

# REALIZING THE POTENTIAL OF C4I

## FUNDAMENTAL CHALLENGES

COMPUTER SCIENCE AND TELECOMMUNICATIONS BOARD  
NATIONAL RESEARCH COUNCIL

# Realizing The Potential Of C4i Fundamental Challenges

**National Academy of  
Engineering, National Research  
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Physical Sciences, Computer Science  
and Telecommunications  
Board, Committee on Improving  
Cybersecurity Research in the United  
States**

## **Realizing The Potential Of C4i Fundamental Challenges:**

*Realizing the Potential of C4I* National Research Council, Division on Engineering and Physical Sciences, Computer Science and Telecommunications Board, Commission on Physical Sciences, Mathematics, and Applications, Committee to Review DOD C4I Plans and Programs, 1999-05-17 Rapid progress in information and communications technologies is dramatically enhancing the strategic role of information positioning effective exploitation of these technology advances as a critical success factor in military affairs These technology advances are drivers and enablers for the nervous system of the military its command control communications computers and intelligence C4I systems to more effectively use the muscle side of the military Authored by a committee of experts drawn equally from the military and commercial sectors Realizing the Potential of C4I identifies three major areas as fundamental challenges to the full Department of Defense DOD exploitation of C4I technology information systems security interoperability and various aspects of DOD process and culture The book details principles by which to assess DOD efforts in these areas over the long term and provides specific more immediately actionable recommendations Although DOD is the focus of this book the principles and issues presented are also relevant to interoperability architecture and security challenges faced by government as a whole and by large complex public and private enterprises across the economy

**Realizing the Potential of C4I** Committee to Review DOD C4I Plans and Programs, Commission on Physical Sciences, Mathematics, and Applications, Computer Science and Telecommunications Board, Division on Engineering and Physical Sciences, National Research Council, 1999-05-31 Rapid progress in information and communications technologies is dramatically enhancing the strategic role of information positioning effective exploitation of these technology advances as a critical success factor in military affairs These technology advances are drivers and enablers for the nervous system of the military its command control communications computers and intelligence C4I systems to more effectively use the muscle side of the military Authored by a committee of experts drawn equally from the military and commercial sectors Realizing the Potential of C4I identifies three major areas as fundamental challenges to the full Department of Defense DOD exploitation of C4I technology information systems security interoperability and various aspects of DOD process and culture The book details principles by which to assess DOD efforts in these areas over the long term and provides specific more immediately actionable recommendations Although DOD is the focus of this book the principles and issues presented are also relevant to interoperability architecture and security challenges faced by government as a whole and by large complex public and private enterprises across the economy

Realizing the Potential of C4I: Fundamental Challenges, 1999 Section 262 of the Defense Authorization Act for Fiscal Year 1996 directed the Secretary of Defense to request that the National Research Council conduct a review of current and planned service and defense wide programs for command control communications computers and intelligence C4I with a special focus on cross service and inter service issues For purposes of this report C4I systems include systems designed to support a commander s exercise of

command and control across the range of military operations and to generate information and knowledge about an adversary and friendly forces Although the Cold War is over new regional threats to U S interests are increasingly likely The U S military in its traditional role as an instrument of national power will be required to deal with a more varied set of military tasks and missions helping to both establish and maintain regional peace and stability and also coping with less traditional tasks such as humanitarian relief and disaster recovery Budget pressures have already resulted in a significantly reduced force structure and withdrawal of U S military presence from many overseas locations Joint operations are now the norm and in many cases U S military operations are combined with those of allied and coalition forces Forces responding to contingencies are likely to be employed come as they are with only minimal time for preparation and deployment before entering the operational phase of a contingency The military that must play these roles has many different C4I systems both old and new Older systems often were built for single purpose stand alone applications and often rely heavily on military specific technology In contrast current systems are increasingly being built to meet explicit requirements for interoperability and flexibility and the Department of Defense has been increasingly capitalizing on commercial information technologies for C4I systems

