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AD-A180 156

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NONDEVELOPMENTAL ITEM ACQUISITION

BY

COMMANDER JOHN H. FEDER

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM	
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A180 156	3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle) Nondevelopmental Item Acquisition		5. TYPE OF REPORT & PERIOD COVERED Individual Essay	
		6. PERFORMING ORG. REPORT NUMBER	
7. AUTHOR(s) Commander John H. Feder, USN		8. CONTRACT OR GRANT NUMBER(s)	
9. PERFORMING ORGANIZATION NAME AND ADDRESS US Army War College Carlisle Barracks, PA 17013-5050		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
11. CONTROLLING OFFICE NAME AND ADDRESS Same		12. REPORT DATE 23 March 1987	
		13. NUMBER OF PAGES 23	
14. MONITORING AGENCY NAME & ADDRESS (If different from Controlling Office)		15. SECURITY CLASS. (of this report)	
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE	
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution is unlimited.			
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)			
18. SUPPLEMENTARY NOTES			
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)			
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The President's Blue Ribbon Commission on Defense Management issued its final report to the President in June 1986. The Commission made a strong recommendation to make greater use of components, systems, and services available "off-the-shelf." These items are known as nondevelopmental items (NDI) and increased use should save millions of dollars daily, shorten acquisition times, and produce a higher quality product. To take advantage of NDI the Department of Defense (DOD) must not only start to acquire more commercial products, but (Cont)			

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perhaps more importantly start to do business in a more commercial way. There is present legislation that works at cross-purposes to these NDI goals. The mood in Congress and within DOD is very pro NDI. The time is right to get on with NDI. Instructions and objectives are being promulgated on implementation of NDI. The National Defense Appropriations Act for FY 1987 has directed DOD to identify impediments in current legislation. The Packard Report and subsequent DOD instructions include definite recommendations to take advantage of the advanced technology found in the commercial marketplace. NDI enthusiasm is surging and we will soon have NDI candidates that constitute components of complex integrated combat systems. Pitfalls may exist here. Program Managers will soon be leading the charge to reap the benefits of NDI acquisitions in their programs; however, they must proceed with caution and choose their NDI candidates with care. When making the NDI decision in an integrated combat system, good up-front systems engineering will be more important than ever. We must guard against the very real possibility that introduction of a seemingly noncombat-related system component could result in an unacceptable combat system degradation.

Unclassified

USAWC MILITARY STUDIES PROGRAM PAPER

NONDEVELOPMENTAL ITEM ACQUISITION

An Individual Essay

by

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US Army War College
Carlisle Barracks, Pennsylvania 17013
23 March 1987



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ABSTRACT

AUTHOR: John H. Feder, CDR, USN

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The President's Blue Ribbon Commission on Defense Management issued its final report to the President in June 1986. The Commission made a strong recommendation to make greater use of components, systems, and services available "off-the-shelf." These items are known as nondevelopmental items (NDI) and increased use should save millions of dollars daily, shorten acquisition times, and produce a higher quality product. To take advantage of NDI the Department of Defense (DOD) must not only start to acquire more commercial products, but perhaps more importantly start to do business in a more commercial way. There is present legislation that works at cross-purposes to these NDI goals. The mood in Congress and within DOD is very pro NDI. The time is right to get on with NDI. Instructions and objectives are being promulgated on implementation of NDI. The National Defense Appropriations Act for FY 1987 has directed DOD to identify impediments in current legislation. The Packard Report and subsequent DOD instructions include definite recommendations to take advantage of the advanced technology found in the commercial marketplace. NDI enthusiasm is surging and we will soon have NDI candidates that constitute components of complex integrated combat systems. Pitfalls may exist here. Program Managers will soon be leading the charge to reap the benefits of NDI acquisitions in their programs; however, they must proceed with caution and choose their NDI candidates with care. When making the NDI decision in an integrated combat system, good up-front systems engineering will be more important than ever. We must guard against the very real possibility that introduction of a seemingly non-combat related system component could result in an unacceptable combat system degradation.

