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FINAL REPORT

of the

DEFENSE SCIENCE BOARD

1986 SUMMER STUDY

USE OF COMMERCIAL COMPONENTS IN MILITARY EQUIPMENT

AD-A180 338

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January 1987

Office of the Under Secretary of Defense for Acquisition

Washington, D.C. 20301

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FINAL REPORT

of the

DEFENSE SCIENCE BOARD

1986 SUMMER STUDY

USE OF COMMERCIAL COMPONENTS IN MILITARY EQUIPMENT

Co-Chairmen

Dr. James R. Burnett
Dr. William J. Perry

January 1987

Office of the Under Secretary of Defense for Acquisition

Washington, D.C. 20301

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WASHINGTON, D.C. 20301

DEFENSE SCIENCE
BOARD

February 10, 1987

MEMORANDUM FOR THE SECRETARY OF DEFENSE
THROUGH: UNDER SECRETARY OF DEFENSE
(ACQUISITION)

SUBJECT: Defense Science 1986 Summer Study on the Use of Commercial Components in Military Equipment

The attached report of the Defense Science Board 1986 Summer Study on the use of Commercial Components in Military Equipment was prepared under the Co-Chairmanship of Dr. James R. Burnett and Dr. William J. Perry.

The Packard Commission concluded increased use of commercially developed, off the shelf equipment would save money. This report documents some successful examples of commercializations and makes recommendations on ways to do more.

More importantly, this Panel recognized that although the increased use of commercial equipment is good, the increased use of commercial procurement practices could be even better.

Quite simply, it is difficult to fault government buyers for using extremely restrictive specifications and contract procedures when even correct business and technical decisions can be frivolously challenged by distraught losing bidders.

It seems there must be some middle ground where we could allow our program management people greater latitude to use the wisdom inherent in commercial bidding practices and still ensure the fairness implicit in our American way.

I believe we should begin immediately to discover the best in commercial practices and quantify the attendant savings and pitfalls by the use of pilot programs.

I recommend you read the Co-Chairmen's transmittal letter, review the very short Executive Summary and sign the attached implementing memorandum.

C A Fowler

Charles A. Fowler
Chairman

Attachment:
As stated

OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON, D C 20301

DEFENSE SCIENCE
BOARD

January 15, 1987

Mr. Charles A. Fowler
Chairman
Defense Science Board, OUSD(A)
Room 3D1020, The Pentagon
Washington, D.C. 20301-3140

Dear Mr. Fowler:

Attached is the final report of the 1986 Summer Study on the Use of Commercial Components in Military Equipment.

This study was chartered to find ways to increase the use of commercially developed items in military equipment, but it quickly became apparent that the use of commercial practices themselves could be of even greater benefit.

The legislative requirements for "full and open" competition and the allowing of almost unlimited, even frivolous protests by losing bidders inhibit the use of wise judgment in government purchasing. Under such conditions it is not surprising that government buyers depend on detailed specifications to protect themselves from protests. That dependence on rigid, detailed specifications leads to uniquely developed equipment and discourages or even disqualifies commercial equipment.

Just as an open market helps consumers buy goods and services at reasonable (we often use the term competitive) prices, the goverment's use of competition in the commercial market will help the Department of Defense buy its equipment more cheaply. Inherent in this free market approach, however, is the necessity for the consumer to subjectively trade somewhat flexible requirements against costs and choose the best value. Our recommendations are intended to strengthen the role of the government buyers and enhance their capability to choose wisely.

We of course recognize that good business decisions are not always good political decisions. Some of the resistance to our recommendations to buy commercially and reap the benefits of a free market might well come from some of the very same critics who currently complain that we pay to much for our military equipment.

As with any change someone's ox gets gored and the changes we are recommending are no different. There may be a number of detractors who will want to protect various parochial interests. Some of them might well have valid claims but we firmly believe that when a system has fundamental flaws you should not expect the repairs to be painless.

In summary, the results of this study show that increased use of both commercial buying practices and commercial equipments offer the potential for large savings in meeting our equipment needs; we should do so as fast as the laws allow. Additionally, we suggest pilot programs to identify impediments to commercialization and also to quantify savings to help convince lawmakers of its wisdom.

It was an honor for us to co-chair this distinguished panel and we thank you for inviting us to do so.

James R. Burnett

Dr. James R. Burnett

William J. Perry

Dr. William J. Perry

USE OF COMMERCIAL COMPONENTS IN MILITARY EQUIPMENT

EXECUTIVE SUMMARY

BACKGROUND

Following the Packard Commission recommendations to increase the use of commercial equipment for military needs, this DSB summer study panel was asked by the Under Secretary of Defense for Research and Engineering to evaluate the cost-effectiveness and performance trade-offs involved in doing so and to recommend specific ways to accomplish it. This was to include: past program comparisons of mil-spec vs. commercial; potential risks such as logistics issues, data rights etc.; identification of impediments to commercial acquisition; and specific recommendations for action. It was quickly determined that this issue could not be addressed without also looking at the differences between how commercial items are bought, and how defense equipment is specified and purchased. This determination resulted in the expansion of our charter to consider both commercial products and commercial practices, and their strong inter-relationship.

SUMMARY CONCLUSIONS

1. Commercial practices used to procure commercial products are sufficiently different from DoD practices (because of history, regulations, and statute) that the expanded use of commercial products in DoD systems will be inhibited until the differences are reduced.

2. There are, however, many examples of commercial products already being used in DoD systems.

3. Rapid technological changes in the commercial world, for example, electronics, offer a rich potential for DoD exploitation with potential gains in performance, quality, and schedule at lower costs.

   A. Use of commercial products should result in large annual savings

   B. Savings thru use of commercial practices for military products should be even greater

   C. Achievement of these benefits will require creation of preference and incentives for commercialization in appropriate areas

4. Pilot programs should be used to determine limiting factors and statuatory impediments as well as to quantify both risks and payoffs of commercialization. As the military tends to own and operate systems for many years, identification and evaluation of long term logistics requirements should be an integral part of those pilot programs.

IMPLEMENTATION PLAN

1. Recommendation: Revise FAR to implement policies, guidance, and procedures for acquiring commercial products and using commercial practices

   Action: Assistant Secretary of Defense for Procurement and Logistics (ASD(P&L))

2. Recommendation: Change the requirements process to include a "needs" document which includes commercialization tradeoffs and selected contractor inputs

   Action: Under Secretary of Defense for Acquisiton (USD(A))

3. Recommendation: Give PM discretionary authority to use commercial practices and products when appropriate

   Action: Defense Acquisition Executive (DAE), and Service Acquisition Executives (SAEs)

4. Recommendation: Strengthen the emphasis on the specifications and standards initiatives - Mil Prime, commercial specifications, streamlining, variable environments, etc.

   Action: Assistant Secretary of Defense for Procurement and Logistics (ASD(P&L))

5. Recommendation: Shift the integrated circuit procurement process to include removing the precedence of MIL-STD-454, certifying designs and processes vs parts, streamlining the MIL drawing system, and adopting a military/industrial specification

   Action: Assistant Secretary of Defense for Procurement and Logistics (ASD(P&L))

6. Recommendation: Implement pilot programs to validate benefits of legal and regulatory exemptions implicit in commercial practices

   Action: Defense Acquisition Executive (DAE), and Service Acquisition Executives (SAEs)

PREFACE

Commercial buyers using commercial buying practices benefit from the ease with which they can use common sense. Commercial buyers use competition to their advantage, getting maximum value for an affordable price. They neither key on lowest price nor maximum performance but go for the more subjective "value". Once they make a decision it is basically unassailable by the losing bidders.

To the contrary, government buyers must use "full and open" competition and face almost unlimited, even frivolous, protests by the losing bidders. Under such conditions, where good judgment and common sense don't count, it is not surprising that government buyers depend on detailed specifications to protect themselves from the protesters.

It must be recognized that a really substantial change in our buying practices will require changes in our laws. A move to "effective" competition with an appropriate level of "common sense subjectiveness" and a move to limit or prohibit protests by losing bidders are needed before we can realize the benefits inherent in good commercial practices.

Although we make several other specific, detailed recommendations to encourage the use of commercial equipment and practices, the above recommendations are fundamental if we want to significantly improve our acquisitions.

DoD AND COMMERCIALIZATION

DR. J.R. BURNETT
DR. W.J. PERRY
CO-CHAIRMEN

CHARTER

The underlying issue for our Summer Study is the need to find ways to reduce defense equipment costs without affecting military effectiveness -- an ever-present challenge, but one that will be even more critical in the year ahead.

We were asked to look at cost/performance tradeoffs "using foreign and domestic commercial equipment" and we were told to "define commercial components to include all levels of piece parts, assemblies and end items."

We were asked to look at specific case studies and to assess the "what if it had been done without MIL-SPECS" cost and performance impacts. Additionally, we were specifically charged to look at any potential "down side" risks to the use of commercial equipment -- including such issues as logistics, supportability, proprietary data rights, etc.

Finally, we were asked to "identify the impediments to the greater use of commercial equipment -- should this prove to be a wise course -- and to make specific recommendations for making it easier for the DoD to expand its use of commercial piece parts, subsystems and systems."

Our first, and most critical discovery, was that we could not even address this subject without looking at the differences between how commercial items are bought and how defense equipment is specified and purchased. So, with the DSB Chairman's concurrence, we expanded our charter to consider both commercial products and commercial practices -- and their strong inter-relationship.

CHARTER

EVALUATE THE COST-EFFECTIVENESS AND PERFORMANCE TRADE-OFFS FROM INCREASING THE USE OF COMMERCIAL PIECE PARTS, ASSEMBLIES, AND END ITEMS.

INCLUDE:
- PAST PROGRAM COMPARISONS: MIL-SPEC VS COMMERCIAL
- POTENTIAL RISKS: LOGISTICS, DATA RIGHTS, ETC.
- IDENTIFICATION OF IMPEDIMENTS
- SPECIFIC RECOMMENDATIONS FOR ACTIONS

SINCE "HOW WE BUY" DETERMINES "WHAT WE BUY" THE SUMMER STUDY HAD TO EXPAND THE SCOPE TO INCLUDE COMMERCIAL PRACTICES.

THE TIMING FOR GREATER "COMMERCIALIZATION" IS IDEAL

Perhaps the most important aspect of our current study is that the timing for realizing the benefits of commercialization is ideal. To begin with, rapid technological change has expanded the potential for high-quality, high-performance, low-cost commercial equipment to satisfy many military requirements. This is especially true in electronics. For example, microcircuits which are now being produced in high volume and extremely high quality, operate hard-mounted to automobile engines and wheels (environments at least as severe as many military applications).

