

MIL-STD-461 vs. Nondevelopmental Items

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The push for the Department of Defense (DoD) to procure more electronic equipment which is commercially available versus procuring items designed to meet sometimes unnecessary military specifications has been increasing significantly over recent years. To launch this concept, the DoD issued its SD-2 publication entitled "Nondevelopmental Item Acquisition Handbook," dated May 31, 1990. SD-2 defined nondevelopmental items (NDI) as already-developed hardware or software, capable of fulfilling operational requirements either "as is" or with modification, therefore minimizing or eliminating the need for costly, time consuming, government-sponsored research and development programs. NDI acquisitions by the Government are to take advantage of advances in technology and the high quality standards of commercial markets resulting from competitive pressures in those markets.

NDI can consist of items already developed by foreign governments which can be supplied in accordance with mutual defense cooperation agreements and DoD acquisition regulations. Items obtained from a domestic or foreign commercial marketplace such as commercial off-the-shelf (COTS) items are only one category of NDI. Items already developed and in use by the military services and other defense activities and government agencies are also part of NDI.

Waivers alleviate the compatibility crisis confronting Navy acquisitions. MIL-STDs-461/462 can still be used to set forth performance criteria for NDI.

ADVANTAGES AND DISADVANTAGES OF NDI

There are many advantages to the acquisition of NDI. These include the reduction or elimination of product development time, the elimination of production time, the existence of an expanded industrial base of replacement parts and equipment, quick response time to operational needs, and the application of current state-of-the-art technology to today's requirements.

There are also many disadvantages to the purchase of NDI, some not as obvious as some of the advantages. For instance, if a COTS needs to be modified to withstand a specific environment or to fit a specific application, these modification costs can be very expensive, with high non-recurring engineering costs and the lack of spare parts. Also, most COTS cannot withstand the harsh environments that military equipment, especially tactical equipment, must withstand. A computer in an industrial site will probably work well

in a ground-based administrative military installation. To put that computer on an aircraft carrier requires a different environmental consideration. There is also the problem of life cycle spare parts, since military electronics are expected to perform over a longer period of time than are commercial products. Most importantly, the commercial products may not meet the EMI criteria necessary to work in a compatible fashion in a military environment.

SD-2 AND EMI

SD-2 addresses the potential problem of electromagnetic compatibility and states the following:

"The degree of electromagnetic compatibility compliance with military specifications and standards must be ascertained to ensure performance is not degraded in the mission environment. The NDI must also be electromagnetically compatible with existing operational equipment and systems. The fact that an NDI may already be accepted in the commercial marketplace does not ensure electromagnetic compatibility requirements are met."

Essentially, the above concepts require that an NDI be tested and comply with the tailored EMI requirements in MIL-STD-461. The Handbook examines two methods of determining compliance: analysis and testing.

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The EMC performance of an item is a function of its electrical and mechanical design. Since NDIs are already designed, it is essential to assess the ability of the NDI to operate compatibly in its intended environment. The Handbook stresses in-depth analyses to correlate the design criteria and/or requirements of commercial product assurance programs with their military counterparts. Unfortunately, it can be difficult or even impossible to make such a correlation.

For example, electrical and electronic equipment sold to commercial customers in the United States must comply with the EMC requirements of the Federal Communications Commission (FCC). The FCC requires conducted emissions testing in the frequency range of 450 kHz to 30 MHz and radiated electric field emissions testing in the frequency range of 30 MHz to 1000 MHz. Note that the FCC emissions tests omit significant frequency ranges required by the military, including the 30 Hz to 450 kHz range (sonar), the 3 MHz to 30 MHz range (communications), and frequencies above 1 GHz (radar).

The FCC emissions tests cannot be correlated within the ± 2 dB accuracy requirement of MIL-STD-462 to the equivalent MIL-STD-461 tests (CE03 and RE02) required by the military. This is due to differences in test configurations, test procedures, and measurement methods required by the FCC and by MIL-STD-462. Another problem area is that the FCC requires no susceptibility testing. Susceptibility testing is extremely critical if the operational environment is the flight deck of an aircraft carrier. Since most military environments are severe enough to require susceptibility testing, the only way to ensure the EMC of NDIs is to require full MIL-STD-461/462 testing.

A NEW WAY OF DOING BUSINESS

On June 29, 1994, a memorandum signed by Secretary of Defense William J. Perry significantly changed the way the Government utilizes military standards. He stated his support for the use of performance and commercial specifications and standards in lieu of military specifications and standards unless no practical alternative exists to meet the user's needs. Furthermore, he directed that immediate action be implemented to dispense with the use of military standards.