In the summer of 1986, the President's Blue Ribbon Commission on Defense Management issued its final report to the President. The Commission's charter was to "study the issues surrounding defense management and organization, and report its findings and recommendations."¹ One of the recommendations under the heading of Acquisition Organization and Procedures was to "make greater use of components, systems, and services available 'off-the-shelf'."² In Department of Defense (DOD) jargon off-the-shelf items are referred to as nondevelopmental items and are defined as material available from a variety of sources with little or no development by the government. These items may be used "as is" with no modification or they may require slight modification to fulfill their military mission. It is the aim of this paper to examine the reasons that this exceedingly good idea has been so slow in maturing, give pros and cons of the NDI process, evaluate the political atmosphere for NDI support, and finally present thoughts on aspects of NDI acquisition that need careful thought and special consideration.

The recommendations made in the Packard Report concerning increased emphasis on the acquisition of commercial products are not revolutionary realizations. In fact, various commissions, committees, study groups, and federal agencies have identified NDI as a target for time and money savings for a decade and a half. In December 1972, the Commission on Government Procurement (COGP) issued its report and concluded that the government should take greater advantage of the efficiencies offered by the commercial market. In 1974, the Office of Federal Procurement Policy (OFPP) was established by Congress to direct federal procurement policy. The Department of Defense got into the act in December 1975 and established the Commercial Commodity

Program that was designed to increase the amount of goods purchased off-the-shelf by DOD. The newly established OFPP issued a memorandum to DOD, the General Services Administration (GSA), and Veterans Administration (VA) in May 1976. This memorandum laid out policies encouraging the procurement of commercial products.

The Government will purchase commercial, off-the-shelf, products when such products will adequately serve the Government's requirements, provided such products have an established commercial market acceptability. The Government will utilize commercial distribution channels in supplying commercial products to its users.³

In response to the OFPP guidance, DOD established the Commercial Commodity Acquisition Program (CCAP) in August 1976. The aim of the CCAP was twofold. First, to provide a pilot program to ascertain if products produced for the public could meet the requirements of the military and second, to test different procurement methods in the acquisition of commercial products. As early as December 1976 the OFPP issued guidance on the establishment of "commerciality" in the form of a memorandum entitled "Incremental Implementation of Policy on Procurement and Supply of Commercial Products - Planning and Analysis Phase" to DOD, GSA and VA. This is very important because we are now a decade later still wrestling with similar terminology. Although not immediately apparent, some of this terminology is responsible for the slow progress of NDI procurement. These important definitions are as follows:

Commercial, off-the-shelf products - a commercially developed product in regular production sold in substantial quantities to the general public and/or industry at an established market or catalog price.

Established commercial market acceptability - relates to commercial products that are currently marketed in substantial quantities for the general public and/or

industry which involve commercial sales that predominate over Government purchases.⁴

Exploring the merits of commercial products in the military arena on another level, DOD established the Commercial Item Support Program (CISP) in November 1977. Instead of acquisition, the aim of this program was to see if commercial distribution channels could cost-effectively supply products to the military services. In December 1977 the OFPP issued a memorandum entitled "Implementation of Policy on Acquisition and Distribution of Commercial Products." DOD followed up and by September 1978 DOD had issued DOD Directive 5000.37 which set up the Acquisition and Distribution of Commercial Products (ADCOP) Program in DOD. This policy was anchored by OFPP's May 1976 guidance to acquire commercial off-the-shelf products that would serve the government's requirements provided the products had an established market acceptability and OFPP's December 1976 guidance on the meaning of commerciality, i.e., predominate public sales and established market acceptability. In addition to these highlights the ADCOP Program also assigned tasks relating to specification refinement. The aim of this specification refinement was to get away from the detailed design specifications and convert them to functional specifications. This was a giant step along the trail to a viable NDI program. As a result of work in this area of specification refinement, the Deputy Under Secretary of Defense issued a memorandum entitled "Implementation of Acquisition and Distribution of Commercial Products (ADCOP) Policies." This policy established the use of Commercial Item Descriptions (CIDs) as the preferred way to acquire commercial items. The CID is a simplified functional performance characteristic that is inducive to procurement of commercial items. In March 1982 President

Reagan issued Executive Order 12352 Federal Procurement Reforms which ordered agencies to:

Establish criteria for enhancing effective competition . . . /including/ such actions as eliminating unnecessary Government specifications and simplifying those that must be retained, expanding the purchase of available goods and services, and, where practical, using functionally-oriented specifications or otherwise describing Government needs so as to permit greater latitude for private sector response. . . .⁵

Then in 1984 Congress passed the Competition in Contracting Act. It was in concert with the present trend and supported buying commercial products and most importantly it removed one of the largest impediments to nondevelopmental item procurement. This major breakthrough was the elimination of the preference for the formal advertising method of contracting and language stating that the negotiated method of contracting could be used when most appropriate.

