THE SUMMER 2021

BRIDGE

The Official Magazine of the Naval War College Foundation

ARTIFICIAL INTELLIGENCE ON THE FRONT LINES

Understanding Artificial Intelligence and Its Military Applications

Ethics of Artificial Intelligence

Learning AI for the All-Many-Few in the Naval Forces



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Educate Today. Secure Tomorrow.



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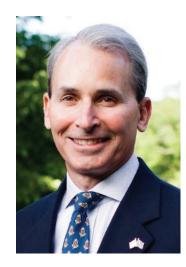
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FEATURE: AI

In its report released earlier this year, the National Security Commission on Artificial Intelligence (NSCAI) wrote: "The Commission concludes that the United States must act now to field AI systems and invest substantially more resources in AI innovation to protect its security, promote its prosperity, and safeguard the future of democracy." In keeping with that directive, the Naval War College Foundation is acting to support the advancement of AI research, policy development and education at the U.S. Naval War College. In this issue, you'll hear from many of the field's experts at the USNWC about why there is such an imperative to act now, and how we might proceed forward.

Note: The views expressed by authors herein are solely those of the individual authors and do reflect the position of the U.S. Naval War College, the U.S. Navy, or the Department of Defense.

At the Helm



on many fronts to support our College (USNWC).

threats such as Artificial Intelligence (AI), Cyber, or the in our daily lives. Arctic, we are supporting critical Department of Defense in the professional education of senior

officers at the Naval War College. Unlike most government funding, NWCF funding is at the speed of relevance to address rapidly evolving challenges.

to accelerate strategic funding years before appropriations through government channels. Your Foundation does not stop working during government shut-downs or national pandemics. We provide reliable, strategic funding for the "margin of excellence" at the USNWC that government budgets do not provide. We ensure that all philanthropic Naval War College.

The NWCF has led from the front before at the speed of Defense. of relevance — notably in cyber security education. Years before "cyber" was part of the national dialogue, we stood up the NWCF Cyber Task Force to build public awareness of the cyber threat. We convened prominent civilian and military leaders with our esteemed faculty to host a series of Philip Bilden policy forums and war game simulations to understand the threat to our Nation's military and critical infrastructure.

This multi-year campaign allowed the NWCF to raise awareness and philanthropic funding to prepare USNWC future leaders to operate on air, land, sea & space — and in https://nwcfoundation.org/artificial-intelligencethe cyber domain. Anchored by a \$10 million donation, symposium/ and with generous support of our Board of Trustees, the https://nwcfoundation.org/national-security-commission-NWCF established funding for the The Admiral James R. on-ai-releases-final-report/ Hogg Cyber & Innovation Policy Institute (CIPI) at the

I AM PLEASED to report that your Naval War College. This would not have happened without Naval War College Foundation NWCF leadership addressing a gap and accelerating (NWCF) is leading from the front funding at the speed of relevance to our future warfighters.

Today, your NWCF is moving out again at flank speed to future leaders at the U.S. Naval War build awareness and funding for another rapidly evolving national security threat: Artificial Intelligence. You are not Whether addressing emerging alone if you have heard much discussion about AI, but do not understand its implications in our national security or

AI is surrounded by much hype and public national security priorities of the misunderstanding, as USNWC Professor of Future Warfare Studies, Sam Tangredi, notes in his submission, "Understanding AI and Its Military Applications." USNWC Professor Tom Creely highlights the ethical implications of AI and the risk of unethical AI by our adversaries, notably China, in strategic competition with the U.S. USNWC As an independent 501(c)3, the NWCF is positioned Professors Chris Demchak and Michael O'Hara address the challenge of how to teach our future leaders what they need to know to operate in an AI environment.

These scholarly contributions to The Bridge lay the groundwork for the NWCF AI events series in 2021-2022. We commenced June 15th with the San Francisco Symposium, AI On the Front Lines, moderated by the monies are invested for the highest and best use at the Honorable Robert Work, co-Chairman of the National Security Commission on AI, and former Deputy Secretary

> Join us in these events, become informed, and help us educate our future leaders at the speed of relevance to secure tomorrow.

Naval War College Foundation

For more information:

The NWCF has led from the front before at the speed of relevance — notably in cyber security education.

