LOCKHEED MARTIN
We never forget who we're working for™

Advanced Technology Laboratories

TECHBRIEFS

December 7, 2007
Volume 2, Number 5
www.atl.lmco.com

Technology: Nanotechnology Modeling

Thinking Small in a Big Way

Introduction

Nanotechnology is the applied science of working with matter at the molecular level—at scales of 1 to 100 nanometers. As a polite reminder, one nanometer is one billionth of a meter, or roughly the size of a marble compared to the earth.

There is, however, nothing small about the potential—in terms of both technology and investment. Conservative estimates suggest that tens of billions of dollars will be invested in nanotechnology research and development in the coming decade, leading to major breakthroughs in computing, manufacturing, communications and even production of food and medicine.

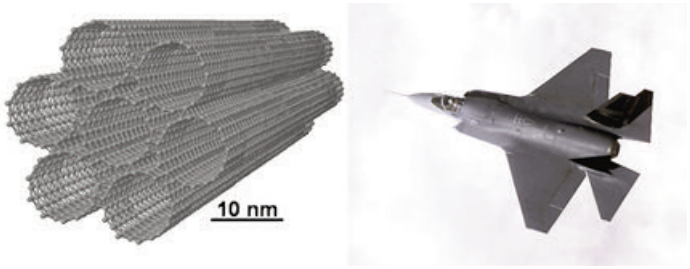
Nanotechnology is not just about thinking small; it is about thinking differently.

These technology advances are the motivation behind Lockheed Martin's (LM) Nanotechnology Strategic Technology Thread—under the corporate leadership of Brad Pietras—that is focusing on three areas: ultra-light structures (LM Aeronautics), systems and distributed sensors (LM Advanced Technology Center) and modeling and simulation (LM Advanced Technology Laboratories (ATL)).

Nanotechnology is not just about thinking small; it is about thinking differently. Real advances in nanotechnology will be best achieved through the coordinated and collaborative efforts of physicists and chemists, computational and material engineers, manufacturing engineers, and modeling and simulation engineers—all of whom must be true visionaries and innovators.

Program Goals

Computer science offers the most cost-effective approach for the development of new materials and sensors. ATL will expand modeling and simulation technologies that will provide an order-of-magnitude less expensive means of development and testing emerging nano-scale devices compared to traditional laboratory-only research.



Carbon nano tube (CNT) structures possess extraordinary mechanical properties: For example, they are as stiff as a diamond—ideal for reinforced composites. F-35 structures could be 50% stronger and 40% lighter if CNTs were used.

For example, ATL is developing modeling technologies for nano-composite structures, nano-electronic sensors, nano-enabled medical diagnostic sensors, and nano-enabled conformal RF sensor arrays.

ATL's efforts will provide nanotechnology support to Lockheed Martin through its scientific computing infrastructure and modeling, simulation, and materials science collaborations with universities, small companies, and government laboratories—Sandia, Oak Ridge, Lawrence Livermore, etc. This means that revolutionary nano technologies will be ready for transition to practical uses in much less time.

The Future

These collaborations will also likely lead to computer processors operating at a fraction of current energy requirements, a one-million fold increase in computer efficiency and sensors collecting and communicating massive amounts of data at nano-scale sizes and weights.

Eventually, the program will develop computational modeling tools that are able to evaluate nanotechnology-based materials and device designs and transition these novel capabilities across Lockheed Martin.

For More Information:
Lockheed Martin Advanced Technology Laboratories
Hugh Pearce, PhD, Director Business Development
3 Executive Campus • 6th Floor • Cherry Hill, NJ 08002
856.792.9810 • hpearce@atl.lmco.com