

Industry Study Program Descriptions & Faculty Leaders

INDUSTRY STUDY GROUP	FACULTY LEAD	OFFICE	PHONE
Agribusiness	Dr. Jim Lapse	Rm 239	685-3996
Aircraft	Dr. Sorin Lungu	Rm 352	685-4186
Biotechnology	Mr. Brad Calhoun	Rm 385	685-4769
Education	Col Joe Brownell	Rm 324	685-4349
Electronics	Dr. Steve Basile	Rm 423	685-4794
Energy	CAPT Bill Johns	Rm 269	685-4355
Environment	Dr. Greg Foster	Rm 339	685-4166
Financial Services	Col Tony Krawietz	Rm 493	685-4477
Health Care	COL Stephen Bowles	Rm 438	685-4319
Information & Communications Technology	Col Paul Gillespie	Rm 437	685-4049
Land Combat Systems	Dr. Rich Shipe	Rm 430	685-4487
Manufacturing	Dr. Linda Brandt	Rm 334	685-4488
Private Sector Support & Services (PS3)	COL Quenton Rashid	Rm 391	685-4320
Reconstruction	Dr. Andrew Leith	Rm 390	685-3985
Robotics & Autonomous Systems	CAPT Rich Davis	Rm 497	685-4428
Shipbuilding	CAPT Tom Monroe	Rm 265	685-4325
Space	Dr. Clark Groves	Rm 434	685-4773
Strategic Materials	Mr. Byron Hartle	Rm 384	685-4280
Transportation	CAPT Matt Callan	Rm 496	685-4478
Weapons	COL Rich Paquette	Rm 140	685-4475

AGRIBUSINESS (AGR): American agribusiness is in the midst of a global competition that is re-defining the role of U.S. agriculture in the world marketplace and the domestic economy. Factors shaping the industry today include an accelerating pace of change and unprecedented levels of complexity in what has been considered a traditional, simpler commercial sector. These factors are driven by increasing demand in both the quantity and variety of foods amongst worldwide consumers that shows no signs of leveling off. This powerful dynamic is further magnified by both domestic politics and international diplomacy. This study fully explores the industry by approaching it from a variety of perspectives and data sources. We will examine the entire value chain, beginning with research and development and continuing through the major participants and processes that add real and perceived consumer value. Food production is not a continuum; the business varies widely by product, market, and locale. We will therefore examine the domestic industry both by commodity and by region, contrasting the challenges and outlooks for these components of the industry. The study will also examine a wide array of global issues that directly impact agribusiness, including: environmental concerns; water availability and management; land use and encroachment; biotechnology; food safety; agro terrorism; diseases and invasive species; growing labor and immigration issues; the effects of globalization; sustainability; food security; world trade issues; rural social and economic impacts; and U.S. government farm legislation.

American agribusiness is an essential aspect of our national power that will be even more valuable in the coming decades. There are a number of significant issues related to agribusiness that impact the national security and economic interests of the United States, some of which may not be obvious. These include international issues such as: food crises and social unrest, competition for water in Asia, and population growth; plus domestic issues such as farm labor and immigration policy, nutrition and health concerns, and global warming and environmental regulations. While both domestic and international issues are important, it is the international agricultural challenges that pose a larger national security concern. Competition for food and resources could result in instability and conflict involving US defense forces and industry if it is not addressed strategically.

AIRCRAFT (AIS): The Aircraft Industry Study (AIS) addresses the strategic importance of the U.S. aircraft industry to national security. The AIS seminar focuses on the U.S. and international aircraft industry, including commercial and military fixed-wing and rotary-wing aircraft, and related propulsion systems. Based on discussions with senior executives and information acquired during field visits and through industry analysis methodologies, the seminar analyzes and evaluates major issues facing the industry, including corporate planning and management strategies, modern manufacturing techniques, and government-to-corporate organizational relationships to increase aircraft industry competitiveness. During discussions with industry, emphasis is placed on the structure, conduct and performance (SCP) of the industry, and government policies and decisions that affect the industrial base. Key questions to be addressed this year include:

- existing and emerging patterns of governance in the in the U.S. and global aircraft sector and implications for U.S. national security;
- the impact of national and regional business-governments relations on (U.S., European Union, China, Russia, India and Brazil) on the aircraft industrial sector's key SCP parameters;
- government (direct and indirect) subsidies to commercial aircraft manufacturers and their effects on international competition and high-technology trade;
- the global nature of the aircraft industry supplier base and the emerging possible and probable risks to national security;
- the growing role of unmanned air systems (UAS/UCAS) in both military and civilian applications; and,
- the state of fighter aircraft, helicopter, air refueling and military transport production.