**A Review of the FBI's Trilogy Information Technology Modernization Program** National Research Council, Division on Engineering and Physical Sciences, Computer Science and Telecommunications Board, Committee on the FBI's Trilogy Information Technology Modernization Program, 2004-06-10 The Federal Bureau of Investigation FBI is in the process of developing a modern information technology IT system the Trilogy program that is designed to provide a high speed network modern workstations and software and an application the Virtual Case File VCF to enhance the ability of agents to organize access and analyze information Implementation of this system has encountered substantial difficulties however and has been the subject of much investigation and congressional concern To help address these problems the FBI asked the National Research Council NRC to undertake a quick review of the program and the progress that has been made to date This report presents that review The current status of four major aspects of the program the enterprise architecture system design program management and human resources are discussed and recommendations are presented to address the problems

**Cybersecurity Today and Tomorrow** National Research Council, Division on Engineering and Physical Sciences, Computer Science and Telecommunications Board, 2002-04-12 This report reviews past NRC studies that have examined various dimensions of computer and network security and vulnerability and brings the results forward into the context of the current environment of security and vulnerability The review includes work done since 1991 such as Computers at Risk 1991 Cryptography's Role in Securing the Information Society 1996 For the Record Protecting Electronic Health Information 1997 Trust in Cyberspace 1999 Continued Review of the Tax Systems Modernization of the Internal Revenue Service 1996 Realizing the Potential of C4I 1999 and Embedded Everywhere 2001 *Trillions for Military Technology* J. Alic, 2007-09-03 *Trillions for Military Technology* explains why the weapons purchased by the U S Department

of Defense cost so much why it takes decades to get them into production even as innovation in the civilian economy becomes ever more frenetic and why some of those weapons don't work very well despite expenditures of many billions of dollars It also explains what do about these problems The author argues that the internal politics of the armed services make weapons acquisition almost unmanageable Solutions require empowering civilian officials and reforms that will bring choice of weapons into the sunshine of public debate

Crisis Management: Concepts, Methodologies, Tools, and Applications  
Management Association, Information Resources, 2013-11-30 This book explores the latest empirical research and best real world practices for preventing weathering and recovering from disasters such as earthquakes or tsunamis to nuclear disasters and cyber terrorism Provided by publisher

*State Voter Registration Databases* National Research Council, Division on Engineering and Physical Sciences, Computer Science and Telecommunications Board, Committee on State Voter Registration Databases, 2008-05-17 The Help America Vote Act of 2002 requires the states to develop a single computerized voter registration data base VRD that is defined maintained and administered at the state level To help the states with this task the U S Election Assistance Commission asked the NRC to organize a series of workshops and prepare an interim report addressing the challenges in implementing and maintaining state VRDs The EAC also asked the NRC to advise the states on how to evolve and maintain the databases so that they can share information with each other This report provides an examination of various challenges to the deployment of state VRDs and describes potential solutions to these challenges This interim report's primary focus is on shorter term recommendations although a number of long range recommendations are presented The final report will elaborate on the long range questions and address considerations about interstate interoperability of the VRDs

**Unmanned Aircraft Systems** Ella Atkins, Anibal Ollero, Antonios Tsourdos, 2017-01-17 UNMANNED AIRCRAFT SYSTEMS UNMANNED AIRCRAFT SYSTEMS An unmanned aircraft system UAS sometimes called a drone is an aircraft without a human pilot on board instead the UAS can be controlled by an operator station on the ground or may be autonomous in operation UAS are capable of addressing a broad range of applications in diverse complex environments Traditionally employed in mainly military applications recent regulatory changes around the world are leading to an explosion of interest and wide ranging new applications for UAS in civil airspace Covering the design development operation and mission profiles of unmanned aircraft systems this single comprehensive volume forms a complete stand alone reference on the topic The volume integrates with the online Wiley Encyclopedia of Aerospace Engineering providing many new and updated articles for existing subscribers to that work The chapters cover the following items Airframe configurations and design launch systems power generation propulsion Operations missions integration issues and airspace access Coordination multivehicle cooperation and human oversight With contributions from leading experts this volume is intended to be a valuable addition and a useful resource for aerospace manufacturers and suppliers governmental and industrial aerospace research establishments airline and aviation industries university