In April 1986, the Packard Commission reported to the President.

Rather than relying on excessively rigid military specifications, DOD should make greater use of components, systems, and services available 'off-the-shelf.' It should develop new or custom-made items only when it has been established that those readily available are clearly inadequate to meet military requirements.⁶

The most recent development in endorsing NDI acquisition is the Defense Authorization Act for FY 1987. Section 907 of the act is titled "Preference for Nondevelopmental Items" and states that "requirements of DOD for procurement of supplies will be stated in terms of functions to be performed, performance required or essential physical characteristics"⁷ so that these requirements may be fulfilled by nondevelopmental items.

Using industry as a model, the Commercial Commodity Acquisition Program as evidence, and some recent NDI acquisitions as real time examples, it is clear that there are significant benefits to be derived from NDI procurement. In a nutshell, the gains include reduced time in fielding the system, state-of-the-art technology, and reduced life cycle costs.

The NDI process presents benefits in the time dimension in two ways. First, the overall fielding time is reduced because the research and development time has been greatly reduced or eliminated. Then secondly, NDI helps the Program Manager in the very important area of scheduling. He already knows the product. He can see it, feel it, and test it. NDI eliminates to a great extent the time and money uncertainties in the research and development phase and then the transition from development into production. Removing this uncertainty of time gives the Program Manager a big advantage in allowing him to remove unknowns from his program and giving it stability and credibility.

Buying NDI gives the Program Manager the capability of having state-of-the-art technology now. The government no longer has the corner on the technology market. Breakthroughs that occur in industry and that are applicable or adaptable to military use now become available immediately through NDI. Without the NDI process and with the requirement for a detailed design specification to military standards, the procurement cycle takes years to field the technology present today in industry. The other positive aspect of taking high technology from industry is that there is little or no risk. It's there, it's state-of-the-art, and you can have it through the NDI process. In a major acquisition in which you are trying to project and work at the leading edge of technology, there is the research

and development cycle, the element of risk and uncertainty, and many times by the time your system is fielded it may be overtaken by technology.

Probably the factor easiest to quantify is cost savings generated through buying commercial goods. First and foremost is that you know what you are getting into in an NDI procurement. The program should be more stable because the uncertain research and development costs are practically eliminated. The item you desire is in use commercially and has a price tag. You can use a calculator to project your funding requirements instead of a crystal ball. Point number two under cost advantage is that commercial products generally cost less than products traditionally developed for the military. There are a great many reasons why commercial products are less expensive, some advantageous to the government and some that require the government to make a conscientious decision to accept less ruggedness or capability or not to go commercial at all. Generally the overriding reasons for the reduced cost are little or no research and development funds expended by the government, economy of scale, i.e., the government is not the only buyer, and as a rule commercial gear is less rugged.

Is there a big monetary payoff? The answer is emphatically yes. There have been several estimates of overall cost savings and probably the first was the result of the 1977-1979 Commercial Commodity Acquisition Program (CCAP) pilot program. Fifty-two major acquisitions costing 40.5 million dollars were contracted through an NDI pilot program. These 52 major acquisitions were procurements of technical items such as airborne and shipboard navigation systems instead of expendable consumable items. The program was very carefully constructed to produce data that could be compared to standard procurement

methods. For example, the quantities of items contracted for were carefully maintained to within 10% of previous buys of similar items and a comparable amount of small business participation was used. The results of the CCAP made a strong case to pursue nondevelopmental item acquisition. The number of bidders was doubled, the items that were delivered were of equal or better quality 90% of the time, the delivery time was reduced by an average of 28 days, and prices were lowered by 10%.⁸ Jacques Gansler, a former Deputy Assistant Secretary of Defense, has projected in his book, The Defense Industry, that from a 145 billion dollar defense budget (FY 1984) a savings of 2.2 billion dollars could be reaped from an aggressive NDI program. Another study, conducted by the Center for Naval Analysis that was focused on the NDI procurement of commercial substitutes for items on the Table of Authorized Material for a Marine 105 howitzer battery, projected a DOD-wide cost savings of 23.3% through the procurement of commercial items. The Defense Logistics Agency has run less extensive cost comparisons than the CCAP and come up with cost savings in the 10% range that are very similar to the CCAP study.

