

Russia's War on Ukraine and Lessons For Strategic Competition With China



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“Fools learn by experience, wise men learn by other people’s experience.”—Otto von Bismarck

Executive Summary: Key Lessons

- No easy answers: focus on dynamics, frameworks, emerging trends
- Industrialized warfare is back and a Taiwan fight would unleash worse consequences than the present (and awful) assault on Ukraine—we are behind curve and need to act fast.
- We also face existential domestic and foreign threats that pose an unprecedented set of challenges—it's 1860 and 1939 rolled into one.
- Molecules matter!
- As does U.S. global centrality, with events running counter to prior narratives
- Industrial war consumes munitions, materiel, and manpower at prodigious rates
- Limits of economic warfare
- We must be ready at as many levels as possible for a long conflict
- We must also balance securitization with the advantages reaped from the United States' status as a global haven and renew those sources of strength
- We need allies and the way we get/retain them is by steadfast defense of a rules-based global order. We must defend forward, engage with the world, and meet problems proactively. Isolationism is doomed to fail.



1939



1990



2022?

Wars Often Shape the Next 25-to-50 Years

Sources (left to right): BBC, Army Corps of Engineers, Reuters

Near-Existential Strategic Stakes

- The last 20 years have been about brushfire wars. Great power conflict would involve full societal mobilization, with dramatic consequences worldwide.
- Total war between industrialized titans is a terrible enterprise. Things that are nearly unimaginable under “normal” circumstances can rapidly become standard and acceptable.
- Cyber, maritime, air, space domains would all be bitterly contested. Everything from factories, to critical home front infrastructure, to pointy end of military spear will be shot at and/or hacked by the adversary.
- Long war an uncomfortably likely scenario
- U.S. victory far from assured—and could well prove Pyrrhic.
- Massive destruction of global industrial and technological base. Combined, China and the U.S. are in practical terms, irreplaceable across multiple physical, intellectual, and technological value chains.
- Huge setback for progress in multiple key domains.
- No country/supernational bloc logically positioned to meaningfully supplant the role of temporarily dis-empowered China + United States.
- Likely sets stage for massive follow-on disorder as mid-sized powers compete to fill the temporary vacuum.



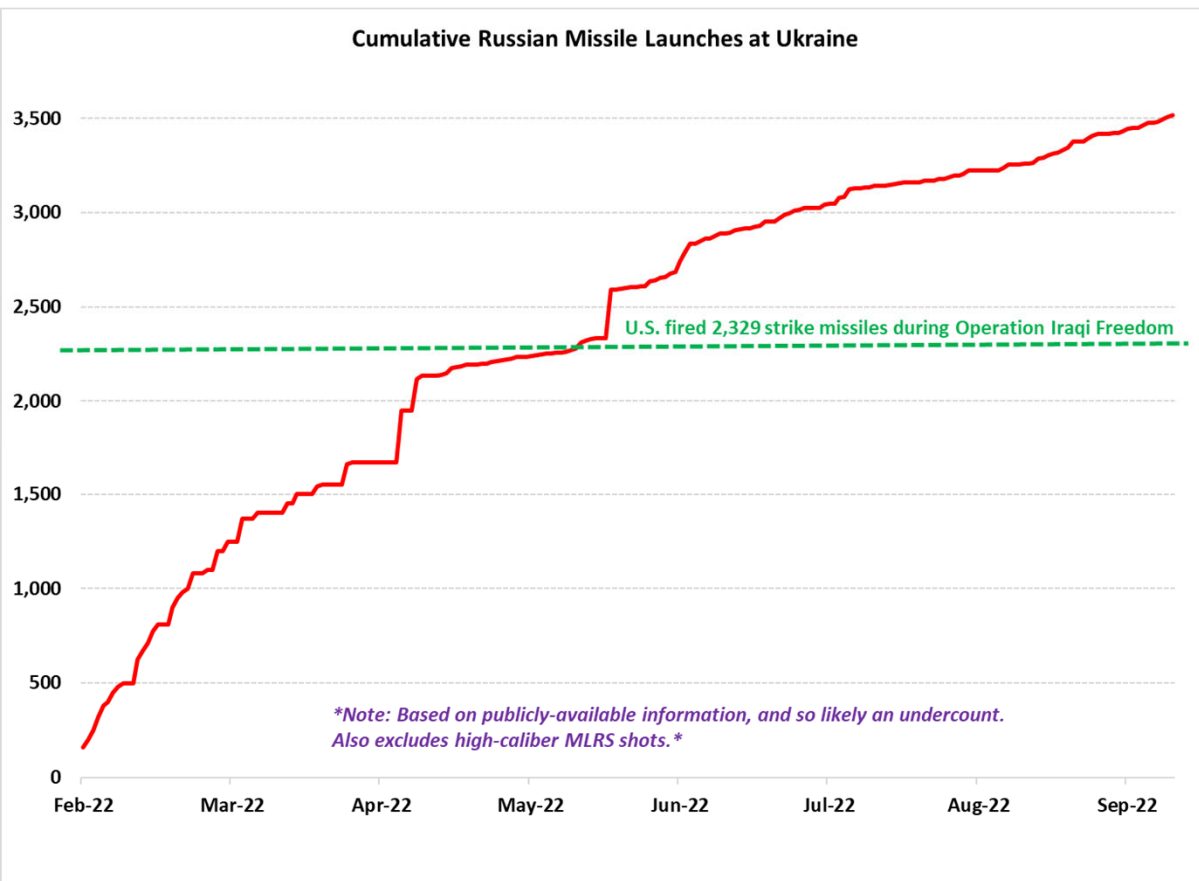
Putin's War

Russian Territorial Ambitions Likely Extend Beyond Ukraine



Russia Deploying Massive Missile and Artillery Firepower

Russian Strike Missile Launches at Ukraine



Source: US DoD, CSIS Missile Defense Project, Ukrainian Media, RUSI (artillery rounds), Author's Estimates

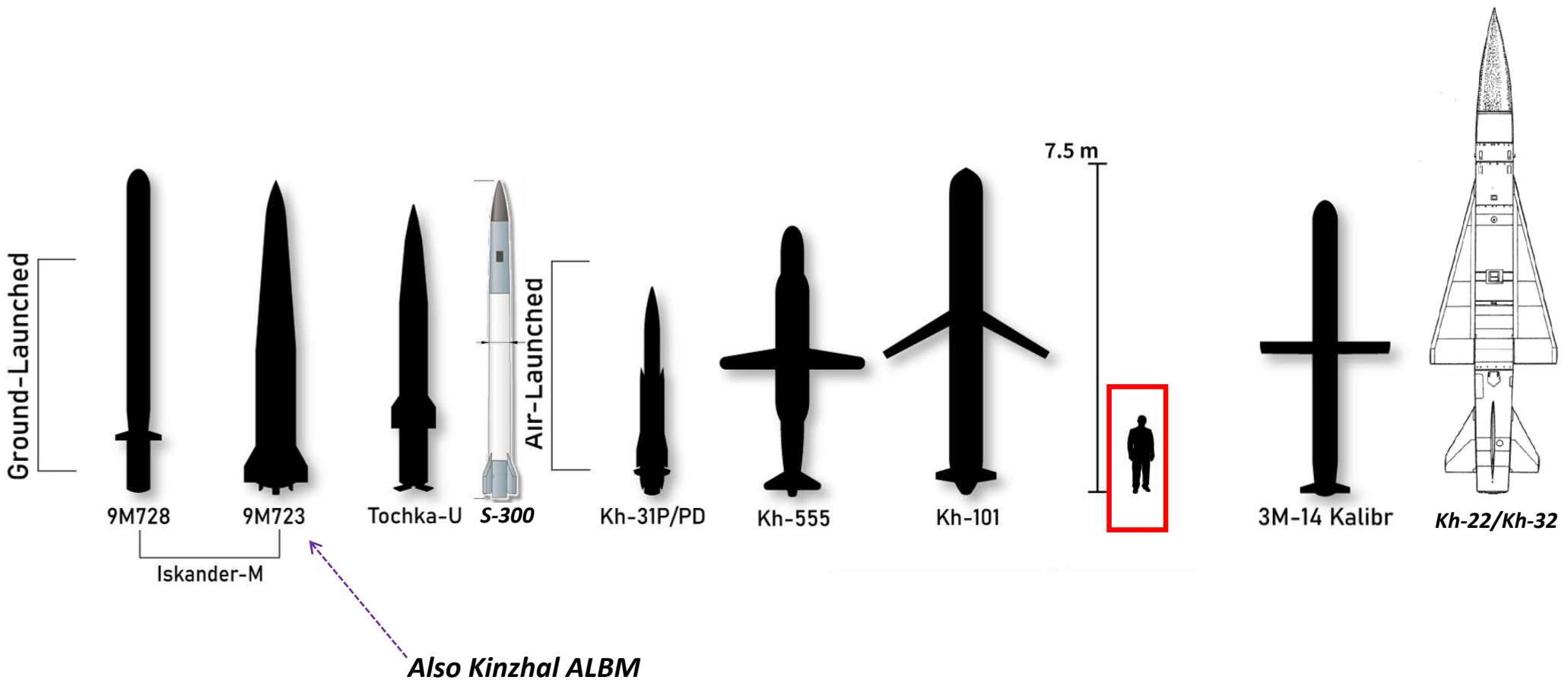
Estimated Artillery Rounds Fired Based on Actual Fire Missions Reported by Russia MoD

