



NPS IN THE NEWS

Weekly Media Report –Aug. 18-24, 2020

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INTERNATIONAL:

1. [Ambassador: U.S. Fully Supports Azerbaijan’s Independence, Stability and Prosperity](#)

(*News.az 19 Aug 20*) ... News.az Staff

The United States has fully supported Azerbaijan’s independence, stability, and prosperity since its independence from the Soviet Union, U.S. Ambassador to Azerbaijan Earle Litzenger said.

Litzenger made the remarks at the **2020 Naval Postgraduate School Regional Energy Security Symposium**, the U.S. Embassy told News.Az.

EDUCATION:

2. [First American Woman to Walk in Space and Dive the Deepest Ocean to Lecture at NPS Ahead of Women’s Suffrage 100th Anniversary](#)

(*Navy.mil 19 Aug 20*)

(*NPS.edu 19 Aug 20*) ... NPS Office of University Communications

The Naval Postgraduate School (NPS) has taken its popular Secretary of the Navy Guest Lecture (SGL) series virtual, exposing university students, faculty and staff to prominent leaders across a broad spectrum of disciplines through live, interactive presentations online.

Ahead of Women’s Equality Day, this year honoring of the 100th anniversary of women gaining the constitutional right to vote, former NASA Astronaut and oceanographer Dr. Kathryn Sullivan presents “From Sea to Space and Back Again: Lessons from an Unconventional Leadership Journey” on Tuesday, August 25, live at 3:00 p.m. PDT.

RESEARCH:

3. [COVID-19: Maritime Tech Startups Provide First Response in Global Pandemic Efforts](#)

(*gCaptain 18 Aug 20*) ... gCaptain Staff

In recent months organizations like the Royal Navy, maritime heavyweights like IGP&I, the US Department of Transportation’s Volpe Center, among others, have been partnering with startups and groundbreaking new companies like the UK based Geollect and the MIT based startup blkSAIL to develop maritime COVID tracking dashboards, maps, and AI algorithms. This week the US Navy joins the fight with new programs for maritime innovation... “The new Tech Bridge locations bring in a deeper connection to the Fleet, rapid prototyping mechanisms and the access to talented naval students **at the Naval Postgraduate School**,” said Cmdr. Sam Gray, Tech Bridges director. “We have seen this network mobilize during the COVID-19 national crisis and are excited to watch them strengthen and serve our country during times of peace and otherwise, in the future.”

4. [Developing a Wargame to Better Understanding the Stand-In Force](#)

(*USNI 21 Aug 20*) ... USMC Maj. Danial Yurkovich, USMC Capt. Jonathan Boron, USA Lt. Col. Glenn Hodges

In the past decade, the capabilities of U.S. competitors in the Indo-Asia-Pacific have steadily weakened what once was absolute U.S. naval and air supremacy of the region. An array of coastal and off-shore bases combined



with a robust suite of short- to long-range ballistic missiles have been employed to counter some of the most valuable U.S. naval assets, specifically aircraft carriers and amphibious assault platforms. One of the countermeasures that the Marine Corps' has taken to address this growing threat is the development of the expeditionary advanced base operations (EABO) concept—a future naval operating model in which forward-postured forces provide credible capabilities to target and strike adversary naval and air resources. According to the concept, these forces will have to be persistent yet low signature, unable to rely on the large infrastructure and logistics tail that U.S. forces previously have enjoyed.

While the strategic and operational objectives of EABO are well developed, there still is a significant knowledge gap in how operations guided by the concept will be conducted at all levels of war. Moreover, guidance published by the Commandant of the Marine Corps has called for innovative thinking on future force design, with an emphasis on naval integration and resiliency while operating in an adversary's threat ring. Considering these factors, a group of students within the **Modeling Virtual Environments and Simulation (MOVES) Institute at the Naval Postgraduate School** have developed a turn-based, virtual wargame to aid the development and understanding of EABO at the tactical edge.

FACULTY:

5. [East Med Pipeline: Maybe Someday](#)

(Petroleum Economist 18 Aug 20) ... Victor Kotsev

Israel's ratification of an agreement struck earlier in the year to build the Eastern Mediterranean Gas (East Med) pipeline, designed to ship Israeli and Cypriot gas to Greece and on to Western Europe by the middle of the decade, coincided almost simultaneously with Chevron's \$5bn deal for Noble Energy, one of the region's leading operators. Unsurprisingly, both stoked renewed optimism around the project ... "The only potentially foreseeable event that could garner sufficient commercial attraction to the project, would be if supplies from Algeria to Europe were seriously disrupted and were no longer viewed as reliable," says **Brenda Shaffer of the Energy Academic Group at the US Naval Postgraduate School**. "Algeria is going through a period of instability, which has not received much media coverage. And security in North Africa is getting worse, with IS fighters moving to the region after being dislodged from Iraq and Syria."

6. [Prospects for Game-Changers in Submarine-Detection Technology](#)

(Australian Strategic Policy Institute 22 Aug 20) ... Sebastian Brixey-Williams

Anti-submarine warfare (ASW) has always been a game of hide and seek, with adversarial states looking to adopt and deploy emerging technologies in submarine stealth or detection to give them the strategic edge. The advantage has shifted back and forth, but, on the whole, it has proved easier to hide a submarine than find one: the oceans are wide, deep, dark, noisy, irregular and cluttered ... According to **James Clay Moltz at the US Naval Postgraduate School**, writing in 2012, some 'emerging autonomous-tracking technologies ... are likely to be widely available within the next 20 years ... [raising] the prospects for successful ASW against US forces'. If this proves correct, in spite of the United States' world-leading stealth technologies, it would imply that nuclear-capable states in the Indo-Pacific deploying relatively noisy SSBNs might have even weaker prospects of survival by the early 2030s. This would have important implications for India's first-generation Arihant-class SSBN and China's Type 094, for example.

7. [After Ship Fire in Port, Is the Navy Capable of Responding to China Policy?](#)

(Federal News Network 24 Aug 20) ... Tom Temin

If the United States is to make some sort of containment of China a foreign policy priority, the Navy would have a big part of the job. But is the Navy fully capable? The recent burning of an important ship while in port is the latest event to call into question the basic condition of the Navy. **James Russell is associate professor in the Department of National Security Affairs at the Naval Postgraduate School**. He talked about the implications on Federal Drive with Tom Temin.



ALUMNI:

8. [Virtual Rites: Rear Adm. Small Takes Command of San Diego's NAVWAR](#)

(Times of San Diego 21 Aug 20) ... Ken Stone

Rear Adm. Douglas Small, a Naval Postgraduate School alumnus, relieved Rear Adm. Christian Becker of his command of Naval Information Warfare Systems Command in a virtual change-of-command ceremony at command headquarters in San Diego.

9. [Eugene "Gene" Cernan: The Last Human Being to Walk on the Moon](#)

(Interesting Engineering 23 Aug 20) ... Christopher McFadden

Everyone knows about the first time that mankind placed a foot on the Moon, but what about the last time? That honor goes to the revered and sadly missed, Eugene Cernan, a Naval Postgraduate School alumnus.

UPCOMING NEWS & EVENTS:

August 25: [V-SGL with Dr. Kathryn Sullivan](#)



INTERNATIONAL:

Ambassador: U.S. Fully Supports Azerbaijan's Independence, Stability and Prosperity

(News.az 19 Aug 20) ... News.az Staff

The United States has fully supported Azerbaijan's independence, stability, and prosperity since its independence from the Soviet Union, U.S. Ambassador to Azerbaijan Earle Litzenberger said.