After reading these proven and projected cost savings, a very conservative savings figure would be 10%. To translate that percentage into dollars one must decide what portion of the DOD budget this 10% figure should be applied against. Again taking a conservative approach, it would seem logical to apply this factor against the "Supplies and Equipment" category in the DOD procurement budget. Again taking a conservative approach, knowledgeable professionals in this field believe that one-half of the "Supplies and Equipment" items could be purchased through NDI procurement.⁹ Using the above assumptions on the FY 1985 100 billion dollar supplies and equipment line, applying a 10% savings

to one-half of 100 billion dollars would project a savings of 5 billion dollars a year. Savings like this are not insignificant and must be aggressively pursued. A 5 billion dollar annual savings translates to 14 million dollars a day.

Another benefit of NDI procurement is that far less time, money, and people should have to be allocated for a testing program. Part of the definition of commercialization is proven market acceptability. This means that not only has the producing company conducted testing, but there are thousands of happy or unhappy customers that can confirm or deny the quality of the product. The benefits derived from the NDI process in time, cost, and quality seem overwhelming.

Everyone from the taxpayer on up are recipients of the benefits of the NDI process, but the level of management that stands to reap the greatest harvest is the Program Manager. He now has a tool to cut the acquisition cycle time, reduce risk, stabilize his program, and produce a quality state-of-the-art product at reduced cost. Why aren't these Program Managers leading the charge?

The simple fact of the matter of why Program Managers and Contracting Officers have been cool on acquisition of nondevelopmental items is that there have been and still are laws and regulations that work at cross-purposes with the goal of procurement of nondevelopmental items. And the private sector contracting model does not apply to the government.

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.¹⁰

Probably one of the largest impediments to an aggressive NDI program is
the government's history of the use of detailed design specifications and
formal advertizing for acquiring new systems.

As early as May 1976 the ADCOP program recognized that in our acquisition
process the use of detailed design specifications was not conducive to NDI
procurement. As a result, ADCOP went on to direct the services to produce
specifications in more functional terms. It is vitally important to under-
stand why the services were using detailed design specifications and their
reluctance to abandon this process. The Armed Services Procurement Act (ASPA)
authorizes two principal methods of defense procurement. The two methods are
formal advertizing or the "sealed bid" method and negotiation. Until the
advent of the Competition in Contracting Act of 1984, DOD was required by law
to use the formal advertizing method unless one of a few limited exceptions
applied. Until 1984, Congress' position was that formal advertizing would
produce lower prices, be more objective, create more competition, and be less
subject to fraud, waste, and abuse. In the formal bid process the government

makes a public solicitation to industry to produce a product for the government. In order to allow industry to make a bid of an exact price to produce the product, the government must basically design the wanted product in detail before soliciting. This is where the term detailed design specifications comes from. With these detailed design specifications in hand the competitors make a "sealed bid." The bids are opened at a public opening and the low bidder gets the bid to produce the product in question. Since the low bidder gets the contract, specification writers go to great length to make sure no loopholes exist where a contractor could substitute material of lower quality. This safeguarding produces detailed design specifications of amazing length and detail. In fact, they are of such detail that products must usually be custom made. This process is usually not appropriate to procuring NDI.

The second authorized method of contracting is negotiation. In this process the government states its needs to industry in functional terms, what is the piece of gear supposed to do, performance required, how will it be tested or evaluated, and essential physical characteristics. This is a public offering and the government is seeking the expertise of the market to satisfy the functional requirement. Detailed design specifications are inappropriate here and would thwart industry's initiative to show the government various alternatives to the functional requirement. In the negotiated contract, factors other than price may be considered. The government may factor in technical merit, contractor's past performance, contractor's management, etc. When the proposals from industry are received, the government ranks them by technical merit, price, and contractor performance. Those found to be

in the competitive range are called in for a round of discussions and negotiations; then the proposers are asked to submit their best and final proposals. The award is made on technical merit, price, contractor performance, government need, and all other things considered. It is clear that the negotiated contract is the best way to contract for a nondevelopmental item. This is also the contracting method that most closely resembles the contracting process common in industry. On the other hand, formal advertising is still an appropriate way to solicit on a complex combat system or a sophisticated combat aircraft that has no equal in the marketplace.