BIOTECHNOLOGY (BIO): Biotechnology is a term that refers to “techniques for using the properties of living things to make products or provide services”ⁱⁱ The core of the biotechnology industry, however, is the enabling technologies that underpin these techniques.ⁱⁱⁱ These enabling technologies have broad applications for healthcare, agriculture, and industrial/environmental needs (e.g. renewable energy). Another important application of biotechnology that is closely tied to healthcare, although with its own unique requirements, is biodefense. The importance of biotechnology to US national security is demonstrated by the Obama Administration publishing the 2012 Bioeconomy Blueprint, which states,

The bioeconomy has emerged as an Obama administration priority because of its tremendous potential for growth as well as the many other societal benefits it offers. It can allow Americans to live longer, healthier lives, reduce our dependence on oil, address key environmental challenges, transform manufacturing processes, and increase the productivity and scope of the agricultural sector while growing new jobs and industries.^{iv}

The BIS program will conduct a strategic assessment of the biotechnology industry, beginning with the core of the industry – the science. We will focus on the entire value chain of the industry including research and innovation, the transition from science to commercial product, and the supply and support requirements to successfully compete in the various markets that include biotechnology products and services. This value chain is generally applicable to all segments of the industry with the added complexity of regulatory approval required in the Healthcare segment.

The assessment will include an analysis of each of the industry segments: Health, Well-being and Biodefense; Industrial and Environmental; and Bio Agriculture. We will also evaluate the business, science, and policy dynamics that shape the evolution and interaction within the segments and evaluate the overall economic and security contribution of the biotechnology industry.

EDUCATION (EDU): Traditionally, the U.S. has depended upon an enlightened public to participate in its democratic processes, to support its economic progress, and to maintain technological competitiveness as an element of its national security. Policymakers at national, state, and local levels have proposed and implemented various initiatives for enhancing education and training excellence to offset a perceived decline in educational performance. This perception is reflected in such indicators as low relative international standing of U.S. students on achievements tests, continuing achievement gaps for minorities, and a perception that U.S. workers lack the skills to keep America technologically and economically competitive.

The Education Industry Study analyzes the condition of education with emphasis on: general education (pre-K, elementary (public, catholic and charter), secondary, and post-secondary to include community colleges, four year public and private, and for-profit); vocational/technical education; education and training in the workplace; university research and business innovation; and supporting industries to include book publications, learning tutorial, online, and test development firms. We will talk first-hand with federal, state, county and local policymakers and practitioners to include congressional staff, state chancellors, university deans, corporate learning officers, city and county superintendents, think tank experts, education lobbyists, headmasters, principals, teachers, and students. We'll visit both high-end and challenged school systems. And, we'll discuss the difficult issues in this industry: common core learning standards, testing, teacher preparation, recruitment and retention, equity and equal access, student learning and performance, STEM, remediation, spiraling university cost, student debt, higher education act re-authorization, and many others.

ELECTRONICS (ELE): *“Steady improvements in semiconductor cost and performance have been a major driver in the improvements in US productivity and growth in the postwar period (Jorgenson and Stiroh, 2000). Because of the strategic economic*

importance of the chip industry in supporting innovation and growth across industries, as well as its importance in military equipment and operations, governments worldwide have taken a keen interest in supporting domestic development of the industry and in regulating export of its technology and products.”

Clair Brown and Greg Linden, *Chips and Change: How Crisis Reshapes the Semiconductor Industry*

Advances in the electronics industry, enabled largely by semiconductors (also referred to as “chips” or “integrated circuits (IC)), have increased productivity and led to numerous innovations in defense, education, healthcare and other industries across all sectors of the global economy. U.S. leadership in the industry has enhanced innovation, economic growth, and the development of advanced defense technologies and capabilities.

The “electronics industry” consists of numerous sectors and product categories, ranging from aerospace, automotive and medical to consumer and defense electronics. Additionally, the “defense electronics” sector includes such diverse applications as radar, sonar, communications, lasers, guidance and navigation and electronic warfare systems. While surveying a wide variety of applications within the defense electronics sector – and to a limited extent, commercial applications – the Electronics Industry Study (EIS) will use semiconductor production as a focal point.

While historically the Department of Defense has played a significant role in technological innovation and the advancement of the electronics industry, its influence has diminished as the electronics industry increasingly operates in a commercially-driven global market. The EIS will seek to examine and assess the electronics industry, from both a domestic and international perspective, in supporting U.S. national security capability requirements with respect to a global electronics industry.

A technical background is not required for this seminar! Students from all backgrounds will be able to participate fully in the learning experience.

ENERGY (ENG): The Energy Industry is a global enterprise involving governments, multinational companies, and international environmental and social policies. The major areas of the Energy Industry include petroleum, gas, coal, nuclear and renewables. The Energy Industry provides key resources that underpin or facilitate almost all other industries. As an economic driver, energy influences and often drives U.S. national and global competitiveness. Therefore, it is imperative that strategic decision-makers understand the energy sector and the environment in which companies and nations compete and cooperate. There is also significant Department of Defense (DoD) interest in the development of operational energy (OE). The energy industry also has significant linkages into other industries since energy is the main economic driver. An example of this is in the water industry: This concerns how much energy is used to move and treat water, and how much water is used in the numerous processes of the energy industry. Students of the Energy IS will evaluate, synthesize, analyze, and learn the breadth of global energy resources. This includes the production, supply, and consumption of energy. This detailed research and study of the energy industry will allow students to achieve all lesson objectives.