engineering and science departments and industry analysts consultants and researchers     Improving State Voter Registration Databases National Research Council, Division on Engineering and Physical Sciences, Computer Science and Telecommunications Board, Committee on State Voter Registration Databases, 2010-02-26 Improving State Voter Registration Databases outlines several actions that are needed to help make voter registration databases capable of sharing information within state agencies and across state lines These include short term changes to improve education dissemination of information and administrative processes and long term changes to make improvements in data collection and entry matching procedures and ensure privacy and security     Information Technology for Counterterrorism National Research Council, Division on Engineering and Physical Sciences, Computer Science and Telecommunications Board, Committee on the Role of Information Technology in Responding to Terrorism, 2003-04-07 Information technology IT is essential to virtually all of the nation's critical infrastructures making them vulnerable by a terrorist attack on their IT system An attack could be on the system itself or use the IT system to launch or exacerbate another type of attack IT can also be used as a counterterrorism tool The report concludes that the most devastating consequences of a terrorist attack would occur if it were on or used IT as part of a broader attack The report presents two recommendations on what can be done in the short term to protect the nation's communications and information systems and several recommendations about what can be done over the longer term The report also notes the importance of considering how an IT system will be deployed to maximize protection against and usefulness in responding to attacks     *Science and Technology to Combat Terrorism* United States. Congress. House. Committee on Science, 2002     Making the Nation Safer National Research Council, Division on Engineering and Physical Sciences, Committee on Science and Technology for Countering Terrorism, 2002-10-05 Vulnerabilities abound in U S society The openness and efficiency of our key infrastructures transportation information and telecommunications systems health systems the electric power grid emergency response units food and water supplies and others make them susceptible to terrorist attacks Making the Nation Safer discusses technical approaches to mitigating these vulnerabilities A broad range of topics are covered in this book including Nuclear and radiological threats such as improvised nuclear devices and dirty bombs Bioterrorism medical research agricultural systems and public health Toxic chemicals and explosive materials Information technology such as communications systems data management cyber attacks and identification and authentication systems Energy systems such as the electrical power grid and oil and natural gas systems Transportation systems Cities and fixed infrastructures such as buildings emergency operations centers and tunnels The response of people to terrorism such as how quality of life and morale of the population can be a target of terrorists and how people respond to terrorist attacks and Linked infrastructures i e the vulnerabilities that result from the interdependencies of key systems In each of these areas there are recommendations on how to immediately apply existing knowledge and technology to make the nation safer and on starting research and development programs that could produce

innovations that will strengthen key systems and protect us against future threats The book also discusses issues affecting the government's ability to carry out the necessary science and engineering programs and the important role of industry universities and states counties and cities in homeland security efforts A long term commitment to homeland security is necessary to make the nation safer and this book lays out a roadmap of how science and engineering can assist in countering terrorism