At the same time, we appear to be in an era of increasing defense budget pressures, which is aggravated by a need for greater quantities of high-performance weapon systems. These pressures demand that we exploit the potential of increased commercialization now!

Commercialization has been studied by many different groups beginning in 1972 with Army, Navy, and Air Force Acquisition Review Committees. But certainly, the current focus, is the recently concluded Packard Commission, which has been fully supported by the President and the Secretary of Defense.

Additionally, the Congress has responded to the Packard Commission recommendations and has been moving to develop some of the needed legislative changes. For example, a commercial preference bill was recently adopted in the House and is expected to become law in the fall. The bill would require immediate DoD implementation and a detailed report, including identification of legislative barriers, within one year. The Congress has also initiated action on bills dealing with "Data Rights," "contract awards emphasizing value," and providing greater authority to program managers. All of these are positive and necessary -- but not sufficient -- legislative steps; and we will comment later on the further Congressional actions that are required.

Finally, we were extremely pleased to hear about the many positive steps already being taken by the services both in the significantly increased use of commercial equipment and on the many needed complementary areas of commercial practices; for example: specification streamlining, program cost and requirements baselining, acquisition professionalism, etc. We also heard of other initiatives, such as "MIL-PRIME" specifications that are performance oriented; the greater use of commercial warranties through the "product performance agreement center;" source selections in which prior performance is heavily weighted; and many others -- all of which have been started and which we strongly support.

Thus, we believe <u>the timing is ideal</u> and the DoD has an excellent chance of realizing the potential of our conclusions and recommendations.

INTRODUCTION

THE TIMING FOR GREATER "COMMERCIALIZATION" IS IDEAL

- RAPID TECHNOLOGICAL CHANGE (ESPECIALLY ELECTRONICS)
- NEW POTENTIAL FOR HIGH QUALITY COMMERCIAL EQUIPMENT
- BUDGET PRESSURE AND NEED FOR INCREASED MILITARY EQUIPMENT
- MANY PAST STUDIES SUPPORT COMMERCIALIZATION (1972 TO PRESENT)
- PACKARD COMMISSION STRESSED COMMERCIALIZATION—PRESIDENT AND SEC DEF SUPPORT
- CONGRESS APPEARS TO SUPPORT INCREASED COMMERCIALIZATION
  - COMMERCIAL PREFERENCE BILL
  - INITIATING SUPPORTIVE BILLS
- DoD IS ALREADY MOVING OUT
  - INCREASED USE OF COMMERCIAL EQUIPMENT
  - INITIATIVES TO ASSIST COMMERCIALIZATION

"COMMERCIAL PRODUCTS" CLEAN DEFINITION"

We have defined "commerciality" as included both commercial products and practices. Unfortunately, even commercial products have no unique definition. This chart is one "clean definition." However, it doesn't fit the full spectrum.

"COMMERCIAL PRODUCTS"

CLEAN DEFINITION

COMMERCIAL ITEM IS ANY PRODUCT, DEVICE, COMPONENT, SOFTWARE, SYSTEM OR SERVICE THAT IS AVAILABLE IN THE COMMERCIAL MARKET PLACE.

- AVAILABILITY MEANS THE ITEM IS FULLY DEVELOPED AND IN PRODUCTION
- COMMERCIAL MARKET PLACE MEANS THE ITEM IS AVAILABLE, OR OFFERED, THROUGH COMMERCIAL DISTRIBUTION CHANNELS OR OUTLETS IN THE UNITED STATES AND/OR ITS ALLIES

SCOPE (DEFINITION) COMMERCIAL PRODUCTS

A broader, more encompassing scope of commercial products is reflected here. As this chart demonstrates, the term "commercial product" applies across many spectrums. In terms of degree, it varies from catalog to more complex items. Commerciality also varies by type, level, environment, and category of support. In each case the concept varies over a continuum which defies specific definition.

INTRODUCTION

SCOPE ("DEFINITION") COMMERCIAL PRODUCTS

DEGREES	TYPES	LEVELS	ENVIRONMENT	SUPPORT
• CATALOG ITEMS • MODIFICATIONS OF CATALOG ITEMS • NEW COMMERCIAL SYSTEMS BUILT WITH CATALOG ITEMS • NEW MILITARY SYSTEMS BUILT WITH CATALOG ITEMS • NEW EQPT. BUILT TO COMMERCIAL STANDARDS • NEW EQPT. BUILT WITH COMM. PRACTICES BUT MIL-SPECS	• COMMON SUPPLIES • SERVICES • LOGISTICS PARTS • SUPPORT EQPT. • CONUS SYSTEMS • SYSTEMS	• SYSTEMS • SUBSYSTEMS • COMPONENTS • SOFTWARE	• "CONSUMER" • "INDUSTRIAL" • "RUGGEDIZED" • "MILITARIZED" • "SPECIAL MIL-SPECS"	• CONTRACTOR MAINTENANCE • WARRANTIES • "ORGANIC" WITH COMM. PARTS • "ORGANIC" WITH COMM. PRACTICES AND MIL PARTS

PRINCIPAL COMMERCIAL PRACTICES

Commercial practices, as we studied in depth about the Boeing 767 acquisition, have some significant differences from DoD acquisition practices. Here is a list of key commercial practices. They use functional requirements, and select sources based on past performance, quality of product, management, and financial strength. Protests are limited to personal entreaties, there being no process in the Uniform Commercial Code (UCC) for protests. "Best value" to the program is the selection criteria for a source, rather than lowest cost. An adapted Uniform Commercial Code is employed which is quite simple as compared to DoD contracts. Schedule is paramount, and resources -- in terms of money and people -- are planned to solve problems in an effort to hold schedule. The program manager has very great authority and responsibility. His review levels are very few -- 2 or 3 at most.

PRINCIPAL COMMERCIAL PRACTICES

- FUNCTIONAL REQUIREMENTS
- SELECTED SOURCES
- LIMITED PROTESTS - WORK CONTINUES
- "BEST VALUE" SELECTION VS "LOWEST COST"
- SIMPLIFIED CONTRACT FORM - ADAPTED UNIFORM COMMERCIAL CODE (UCC)
- ON-GOING REQUIREMENTS/COST TRADES
- SCHEDULE EMPHASIS - RESOURCES TO HOLD
- PROGRAM MANAGER AUTHORITY
- QUICK RESPONSE TO FIELD EXPERIENCE
- GREATLY REDUCED DOCUMENTATION
- SMALL SOURCE SELECTION TEAMS

CURRENT EXAMPLES OF USE OF COMMERCIAL PRODUCTS IN DOD SYSTEMS

The DoD has used commercial equipment to satisfy system and subsystem needs in many areas, some of which are shown on this chart.

For example, commercial aircraft have been used for the AWACS, the Airborne Command Post, the KC-10 refueler/transporter, Guardrail, and many more. The P&WA 203T and the CFM56, both commercial engines, are used on C-17 and the KC-135 respectively. The Carousel Inertial Navigation System, developed for airline service, has found acceptance in Air Force and Army systems.

The Navy has procured support ships to commercial standards from overseas shipyards. The Army has adapted the Chevy Blazer to meet its Commercial Utility Cargo Vehicle requirement, and almost half of the parts in the HUMMV are commercial.

Commercial test equipment and precision measurement equipment have historically been procured by the services when the environment in which they were to be used was suitable.

The common characteristics of these programs are a similarity between the functional requirements of the commercial and military user, compatibility of the environments (or the ability to ruggedize the commercial equipment at reasonable cost), and the ability of the commercial supplier to support the extended logistic requirements of the military.

POTENTIAL

CURRENT EXAMPLES OF COMMERCIAL PRODUCTS IN DoD SYSTEMS

- AIRCRAFT
- AIRCRAFT ENGINES
- INERTIAL NAVIGATION EQUIPMENT
- SHIPS
- VEHICLES
- COMPUTERS AND SOFTWARE
- TEST EQUIPMENT
- PRECISION MEASUREMENT EQUIPMENT
- COMMUNICATION EQUIPMENT

SUCCESSFUL WHEN

- FUNCTIONAL REQUIREMENTS SIMILAR
- ENVIRONMENTS COMPATIBLE
- SUPPORT POSSIBLE

MANY PROMISING COMMERCIAL AREAS
(A mix of rapidly and slowly changing technologies)

Our study does indicate many promising areas which are open to the potential increased use of commercial products as shown here. As you can see, these targets of opportunity vary from rapidly changing technological areas to some which are rather stable.

We studied two classes of products in depth, integrated circuits and computers, and believe there is a high potential for greater use of commercial products in these cases especially.

POTENTIAL

MANY PROMISING COMMERCIAL AREAS

(A MIX OF RAPIDLY AND SLOWLY CHANGING TECHNOLOGIES)

- SEMICONDUCTORS AND MICROCIRCUITS
- COMPUTERS AND SUPPORT SOFTWARE
- NAVIGATION EQUIPMENT
- COMMUNICATION EQUIPMENT
- TRANSPORTATION
- POWER
- ENVIRONMENTAL CONTROL - HEATING/COOLING
- OVERHAUL, MAINTENANCE, REPAIR, AND ADMINISTRATION
- HEALTH AND HABITABILITY

AREAS NOT SUSCEPTIBLE TO COMMERCIAL PRODUCTS

As shown here, the panel also found early in the session that there are some areas of military hardware unlikely or not susceptible at all as candidates for potential use of commercial products. However, some use in some subsystems, or on a component basis, may be possible and commercial practices may still be applicable.

POTENTIAL

AREAS NOT SUSCEPTIBLE TO COMMERCIAL PRODUCTS

- NUCLEAR PROPULSION
- CERTAIN FUELS
- COMBAT AIRCRAFT
- MISSILE SYSTEMS
- EXPLOSIVE MUNITIONS AND PROPELLANTS
- DESTRUCTIVE WEAPONS
- SPACE SYSTEMS
- RADIATION HARD EQUIPMENT

COMMERCIAL COMPONENTS AND PRACTICES STILL MAY BE APPLICABLE

INTEGRATED CIRCUITS (1)

In the case of integrated circuits, DoD currently represents about 8% of the total semiconductor market (in dollars) or just 1 or 2% in units. In addition, about $700 million of DoD semiconductor purchases already are commercial.

Also of interest is the fact that about 90% of the total military needs are purchased through prime contractors.