Litzenberger made the remarks at the 2020 Naval Postgraduate School Regional Energy Security Symposium, the U.S. Embassy told News.Az.

"Thank you for the invitation to speak to this year's Regional Energy Security Symposium. We are now in the third year of this valuable event. I was pleased to address this forum last year and reinforce our commitments to Azerbaijan's sovereignty, independence and contributions to European energy security," Litzenberger said.

He then once again thanked the Naval Postgraduate School, ADA University, SOCAR, and BP for their successful continued collaboration on these issues.

The diplomat noted that this has been a difficult year full of challenges unprecedented in their scope and scale.

"Nonetheless, the theme of this symposium, the intersection of energy and security, remains an important and relevant topic. During my tenure as Deputy Chief of Mission at the United States Mission to NATO and as Senior Official in our Bureau of Political-Military Affairs, I saw firsthand the value of the work done by NATO via the Energy Security Center of Excellence and by our military post-graduate educational institutions in bringing energy security issues to the fore," he said.

Litzenberger stressed that US' message has been clear and consistent: Azerbaijan's role in supporting and contributing to European and global energy security and stability represents a sustained positive commitment and contribution we deeply value.

"I want to emphasize a point: the United States has fully supported Azerbaijan's independence, stability, and prosperity since its independence from the Soviet Union. Throughout Azerbaijan's history our bilateral relationship has rested on three common pillars: security cooperation, economic and energy cooperation, and support for human rights and the rule of law."

"Security cooperation, as one of these three pillars, includes this week's event. The United States and Azerbaijan also have robust ongoing cooperative security initiatives underway throughout the country to strengthen border security, protect critical energy infrastructure on the Caspian Sea, enhance cyber security, and counter transnational terrorism, the diplomat said.

"In the last two years, the United States approved \$100 million for security assistance to Azerbaijan. Approximately half of that funding is being used on the Caspian Sea for surveillance equipment, small vessels, and training that will enhance security and the protection of maritime critical energy infrastructure."

"The keystone of our economic and energy cooperation has been strong U.S. support for Azerbaijan's efforts to secure export routes to world markets for its abundant energy resources, and thereby diversify Europe's energy supply. At the same time, the United States is cognizant of the fact that Azerbaijan is transitioning from mainly oil exports to a greater share of gas exports through the Southern Gas Corridor, supported by a more-diversified non-oil economy," he added.

<https://news.az/news/ambassador-us-fully-supports-azerbajjans-independence-stability-and-prosperity>

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EDUCATION:

First American Woman to Walk in Space and Dive the Deepest Ocean to Lecture at NPS Ahead of Women's Suffrage 100th Anniversary

(Navy.mil 19 Aug 20)

(NPS.edu 19 Aug 20) ... NPS Office of University Communications

The Naval Postgraduate School (NPS) has taken its popular Secretary of the Navy Guest Lecture (SGL) series virtual, exposing university students, faculty and staff to prominent leaders across a broad spectrum of disciplines through live, interactive presentations online.

Ahead of Women's Equality Day, this year honoring of the 100th anniversary of women gaining the constitutional right to vote, former NASA Astronaut and oceanographer Dr. Kathryn Sullivan presents "From Sea to Space and Back Again: Lessons from an Unconventional Leadership Journey" on Tuesday, August 25, live at 3:00 p.m. PDT.

Sullivan was one of the first six women to join the NASA astronaut corps in 1978 and holds the distinction of being the first American woman to walk in space. More recently, her submersible dive to the Challenger Deep in June of 2020 made her the first person to both orbit the planet and reach its deepest point.

Since leaving NASA, she held Presidential appointments on the National Science Board and as Chief Scientist and Administrator of the National Oceanic and Atmospheric Administration (NOAA). She currently serves on the boards of International Paper, Accenture Federal Services, the National Audubon Society and Terra Alpha Investments, and is a Senior Fellow at the Potomac Institute for Policy Studies.

"I'm an oceanographer who went into space, and an astronaut who went into the deep sea," said Sullivan. "They are two different missions in almost opposite environments, but exploring these two extremes had a common purpose, and that was to understand how our planet works. I was also a naval officer, and I know that NPS has strong curricula in space and oceanography, the latter you might expect, but a little known fact about NPS is that it provides more astronauts to NASA than any other graduate university. Space connects our world and our naval forces around the globe."

According to NPS President retired Vice Adm. Ann E. Rondeau, as an astronaut, an aquanaut, a naval officer and a leader, Sullivan is an extraordinary inspiration to the next generation.

"We are fortunate to have her to speak to the NPS community and beyond," said Rondeau. "Her life is a brilliant testimony to the American spirit of science and innovation, and also a fitting tribute to what is possible in the pursuit of knowledge that our great country enables. Her talk is especially appropriate as we also honor the 100th anniversary of American women's constitutional right to vote."

SGL presentations are delivered in a "TED Talk" format for accessibility to a broader audience. The talk can be viewed live online via the [NPS streaming channel](https://www.navy.mil/Press-Office/News-Stories/display-news/Article/2318762/first-american-woman-to-walk-in-space-and-dive-the-deepest-ocean-to-lecture-at/) on Tuesday, August 25 at 3 p.m. PDT.

<https://www.navy.mil/Press-Office/News-Stories/display-news/Article/2318762/first-american-woman-to-walk-in-space-and-dive-the-deepest-ocean-to-lecture-at/>

<https://nps.edu/-/first-american-woman-to-walk-in-space-and-dive-the-deepest-ocean-to-lecture-at-nps-ahead-of-women-s-suffrage-100th-anniversary>

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RESEARCH:

COVID-19: Maritime Tech Startups Provide First Response in Global Pandemic Efforts

(gCaptain 18 Aug 20) ... gCaptain Staff

In recent months organizations like the Royal Navy, maritime heavyweights like IGP&I, the US Department of Transportation's Volpe Center, among others, have been partnering with startups and groundbreaking new companies like the UK based Geollect and the MIT based startup blkSAIL to



develop maritime COVID tracking dashboards, maps, and AI algorithms. This week the US Navy joins the fight with new programs for maritime innovation.

“In an effort to Bolstering the national response to COVID-19.” says the official Navy press release. “The US Navy is expanding relationships with non-traditional industry partners to tackle naval needs.” This effort includes spurring innovative research in ship autonomy and improving the maintenance and sustainment of naval assets.

Since its establishment last year, the Department of the Navy’s Tech Bridges initiative has harnessed collaboration and creativity to address naval concerns and capabilities. It’s been so successful that the Naval Agility Office (NavalX) recently announced the creation of six new Tech Bridge locations—doubling the number to 12.

“I’m proud how much NavalX has accomplished in their first year in support of the Navy,” said James Geurts, assistant secretary of the Navy for Research, Development, and Acquisition, who also oversees NavalX. “They have accelerated the rapid adoption of proven, agility-enhancing methods. They did this collaboratively, with great support and partnership from the DoN’s research, development and acquisition teams, industry, and state and local governments.

“The doubling of Tech Bridge locations exponentially scales this network, enabling us to get new capabilities and solutions into the hands of our Sailors and Marines,” Geurts continued.

A partnership between the Office of Naval Research (ONR), and NavalX, Tech Bridges are regional innovation hubs where warfare centers, government, academia, and industry can team up and work together on technology research, evaluation, and commercialization—as well as economic and workforce development.

