BIOGRAPHY

John Karas

Vice President, Space Exploration Business Development/ Advanced Programs
Lockheed Martin Space Systems Company

Joined Corporation in 1978
Appointed to Space Exploration position February 2004
Appointed to Business Development position April 2003

John Karas is Vice President of Space Exploration and Business Development/Advanced Programs for Space Systems Company. In his Space Exploration position, he is responsible for coordinating the corporation's capabilities and assets for human and robotic space exploration. Through Business Development he is responsible for strategic planning, advanced technology concepts, and new business acquisition efforts for strategic and defensive missiles, and commercial, civil, and classified space lines of business in both Denver and Sunnyvale. Mr. Karas reports directly to Tom Marsh, Executive Vice President of Lockheed Martin Space Systems Company.

Previously, he was Vice President, Atlas and Advanced Space Transportation, part of Lockheed Martin Space and Strategic Missiles. This responsibility included launch systems development and recurring operations for the Atlas program and advanced space transportation opportunities such as Orbital Space Plane and other manned, unmanned, reusable and expendable systems, including their business development, implementation and operations.

Prior to this assignment, from 3/97 to 12/02, Mr. Karas was Vice President and Deputy of the EELV/Atlas V organization and was responsible for developing new launch vehicles such as the Atlas IIIA, IIIB and the Atlas V family, and their launch facilities.

Karas began his career with General Dynamics' Space Systems Division in 1978 and joined Lockheed Martin in May 1994 when Lockheed Martin acquired the Space Systems Division. From 1995 to 1997 Karas was the Program Director for advanced Atlas launch vehicles, specifically the Atlas IIIA launch system. He was instrumental in the creation of the company's launch vehicle strategy, which included the Atlas II, III and V family evolution.

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Previously Karas was the Director of the Advanced Space Systems and Technology department and Site Director of the company's operations in Huntsville, Alabama. In this position he was responsible for management of operations research, system predesign, technology development and new business funds for the entire division. Under his direction, the department focused on structures and propulsion technology.

For example, new materials (aluminum-lithium and composites) and manufacturing technologies (near-net forming) were matured for cryogenic tanks. New cryogenic feedlines and Russian engines and subsystems such as the initiation and development of RD-180, advanced Russian

propellants and flange tests also were completed during propulsion technology development, all of which were successfully transitioned into production on the Atlas III, Atlas V and EELV programs. Karas was also responsible for SSTO and NASP cryogenic systems and contracted R&D.

Karas also served as Manager of Advanced Avionics Systems. This group was responsible for new technology demonstration; conceptual predesign; avionics system design; and system integration lab testing for airborne guidance, navigation, and control (GN&C) functions. These new technologies included developments such as adaptive GN&C, multiple fault-tolerant controls, a

totally electric vehicle using electromechanical actuators and artificial intelligence applications. The Advanced Avionics Systems group also had the responsibility for the development of independent and contract research and development (IR&D and CR&D) and insertion of new cost savings and performance enhancement technologies into existing products. During his tenure in this position, Karas was designated "Employee of the Year" for the development leading to the upgrade of the Atlas avionics system.

Prior to leading the advanced avionics department, Karas spent 7 years working all levels of integration on the Shuttle-Centaur program. Karas led the integration of Centaur and associated airborne and ground support equipment with Shuttle Airborne, Ground Systems and Flight Operations. In this capacity, Karas became very familiar with expendable and manned systems and with operations at NASA's Johnson, Kennedy and Lewis Space Centers.

His technical expertise includes system definition, propulsion & avionic technology development and insertion, and hardware/software integration. Karas also has developed redundancy management concepts for several flight-critical systems and their associated system demonstration and validation techniques. Karas has served on several national and international committees on these subjects.

Karas was one of five senior managers that received Aviation Week's 2000 Laureate Award for Aeronautics/Propulsion for the merger of the RD-180 Russian engine with Lockheed Martin's Atlas launch vehicle. He was also named Lockheed Martin Astronautics Manager of the Year for 2000. Most recently Mr. Karas and the Atlas team was awarded the 2002 leadership award for the Space Systems sector of Lockheed Martin for the on-cost and on-schedule successful first launch of EELV/Atlas V.

Karas received his bachelor's degree in Electrical Engineering from the Georgia Institute of Technology in 1978. While working toward his degree, Karas was a co-op student for 4 years where he worked for NASA at the Kennedy Space Center. Karas has taken advanced course work toward a masters in engineering and an MBA.