



# POTOMAC INSTITUTE FOR POLICY STUDIES

## 2022 ANNUAL REPORT



[WWW.POTOMACINSTITUTE.ORG](http://WWW.POTOMACINSTITUTE.ORG)





# TABLE OF CONTENTS

FROM THE CHAIRMAN AND THE CHIEF EXECUTIVE OFFICER . . . . .	4
LEADERSHIP AND BOARDS . . . . .	5
NEW REGENTS AND SENIOR FELLOWS. . . . .	5
POTOMAC INSTITUTE FOR POLICY STUDIES . . . . .	6
Brief History. . . . .	6
2021–2022 Focus . . . . .	6
Looking Forward in 2023 . . . . .	6
PUBLICATIONS . . . . .	7
Critical Minerals . . . . .	8
Understanding Human Health, Safety, and Performance in Space Science, Technology, Engineering and Policy Studies (STEPS). . . . .	10 12
POTOMAC INSTITUTE IN THE NEWS . . . . .	13
EDUCATION . . . . .	14
Internships . . . . .	15
2022 Science and Technology Intern Research Reports . . . . .	16
2022 ENDURING INFLUENCE . . . . .	17
Global Competition Project (GCP) . . . . .	18
Center for Emerging Threats and Opportunities (CETO) . . . . .	20
Naval Surface Warfare Center (NSWC) Indian Head Division . . . . .	21
International Center for Terrorism Studies (ICTS) . . . . .	22
FINANCIALS . . . . .	23
LOOK AHEAD AT 2023 . . . . .	24
EMPLOYMENT OPPORTUNITIES . . . . .	25

# FROM THE CHAIRMAN AND THE CHIEF EXECUTIVE OFFICER

The Potomac Institute (the “Institute”) has never had an identity crisis, at least not in terms of our basic mission. That mission has always centered around four factors: national security, science and technology (S&T), US industry, and government policy. The Institute’s goal has always been to find ways to create or improve government policy with business best practices to address the nation’s hardest challenges.

The work we do for our customers is a direct reflection of our priority to research and recommend science and technology policies. Our Focus Areas and the areas where they overlap allow us to integrate themes and incorporate data across our portfolios. We find the most success when we elevate the discussion and provide big ideas to address the complexity of national security.

In 2022, we added two economists, an education program director, several strategic communications and policy experts, and eleven new Board of Regents and Senior Fellows (see next page for full list). We continue to diversify our staff and affiliate expertise to support our growing client base and add new dimensions to research and recommendations.

We are lifetime learners, each at the Institute to grow our minds and develop big ideas to change the world. Our researchers and analysts are continuously identifying new ways to understand the future technical landscape and political environment. We value knowledge and teaching, as seen in our academic studies, our education programs, and our publications.

In this report, we highlight several key accomplishments and work from last year. This work led us to identify important areas of impact that our staff is uniquely qualified to study and produce high quality publications to impact the ongoing S&T policy dialogue. We couldn’t do it without our incredibly supportive client base, talented staff, Board of Regents, and Senior Fellows.



General Al Gray, USMC (Ret.)  
Chairman, Board of Directors and Board of Regents  
Potomac Institute for Policy Studies



Jennifer Buss, PhD  
Chief Executive Officer  
Potomac Institute for Policy Studies

**“Do as much good as you can, for as many  
people as you can, for as long as you can.”**

—GENERAL AL GRAY, USMC (RET.)

# LEADERSHIP AND BOARDS



View full profiles from the "About Us" dropdowns at [potomacinstitute.org](http://potomacinstitute.org)

## BOARD OF DIRECTORS

General Al Gray, USMC (Ret.)  
*Chairman, Board of Directors*

Jennifer Buss, PhD  
Gail G. Clifford, CPA, MBA, CGMA  
Lyle Cox, PhD  
Theodore Glum  
Howard K. Schue  
Gary L. Sojka  
The Hon. John J. Young

## MANAGEMENT TEAM

Jennifer Buss, PhD  
*Chief Executive Officer*

Curtis Pearson  
*Vice President*

Robert Hummel, PhD  
*Chief Scientist*

Abby Gillett  
*Director of Strategic Communications*

Gail Clifford, CPA, MBA, CGMA  
*Vice President for Financial Management and Chief Financial Officer*

Miriam Jackson  
*Assistant Vice President for Financial Management*

Ryan Lewis  
*Assistant Vice President*

## BOARD OF REGENTS

General Al Gray, USMC (Ret.), *Chairman*

Prof. Yonah Alexander, PhD  
Jeff "Skunk" Baxter  
MajGen Charles Bolden, Jr., USMC (Ret.)  
The Hon. Lee Buchanan, PhD  
Terry L. Collins, PhD  
Rita R. Colwell, PhD  
Peggy Evans  
Raul Fernandez  
LtGen George Flynn, USMC (Ret.)  
RADM Ted Gordon, JAGC, USN (Ret.)

Melissa Hathaway  
John C. Johnson  
The Hon. Donald Kerr, PhD  
Kathleen Kiernan, PhD  
Jerry Krasner, PhD  
Francis Landolf  
The Hon. Zachary Lemnios  
The Hon. Arthur L. Money  
Brian J. Morra  
Alden V. Munson, Jr.

ADM Robert Natter, USN (Ret.)  
Gordon C. Oehler, PhD  
Robie Samanta Roy, PhD  
Timothy R. Sample  
The Hon. Alan R. Shaffer  
George A. Spix  
LtGen Keith J. Stalder, USMC (Ret.)  
The Hon. Kathryn Sullivan, PhD  
Doug Wolfe  
Lt Gen Donald C. Wurster, USAF (Ret.)

# NEW REGENTS AND SENIOR FELLOWS



**The Hon. Matthew Donovan**  
Board of Regents Member  
*Former Under Secretary of Defense, Personnel and Readiness*



**Lt Gen Timothy Fay, USAF (Ret.)**  
Board of Regents Member



**Brian Shirley**  
Board of Regents Member  
*Microelectronics industry expert*



**The Hon. MAC Thornberry**  
Board of Regents Member  
*Former Chairman, House Armed Services Committee*



**RADM James (Jay) Bynum, USN (Ret.)**  
Senior Fellow



**Dean Cheng**  
Senior Fellow  
*US/China relations*



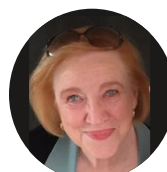
**CDR Kenneth Conley, USN (Ret.)**  
Senior Fellow



**Josh Mendelsohn**  
Senior Fellow  
*Policy making and technology*



**Sarah Mineiro**  
Senior Fellow  
*Defense, intelligence, space, S&T*



**Jody Moxham**  
Senior Fellow  
*Strategic communications*



**John Wilson**  
Senior Fellow  
*Technology entrepreneur/investor*

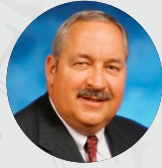
# POTOMAC INSTITUTE FOR POLICY STUDIES

## BRIEF HISTORY

# 1995



General Al Gray



Michael Swetnam



Jim Richardson, PhD



The Hon.  
H. Lee Buchanan, PhD

The Potomac Institute's history began with its involvement in the Technology Reinvestment Program (TRP) Office under Lee Buchanan's Defense Science Office. In 1995, Michael Swetnam, General Al Gray, Lee Buchanan, and Jim Richardson decided to study the foundational philosophy guiding dual-use research and development, using the TRP as a focal point. The Institute found that policymaking was generally dominated by political and short-term considerations, even in issue areas with significant scientific content. The elimination of the congressional Office of Technology Assessment (OTA) was a substantial motivation for forming the Potomac Institute for Policy Studies, a think tank designed to provide ready access to scientific insights, forecasting and impact information, program management advice, and science and technology policy recommendations.