The hubs connect and sustain “acceleration ecosystems” in off-base locations across the DoN, fostering greater collaboration. This is done by partnering with colleges and universities, research institutions, start-ups, corporations, small businesses and non-profits, among others.

Each Tech Bridge is supported by NavalX and operates on a “franchise” model that facilitates projects in its respective region—efforts designed to solve pressing problems and technology needs identified by the fleet and DoN workforce.

Notable successes in the past year include funding \$45 million in projects to solve naval problems; awarding more than \$2 million in prize challenges to non-traditional industry partners; sponsoring \$37.5 million in small business innovation research targeting maintenance and sustainment; and helping to distribute over \$800,000 to COVID-19 response efforts.

“The new Tech Bridge locations bring in a deeper connection to the Fleet, rapid prototyping mechanisms and the access to talented naval students at the Naval Postgraduate School,” said Cmdr. Sam Gray, Tech Bridges director. “We have seen this network mobilize during the COVID-19 national crisis and are excited to watch them strengthen and serve our country during times of peace and otherwise, in the future.”

Besides the US Navy, commercial maritime technology hubs like Sea Ahead, founded by former GE venture capitalist Mark Huang, in Boston and theDOCK, former Naval Officers, in Isreal are also providing services for startups. According to one Sea Ahead adviser, it has been joint efforts between small startups, like the partnership between geollect and the sea ahead member company blkSAIL, that have been most effective in providing technology solutions in the wake of COVID19.

“With products like SHOREWATCH, blkSAILS’s AI system to identify ships based on the risk factors identified by port state, port operator, and customs to track and screen ships.” says blkSAIL founder and former MIT research scientist Dr. Mohamed Saad Ibn Seddik. “We can correlate COVID19 infection data with ship movement data to gain valuable insight for port states. With partnerships with companies like geollect we can use AI to power new dashboards, charts, and geospatial data.”

Mariners and maritime industry leaders with innovative ideas for managing ships in a post-COVID19 world are encouraged to apply for Blue Economy startups programs by Sea Ahead, NAVAL X, theDOCK, MassChallenge, or find a maritime accelerator near you.

<https://gcaptain.com/covid-19-maritime-response-startups/>



Developing a Wargame to Better Understanding the Stand-In Force

(USNI 21 Aug 20) ... USMC Maj. Danial Yurkovich, USMC Capt. Jonathan Boron, USA Lt. Col. Glenn Hodges

The Situation

In the past decade, the capabilities of U.S. competitors in the Indo-Asia-Pacific have steadily weakened what once was absolute U.S. naval and air supremacy of the region. An array of coastal and off-shore bases combined with a robust suite of short- to long-range ballistic missiles have been employed to counter some of the most valuable U.S. naval assets, specifically aircraft carriers and amphibious assault platforms. One of the countermeasures that the Marine Corps' has taken to address this growing threat is the development of the expeditionary advanced base operations (EABO) concept—a future naval operating model in which forward-postured forces provide credible capabilities to target and strike adversary naval and air resources. According to the concept, these forces will have to be persistent yet low signature, unable to rely on the large infrastructure and logistics tail that U.S. forces previously have enjoyed.

While the strategic and operational objectives of EABO are well developed, there still is a significant knowledge gap in how operations guided by the concept will be conducted at all levels of war. Moreover, guidance published by the Commandant of the Marine Corps has called for innovative thinking on future force design, with an emphasis on naval integration and resiliency while operating in an adversary's threat ring. Considering these factors, a group of students within the Modeling Virtual Environments and Simulation (MOVES) Institute at the Naval Postgraduate School have developed a turn-based, virtual wargame to aid the development and understanding of EABO at the tactical edge.

The mission of Naval Post Graduate School is to provide defense-related graduate education to enhance the combat effectiveness, technical acumen, and warfighting advantage of the naval services. It supports research on a diverse set of defense-related topics, from mechanical engineering to foreign policy to cyber operations. Among this spectrum of research falls the MOVES Institute. Nested within the computer science department, MOVES is a blend of operations research and computer science. It provides a strong focus on analysis while employing simulation and software development expertise. Consequently, the MOVES curriculum for graduate and doctoral students encompasses an assortment of highly relevant technical courses, including artificial intelligence, networking, combat modeling, and virtual training systems. Furthermore, MOVES students in their final year are introduced to modeling conflict, a class in which students select a relevant problem, decompose it, identify the relevant variables to model, and develop rules for variable interactions and an overall structure for the model. In line with the Commandant's guidance and incorporating knowledge from nonresident Expeditionary Warfare School and Command and Staff College, the MOVES class of 2020 chose to focus its efforts in this class on EABO and the tactical maneuver of stand-in forces in the contact layer.

Solution

The result of these efforts is an unclassified, distribution unlimited prototype wargame, "Crisis in the South Pacific," which allows a notional Special Purpose Marine Air-Ground Task Force (SPMAGTF) commander to design a tailored force and operate in a resource-constrained environment. In contrast to traditional force-on-force wargames, the player's focus is to improve U.S. perceptions in the host nation while shaping the environment to support a future mission tasking. In this regard, the player has no direct ability to attrite enemy forces and must carefully plan each move, as every action increases the overall force signature and the likelihood that the enemy will target and successfully strike highly-visibility units. This latter feature is particularly unique, as most modern combat simulations and wargames do not explicitly force the player to consider their signature emissions or electromagnetic profile. In addition, opposing forces have both kinetic and non-kinetic offensive capabilities, able to physically destroy player assets through missile strikes or temporarily suppress them with cyber fires. Ultimately, the aim of this wargame is to increase understanding of stand-in forces operating in the contact layer and assist in

identifying optimum force structure and behavior when working against a technologically sophisticated opponent. In closing, the wargame aids in the creation of “new ideas and understandings to feed into the cycle of research”; it allows players of all backgrounds and skill levels to aid in “designing a force for naval expeditionary warfare in actively contested spaces” at the contact layer.

As with any wargame or combat simulation, there are strengths and weaknesses. Some of the self-identified strengths include:

1. As an unclassified wargame, it places myriad players into the decision-making process at the tactical level of the Marine Corps’ future concepts.
2. Encourages critical thinking across multiple warfighting domains, particularly cyber and signature control.
3. Multiple elements—perception, signature, emissions—are abstracted to allow for discussions on validity, gear, and follow-on concepts. These abstractions allow for an immediate appreciation of the factors, while not requiring a subject matter expert for a full explanation the capabilities, conditions, and interactions.
4. Easy to use compared to historic board games and other major simulations like MAGTF Tactical Warfare Simulation, commonly known as MTWS, and COMBAT XXI.

Identified weaknesses include:

1. The wargame is developed for concept development, idea generation, and discussions. None of the data produced should be used for analysis due to the large number of abstractions.
2. Enemy actions are computer controlled. Thus, opposing strategies do not adapt or evolve as one would expect with a human opponent.
3. The impact of interactions between player forces and the local population are stochastically determined. A better study of local population and RAND reports can yield a better model for the human dimension within the game.
4. Supply is abstracted to a singular object and is not differentiated between the different classes.

