START Selected Topics in Assurance Related Technologies
Volume 5, Number 4

Commercial Off-the-Shelf Equipment and Non-Developmental Items

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Introduction

In the early 1980's, the Department of Defense's (DoD) only incentive to use commercial items was the potentially lower procurement costs that result from the economies of scale of the larger commercial market. Given today's austere defense budgets, cost savings remains a strong incentive.

Over the past 10 years or so, however, additional incentives have arisen. In 1986, for example, Congress passed legislation requiring DoD to give preference to the acquisition of non-developmental items (NDI). The passage of this legislation was a response to the:

- Increasing cost of system development programs
- Increasing time to field systems
- Technical risk associated with new development

Use of already developed items, whether commercial or military, saves research and development costs, shortens the time to field systems, and reduces the risk associated with new development. Based on these incentives, Congress broadened the preference for the acquisition of commercial items to preference for the acquisition of NDI, coining the term. In the 1990's, two more compelling reasons for using commercial items specifically were recognized.

First, the Department of Defense recognized that it must buy from the commercial market to access state-of-the-art technology and products. In his memorandum of June 29, 1994, then Secretary of Defense Perry articulated the importance of buying from the commercial market. In many of the defense-significant technological areas, the defense department trails private industry in research, development and application. For example, in the fields of communications, electronics, and computers the pace of technological evolution resulting from high commercial demand outstrips the capabilities of any government research and development program.

A second compelling reason to use commercial items is the integration of the defense and commercial industrial bases. DoD requirements that can be satisfied by commercial production are far more likely to have a stable and existing industrial base to draw from if there is a surge in requirements due to an emergency. Additionally, in times of reduced procurement, DoD business is not sufficient to keep many defense-unique suppliers in business. Integrated commercial and defense production is beneficial for the nation's security and economy in the long run.

Definitions

Commercial Off-the-Shelf (COTS) is the term most often used to refer to commercial items already developed and readily available for purchase by the government. The term "commercial item" is defined in the Federal Acquisition Regulations (FAR Part 12). The statutory definition of "commercial item" was developed to trigger the statutory procedures and exemptions for buying commercial items in the Federal Acquisition Streamlining Act to make it easier for the government to buy commercial items. The overall goal is to use commercial items to fill DoD requirements whenever practical. The FAR definition is too involved and lengthy to include here, but Figure 1 provides a summary.

A non-developmental item (NDI) is also defined in the FAR. Again, the definition is too lengthy to provide here. Figure 2 summarizes the FAR definition for NDI.

Challenges in Using COTS and NDI

For both COTS equipment and NDI:
- the basic design is set
- design changes are not controlled by the buyer (i.e., buyer does not have configuration control)
- the maximum use of commercial practices is desired