## 2021-2022 FOCUS

# 2021-2022



The Potomac Institute for Policy Studies remained an avenue for the government to engage with commercial and defense agencies. In 2021 and 2022, we focused on economic defense needs. We recommended ways that industries in the United States can play a more effective role in redefining national security. We enhanced customer organizational effectiveness through strategic messaging and strategic human resource planning, and brought together business and government to identify and lead discussions on crucial S&T issues.

## LOOKING FORWARD IN 2023

# 2023



As we look into 2023, the Institute has identified eight key areas that will help us support the continued national discourse between government and business. Focus in the following areas will ensure we continue to deliver research and insights based on our founding principles. **1) Global Competition, 2) Mission Engineering and Risk, 3) Economics and Warfare, 4) Strategic Communication and Cognitive Security, 5) Space Policy, 6) Human Health and Performance, 7) Microelectronics, and 8) Technology Futures and Mission.** See page 24 for more information.

# THE POTOMAC INSTITUTE DIFFERENCE

The Potomac Institute for Policy Studies has been shaping and supporting the US government’s development of meaningful S&T policy for over 28 years. We operate in a unique space—at the intersection of government and industry—allowing us to look to the future and conduct research without the risk of outside influences. This enables us to be uniquely relevant in the realm of S&T. Our goal has been, and will always be, to deliver S&T research that drives meaningful, data driven policy solutions for the US government.

Our staff, Senior Fellows, and Board of Regents are some of the world’s leading experts in disciplines ranging across the spectrum—from microelectronics and the CHIPS Act (see pages 12-13) to critical minerals (see page 7) and US economic competition with China (see pages 12-13). We take pride in our studies, in the research we conduct, and the results we provide to our customers.

In our work, we identify key emerging technologies or scientific fields with disruptive potential, anticipate and understand the likely societal-level impacts of these technologies, and recommend meaningful policy options to the government. The Institute is keenly aware that implementation is the most difficult component of policy work. As a result, we do not merely conduct a study and provide a report. We roll up our sleeves as a think and “do” tank!

The quote from CEO Jennifer Buss, PhD defines the principles that make the Potomac Institute so unique. As a non-partisan, not-for-profit, research-based

**“Not everyone is going to be happy with what we have to say, but someone has to say it. We seek the truth; we trust the science.”**

—JENNIFER BUSS, PHD  
CHIEF EXECUTIVE OFFICER

organization, we uphold these tenants for how we impact public policy for the betterment of society. Our goal is to conduct honest, carefully thought-out, data-driven research and to educate and support the development of better policymaking for the US federal government. This research and the associated reports ensure that the S&T communities are well-informed and connected to solve their most pressing policy challenges.

Decades of experience have honed our philosophy to two basic principles. First, we fiercely maintain objectivity and credibility, remaining independent of any federal or state agency, and owing no special allegiance to any political party or private concern. Second, we seek extensive collaboration with similar organizations, as well as with industry, academia, and all of levels of government. We believe that the study of today’s complex issues demands a wide variety of contributions from various perspectives. We are proud to call ourselves “fiercely objective” as a result of our track record in divorcing political issues from policy challenges.

## PUBLICATIONS



Access all published reports at:  
[potomacinstitute.org/publications/reports](https://potomacinstitute.org/publications/reports)

Over the years, the Institute published hundreds of papers on topics ranging from international space station commercialization to changes in acquisition cycle timelines. The following pages offer executive summaries of two 2022 publications that highlight some key areas of interest looking into 2023.

# CRITICAL MINERALS

Critical minerals are essential for manufacturing modern technologies, such as consumer electronics, green technologies, military hardware, medical tools and devices, automobiles, and satellites. As demand for these technologies increases worldwide, the need for critical minerals grows exponentially. It is undetermined if supplies will be available to support demand.

The natural asymmetrical distribution of critical minerals worldwide means that many minerals come from limited sources of both raw materials and refining plants. The complex, resource-intensive critical mineral lifecycle and refinement processes compound distribution challenges and result in significant environmental impacts. Furthermore, many countries need more infrastructure to process these unrefined raw materials. Additionally, critical minerals embedded in internationally sourced finished products mask a reliance on foreign sources.

The United States is dangerously dependent on foreign sources for several of the 50 federally designated critical minerals of vital importance to the US economy or national security. Given this heavy reliance on international supply chains, the United States is vulnerable to supply disruption from unstable market pressures, natural catastrophes, geopolitical turmoil, trade embargoes, and fickle or adversarial nation sources.

Restrictions or supply chain disruptions of critical minerals would significantly affect the US economy and national security. In light of this, the United States must: 1) identify new sources; 2) develop a diverse portfolio of acquisition routes; and 3) secure stable, long-term supply chains of critical minerals to mitigate risks and reduce vulnerabilities to the defense and commercial sectors. Ultimately, a diverse range of options for supplies and alternatives leads to the most robust, secure access to critical minerals.

## What is the US reliance on critical mineral imports?\*

**100%** reliant on imports for **14 of 50** critical minerals

**25%** domestic production for **10 of 50** critical minerals

\* Executive Order 13817, December 20, 2017



A strategy to stabilize the long-term critical minerals supply is needed. In this Potomac Institute publication, the authors presented four components of such a strategy:

**1. Diversify international trade avenues**

Reliance on a single supplier is unstable. Multiple competing supply chains will increase stability of access, as is typical with other commodities. Should one source no longer be available, the US would still be able to access the materials needed. Strategic partnerships through prior agreements can ensure reliability.

**2. Increase domestic production across the lifecycle of minerals**

Establishing US domestic vertical supply chains for certain critical minerals and their applications may be highly desirable but only sometimes feasible. Government initiatives, like utilization of the Defense Production Act, reforming permitting processes to be faster, and other incentives and grants are needed to expand all parts of the supply chain—not just mining. For some minerals, investing in domestic refining capacity (e.g., rare Earth elements) may be advantageous. Additionally, expanded recycling capabilities can increase recapture.

**3. Continuously re-evaluate domestic needs**

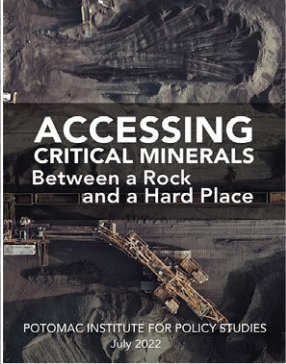
Criticality is not static; it constantly evolves as technological innovation and resource needs advance. The current US government list of designated critical minerals needs regular updating and better accounting for direct demand caused by imported minerals used in finished or semi-finished products. For some resources, stockpiling is appropriate for the short term.