Today, your NWCF is moving out again at flank speed to build awareness and funding for another rapidly evolving national security threat: Artificial Intelligence.



From the President, U.S. Naval War College

Dear NWC Foundation Members:

Through a virtual 2020-2021 Academic Year, the United States Naval War College (USNWC) has continued to distinguish itself as a premier center for education, research and outreach. The teamwork and collaboration amongst Dean of Academics (DOA), College of Leadership and Ethics (CLE), College of Maritime Operational Warfare (CMOW), International Programs (IP), Dean of Students (DOS), College of Distance Education (CDE),

and Center of Naval Warfare Studies (CNWS), along with our superb support staff, facilitated another successful year of academic achievement, despite continued challenging circumstances. Our faculty and staff maintained the high standards expected of our students, producing graduates with the experience and intellectual capacity to anticipate and prepare strategically for the future, strengthen the foundations of peace, and create a decisive warfighting advantage. Our way of business evolved, but our commitment to being a leading voice in the U.S. Department of Defense (DoD), and among international militaries, dedicated to the understanding and development of maritime strategy, remained steadfast.

Our outreach programs continue to build partnerships and form relationships throughout the globe, strengthening the security of NAVNORTH. our nation. The USNWC Community has been able to accomplish I could not be prouder of them.

With the assistance of the Teaching Excellence Center during the summer of 2020, the faculty and staff improved their methodologies and learned to more effectively utilize new teaching platforms to work more efficiently with students in the virtual environment. As year was markedly improved.

Our DOS awarded 498 Master's degrees during the 2020-2021 academic year. Despite immense changes to the traditional educational experience, the resident students still provided extremely positive feedback and noteworthy accolades in their end of course surveys.

CMOW's Maritime Staff Operations Course (MSOC) and Maritime Operational Planners Course (MOPC) were able adapt their classrooms and processes to support classified in-residence curricula. This was aided by a gracious and timely Foundation gift which allowed the college to reconfigure and rewire spaces to meet COVID-19 safety guidelines. Since July 2020, when the stop movement order was lifted, both courses have continuously

> operated, graduating 466 students to support Fleet requirements. Additionally, the Executive Level Operational Level of Warfare Course (ELOC) convened virtually three times, reaching 30% more students than in the traditional physical classroom

> The War Gaming Department (WGD) obtained the necessary technology and developed creative approaches to execute distributed war games from multiple remote sites throughout the Fleet. With this distributed model and subsequent inperson events, they completed six critical wargames for the Commander, NAVCENT, Commander, Pacific Fleet; the Commander, Seventh Fleet; the DCNO for Logistics (N4);

Commander, STRATCOM and the Commander, NAVEUR and

A multitude of USNWC study groups and research centers all of our objectives this year, through a multitude of obstacles, and conducted conferences, symposia and workshops within their respective fields of study. This fostered critical and innovative thinking within the Department of Defense, interagency, and the militaries of our international partners. These groups contributed scholarly work in the fields of Irregular Warfare, Arctic Security, Future Warfighting, Humanitarian Response, Women Peace and a result, the curriculum delivered at the beginning of the academic Security, Changing Climate, Cyber, Law, China Maritime Studies, and Genocide Prevention. Additionally, IP and CMOW held virtual senior leader seminars in support of the Combined Force Maritime Component Commander courses. These seminars provided a venue for African and Middle East Fleet Commanders to present issues to



their counterparts in an academic environment, facilitating open discussion.

The USNWC outreach program is essential to building enduring relationships with our alumni and partners. The primary objective of International Programs is to promote outreach and provide education for officers of partner/allied nations. This academic year, we welcomed 90 international officers from 59 nations to our campus, a major undertaking and substantial accomplishment while operating under pandemic conditions. Additionally, a critical element of our international officers' educational experience is the DoD-mandated Field Studies Program (FSP). IP created and developed a largely virtual FSP program, an innovative capability which opened access to an array of venues and speakers our Sincerely, international students would have otherwise missed.