ENVIRONMENT (ENV): The Environment Industry Study examines the extraordinarily varied and complex network of actors, processes, legal and regulatory mechanisms, and perspectives that converge at the intersection of environmental concerns, economic performance, and security. Markedly unlike traditional industrial sectors, the environmental industry consists of those revenue-generating goods and services associated with environmental protection, assessment, compliance with environmental regulations, pollution control, waste management, remediation of contaminated property, design and operation of environmental infrastructure, and the provision and delivery of environmental resources. This highly fragmented industry includes air, water, and soil pollution control; solid and toxic waste management; site remediation; and environmental monitoring and recycling. One of the fastest growing sectors in the world economy—a roughly \$600 billion market for goods and services—the environmental industry has evolved in response to growing concerns about the risks and costs of pollution and the enactment of pollution control legislation in the United States and around the world.

The Environment IS will give due attention to the full range of organizations and perspectives that could affect the performance of U.S. and international business in the environmental sector and will address itself to the following questions: What is the relationship between the environment and security? How strategically important are environmental priorities and technologies? How do environmental concerns and measures interact with the economy? What is the relationship between environmental protection/stewardship and economic competitiveness? How, and how effectively, is the U.S. government organized for environmental affairs? What domestic and international organizations (governmental and non-governmental) have an important impact on this sector? What domestic and international environmental laws, regulations, and standards affect the performance of industry? How is the environmental industry organized? What other private-sector organizations focus on the environment? How capable is the U.S. environmental industry of responding to domestic and international emergencies? How competitive is the U.S. environmental industry vis-à-vis that of other countries?

FINANCIAL SERVICES (FS): Six years after the financial meltdown of 2008 many of the fundamental questions that emerged in its wake remain unanswered. Although Congress and the Administration have addressed some of the conditions that contributed to the crisis and it is now one of the most heavily regulated sectors of the economy, no consensus has emerged on the vulnerability the industry still poses to national interests. The core area for consideration in FSIS is the causes of the 2008 Financial Crises and whether subsequent policy and regulation (much of which is found in the 2010 Dodd-Frank Act) has adequately addressed them, and in doing so if the potential for profit and innovation remained adequate for this industry to be sustainable and provide the necessary contribution to a growing U.S. economy in the future? Is this sector now safer? What vulnerabilities remain? Has it become more efficient or effective? Is there another crisis on the horizon?

Particular emphasis during the first half of the course is on commercial and investment banking, both because of their pivotal role in the Financial Crises and as they have thus far received most of the regulatory reform. We will then examine how this regulatory reform is pushing systemic risk from the core of these industries into adjacent markets such as global markets, shadow banking, private equity, student loan industry, and the insurance industry. These adjacent

markets, together with areas simply not fully included in Dodd-Frank (fragmented regulatory structure, global systemic risk, government sponsored agencies such as Fannie Mae, money markets, and credit rating agencies), as well as innovative and potentially high risk new financial tools (high frequency trading & dark pools), offer opportunities from which students can work with faculty to customize the second half of our program.

HEALTH CARE (HC): The Health Care Industry sustains the heartbeat of the nation. It has strong links to US national security and brings together the Federal interagency and the (Defense) Industrial Base. Significantly, the health care industry impacts all four of the enduring interests identified in the National Security Strategy of 2010, including security, prosperity, values, and international order.^v

* **Security.** The National Security Strategy recognizes the critical role that healthcare plays in strengthening security and resilience at home and in managing emergencies.^{vi} The Health Care Industry stands as the nation's line of defense against illnesses and injuries resulting naturally and occurring due to various threats including terrorism, natural disasters and pandemics.^{vii} Further, the National Security Strategy specifically notes the central role that various components of the Health Care Industry have in countering biological weapon threats to security.^{viii}

The Health Care Industry also impacts readiness, retention and recruiting within DoD. Population readiness is becoming increasingly problematic because of high rates of obesity, heart disease and diabetes in younger Americans due to a lack of physical fitness and poor eating habits. An increasing percentage of our youth are excluded from entering military service due to these and other health care problems. Additionally, the Health Care Industry supports the health and readiness of DoD's uniformed and civilian personnel in support of DoD's mission. Retention is promoted through the delivery of healthcare that meets the needs of DoD personnel and their families. Recruiting is promoted through the promise of quality healthcare for those joining DoD's ranks. Finally, in the wake of the wars in Iraq and Afghanistan, DoD's links with the Health Care Industry are vital for the treatment of our wounded warriors, who need extensive care after surviving wounds at record rates due to life saving medical treatment.

