast the military "threat" 25 years into the future)
- To be made prior to moving ahead to each new phase (but in parallel with performance testing)
- Inputs that should be considered in arriving at a weapon system's "value" include:
  - Relative priority of this mission-need, given its price tag, vs. others -- within the total acquisition resources available
  - Price and benefit of doing a similar mission other ways (including the current way -- with, or without, upgrades)
  - Price and benefit of similar other equipment (military, commercial, foreign)

These are the types of performance/price "value" judgments we all make every day in our own life and in our businesses.

SOURCE SELECTION

- Judgment (vs. process) oriented
- Form of competition and selection weighting criteria will vary by program phase and by type of product
- Heavy consideration given to contractor prior performance (but need not have been on defense business)
- Contractor processes (e.g., design, software, production, support) will be assessed for proven quality and performance -- low quality bidders will not be acceptable
- The emphasis on prior performance and quality suppliers greatly reduces government risk; it also allows for short, simple proposals and evaluations
- The presence of a continuous alternative should significantly discourage "buy-ins"

FIXED-PRICE, FLEXIBLE PERFORMANCE DEVELOPMENT

- By phases (not total package procurement)
- Contract written against mission need (not product performance)
- Capability to satisfy mission need continuously assessed by user
- Always in a "competitive" environment
- Payments made to milestones
- Option always exists to terminate
- Government program manager has visibility into progress on performance and future production and support prices

BUDGETING FOR THE NEW (RAPID CYCLE) R&D MODEL

The current planning/budgeting cycle is not responsive to the short-times required. The new system requires:

- **Pre-phase 1 "Tech. Base" funding must be maintained**
- **Initial Phase 1 "Risk Reduction" dollars (if required) can come from reprogramming; then future years' dollars may need to be budgeted**
- **Initial Phase 2 "System Demo." dollars can come from reprogramming, but the rest will have to be subsequently budgeted for the outyears**
- **Initial Phase 3 "build" dollars should be budgeted 18 months before the go-ahead decision, to assure the required continuous funding if the demonstration is positive. Then the rest of the builddollars can be budgeted following the build decision.**

Note: Even reprogramming is difficult if it is across services

An extremely attractive approach would be shifting to "mission area budgeting -- for long-term planning, quantity/quality tradeoffs, current vs. new system evaluations, affordability analyses, etc.

TEST AND EVALUATION IMPLICATIONS

- A critical part of the development process -- to measure use rvalue (OT&E) and to reduce risk (DT/OT&E)

- Viewed very differently in the commercial and government worlds:

  - Commercial: Testing is to provide user evaluations ("consumer reports"). The plan assumes program will be a success unless tests show otherwise. Objective is to find where the system will not work and continue to improve it (to enhance its value to the user); thus, they push to create failures, in order to increase robustness)

  - DoD: T&E has historically been viewed (especially in the 1980s) as an auditing function ("final exam"); thus, tests are designed for minimum failures (so little is learned) and "the fewer and later the tests the better"

    - Current efforts are being made to move away from this view. it would be more effective to have one T&E organization (doing DT&OT).

    - improved simulations can increasingly be used in the mission regions that are well understood and modelable; while live tests are used on the boundary regions to improve the system's robustness

DT&E and OT&E must be integral to the acquisition process (yet "independent"; by being objective and honest) -- recent examples of this integral approach are Tier II+ and JDAMS

DEALING WITH CONTRACT CHANGES

- Contract is written based on mission need (not product performance), so there should be little cause for contract changes (even as product design changes)
- No unilateral changes -- all must be assessed for "value" (benefits and total prices) and negotiated prior to implementation (in selected, time-urgent cases, could be initially based on not-to-exceed prices)
- Government to assess "fair and reasonable" price of the change via techniques #3-#9
- Contractor responsible for maintaining configuration control
- Whenever possible, product changes should be saved up for "block changes"
- Quality and/or performance enhancement, at the same or lower price, should be encouraged -- as well as price-reducing product or process changes that don't impact quality or mission performance

LOGISTICS SUPPORT ASPECTS OF THE NEW R&D MODEL

- Design to supportability/minimum life-cycle-prices/high readiness
- Prime contractor(s) must do detailed supportability and support cost planning and analyses during the system demonstration phase (Phase 2)
- Plan for warranties, contractor support, and contractor configuration management during design
- Utilize "form, fit, and function" interface specifications for subsystems (to assure future competition -- as airlines utilize ARINC specs.) -- and demonstrate integration prior to insertion
- For defense-unique items, prime contractor to assure incentives exist for lower-tier suppliers to continuously improve the product and lower the prices (e.g., JDAM gets data rights if spares prices rise inappropriately)
- Utilize the "commercial-style R&D" model for major (block) upgrades and modifications
- Provide contractual provisions to allow interruption of commercial deliveries for those items required for military surge in times of crisis

R&D SERVICES (INCLUDING SOFTWARE)

- **Objective: To be able to buy world-class R&D services for the DoD -- including buying them from commercial firms (so the same engineers and computer scientists could be used to do civil and military work, without specialized cost accounting standards, TINA submittals, and other barriers)**

- **Federal Acquisition Circular 90-32 (implementing FASA'94) allows the flexibility of commercial R&D services (under FAR Part 12) if such services are defined as "commercial items". (Then they could fall under exceptions contained in FAR 15.804-1(a)(1) or 15.804-1(a)(2))**

- **Awards would be based on "best value"; and prices would be based on "market prices" and evaluated by the government through market analysis (to assure that the prices are fair and reasonable)**

DOD DATA RIGHTS: A Major Barrier to Commercial Practices (Per Inputs from Commercial Firms)

- **Spare parts and/or competitive reprocurement should no longer be major issues with the proposed new model -- utilizing warranties and maintaining continuous alternatives**

- **FASA '94 provides relief for "commercial items," and could help significantly if current rules intended for primes only are not flowed down to lower tiers**

- **A new rule for data rights on products that have received contractor funding went into effect on September 1, 1995**

- **The remaining issue is for defense-unique products (with embedded dual-use technology) that have been government funded. Here:**

  - **The contractor and its subcontractors should retain the rights to all technical data and computer software (the Government obtaining limited rights)**

  - **The contractor should be responsible for the continuing maintenance of the contract drawings and will be the data repository**

  - **The contractor and the Government should negotiate, during the Phase 2 contract, a spare parts plan that will ensure that the parts can be obtained at reasonable prices for the life of the program (as was done in JDAM)**

  - **The contractor and its subcontractors should agree to provide a complete technical data package with full rights if the product or firm is withdrawn from the market**

MANAGING WITH INTEGRATED PRODUCT TEAMS (IPTs)

- User, prime contractor, and government program manager (who form the IPT) must collectively make the "value" assessments (within the available resources) on all critical decisions -- during all phases of the program
- The IPT must have budget control (a lesson learned on "Comanche")
- There must be a designated, higher level "decision maker" to resolve the few issues the IPT cannot agree on (e.g., the PEO)
- The IPT provides government insight into program performance and price progress (instead of detailed government auditing)
- Where two sources for the product exist, the government should establish two full IPTs (similar to JDAM)