Conclusion

In light of the pros and cons outlined above, the hope is that this wargame spurs meaningful dialogue on several topics of interest. Not least among these is whether the current, or projected, Marine Corps’ inventory and force structure is capable of accomplishing the overarching objectives of the stand-in force concept at the tactical and operational levels. The follow-on question, should it be determined that current capabilities are insufficient, is how to develop, train, and educate the future force to correct shortfalls and meet mission requirements. In addition to examining force structure, the impact of technology maturation is a serious consideration. Autonomous vehicles and small surface connectors will certainly affect signature profiles and the way in which we sustain forward postured forces, but how to effectively implement and balance these platforms has not been sufficiently explored. Moreover, the impetus for close naval integration will influence the supporting-supported relationship of the Navy-Marine Corps team. The effect this has at the tactical level and how small units will operate and coordinate with Navy counterparts is another point for debate.

In summary, the aim of this project and publication is three-fold. First, the wargame is a tool for all users to create discussion in an unclassified space, which can aid the Marine Corps in its development of the stand-in force. Secondly, it can demonstrate how simple wargames “are the front-end, door-kicking tool of new ideas, dangers, and concepts.” Finally, this product shows how the staff non-commissioned officers and commissioned officers at the Naval Postgraduate School continue to support the warfighter and national security through defense-oriented research.

<https://blog.usni.org/posts/2020/05/20/fight-the-fads-and-think>

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FACULTY:

East Med Pipeline: Maybe Someday

(Petroleum Economist 18 Aug 20) ... Victor Kotsev

Israel's ratification of an agreement struck earlier in the year to build the Eastern Mediterranean Gas (East Med) pipeline, designed to ship Israeli and Cypriot gas to Greece and on to Western Europe by the middle of the decade, coincided almost simultaneously with Chevron's \$5bn deal for Noble Energy, one of the region's leading operators. Unsurprisingly, both stoked renewed optimism around the project.

But many experts caution against premature enthusiasm for the 10bn m³/yr link—1,300km of the total 1,900km of which would be offshore, making it among the longest undersea gas links in the world, and that does not include a further more than 200km subsea connection from Greece to Italy. Beyond Byzantine geopolitics and the Covid-19 pandemic that has temporarily decimated gas demand, economics weigh heavily down on it.

"I do not think it will happen soon," says Panos Papanastasiou, an engineering professor at the University of Cyprus. "This is not a very mature project."

The politics are convoluted but may prove soluble. Turkey has a long-running dispute with Greece and Cyprus, while its relationship with Israel has been on the rocks for about a decade now over the Palestinian issue. East Med would have to run through waters claimed by Turkey as its exclusive economic zone.

But those politics have been in flux recently. Israel has made its peace with major Arab political mover the UAE. In turn, Turkey has been making diplomatic gestures toward improving relations with Israel, such as the resumption of Israeli flag carrier El Al cargo flights to Istanbul in May.

On the other hand, Ankara is actively pursuing an ambition to become a regional gas hub. Turkey's state media, which rarely deviates significantly from government-approved positions, cheerleads for the country to provide an alternative to East Med.

"The cheapest way to route the pipeline is to Cyprus, then to Turkey, and then cross the Sea of Marmara into Europe," says Ariel Cohen, a senior fellow at the Atlantic Council thinktank in Washington, DC. "If that's not possible, it will go to Crete, and from Crete to Greece and then to Europe."

Rare Consensus

Turkey's adventurism in East Med waters and in Libya has galvanised influential actors opposed to the Erdogan regime's posturing—including France, Greece, Cyprus, Egypt and the UAE—to rally (with Italy notable for much lesser enthusiasm) behind the project. If demand and price can be made to work with the East Med's proven and probable reserves, now could be the project's time.

The challenge, at least in the short term, is in both too much alternative global supply and lacklustre post-Covid European demand. Competition is stiff from other existing and potential gas suppliers to Europe, ranging from Norway to Russia to Algeria to Azerbaijan to Libya—and, in the case of LNG imports, exporters more globally.

"The only potentially foreseeable event that could garner sufficient commercial attraction to the project, would be if supplies from Algeria to Europe were seriously disrupted and were no longer viewed as reliable," says Brenda Shaffer of the Energy Academic Group at the US Naval Postgraduate School. "Algeria is going through a period of instability, which has not received much media coverage. And security in North Africa is getting worse, with IS fighters moving to the region after being dislodged from Iraq and Syria."

Italy, which failed to sign on to the €6bn (\$7.1bn) East Med agreement in January, imports significant volumes from Algeria through the c.18bn m³/yr Transmed pipeline. It also has the 8bn m³/yr Green Stream link to Libya, although fighting there has curtailed flows in recent years.

But the country is not short of supply options. Another 10bn m³/yr connection, the Trans-Adriatic Pipeline (Tap), is expected to start pumping gas from Azerbaijan through Turkey to Greece, Albania and Italy by the end of the year.



Domestic opposition to fossil fuel imports and an abundance of import options that also include three LNG regas terminals further motivates Rome’s reluctance to join the project, adds Shaffer. “Without an anchor market like Italy, it is hard to see the commercial viability for the East Med pipeline,” she says.

European Challenge

A combination of sluggish demand projections—due to the impact of Covid-19 and more lukewarm attitude to gas as a solution in the low-carbon future—and abundance of other supply options is not an obstacle to the East Med dream in Italy alone. It is Europe-wide.

Most new offshore work in the Eastern Mediterranean is on hold for at least a year, experts say, due to anaemic post-Covid European and global gas prices. But challenging gas price trends predated the pandemic and will likely outlast its immediate impact.

Structurally, Europe’s domestic gas production is gradually declining, mostly due to falling output in the UK North Sea and the Netherlands’ decision to shutter its giant Groningen field. EU (including UK) supply was down by 9pc year-on year in 2019, to 109bn m³.

But demand growth will be slow at best. Most coal-to-gas switching in major electricity markets is already done, while industrial demand for gas will never recover from the continent’s de-industrialisation. While an increase in electrification could see requirements rise substantially, renewables will likely grab an ever-growing slice of existing and new power demand.

Other trends, such as environmental lobbying against gas for space heating and growth in green hydrogen, will also impact negatively on the continent’s appetite. “[European] demand is expected to increase only marginally or flat-line in the 2020s,” thinktank the Oxford Institute for Energy Studies (OIES) concluded in a mid-2019 report. Its projections back then, even prior to the impact of Covid-19, were that demand would not recover to 2010 levels until 2025.

Supply Battle

But Europe still remains attractive to global gas producers, “the sinking ground for gas” in the OIES’ words. Any supply-demand issues arising from its domestic production decline will have plenty of would-be fillers.

Russia, which already supplies around 40pc of Europe’s gas, would be one candidate. As its Arctic LNG projects have spectacularly proven, its access to more low-cost reserves is far from exhausted.

The 27.5bn m³/yr Nord Stream 2 pipeline expansion to Germany could, admittedly, face long delays or even, if less likely, abandonment due to US political pressure. But its ability to significantly increase supply to northwest Europe, the continent’s demand hub and area most affected by production decline, remains through its existing transit links—should it choose, and have available supply, to use them fully.

And Russia’s ability to supply southern Europe, East Med’s initial stamping ground, expanded by 15.75bn m³/yr in January with the startup of the 31.5bn m³/yr Turkstream pipeline to Turkey and Bulgaria. Project extensions to expand deliverability further into Serbia and Hungary are underway.

Diversification Appeal

But Russia does not necessarily see its ambitions as competing with other would-be European suppliers in a zero-sum game. East Med is “an interesting and important regional project”, says Stanislav Ivanov, an expert at the Russian Academy of Sciences’ Institute of World Economy and International Relations.

And Europe’s desire for optionality could be a trump card for the project, particularly given that domestic gas production is expected to decline another 25pc over the next decade, according to IEA data.