**4. Invest in Research and Development for alternatives**

Research and development (R&D) activities may uncover comparable or improved capabilities separate from today’s processes or materials. Projects like Advanced Research Projects Agency–Energy (ARPA-E)’s “Rare Earth Alternatives in Critical Materials” (REACT) project can result in new technologies and decrease reliance on certain critical minerals. R&D could also result in new or improved extraction and refining capabilities.



Access the full report at:  
[potomacinstitute.org/  
publications](http://potomacinstitute.org/publications)



# UNDERSTANDING HUMAN HEALTH, SAFETY, AND PERFORMANCE IN SPACE

As society prepares to send humans beyond low Earth orbit (BLEO), the unique challenges of the space environment increasingly pose risks to the crew's health, safety, and performance. NASA is responsible for limiting human spaceflight exploration risks to individuals, crew, and the mission/system.

Genetic information, combined with other molecular physiologic information, is part of a holistic approach to astronaut healthcare and performance. Understanding genetics and genetic-based disease prediction can help mitigate some health concerns associated with human spaceflight. However, successful mitigation depends on transparent, evidence-based decision-making processes and the comprehensive collection, analysis, and use of astronaut health data.

NASA will likely need to leverage significant amounts of genomic and environmental data from its crew to ensure its astronauts' health, safety, and performance on long-duration exploration missions. However, the Genetic Information Nondiscrimination Act of 2008 (GINA) prohibits employers like NASA from unrestricted use of genetic information and family history. Thus, the GINA impedes NASA's data collection for risk mitigation,

decision making, and treatment approaches. A significant component of gathering genetic information is ensuring NASA's medical policies keep pace with genetic and healthcare research advances.

Leveraging genetic data to make mission decisions could reduce overall mission risk. Genetic risk comes into play for a crewed Mars mission or beyond where medical intervention is not possible on the time scale necessary to prevent significant health or performance degradation. The absence of fail-safes on long-duration design reference missions dictates caution, particularly for assignments with significant understanding gaps regarding long-term space exposure on human health.

Potential benefits of incorporating genetic data and family history may include a safer work environment through a better understanding of occupational hazards of spaceflight. Another benefit could be the decreased costs and risks associated with medical interventions. A final benefit could include a more tailored development of countermeasures, regimens, and therapeutics, and establishment of new countermeasures for the protection of the broader population of BLEO exposed individuals.



Read the 2008 GINA Act online.

**6,000+** genetic diseases identified\*

**1 in 5** "healthy" people have risk markers for rare diseases\*\*

**We expect to see a dramatic increase in disease diagnoses, with the promise that cures are quick to follow.**

From informational interviews with key subject matter experts and stakeholders, literature review, and research, the Potomac Institute identified following overarching findings and recommendations:

## FINDINGS

- 1. NASA currently cannot use genetic information (including family history) in decision making for astronaut selection or mission assignment.**
- 2. Genetic research data and medical advances associated with genomic research have increased significantly in recent decades.**
- 3. Unfortunately, application of genetics to disease prediction is incomplete, particularly for polygenic conditions.**

NASA is subject to upholding GINA. This policy hinders NASA's ability to use an individual's genetic information and family history to make informed decisions and better mitigate risks.

Terrestrial understanding and application of genetics research toward healthcare decisions have substantially increased in recent years. Additional collected and analyzed data lead to better models of disease conditions. The field of genetics continues to advance, yielding new and better healthcare approaches to disease prediction.

Gaps still exist in our understanding of terrestrial and spaceflight genetic risk and genetic-based disease prediction, especially for polygenic conditions (disease states resulting from more than one gene). Genetic research and analysis, particularly for the "healthy" terrestrial populations most analogous to astronauts, are also limited but steadily growing.

## RECOMMENDATIONS

- 1. Request an exemption to GINA for informed mission assignments based on genetics.**
- 2. Revise medical standards and qualifications for mission assignment to reflect current and future advances to include genetics.**
- 3. Leverage current data from long-duration crewed missions to better understand genetics and evaluate precision health capabilities.**

Genetic data (including family history) can offer insight into an individual's potential health and medical risks. Using this information for mission assignments can better NASA's decision making and help mitigate spaceflight medical risks that could have adverse impacts. Although genetic risk prediction is nascent, risk prediction for several monogenic disorders is currently possible. Future research and prediction capabilities will advance the field.

Evaluate current medical standards and mission assignment criteria at the Agency level to ensure they are appropriate and modernized, focusing on long-duration exploration missions. Review and update spaceflight genetics policies continuously to account for growing terrestrial and spaceflight knowledge.

Spaceflight provides an environment to control a study in ways that might be more difficult to conduct on Earth, offering a unique and viable testbed opportunity for understanding the consequences of spaceflight on human genetics and precision health technologies. The limited resources brought on missions within a confined environment mean many factors influencing health and wellness (e.g., environmental factors, nutrition/diet, fitness regime) can be collected.

# SCIENCE, TECHNOLOGY, ENGINEERING AND POLICY STUDIES (STEPS)

The Potomac Institute's STEPS publication provides original articles from staff, affiliates, and contributors to the work of the Institute on timely topics relevant to S&T policy. This publication provides a space for new experts in the S&T field to partner with and learn from our more established experts on the Board of Regents and Senior

Fellows to publish on important contemporary subjects. It is a huge part of our belief in the need to grow new voices for S&T policy matters.

In 2022, we produced two issues that received attention in the press and on social media.



Read current and past issues of STEPS online at: [potomac institute.org/steps](http://potomac institute.org/steps)



ISSUE 6 (APRIL) 2022

US National Security in a New Era of Intense Global Competition  
*The Hon. Zachary J. Lemnios*

Standing Tall: Maintaining US Economic and Military Competitive Posture During Turbulent Times  
*The Hon. Alan R. Shaffer*

Microelectronics:  
Supply Chain Challenges  
*Michael Fritze, PhD*

Counting Things that Count: Assessing the Fundamental Missions of Research and Development Organizations  
*James J. Richardson, PhD*

Free of Charge: Escaping China's Lithium-Ion Battery Dominance  
*Moriah Locklear, PhD*

The Hypersonic Conundrum  
*Bob Hummel, PhD*

## ARTICLES FROM 2022



ISSUE 7 (SEPTEMBER) 2022

Reclaiming the Narrative: The US and International Communications  
*Curtis Pearson; Jody Moxham; and Jeffrey "Skunk" Baxter*

Education of Americans Across Various Generations as a Preparation for Global Competitions  
*The Hon. Alan R. Shaffer and Trevor Huffard*

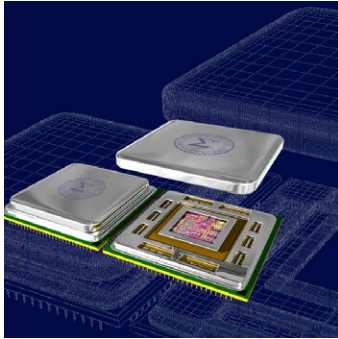
Don't Forget About Memory  
*Brian Shirley*

Batteries Not Included  
*Moriah Locklear, PhD; Claire Costenoble-Caherty, PhD; and Sharon Layani*

Accessing Critical Minerals: Between a Rock and a Hard Place  
*Sharon Layani and Alyssa Adcock, PhD*

CHIPS has Passed: Now Comes the Hard Work  
*The Hon. Alan R. Shaffer; Mike Fritze, PhD; and Bob Hummel, PhD*

# POTOMAC INSTITUTE IN THE NEWS



## **The CHIPS Act has Passed: Now Comes the Hard Work**

*Breaking Defense*

The Hon Alan R. Shaffer;  
Mike Fritze, PhD; and  
Bob Hummel, PhD

The CHIPS for America Act was only the beginning in a long laundry list of money and incentives needed to begin to compete with China and Taiwan in semiconductor production. What we do with that money matters—find out why.