Finally, I would like to acknowledge you, Naval War College

Foundation members, and thank you for your ongoing support to this institution. For more than 50 years, the Foundation's commitment to the College has remained firm: to educate today in order to secure tomorrow. Through your efforts, the Naval War College has been able to expand the intellectual capacity of naval, joint, interagency, and international leaders to develop strategically minded joint warfighters. Your advocacy has enabled this college to support the Joint Forces, preparing them for today and given them a competitive advantage for tomorrow. Thank you, again, for your incredible service and support to this college, the U.S. Navy and our

RADM Shoshana Chatfield President, U.S. Naval War College

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Understanding Artificial Intelligence and Its Military Applications

Sam J. Tangredi and George Galdorisi

ARTIFICIAL INTELLIGENCE (AI) may be the most beneficial technological development of the 21st century. However, it is undoubtedly the most hyped technological development of the past two decades. This hype has raised expectations for results and, of AI and its limitations as well as potential.

The very characteristics of AI, machine learning, human-machine teaming, and analysis of big data are poorly understood outside of specialists, and the terms have been publicly used in arbitrary fashions, sometimes deliberately.

WHAT REALLY IS ARTIFICIAL INTELLIGENCE?

In reality, artificial intelligence is not magic, mystery or a superior way of thinking. Any well-functioning human brain could perform the same functions as any AI machine if time, energy, focus, and data storage (recollection) were not factors and limits. AI machines consist of software and input composed of programming, algorithms, and collected, correlatable data running on computer hardware. AI machines have beaten human masters of chess, iGo, and Texas Hold-Em Poker because they can contain and recall more data in a shorter amount of time than the human brain.

AI has had a myriad of definitions since its initial development as a branch of computer science in the late 1950s, but they can be distilled to "the capability of a machine to imitate human behavior," or, more specifically, "a computer system able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages." This involves self-learning: the system is designed to learn from mistakes and (in effect) re-write its operational code so as to include more data.

Clive Swan, a vice president of Oracle, defines the result of this programming and self-programming very succinctly: AI is "the set of statistical techniques that teaches software to make decisions on armed drone missions have been conducted by human operators. past data."

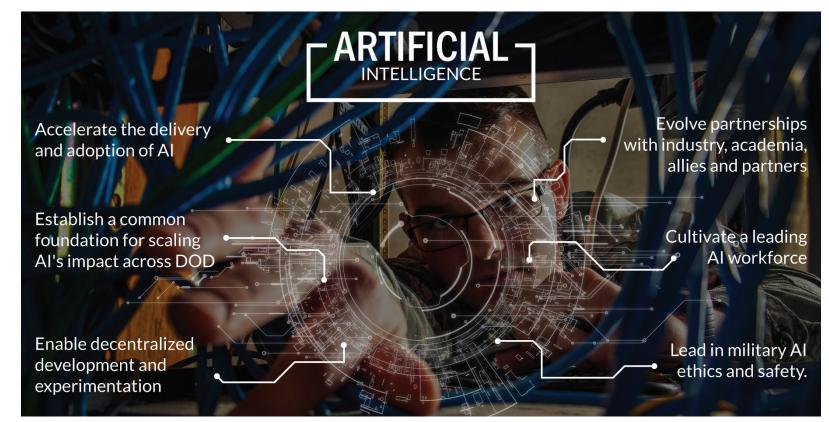
AI machines have vulnerabilities, some greater, some less than humans. Like humans suffering massive heart attacks or devastating

combat trauma, AI machines can "die" instantly, if separated from their power sources. Contained in metal boxes, AI machines can be armored for protection from shock, but so can humans. AI machines can be constructed in robot form with some limited unfortunately, has clouded public understanding of the true nature degree of movement using mechanical strength that surpasses human strength. However, the ability to engineer a robot to fully mimic all the degrees of human movement requires effort and cost that exceeds the actual programming costs of AI. In industry, current robots remain very limited in function in order to perform narrow tasks that are repetitive in nature. Even if AI-driven, they are not designed to multi-task outside of limited functions simply because it is not cost-effective.