The EU is offering significant financial backing not just to new import initiatives, such as East Med, that it defines as projects of common interest, but also supporting investment in being able to move gas around the European network more easily. So, in the future, it will matter considerably less if Europe’s supply deficit is in its northwest, but East Med offers a new southeast supply option.

“The reserves offshore Cyprus, Israel, Egypt et al are quite considerable and the Europeans having it relatively close, closer than Russian gas, would be amiss if they do not develop it,” says Cohen. “If the



Europeans decide not to do it, most of that East Med gas will become LNG and will be sold to the global market, especially to East Asia.”

The EU has already invested €35mn in Feed studies, as has the joint venture between Greece’s Depa and Italy’s Edison that is promoting it. Building contractors are also reportedly being sought, in line with a 2022 FID aim. That timescale is probably too ambitious; the pipeline itself may be less so.

<https://www.petroleum-economist.com/articles/midstream-downstream/pipelines/2020/east-med-pipeline-maybe-someday>

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Prospects for Game-Changers in Submarine-Detection Technology

(Australian Strategic Policy Institute 22 Aug 20) ... Sebastian Brixey-Williams

Anti-submarine warfare (ASW) has always been a game of hide and seek, with adversarial states looking to adopt and deploy emerging technologies in submarine stealth or detection to give them the strategic edge. The advantage has shifted back and forth, but, on the whole, it has proved easier to hide a submarine than find one: the oceans are wide, deep, dark, noisy, irregular and cluttered.

Technological change can alter the balance of military power, however, and parallel technological trends facilitated by the ‘digital revolution’ may gradually make submarine detection more reliable. Certain scientific or technical breakthroughs and investments may even prove to be game-changers for submarine detection—defined here as a combination of technologies that significantly reduce or even eliminate a state’s confidence that its submarines can elude tracking and remain undetected most of the time.

History cautions that there can be no jumping to conclusions, however. Truly game-changing ASW technologies have been awaited for decades and are by nature difficult to predict. This was clearly expressed in Western deterrence and arms-control literature in the 1970s and 1980s, which reflected fits of ‘transparent oceans anxiety’: a persistent and partially unfalsifiable disquiet that a technological innovation could make the oceans transparent and undermine strategic stability by making US nuclear-powered ballistic missile submarines (SSBNs) sitting ducks in a bolt-from-the-blue first-strike attack. Technologies available towards the end of the Cold War were insufficient to give seekers the advantage that some analysts predicted and, as Owen Cote notes, also contributed directly to the development of effective countermeasures that ensured the survivability of US SSBNs. After the Cold War, the notion that submarines (above all, SSBNs) were ‘invisible’ became politically unassailable.

Several articles and studies in recent years have revisited the survivability of SSBNs, for which game-changers would perhaps have the greatest consequences for international security. As Norman Friedman notes, ‘strategic submarines seem to be key to strategic stability’, providing what is generally believed to be the most survivable nuclear second-strike force. Friedman marshals some of the limited evidence available in the public sphere, but is deliberately cautious about making bold and certain predictions.

The technologies outlined here relate primarily to emerging ASW capabilities developed by the US, which has higher levels of transparency about its SSBN capabilities and nuclear strategy than other countries, but it may be assumed that similar technologies will proliferate to other navies.

Sensor platforms

ASW traditionally relies on a limited number of costly manned platforms such as attack submarines (SSNs and SSKs), frigates and maritime patrol aircraft fitted with a variety of sensors. Today, there’s evidence of a move away from this model towards unmanned aerial vehicles (UAVs), unmanned surface vehicles (USVs), and unmanned underwater vehicles (UUVs) fitted with equivalent sensors, which are more expendable and are becoming cheaper to develop, produce, modify and deploy at scale. Navies are indicating that this is the direction of travel; as Robert Brizzolara, a US Office of Naval Research program



officer, states: ‘The U.S. military has talked about the strategic importance of replacing “king” and “queen” pieces on the maritime chessboard with lots of “pawns”.’

A prime example is the US Navy’s medium displacement USV, or MDUSV. The prototype launched in April 2016, Sea Hunter, was reported to have demonstrated autonomous SSK detection and tracking from the ocean surface from 3.2 kilometres away, requiring only sparse remote supervisory control for patrols of three months, using a combination of ‘advanced hydro-acoustics, pattern recognition and algorithms’. Since the range and resolution of acoustic sensors are highly variable according to oceanic conditions (such as depth, temperature and salinity), the range may well go further in favourable conditions; a Chinese estimate puts it at 18 kilometres. Since SSKs using air-independent propulsion or running on batteries are virtually silent, MDUSVs should theoretically be capable of pursuing SSNs and SSBNs (whose nuclear reactors continuously emit noise) at greater distances, and there are reports that they will be armed.

Whereas the new US FFG(X) frigate costs a sizeable US\$1 billion per ship, MDUSV platforms are reported to cost only US\$20 million each and so could conceivably be produced at scale to autonomously or semi-autonomously seek and trail submarines. Former US deputy defense secretary Robert Work has suggested as much: ‘These will be everywhere.’

Signal processing

ASW relies on separating tiny submarine signals from background ocean noise, primarily by using active and passive acoustic sensing (sonar) and magnetic anomaly detection (MAD), and it looks likely that these will remain the most important signals in the near future. However, the range of signals may grow as sensor resolution, processing power and machine autonomy reach the necessary thresholds to reliably separate other, ‘quieter’ kinds of signal. As Bryan Clark notes, ‘While the physics behind most [non-acoustic detection] techniques has been known for decades, they have not been exploitable until very recently because computer processors were too slow to run the detailed models needed to see small changes in the environment caused by a quiet submarine.’ However, he adds there’s now ‘the capability to run sophisticated oceanographic models in real time’.

No breakthroughs have been publicly disclosed, though an independent investigation by British Pugwash in 2016 identified light detection and ranging, or LIDAR, using blue–green lasers; anti-neutrino detection; and satellite wake detection as signal types that may merit further examination. Higher processing power can also enable digital sensor fusion, whereby different kinds of signal are synthesized and analyzed together, and better simulations of the baseline ocean environment, which would show up anomalies in greater contrast.

Persistent observation

Tracking submarines across large areas of ocean remains a key challenge for ASW. Manned platforms have limited ranges, and while the US Navy’s passive sonar system, SOSUS, is still in operation in parts, it is geographically bounded and requires substantial modernization to detect today’s quiet submarines. This gap has been partially filled by modern acoustic sensor arrays like the fixed reliable acoustic path, but in relative terms these cover very small areas of ocean.

Distributed remote sensing networks, however, which link interoperable manned and unmanned sensor platforms together as nodes in a larger system of systems, could be used to scale up persistent observation across wider areas. Networks in development include the US Defense Advanced Research Projects Agency (DARPA) distributed agile submarine hunting program, which is developing ‘a scalable number of collaborative sensor platforms to detect and track submarines over large areas’, and PLUSNet (persistent littoral undersea surveillance network), which aims to create ‘a semi-autonomous controlled network of fixed bottom and mobile sensors, potentially mounted on intelligent [unmanned platforms]’ in littoral zones.