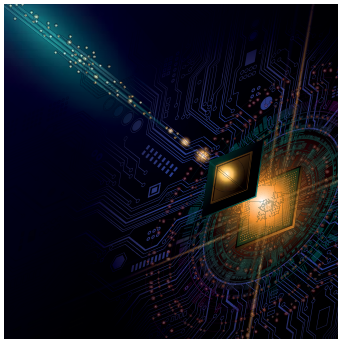


## **The Dangerous Depletion of US Weapon Arsenals**

*US Naval Institute*

Ashley G. Johnson

Outside of wartime, commercial industry has no need to be wartime ready, but the same cannot be said for the US Military. Our lack of discussion on the replenishment of these arsenals may impact us even further.



## **US Must Preserve its Quantum Advantage**

*National Defense*

Col (Ret.) John C. Johnson

Quantum technology is no longer a comic book dream, but a very serious reality should it fall into the hands of our adversaries. Quantum computing and quantum sensing may be the advantage needed for rising global competition.



## **Russia's Withdrawal from Kherson is Not the End of the War**

*The Washington Post*

Brian J. Morra

A victory for Ukraine or a tactical retreat for Russia? Even with troops withdrawing from Kherson, the Ukraine and the US should be prepared for more to come. This war for Russia wasn't a failure—it may only be halftime.



## **When Did World War II Become so Boring?**

*Defense.info*

Brian J. Morra

With the rollout of the B-21, the first nuclear bomber America has created in decades, you'd think Americans would be more concerned with what's happening in Russia/Ukraine. But how much say do we have, really?

# EDUCATION



[potomacinstitute.org/events/education](https://www.potomac institute.org/events/education)

The Potomac Institute for Policy Studies values education, research, and our people. Thinking outside of the box helps us contemplate and plan for the challenges and opportunities the future may present. Our Education Program provides a space for us to do that by sharing and learning across our community and staff. Lakishia Biggs, our recently hired Education Program Manager, leads our newly developing education initiative. The initiative will further enhance staff learning opportunities by building a hub of courses that clients and staff leverage for more profound knowledge of the Institute and our research.

Events like our monthly **Staff Summarizing Institute Projects Series (SIPS)** and **Brewing Bold Ideas** events, bring together our staff to identify emerging areas of study and enhance our client education opportunities. They provide a window into various projects happening in the organization and how they are connected, while allowing staff members to refine their presentation skills with their peers.

For example, in October the Institute conducted an executive course entitled CHIPS: The Real Deal and What it Means for US. This timely course, focused on the new CHIPS Act Legislation, was led by Michael Fritze, PhD and our esteemed instructors from academia,

**“If you are not teaching, you are not leading. Training and education are the essence of preparedness.”**

—GENERAL AL GRAY  
29TH COMMANDANT OF THE US MARINE CORPS

government, and industry. This course allowed us to support our clients and grow our collective knowledge as this topic receives increasing attention across the S&T community because it touches almost every aspect of all our lives.

Looking ahead, we will host courses on critical minerals (Critical Minerals: More Valuable than Diamonds in the Rough), US global competition with China, and critical aspects of commercial space in 2023. These courses will continue to grow to meet our customer’s needs by leveraging our Board of Regents, internal scholars, and the subject matter experts who support our research. Our objective for this emerging capability is to help our clients and the Potomac Institute for Policy Studies accomplish our goal of not just thinking but helping those who can “do” based on the most current and leading-edge policy discussions.



## INTERNSHIPS

The Potomac Institute's Science and Technology (S&T) Internship Program allows aspiring graduate and undergraduate students to research an S&T topic of their choosing, provide bold, insightful recommendations in a policy research report, and present their findings to Institute staff and leadership.

This program, and our International Center for Terrorism Studies (ICTS) program, are both part of our commitment to develop and encourage the next generation of policy leadership. We take pride in leveraging our networks to support the students' development of their articles. The four abstracts on page 16 are samples from our 2022 programs.

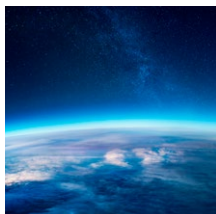


View internship opportunities online at:  
[potomac institute.org/about-us/internships](http://potomac institute.org/about-us/internships)

**"Education is the foundation upon which  
we build our future."**

—CHRISTINE GREGOIRE  
CEO FOR CHALLENGE SEATTLE  
22ND GOVERNOR OF THE STATE OF WASHINGTON

# 2022 SCIENCE AND TECHNOLOGY INTERN RESEARCH REPORTS



Louis Gleason  
Spring 2022

## ***Made in Space: Leveraging Market Incentives to Catalyze Space-Based Pharmaceutical Development***

One of the many ways that public health and outer space might become entwined in the future is through space-based laboratories, which could allow pharmaceutical companies to exploit the unique low-gravity environment known as “microgravity.” Soon, satellite laboratories operated by pharmaceutical companies may become medical knowledge hubs, contributing significantly to new vaccine and drug developments that would be difficult—if not impossible—to develop on Earth. Through these types of innovative developments, your physical exam of the future could include receipt of a made-in-space vaccine or pill.



Elina Vanuska  
Spring 2022

## ***Deep-Sea Mining: Where Geopolitics and Technology Meet***

Over the last 10 years, deep-sea mining technology R&D has resurged worldwide. This continued interest is driven by the need for critical minerals found on the seafloor. These minerals are essential components of numerous modern devices in renewable energy, smartphone, and defense technologies. Advances in robotics technologies and decreased costs have enabled scientists and engineers to pursue deep-sea mining seriously. Commercial-scale deep-sea mining still needs to overcome obstacles despite substantial technological advancements. If the United States wants to gain access to marine minerals, various avenues exist to kick-start the industry. This report proposes recommendations to take a proactive approach to deep-sea mining.



Paige Maylath  
Fall 2022

## ***The Role of the United States in the Global Market for Armed Drones***

This paper investigated the market for strike-capable, mid-altitude, long-endurance unmanned aerial systems (UAS). The UAS discussed in this paper are in Group 5 of the US Department of Defense (DOD) classification of unmanned vehicles, which means that they operate above 18,000 feet and have a maximum takeoff weight of at least 600 kilograms. While drones of this size have been in operation since the 1990s and the first drone strike took place in 2001, there has recently been a marked change in global usage patterns. The rapid proliferation of Group 5 strike-capable UAS during the last five years has led to their increased presence in ongoing conflicts between states. Previously, states typically used drone strikes in targeted attacks against the leadership in non-state organizations. As UAS take on a more prominent combat role, market demand is shifting and growing in a way that favors Turkish and Chinese products. By contrast, the United States, already restricted by its strict adherence to the Missile Technology Control Regime, will likely find its influence and share in the market severely diminished as its acquisition interests diverge from the rest of the global market.