Date	Fire Missions	Rockets Fired	Shells Fired
19-May-22	356	811	4,389
20-May-22	251	572	3,094
21-May-22	735	1,674	9,061
22-May-22	700	1,594	8,630
23-May-22	688	1,567	8,482
24-May-22	684	1,557	8,432
25-May-22	490	1,116	6,041
26-May-22	526	1,198	6,485
27-May-22	499	1,136	6,152
28-May-22	542	1,234	6,682
29-May-22	717	1,633	8,839
30-May-22	710	1,617	8,753
31-May-22	710	1,617	8,753
Total		17,323	93,791

Key Assumptions: Rocket launcher discharges 6 rounds per fire mission, a tube battery nominally has 6 guns but 4 actually work, firing four rounds apiece per mission, 1/3 of fire missions served by rockets, remainder by tube artillery, 15% wastage of ammunition due to haste, counterbattery fire, shooting beyond allocation

Note: Russia estimated to have fired around 7 million total projectiles to date in Ukraine— nearly 4X the amount of 155 MM shells Iowa Army Ammunition Plant produced to support OIF between March 2003 and August 2010.

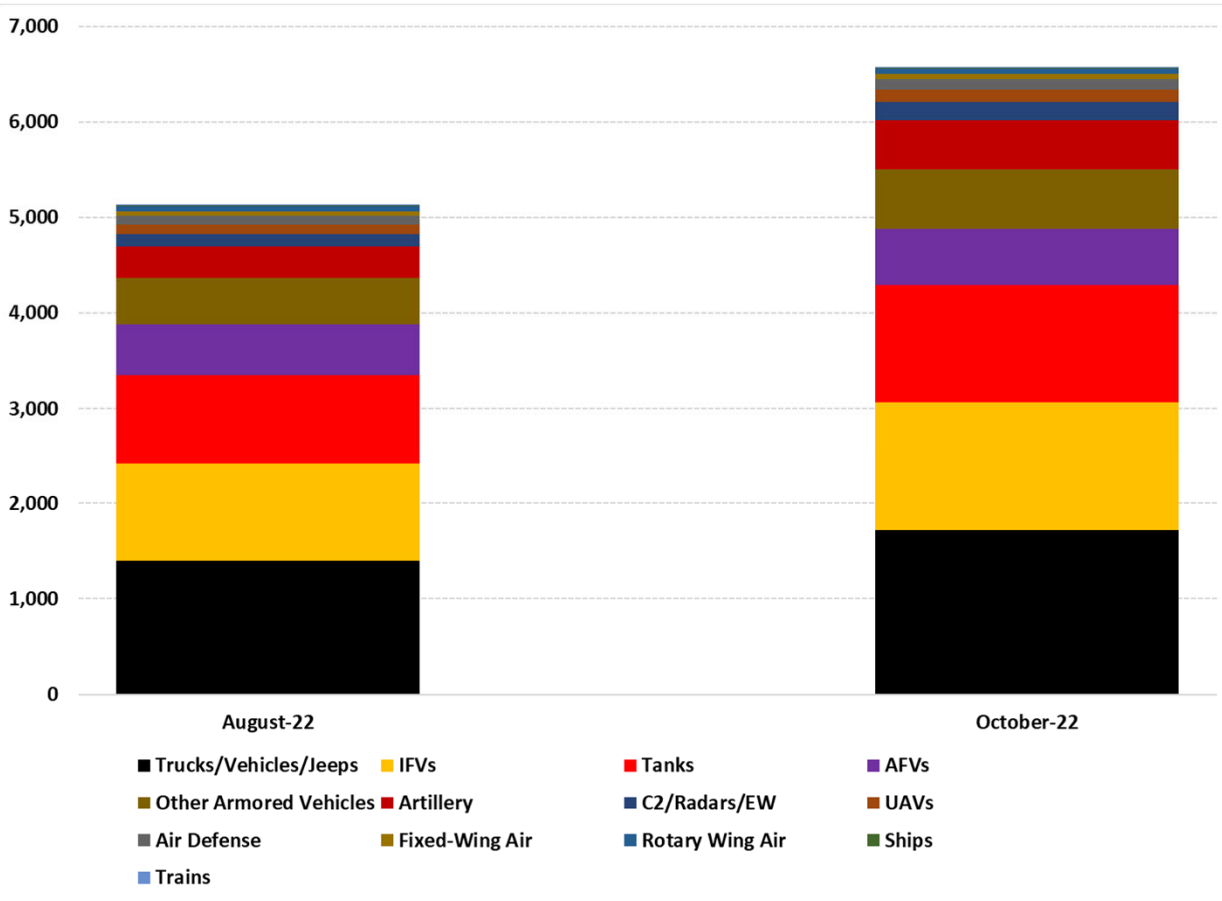
Sample Strike Missiles Russia Is Using in Ukraine



Sources: CSIS Missile Defense Project, <http://airwar.ru/weapon/kr/x22.html>, Ria Novosti, Author's Analysis

And Both Sides Are Expending Masses of Men, Materiel, and Munitions

Russian Equipment Losses (10 Aug. 2022/1 October 2022 Confirmed)



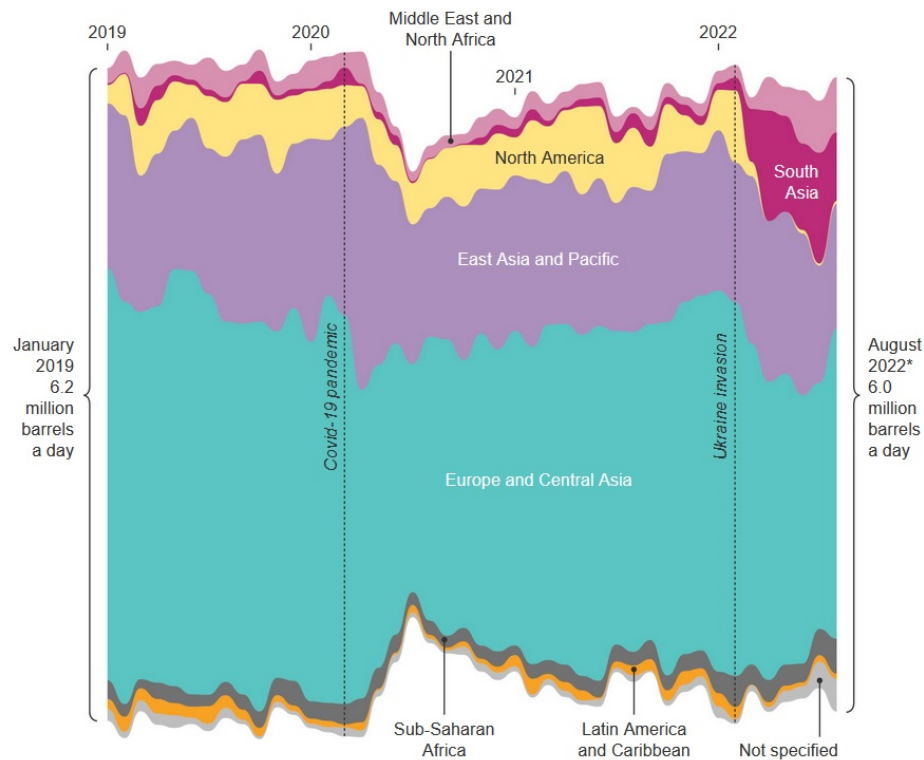
- Perspective: Russia has already lost more than 1/3 as many tanks and infantry fighting vehicles as US has in its entire active-duty inventory
- Source: IISS 2021 Military Balance