It is important to note that, in many cases, the chips and their production processes are identical, only the documentation packaging and testing are different.

INTEGRATED CIRCUITS

- DoD 1985 USE
  - ≈ $1.3B 'DIRECT' MILITARY SYSTEM USE
    ≈ 8% OF WORLDWIDE CONSUMPTION
  - ADDITIONAL ≈ $0.7B 'EXEMPT' MILITARY EQUIPMENT (ALREADY COMMERCIAL)
- PROCUREMENT
  - ≈ 90% BY EQUIPMENT CONTRACTORS
  - ≈ 10% DIRECTLY BY DoD
- CHIPS AND PRODUCTION PROCESSES ARE THE SAME (IN MOST CASES)

INTEGRATED CIRCUITS (2)

The issue here is: "How can DoD increase the use of commercial ICs to achieve the cost benefits while achieving with high confidence the requisite reliability?"

Today the military buys ICs for prices that are as much as 15 times that of functionally identical products built to commercial specifications. The primary difference is in the level of control and testing required by the government.

Even though mechanisms exist for the use of commercial ICs, uncertainty drives the selection of the most expensive product as the safest, easiest, course. MIL-STD-454 explicitly calls out the order of selection, starting with the most costly.

Military quality and reliability management philosophy was established at a time when the DoD was the major semiconductor user, components were relatively simple, and semiconductor physics rather poorly understood. Exhaustive testing was necessary.

Tremendous industry-wide gains have now been achieved in product quality and reliability - these advances are being driven largely by the demands of commercial IC customers. Many advances are being reported by manufacturers who are not current suppliers to the DoD. A key component of these improvements is statistical process control, which requires significant production volumes and quality feedback.

The DoD has the opportunity to link up with this industrial base and achieve substantial gains in system cost, quality, and performance.

Some of the quality data we reviewed was conflicting, but generally encouraging. However, good reliability data could not be found. By its nature, reliability testing is a simulation of reality, and field data takes years to collect...then it is often hard to isolate at the component level. The automative industry has studied the problem and has opted for a "ruggedized commercial" specification, rather than MIL-SPEC, for a very demanding under-hood environment. The reliability question is of vital importance in many military applications and, while we believe reliability goes with quality, additional data must be gathered to substantiate this.

POTENTIAL

INTEGRATED CIRCUITS

ISSUE: HOW CAN DoD INCREASE THE USE OF "COMMERCIAL" IC'S TO ACHIEVE THE COST BENEFITS, WHILE ACHIEVING—WITH HIGH CONFIDENCE—THE REQUISITE RELIABILITY?

INTEGRATED CIRCUIT CHARACTERISTICS

- CLASSES OF INTEGRATED CIRCUITS

— SOURCE CONTROL DRAWING DEVICES	$9-$10	APPROXIMATE AVERAGE SELLING PRICE
— JAN (MIL-M-38510)	$5-$8	
— 883 & MIL DRAWINGS	$2.50	
— RUGGEDIZED INDUSTRIAL	$0.60	

- COMMERCIAL INTEGRATED CIRCUITS HAVE MADE VERY SIGNIFICANT <u>QUALITY</u> IMPROVEMENTS OVER THE LAST 2-3 YEARS
  - MATERIALS
  - PROCESS CONTROL
  - PACKAGING
- WE BELIEVE THE RELIABILITY GOES WITH THE QUALITY, HOWEVER ADDITIONAL DATA MUST BE GATHERED TO SUBSTANTIATE THIS

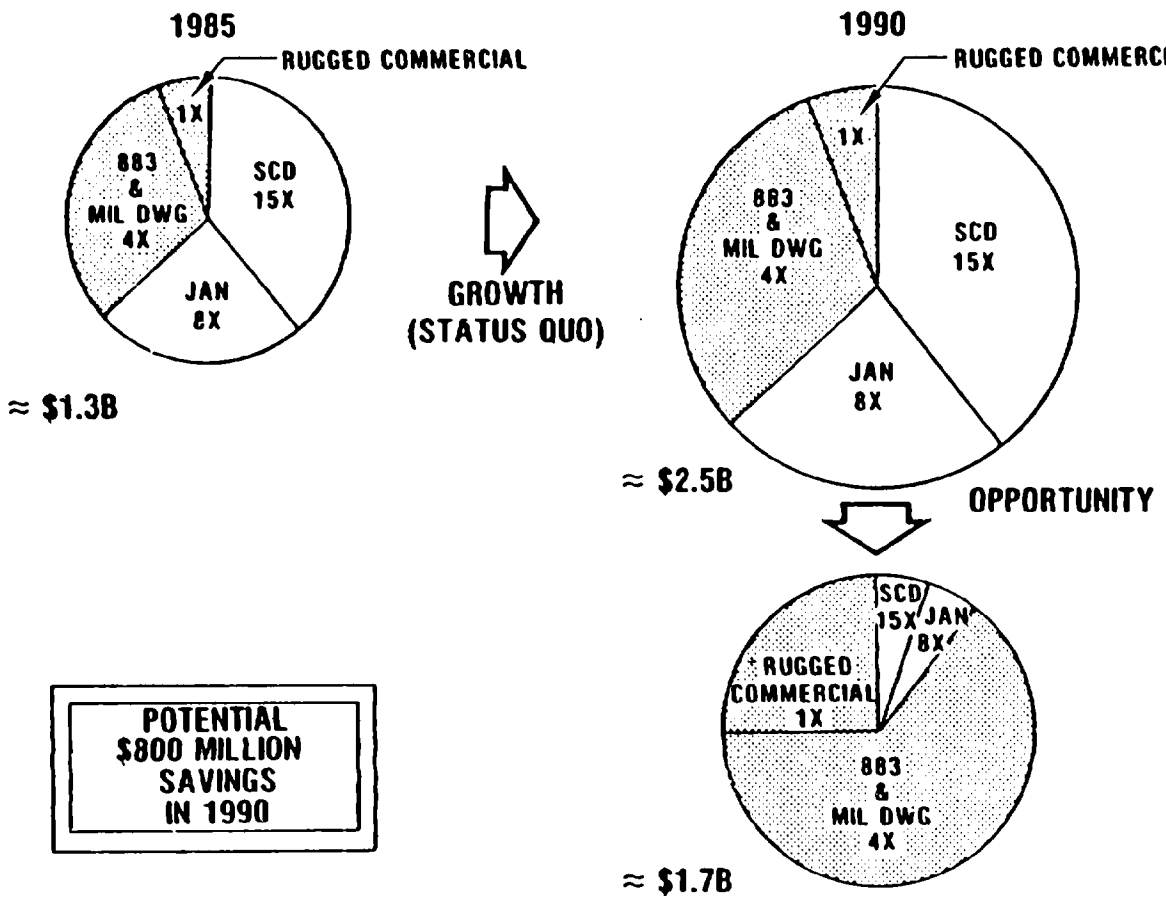
DoD INTEGRATED CIRCUIT PROCUREMENT

The relative uses and costs of the classes of devices are shown. Note that in 1985 the highest percentage of usage was from the more expensive classes. We believe this resulted from a perceived bias in the MIL-SPECS which demands the "best" part available, regardless of the requirement. In addition there is some distrust of recent technology advances in ruggedized industrial integrated circuits. We believe however, that the opportunity exists to reduce the use of the more expensive devices to only when the requirements demand. We also believe that ruggedized (and less costly) industrial devices could be more widely used in DoD applications. Also, commercial design and production process certification procedures must be adapted by DoD to accommodate requirements for small lots of many different application-specific designs.

The combination of these factors will result in significant annual savings.

POTENTIAL

DoD INTEGRATED CIRCUIT PROCUREMENT



POTENTIAL
$800 MILLION
SAVINGS
IN 1990

INTEGRATED CIRCUITS, RECOMMENDATIONS TO REMOVE IMPEDIMENTS

The Panel recommends the following, relative to integrated circuits, to accomplish the potential savings. We need to stream-line the MIL drawing system and create a cross-reference index to minimize source control drawings. A joint military/industrial IC specification should be adapted (based on the commercial specification) and appropriate integrated circuit component classes selected for application. The joint integrated circuit technical specification should be adopted DoD-wide for use in selected environments.

Current and future equipment developers must be required to identify the minimum IC component class to match the operational and environmental use environments, including the use of Industrial Plastic Encapsulated ICs. A reliability data base and vendor feedback system need to be developed.

Finally, MIL-STD-454 needs to be rewritten to delete the order of precedence for IC selection and to reflect other changes above. Also, a guidebook which describes IC selection is needed for program offices and other procurement activities. The key is to give the program manager the data and let him decide which IC parts satisfy his real requirements. To prevent unnecessary turmoil during the implementation of these recommendations, we suggest a measured and systematic approach. Although the total elimination of the order of precedence remains a good long range goal it should not occur until other actions have been taken that will allow its orderly removal. Action on the first seven of these items should be timed to allow modification of the order of precedence to begin 1 January 1988. Implementation should be consistent with the Semiconductor Applications Guidebook. After experience is gained with this two tiered precedence list, an evaluation for total removal of the precedence preference should be done.

POTENTIAL

INTEGRATED CIRCUITS RECOMMENDATIONS TO REMOVE IMPEDIMENTS

- STREAMLINE MIL DRAWING SYSTEM
- PREPARE INDUSTRIAL IC SPEC AND SPECIFY ENVIRONMENTS FOR USE
- USE INDUSTRIAL PLASTIC ENCAPSULATED ICs IN SELECTED APPLICATION
- CERTIFY AND AUDIT IC SUPPLIERS AND PROCESSES
- REVITALIZE RELIABILITY DATA BASE
- DEVELOP QUALITY/RELIABILITY REPORTING SYSTEM
- DEVELOP SEMICONDUCTOR APPLICATIONS GUIDEBOOK
- MODIFY MIL-STD-454 TO MAKE JAN DEVICES AND MIL DRAWING DEVICES OF EQUAL PRECEDENCE, WITH MIL-STD-883C DEVICES A SLIGHTLY LOWER PRECEDENCE

COMPUTERS AND SOFTWARE

The issue here is similar to that of ICs. Can DoD increase the use of commercial computers and software?

For some time, both DoD and industry have recognized the benefits of commercial equipments. The range of military operating environments, however, has normally driven the requirement specifications away from commercial (or modified commercial) to the only alternative range of formalized requirements - MIL-SPEC. The MIL-SPEC performance has at times been higher than necessary for the real operating environment - and definitely more costly.