Kelsey Coppola  
Fall 2022

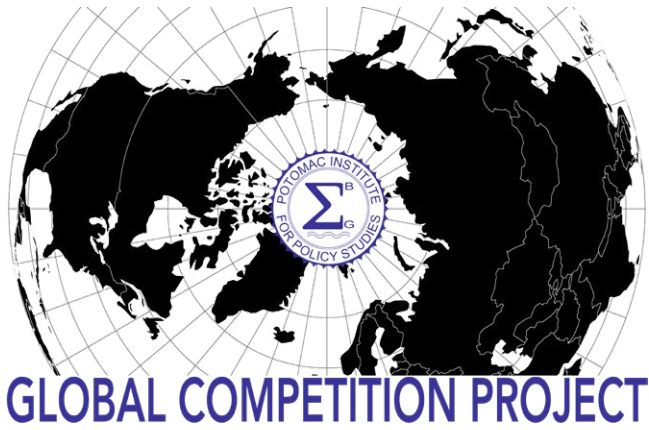
## ***The Future of Electric Vehicle Batteries: US Opportunities in a Chinese Dominated Market***

Recent years have witnessed an explosion in demand for electric vehicles. Despite China’s current lead in the electric vehicle battery market, the US industry still has the opportunity to use what China needs: the best-in-class battery of the future. This report explores US vulnerabilities in the electric vehicle battery supply chain and provide strategies to improve current methods of procuring raw materials. Additionally, it establishes the interrelatedness of sustainable investment and US national security and economic interests.



# 2022 ENDURING INFLUENCE





The Potomac Institute for Policy Studies established the Global Competition Project (GCP) in 2021 to help identify, elevate, and address some of the most vexing societal-level challenges facing the US today. This project aims to leverage the lens of the global competitive environment to bring contextual relevance to the Institute’s unique science and policy-focused mission and contributions to the nation. The Institute’s work is especially influential at the intersection of prosperity and security by helping to ensure the adoption of the right policies and processes to enable the nation to flourish when faced with the complexities of the dynamic contemporary global landscape.

Over the past two years, the Project has provided a platform to engage with experts from diverse fields to highlight and gain insight into the primary challenges and opportunities inherent in global competition. The Project delivers coherence and a framework for addressing elements of the still-emerging, evolving societal-level approach for policymakers and the private sector.

**2022 RESEARCH AND EVENTS**  
**6 key themes that require critical action**  
**by policymakers, government leaders, and industry**



**FAITH IN INSTITUTIONS**  
 to include the media, academia,  
 and the US government



**WANING US DOMINANCE IN SCIENCE AND TECHNOLOGY**  
 based on education, workforce, and innovation



**THE INTERDEPENDENCE OF HUMAN NEEDS**  
 to include food, water, energy  
 and certain natural resources



**COMPETITION, COOPERATION AND CAPITALISM**  
 the importance of free enterprise and economics in  
 our future competitive posture, lending to security  
 and prosperity.



**NATIONAL VALUES**  
 threats to a unifying vision and  
 democracy in the pursuit of ideas



**THE PROLIFERATION OF INFORMATION**  
 its ubiquity, flow, and manipulation

The GCP events have been invaluable for understanding the nature of competition in the modern era. Competition requires more than understanding how and why the complexities of the Information Age and the uber-interconnectedness of society (economically and otherwise) influence US competitive advantage.

To pursue competitive advantage in the face of rising threats, while preserving the tenets of our base institutions, we must strike an acceptable balance between risk, oversight, and flexibility. Moving forward, the Institute will continue to support US security and prosperity by developing recommendations for actions aligned with our mission for the private and public sectors.

On November 30th, 2022, **The Hon. William “Mac” Thornberry**, Potomac Institute Board of Regents member and former Chairman of the House Armed Services Committee, was our keynote speaker for the GCP conference “Advancing American Competitiveness: Challenges and Opportunities in the Decades Ahead.” This event initiated a Potomac Institute-hosted venue for consistent, focused engagement across the government, the policy community, and the private sector. It was foundational for partnerships to counter common grey zone economic threats. To address threats of adversarial economics, panel participants recommended that the US government invest in specific functions and organizations to improve strategy cohesion, structural unity, and effort coordination.



Visit the GCP online at:  
[potomac institute.org/academic-centers/gcp](https://potomac institute.org/academic-centers/gcp)



CETO is an internal Marine Corps think tank that supports the Deputy Commandant for Combat Development and Integration (DC CD & I). CETO's core mission is to provide the Commanding General of the Marine Corps Warfighting Lab (MCWL) with technical and analytical support for concept development, wargaming, and experimentation programs. CETO conducts assessments of the strategic environment, future threats and potential adversaries, and the associated geographic, environmental, economic, and demographic trends that may influence future warfighting requirements. The following is a list of how the Potomac Institute staff supported Marine Corps efforts in 2022:

This year, CETO completed two future forecasting reports based on the National Intelligence Council (NIC) Global Trends 2040 study. These reports assessed potential national security implications associated with scenarios presented in the research and recommended consideration of relevant Marine Corps capability requirements.

CETO continued support to MCWL wargame development and execution last year. Three games that stood out in 2022 were Expeditionary Warrior 22, Maltese Dragon 22, and the 2022 Naval Services Game.

**The annual Expeditionary Warrior**, a Commandant of the Marine Corps Title Ten wargame, the team facilitated gameplay in player cells that functioned at the strategic, operational, and tactical levels and in the red, or adversary, game cell.

**The Maltese Dragon**, a game looking at impacts of potential future S&T applications, focused on logistical support and sustainment of Marine Corps operating forces as structured in the Commandant of the Marine Corp's Force Design 2030 initiative. CETO staff did what that was crucial in exploring potential new structures for a future Marine logistics organization.

**The Naval Services Game** ensured the Seventh Fleet and III Marine Expeditionary Force planners and Pacific Fleet and Marine Forces Pacific staff were able to explore the future logistics distribution schemes and naval force sustainment in the Indo-Pacific.

MCWL develops and conducts live force experimentation with USMC Fleet Marine Force units. This year, the primary focus was experimenting with the 2030 Infantry Battalion Design (IBX 30). MCWL experimentation helps identify the strengths and weaknesses of the future battalion structure as envisioned and ultimately helps identify beneficial organizational and equipment modifications. The Potomac Institute staff supported the MCWL Experiment Division teams that designed, executed, and assessed IBX 30 throughout the year. They are now participating in experiment planning for a new Marine formation, the Marine Littoral Regiment (MLR). The MLR experimentation will take place during exercises and training events throughout 2023.

During 2023, CETO will continue to track strategic patterns and trends and consider plausible futures and their implications for national security in general and specifically for naval forces in 2030 and beyond.