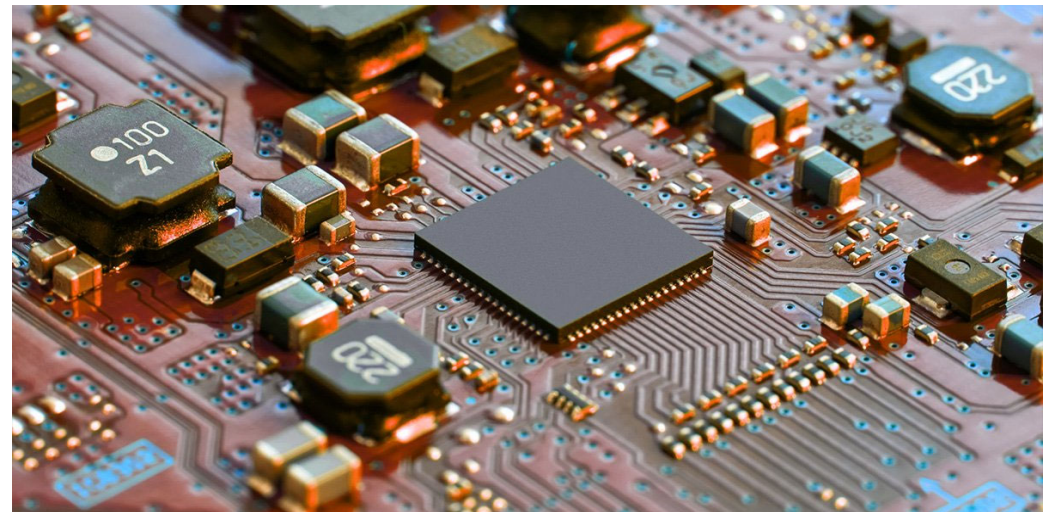
Source: Oryxspionkop, Author's Analysis

Do Continued Oil Revenues = Russian Military Regeneration?

Russian shipments of crude oil and products



*As of Aug. 20
Source: Vortexa
Andrew Barnett/THE WALL STREET JOURNAL



Much Fighting Lies Ahead

Ukraine Still Seeks to Retake Territory Equivalent to Kentucky or Hungary in Size

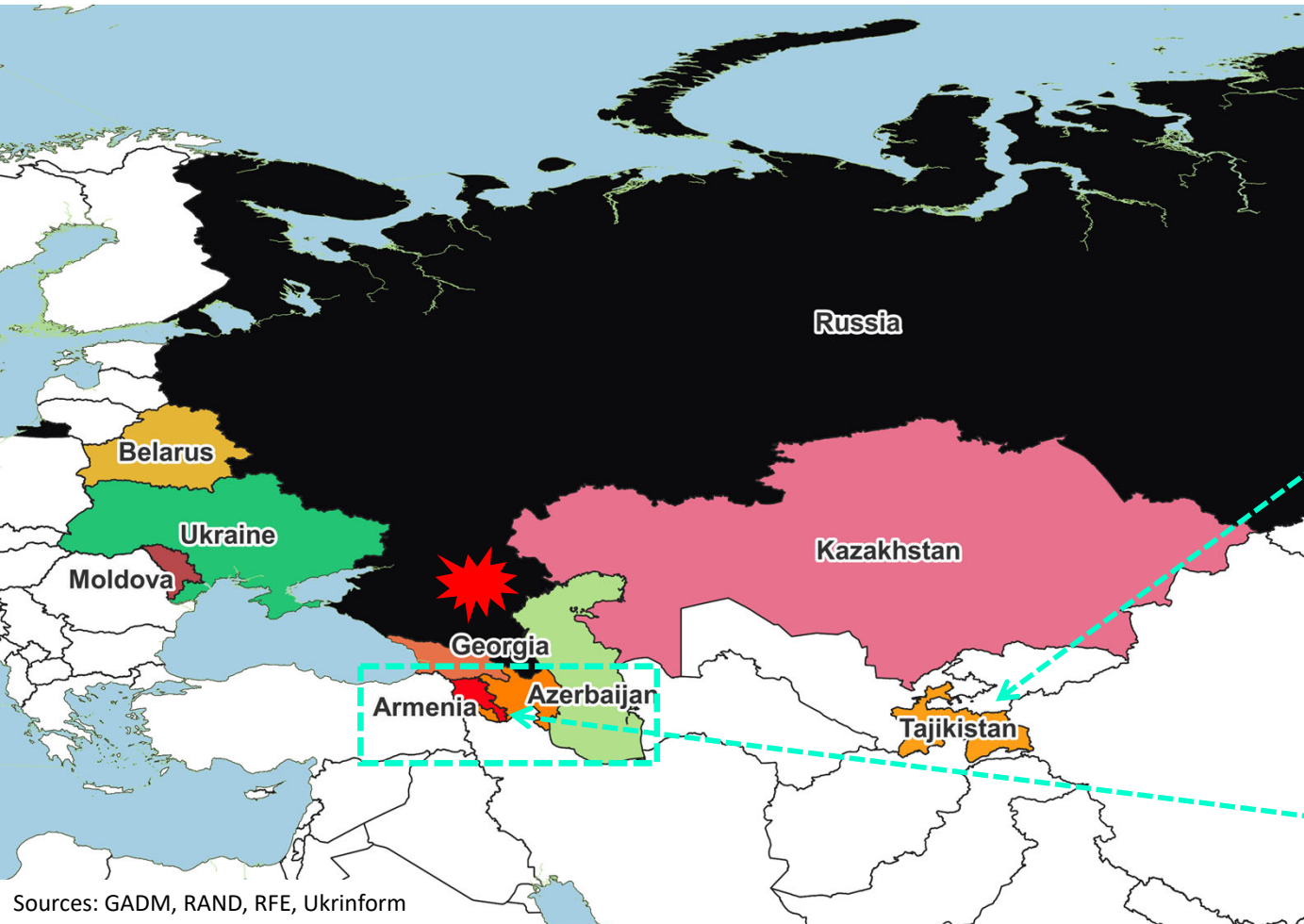


Source: ISW, <https://storymaps.arcgis.com/stories/36a7f6a6f5a9448496de641cf64bd375>

One thing is more certain: Ukraine much less likely to follow the “typical” frozen conflict trajectory Russia seeks

Will War Unfreeze Conflicts Along—And Perhaps, Within—Russian Borders?

Places Where Russian Troops Are Deployed—Or Where They Are Critical to Regime Support