In later briefings, it was revealed that performance and interface specifications would be exempt from these requirements. However, the Government has to go through a procedure to have individual standards and specifications approved as performance or interface standards before they can be applied to a contract. Thus, MIL-STD-461/462 would no longer be imposed on new acquisitions and was scheduled to be removed from some military contracts.

Secretary Perry's memo, as well as its misinterpretation and re-interpretation, severely upset the DoD acquisition system. The military quickly looked to industry to see if equivalent EMI standards exist which would assure the compatibility of electronic equipment in a military environment. FCC requirements fall quite short since they do not include product susceptibility criteria. IEC requirements also fail to provide criteria which could assure the compatibility of equipment in military environments. The environments specified in IEC requirements are, at worst, industrial, and the radiated susceptibility characteristics specified are not much more severe than what is required to survive

in an urban environment. There are other commercial requirements such as product-specific susceptibility criteria, but the test methods vary for each requirement. Thus, the task of trying to correlate test limits by analyzing test methods is an almost impossible task due to the many significant variances which exist.

THE RECOVERY PERIOD

By the end of December 1994, the U.S. DoD realized that the initial interpretation of Secretary Perry's memo was severely hindering the acquisition process and that EMI problems would surely overwhelm and degrade the military's function. It was finally concluded that if there were no commercial equivalent environmental or interface document in industry, a waiver could be granted for the use of a military standard. The definition of a military standard that may be used is one that sets forth performance criteria, not design criteria. Since MIL-STDs-461 and 462 meet this definition, waiver requests within the Air Force and Navy were made. At the end of December 1994, the Air Force granted a waiver for the use of MIL-STD-461 but not for MIL-STD-462. This is not considered to be a crisis since compliance to MIL-STD-461 must still be demonstrated, and MIL-STD-462 is the only document which would be accepted for this purpose.

In February 1995, the Navy granted waivers for the use of both MIL-STD-461 and 462, thus alleviating the compatibility crisis that was confronting Naval acquisitions. The Army also is considering a waiver, but as of February 15, 1995, the waiver process is not known to have started.

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Waivers are granted by each service for the use of what they define as environmental standards which have no commercial equivalency. Whether or not these waivers are limited to only two years or are for an indefinite period of time still is to be defined. What will probably happen is that the approval to use standards such as MIL-STD-461/462 will be elevated to the DoD level such that unique performance standards will be approved for use by all elements of the DoD. If MIL-STD-461/462 receives this approval, it will alleviate the problem for the Army and solve the MIL-STD-462 dilemma for the Air Force.

CONCLUSION

NDI and COTS will continue to be procured in increasing numbers. The amount of EMI problems experienced by the DoD will increase. The reports of these

problems will lag behind their actual occurrence, since the reporting of problems has a negative effect on a commander's fitness reports. Nonetheless, they will reach such proportions that entire procurements will be warehoused and replaced with new products to which MIL-STD-461/462 have been properly applied. By using its MIL prime concept, the Air Force is not as likely to have as many problems as the Navy and Marines, since the Air Force places responsibility for the compatibility of an aircraft on the aircraft manufacturer. However, the Navy and Marines do their own compatibility studies, and through the pressure of cost reduction, NDI procurements, and negative attitudes (see editorial), more and more EMI problems are likely to be seen.

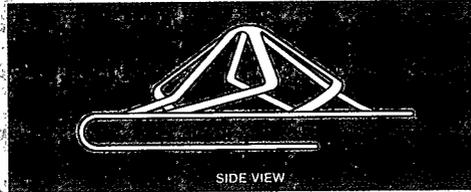
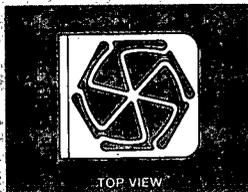
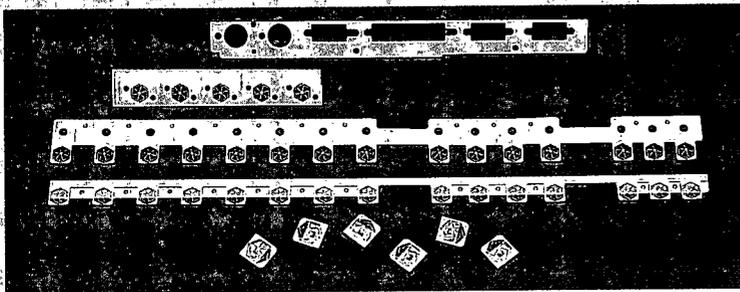
Now that MIL-STD-461D and MIL-STD-462D have been in circulation for a couple of years,

several problems have been revealed. However, the updating of these standards must await resolution of the Government's uncertainty over how to apply E³ standards. Thus, the use of the EMI test procedure is currently the best way to address corrective measures when necessary.

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