# NSWC

The Potomac Institute continues to provide technical and strategy development support to the Naval Surface Warfare Center (NSWC) Indian Head Division (IHD) in southern Maryland. The Navy established IHD in 1892 as its powder factory and has since broadened its mission to advance the state of the art of energetics—quite simply, those ingredients that determine the range, speed, and lethality of a munition—and steward this core expertise and capability as the Navy’s only Arsenal.

During its 131-year history, 2022 may truly end up being IHD’s most significant and an inflection point in our nation’s history without hyperbole. As a result of Russia’s unprovoked invasion of Ukraine in February, the message the Institute has been helping disseminate regarding IHD and the relevance of energetics is becoming broadly accepted and supported.

Wars are won or lost by munitions—both by their sheer numbers and by their performance. However, daily news reports have demonstrated just how fragile our national Munitions Industrial Base (MIB) has become. After decades of focus on advanced platform development and other warfighting priorities, the capacity of our MIB to produce munitions and energetics has greatly, yet predictably, eroded to a worrisome state.

It is critical we maintain our national munitions production capability and expertise. In peacetime, industry rightfully exits sectors with inadequate business cases, creating the current environment with lengthy munition production startup delays and supply chain challenges. The nation must protect those assets critical to national security with lower peacetime business relevance—like the government owned and operated arsenal at IHD.

The Potomac Institute team assists the government to develop this “energetics renaissance” strategy, along with corresponding messaging, research, analytical

tools, training strategies, and improved processes to help implement change at IHD. It is imperative that IHD can adequately respond to the coming increased demand for the Navy’s Arsenal and provide our warfighters with operationally relevant energetics and munitions in sufficient capacities.

From a revised hybrid business model that accounts for true sustainment costs of an arsenal to the development of a comprehensive modernization plan to service the Arsenal’s infrastructure and equipment for the next ten years, the expertise and experience of the Institute team is unmatched and continues to deliver meaningful and impactful products to the government. The team is excited to finally see their vision come closer to reality, unfortunately accelerated by the devastation seen in Ukraine.

When the Institute started supporting IHD in 2015, very few people outside of the business knew what energetics were. Now, in large part due to the success of the team’s strategic outreach, many of our senior military leaders in the Navy and DOD, along with our elected officials, recognize just how critical the MIB, energetics, and IHD will be in order to win the next war. This is a clear example of the difference the Institute brings to the national discourse and our clients.

# INTERNATIONAL CENTER FOR TERRORISM STUDIES (ICTS)



For more information, contact  
Board of Regents Member  
Professor Yonah Alexander, PhD at:  
[Yalexander@potomac institute.org](mailto:Yalexander@potomac institute.org)



Visit the ICTS webpage at:  
[potomac institute.org/academic-centers/international-center-for-terrorism-studies-icts](http://potomac institute.org/academic-centers/international-center-for-terrorism-studies-icts)

Professor Yonah Alexander is the Founder and Director of the ICTS. For over two decades, the ICTS has monitored current and future potential terrorism threats and developed response strategies at governmental, inter-governmental, and non-governmental levels. Through numerous Forums and publications, the ICTS sponsors continual communications with policy makers, academic institutions, business, media, and civic organizations nationally and globally. The ICTS is an internationally recognized pioneering research program that, throughout the pandemic, focused on critical health and security issues.

During 2022, the ICTS held ten Zoom Forums discussing not only the Russian invasion of Ukraine, but also combating terrorism in other regions.

## SELECTED 2022 ICTS FORUMS

January 20	22nd Annual Ambassadors' Forum: Combating Terrorism: A Review of 2021 and Future Outlook for 2022
February 24	State-Sponsored Terrorism: Challenges for 2022 and Beyond
March 24	Preventing Nuclear Terrorism in Ukraine and Beyond: International Dimensions
March 31	Ukrainian Humanitarian Crisis: Lessons For Preventing the Next Genocide?
April 28	NATO: Strategic Lessons From the Russian Invasion of Ukraine
May 25	Combating the Religionization of Terrorism: Governmental, Inter-Governmental, and Non-Governmental Perspectives
June 30	Iran's Security Challenges and Prospects for Conflict-Resolution?
September 15	The Global Energy Crisis: Challenges and Opportunities
November 2	The Security Situation in the Sahel: Assessing Threats and Responses
November 30	Latin American Security Concerns

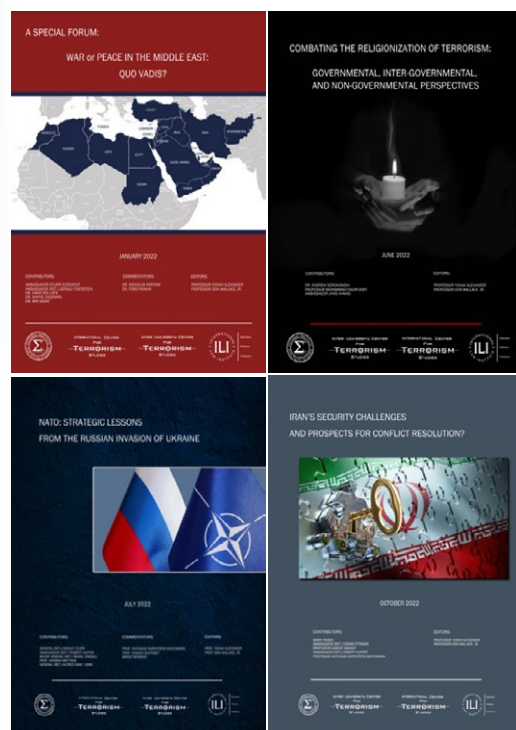
Additionally, the ICTS INTERNSHIP PROGRAM hosted 21 undergraduate, graduate, and PhD students from US and foreign institutions.

The 2022 effort was coordinated by Kevin Harrington.