Russian 201st Army convoy, April 2022

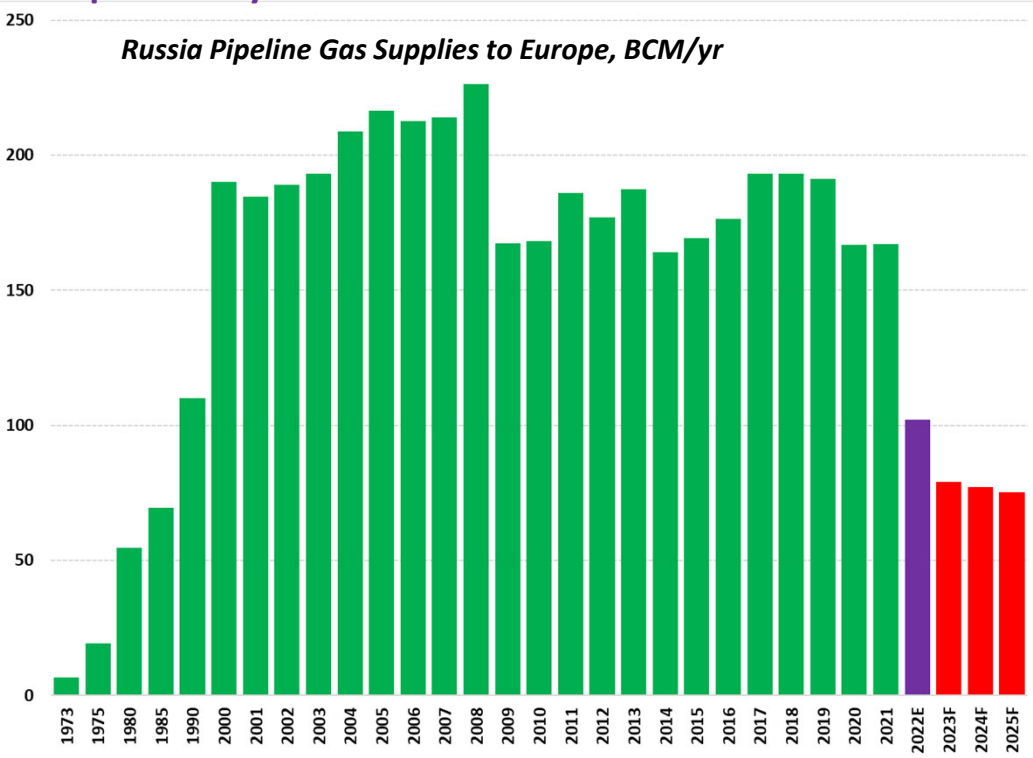


Nagorno-Karabakh, September 2022



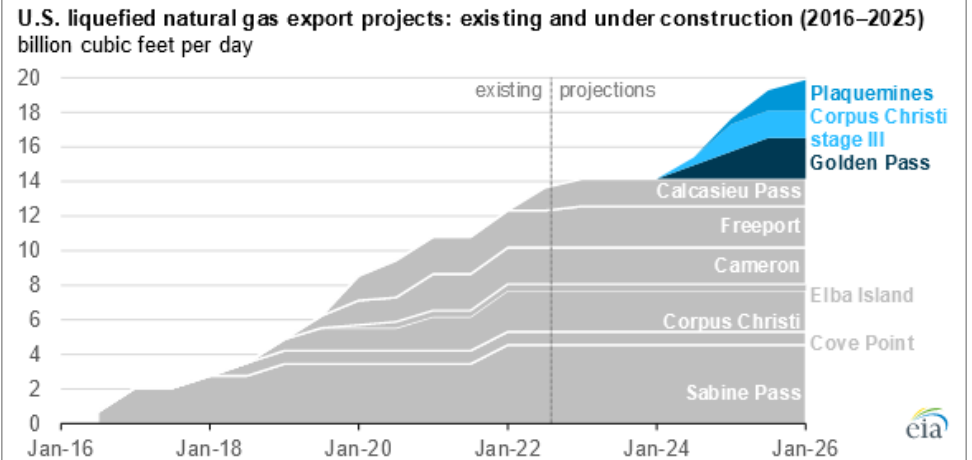
Higher Certainty: Swathes of Europe Poised For Multi-Winter Energy Crisis

Russia's New Budget Assumes 2023-2025 Gas Supplies To Europe At Early 1980s Levels...



Source: BP Statistical Yearbook of World Energy 2022, Bloomberg, Author's Analysis

...Amidst Limited Global LNG Surge Capacity



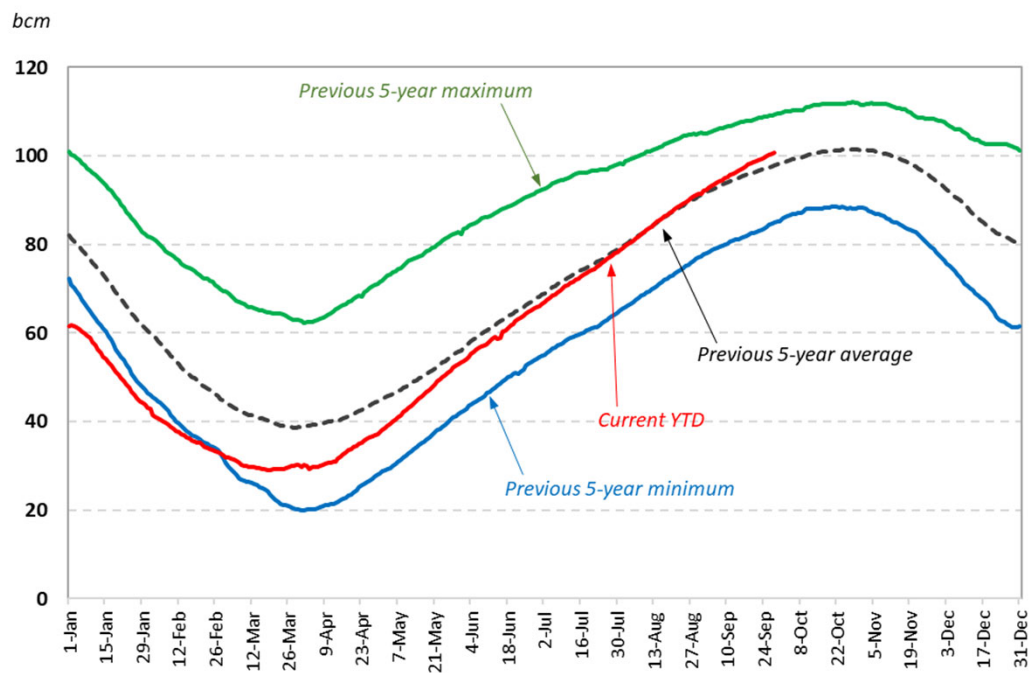
<https://www.eia.gov/todayinenergy/detail.php?id=53719>

Focus on U.S. because it is now the biggest global LNG exporter and also the one poised to add the most capacity in coming years.

Global Impacts of Russia's Ongoing Gas Manipulation Already Approaching Magnitude of 1973 Oil Embargo

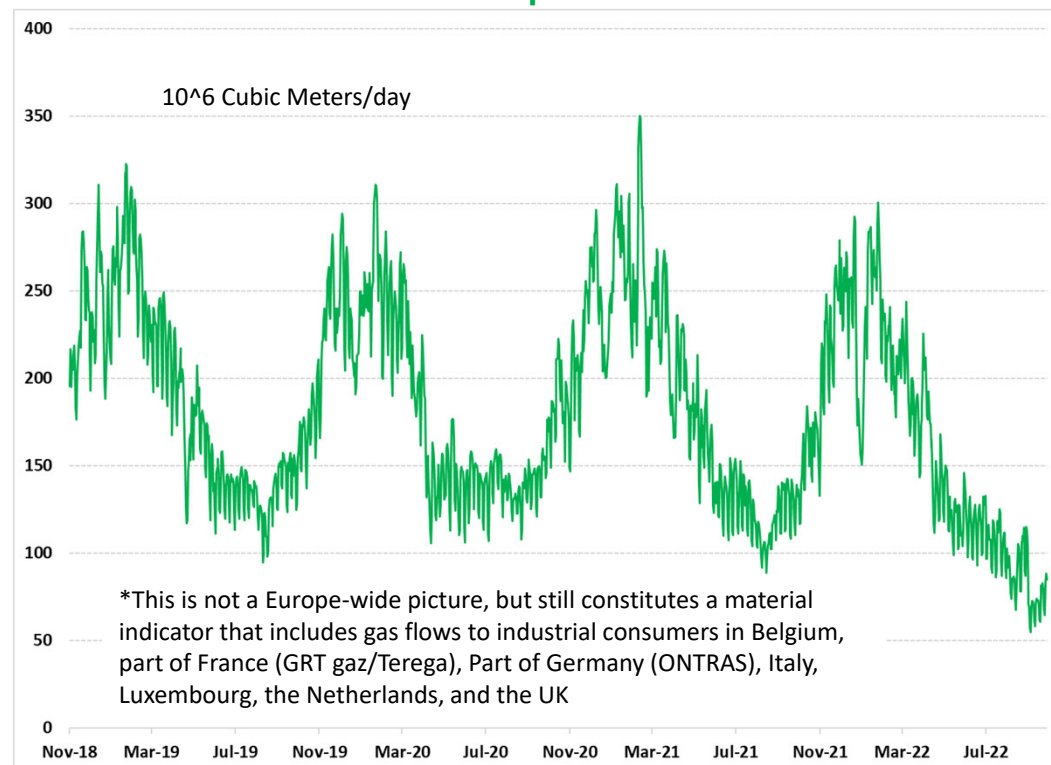
Europe Already Sacrifices Industrial and Power Sector Gas Use to Supply Citizens

European Gas Storage Levels Track the 5-Yr Average...