Even though the Competition in Contracting Act of 1984 sought to make it clear that award of contract through competitive negotiation is a method of procurement no less acceptable than formal advertising, the Packard Commission ascertained that other language in the Act concerning the requirement for "full and open competition" has been interpreted by some to mean that the government must make the award to the lowest offerer.¹¹ This interpretation reinforces the tendency to use formal advertising and detailed design specifications. Another impediment along the way has been the Small Business Lobby. As part of ADCOP in 1979 a team started conversion of the over 26,000 detailed design specifications to shorter more functional (NDI inducive) Commercial Item Descriptions (CID). The rate was slow (400/year) but nevertheless a step in the right direction. The CIDs contained a quality control requirement to meet commercial "market acceptability." Small businesses that only sold mostly to the government found this proviso prejudicial and in the DOD Appropriation Acts of FY 1983, 1984, and 1985, language was present that prohibited the "market acceptability" criteria for procurement. As a

result, the CID conversion process came to a halt until DOD and Congress worked out a compromise where small business again enjoyed a favored status. Another innovation recommended in the Packard Report was to maintain "lists of qualified suppliers that have maintained historically high standards of product quality and reliability."¹² Suppliers would be highly motivated to get on and stay on these lists because as long as quality remains high, money would be saved on both sides because exhaustive inspections could be waived. Procurement officers would be encouraged to limit bids to these qualified suppliers that have demonstrated they consistently produce a quality product. This is a common way industry does business and saves money. In Appendix H of the Packard Report which addresses the legal aspects of NDI, the author, Ms. W. T. Kirby, cites numerous legal precedents that would indicate that a list of "qualified suppliers" to do business with may be impossible in the near future. Maybe most pervasive is what the Packard Report describes as DOD works in "an environment of far too many laws, regulations and detailed instructions of how to do their work . . . an increasingly bureaucratic and overregulated process."¹³ These laws and regulations create a reluctance for many companies to deal with the government.

These include the requirement to identify all component parts and their producers, and the submission of detailed pricing certifications. Industry strongly objects to the lack of a continuous contractual relationship due to mandatory competition and then subsequent release of technical data to competitors. Companies are sometimes unfamiliar with federal laws and contract clauses that differ from the Uniform Commercial Code, and they object to the government's right to audit. Private industry as a rule does not like

the government's excessive paperwork requirements, crisis management, inadequate lead time in many projects, and undue delay in problem solving. Finally, many contractors are unwilling to comply with mandatory socioeconomic contract clauses. There are over 50 of these socioeconomic clauses in the Federal Acquisition Regulation, and they range from utilization of Small Women Owned Businesses to use of Convict Labor.

Finally, and probably of most importance, is that if Congress does indeed desire a more efficient and corporate-like way of doing business, they must be receptive to some changes in law to allow the government to perform in this manner. Probably the next most important thing is that contracting officers must be allowed to work with the user and use common sense and good judgment and do as is specified in the Competition in Contracting Act of 1984 and factor value and quality into the award along with price. This is difficult because price is easy to justify but it may not be easy to justify quality and overall value.

Even though there are impediments that are present in the acquisition of nondevelopmental items, there is an overwhelming ground surge on all fronts that is pushing quickly for greater use of NDI. Commercialization in the way we do business in the defense acquisition sector and the acquisition of commercial products is going to happen, and we must be ready to take advantage of it but not get overwhelmed by it. In the past, a true statement could be made that technology that was designed for military application was really the state-of-the-art and well ahead of the technology seen in private industry. Now this is simply not true. Today average folks have within their homes computers that the military would have found beyond belief ten years ago, the

connectivity to access worldwide data banks, the ability to make a television program, and the ability to track satellites and receive satellite information. In fact, there are many areas in which technology in industry is considered ahead of the military. In addition, the commercial equipment available must compete in the marketplace and has to be of high quality. Private companies are producing goods in a marketplace where their aim is to produce high quantities of equipment that are priced competitively, safe, reliable and, in most cases, have a guarantee. These are the things the public demands. The Defense Department needs these things, too, and they are there. With the prospects of a shrinking Defense budget, we must investigate and take advantage of savings that are available by buying off-the-shelf whenever possible. The background has been laid in the continuing trail of studies and recommendations that have been going on since 1972. The Packard Commission of 1986 was a significant report that included recommendations for greater use of commercial practices and acquisition of commercial items. It received full support from the President and the Secretary of Defense. These issues are in the spotlight now and the services have been directed to get on with the program. The Navy has started to implement these recommendations as seen in Sec NAVINST 4210.7 of June 1986:

Applies to all Navy programs that result in the procurement of hardware/software. The use of NDI systems/equipment will be a principal means of satisfying the material needs of the Navy. . . .