## DISTINGUISHED INVITED SPEAKERS INCLUDED:

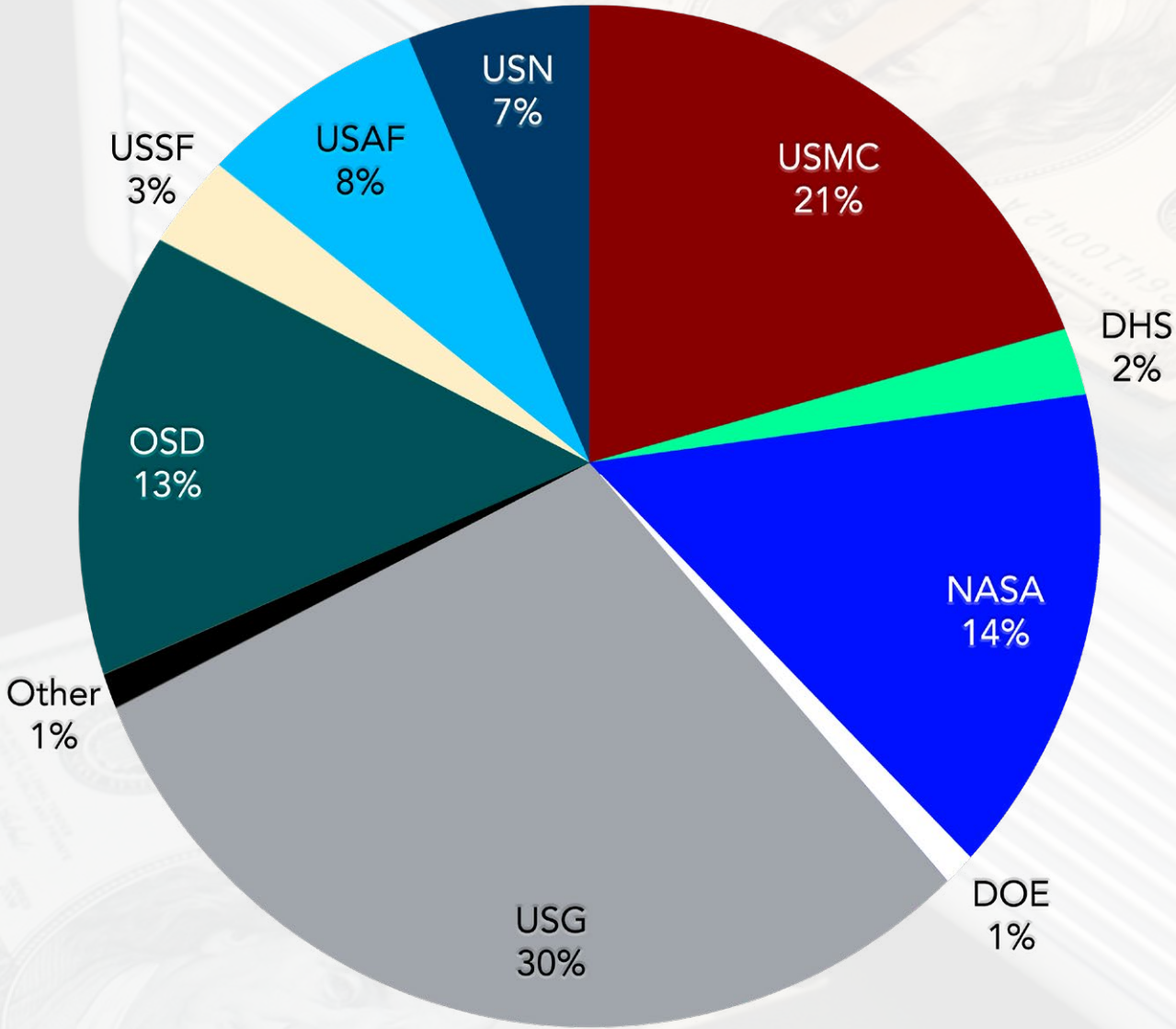
- General AI Gray (Ret.)
- General Wesley Clark (Ret.)
- BGen David G. Reist, USMC (Ret.)
- Major General Mihail Ionescu, PhD (Ret.)
- The Hon. Stuart Eizenstat
- The Hon. Raffi Gregorian
- The Hon. Guy Roberts
- Ambassador Robert Hunter (Ret.)
- Ambassador Lino Gutiérrez (Ret.)
- Ambassador Charles Ray (Ret.)
- Ambassador Javid Ahmad (Ret.)
- Ambassador Zango Abdu (Ret.)
- Professor Rita Colwell, PhD
- Professor Abraham Sofaer
- Professor Mohammad Faghfoory, PhD
- Professor Jaime Suchlicki, PhD
- Professor Natividad Carpintero-Santamaría, PhD
- Professor Shimon Shetreet, PhD

## 2022 ICTS REPORT PUBLICATIONS



# FINANCIALS

The chart below shows the wide range of S&T organizations that invested in Potomac Institute's unique skill sets to help them accomplish their missions. Through this work we have been able to help our clients and the S&T community move forward on key policy challenges and solutions.



# LOOK AHEAD AT 2023

The work we have done over the past 28 years has led us to identify the following 8 focus areas for our team and experts in the coming year. These interests are closely linked with the work we do for our government clients to continue to push important policy areas that will help ensure our nation is able to compete and lead in the S&T world.

## GLOBAL COMPETITION



- US Position on the Global Stage
- Strategic Levers in the Grey Zone
- Strengthening Partnerships
- Work Force and Education

## MISSION ENGINEERING AND RISK



- Mission Level Enterprise and Risk Management
- Mission Integration and Acquisition
- Reliability of Commercial Capabilities

## ECONOMICS AND WARFARE



- Economics as a Diplomatic and Warfare Discipline
- The Role of Industrial Policy
- Supply Chains, Transportation, and Logistics Under Fire

## STRATEGIC COMMUNICATIONS AND COGNITIVE SECURITY



- Reclaiming the Narrative
- Communicating Within and Without
- Truth and Public Diplomacy

## SPACE POLICY



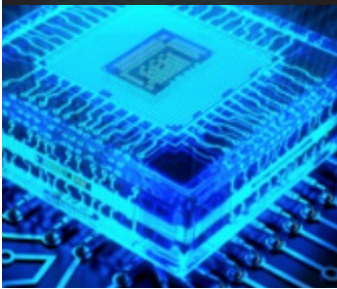
- Commercial Systems Planning
- Enterprise-wide Integrated Mission
- Roles and Missions

## HUMAN HEALTH AND PERFORMANCE



- Astronaut Health Risk Reduction
- Health Care Systems Enhancement
- NASA Systems Supporting Humanity
- DOD and Intelligence Community Support to Warfighting

## MICROELECTRONICS



- Realities of CHIPS
- Mission Needs Versus Economic Realities
- Re-shore/Near-shore Decision Making

## TECHNOLOGY FUTURES AND MISSION CAPABILITY



- Eliminating the Bureaucratization of Innovation
- Mission Operations Value of Technology
- DOD Stimulating the Industrial Base



# EMPLOYMENT OPPORTUNITIES

We are continuing to grow our staff and expertise to meet the demands of our clients and the future environment.



See employment opportunities online at: [potomacinstitute.org/about-us/employment](http://potomacinstitute.org/about-us/employment)