Source: GIE, Authors' Analysis

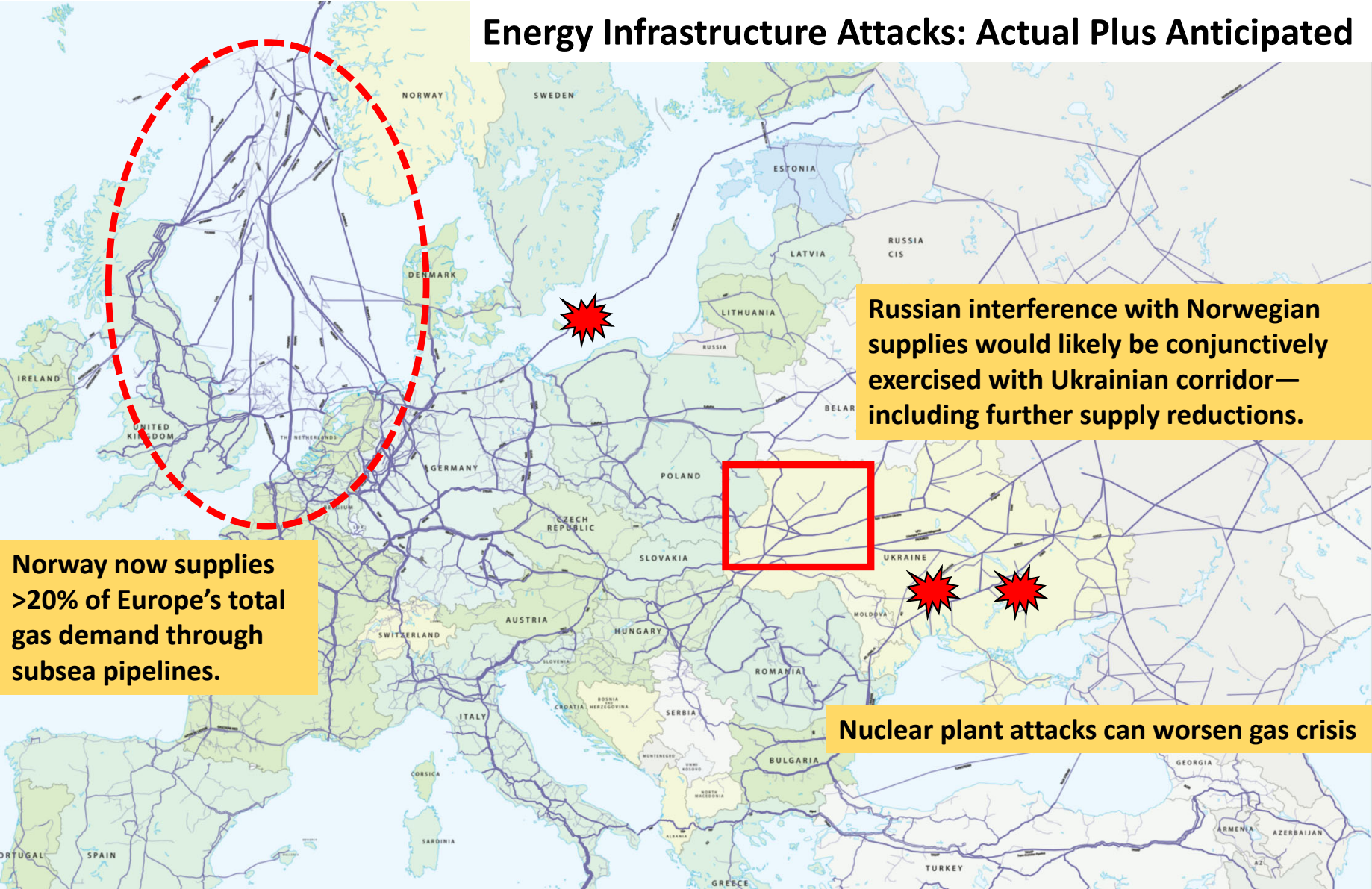
...But Have Been Built at Expense of Industrial Gas Use



Source: ENTSOG, Authors' Analysis

Sacrificing industrial gas consumption to fill storage is not a sustainable strategy and cannot cope with the multi-year gas security challenges ahead.

Energy Infrastructure Attacks: Actual Plus Anticipated



Russian interference with Norwegian supplies would likely be conjunctively exercised with Ukrainian corridor— including further supply reductions.

Norway now supplies >20% of Europe's total gas demand through subsea pipelines.

Nuclear plant attacks can worsen gas crisis

Metals and Materials Coercion Likely As Well

	2021 Production, 10 ⁶ tonnes	Russia Share of Global Supply	Price, \$/tonne	Export Share of Total Production	Potential Gross Revenue Loss, Million\$
Crude Oil	536	12.7%	\$621	75%	\$250,418
Natural Gas	509	17.4%	\$669	37%	\$125,163
Coal	434	5.3%	\$280		
Wheat	75	9.6%	\$320	50%	\$12,025
Steel	73	3.8%			
Copper	0.9	3.5%			
Cobalt	0.008	4.5%	\$51,955	50%	\$197
Aluminum	3.7	5.4%	\$2,251	50%	\$4,164
Nickel	0.250	9.3%	\$24,964	50%	\$3,121
Titanium	0.027	12.9%	\$43,220	50%	\$583
Vanadium	0.019	17.3%	\$30,000	50%	\$285
Platinum	0.00002	10.6%	\$34,562,056	50%	\$328
Palladium	0.00007	37.0%	\$77,033,197	50%	\$2,850
Potash	9.0	19.6%	\$800	50%	\$3,600
Ammonia	16.0	10.7%	\$950	50%	\$7,600
Sulfur	7.5	9.4%	\$400	50%	\$1,500
Key Non-Hydrocarbon exports, total value					\$11,529

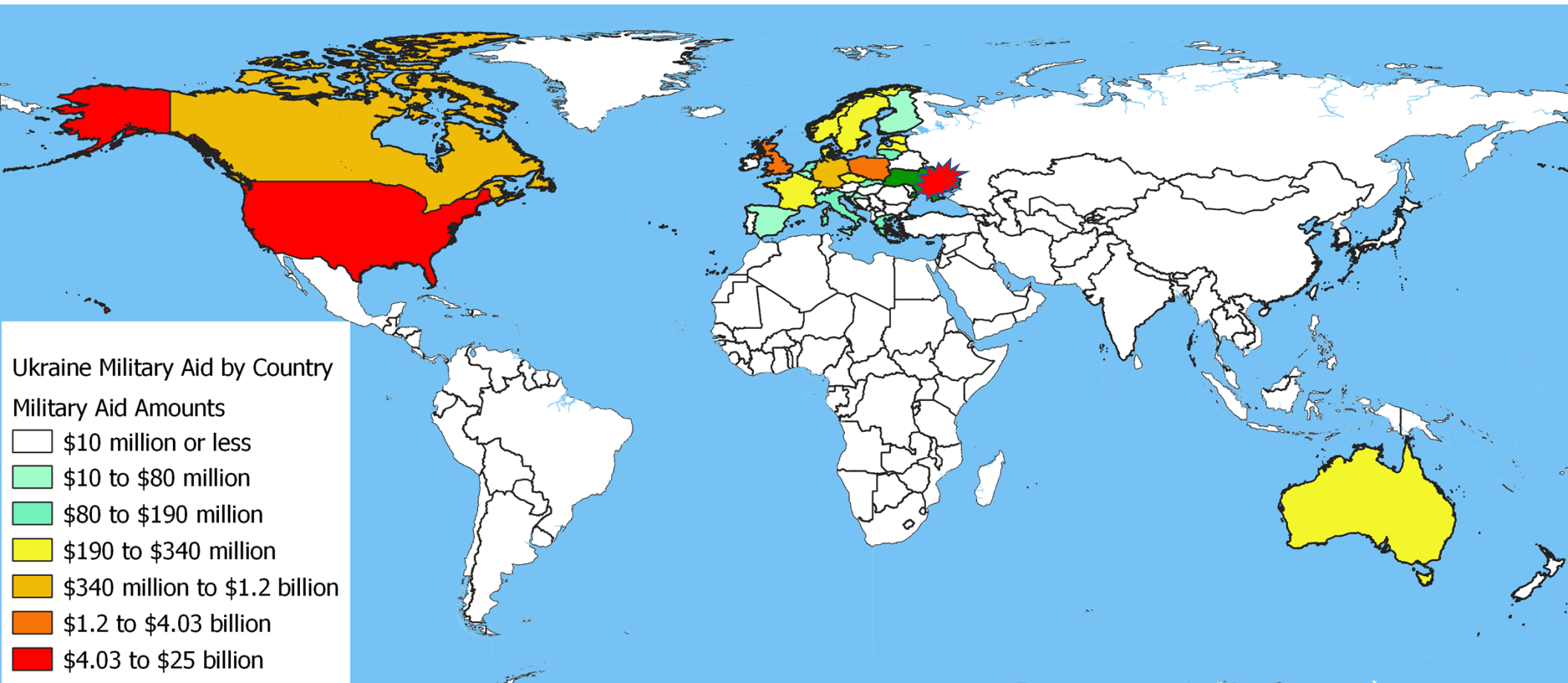
Further escalation via energy cutoffs, especially during the winter months, is very likely

Russia can withhold key metals' exports for a full year at the revenue cost of about 2 weeks' worth of oil exports.