* **Prosperity.** The Health Care Industry has a unique relationship to economic prosperity. Not only is healthcare the largest industry in the US, accounting for nearly one-fifth of US GDP, but it also serves as the enabling foundation upon which national economic prosperity is built. The general health and well-being of the American people is central to economic development. Chronic health conditions negatively affect almost one in four working age Americans and cost the economy almost \$1 trillion in lost productivity and \$280 billion in treatment each year. The National Security Strategy observes that national economic health and well-being depends upon affordable healthcare that does not constrain the public, industry and government.^{ix} Individuals, industry and government are all struggling to contain healthcare costs. The uncertain implementation of the Patient Protection and Affordable Care Act leaves a cloud of uncertainty over the economic future. Within DoD, as with the nation, healthcare costs continue to rise at an unsustainable rate. DoD leaders warn that healthcare expenditures are crowding out spending for acquisition, other defense related programs and personnel.

* **Values.** The National Security Strategy states that the US has a “moral and strategic interest” in pursuing a comprehensive global health strategy.^x By responding to critical humanitarian needs elsewhere, the US provides global leadership for humanitarian relief. The Health Care Industry thus serves as an instrument of “soft” power and enables the US to engage in various forms of “healthcare diplomacy.” Such efforts leave lasting, positive impressions and promote American values. DoD engages in significant healthcare related humanitarian relief activities every year, demonstrating strong links with the industry.

* **International Order.** Pandemics and infectious disease are listed in the National Security Strategy among the key global challenges requiring international cooperation.^{xi} Such cooperation depends on a conducive international environment. The U.S. Health Care Industry takes a central role in addressing these complex, multi-faceted efforts. The U.S. is the world leader in the effort to improve global health—and to have a positive impact on the lives of billions of people worldwide. The U.S. has the research and industrial capacity for developing diagnostic tests, preventive measures, treatments, and vaccines that target the world’s most pressing global health needs.

Health abroad matters to Americans for additional reasons that may not be immediately clear, but they are nevertheless very real. For example, rising incidences of diseases like HIV/AIDS, malaria, cholera and TB are increasing poverty and political instability in many countries. That in turn has political and economic consequences worldwide. Addressing health problems can help prevent civil strife in other countries. Thus, the health care industry can support economic stability and prosperity and improve the quality of people’s lives. This promotes U.S. security, our economy, and the way our country is perceived throughout the world. With alliances strengthened, and economies more productive and stable the globe is more secure and prosperous. The Health Care Industry provides the instrument

This industry study will undertake a comprehensive review of the health care industry - national and international - from the perspectives of the provider, consumer, payer, advocate and regulator. We will focus on the ability of the major industry sectors (such as pharmaceuticals, hospitals, manufacturing, insurance, distribution, and research and development) to support the national military strategy and national security strategy. We will consider the government’s role and interactions with industry to best serve our enduring interests. We will also conduct a comparative analysis of U.S. and other national, and international health care policies and systems for both defense and non-defense environments. Field studies at home and abroad (India, United Kingdom) will promote and facilitate learning from national and international industry leaders. As a result, this industry study provides an excellent opportunity to provide generalizable knowledge and understanding of industry perspectives on value creation, interaction with government, and responses to government actions to regulate and draw resources from industry.

INFORMATION AND COMMUNICATIONS TECHNOLOGY (ICT): ICT is the transforming medium and enabler of the global economy. It affects the lives of citizens worldwide on a daily basis, both in their individual communications and entertainment as well as their interactions with business and government at all levels. The health and global

competitiveness of US ICT firms are essential to national security and national power. The ICT industry is marked by extraordinarily rapid growth and technological change, making strategic decisions by industrial competitors and governments extremely difficult. Within this dynamic and exciting arena, this industry study will examine primary sectors of the ICT industry including: telecommunications service providers (including internet providers and networking firms), operating system and application software publishers, data services and system integration firms, and ICT equipment manufacturing companies. In the course of that examination, key topics to be addressed will include market competitiveness, public and private governance, national security concerns, cybersecurity, privacy, intellectual property protection, electronic commerce challenges, international trade, access to broadband services, and maintaining a competitive national workforce. The study concludes by assessing and recommending necessary changes to federal enabling policies.

LAND COMBAT SYSTEMS (LCS): This seminar will focus on *analyzing and evaluating the various actors, firms and organizations—both on the demand and supply side—that comprise the combat and tactical vehicle systems sector of the US defense industry.* The seminar will use a multitude of evaluation tools to study how differences in structural variables (ownership, market structure, policy, technology, decision processes, constraints, etc.) influence conduct which in turn determines industry performance in efficiently satisfying national security requirements.

The US Land Combat Systems industry is somewhat unique in that: (1) it produces what are essentially public goods, (2) the US Government is the primary buyer of US produced LCS products (domestic monopsony), (3) demand for LCS products is determined by a public policy decision making process, (4) suppliers are able to influence consumption decisions via participation in the political decision making process, (5) the demand for LCS products can change dramatically depending on national security needs (*i.e.*, low demand in peacetime and high demand in times of conflict) and (6) the customer (government) regulates to whom industry can sell their products (arms and technology export regulation)

During the industry study, students will conduct primary research through site visits, field studies, leadership interviews, and literature reviews in order to analyze and address such complex issues as:

- Given the unique nature of the industry structure, can the government rely on a policy of unfettered competition to regulate the industry? If not, how should the government use its regulatory tools (*i.e.*, acquisition strategies, budget decisions, anti-trust policies, ownership of assets, operation of government facilities and sponsorship of new entrants) to manage the LCS industrial base?
- The US government owns a significant amount of LCS production assets and also operates some important technology development activities. Why does the US Government own and in some cases operate LCS enterprises? What are the conduct and performance characteristics of government owned enterprises? How does this compare to private industry's conduct and performance in this sector? Should the US government continue to own and operate LCS enterprises, or should it develop a strategic plan for divesting itself of these assets?

