

Applied Information Technology (IT) For Ship Design, Production and Lifecycle Support: A Total Systems Approach

by

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ABSTRACT

This thesis analyzes the material flows, manpower usage, administrative requirements and procedures, and technical interface needs employed in the logistics systems onboard aircraft carriers and submarines to determine where Information Technology (IT) could be applied to reduce lifecycle costs and manning demands. The concepts and recommendations derived from this study support the “Focused Logistics” pillar of Joint Vision 2010 (JV 2010), and guidance of the Federal Acquisition Streamlining Act (FASA), the Federal Acquisition Reform Act (FARA), and DoD Directive 5000.1 (March 15, 1996) to incorporate proven commercial business practices into DoD processes.

The first step was to baseline the existing logistics infrastructure for two platforms, namely the aircraft carrier and the submarine, to identify what could be done with IT to make the process more effective. In addition, a broad area search of Navy-wide logistics IT insertion initiatives, and numerous discussions with logistics experts across the Navy and their supporting contractor base were made to ensure that recommendations would be pertinent to current issues. Once the data was all compiled, it was analyzed to identify any gaps which could be potentially solved through the insertion of IT. This analysis indicated that the computer migration plan under the Naval Tactical Command Support Systems (NTCSS) application programs was progressing smoothly, and that the communication connectivity issues associated with exchanging real time data were also well underway through the Information Technology 21st Century (IT-21) initiatives. The one glaring area which was demanding a great deal of time for shipboard supply personnel, and was not getting much attention by the Navy logistics leadership, was in the data acquisition point in the system. Thus, for logistics, material tagging technology in support of more efficient receipt and inventory actions needed to be investigated.

A review of commercial practices using Electronic Resource Planning (ERP) tools, and tracking technology to improve logistics system accuracy and throughput revealed that a new technology known as Radio Frequency Identification Device (RFID) tags had just recently matured to the point where it could provide a viable solution. There are a wide variety of products available from an ever-expanding vendor base, and these products are providing very reliable performance in logistics applications, at reasonable cost. To date, commercial applications of the technology have been for baggage, parcel, pallet, and container tracking. In addition warehouse management systems and retail electronic pricing concepts are also gaining an ever-increasing level of use. The question is whether this technology can be applied in a cost-effective manner to improve upon the shipboard logistics system.

This thesis identifies potential uses and risks of employing RFID aboard ships. In addition, it lays out a conceptual approach toward developing a notional, hybrid, barcode/RFID Automated Material Handling System (AMSH) for both platforms. The physical characteristics of the shipboard logistics system drive the specific product mix of tags, thus the recommended solution for the aircraft carrier is substantially different than that provided for the submarine.

In conclusion, RFID tagging technology provides a logical next step toward a more automated logistics system for the fleet. There are vast commercial applications that enable complex interconnected logistics systems to operate at improved efficiency and this provides an impetus for potential military applications for the technology and the current cost reductions and product capability improvements can be expected to continue. All of the Navy's ship design teams could benefit from investigating how this technology may be applied toward their manning and lifecycle cost reduction efforts. Such analysis would help to better define their platform's logistics flows, both physically and electronically, early enough in the design process to permit cost effective posturing for the insertion of the IT solutions when risk and cost assessments show a payoff. The technology is here, and it is now time for innovative design engineers to conduct pilot testing, and for the budget managers to conduct Business Case Analysis (BCA), similar to that provided for the Operating Space Items (OSI), to quantify the potential benefit of RFID onboard U.S. Naval warships.

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