It is Secretary of the Navy policy to institutionalize NDI consideration during the acquisition process to such an extent that its use becomes the rule rather than the exception.¹⁴

Indeed, Congress appears to support increased commercialization as evidenced in the Defense Authorization Act of FY 1987. The language in this Act

is important because it charges DOD with aggressive pursuit of NDI procurement but it also realizes that there are impediments to this process and directs DOD to report what they are. I believe this to be the first step to new enactment of laws to allow DOD to do business in a more economical, commercial way. With everyone on board for the program and visibility at all levels, NDI procurement will be a reality very quickly.

The case has been made. We understand what NDI is all about, read its history, know the advantages, have been exposed to the impediments that have slowed its progress and probably agree that the timing is right for the NDI process to take some major steps forward. I believe the time is right and this is going to happen quickly and probably with more congressional guidance than we need. I believe that we should proceed at good speed but let's not fall into one of the traps that the military has been accused of in the past-- if it's worth doing, it's worth overdoing. The area that particularly concerns me is incorporating the NDI process at the integrated combat system level. Instructions, various service guidelines for NDI implementation, NDI "how to" publications all make various qualifying statements that NDI may not be appropriate in combat environment or in complex systems; however, the overwhelming trend--the new surge to get on with NDI--is not increased "ketchup and clothing sales," it's high technology and that translates to sophisticated components in integrated systems. We may quickly get into an NDI backlash where great pressure will be exerted to go NDI and I believe that Program Managers are going to be faced with some very hard decisions. Right at the top of the list is the matter of degradation of system specifications to take advantage of present commercial products. This process is certainly not all

bad; in fact, it is the backbone of the NDI program. It is trading off unrealistic specifications to reap a substantial reward in time schedule and monetary savings. Also true is that the Program Manager does not make this decision himself; however, one must be on guard. Survivability is another area that is a trade off, and the Program Manager will be sorely tempted to relax standards to accommodate commercial equipment. Again, current instructions make the dutiful statement to cover the promulgating agency by stating that NDI may not be appropriate here; however, the message is clear to think long and hard whether the computer or navigation device really needs to withstand a 2G shock. Again, watch the backlash. Health and safety is another area that the military requires some unique features. Electronics gear destined for the military, in particular ships and airplanes, need special grounding, hold-open devices in equipment doors, and safety interlocks throughout the equipment. The path of coming up with a "procedural safeguard" instead of equipment modification must be evaluated long and hard. Standardization is very important in unit readiness. Interchangeable parts between equipment on a single ship or between ships is important to overall readiness. When purchasing repair parts or pieces of equipment, such as fire pumps, standardization is important. Form fit and function philosophy fits nicely into the NDI process but a ship with two or three different types of fire pumps is at a great disadvantage in material readiness. The ship must carry several different groups of spare parts and then cannibalization from one pump to the other is impossible. This consideration must not be overlooked in an attempt to buy off-the-shelf equipment. Logistic support is another area that is vitally important and that can not be overlooked. The very

nature of the NDI process, i.e., gear in the field quicker, means that careful consideration must be given to gearing up the services' Integrated Logistic Support pipeline. Even in today's agonizingly slow equipment acquisition, logistics seem to lag. The Program Manager must carefully make provisions for interim contractor support and remember that if this is a combat system that will go to sea or deploy to Central America, the ILS support can not be too innovative or the equipment will simply not have the spares it requires when they are needed. Thought must also be given to commercially built-in early obsolescence. Is the equipment rugged enough to last the expected service life of military equipment and will there be a big enough buy to stockpile spares or will the assembly line be able to be activated again.

In integrated systems that interact by means of hardware and software, configuration control is vital. The Program Manager must not be at the mercy of the manufacturer. A change in one piece of equipment hardware or software has the potential to ripple throughout the system producing degradation that could not be foreseen by a single equipment manager.