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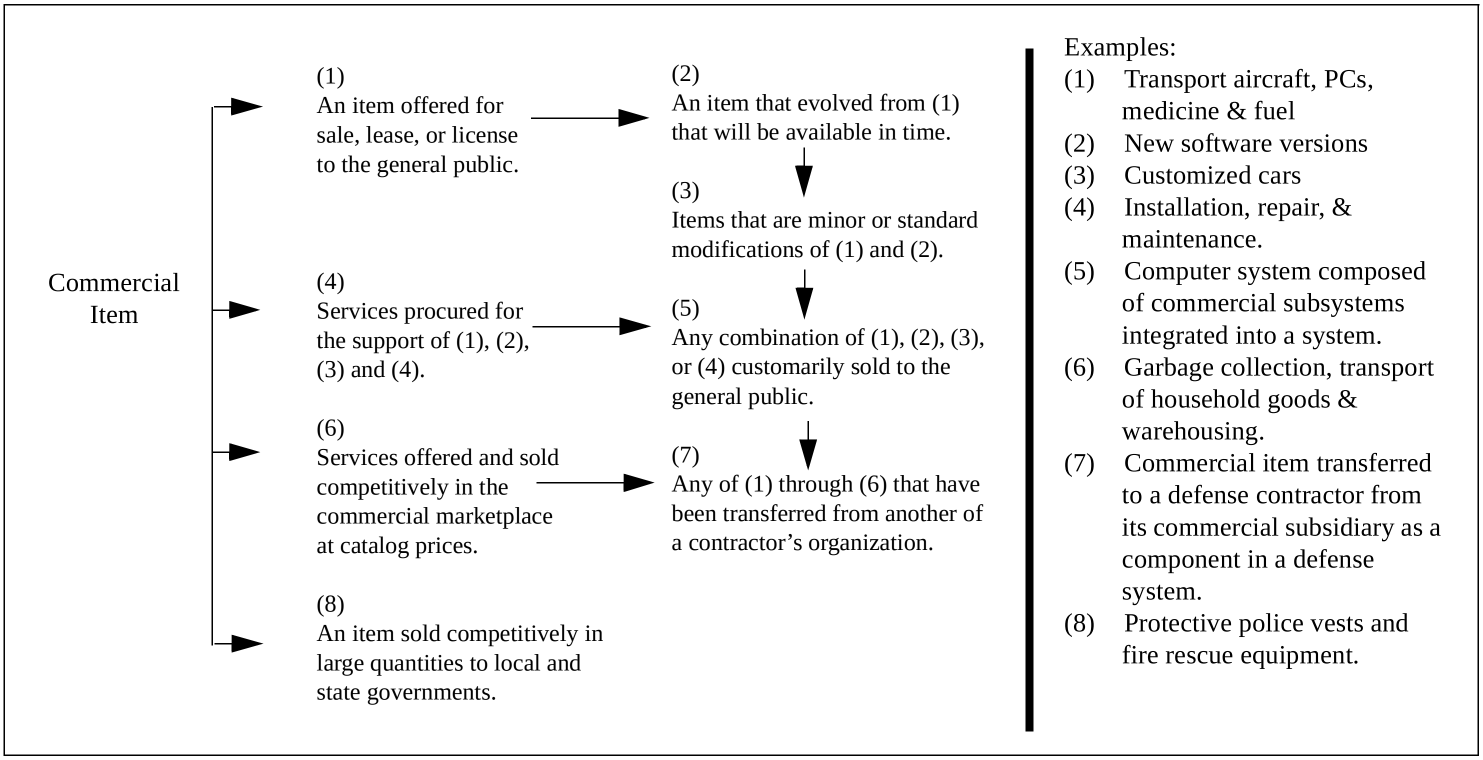

Figure 1. Summary of FAR Definition of Commercial Item

Non-developmental Item

(1)
Any previously developed item used by federal, state, local, or allied governments

(2)
Any item under (1) that requires only minor modification

(3)
Any item currently being produced that does not meet (1) or (2) solely because the item is not yet in use.

(4)
Integration of NDI subsystems and components.

Examples:

(1) Canadian dereefer used for US Army's cargo parachutes.

(2) Modification of British Light Gun into the US Army's M-119 Howitzer

(3) Self-explanatory

(4) Self-explanatory

Figure 2. Summary of FAR Definition of Non-developmental Item

These characteristics mean that buying and using COTS equipment and NDI presents unique challenges and requires some departure from acquisition "business-as-usual." Two of the most important areas for items developed primarily for the non-DoD marketplace are performance trade-offs to meet DoD needs and logistics support.

Performance trade-offs. A well-designed product is one that has performed "up to spec" in a defined environment. Most products, however, will not operate well if used in an environment more severe than the one in which it was designed to be used. Many commercial items (COTS equipment) were not designed to operate in the range of environments to which many military systems are exposed. One example is the ubiquitous personal computer (PC). Commercial PCs are designed for an office or home environment. In such an environment, temperature and humidity are usually controlled within a narrow range, the air quality is good, with little dust or other contaminants present, and vibration and shock are essentially non-existent. It would probably be risky to mount a PC on an M998 HMMWV (Hum-Vee) vehicle being operated in the desert. Reliability would undoubtedly degrade significantly and overall performance would suffer.

Many commercial components, on the other hand, were designed to operate in very harsh environments. Some automotive components, for example microprocessors, must operate under the hood of a vehicle where temperature and vibration are severe, and air quality poor. Using such a commercial component in a military environment would probably pose little risk. So it is vitally important to assess not only the potential cost savings from using a commercial item, but any degradation in performance that might result from a change in operating environment (i.e., conduct studies to trade cost savings for performance).

Logistics Support. When a commercial item such as a PC is purchased, the government seldom is able or can afford to purchase the design data or assume responsibility for configuration control. Essentially, a form-fit-function-interface (F^3I) purchase has been made. Under these circumstances, logistics support normally is provided by the supplier. In the case of a PC, this approach poses no special problems. In contrast, when a commercial item, such as a display, is integrated into a larger subsystem or system, logistics support is less of a straight-forward issue. Should the customer limit maintenance to remove and replace, and ship faulty displays back to the supplier? Does the display have built-in test points to aid in fault isolation or do test points have to be included in the interfaces to the display? Is there some method by which the customer can verify that a display is faulty before incurring the expense and time delays associated with shipping the unit back to the supplier?