The DSB found some hard examples, through a study of 17 cases, where the acquisition strategy did ask the question: "Is something less than MIL-SPEC available to meet the specific operational needs?"

Industry responded with innovations that ranged from special military transit cases for commercial computers, to reasonable cost, commercial modifications such as cabinet/card stiffeners and sealers. The technical approach to most of these innovations was not to alter the basic commercial components but instead to add environmental protection or mechanical stress protection, i.e., they improved the "COCOON," not the contents.

One example is radar systems which historically have been developed using full MIL-SPEC requirements. The latest ballistic Missile Early Warning System - the AF Pave Paws - will use a largescale commercial computer housed in an environmentally controlled facility. Similarly, a ship-borne intelligence gathering radar system utilized commercial computers with only minor mechanical additions for the high seas environment.

Numerous examples of commercial equipment, configured in vans for field mobility, were noted. The Army Combat Supply Support System, with standard IBM mid-size computers modified to withstand transport stress, is one such example. Another is the van system for the AF Deployable Combat Support System - Burroughs B25 microcomputers and other various field intelligence and logistics systems.

The Marine Corps started with a MIL-SPEC requirement for field data entry systems (e.g., sea/air transport, water submersibility to 3 feet, landing beach/bivouac environment), but was able to competitively acquire an unmodified commercial system instead (i.e., IBM Series I). The innovation which allowed this acquisition was a foam-lined, sealed transit case, weighing 30 lbs., similar to proven Navy plastic cases.

POTENTIAL

COMPUTERS AND SOFTWARE

ISSUE: HOW CAN DoD INCREASE THE USE OF "COMMERCIAL" COMPUTERS AND SOFTWARE TO ACHIEVE THE COST BENEFITS WHILE ACHIEVING WITH HIGH CONFIDENCE THE REQUISITE RELIABILITY?

BACKGROUND
- 17 CASES STUDIED
- ACQUISITION STRATEGY ALLOWED INDUSTRY BID OF LESS THAN MIL-SPEC
- MILITARY OPERATIONAL ENVIRONMENT WAS MORE SEVERE THAN COMMERCIAL

CASE CATEGORIES
- INTELLIGENCE AND EARLY WARNING RADARS
- ARMY MOBILE COMBAT SUPPORT
- NAVY SHOREBASED COMM SUPPORT NETWORK
- MARINE DEPLOYABLE FIELD DATA ENTRY
- GROUNDBASED SATELLITE CONTROL—AIR FORCE

CONCLUSION: DoD CAN ACHIEVE BOTH COST AND RELIABILITY BENEFITS, WITH CONFIDENCE, GIVEN THE SAME CAREFUL APPROACH IS TAKEN AS IN THE PRECEDING IC CASE

COMPUTERS AND SOFTWARE

Finally, utilizing commercial software has also provided major cost and development time savings as in the case of the Navy ASHORE program and the real time satellite control systems of GPS and the AF Satellite Control Facility (SCF). Both of the latter cases used, intact, a large existing IBM operating system.

These cases point out the practicality of applying commercial systems where MIL-SPEC "only" requirements have been used in the past.

Again, the conclusion is similar to that for ICs...we can increase the use of commercial computers and software.

EXAMPLE OF BROADENED CLASS OF MIL ENVIRONMENTS

There is currently a wide gap between commercial system specifications, on the left, and full MIL-SPEC systems, on the right. There is also a large gap in price, which increases exponentially as you go to the right. In reality, there is a full spectrum of applications and requirements, several of which are desirable to commercial users, and acceptable for many military applications. Establishing standard performance levels, such as those shown here, would greatly enhance the development of commonality between commercial and military systems. The payoff is lower costs and better fit with specific applications...that is, reduced "over specification."

A conclusion at this point seems obvious. DoD can achieve both cost and reliability benefits, with confidence, through use of a more stratified approach to environment and reliability, constructed and applied with discipline.

USE OF COMMERCIAL COMPONENTS IN MILITARY EQUIPMENT

POTENTIAL

EXAMPLE OF BROADENED CLASS OF MIL ENVIRONMENTS

	PARAMETER	COMMERCIAL	INDUSTRIAL	RUGGEDIZED	MILITARIZED	MIL-SPEC
REQUIREMENTS	Temperature					
	Operating	-10 to 40°C	0 to 60°C	0 to 55°C	-40 to 55°C	-54 to 55°C
	Nonoperating	0 to 55°C	0 to 55°C	-62 to 85°C	-62 to 85°C	-62 to 85°C
	Vibration	0.07G, 17-150 Hz 0.035G, 150-500 Hz	0.07G, 17-150 Hz 0.037G, 150-500 Hz	2.0G, 20-2,000 Hz	2.0G, 20-2,000 Hz	2.0G, 20-2,000 Hz
	Shock	0.5G, 10 ms	0.5G, 10 ms	15G, 11 ms	15G, 11 ms	15G, 11 ms
	Humidity	8% to 80% RH Noncondensing	8% to 80% RH Noncondensing	95% RH Noncondensing	95% RH Noncondensing	100% RH Condensing
	Altitude	7,000 ft	7,000 ft	15,000 ft	50,000 ft	50,000 ft
	Input Power	Commercial	Commercial	MIL-STD-704D and exceeds MIL-STD-4158	MIL-STD-704D and exceeds MIL-STD-4158	MIL-STD-704D
	EMI/EMC	None	None	Per MIL-STD-461	Per MIL-STD-461	MIL-STD-461
OPTIONS	Nuclear	None	None	Tactical Levels	Tactical Levels	Tactical or strategic levels
	TEMPEST	Per NACSIM-5100 and NACSIM-5201	Per NACSIM-5100 and NACSIM-5201	Per NACSIM-5100 and NACSIM-5201	Per NACSIM-5100 and NACSIM-5201	Per NACSIM-5100 and NACSIM-5201

CONCLUSION: DoD NEEDS TO TAKE MORE STRATIFIED APPROACH TO ENVIRONMENT

MIL-SPEC VS COMMERCIAL COMPARISONS

In order to provide quantitative data regarding the differences between MIL-SPEC and commercial equipment, we identified several commercial and MIL-SPEC systems with essentially the same functional requirements. These included a MIL-SPEC design of a Sony color monitor, a classified data processor, a militarized upgrade to Guardrail special mission electronics, a commercial model of the NSA secure phone, and its militarized equivalent, the military version of DEC's PDP 11/44, a remote sensor, and the Carousel Intertial Navigation system developed for the airlines.

As this chart shows, the cost of military equipment can be from 2 to 10 times more expensive. Acquisition time can be much longer, and reliability may be no better -- indeed in two cases it was much worse. In several cases, the size of the militarized equipment is significantly smaller, reflecting weight and volume constraints in weapon systems. The continuing trend of miniaturization in commercial electronics should lessen the need to repackage to meet military needs.

We believe this data indicates the range of cost and schedule savings possible, without sacrifice of reliability when DoD can fulfill system and subsystem needs with commercial products.

POTENTIAL

MIL-SPEC VS COMMERCIAL COMPARISONS (FOR SIMILAR QUANTITIES)

MIL-SPEC TO COMMERCIAL RATIO

ITEM	COST	ACQ TIME	RELIABILITY	SIZE
SONY COLOR MONITOR	8X	–	SIMILAR	SAME
DATA PROCESSOR (CLASSIFIED)	9X	3X	WORSE	1/6
GUARDRAIL V/IV	2X	2X	SIMILAR	SAME
SECURE PHONE STUII/STUIII	5X	4.5X	–	6X
STU III	4X	1.5X	SIMILAR	LARGER
COMPUTER PDP 11/44	8X	–	WORSE (11X)	1/8
REMOTE SENSOR	4.5X	–	SIMILAR	1/4
INERTIAL NAVIGATOR CAROUSEL/ASN 132	1.7X	–	WORSE (5X)	

POSSIBLE GAINS

Possible gains are apparent from our study...as shown here... specifically in integrated circuits and other electronic equipments.

The panel concludes that through techniques similar to those discussed for ICs, significant gains are possible for all commodities. The direct cost savings from using commercial products is potentially large, but the potential cost savings from adopting commercial buying practices is even larger. However, the shift in direction to commercial practices won't be easy.

DoD has a long history of "make to MIL-SPEC" and indeed this is its basic way of doing business. It is to the credit of DoD that there are many current examples of commercial products and processes in use. To further aid DoD in pursuit of commercialization the process impediments need to be identified and eliminated. Alleviating these process impediments will not be easy.

POSSIBLE GAINS

INTEGRATED CIRCUITS

- RUGGEDIZED COMMERCIAL COST 5 TO 10 TIMES LESS THAN MIL-SPEC
- ESTIMATE 25% OF DoD NEEDS COULD BE SATISFIED BY SUCH DEVICES

ELECTRONIC EQUIPMENTS (AND OTHERS)

- WHERE COMMERCIAL MEETS REQUIREMENT
  - DEVELOPMENT COST AVOIDED
  - PRODUCTION COST 2 TO 10 TIMES LESS
  - SCHEDULE SAVING MORE THAN A FACTOR OF 2

CONCLUSION

- DIRECT COST SAVINGS FROM USING COMMERCIAL PARTS AND EQUIPMENT POTENTIALLY LARGE

BUT

- IMPACT ON DoD WAY OF DOING BUSINESS IS ALSO LARGE
- IT WON'T BE EASY

SPECIFIC PROCESS IMPEDIMENTS

As things now exist, there are burdensome impediments to the acquisition process, which greatly discourage the use of commercial equipment and practices. Despite these impediments, the DoD has demonstrated significant commitment to procuring commercial equipment in cases where operational requirements and supportability concerns could be satisfied. For example of 556 active procurement programs in the Army, 182 are being satisfied with non-development items. To greatly increase the use of commercial systems, subsystems, and components it is essential that relief of the impediments be addressed.

The prevalent issues and our recommendations for overcoming these process impediments will be addressed in the categories indicated on this viewgraph (Requirements Process, MIL-SPEC Process, Procurement Process, Logistics Process, the Upgrade Process, and the Program Management Process).

Our intent is to shift from the current burdensome - "discouragement" environment to one that will encourage the use of commercial products.