- The number and size of LCS product development and production centers in the US is heavily influenced by both national security and political considerations. Maintaining capacity excess to national security needs imposes significant costs on society and strains the defense budget. Conversely, maintaining too little capacity in the face of uncertain demand may compromise national security. Is the capacity of the LCS industry too small or too large for national security needs? What actions can DoD take to better manage the size of the LCS industrial base? And, what actions should DoD take to fund and retain research and development capabilities for the advanced land combat systems of the future?

The seminar will also analyze and evaluate the structure, conduct, and performance of the European LCS sectors by comparing and contrasting with US defense industries. Further, the seminar will evaluate European efforts to reform its defense industry in the face of decreasing budgets and declining demand.

ADVANCED MANUFACTURING (MAN): Brilliant manufacturing, disruptive manufacturing, high velocity manufacturing, innovation hubs; all of these phrases have been used to describe Advanced Manufacturing. Manufacturing itself is an enabling technology which underpins and supports any number of defense and industrial sectors. As such, it is critical to the national economy and to national defense. The Department of Defense has a longstanding interest in the sector, as both a developer of advanced manufacturing technology, and a customer of manufactured products. Advanced technology and innovation are underpinnings of defense, and are the basis of the Department's Third offset strategy.

This IS will examine a number of the disruptive technologies that make up Advanced Manufacturing. These include:

- The manufacturing version of the internet of things; the embedding of sensors in parts, machines and products, both on and off the factory floor, which allows the transmission of information, and the integration of machines, products, maintenance, as well as speed and traceability;
- Additive manufacturing (3D Printing), or the use of digitization to create tangible goods in in real time, and in distributed or diverse locations;
- Robotics and human, machine interfaces;
- Big data and advanced analytics.

These and many more will be a source off innovation and strength for those countries and companies that can take advantage of these disruptions, but will also pose a threat to those entities that cannot participate in the innovation boom.

The IS will examine the role of global and domestic governments (national, state and local) in this innovative and disruptive field. How, and when, are innovative technologies started, spread and implemented across industries? What role and interest does the Defense Department have in the development of innovative and disruptive technologies? How and when does industry participate and lead in this effort? What, if any national policies are necessary and sufficient to

foster advanced manufacturing innovation? Will there be winners and losers? Domestically? Globally? By company?

We will examine the alliances between academia, government and industry that work together to allow the development, growth and diffusion of advanced technologies. We will visit Federal labs, where advances in additive manufacturing are taking place, we will visit companies who are recreating themselves around brilliant manufacturing, and academia, where research and development are taking place, and workers capable of working in advanced manufacturing are being educated and trained. We will examine Innovation Hubs, where effective synergy takes place.

PRIVATE SECTOR SUPPORT and SERVICES (PS3): Today, the Department of Defense spends more on Services than material. From the guards at the Fort McNair gate to the mess hall on Fort Myer to the logistics when deployed to the SME in your office, we all manage or experience contractor support every day. The PS3 industry study examines and recommends policy to improve or mitigate the effectiveness, efficiency, risks and challenges of contractor support to operations, at home or abroad, the success of which are critical to U.S. national security. It examines domestic and international private firms that provide myriad services to the Department of Defense and other U.S. government agencies, in particular Departments of State and Homeland Security, in support of a wide variety of operations. This includes logistics support, military training, consulting, law enforcement training, intelligence, maintenance, base operations, and security services.

Since the end of the Cold War, many military and interagency functions have migrated into the private sector, largely as a function of cost savings. While “good for business” for some companies, the conflicts in Iraq and Afghanistan exposed the increasing demands being placed on military and interagency acquisition systems, command and control arrangements, readiness requirements, and daily operations. Areas of doctrine, policy, organization, culture, as well as both interagency and coalition coordination have simply not kept up. Recent activities of some contractors in ongoing operations, particularly private security personnel, also demonstrate that neither U.S. nor international legal regimes have kept pace with the realities of contractors on the battlefield.

The PS3 industry study seeks to understand the strategic impact of using commercial firms to provide support across the spectrum of domestic and international contingencies and operations. We will examine and assess the historic effectiveness and efficiency of contractor support in recent operations, and identify areas for improvement. We will challenge the notion that certain capabilities and functions are “inherently governmental,” and assess the impact of expanding private sector involvement in contingency operations. Our field studies we will allow us to anchor our studies with academic rigor through discussions with some of the world’s foremost experts in this industry, and will include visits to major domestic and international companies who operate in nearly every hot spot in the world. We also engage U.S. strategic leaders who deal with the political realities associated with contractor performance. Finally, international travel will allow students to examine and learn from the experiences of government, military, trade union and industry leaders of key allies (United Kingdom and France) with a range of perspectives and experiences in the use of contractors in support of operations. If funding

permits, students will use Operation Overlord (Normandy) as an historical case study on the use of contracted support to operations while in France.

