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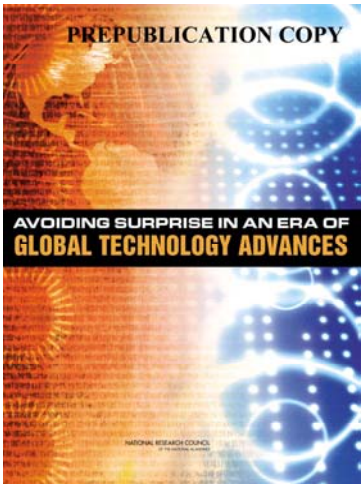
Avoiding Surprise in an Era of Global Technology Advances—*Summary*

Division on Engineering and Physical Sciences

Background



The global spread of science and technology expertise and the growing commercial access to advanced technologies with possible military application are creating potentially serious threats to the technological superiority underpinning U.S. military strength. Key to dealing with this situation is the ability of the U.S. intelligence community to be able to provide adequate and effective warning of evolving, critical technologies. To assist in performing this task, the Technology Warning Division of the Defense Intelligence Agency (DIA) asked the National Research Council (NRC) to undertake a study examining technology warning issues. In particular, the NRC would carry out analyses of technologies and capabilities of interest to the DIA, provide estimates of when technologies and capabilities under development by foreign nations could pose a threat to U.S. forces, and highlight technologies and capabilities that warrant future in-depth analysis. This report would assess critical, evolving technologies; postulate ways potential adversaries could disrupt these technologies; and provide indicators for the intelligence community to determine if such methods are under development. The intention of this report is to establish the foundation for a long-term relationship with the technology warning community to support the examination of technology warning issues.

Introduction

The report first presents a methodology developed by the study committee that would enable identification, assessment, and prioritization of emerging technologies and capabilities in terms of their potential impact on U.S. military capabilities. Following this, the report describes the application of this methodology to a selection of technologies to assess potential threats to those capabilities.

Methodology The approach begins with the question: What technological capabilities does the United States have that, if threatened, impact its military preeminence? Subsequent steps are identification of critical, evolving technologies and observables that might indicate adoption or exploitation of such technologies by potential adversaries; assessment of accessibility, maturity, and consequence of such exploitation; the priority

that should be placed on the technology warning process for each emerging technology; and the assignment of relevant intelligence collection requirements.

Technologies The technologies selected include information technology-enabled systems and applications, air superiority, friend-foe-neutral and target discrimination, and biotechnology-related capabilities. In each case, developments are taking place in foreign countries that could permit adversaries to compromise key U.S. capabilities. In many cases, commercial sources ranging from small, start-up firms to large companies are an important source of foreign technology development. This situation expands the types of indicators that must be monitored to gain useful intelligence.

Findings and Recommendations

Need for New Collaboration and Engagement Global, nongovernmental scientific and technical entities are driving advances for a wide range of evolving technologies. As a result the technology warning community needs to establish a sustained relationship with such entities to enhance its understanding and anticipation of technology trends. In particular, the DIA Technology Warning Division and other relevant intelligence organizations should establish an ongoing collaborative relationship with the scientific and technical communities in the industrial and academic sectors.

Need for New Indicators Because U.S. technological lead in relevant areas is no longer assured, the technology warning community must search in non-traditional areas and in different ways to be able to warn against technological surprise. The DIA and other relevant organizations should establish, maintain, and analyze a comprehensive array of indicators pertaining to globalization and commercialization of science and technology. The first steps in this approach to technology warning should be to decompose, systematically, the broad indicators found from commercial sources into potential observables and then to evaluate the utility and applicability of analytic techniques for technology warning already in use in Open Source Intelligence analysis.

Need for a Framework Methodology Monitoring the vast and diverse array of critical, evolving technologies requires a disciplined approach to facilitate optimal allocation of the technology warning community's limited resources . In particular, it is difficult to identify those specific technologies that have the potential for significant impacts if in the hands of U.S. adversaries. The technology warning community would benefit from a disciplined approach to the identification and setting of priorities of evolving technologies that may threaten U.S. military preeminence. The DIA and other relevant intelligence community organizations should adopt a capabilities-based framework within which to identify and assess potential technology-based threats. Such a methodology enables a systematic approach to technology warning while reducing the tendency to focus only on advances in discrete technologies.

Foreign governments and nonstate actors are gaining access to the same technologies that are the building blocks of current U.S. military capabilities, often through commercial

markets. The recognition by the DIA's Technology Warning Division that these challenges require new approaches is an important step.

For further information:

Copies of the complete report, *Avoiding Surprise in an Era of Global Technology Advances,* can be obtained on the National Academy Press Web site <www.nap.edu/catalog/ >

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COMMITTEE ON DEFENSE INTELLIGENCE AGENCY TECHNOLOGY FORECASTS AND REVIEWS

Staff