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Technology and Manufacturing Track

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*Technology Assessment in Support of the Presidential Vision for
Space Exploration*



by

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ABSTRACT

This lecture discusses the process and results of technology assessment in support of the United States Vision for Space Exploration of the Moon, Mars and Beyond. First, the Presidential Vision is reviewed: a major endeavor in building systems of systems. We discuss why we wish to return to the Moon; and the exploration architecture for getting there safely, sustaining a presence, and safely returning. Next, a methodology for optimal technology investment is proposed with discussion of inputs including a capability hierarchy, mission importance weightings, time dependent cost profiles and available resources, likelihoods of development success, and an overall objective function. A temporal optimization formulation is presented, and the investment recommendations provided along with sensitivity analyses. Key questions addressed are sensitivity of budget allocations to cost uncertainties, reduction in available budget levels, and shifting funding within constraints imposed by mission timeline.

ABOUT THE SPEAKER:

Charles Weisbin currently serves as Deputy Program Manager for the Strategic Systems Technology Office of the Chief Technologist at the Jet Propulsion Laboratory. Prior to this, at JPL, he led the Surface Systems Thrust Area, within the NASA Cross-Enterprise Technology Development Program. He was Program Manager for Robotics and Mars Exploration Technology Programs and before this, Section Manager for Robotic Systems and Advanced Computer Technology. At the Oak Ridge National Laboratory, he was Director of the Robotics and Intelligent Systems Program and Director for the Center for Engineering Systems Advanced Research.

Dr. Weisbin was Associate Professor of Computer Science, teaching artificial intelligence at the University of Tennessee. He has served as associate editor for IEEE Expert, as editorial board member for the International Journal of Applied Intelligence and IEEE Robotics and Automation. Dr. Weisbin was program chairman for the IEEE Second

International Conference on Artificial Intelligence Applications. He was the co-chairman of the NASA Telerobotics Intercenter Working Group for seven years and received the 1993 NASA Exceptional Service Medal for formulation and development of the NASA Telerobotics Program. He is a recipient of the 1998 Thomas O Paine Award for Advancement of Human Exploration to Mars and a IEEE Computer Society Golden Core Member award. He also received the 1999 NASA Exceptional Service Medal for development and infusion of robotics from basic research into NASA flight missions and missions of other agencies. He received the award for Outstanding Leadership in Surface Robotics for the year 2000, the Decadal Planning Team achievement award in 2001, the NASA Group Achievement Award in 2001 for contributions to the NASA Decadal Planning Team, a Lifetime Achievement Award from the World Automation Congress in 2004, and the award for Best Paper published in the System Engineering Journal in 2004. In 2005 he also received a NASA award (monetary) for software development.

Dr. Weisbin has made important contributions in diverse technical fields including nuclear reactor physics and shielding, energy-economy supply-demand modelling, global climate assessment, robotics and intelligent machines, and most recently, systems analysis with focus on methodological advances extending risk assessment approaches to include advanced research with application to planetary exploration and search for life beyond earth. NASA Program Analysis and Evaluation and the NASA Exploration Directorate are currently benchmarking technology systematic R&D allocation developed by Weisbin and colleagues with the intent to apply it at broader scale within the agency.