RECONSTRUCTION (REC): The Reconstruction industry is a multi-billion dollar enterprise comprised of an ‘industry-of-industries’, focusing on disaster relief, humanitarian assistance and the national security priorities of preventing conflict, stimulating economic growth, strengthening weak and failing states, lifting people out of poverty, combating climate change and epidemic disease, and strengthening democratic governance.

In a period of declining discretionary budgets, the US will be faced with the challenge of balancing national security concerns with overseas disaster relief, humanitarian assistance and stabilization efforts. The 2016 Reconstruction Industry Study will assess the feasibility of using this period of declining budgets to force efficiencies into the U.S. disaster relief, stability, and development calculus. Continuing to spend billions in aid without unified long-term objectives and a strategy to achieve those objectives not only cripples the U.S.’ ability to synergistically set and achieve security priorities, but actually hinders host countries in their efforts to build and sustain government services and economic capacity.

Guided by the June 2015 USAID Policy on Cooperation with the Department of Defense and research topics framed by OSD Policy Stability and Humanitarian Affairs the analysis will expose students to a wide variety of differing opinions and perspectives with most of the interaction being provided by subject matter experts from organizations such as the Office of Transition Initiatives through to corporate entities such as Management Systems International and the Louis Berger Group. In 2016 the students and faculty involved in the analysis will potentially travel to the Solomon Islands and Vanuatu with the specific purpose of interacting with businesses and organizations supporting the overall reconstruction and stabilization objectives of the Regional Assistance Mission to the Solomon Islands and also post disaster relief efforts in Vanuatu following Cyclone Pam in March 2015.

ROBOTICS AND AUTONOMOUS SYSTEMS (RAS):

Computers seem overwhelming enough, but over the last few years I became more and more convinced that my generation was living through something perhaps even more momentous. From the robot vacuum cleaner that patrols my floors to the unmanned planes that my friends in the air force use to patrol Iraq, humanity has started to engineer technologies that are fundamentally different from all before. Our creations are now acting in and upon the world without us.

P.W. Singer, *Wired for War*

Many observers agree with P.W. Singer’s assessment above...robotic technology and engineering are changing the way we live and fight wars. The Robotics and Autonomous Systems (RAS) industry study will examine this proposition as well as the strategic importance of the RAS industry to US national security. RAS industry study participants will identify, analyze, and assess the structure, conduct, and performance of RAS markets, both in the US and abroad. Topics include: Market structure and its impact on innovation, sustainment of RAS, R&D investment, ethics and accountability issues, and overall health of the US RAS industry

both in the defense sector and commercial applications. The RAS industry study will visit these (and other) topics with primary focus on the US and Asia. Ultimately, RAS industry study participants will provide an empirically-based answer to the question – Does the RAS industry support US national security requirements today? Will it in the future? The study will also attempt to answer such questions as:

- Are robotics and autonomous systems transforming society?
- How are robotics and autonomous systems impacting US industry and the workforce?
- Who is providing the capital for R&D investment in RAS-related markets? Is the answer the same for defense and commercial RAS markets? Why or why not?
- How do RAS firms make investment decisions? Is the process the same for defense and commercial firms? Why or why not?
- Do defense related robotics and autonomous systems constitute a “revolution in military affairs”?
- Are the military services “embracing” these disruptive technologies? Why or why not?
- What are the ethical considerations associated with employing RAS on the modern battlefield? Does the increased use of RAS make the decision to use force “easier” for US leaders?
- How does the current US export control policy help or hinder the US RAS industry? When will the use of RAS lead to significant personnel cost savings for the US military?

SHIPBUILDING (SHP): The goals of this year’s Shipbuilding Industry Study Program are to develop the capabilities to analyze the industry’s ability to support our national security requirements in both the near and long term, and to develop and present a set of policy options and recommendations for improvement at the national level, based on an understanding of the complexities of the structure, conduct and performance of the U.S. shipbuilding industry, in the domestic as well as the international context. The study will specifically require the students to understand the current health of the industry, and critically assess and evaluate what the future resource constrained environment holds. The students will be required to develop a set policy options and recommendations for the Defense Department, congress and industry that would ensure that the shipbuilding industry is available to support national security and global stability requirements now and in the future. We will attempt to answer such questions as:

- What are the strengths and weaknesses of the industry?
- What is the industry doing to posture itself for the future?
- Is this industry truly a critical defense industry and why?
- What role, if any, is and should the federal government playing in the industry?
- What impact will decreasing national budgets have on this industry’s ability to support our national military and security strategies?
- Who are the world leaders and how have they achieved success?
- How have/will rapid technological advances & the information age impact the industry?
- Will the industry be able to continue to provide warships for the U.S. Navy in 20XX?
- Will the industry be able to continue to provide advanced ships to support emerging national security requirements in an environment of decreasing national resources?