Obviously, in making a decision to buy COTS equipment, the procuring activity must determine which concept for logistics support is most feasible and practical for that equipment. It must then evaluate the impact of that logistics support concept on ownership costs and readiness.

For Further Study:

1. Web Sites. Additional information on COTS and NDI can be obtained from the following web sites.
   a. http://www.acq-ref.navy.mil/buying.html
   b. http://aegis.dynsys.com/cotsbib.html
   c. http://www.dsmc.dsm.mil/r/port/mm/mei4739b.htm
   d. http://www.bmpcoe.org/knowhow/SD2/pol-def.html
2. Publications:
   a. "Acquisition of Commercial Items," Federal Acquisition Regulation, Subchapter B, Part 12.
   b. AT&T/US Navy, Design's Impact on Logistics, McGraw-Hill, New York, NY, 1993.
   c. Buying Commercial & Nondevelopmental Items: A Handbook, Office of the Under Secretary of Defense for Acquisition and Technology, April 1996.
   d. "Commercial Practices for Defense Acquisition," Defense Systems Management College, January 1992.
   e. "Engineering Off-the-Shelf Solutions," Naval Engineers Journal, May 1996.
   f. "Supply Support Handbook for Nondevelopmental Items," Ship Parts Control Center (NAVICP), 22 July 1996.

Other START Sheets Available:

94-1	ISO 9000
95-1	Plastic Encapsulated Microcircuits
95-2	Parts Management Plan
96-1	Creating Robust Designs
96-2	Impacts on Reliability of Recent Changes in DoD Acquisition Reform Policies
96-3	Reliability on the World Wide Web
97-1	Quality Function Deployment
97-2	Reliability Prediction
97-3	Reliability Design for Affordability
98-1	Information Analysis Centers
98-2	Cost as an Independent Variable
98-3	Applying Software Reliability Engineering (SRE) to Build Reliable Software

To order a free copy of one or all of these START sheets, contact the Reliability Analysis Center (RAC), 201 Mill Street, Rome, NY, 13440-6916. Telephone: (888) RAC-USER (888 722-8737). Fax: (315) 337-9932. E-mail: rac@iitri.org. These START sheets are also available on-line at http://rac.iitri.org/DATA/START in their entirety.

Future Issues:

RAC's Selected Topics in Assurance Related Technologies (START) are intended to get you started in knowledge of a particular subject of immediate interest in reliability, maintainability and quality. Some of the upcoming topics being considered are:

- Accelerated Testing
- Mechanical Reliability
- Reliability Growth
- Performance-Based Requirements

Please let us know if there are subjects you would like covered in future issues of START.

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Mr. Criscimagna holds a Bachelor's degree in Mechanical Engineering from the University of Nebraska-Lincoln, a Master's degree in Systems Engineering from the Air Force Institute of Technology, and he did post-graduate work in Systems Engineering and Human Factors at the University of Southern California. He completed the U.S. Air Force Squadron Officer School in residence, the U.S. Air Force Air Command and Staff College by seminar, and the Industrial College of the Armed Forces correspondence program in National Security Management. He is also a graduate of the Air Force Instructors course and completed the ISO 9000 Assessor/Lead Assessor Training Course. Mr. Criscimagna is a member of the American Society of Quality (ASQ) and a Senior Member of the Society of Logistics Engineers (SOLE). He is a certified Professional Logistician, chairs the ASQ/ANSI Z-1 Dependability Subcommittee, is a member of the US TAG to IEC TC56, and Secretary for the G-11 Division of the Society of Automotive Engineers.

About the Reliability Analysis Center

The Reliability Analysis Center is a Department of Defense Information Analysis Center (IAC). RAC serves as a government and industry focal point for efforts to improve the reliability, maintainability and quality of manufactured components and systems. To this end, RAC collects, analyzes, archives in computerized databases, and publishes data concerning the quality and reliability of equipments and systems, as well as the microcircuit, discrete semiconductor, and electromechanical and mechanical components that comprise them. RAC also evaluates and publishes information on engineering techniques and methods. Information is distributed through data compilations, application guides, data products and programs on computer media, public and private training courses, and consulting services. Located in Rome, NY, the Reliability Analysis Center is sponsored by the Defense Technical Information Center (DTIC). Since its inception in 1968, the RAC has been operated by IIT Research Institute (IITRI). Technical management of the RAC is provided by the U.S. Air Force's Research Laboratory Information Directorate (formerly Rome Laboratory).