**Right To National Self-Defense** Dimitrios Delibasis, 2007-11-19 This ambitious work which took the better part of a decade to produce will be essential reading for all serious defence study students and of absorbing interest to military professionals and lay people concerned with the future of warfare and all aspects of response to military attack Its ultimate aim is to demonstrate that the advent of Cyberwarfare has pushed traditional legal thinking regarding the regulation of forcible action beyond traditional boundaries It attempts to do so by critically analyzing specific characteristics which are inherent to Cyberwarfare such as stealth speed untraceability the availability to State as well as Non State sponsored agents their defiance of traditional borders and an unprecedented potential for destruction all of which have played a major role in making obsolescent traditional legal norms relied upon for the effective regulation of the use of force It follows from the above that no defence system can be effectively regulated especially one as new and unconventional as Information Warfare unless all its specific aspects are explored as deeply as possible The best means to achieve such a purpose have been deemed to be through the inclusion as well as the careful analysis of as many real life examples of Information Warfare operations as possible in order to illustrate the special nature of Information Warfare and its various individual features The examples compiled for inclusion have been selected not on the basis of being the most recent but on the basis of their factual background being as fully known as possible Consequently this book has been constructed around the concept of legality starting with a section outlining currently existing legal norms of individual self defense then applying those norms to Information Warfare Operations including a presentation of existing international legal instruments with provisions applicable to Information Warfare which could serve as additional essential guidelines for a future legal framework specifically crafted to regulate the use of force in cyberspace Last but not least this book sets a paradigm with regard to Cyberwarfare as well as with other methods of warfare which escape the boundaries of the traditional State monopoly of the use of force It ultimately shows the extent to which traditional legal thinking which is shaped around the premise of regulating typical forms of State forcible action when faced with such methods of warfare is totally obsolete

Preparing the U.S. Army for Homeland Security Eric V. Larson, John E. Peters, 2001-03-26 Homeland security encompasses five distinct missions domestic preparedness and civil support in case of attacks on civilians continuity of government continuity of military operations border and coastal defense and national missile defense This report extensively details four of those mission areas national missile defense having been covered in great detail elsewhere The authors define homeland security and its mission areas provide a methodology for assessing homeland security response options and

review relevant trend data for each mission area. They also assess the adequacy of the doctrine, organizations, training, leadership, materiel, and soldier systems and provide illustrative scenarios to help clarify Army planning priorities. The report concludes with options and recommendations for developing more cost-effective programs and recommends a planning framework that can facilitate planning to meet homeland security needs. [Avoiding Surprise in an Era of Global Technology Advances](#) National Research Council, Division on Engineering and Physical Sciences, Committee on Defense Intelligence Agency Technology Forecasts and Reviews, 2005-05-31. 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. This report provides the first part of that study. It presents an assessment of critical evolving technologies, postulates ways potential adversaries could disrupt these technologies, and provides 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. *US Military Innovation Since the Cold War* Harvey Sapolsky, Benjamin Friedman, Brendan Green, 2009-04-28. Explains how the US military transformation failed in the post-Cold War era. Harvey Sapolsky is a leading defence scholar in the US, will be of interest to students of strategic studies, defence studies, military studies, US politics, and security studies in general. **Astride Two Worlds** Barton C. Hacker, 2016-05-03. By the middle of the nineteenth century, industrialization and military technological innovation were beginning to alter drastically the character and conditions of warfare as it had been conducted for centuries. Occurring in the midst of these far-reaching changes, the American Civil War can justly be labeled both the last great preindustrial war and the first major war of the industrial age. Industrial capacity attained new levels of military significance as transportation improved, but in this, as in many other respects, the Civil War was distinctly transitional. Smoothbore artillery still dominated the battlefield; horse-drawn wagons and pack mules still carried the main logistic burden; seamstresses still outnumbered sewing machine operators. *Astride Two Worlds* addresses the various causes and consequences of technological change for the course and outcome of the American Civil War. **Toward a Safer and More Secure Cyberspace** National Academy of Engineering, National Research Council, Division on Engineering and Physical Sciences, Computer Science and Telecommunications Board, Committee on Improving Cybersecurity Research in the United States, 2007-11-24. Given the growing importance of cyberspace to nearly all aspects of national life, a secure cyberspace is vitally important to the nation, but cyberspace is far from secure today. The United States faces the real risk that adversaries will exploit vulnerabilities in



the nation's critical information systems thereby causing considerable suffering and damage. Online e-commerce business, government agency files and identity records are all potential security targets. Toward a Safer and More Secure Cyberspace examines these Internet security vulnerabilities and offers a strategy for future research aimed at countering cyber attacks. It also explores the nature of online threats and some of the reasons why past research for improving cybersecurity has had less impact than anticipated and considers the human resource base needed to advance the cybersecurity research agenda. This book will be an invaluable resource for Internet security professionals, information technologists, policy makers, data stewards, e-commerce providers, consumer protection advocates and others interested in digital security and safety.