SPACE (SPC): At the height of the Cold War, U.S. astronauts made a “giant leap for mankind” and stepped onto the surface of the Moon. It was the culmination of a decade of intense effort by

the United States to fulfill President Kennedy's call to win the Space Race and conquer space challenges "not because they are easy, but because they are hard ...". Nearly five decades have passed, and the U.S. is still the only nation in history to accomplish the amazing technical feat of placing humans on another celestial body. Creating and sustaining space industrial capabilities remains very hard, even today.

However, the global space enterprise has changed significantly since the height of the Cold War, and is now at an inflection point in its history. The capability to manufacture, launch, and operate spacecraft is no longer limited to the United States and Russia. The number of nations competing in the space economy has grown significantly, with multiple EU countries, Japan, China, India, and Brazil all having highly capable space industries, and countries such as South Korea and Viet Nam engaging in serious space development efforts. Additionally, most of the roughly \$300B per annum spent globally in the space economy goes to commercial space companies such as Direct-TV, Sirius-XM, and Iridium, who use satellites to provide telecommunications services to the general public. Strong growth in demand for commercial space services is expected for the foreseeable future, with most new customers living in the developing world. At the same time, space remains strategically and militarily important to the Great Powers. It is the basis for achieving instantaneous global communication, command-and-control, precision strike, persistent surveillance, global intelligence, geolocation, weather prediction, missile warning, and nuclear force delivery. The U.S. is especially dependent on space for achieving military competitive advantage. We have unique military-intelligence space capabilities that no one else can match. For us space is not just a force multiplier, it has become a primary element of U.S. global presence and strategic depth. Our adversaries are well aware of our military dependence on space, and are developing ways to counter our advantages.

The need protect our most advanced military space capabilities, while allowing U.S. space companies to compete globally in the commercial sector (using some of the same emerging technologies) is the primary policy dilemma facing our national leaders. The affordability and sustainability of our space architecture depend upon achieving the proper balance in this equations. The Space Industry Study seminar will analyze both domestic and global elements of the space economy, with an emphasis on the most competitive emergent technologies. We will examine short and long-term trends, and forge recommendations for policies to ensure the U.S. maintains its key global advantages in both the security and economic domains. The overarching focus will be analyzing the strength of U.S. space firms relative to an increasingly competitive global context.

Specific emphasis will be given to these areas:

- Divergence of commercial vs. government space procurement practices and norms
- Affordability in the remaining military/government monopsony market segments
- Re-emergence of a U.S.-based commercial launch sector (and the effect of regulations and policies, as well as how to foster international business opportunities)
- Emerging space markets (small sat manufacturing; high resolution commercial space imagery; space tourism; and, the effect of policies on creating U.S. advantage)

Students will focus on the following industry analytics frameworks:

- How to use “Structure–Conduct–Performance” and Porter’s “Five Forces” frameworks to analyze the space industry and evaluate policy issues.
- How to use a business strategy framework to analyze and evaluate the behavior of firms and their response to changes in market conditions and government policy.

STRATEGIC MATERIALS (SM): Everything is made of materials. Materials are the foundation in which all things are built from. Materials are the foundation for all activities of an economy be they rudimentary (i.e., simple construction); advanced (i.e., high grade steel) or high tech (i.e., computers and cell phones). The production of everything in an economy begins with the discovery, extraction, and manufacturing of raw materials. To paraphrase a statement by the Committee on Critical Mineral Impacts on the US Economy, all sectors of the economy rely on the services of *materials*.^{xii}

Determining if a material is “strategic” or “critical” is subject to idiosyncratic interpretation. In addition to the importance in the use of the material, and the reliability in accessing and obtaining it is compounded by the level of integration and sophistication the economy, and the perceptions of importance at the time by key public and private sectors decision makers. Add to this situation the realization that needed minerals are often not readily available; not evenly distributed throughout the earth; and highly subject to market forces. This is further compounded by technology...especially disruptive technologies...making increasing demands for access and use of legacy as well as new materials. The end result is a paradoxical position for government and business decision makers; that is, they are forced to protect what they have while enticing others to provide greater access to what is needed at the same time encouraging greater cooperation in an ever increasing competitive and highly, integrated global economy. For these reasons and the potential impacts strategic materials (minerals) will have on the US economy as a whole, the study of strategic minerals (STRATMAT) is considered not only important, but vital for future strategic advisors and leaders in understanding the impact and implications for the US Defense Industrial Base (DIB).

The Academic Year 2014-2015 STRATMAT program is focused on evaluating the health of the US strategic materials industry and its ability to support the US economy and the nation’s security interests. This is done from three perspectives. First is to ascertain what the STRATMAT industry is by investigating the economic vitality of selected firms (businesses). In conjunction, selected legacy materials and Rear Earth Elements (REE) are examined to assess what materials are strategic or critical or both from a US national security perspective as well as from various economic sectors perceptions. Couple to this will be evaluation of the competitive business environment for another nation’s outlook as well as from a global viewpoint. The heart and emphasis of this program is the construction of a rigorous structured assessment of... with specified policy recommendations... the STRATMAT industry’s ability to support the US economy and nation’s security interests.