Networks of this type could be greater than the sum of their parts, with nodes able to carry heterogeneous sensors, cross-reference positive signals from multiple directions and domains, and move and respond to get a better look at signals using real-time swarming. A video of a 56-strong ‘shark

swarm’ of Chinese USVs conducting complex manoeuvres on the sea surface has demonstrated that USV swarming is already possible, and the size of swarms can be expected to grow considerably just as it has for UAVs. It’s easy to imagine fleets of MDUSVs being used in the same way, potentially much further apart. Some technical challenges remain, including scaling up to blue water and improving underwater communication, autonomous decision-making, self-location and battery life, but none appear insurmountable and some of the physical limitations felt by a single vehicle can be mitigated by swarming.

Sensor resolution

While it seems likely that the proliferation of distributed remote sensing networks could decrease the importance of extending sensor range and resolution as the quantity of platforms goes up, the two principal ASW sensor types (sonar and MAD) have, or are hoped to enjoy, significant improvements in resolution on their Cold War antecedents.

Acoustic sensing in peacetime relies mostly on passive sonar, as active sonar ‘pings’ of adversary submarines risk a hostile response and disrupt ocean fauna. Recent techniques under development at the Massachusetts Institute of Technology’s Laboratory for Undersea Remote Sensing, which use particular features of the ocean as acoustic waveguides for efficient long-range propagation, offer the potential for significantly greater ranges to detect and classify submarines under certain conditions. The POAWRS (passive ocean acoustic waveguide remote sensing) system was able to ‘detect, localise and classify vocalising [marine mammals] from multiple species instantaneously’ over a region of approximately 100,000 square kilometres, and detect quiet diesel-electric surface vessels ‘over areas spanning roughly 200 kilometres in diameter’ (30,000 square kilometres). The active variant (OAWRS) can localise manmade objects as short as 10 metres over areas 100 kilometres in diameter (8,000 square kilometres), provided the resonant frequencies scattered by the object are known. Crucially, by using many frequencies transmitted at once—multi-frequency measurements—the system can distinguish fish or seafloor clutter from manmade targets. POAWRS can also be mounted on unmanned vehicles and used to detect larger manmade objects like submarines, even if their signal is partially mitigated by acoustic cloaking.

Today’s MAD magnetometers can detect a submarine’s ferromagnetic hull at a maximum range of several hundred metres. The use of more sensitive magnetometers with a range around an order of magnitude higher, known as superconducting quantum interference devices, or SQUIDS, has been limited by their oversensitivity to background noise and their need for super-cooling.

However, in June 2017, an announcement by the Chinese Academy of Sciences, which was later taken down, claimed that a Chinese team had produced a ‘superconductive magnetic anomaly detection array’, which technical experts indicated could have ASW applications and could contribute to a wider strategy to create a ‘Great Underwater Wall’ to monitor underwater traffic in and out of the South China Sea. One expert in magnets estimated that such an array could have a range of 6 kilometres or further. If this technology can be proved to work and be mounted on unmanned platforms, it could have significant implications for shorter-range submarine detection, though these reports remain unverified in the public domain.

Data transmission speed

Most data can be transmitted in ‘nearly real time’ through air. Undersea communications are more challenging, as radio waves are heavily absorbed by water. While acoustic signals can be used, this has remained an expensive technique involving significant processing power. As a workaround, DARPA’s POSYDON (positioning system for deep ocean navigation) program looks to relay data between UUVs via low-frequency acoustic messages to USVs, and from them by radio to satellites, which can make use of radio waves.

Meanwhile, a team at Newcastle University in the UK has developed ultra-low-cost acoustic ‘nanomodems’, which can send data via sound up to 2 kilometres for use in short-range underwater



networks. Improving the ‘intelligence’ of each node in the network so it can discriminate useful data and minimize data packets would also increase the speed of transmission.

Hurdles still remain, but it seems that low-cost workarounds can be found.

Conclusion

The introduction of autonomous, unmanned platforms mounted with improving and digitally fused sensors, integrated within cooperative systems, will enable wider surveillance of the ocean. One effect may be to elevate the reliability of submarine detection and, in some circumstances, these technologies could prove to be game-changers that tip the balance in the favour of ASW. Nevertheless, because the history of science and technology is littered with unforeseen obstacles and elusive breakthroughs, and because many of these technologies are currently classified, it’s difficult to offer any kind of firm timeline for game-changers in ASW.

According to James Clay Moltz at the US Naval Postgraduate School, writing in 2012, some ‘emerging autonomous-tracking technologies ... are likely to be widely available within the next 20 years ... [raising] the prospects for successful ASW against US forces’. If this proves correct, in spite of the United States’ world-leading stealth technologies, it would imply that nuclear-capable states in the Indo-Pacific deploying relatively noisy SSBNs might have even weaker prospects of survival by the early 2030s. This would have important implications for India’s first-generation Arihandt-class SSBN and China’s Type 094, for example.

As the technological picture becomes clearer, future work will need to continually evaluate the relative gains and losses in detection and survivability that these technologies could provide to each state and offer tangible responses to reduce strategic nuclear risks both in the region and globally.

<https://www.aspistrategist.org.au/prospects-for-game-changers-in-submarine-detection-technology/>

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After Ship Fire in Port, Is the Navy Capable of Responding to China Policy?

(Federal News Network 24 Aug 20) ... Tom Temin

If the United States is to make some sort of containment of China a foreign policy priority, the Navy would have a big part of the job. But is the Navy fully capable? The recent burning of an important ship while in port is the latest event to call into question the basic condition of the Navy. **James Russell is associate professor in the Department of National Security Affairs at the Naval Postgraduate School.** He talked about the implications on Federal Drive with Tom Temin.

Interview Transcript:

Tom Temin: This Bonhomme Richard fire was really a disturbing thing to watch in and of itself, but it did come at the end of a string of issues with the Navy. Review them for us and what your takeaway is from what’s been happening over the last several years.

James Russell: Yes, well, thanks. And I’d like to state at the outset for your listeners that I work at the Naval Postgraduate School as a professor, but I’m here providing to you my personal opinions, not representing the views of NPS or the Department of the Navy.

Tom Temin: Got it.

James Russell: But the point of the Bonhomme Richard fire, it’s like all of us, I suppose, we look for sort of implications of these events. And the fact of the matter is that for the Navy, if one goes back six months, two years, four years, five years, you see a string of incidents that are really quite troubling. So the Bonhomme Richard fire, for example, comes on the heels of a very sort of troubling five or six months stretch just in the early part of 2020, which feature the firing, for example of Captain Crozier, which featured the firing of the Navy Secretary, which featured the removal of his successor who was acting in the Navy Secretary capacity at the time, and which also, of course, in the context of questions being raised in Congress, very serious questions being raised in Congress, over the ability of the Navy to



deliver on its plans to increase the size of the fleet to this targeted number of 355 ships within sort of budgetary constraints. In this sort of communication back and forth between Congress and the Pentagon, the Senate in particular has made clear that it has no confidence in the Navy's ability to be able to deliver a plan it has laid out in its 30 year shipbuilding plan. And this shipbuilding plan, of course, has been held up by the Secretary of Defense Mark Esper, and his nominee to take over the civilian side of the Pentagon, sort of program analysis function, was on the hill a couple of weeks ago, and called the Navy's own plan, quote unquote, "not a credible document." In which, as he said, this plan does not sort of accord with sort of fiscal realities that the country is facing, fiscal realities I might add, that are only getting worse as we are struggling to sort of get on the other side of the pandemic and we're looking at having to sort of basically we're in the business now of printing money, stop people from going hungry, which which is only going to increase the pressure on the services budget. And of course, the Navy's response to the criticisms of this basic phenomenon of its ability to deliver ships as advertised, on schedule, and on budget — the Navy's response has basically been give us more money,

Tom Temin: Right. And they've had some expensive deals here with the Littoral Combat ship, the carrier program. But if you look at even the longer picture, the welds are very barely cooled off from repairs of ships that crashed a few years ago in the western Pacific. So that was a failure of training and of the seamanship basic of the people standing there on the bridge operating the ship — so it sounds like they have issues from the very top leadership on down to the people that are operating at night in a control room.