NWC EFFORTS IN UNDERSTANDING MILITARY AI

In the public perception of military affairs, the term AI almost universally conjures up images of "killer robots" running amok and deliberately attacking non-combatants, possibly destroying the entirety of the human race. Obviously, this mental image is elicited by a large series of popular movies and novels based on that theme. This fear exists to the extent that certain scientists and scholars have conflated artificial intelligence with unmanned military systems (these so-called killer robots). A coalition of non-governmental organizations has established a "campaign to ban killer robots," which they define as an effort to "ban fully autonomous weapons and thereby retain meaningful human control over the use of force." This coalition defines autonomous weapons as weapons that "would be able to select and engage targets without human intervention," a definition so broad that it could conceivably cover such existing weapons as heat-seeking missiles (originating in the 1950s) or stationary naval mines (the first recorded, verifiably successful mine attack was in 1855). In fact, their definition refers to "armed drones" as "precursors" to killer robots, despite the fact that all verifiable

In reality, current applications range from analyzing maintenance data from U.S. Marine Corps helicopter engines, to Project Maven, in which an AI system viewed thousands of hours of drone video



Department of Defense photo by Erik Sams/Released

footage from flights over Afghanistan and Iraq (and elsewhere) in order to spot suspected theorists. Such efforts would take humans many days to analyze. But no killer robots.

This lack of understanding is the result of the fact that there are very few open, public sources — articles, books, published studies — that discuss in any detail the specific, functional applications of Al to the discrete elements that constitute preparation for, deterrence of, and conduct of military operations. Part of this difficulty is due the security classification of such information. Part of the difficulty is that many of the professional articles written on the potential for AI application to military affairs are direct, indirect, or (rarely) subtle arguments for spending additional financial and personnel resources (e.g., money, labor and time) on the development of AI and related techniques. Other sources are arguments for the greater importance (or "status" in the bureaucratic hierarchy) of AI programs in the U.S. Department of Defense. It is hard to give a balanced assessment of the application of AI (cons as well as pros)

while advocating for more money or status.

The objective of the AI policy research that has been conducted by the Naval War College in collaboration with Naval Information Warfare Center Pacific has been to provide objective analysis for the potential of military applications of AI without hype, mystification, or advocacy. We have sought to be honest brokers in providing best professional advice to Department of the Navy and Department of Defense decision-makers concerning future investments in military applications of AI. All interested NWC Foundation members are invited to seek more information by e-mailing sam.tangredi@

This article is excerpted and adapted from the Introduction of AI at War: How Big Data, Artificial Intelligence and Machine Learning Are Changing Naval Warfare, published in April 2021 by Naval Institute Press.



Dr. Sam Tangredi serves as the Leidos Chair of Future Warfare Studies and is the Director of the Institute for Future Warfare Studies at the U.S. Naval War College



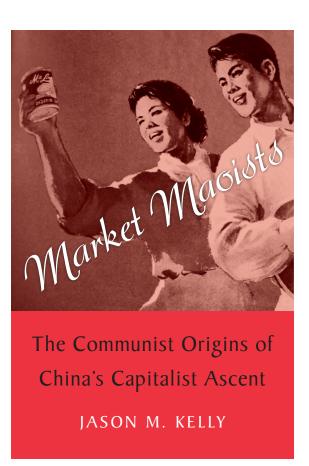
CAPT George Galdorisi, USN (Ret.) is the Director of Strategic Assessments and Technical Futures at the Naval Information Warfare Center Pacific.

Market Maoists: The Communist Origins of China's Capitalist Ascent

IN HIS NEW BOOK, Market Maoists: The Communist Origins impression of China during his rule as either raging against the of China's Capitalist Ascent, author Jason Kelly examines China's relationship with capitalism under the leadership of Chinese impression mistaken, and how do you hope to correct it with this Communist Party (CCP) Chairman Mao Zedong, a relationship book? that is sometimes seen as at odds with CCP ideology.

Department at the U.S. Naval War College. He spoke with the NWCF about the book.

Mao gave a speech in which he said, "All Chinese without exception must lean either to the side of imperialism or to the side of socialism. Sitting on the fence will not do, nor is there a third road," and you write that "the tendency to emphasize Mao's outlook also reinforces the mistaken



capitalist world or contentedly detached from it." Why is this

Kelly is an assistant professor in the Strategy and Policy It's a common presumption, even among historians, that China withdrew from global capitalism after the founding of the People's Republic of China in 1949. But this presumption, which was partly shaped by Mao's own rhetoric about China's decision to "lean" toward socialism in its foreign affairs, is an oversimplification. As I show in the book, China's ties to capitalism transformed under Mao but never stopped entirely. Mao certainly raged against the capitalist world during much of his rule, but alongside this rhetoric the CCP worked diligently to expand China's trade with capitalists around the world.