Lesson #1 For U.S.

**We Face Potential For a Two-Theatre Conflict Again...With
China Far More Capable Than the Soviet Union Was**

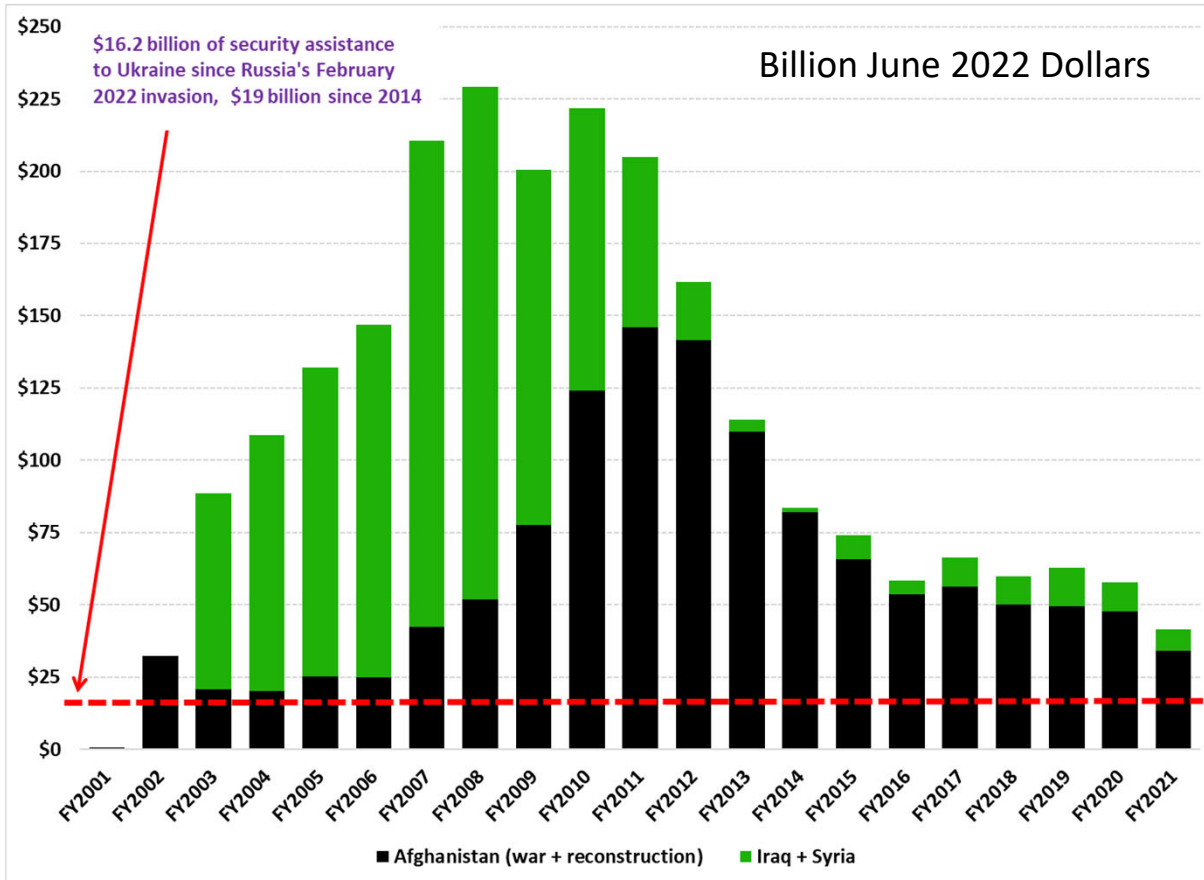
U.S. and a Few Allies Own the Military Support Side of Ukraine War Effort



Source: Ukraine Support Tracker (as of 1 October 2022), Author's Analysis

At Macro Level, Can The U.S. Simultaneously Underwrite War in Ukraine and Indo-Pacific Buildup?

A High-Impact Ukraine War Effort Would Annually Cost >1/2 of What Our Last Year in Afghanistan Did



- Yes, different types of conflict. Ukraine is land fight (lots of lower cost hardware), INDOPAC is air + maritime (numerous, much more expensive systems)
- Also, while Ukraine support is donation-oriented, Indo-Pacific partners like Taiwan can pay full price for defense articles.
- Ukraine also thus far demonstrates through consistent competent action that it is making far better use of US materiel support than the vast majority of our partners over the past 20 years have.

...And Ukraine Is Succeeding On Battlefield But Will Need a Marshall Plan Once Hostilities Ebb

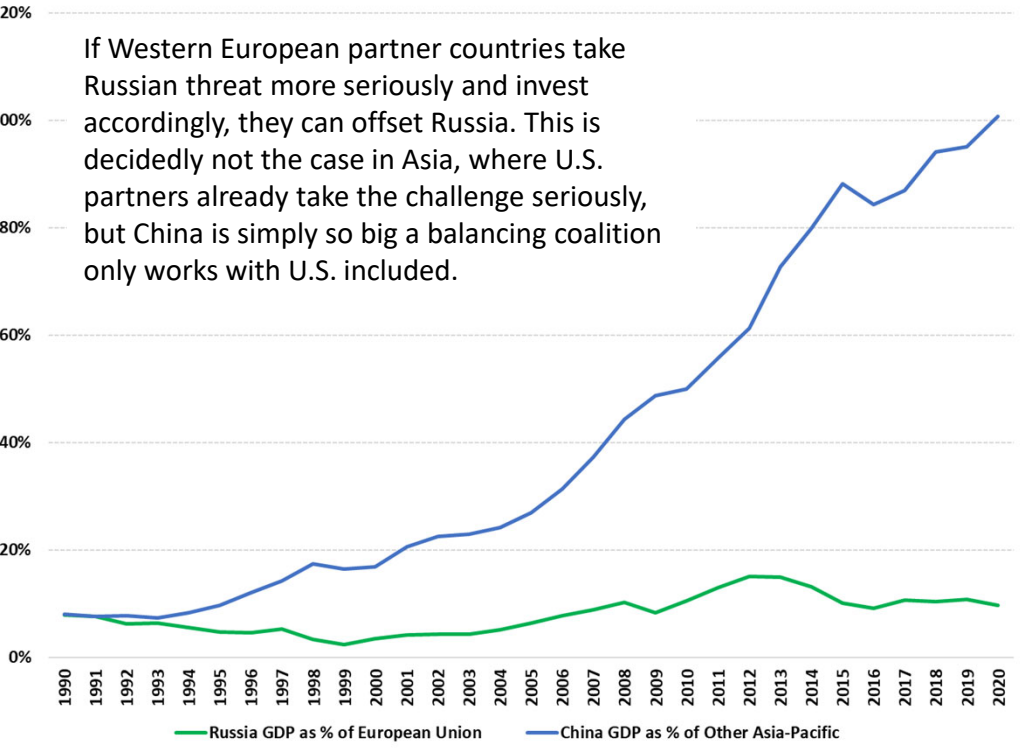
- Ukraine cannot fully recover its sovereignty without a robust economic foundation
- Raw cost of rebuilding civilian infrastructure likely in the \$ hundreds of billions
- You can't change your neighbors, but you can have a stout fence and formidable guns--Ukraine is going to have to adopt an **“Israel on the Black Sea”** approach, with a large hostile neighbor to the east and a hostile puppet to the north
- Balance security and economic development. Make sure geopolitical risk does not deter badly needed investment