James Russell: To the Navy's credit, I would say that after the incidents in the Pacific Fleet, they commissioned a group of experts to go and look at what had happened. And some of them were Naval Postgraduate School people served on the review of what had gone on. And I would urge all of your listeners who are interested in and concerned about the Navy to read the readiness report, which details a litany of problems in the fleet. But a very troubling characteristic of those problems was that not necessarily, although they are troubling, but the fact that the problems existed, it's that the lower levels of the fleet had reported these problems of persistent, lack of competencies up the chain of command for the Navy leadership. The Navy leadership did not respond to the repeated sort of warnings that were coming up to it from the bottom of the sort of pyramid. The Navy since this has come out in 2017, I think they're taking aggressive steps to try and fix this, which means basically, that they are going to have to say no to some of the mission requests that are being handed down to them by the combatant commands. So this again is a difficult issue. And I think the Navy is moving out on it. But again, we have this this pattern of problems of the leadership, which ignores the warnings from below, refuses to take action until there is these incidents. And you have to understand that when there's something like a crash, just like an airplane crash or anything, there's always this sort of pyramid below the incident that has piled up iteratively over time to have produced this problem, this crash in the case.

Tom Temin: I guess you'd call those systemic problems — and systemic problems, never have simple fixes. But it seems like some of the problems of the Navy are also rooted in the political leadership and in the way that the foreign policy has been non conducted, you might say, over the last several years over the past maybe 10, 12 years even.

James Russell: Yeah, so this gets to a broader issue, I think of so we have, which is tied to circumstance — so the circumstance of the United States over the last 20 years is that we have been engaged in land wars all across South Asia. The Army has been deployed to Iraq and Afghanistan. And frankly, the Navy has been in a kind of supporting role. They have, of course, actively supported the deployments of the land forces. But now the country seems to be in a place where the political leadership of the countries in a place where we are, I think this is the right thing. Bringing the forces home. Which highlights of course, the Defense Department's new strategic priority of trying to counter the rise of Russia and China. So this puts the Navy at the front center in the national security strategy, a place that it has not had over the last 20 years. So the confrontation with China, we have to be honest about this in the South China Sea and across the Indo-Pacific is a maritime challenge. There isn't any other way of describing it. So the Navy is being asked to shoulder an increasing sort of burden for taking on missions associated with this sort of strategic priority. So this is all happening, of course, in the context of a Naval



buildup by China, in which of course, they are moving out aggressively across and developing a range of new weapons systems, which defense analysts would characterize as precision strike complexes, in which the idea is that you hold sort of targets or ships at risk with the range of munitions not just based at sea, but also based on land. And we see examples of this, for example, in Iran and North Korea, again, countries that have developed significant sort of different kinds of weapons systems that frankly call into question the ability of navies, including the American Navy, to operate in these quote unquote, contested areas. So here we have the strategic context again, the land wars drawing to a close, we have the return of the Navy to prominence. And we have sort of arguments very good and useful arguments I might add that are being voiced about a changing kind of strategic paradigm, or how the navies, and navies in general are supposed to be structured — the systems they're going to need, their method of fighting, which then also gets to this broader question of what are navies for in the 21st century? What's the purpose of navies? So all of these questions and the sort of debates about this, these are good things. So all of this is hitting the United States Navy sort of at the same time. Which again, comes on the heels of this sort of 20 year period where they have not had a particularly stellar record of being able to produce innovative new ship designs that meet basic reliability and warfighting standards. They've established a track record, in fact, over the last 20 years, showing an inability to bring innovative new designs, and to be able to generalize those innovative new designs to make them accessible to the fleet writ large. So all of these things are kind of colliding together with regrettably the COVID pandemic and the budgetary pressure on the defense budget. And hence you have the Defense Department's experts up on the hill sort of saying these plans don't reflect the strategic and budget reality. The Navy would be needing significantly more money for shipbuilding over the rest of the decade and beyond if it's going to realize its plans to grow the fleet.

Tom Temin: Alright, so basically they need to be ready to be ready.

James Russell: Yes, that's correct. But it's broader than just that. It's that I think there is really a national debate which is needed. And I think we're starting to sort of see that, which is that the issue is bigger than just giving the Navy more money. It's having a real sort of discussion about what are the purposes of navies in the 21st century? And I think those of us in the academic business would sort of say that, back in the late sort of 19th, early 20th centuries, there was no question that having strong navies was seen as sort of instrumental to national power and influence. And I think that's a question for the 21st century. It's not clear that's really the case, or it's clear that the context has changed, but we need to sort of have a discussion about this. So all these issues are in play.

<https://federalnewsnetwork.com/navy/2020/08/after-ship-fire-in-port-is-navy-capable-of-responding-to-china-policy/>

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ALUMNI:

Virtual Rites: Rear Adm. Small Takes Command of San Diego's NAVWAR

(Times of San Diego 21 Aug 20) ... Ken Stone

Rear Adm. Douglas Small Friday relieved Rear Adm. Christian Becker of his command of Naval Information Warfare Systems Command in a virtual change-of-command ceremony at command headquarters in San Diego.

Vice Chief of Naval Operations Adm. William Lescher served as the presiding officer for the ceremony, attending the event virtually from the Pentagon. During the event, Lescher spoke about Becker's leadership, a number of accomplishments by the Naval Information Warfare Systems Command — better known as NAVWAR — team and his confidence in Small to elevate NAVWAR

“I want to recognize the amazing sailors and Navy civilians who make up this extraordinary command,” said Lescher. “Their exceptional professionalism, expertise and innovation bring a unique skill set needed to meet fleet information warfare requirements. Thank you for all your hard work to rapidly deliver warfighting capabilities from seabed to space.



Lescher also presented NAVWAR with the Meritorious Unit Commendation award for impactful achievements and distinctive accomplishments made under the leadership of Becker

Becker reflected on his time at NAVWAR, thanked his family and emphasized the driving force behind NAVWAR's success: "its people.

"As NAVWAR commander, I have had the privilege to lead a world-class command with a world-class workforce, dedicated to delivering the most advanced capabilities to the warfighter," he said. "I am extremely proud to have served alongside such great professionals these past three and half years, and the 20 years prior to that. I wish Adm. Small and this tremendous Navy command the very best success going forward.

As Becker's flag was lowered and Small's flag raised, Small became NAVWAR's commander, responsible for leading a workforce of more than 11,000 civilian and military personnel who design, develop and deploy advanced communications and information capabilities for the Navy

"The talent and dedication across the command is exceptional, and I am confident with your support and unmatched technical competence that together, we will make certain that NAVWAR continues to develop platforms that pace evolving technologies and threats while delivering unparalleled capability to the warfighter for years to come," Small said

Small is coming to NAVWAR after serving as the program executive officer for Integrated Warfare Systems in Washington, D.C. A native of Birchwood, Wisconsin, Small received a B.S. in physics degree from Marquette University in Milwaukee, Wisconsin, and a **doctorate in Ph.D. from the Naval Postgraduate School in Monterey.**

<https://timesofsandiego.com/military/2020/08/21/rear-adm-small-takes-command-virtually-of-san-diegos-navwar/>

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Eugene "Gene" Cernan: The Last Human Being to Walk on the Moon

(Interesting Engineering 23 Aug 20) ... Christopher McFadden

Everyone knows about the first time that mankind placed a foot on the Moon, but what about the last time? That honor goes to the revered and sadly missed, Eugene Cernan.