SPECIFIC PROCESS IMPEDIMENTS

- REQUIREMENTS PROCESS
- MIL-SPEC PROCESS
- PROCUREMENT PROCESS
- LOGISTICS PROCESS
- THE UPGRADE PROCESS
- PROGRAM MANAGEMENT PROCESS

REQUIREMENTS PROCESS

In looking at the current requirements process we realize that we have evolved in a rational way, the use of specifications and standards to give detail to the product or service we are attempting to procure. This application of specifications and standards normally occurs well in advance of the solicitation effort. This process often leads to asking for a solution encumbered by specifications, and eliminates opportunities for a commercial product solution. Streamlining is a positive initiative currently underway which will improve the solicitation process, however, a "performance" description model, we feel, offers further improvement.

As always, the first step is describing the "need," but we suggest doing it in a slightly different manner. Broad functional and performance requirements would be defined withholding "how to" specifications at this point in time. In this manner, responders would have the first opportunity to offer how they would envision satisfying the need and would be more open to suggesting tradeoffs. The tradeoff deliberations would encompass all of the cost, performance, and supportability issues, and would also allow for a more detailed and free exchange. In the case of several responders, the customer would have the advantage of considering multiple solution options.

These deliberations would consider commercial versus militarized solutions; analysis of existing product performance (if available and proven); fully discuss the capability to do early testing; and, consider concepts for support from cradle to grave.

We recommend that the requirements process be changed to focus on a "needs" description, with a requirement to consider commercialization.

PROCESS CHANGES

REQUIREMENTS PROCESS

ISSUE: CURRENT REQUIREMENTS PROCESS RESULTS IN SPECIALIZED PRODUCTS

CONCLUSION

"NEEDS" MUST BE DESCRIBED IN BROAD FUNCTIONS AND PERFORMANCE (NOT IN MIL-SPEC TERMS) EARLY ON IN THE DEFINITION PHASE. THE TRADE OFF DELIBERATIONS BETWEEN OPERATORS AND ACQUIRERS SHOULD INCLUDE A PREFERENCE FOR COMMERCIALIZATION

THE TESTS FOR COMMERCIALIZATION USAGE SHOULD INCLUDE:

- COST/PERFORMANCE
- HAS OR CAN PERFORMANCE BE PROVEN
- METHOD OF LOGISTICS SUPPORT
- EARLY TESTING IN PROPER ENVIRONMENT
- MODIFICATION

THE CONTRACTOR RESPONSES WOULD OFFER THE "HOW TO" AND THE "AVAILABILITY" INFORMATION

RECOMMENDATIONS

CHANGE THE REQUIREMENTS PROCESS TO FOCUS ON A "NEEDS" DESCRIPTION, WITH A REQUIREMENT TO CONSIDER COMMERCIALIZATION

MIL-SPEC PROCESS

Military specifications and standards have been criticized as adding cost and inhibiting use of commercial products. While that is a possible result, specifications and standards are usually necessary to describe products for acquisition. They are used extensively by industry, and if properly written and appropriately tailored, can facilitate purchase of commercial products.

To allow for and encourage proper use, some changes are needed.

Emphasis in FAR, DFAR, and DoD Directives must be placed on the desirability of describing required performance, or selecting product descriptions which result in purchase of commercial products.

A fast-track review of specifications and standards is needed in areas of high commercial potential. The object should be to replace military documents with non-Government standards or simplified Commercial Item Descriptions where appropriate.

Too frequently, specifications include detail which inhibits consideration of commercial alternatives and limits the program manager's ability to make smart tradeoff decisions. Specifications should describe what is needed rather than how to achieve performance. The Air Force's "MIL-PRIME," and the Construction Guide Specifications used by the Army and Navy are examples of "fill-in-the-blanks" type specifications which achieve this goal while providing maximum tailoring flexibility. The MIL-PRIME specification for landing gear is 13 pages long and contains two references. It replaces 13 specifications with their 256 references previously used to buy landing gear. An appendix to the MIL-PRIME specification contains 170 pages of "lessons learned" and guidance regarding application of requirements. Because of the clear benefits, we recommend that development and use of this kind of specification be accelerated and adopted DoD-wide.

Improving the body of specifications and standards, and optimizing DoD's use of commercial products, require both DoD and industry involvement. While some mechanisms exist, industry participation must be reinvigorated through greater use of industry/DoD working groups, increased participation by DoD personnel in non-Government standards activities, and appropriate coordination of specifications and standards with industry. Both manufacturers and integrating contractors should be involved in these efforts. Feedback systems need regular publicity and new ideas must be explored.

DoD development, update, and delivery of specifications and standards is cumbersome and management information is sparse. Document tiering within specifications results in

PROCESS CHANGES

MIL-SPEC PROCESS

ISSUE: IT HAS BEEN ALLEGED THAT SPECIFICATIONS AND STANDARDS DRIVE COSTS AND INHIBIT PURCHASE OF COMMERCIAL PRODUCTS

CONCLUSION: SPECIFICATIONS AND STANDARDS ARE NECESSARY—BUT—THEY MUST BE PROPERLY WRITTEN AND APPROPRIATELY APPLIED; THE SYSTEM NEEDS ADEQUATE AUTHORITY AND RESOURCES TO ENSURE SAME

RECOMMENDATIONS:

- REVIEW AND REVISE FAR/DFAR, AND DIRECTIVES FOR SMART USE OF SPECIFICATIONS
- REPLACE SPECIFICATIONS AND STANDARDS WITH NON-GOVERNMENT STANDARDS OR COMMERCIAL ITEM DESCRIPTIONS
- DEVELOP AND USE FILL-IN-THE-BLANKS SPECIFICATIONS
- REVITALIZE INDUSTRY INVOLVEMENT
- AUTOMATE DEVELOPMENT, UPDATE, DELIVERY, AND INFORMATION SYSTEMS
- STRENGTHEN THE MANAGEMENT OF THE DEFENSE STANDARDIZATION PROCESS

contractual imposition of references without conscious program management decisions. While current DoD "streamlining" initiatives address this issue, automation of systems to ensure availability of good specifications is long overdue.

Improvement of the specifications and standards process has traditionally fallen into the trap of being part of the swamp that didn't get drained because we were too busy fending off the alligators. Priorities and resources must be allocated to this job before we drown in the swamp.

PROCUREMENT PROCESS

These next two charts will review the changes required in the procurement process to facilitate commercialization. Those recommendations without an asterisk can -- and should -- be done as soon as possible. We believe those with one asterisk can be accomplished by DoD with some degree of Congressional help -- and DoD should move out here also. Finally those with two asterisks require legislative change to fully implement -- but, again, DoD should take the initiative. To begin with then:

1. We noted that there is no place in FAR or the Defense FAR Supplement which provides guidance on the use of commercial products or procedures. Therefore, we recommend a single section be established which provides policy and procedural guidance. The thrust of this section will be to state a clear preference for commercial products when they are able to meet mission requirements.

2. Secondly, we note that the major inhibitor to the use of commercial procedures is the so-called "fairness" doctrine which dictates that <u>all</u> contractors have the right to submit a proposal on any DoD requirement. We believe the DoD should have the right to establish selected source lists based upon capability, the quality of their product and their past performance track record.

3. Next, related to the previous point, we believe that the DoD should have the right to base its selection of sources on "value" vs the current strong reliance on price as the predominant factor.

4. The fourth recommendation focuses on the prime contractor and his major subcontractors. We recommend that clauses be placed in their contracts to provide strong incentives for them to find applications for commercial components within their designs.

5. We have also found that there is an unreasonably large difference in the number of data items required by commercial customers and that required by Defense.

Typically, commercial customers are very careful to weigh the benefits of a data item before deciding to acquire it. This results in a relatively low number of data items being required. For example, in the case of the 767 aircraft, on a typical item the supplier provides only 6 items of data on a "revise as required" basis.

PROCESS CHANGES

PROCUREMENT PROCESS

ISSUE: A NUMBER OF IMPEDIMENTS TO COMMERCIALIZATION EXIST

RECOMMENDATIONS:

1. CLEARLY STATE IN FAR, THE PREFERENCE FOR COMMERCIAL PRODUCTS AND PROCEDURES WHERE THEY MEET THE NEED OF THE AGENCIES BY ESTABLISHING IN ONE FAR SECTION; POLICY, GUIDANCE AND PROCEDURES.

**2. ESTABLISH BID LIST OF SELECTED COMPETENT SOURCES
   - FINANCIAL CAPABILITY, QUALITY OF TECHNICAL PERSONNEL, FACILITIES, COMMITMENTS, PAST PERFORMANCE, ETC.

*3. BASE SOURCE SELECTION ON "VALUE" VS "LOW RESPONSIBLE OFFER"

4. DEVELOP A SERIES OF CONTRACTUAL INCENTIVES TO MOTIVATE THE EXPANDED USE OF COMMERCIAL PRODUCTS AND PRACTICES SUCH AS EXTRA RECOGNITION IN SOURCE SELECTION, USE OF AWARD FEE POOLS AND OTHER INCENTIVE PAYMENTS

*COULD USE CONGRESSIONAL HELP
**REQUIRES LEGISLATIVE CHANGE

On the other hand, the same supplier -- on the identical component -- furnished 42 data items for the Air Launched Cruise Missile, some of which are required on a routine, periodic basis.

We believe that a considerable reduction in DoD data requirements can be accomplished. Therefore, we recommend that DoD place increased emphasis on limiting contract data requirements. Further, we recommend that DoD carefully review all standard data requirements and work with Congress to eliminate any legislated data requirement which is of questionable value.

6. Our next recommendation is in concert with the Packard Commission statement that DoD should protect the patent and technical data rights of its suppliers. We believe that the DoD should have all rights necessary for the operation and maintenance of its equipment. Further, DoD should have the right to license others to use this data on its behalf. Obtaining technical data rights to increase competition for reprocurement and space parts is in DoD's interest. However, for commercial products, the best way to do this is through license and cross licenses. Most commercial manufacturers prefer this approach to licensing the government, because they maintain all rights to the data. Additionally, in the event that the commercial supplier discontinues an item, for whatever reason, the data rights for that item would flow to the government.

7. Next, we believe that, for selected procurements, contractual terms and conditions should be based on the Uniform Commercial code expanded as necessary for administrative and product support requirements. A typical military contract (ALCM) contains 214 general and special provisions. One hundred and forty-four of these provisions flow down to subcontractors. Commercial terms and conditions typically vary from 33 provisions for low value items, to 45 provisions plus 12 product support requirements for high value systems, such as flight control computers. It is essential that DoD tailor its practices to place increased emphasis on commercial terms and conditions.