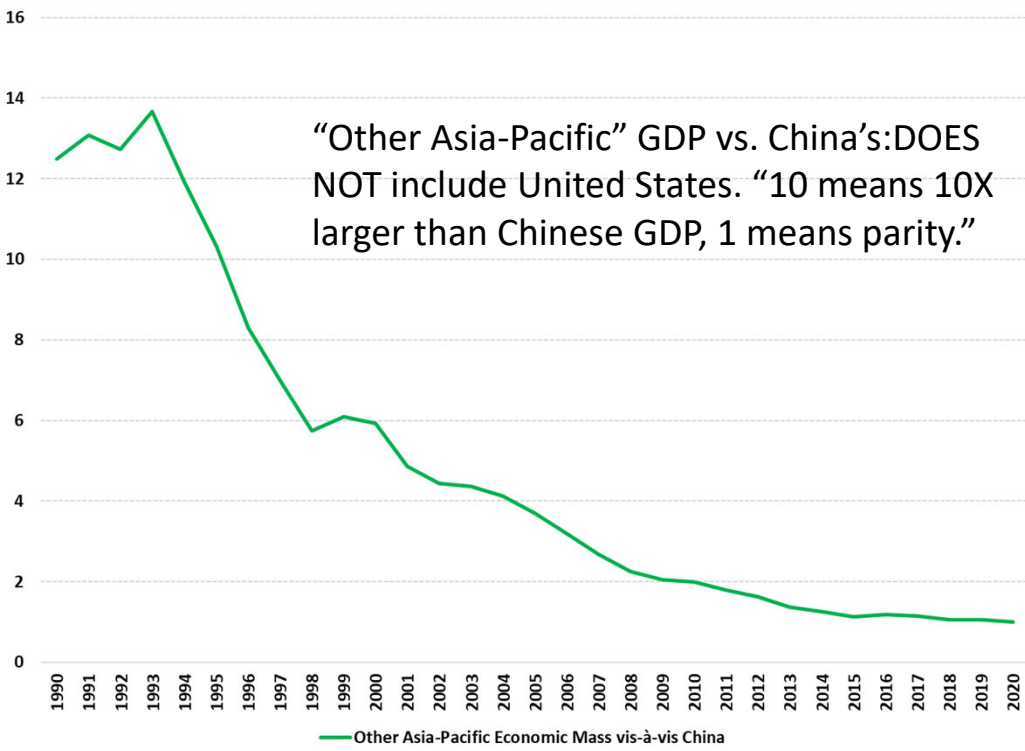
Source: IDF, https://en.wikipedia.org/wiki/Tel_Aviv#/media/File:Flickr_-_Israel_Defense_Forces_-_IAF_Flight_for_Israel's_63rd_Independence_Day.jpg

China's Power Can Only Be Offset With Comprehensive American Participation

Russia GDP vs. Europe, China GDP Vs. Other Asia-Pacific



China's "Economic Mass" Nearing Parity With Rest of Region

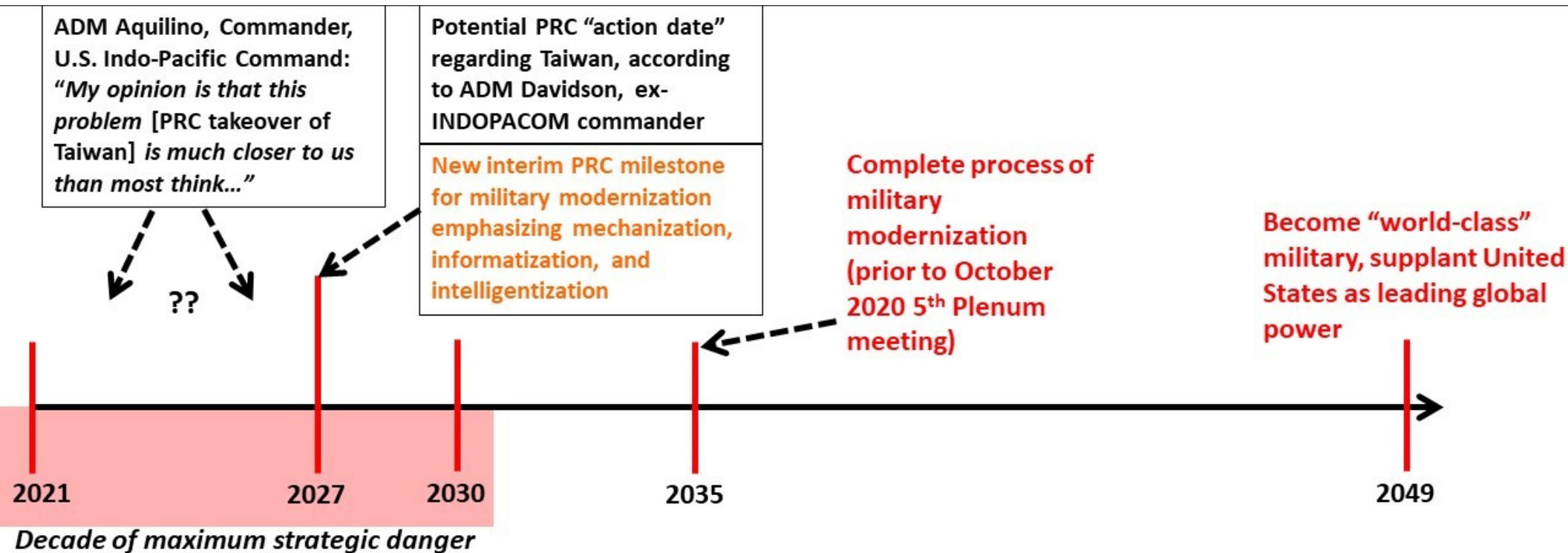


Source: World Bank, Author's Analysis

This dataset has significant implications for how the European and Pacific Deterrence Initiatives compete for funding.

We're Now in The China Strategic Danger Window

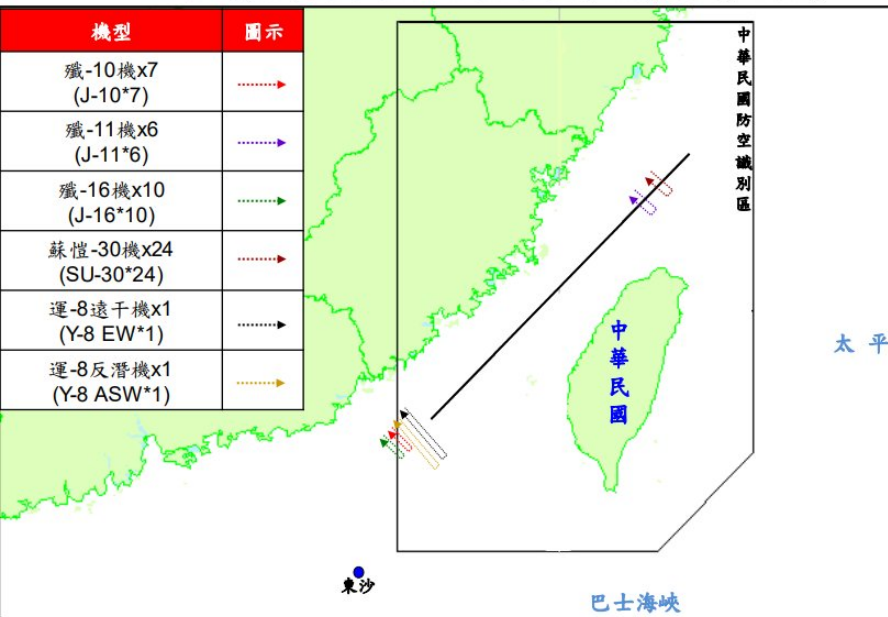
PRC milestone dates in red font, U.S. assessments in black