Here we explore his life in brief and uncover some of the highlights of this great man's career in the air and space.

When was the last moonwalk?

On the 13th of December 1972, the crew of Apollo 17 reached the Moon and landed on it for, unbeknownst to them, the last time in history. The lunar landing site was the Taurus-Littrow Highlands and valley area of the Moon.

The mission was an extraordinary one by any standards, with a nighttime launch (at 12:33 am Eastern Standard Time from Cape Canaveral, Florida), and three days on the Moon. It was also distinguished by its inclusion of the battery-powered Lunar Roving Vehicle (LRV).

The mission included three trips in the lunar rover, the longest of which saw the crew travel 4.7 miles (7.5 km) from the lunar module in the LRV. It was also the first time a trained scientist landed on the Moon.

This was the maximum safe distance they could travel if the rover failed and they were forced to walk back to the module. More lunar rocks were collected than any of the previous landings and these were collected by a trained geologist - Harrison Schmitt.

Just before re-entering the module for the final time, Eugene "Gene" Cernan uttered the final, now infamous words, "... as we leave the Moon at Taurus-Littrow, we leave as we came and, God willing, as we shall return, with peace and hope for all mankind."

We are yet to return.



According to NASA, "This site was picked for Apollo 17 as a location where rocks both older and younger than those previously returned from other Apollo missions, as well as from Luna 16 and 20 missions, might be found."

The objectives of the missions were:

- Geological surveying and sampling of materials and surface features in a preselected area of the Taurus-Littrow region.
- Deploying and activating surface experiments.
- Conducting in-flight experiments and photographic tasks during lunar orbit and transearth coast.
- Some lunar orbital experiments include Biostack II and the BIOCORE experiment.

Various instruments were deployed including, but not limited to:

- The Apollo Lunar Surface Experiments Package, or ALSEP. This device included a heat flow experiment, and lunar seismic profiling, or LSP.
- Lunar surface gravimeter, or LSG.
- Lunar atmospheric composition experiment, or LACE.
- Lunar ejecta and meteorites, or LEAM.

The mission would prove to be the last in a series of three J-type missions planned for the program. J-type missions differed from others (G- and H0-) through extended hardware capability, larger scientific payload capacity and by the use of the battery-powered Lunar Roving Vehicle, or LRV.

Who was the last man to walk on the moon?

At 5:40 UT (Universal Time) on December the 14th 1972, Eugene "Gene" Cernan entered the history books when he took humankind's final step on the Moon. For over half a century, this is yet to be achieved once more.

The module lifted off the Moon's surface at 22:54 UT the same day.

Just prior to this event, Cernan and Schmitt televised and unveiled a plaque on the lunar module that read, "Here man completed his first exploration of the Moon, December 1972 A.D. May the spirit of peace in which he came to be reflected in the lives of all mankind."

Who was Eugene "Gene" Cernan?

As we have already mentioned, Eugene Cernan is most famous for being the last man to walk on the moon. But, there is much to this man's life than this significant mark in human history.

Cernan was born on the 14th of March 1934 in Chicago, USA. He would later graduate from Proviso Township High School in Maywood, Illinois. Eugene Cernan later received a bachelor of science degree in electrical engineering from Purdue University in 1956.

Cernan then completed a Master of Science degree in aeronautical engineering from the U.S. Naval Postgraduate School in Monterey, California.

"Gene" Cernan was a Captain in the United States Navy and distinguished himself by making no less than three flights into space, two of which were to the Moon. Throughout his Naval career, Cernan racked up **over** 5,000 hours (4,000+ on jets) flying T-28 Trojans, T-33 Shooting Stars, F9F Panther, FJ-4 Fury, and A-4 Skyhawks.

His career had some other interesting highlights including becoming the second American to walk in space, where he spent more than two hours in space.

In 1963, Cernan became one of only 14 astronauts selected by NASA. He piloted the Gemini 9 mission alongside Commander Thomas P. Stafford on a three-day flight in June 1966.

Cernan piloted the lunar module for Apollo 10 in 1969, which was the first comprehensive lunar-orbital qualification and verification test of the lunar lander. This mission also included a descent up to around 8 nautical miles (14.8 km) of the Moon's surface.

The only real difference between Apollo 10 and Apollo 11 is that Cernan and the module didn't actually land.



"I keep telling Neil Armstrong that we painted that white line in the sky all the way to the Moon down to 47,000 feet (14.3 km) so he wouldn't get lost, and all he had to do was land. Made it sort of easy for him," Cernan joked in a 2007 interview with NASA.

After the mission, Cernan would retire from the Navy in July of 1976 after 20 years of service. He went into private business thereafter and served as a television commentator for early space shuttle flights.

He would later die in hospital on the 16th of January 2017 in Houston, Texas. Cernan was 82 years old. He was buried with full military honors at Texas State Cemetery and was the first astronaut to be buried there.

Cernan is survived by his wife, Jan Nanna Cernan, his daughter and son-in-law, Tracy Cernan Woolie and Marion Woolie, step-daughters Kelly Nanna Taff and husband, Michael, and Danielle Nanna Ellis and nine grandchildren.

Eugene's illustrious career has been honored in various ways including the naming of the Cernan Earth and Space Center in his hometown of Chicago. This is a public planetarium sited on the campus of Triton College.

The center has a 93-seat capacity underneath a 13-meter dome theater that houses a Konica-Minolta Super MediaGlobe II full-dome digital projector, a Voyager V-17OWC laser projection system, and numerous auxiliary projectors.

Who were the crew of the Apollo 17 mission?

The Apollo 17 crew included Eugene "Gene" Cernan (1937-2017) as the Commander of the mission, Harrison H. Schmitt(1935-) as the Lunar Module Pilot and Geologist of the mission, and Ronald E. Evans (1933-1990) as the Command Module Pilot.

In case of any issues, the backup crew for the mission was John W. Young as Commander, Charles M. Duke Jr. as the Lunar Module Pilot, and Stuart A. Roosa as the Command Module Pilot.

How did Eugene Cernan die?

The last man to walk on the moon, Eugene "Gene" Cernan, died on the 16th of January 2017. His family confirmed in a statement to the press that Cernan died of "ongoing health issues".

When he died, Cernan had reached the ripe old age of 82, and his health had been in decline for several years owing to his advanced age.

"Our family is heartbroken, of course, and we truly appreciate everyone's thoughts and prayers. Gene, as he was known by so many, was a loving husband, father, grandfather, brother, and friend," the Cernan family added in an official statement.

Eugene Cernan died a little over a month after a fellow astronaut, John Glenn, died in December 2016.

Eugene "Gene" Cernan was one of the most accomplished astronauts in human history and, at least for now, holds the honor of being the last member of our species to ever walk on the Moon. For how much longer he will posthumously hold this title is anyone's guess, but he is fondly remembered by friends, family, colleagues, and space enthusiasts to this very day.

Eugene Cernan, we salute you!

<https://interestingengineering.com/eugene-gene-cernan-the-last-human-being-to-walk-on-the-moon>

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