8. Finally, DoD protest procedures should be changed by Congress to require that protests be filed with the contracting officer for resolution. Only in the event that the contracting officer cannot satisfy the protestor should the protest go to the GAO. Also, the "stay provision" of CICA should be modified to prevent programs being held up prior to validation of the protest. We recommend allowing a 30 day response time for the contracting officer and a 60 day response time for the GAO.

PROCESS CHANGES

PROCUREMENT PROCESS (CONT)

*5. SUBSTANTIALLY REDUCE PROGRAM DOCUMENTATION REQUIREMENTS

*6. PROTECT PATENT AND DATA RIGHTS OF CONTRACTORS

**7. TERMS AND CONDITIONS BASED ON UNIFORM COMMERCIAL CODE—EXPANDED TO ACCOUNT FOR ADMINISTRATIVE AND PRODUCT SUPPORT REQUIREMENTS

**8. TAILOR PROTEST PROCEDURES
- TO REQUIRE PROTESTS TO BE FILED WITH CONTRACTING OFFICER PRIOR TO SUBMITTAL TO GAO (MODIFY CICA)
- MODIFY PROTEST "STAY PROVISION" OF CICA

*COULD USE CONGRESSIONAL HELP
**REQUIRES LEGISLATIVE CHANGE

COMMERCIAL PRODUCT AVAILABILITY

A frequently raised issue is "how do government buyers/PM's know what commercial products are available to meet needs." There is a real requirement to make such product data available. But the prospect of viable DoD-wide data bank on all prodcuts is unrealistic.

It is recommended that existing data bases be publicized -- including microfilm based commercial vendor catalogs, and Air Force, Army, Navy and DLA data bases. New data bases should be established only for product categories where there is a demonstrated need. Such data bases must include performance data, and -- most importantly -- have objective oversight in reviewing what is and is not included. Data bases should include characteristics of performance, quality, reliability and environmental factors.

Prime contractors should take the lead to provide subtier data bases.

PROCESS CHANGES

COMMERCIAL PRODUCT AVAILABILITY

ISSUE: HOW DO GOVERMENT BUYERS/PMS KNOW WHAT COMMERCIAL PRODUCTS ARE AVAILABLE TO MEET NEEDS?

CONCLUSION: DATA MUST BE MADE AVAILABLE, BUT DoD-WIDE, COMPREHENSIVE DATA BASE IS UNREALISTIC.

RECOMMENDATIONS:

- PUBLICIZE EXISTING DATA BASES
  - COMMERCIAL MICROFILM BASED VENDOR CATALOGS
  - AIR FORCE, NAVY, AND DLA DATA BASES
- ESTABLISH NEW DATA BASES WHERE THERE IS A DEMONSTRATED NEED
  - FOR SPECIFIC PRODUCT CATEGORIES
  - INCLUDE PERFORMANCE DATA
  - OBJECTIVE OVERSIGHT
- DATA BASES SHOULD INCLUDE CHARACTERISTICS
  - PERFORMANCE
  - QUALITY
  - RELIABILITY
  - ENVIRONMENTAL
- RELY ON PRIME CONTRACTORS FOR SUBTIER DATA BASES

LOGISTICS AND SUPPORTABILITY

The potential impediments to commercialization in the area of logistics and supportability are a very real concern. Generally, military systems remain in the inventory two to four times longer than commercial ones. Commercial support cannot be assumed in the out years, or in remote or combat situations. As a result, initiatives to expand the use of commercial items cannot be insensitive to the importance of logistics and supportability.

Decisions to buy commercial products must be based on careful assessments that assure each item will meet DoD mission requirements, is supportable in its intended military use, and is the most cost effective way to accomplish that mission based on the expected life of the equipment. Such matters as configuration control, interchangeability, proliferation, safety, warranty administration, maintainability, interoperability, and data for maintenance, training, and reprocurement, as appropriate, are particularly important when considering the purchase of commercial components. As a means for ensuring these matters get timely and adequate consideration, acquisition planning must ensure logistics and supportability concerns are satisfied with reasonable assurance before a decision is made to buy commercial products.

Solicitations for acquiring commercial products must require offerers to propose and commit to logistics planning and support that will ensure adequate performance over the expected life and environments in which the product must perform.

Warranties cannot be relied upon to overcome all impediments to buying commercial; however, the Services' current capabilities to administer warranties need to be enhanced to take advantage of commercial warranties. Of course, standard commercial warranties may need to be contractually adjusted to make them operable in actual operating environments. Warranties, like all other logistics concerns, require careful up-front consideration. In addition, the Services need to provide improved field performance feedback data to commercial suppliers over and above warranty data, to facilitate those suppliers' product improvement efforts.

Innovative approaches to logistics and supportability must be developed that will facilitate the acquisition of commercial products to the extent possible.

Not all military needs can be satisfied by using commercial products; but dealing with the potential impediments as discussed here will eliminate some of the barriers to buying commercial.

PROCESS CHANGES

LOGISTICS AND SUPPORTABILITY

ISSUE: THERE ARE IMPORTANT LOGISTICS AND SUPPORTABILITY REQUIREMENTS WHICH MUST BE MET BY COMMERCIAL PRODUCTS

- SPECIAL MILITARY NEEDS AND OPERATING ENVIRONMENTS
- NEED FOR LONG LIFE OF MILITARY EQUIPMENT

RECOMMENDATION: REQUIRE CAREFUL LOGISTICS ANALYSIS AND PLANNING PRIOR TO BUYING COMMERCIAL PRODUCTS

- CONTRACTOR/DoD INTERACTIVE PLANNING
- CONTRACTOR COMMITMENT
- DoD WARRANTY PLAN AND ADMINISTRATION
- IMPROVED FIELD PERFORMANCE FEEDBACK TO CONTRACTORS

THE UPGRADE PROCESS

Marketplace competition drives the commercial world to upgrade and replace products frequently. On the other hand, the planned service life for military items can range to 20 years or longer. The product improvements which occur naturally in the commercial marketplace can provide enhanced military capabilities at relatively low cost if properly taken advantage of by DoD.

The commercial world avoids what could otherwise be a logistics nightmare by using component and subsystem interchangeability. The Boeing 707 and IBM Series One Computer are examples of systems with a long life that are fully supportable.

Shifting to "standard interface specifications", where the environment allows, will enable greater use of "Preplanned Product Improvements (P^3I)"; and adapting to commercial interface specifications, when relevant, will ensure continued benefits of the commercial marketplace.

THE UPGRADE PROCESS

ISSUE: THE COMMERCIAL WORLD UPGRADES ITS EQUIPMENT MORE FREQUENTLY THAN THE DoD

RECOMMENDATIONS:

1. THE DoD SHOULD SHIFT TO GREATER USE OF "STANDARD INTERFACE SPECIFICATIONS" TO ALLOW FOR "PREPLANNED PRODUCT IMPROVEMENTS" (P^3I)
2. THE DoD SHOULD ADOPT COMMERCIAL INTERFACE SPECIFICATIONS WHENEVER RELEVANT
3. THESE SAME PRINCIPLES APPLY TO SOFTWARE AREAS

PROGRAM MANAGEMENT

The program manager and his staff are keys in the acquisition process. If given the proper authority, they can properly influence the expanded use of commercial products.

Although the services are enhancing the Program Manager's authority and capability, this initiative needs to continue to receive the highest priority. The related Packard Commission recommendations will, if adopted, substantially improve the authority of DoD's program managers and aid significantly in further commercialization.

DoD must, however, enhance program management's awareness of the benefits of using commercial products; what is commercially available; and, how these products can be acquired. The program manager and head of the contracting agency are particularly key and need to work together to incentivize prime contractors to use commercial products early in the program requirements definition process.

PROCESS CHANGES

PROGRAM MANAGEMENT

ISSUE: GOVERNMENT PROGRAM MANAGER AND HIS STAFF ARE KEY TO EXPANDED COMMERCIALIZATION USAGE

CONCLUSIONS:

- THE SERVICES ARE ENHANCING PM'S AUTHORITIES AND CAPABILITIES AND THIS SHOULD CONTINUE
- MANY OF THE ISSUES IDENTIFIED BY THE PACKARD COMMISSION RELATIVE TO PM ROLE DIRECTLY SUPPORT COMMERCIALIZATION
  - WORK IS UNDERWAY TO ADDRESS

RECOMMENDATIONS:

- PROGRAM MANAGERS AND COMMODITY MANAGERS MUST BE BETTER TRAINED REGARDING THE BENEFITS OF COMMERCIALIZATION AND HOW TO IMPLEMENT
- PM AND HEAD OF CONTRACTING ACTIVITY MUST WORK TOGETHER TO INCENTIVIZE USE OF COMMERCIALIZATION
- PM MUST INCENTIVIZE POTENTIAL PRIMES TO USE COMMERCIALIZATION IN THEIR BIDS

PILOT PROGRAMS

To implement many of these recommendations, we believe the services should select a series of pilot programs --ranging from "as is" commercial items through all or parts of full military equipments-- to demonstrate the use of commercial practices and validate benefits to the DoD. Legal and regulatory exemptions will be required for many of these programs.

Three types of programs should be considered as follows:

1. Purchase of off-the-shelf commercial products
2. Use of commercial components in military systems
3. Use of commercial practices to develop military systems

The services are best qualified to identify and implement such programs.

Now, if one looks back upon the numerous changes we've recommended, one realizes that there remain potential pitfalls to which we must be sensitive.

PROCESS CHANGES

PILOT PROGRAMS

ISSUE: LEGISLATION DISCOURAGES (OR PROHIBITS) MANY AREAS OF COMMERCIAL PRACTICES; WAIVERS ARE REQUIRED

RECOMMENDATION:

- ESTABLISH A SERIES OF PILOT PROGRAMS TO DEMONSTRATE THE USE OF COMMERCIAL PRACTICES AND VALIDATE BENEFITS TO DoD
  - SEEK LEGAL AND REGULATORY EXEMPTIONS
  - ESTABLISH PERFORMANCE CRITERIA
  - MEASURE PROGRESS AGAINST CRITERIA FOR VALIDATION
- SERVICES TO SELECT AND IMPLEMENT SPECIFIC EXAMPLES

RISK AREAS

As with all new ventures, there are certain risks associated with military use of commercial practices and products. The "American Way" has demanded, and provided for, full and open competition, socioeconomic adjustments, and availability for redress of perceived wrongs in the government contracting proce: Some changes in policy and law may be required.

Primary to the downside risk is the lack of full data that can currently be analyzed in making the commercialization decision. Thus, well thought out implementation plans, data gathering, pilot programs and periodic assessment, or "going slowly," is called for when the depth of data is shallow.

