Concurrent Design:
A Winning Cross-Disciplinary Analysis and Design Approach

Dr. Knut Oxnevad
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12:00 - 1:00 PM
Conference Room 167

The biggest challenge facing space development today does not lie within a specific technology or discipline, but rather in our ability to make these technologies and disciplines work together efficiently to achieve our objectives. The Next Generation Project Development Teams (NPDT) at JPL -- Team I and the MSMS Team – were formed to address this challenge. These teams provide customers with state-of-the-art concurrent analysis, simulation, and design environments, primarily for the early design stages.

The teams utilize interconnected, high-end analysis and design tools. Both COTS and JPL-developed tools, such as MODTool and MMAPT, are being used, and they share and utilize common data and 3D geometries. Teams using the NPDT approach have seen dramatic increases in quality while reducing development time by larger than a factor of four. The ability to quickly bring a design from concept to "hardware" was demonstrated for the Loihi probe. In 3 weeks, the design was developed from just a concept to engineering drawing level quality ready for the Machine Shop. These unique capabilities have helped JPL create a number of winning missions – GRACE, HYDROS, AQUARIUS, CARBON, the Disturbance Reduction System, and Loihi – and innovative Mars rover and lander concepts.

In this talk, Dr. Oxnevad will describe the NPDT concurrent design approach, with special emphasis on the design processes and tools suites that were developed for supporting the OSIRIS mission (precursor to HYDROS AND AQUARIUS), the Loihi, and the Mars Rovers and Landers.

Dr. Knut I. Oxnevad: Design process pioneer/guru. Oxnevad is a senior researcher in the Modeling and Simulation Technologies Group in the Engineering and Communications Infrastructure Section (366) at JPL. For the past five years, he has been setting up and leading state-of-the-art concurrent design teams – the NPDTs -- for space payloads, satellites, and surface/subsurface systems at the Lab. Oxnevad received his Ph.D. from Old Dominion University, Norfolk, VA in 1996, where he proposed a new design approach for spacecraft. Ideas from his research were later implemented into the NPDTs. In 2000, he defined and published "The Eight Principles of Concurrent Design," enabling radical changes in current design process approaches. He is a graduate of International Space University, serves as a visiting scholar at Stanford, and as a visiting researcher at the National Space and Development Agency of Japan (NASDA), is Chairman and Principal of the Concurrent Design Laboratories (CDL), and chairs the New Design Paradigms Workshops. He has published 10 papers, and given more than 30 talks at institutions and conferences in the USA, Europe, and Japan on the topics of concurrent design and design process improvements. He has received international awards for his work, and consults for NASA and national and international institutions on fundamental design process improvements.

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