To meet the above intent, the STRATMAT seminar will interact with a variety of stakeholders ranging from public sector entities such as Congress, Department of Defense (DoD), and US Geological Survey to private sector actors such as selected firms, trade organizations, and

special interest groups. It is planned for the seminar to meet with a DoD specialist who can help them comprehend the interplay of organizations and particular rules for materials such as the Berry Amendment, Specialty Metals clause, and Buy America laws and better understand the impact of the Committee on Foreign Investment in the US (CFIUS) process. To round out the investigation, the seminar will visit mining specialists, trade associations, and academics and business analysts who follow the minerals industries closely. Site visits to titanium sands (Virginia) and deep-rock molybdenum (Colorado) mines are planned to give a perspective on US mining technology and the regulatory environment. Other visits are being sought to metals manufacturing sites during various domestic field studies trips. To provide an international perspective, the seminar will travel to Chile to interact with government and private sector leaders and experts as well as visit select mining and metallurgy operations. Through this combined education and interaction, the STRATMAT industry study student will obtain a full array of tools and knowledge for them to draw upon in meeting and exceeding the Eisenhower School goal of *keeping in touch with industry* and educating the nation's future strategic advisors, decision makers, and leaders.

TRANSPORTATION (TRN): The transportation industry is the backbone of global commerce and enables America's political, informational, military, diplomatic and economic influence in the global community. The industry study will look across the broad and ubiquitous field of transportation that moves people, goods and services, employs millions of workers, generates billions of dollars in revenue, and consumes vast resources. The study will also focus on the importance of the transportation industry on the swift mobilization of the military and support to the sustainment of the armed forces during current and emerging conflicts.

The Transportation Industry Study will examine domestic and foreign freight and passenger transportation and all the principal modes – aviation, maritime, trucking, highways, railroads, inland waterways, pipelines, and transit – that comprise the transportation network. Emphasis will be on group study and analysis that will focus on the infrastructure required to support the transportation industry, locks, ports, airfields, highways, rail lines and pipelines, and the relationship between the public and private sectors administration and control of those facilities and investment considerations. Students will examine the role of government in the industry in terms of policy, execution and compliance. The study will address issues that cut across all the modes, such as economics, operations, technology, systems, infrastructure, regulations, leadership, institutions, and sources of capital. We will meet with the private- and public-sector organizations that operate the components of the transportation system, as well as customers, associations, and the government agencies that regulate transportation. We will also visit a variety of transportation facilities.

The growth of globalization and of the world economy has placed strains on the transportation network, and we will look into the issue of congestion and explore possible ways to increase effective capacity. Transportation security has become a major issue since 9/11. We will meet with public- and private-sector organizations responsible for transportation security. Command and control issues in each of the modes of transportation will be examined and compared. Intermodal transportation (a/k/a containerization), which involves coordination between ocean shipping, ports, trucking companies, railroads, and multimodal parcel delivery companies, has grown tremendously in recent years. We will examine the role it plays in supporting the growing

global supply chains. Throughout the study, we will examine the capability of the transportation system and the individual modes to support DoD requirements for mobilization, deployment, and sustainment.

WEAPONS (WPN): It is common knowledge that precision-guided weapons, and the precise battlefield effects they create, have helped the United States achieve tremendous military successes. Our success is not only attributed to precision targeting and delivery, but also to the warheads themselves. From nuclear to non-lethal, today's technology provides a panoply of weapon choices allowing the military the potential to select the most appropriate means toward the desired end. A neophyte might think that we already have discovered all we need to know about warheads and energetics; however, not only has the technology improved dramatically, but we also seem to continue to find new and innovative ways to employ the latest smart munitions. This industry study will look at the sensor-to-shooter cycle examining the strategy, utility, procurement, production and lifecycle issues associated with effective use of weapons in today's environment.

ⁱ Marco Lagi, Karla Z. Bertrand, and Yaneer Bar-Yam, "The Food Crisis and Political Instability in North Africa and the Middle East," New England Complex Systems Institute, September 28, 2011:2.

ⁱⁱ Eric Grace, *Biotechnology Unzipped: Promises and Realities*, 2nd ed. (Washington, DC: Joseph Henry Press, 2006), 2.

ⁱⁱⁱ Yali Friedman, *The Business of Biotechnology: Profit from the Expanding Influence of Biotechnology*, 3rd ed. (Washington, DC: Logos Press, 2008), 3.

^{iv} National Bioeconomy Blueprint, White House, April 2012

^v National Security Strategy 2010, p. 7, 17.

^{vi} Ibid. p.18

^{vii} Ibid.

^{viii} Ibid. 24.

^{ix} Ibid. 28,

^x Ibid. 39.

^{xi} Ibid. 48-49

^{xii} Committee on Critical Minerals Impacts on the U.S. Economy, National Research Council. Minerals, Critical Minerals, and the U.S. Economy. The National Academies Press, Washington DC, 2008; p.7.