Misapplication of the recommendations is always a risk. Beginning with a small number of activities and growing as people become trained in the new process is recommended.

Another potential problem is the long term logistic support of commercial products used in military applications. The military retains equipment in its inventory much longer than industrial functions. This can lead to the commercial product going out of production, non-availability of replacement parts, and no technical data available to the government for reproducing or reprocuring the failed part. If not properly planned for, these can be serious issues -- so special care is required to reduce this risk.

In the integrated circuit area, and potentially elsewhere, we are currently very highly dependent on offshore products and components. The recommended change to allow the program manager the flexibility to choose the appropriate grade of integrated circuit for his operational and environmental needs will reduce the number of these devices which currently require final onshore assembly, from about 25 percent of DoD needs today (approximately 2 percent of industry volume) to about 5 percent of DoD needs by 1990 (less than 1 percent of industry volume). This will somewhat further increase our offshore dependency. However, we believe overspecifying product quality is not the best solution to this problem. Another DSB study, led by Norm Augustine, is addressing this issue in a far broader context.

Finally, we are concerned about resistance to these changes both inside and outside of the Department, and we urge persistance in the implementation of our recommendations.

Our evaluation of the risk, endorses the use of pilot programs and obtaining further data to support the final conclusions. There, of course, is risk in every venture, yet we see it as manageable in the increasing use of commercialization.

RISK AREAS

ISSUE: THERE ARE POTENTIAL RISKS TO INCREASED COMMERCIALIZATION

AREAS OF CONCERN

- DEPTH OF DATA TO SUPPORT CONCLUSIONS
  - WELL THOUGHT OUT IMPLEMENTATION PLANS (INCLUDING DATA GATHERING, PILOT PROGRAMS, AND PERIODIC ASSESSMENTS)
- MISAPPLICATION
  - START WITH SMALL NUMBER OF ACTIVITIES—GROW AS TRAINED PEOPLE ARE AVAILABLE
- LONG TERM LOGISTICS
  - UPFRONT PLANNING AND ACTION (INCLUDING STANDARDIZED INTERFACES)
- LACK OF FOLLOW UP
  - ASSIGN JOB TO ACQUISITION EXECUTIVE AND HIS SERVICE SUBORDINATES
- FOREIGN DEPENDENCY
- "INSTITUTIONAL RESISTANCE"

CONCLUSION:

- PILOT PROGRAMS AND OTHER DATA GATHERING ACTIVITIES WILL MINIMIZE RISKS
- RISK AREAS ARE MANAGEABLE

CONCLUSIONS

1. COMMERCIAL PRACTICES USED TO PROCURE COMMERCIAL PRODUCTS ARE SUFFICIENTLY DIFFERENT FROM DoD PRACTICES (BECAUSE OF HISTORY, REGULATIONS, AND STATUTE) THAT THE EXPANDED USE OF COMMERCIAL PRODUCTS IN DoD SYSTEMS WILL BE INHIBITED UNTIL THE DIFFERENCES ARE REDUCED
2. NOTWITHSTANDING CONCLUSION 1, THERE ARE MANY EXAMPLES OF COMMERCIAL PRODUCTS WHICH ARE BEING USED IN DoD SYSTEMS
3. RAPID TECHNOLOGICAL CHANGES IN THE COMMERCIAL WORLD, FOR EXAMPLE, ELECTRONICS, OFFER A RICH POTENTIAL FOR DoD EXPLOITATION WITH POTENTIAL GAINS IN PERFORMANCE, QUALITY AND SCHEDULE AT LOWER COSTS
   - A. USE OF COMMERCIAL PRODUCTS SHOULD RESULT IN LARGE ANNUAL SAVINGS
   - B. SAVINGS THRU USE OF COMMERCIAL PRACTICES FOR MILITARY PRODUCTS SHOULD BE EVEN GREATER
   - C. ACHIEVEMENT OF THESE BENEFITS WILL REQUIRE CREATION OF PREFERENCE AND INCENTIVES FOR COMMERCIALIZATION IN APPROPRIATE AREAS

CRITICAL ACTIONS FOR DoD

- REVISE FAR TO IMPLEMENT POLICIES, GUIDANCE, AND PROCEDURES FOR ACQUIRING COMMERCIAL PRODUCTS AND USING COMMERCIAL PRACTICES
- CHANGE THE REQUIREMENTS PROCESS TO INCLUDE A "NEEDS" DOCUMENT WHICH INCLUDES COMMERCIALIZATION TRADEOFFS AND SELECTED CONTRACTOR INPUTS
- GIVE PM DISCRETIONARY AUTHORITY TO USE COMMERCIAL PRACTICES AND PRODUCTS WHEN APPROPRIATE
- STRENGTHEN THE EMPHASIS ON THE SPECIFICATIONS AND STANDARDS INITIATIVES – MIL PRIME, COMMERCIAL SPECIFICATIONS, STREAMLINING, VARIABLE ENVIRONMENTS, ETC.
- SHIFT THE INTEGRATED CIRCUIT PROCUREMENT PROCESS TO INCLUDE REMOVING THE PRECEDENCE OF MIL-STD-454, CERTIFYING DESIGN AND PROCESS VS PARTS, STREAMLINING THE MIL DRAWING SYSTEM, AND ADOPTING A MILITARY/INDUSTRIAL SPECIFICATION
- IMPLEMENT PILOT PROGRAMS TO VALIDATE BENEFITS OF LEGAL AND REGULATORY EXEMPTIONS IMPLICIT IN COMMERCIAL PRACTICES

RECOMMENDATIONS

1. THE UNDER SECRETARY FOR ACQUISITION SHOULD BEGIN IMMEDIATELY – AND CONTINUOUSLY PURSUE – THE IMPLEMENTATION OF SPECIFIC RECOMMENDATIONS – THE MAJORITY OF WHICH ARE WITHIN THE CURRENT PURVIEW OF THE DoD

2. THE UNDER SECRETARY FOR ACQUISITION SHOULD BEGIN IMMEDIATELY – AND CONTINUOUSLY PURSUE – AN EFFORT TO GET THE CONGRESS TO MODIFY CURRENT LEGISLATION TO ALLOW THE DoD TO UTILIZE "ADAPTED COMMERCIAL PRACTICES":

   A) IN ORDER TO EXPAND PROCUREMENT OF COMMERCIAL PRODUCTS AND

   B) TO GAIN THE BENEFITS OF COMMERCIAL PRACTICES IN PROCURING MILITARY EQUIPMENT

THE UNDER SECRETARY OF DEFENSE

WASHINGTON, DC 20301-3010

RESEARCH AND ENGINEERING

8 APR 1986

MEMORANDUM FOR CHAIRMAN, DEFENSE SCIENCE BOARD

SUBJECT: Defense Science Board Summer Study on The Use of Commercial Components in Military Equipment

You are requested to convene a DSB Summer Study on the use of commercial components in military systems.

There has, for many years, been discussion about the cost of military equipment being greatly inflated by the use of military specification (MILSPEC) items when existing commercial items could have been used more cheaply. Your work should analyze this argument and evaluate the cost-effectiveness and performance trade-offs from increasing the use of foreign and domestic commercial off-the-shelf equipment. Include all levels of piece parts, assemblies, and end items in defining commercial components.

The study should address, but not be limited to the following areas:

a. An examination of some past programs where commercial components could have been safely used but MILSPEC items were used instead. Include an estimate of cost savings that could have been realized.

b. An estimate of "down side" risk if commercial components had been used, including an evaluation of logistics issues such as proprietary data rights, control of supplies and suppliers and the impact on maintenance concepts and warranty programs.

c. Identification of the impediments to the use of commercial components and recommendations for making it easier to use commercial components in military equipment if this is a wise course to pursue. Special attention should be paid to actual methods of implementation.

Dr. James P. Wade, Jr., ASD(A&L) and I will co-sponsor, and Dr. William J. Perry and Dr. J.R. Burnett will co-chair the Summer Study. Mr. Andrew Certo of the ASD(A&L) Production Support Office will be the Executive Secretary and Lt Col Herbert R. Vadney, USAF, will be the DSB Secretariat Representative. It is not anticipated that your inquiry will involve any "particular matters" within the meaning of Section 208 of Title 18, U.S.C.

Don Hicks

Donald A. Hicks

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December 15, 1986

Mr. Charles A. Fowler
Chairman, Defense Science Board
Room 3D1020, The Pentagon
Washington, D.C. 20301-3140

Dear Bert:

There have been numerous questions about the semiconductor parts recommendations of the Summer Study on Commercialization. I will attempt in this letter to state what the Panel had in mind when making their recommendations.

The DoD process for ensuring the reliability of semiconductor parts for use in DoD systems was started many years ago, long before the required disciplines in process control of microelectronic design and production were well understood. Also, at that time, the DoD used a large fraction of the world output and virtually controlled the market.

The situation today is quite different. The DoD usage of the world market is approximately 10 percent; the commercial use of semiconductors has exploded. The tremendous commercial market forces of demand, competitive prices and quality have forced the semiconductor supplier to develop highly effective design/manufacturing processes and related process control systems that produce the high production yields required for business survival. These disciplined processes have resulted in dramatic improvements in the quality and reliability of commercial, especially industrial-grade, semiconductors. The industry recognized that the higher production yields (which resulted in dramatic device cost reductions over the typical JAN part) tightly correlated with dramatic improvements in quality.

The Summer Study on Commercialization seriously evaluated and considered these significant trends in their deliberations.

As you know, the Semiconductor Specification Subcommittee of the Summer Study assignment was to develop an integrated set of military and industrial specifications, standards and procedures to:

> Lower cost and procurement cycle time of existing military semiconductor products.
>
> Develop an effective process for selective use of commercial industrial grade semiconductor products in DoD systems to take advantage of lower cost, shorter design-to-production time, and new technology.
>
> Ensure that modified specifications and procedures do not result in a sacrifice of required quality and reliability.

The Summer Study recommendations on semiconductor devices in the DSB are shown in Attachment 1. The Subcommittee's recommendations are summarized as Attachment 2. As you are aware, the majority of these recommendations have received general agreement between DoD, vendors and OEMs; however, several have been questioned extensively. The recommendations and our assessment of the current level of agreement are summarized in Table 1 .