**Cyberspace and National Security** Derek S. Revere, 2012-09-11 In a very short time individuals and companies have harnessed cyberspace to create new industries, a vibrant social space and a new economic sphere that are intertwined with our everyday lives. At the same time individuals, subnational groups and governments are using cyberspace to advance interests through malicious activity. Terrorists recruit, train and target through the Internet; hackers steal data and intelligence services conduct espionage. Still, the vast majority of cyberspace is civilian space used by individuals, businesses and governments for legitimate purposes. *Cyberspace and National Security* brings together scholars, policy analysts and information technology executives to examine current and future threats to cyberspace. They discuss various approaches to advance and defend national interests, contrast the US approach with European, Russian and Chinese approaches and offer new ways and means to defend interests in cyberspace and develop offensive capabilities to compete there. Policymakers and strategists will find this book to be an invaluable resource in their efforts to ensure national security and answer concerns about future cyberwarfare.

Realizing The Potential Of C4i Fundamental Challenges: Bestsellers in 2023 The year 2023 has witnessed a noteworthy surge in literary brilliance, with numerous captivating novels captivating the hearts of readers worldwide. Lets delve into the realm of top-selling books, exploring the captivating narratives that have captivated audiences this year. Realizing The Potential Of C4i Fundamental Challenges : Colleen Hoover's "It Ends with Us" This poignant tale of love, loss, and resilience has captivated readers with its raw and emotional exploration of domestic abuse. Hoover expertly weaves a story of hope and healing, reminding us that even in the darkest of times, the human spirit can succeed. Uncover the Best : Taylor Jenkins Reid's "The Seven Husbands of Evelyn Hugo" This spellbinding historical fiction novel unravels the life of Evelyn Hugo, a Hollywood icon who defies expectations and societal norms to pursue her dreams. Reid's captivating storytelling and compelling characters transport readers to a bygone era, immersing them in a world of glamour, ambition, and self-discovery. Realizing The Potential Of C4i Fundamental Challenges : Delia Owens "Where the Crawdads Sing" This captivating coming-of-age story follows Kya Clark, a young woman who grows up alone in the marshes of North Carolina. Owens spins a tale of resilience, survival, and the transformative power of nature, captivating readers with its evocative prose and mesmerizing setting. These popular novels represent just a fraction of the literary treasures that have emerged in 2023. Whether you seek tales of romance, adventure, or personal growth, the world of literature offers an abundance of captivating stories waiting to be discovered. The novel begins with Richard Papen, a bright but troubled young man, arriving at Hampden College. Richard is immediately drawn to the group of students who call themselves the Classics Club. The club is led by Henry Winter, a brilliant and charismatic young man. Henry is obsessed with Greek mythology and philosophy, and he quickly draws Richard into his world. The other members of the Classics Club are equally as fascinating. Bunny Corcoran is a wealthy and spoiled young man who is always looking for a good time. Charles Tavis is a quiet and reserved young man who is deeply in love with Henry. Camilla Macaulay is a beautiful and intelligent young woman who is drawn to the power and danger of the Classics Club. The students are all deeply in love with Morrow, and they are willing to do anything to please him. Morrow is a complex and mysterious figure, and he seems to be manipulating the students for his own purposes. As the students become more involved with Morrow, they begin to commit increasingly dangerous acts. The Secret History is a exceptional and gripping novel that will keep you wondering until the very end. The novel is a cautionary tale about the dangers of obsession and the power of evil.

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