CDIO and its Adoption at the United States Naval Academy

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INTRODUCTION

The CDIO (Conceive-Design-Implement-Operation) Initiative is based on the principle that product and system lifecycle development and deployment are the context of Engineering Education. Its mission is to graduate engineers able to Conceive-Design-Implement-Operate complex value-added engineering products and systems in modern team-based environments so as to appreciate engineering processes and contribute to the development of engineering products while working in engineering organizations. As a result, intended attributes of CDIO graduates include understanding disciplinary fundamentals, understanding design and manufacturing, possessing a multi-disciplinary system perspective, exhibiting good communication skills, and having high ethical standards.

Of course, each CDIO program develops expected student learning outcomes that are consistent with the program mission and are validated by program stakeholders. Typically, program outcomes include technical knowledge and reasoning, personal and professional skills and attributes, interpersonal skills such as teamwork and communication, and conceiving, designing, implementing and operating systems in the enterprise and societal context.

USNA ADOPTION OF CDIO

The Department of Aerospace Engineering at the United States Naval Academy joined the CDIO Initiative in July 2003. The CDIO Initiative provides us with the framework and tools necessary to make and assess changes in our program. Before describing why and how we adapted CDIO to our program it is necessary to understand the mission of the United States Naval Academy

The mission of the United States Naval Academy is to: Develop midshipmen morally, mentally and physically and to imbue them with the highest ideals of duty, honor and loyalty in order to provide graduates who are dedicated to a career of naval service and have potential for future development in mind and character to assume the highest responsibilities of command, citizenship and government.

The Naval Academy produces officers who serve in the United States Navy and Marine Corps. Therefore, the goals and outcomes of all the academic programs, including the Aerospace Engineering program, support the Naval Academy mission under the leadership of the Academic Dean and Provost. In this regard, the institution has developed a set of attributes of graduates that describe the kinds of graduates it strives to produce.

The mission of the Aerospace Engineering Department must follow from the mission of the Naval Academy and contribute to the development of the Attributes of Graduates, while at the same time emphasizing the role of the aerospace engineering major. Our mission is to: Provide the Navy and Marine Corps with engineering graduates capable of growing to fill engineering, management and leadership roles in the Navy, government and industry, maturing their fascination with Air and Space systems. Our departmental vision follows our mission: Mission fulfilment requires a program wherein Midshipmen Conceive – Design – Implement – Operate complex mission-effective aerospace systems in a modern team-based environment. Our departmental mission and vision are a direct result of our participation in CDIO.

Our primary interest in CDIO initially was its approach to program assessment that is tied to the CDIO syllabus. We felt that this approach would of great assistance in meeting the new accreditation standards set forth by the Accreditation Board of Engineering and Technology (ABET). However, as we learned more about CDIO we were convinced that CDIO was right for us for many reasons, beyond our initial interest in the assessment process. The primary reasons for adopting the CDIO Initiative in to the Aerospace Engineering program at the Naval Academy were: (1) Our desire to go beyond "paper designs" in capstone

design courses. (2) The strong focus at the Naval Academy on operations – our graduates become operators of systems. (3) CDIO provides us with the structure to make necessary changes in our program. (4) CDIO provides us with lessons learned from the original four schools to help guide our design and implementation of a renewed Aerospace Engineering Department.

These reasons provided the motivation for change and made the job of convincing our faculty to adopt the CDIO Syllabus a straightforward process. The survey of our key constituents further solidified the need for change and the advantages of the CDIO Syllabus. Over the last seven years we have continued to develop CDIO in the Aerospace Engineering Department based on the continuous assessment of student achievement and stakeholder needs.