SUMMARY OF SEMICONDUCTOR RECOMMENDATIONS

RECOMMENDATION	AGREEMENT?
Streamline MIL Drawing System	Yes
Prepare Industrial IC Spec and Specify Environments for Use	Yes

SUMMARY OF SEMICONDUCTOR RECOMMENDATIONS (CONT)

RECOMMENDATION	AGREEMENT
Develop Quality/Reliability Reporting System	Yes
Revitalize Reliability Data Base	Yes
Develop Semiconductor Applications Guidebook	Yes
Certify and Audit IC Suppliers and Processes	Yes-Who?
Use Industrial Plastic Encapsulated ICs in Selected Application	Partial
Remove MIL-STD-454 Precedence of IC Selections	No

TABLE 1

We would like to review the three areas of concern: certification, use of plastic encapsulated ICs and removal of precedence between IC selections.

The first question concerns certification/audit, specifically, who performs this function -- the government, the supplier or a qualified independent third party. We all believe that the quality and reliability of semiconductor devices derives from material quality and the disciplined control of design, manufacturing and test processes. There is further agreement that an appropriate certification and audit of supplier processes is required to ensure continued quality. The Summer Study had no bias or preference of a certification/audit agency. It is our belief that such an agency be selected by DoD in consultation with key vendors and OEMs.

The second area of concern is associated with the use of plastic encapsulated semiconductor devices. We strongly believe that commercial, industrial quality "ruggedized" ICs can be used in selected military applications. Some concern over the long term reliability of plastic parts has been expressed. This concern is primarily based on the quality and reliability of consumer grade plastic parts which were not designed to meet stringent environments. Recent developments in plastics and packaging technology, as well as extensive use of these devices in industrial environments, indicate adequate levels of quality and reliability (including long term reliability) for use in selected military applications. It should be emphasized that a strong vendor qualification program is required to ensure success. Several OEMs have offered to provide the DSB with their internal quality/reliability data to further clarify this issue.

The final area of disagreement centers on the recommendations to remove the MIL-STD-454 precedence for specifying JAN, MIL DRAWING and MIL-STD-883C parts. This concern is primarily based on the fear that this action would virtually eliminate U.S. manufacturing of JAN products creating (1) a foreign source dependency particularly on critical JAN Class "S" space application components, (2) a reduction in quality and reliability and (3) increased JAN part costs because of lower volume production. It is our belief that these issues have been adequately addressed.

With regard to the foreign dependency issue, we do not believe that the revision of MIL-STD-454 will "kill" the JAN program. It is obvious that JAN "B" certified facilities in the U.S. will decline over time as adoption of the DESC MIL DRAWING program takes effect. If no other steps were taken, this would put at an "off-shore"

dependency risk another 20 percent of DoD semiconductor procurement (or another 2 percent of total U.S. procurement). Please recognize that 80 percent of DoD semiconductor procurement currently falls in the off-shore dependency class. Another DSB study under the chairmanship of Norm Augustine has been addressing this issue in total. Our recommendations are consistent with the Augustine study preliminary recommendations. If these (Augustine) recommendations are adopted, we feel the dependency issues could be resolved and the savings and the program management prerogatives attendant to our recommendations could be realized. The "business issue" concern of certain semiconductor companies (e.g., more business will go off-shore) is a fundamental issue of U.S. competitiveness, and must be addressed in a much broader commercial/military context.

Please note that our recommendations did not suggest any change in JAN Class "S", or space qualified, device procurement. Concerns that JAN Class "S" production facilities will not survive if Class "B" capacity declines do not take into consideration our total recommendation package. Our recommendations do provide for MIL device facilities that are specifically certified (under the same process disciplines as respective JAN lines), thus there should be appropriate capacity and facilities for quality, space qualified devices. The real issue is one of off-shore dependence for JAN Class "S" type parts and, as noted before, this would be resolved by the Augustine recommendations.

Reference the issue of Quality and Reliability associated with the recommendation to remove precedence. Our recommendation was based on our evaluation of specifications, quality, and reliability. There is good quality data available for decision making which shows the quality of non-JAN military semiconductors from reputable

suppliers is comparable to the quality of JAN parts. Gross data show the incoming quality of non-JAN ICs as measured by OEMs had higher failure rates than JAN devices. However, controlled studies by several OEMs showed that this was due to test correlation problems and handling damage.

The panel believes that there is a high correlation between excellent quality data and excellent reliability; however, we should emphasize that this belief requires further substantiation. There is enough quality/reliability data on JAN parts in the field to indicate that of the relatively old MIL part population, JAN parts show the highest reliability. The implied statement that MIL DRAWING parts and MIL-STD-883C parts from properly certified lines are, on average, less reliable that JAN parts is not known to be true. Since JAN process lines and other MIL process lines must be certified to the same stringent standards, (only the certifier is different -- DESC for JAN, the manufacturers themselves for other MIL) any data from suppliers that shows a significant JAN quality difference indicates they have not upheld their obligation to DOD for self certification and process control.

The recommendations to remove precedence also derives from the points of agreement -- to streamline the MIL DRAWING program and to establish a certification/audit process. Streamlining the MIL DRAWING program will:

- Register electricals and standardize interfaces

- Control part numbers and provide configuration control

- Minimize different IC designs and obtain volumetric needs for economic production

- Minimize SCDs

Establishing a certification/audit process will:

- Provide statistical quality control process
- Provide the basis for cost effective production/certification of ASIC parts
- Provide equivalent quality for JAN, MIL DRAWING and 883C devices
- Assure only qualified suppliers for military semiconductors.

Consequently, when these recommendations are implemented there should be no basis for the quality of non-JAN devices to be less than the quality of JAN devices. And, the foundation established for the production of cost effective reliable ASICs will provide the capability to produce JAN devices.

Compared to the overall cost savings achievable by removing the order of precedence in MIL-STD-454, any increased cost associated with a reduction in the number of JAN parts produced is not an overriding issue in our opinion. Furthermore, as the concept of process certification gains acceptance for all semiconductor devices including ASICs, the production of high quality - reliable parts at competitive costs will continue.

Our original recommendation to remove MIL-STD-454 precedence remains valid; however, we believe two slight modifications are indicated:

- JAN devices and MIL DRAWING devices should be made equal in precedence with MIL-STD-883C devices a slightly lower precedence. This will permit use of qualified devices (MIL-STD-883C) prior to their becoming registered in the MIL DRAWING program but would not permit proliferations of these non-standard devices.

- Implementation of the recommendations should be effective 1 January 1988. This will allow sufficient time to streamline the MIL DRAWING program and to certify suppliers.

In summary, we believe that our recommendations should be implemented as soon as possible and that the benefits derived by these actions far outweigh the negative issues discussed above. Furthermore, the critical off-shore issue can, in our opinion, be solved by the Augustine recommendations for creating competitive on-shore manufacturing processes.

We hope this clarifies the DSB's position on these recommendations. We, along with members of the Semiconductor Subcommittee, would be pleased to brief appropriate DoD officials further on this matter.

Sincerely yours,

J. R. Burnett

W. J. Perry

INTEGRATED CIRCUITS

RECOMMENDATIONS TO REMOVE IMPEDIMENTS

	ACTION
• STREAMLINE MIL DRAWING SYSTEM AND CROSS REFERENCE INDEX DESCRIPTION TO MINIMIZE SOURCE CONTROL DRAWINGS	DESC
• COMPONENT COST VS APPLICATION REQUIREMENTS	
- ADAPT INDUSTRIAL SPEC FOR MILITARY USE	JLC
- ESTABLISH RECOMMENDED COMPONENT CLASSES FOR IDENTIFIED APPLICATION ENVIRONMENTS	JLC
- OBTAIN DoD CONSENSUS	JLC
- CONDUCT INDEPENDENT VERIFICATION TESTS	JLC
- DEVELOPER SELECT MINIMUM APPLICABLE COMPONENT CLASS	PM
- ESTABLISH PROCESS & VENDOR CERTIFICATION PROCEDURES	JLC
- REVITALIZE RELIABILITY DATA BASE	OASD (A&L)
• MIL-STD 454 PROCEDURE	OASD (A&L)
- DELETE ORDER OF PRECEDENCE	
- REWRITE TO REFLECT ABOVE	
• DEVELOP GUIDEBOOK ON IC SELECTION FOR PROGRAM OFFICE	OASD (A&L)

SEMICONDUCTOR PRODUCTS SUBCOMMITTEE RECOMMENDATIONS

DEVELOP NEW APPROACH FOR DoD PROGRAM MANAGERS TO PROPERLY SPECIFY THE USE OF INDUSTRIAL OR MILITARY PARTS:

- REMOVE THE MIL-STD-454 PRECEDENCE BETWEEN JAN MIL-M-38510, MIL-STD-833C, AND DESC MILITARY DRAWING SPECIFICATIONS
- DEVELOP SIMPLE GUIDEBOOK FOR PROGRAM OFFICES
- STREAMLINE DESC MIL DRAWING SYSTEM TO FACILITATE STANDARIZATION AND CONFIGURATION CONTROL
  - REFORM SOURCE CONTROL DRAWING SYSTEM AND DEVELOP CROSS REFERENCE INDEX
- INITIATE QUALITY/RELIABILITY MEASUREMENT DATA BASE SYSTEM
- UPDATE DoD MIL HANDBOOK ON SYSTEM RELIABILITY PREDICTIONS

ACCELERATE SELECTED USE OF RUGGEDIZED INDUSTRIAL DEVICES IN MILITARY SYSTEMS:

- GENERATE SPECIFICATION FOR PROCUREMENT OF RUGGEDIZED INDUSTRIAL SEMICONDUCTORS
- MODIFY MIL-STD-454 TO DEFINE AND SPECIFY EXPLICIT ENVIRONMENTAL REGIMES THAT WILL DEMAND THE USE OF INDUSTRIAL SEMICONDUCTORS
- SELECT INSERTION PROGRAMS FOR IMMEDIATE APPLICATION OF RUGGEDIZED INDUSTRIAL SEMICONDUCTOR DEVICES
  - DEMONSTRATE PLAN VIABILITY
  - MEASURE REAL BENEFITS

PROCURE SEMICONDUCTORS BASED ON CERTIFIED PROCESSES RATHER THAN QUALIFIED PARTS:

- DEVELOP CERTIFICATION REQUIREMENTS FOR SEMICONDUCTOR PROCESSES:
  - DESIGN ASIC
  - MANUFACTURER/ASSEMBLY
  - TEST
- ASSIGN RESPONSIBLE AGENCY TO CERTIFY
  - PROCESSES
  - AUDIT PROCEDURES
- DEVELOP FORMAL QUALITY/RELIABILITY REPORTING SYSTEM AND DATABASE

END

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DTIC