> By digging into this apparent contradiction, the book reveals a much more nuanced picture of Mao's China in the world, one that doesn't fit the stark themes of socialist solidarity and capitalist hostility that have framed our thinking about China's international experience under Mao. Instead, what emerges in the book is an adaptive mode of CCP engagement with capitalism that routinely transcended the Cold War ideological divide. This overlooked engagement is important not only because it gives us a fuller portrait of Chinese trade during the Mao era, but also because it provides a richer understanding of how communist China came of age on the international stage during its first formative decades.

> You argue that there are important legacies of the trade that started under Mao that inform China's current standing as one of the leading global economies. How would you categorize those legacies, and how can they help us understand modern day China?

> One of the most important legacies is simply experience. The CCP has been navigating the challenge of how to maintain political control at home while pursuing trade with capitalist markets

The decades of Mao-era trade experience do help to explain how the CCP has survived China's dramatic post-Mao transformation into a leading economy and a hub of global trade. Without decades of capitalist trade experience during the Mao years, it's doubtful the CCP would have had the wherewithal to oversee China's dramatic "opening up" after Mao died as well as it did.

abroad for decades longer than many people realize. Over the years, the CCP has become quite adept at opening up to foreign markets enough to spur economic growth but not so much that it jeopardized the CCP's political agenda or party control. This doesn't necessarily mean the CCP will be able to maintain this balance in the future, but the decades of Mao-era trade experience do help to explain how the CCP has survived China's dramatic post-Mao transformation into a leading economy and a hub of global trade. Without decades of capitalist trade experience during the Mao years, it's doubtful the CCP would have had the wherewithal to oversee China's dramatic "opening up" after Mao died as well as it did.

You emphasize that in China, "trade always served politics." Is this how they reconcile their capitalist tendencies with their communist ideology?

To an extent, yes. The process of ideological reconciliation actually unfolded over decades. Each political campaign during the Mao era compelled Chinese trade officials to justify and reaffirm their work in acceptable ideological terms. Over time, these justifications helped to embed capitalist trade as a fundamental and accepted component of socialist economic development in China, but this trade never became an end in its own right. The CCP encouraged it
The book is available from commercial booksellers.

only insofar as it furthered the party's goals of modernization and economic development, and it's in this sense that trade always served politics. The CCP has never relinquished its ultimate authority to decide how markets — foreign or domestic — will be permitted to shape political and economic life in China.

What is the biggest takeaway you hope readers get from this examination of trade policy in Mao's China?

I hope the book leaves readers with an appreciation for how the past helps us to understand China in the world today. So many of the challenges that Chinese trade officials confronted in the midtwentieth century remain relevant today, not least the enduring question of how to reconcile an illiberal political system at home with open markets abroad. The book offers readers — not just specialists, but anyone with an interest in China — to step into the shoes of Chinese trade officials and their counterparts. By doing so, readers can see how the hopes, fears, and uncertainties of the past resemble those of the present. Seeing these connections will, I hope, enable readers to place current debate into broader historical

Based on your research, what do you think is next for China?

If history is any guide, the most significant events in China's future may not even be visible yet. Nobody, not even Chinese Communist Party leaders, fully anticipated the events that most shaped Chinese history after 1949 — the Korean War, for example, or the protests in Tiananmen Square on June 4, 1989. This uncertainty can be unnerving, but it's also a reminder that the current trendlines are not set in stone. This is a point worth keeping in mind if for no other reason than to guard against the determinism that can seep into current debates over the rise of China and its implications for the United States and the rest of the world.

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Historical Collection Goes Digital, Inspires Future Conservation and Programming Efforts

IN THE FALL OF 1969, Admiral Richard G. Colbert (USN), President of the Naval War College, wrote a letter to the Chief of Naval Personnel, advocating for the establishment of a nonprofit organization that would "support ... the mission of the Naval War College." He elaborated to indicate that the functions of this organization might include the "acquisition of books of historical significance for the War College libraries; solicitation and acquisition of archival material; acquisition of artifacts, furniture, paintings, memorabilia, memoirs and other papers of distinguished naval leaders for the enhancement of historical resources, traditions, and mission of the Naval War College."