## RESEARCH ANALYST

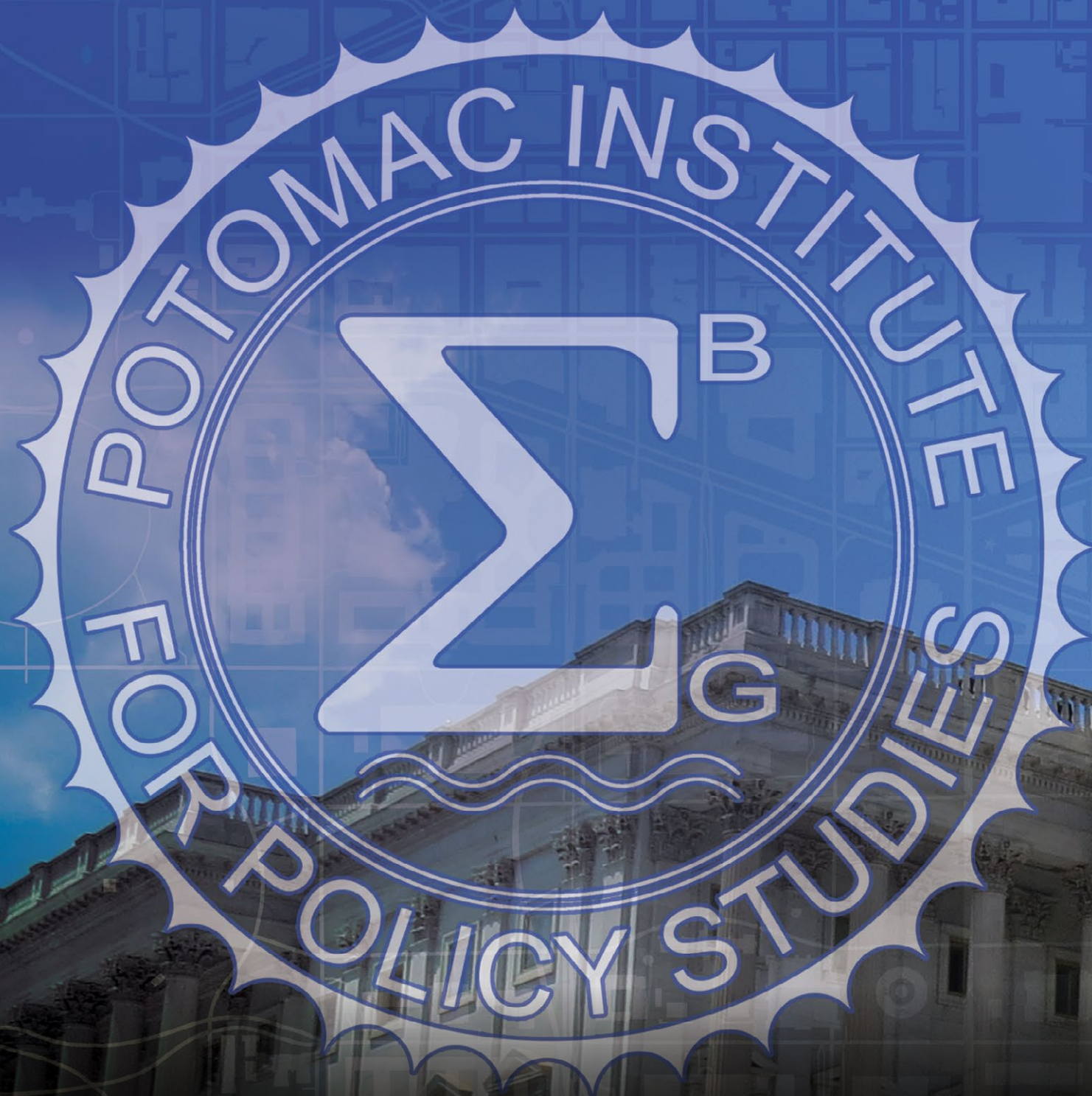
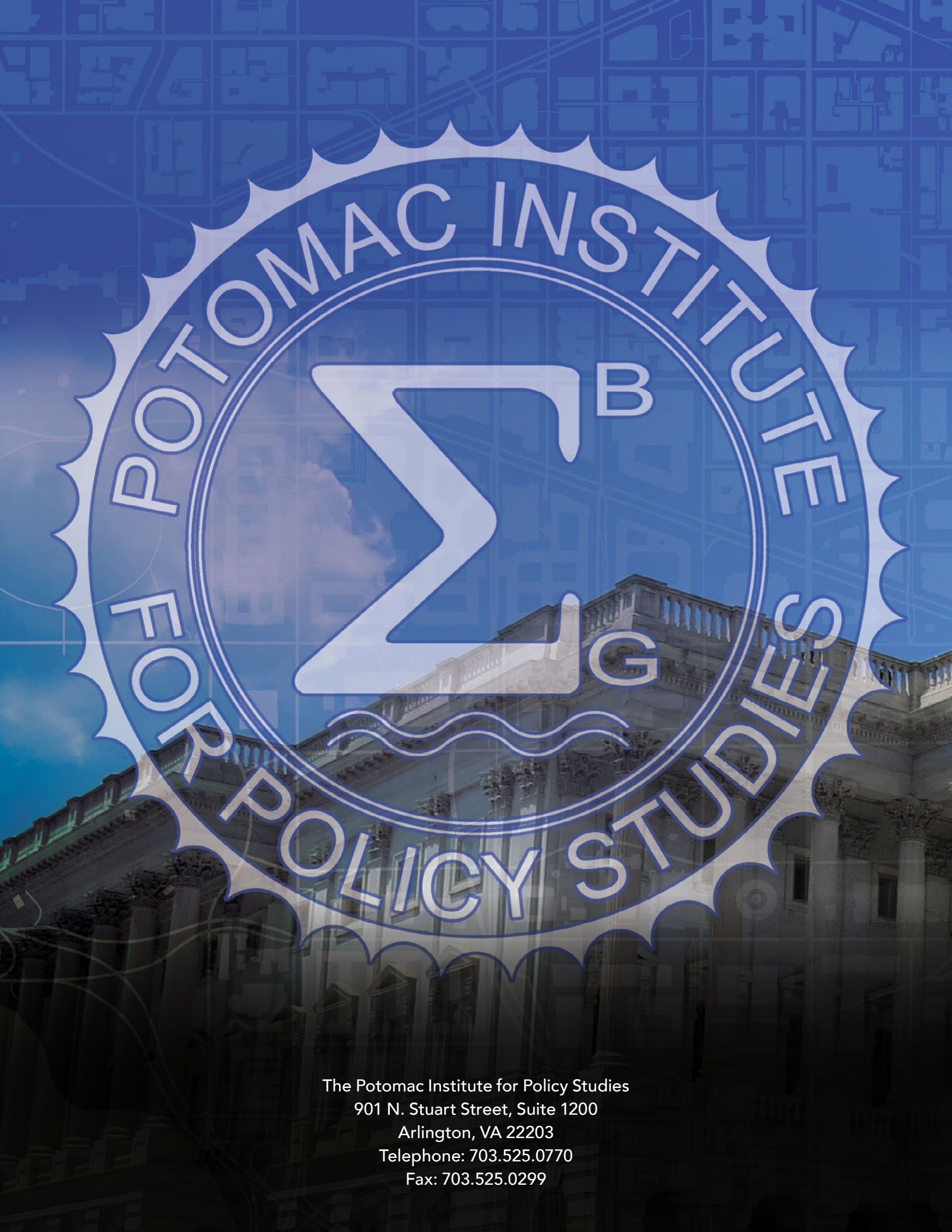
A mid-to-senior level professional, the Research Analyst should have critical thinking and writing skills and be capable of technical assessment and analysis, leading multiple project teams, and managing reporting and budgeting.



## RESEARCH LIBRARIAN

A minimum of five years of experience and a Masters in Library Science, the Research Librarian will be a mid-to-senior level professional specializing in research for government and/or military experience, capable of providing support for multiple projects and compiling data.





The Potomac Institute for Policy Studies  
901 N. Stuart Street, Suite 1200  
Arlington, VA 22203  
Telephone: 703.525.0770  
Fax: 703.525.0299