To put this phenomenon in perspective, take the case of the replacement of a guided missile cruiser's ship's speed sensor. A much advanced digital doppler speed sensor that had enjoyed a good reputation in the merchant fleet was acquired and installed in this class of Navy combatant. After the first couple of installations, it was noted that when the ship accelerated and decelerated quickly the speed indicator would give erroneous indications and that in higher sea states the erroneous indications would also manifest themselves. Then, after a period of these erroneous indications, the ship's inertial navigation system would also start to fault which had further ramifications.

Most notably was the inability for the weapons direction system to receive a proper inertial input from the ship's inertial navigator. This translated into an inability to inertially initialize a surface-to-air missile, the ship's main battery. What was going on here? A piece of "noncombat" equipment that was enjoying a good reputation in the merchant fleet, when installed on a combatant, had the ability to significantly reduce the effectiveness of that combatant. The speed sensor in question was built for merchant ships. The algorithms in the microprocessor were designed for slow changes of speed seen in merchants. When it sensed the rapid acceleration present on combatants, it faulted. Worse yet was that most merchants are of deep draft and very stable. Combatants tend to have shallower draft and are subject to pitch and roll in bad weather. Since the sensor was a doppler transmitter/receiver, the bubbles and air pockets that were produced under the hull in bad weather produced an air/water discontinuity that caused the sensor to fault. The inertial navigator subsequently faulted because it needed a relatively constant speed input to dampen out oscillations caused by the earth's gravitational field. Without the input from the inertial navigator, the ship's missiles were rendered useless. Thus, the linkage of combat system configuration and system level engineering was vital. The Program Manager must therefore factor in very authoritative configuration control to his NDI negotiations. The bottom line then is that we must take advantage of NDI, but proceed especially carefully in the high tech areas when systems are not able to stand alone.

In conclusion, it is clear that the stage is set for increased commercial procedures and more commercial products to be used in DOD acquisitions.

Adopting these commercial procedures and acquiring nondevelopmental items will save us millions of dollars a day. We must do it. As more and more candidates appear to be appropriate for the NDI process and as commercial technology becomes more sophisticated, we must proceed with caution to ensure that integrated systems are not unwittingly degraded. We must depend on excellent system engineering more now than ever before to make certain we procure the proper equipment. Procurement of nondevelopmental items will and should be the Program Manager's best friend, but he must make sure NDI is not turned over to the folks with green eye shades--his engineers must work harder than before to make the right decisions.

ENDNOTES

1. David Packard, A Quest for Excellence, p. xi.
2. Ibid., p. xxv.
3. David Packard, A Quest for Excellence, Appendix, p. 103.
4. Ibid., p. 104.
5. Ibid., p. 105.
6. Packard, A Quest for Excellence, p. xxv.
7. US Congress, House, Committee on Appropriations, National Defense Authorization Act for FY 1987, Sec. 905, p. 105.
8. William Stewart, Defense Acquisition of Commercial Products Draft Report, p. 5.
9. Ibid., p. 8.
10. James Burr:ett and William Perry, Use of Commercial Components in Military Equipment, p. 1.
11. Packard, A Quest for Excellence, p. 63.
12. Ibid., p. 62.
13. Ibid., p. 44.
14. US Secretary of the Navy, Secretary of the Navy Instruction 4210.7, p. 1.

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3. Department of Defense. Secretary of Defense Manual 5000.37M (Draft): Acquisition and Logistic Support of Nondevelopmental Items (NDI) Manual. Washington: Undated.
4. Department of the Navy. Secretary of the Navy Instruction 4210.7: Effective Acquisition of Navy Material. Washington: 16 June 1986.
5. Gansler, Jacques S. DOD Buying Commercial Products as End Items. Arlington, VA: The Analytic Sciences Corporation, 1985.
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8. Packard, David. A Quest for Excellence, Appendix. Washington: The President's Blue Ribbon Commission on Defense Management, 30 June 1986.
9. Stewart, William G. Defense Acquisition of Commercial Products Draft Report. Washington: Georgetown Center for Strategic and International Studies, Defense Acquisition Process Project, 1986.
10. US Congress. House. Committee on Appropriations. National Defense Authorization Act for FY 1987. Conference Report to Accompany S.2638. Washington: Government Printing Office, 1986. (House of Representatives Report 99-1001)