Over the last 52 years, the Naval War College Foundation (NWCF) has worked to realize that vision by collecting hundreds of historically significant artifacts, either through purchases or donations from generous benefactors, and with those artifacts comes all of the documentation about their provenance, which in and of itself has value to the organization. Collections Specialist Maria Vazquez has been working to review, catalog, and digitize that documentation in order to compile a complete inventory of the items in the NWCF's possession.

Vazquez is part organizer, part storyteller. "There are some pretty amazing items in these folders and it's great to connect the dots between them." In her short time on the project, Vazquez has already identified that the NWCF owns commissioning papers for father and son Admirals George and Reginald Belknap; George Belknap's paper is a copy signed by President Lincoln and Reginald's is the original signed by President Theodore Roosevelt. The Naval War College Collection has 13 boxes of correspondence and documents from the Belknaps' lives and naval careers, including personal letters between Admiral Reginald Belknap and his wife, Julia Averill Belknap, and his diary of the year he spent in China, Japan and the Philippines. Vazquez's work will allow the Naval War College Museum staff to easily identify items of significance in the

Collection — like the Belknap Commissioning Papers — which in turn helps their planning for future exhibits.

Vazquez will first catalog and digitize the Archive Collection and then do the same for the Museum Collection, the difference between the two being that the Archive Collection is all paper-based — photographs, diaries, blueprints and the like — and the Museum Collection is object-based — uniforms, model ships, paintings and weapons, for example. By properly identifying the ownership of the objects in the two Collections, the NWCF can then be assured of who has rights to make future decisions about the items.

Vazquez maintains a curator's outlook as she examines the documentation. One set of papers she uncovered included a letter written by Jonas Corey during the Civil War. Aboard the *USS Continental* in 1863, he wrote of seeing freed slaves on the islands near Key West and how that experience helped him realize the importance of the cause for which he fought. Vazquez notes that this type of letter might fit nicely into a larger exhibition about the Civil War or could be used in a discussion about current events. "Once you understand what you have, you can start planning for future programming."

Sifting through and organizing the documentation will take at least a year to complete, at which time Vazquez could turn her attention to conservation of the objects in the Collection. For instance, there is a missing piece of the thumb on one of the Marines in the model of Felix de Weldon's iconic Marine Corps War Memorial, and this should be repaired in order to maintain the integrity of the model. Vazquez's training enables her to identify these issues as she inventories, and she can recommend a course of action for the necessary conservation.

So why undertake this time-intensive initiative? Vazquez notes: "It's sometimes difficult for people to connect with history. When you can bring an exhibit to life for people and make it relevant for them, you can help them see the value of preserving and studying

"A cought of days ago ? sent you rolled sup in a mailing tale the firest photograph This war has given no up to date. It is the Wennessening the U.S. Hag on Tap of Sawbacki. When we sittle down, I want to have This picture framed. Some first chase scalptor should do this in bronge, it is so ferfect."

Above, left: Bronze model of Felix de Weldon's Marine Corps War Memorial statue, located in Spruance Hall at the U.S. Naval War College.

Above, right: Excerpt from letter of Admiral Spruance, USN, to his wife after seeing Joe Rosenthal's photograph of U.S. Marines raising the U.S. flag atop Mount Suribachi during the Battle of Iwo Jima.

history. History is more than memorizing dates and names of people
— it's about the understanding and appreciation you can achieve by
knowing the stories behind the objects."

Vazquez's work contributes to the larger effort by the Naval War College Museum to digitize their Collection. By making the Collection — the objects themselves and the associated documentation — available online, researchers, scholars and interested parties can access it from anywhere in the world. In the first quarter of 2021, the Naval War College Archives (www.

usnwcarchives.org) had over 4,000 users, 40% of whom were from the general, non-USNWC or DoD, public.

EXCERPT FROM LETTER OF ADMIRAL RAYMOND AMES SPRUANCE, USN.

TO HIS WIFE, MARGARET SPRUANCE, MARCH 13, 1945

This project is made possible through the generous support of a bequest from the Estate of CAPT David Judson Gray, USN (Ret.), a member of the NWCF's Heritage Society. His gift is a fine example of the power and impact of planned gifts, and his legacy will live on in the continued use of and expanded access to the invaluable historical collection at the U.S. Naval War College.

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