Table 1: Strategic Priorities for the U.S. Military

Strategic Priority	Challenge potentially requiring S&T innovation
Fleet Protection	There is vulnerability to standoff attack—especially Carrier Task Groups.
Technology for Ground Forces	After the disastrous and costly failure of the Army's Future Combat System (FCS) in implementing ground force robotics, stronger consideration about the real technology needs for ground forces is necessary. In future wars, the military will need to forecast what type of ground forces are needed and how can technology support them effectively.
Air defense vs. Strike	With counter-stealth and increased air defense capabilities, air superiority and dominance may no longer be assured. The U.S. can consider instantaneous precision global strike as an option.
Space-asset defense	The U.S. must consider options to protect space assets given demonstrated capabilities by others, particularly China.
Cyber warfare and cyber defense	The emerging technologies of information and communications gave the U.S. fundamental advantage for decades, but this now raises the prospect of being an Achilles heel, and portends potential security disaster.

Table 2: Promising Emerging Technologies [7] [8]

Emerging Technology	State of Maturity/Security Implication	Vulnerability/Area of Concern/Investment
Advanced Microchips	It is generally recognized that Moore's Law is no longer being achieved in the advancement of integrated circuits and that other technologies will be needed. May need to be considered a national security issue.[7]	Other countries may be developing spintronics, quantum computing, and neuro-synaptic biocomputing. Microelectronics purchased overseas may contain security flaws. Investments may be needed to counter these concerns.
Artificial Intellignce (AI)	AI is steadily penetrating both defense and civilian applications. This portends to reshape how decisions are made—perhaps raising the question of whether and when AI will overtake humans in making decisions. Commercial and military needs for accessing and using massive amounts of data for nearly instantaneous assessment and decisions is becoming a reality (see the article by Lemnios, et al, in this volume).	Today AI is weak compared to what some see as possible, Yet, controlling such advanced AI-based systems raises fundamental ethical questions. It is unclear how ethics should be addressed and by whom, and the U.S. should prepare to confront adversaries who may neglect the ethics entirely.
Robotics and Autonomous Systems	While the "rise of robots" has been projected by futurists for many years, the reality of such capabilities appears to be on the cusp. Yet, robotics in military systems have been rudimentary to date—essentially human-operated or simple autonomy. The value of "real robots"—including autonomous air weapons—in military applications is currently undetermined.	The defense sector will need to determine to what extent should military capabilities be turned over to collaborative cognitive systems, and redlines for how far should autonomy be allowed to go. The risk of not pursuing full autonomous systems will have to be weighed as U.S. adversaries move forward with them.[8]
Human Augmentation and Biologics	Understanding of biology at the micro and macro levels has increased exponentially over the past decade. Daunting questions are being raised regarding how far to pursue and implement biological modifications. Genetic modification using CRISPR offers the prospects of overcoming genetic defects, but also the ability to improve human capabilities.	U.S. defense planners will need to determine how far human augmentation should be allowed to go, with the understanding that adversaries are/will likely pursue these activities. It will be important to discern if there are any realistic mechanisms that can be developed to govern such possibilities.

Emerging Technology	State of Maturity/Security Implication	Vulnerability/Area of Concern/Investment
Nano-MEMSification and Nanobiomechatonics	Micro-electrical mechanical systems (MEMS) are miniature devices based on semiconductor production processes that perform a wide range of physical functions. These have become ubiquitous, but there is a prospect that developing these at the nano-level and integrating them with biological systems could have huge impacts—ranging from bio-sensors for health monitoring, to "Internet of Things," to enabling highly sophisticated robotics with human-like dexterity. Many of these will combine miniaturized sensors with processing and activation capabilities.	The potential impacts of this group of technologies may warrant the focus of a major "enabling technology" investment.