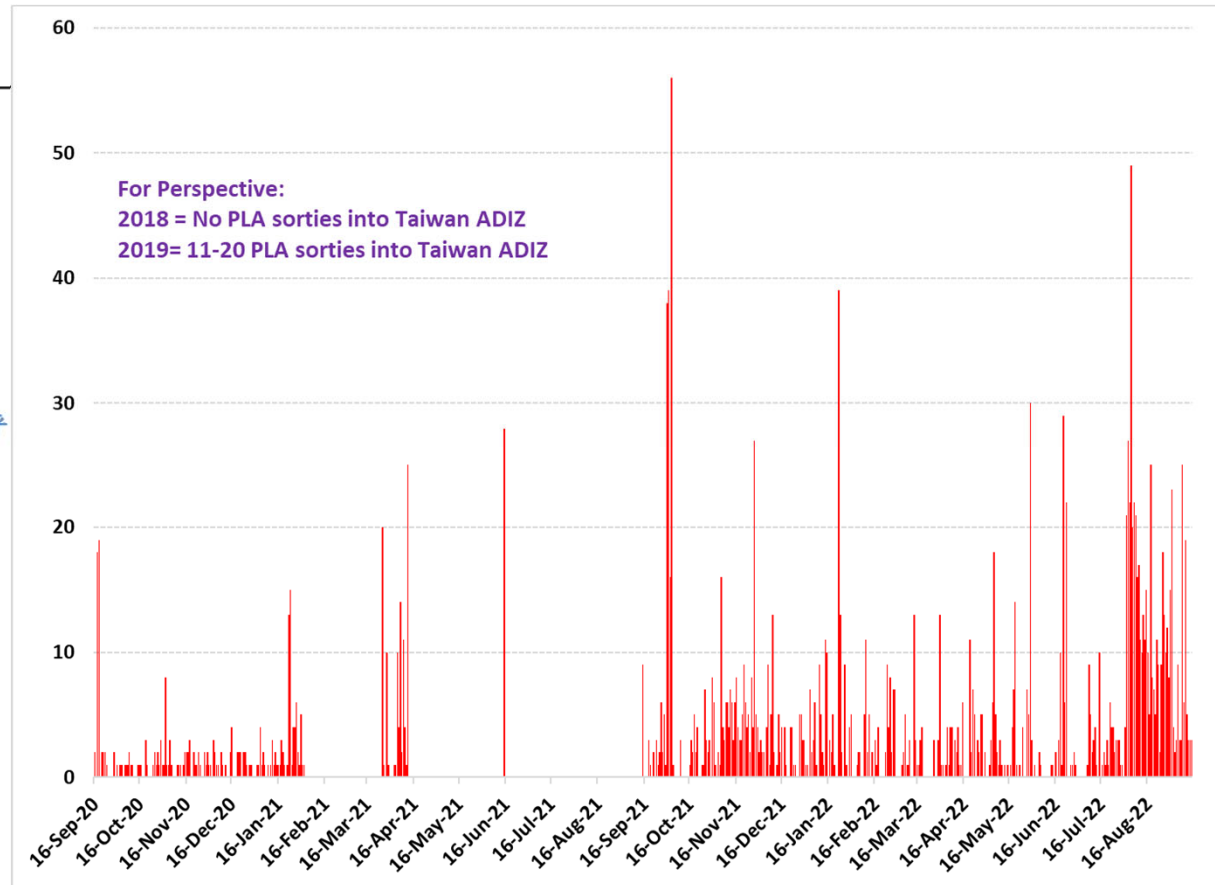
Sources: Andrew S. Erickson, "Make China Great Again: Xi's Truly Grand Strategy," War on the Rocks, October 30, 2019, <https://warontherocks.com/2019/10/make-china-great-again-xis-truly-grand-strategy/>; Erickson and Collins, "A Dangerous Decade of Chinese Power Is Here."

China is Accelerating the Pace of Operations to Stress Taiwanese Air Defenses...

111年08月05日中共解放軍進入臺海周邊空域活動示意圖
(Flight paths of PLA aircraft, August 5, 2022)



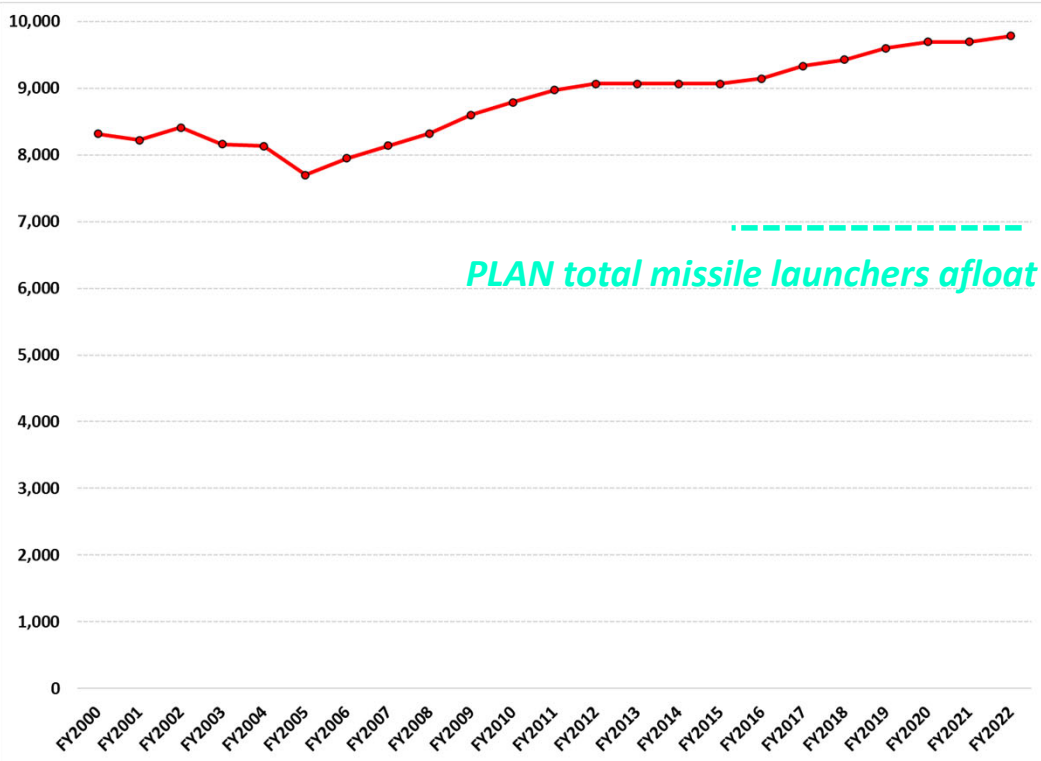
Daily Taiwan Air Defense Identification Zone Violations by PRC Aircraft



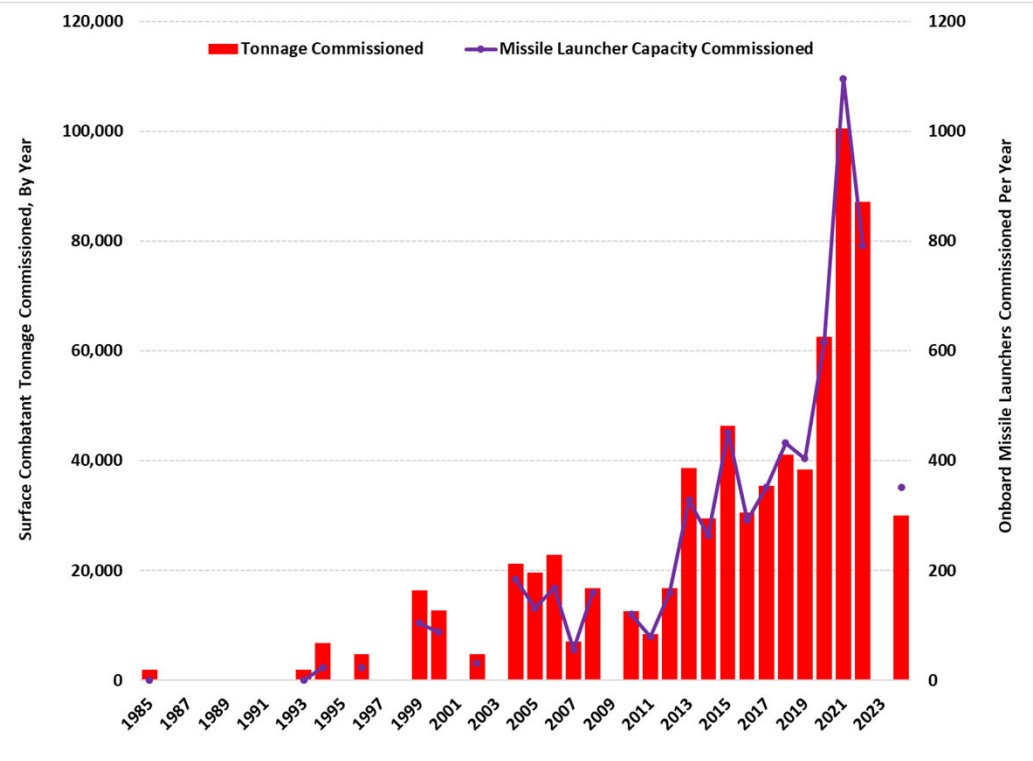
Source: ROC Ministry of Defense, Gerald C. Brown, Ben Lewis

...And Investing Heavily in Relevant Military Power Dimensions

US Navy Still Has More Total Fleet VLS Tubes



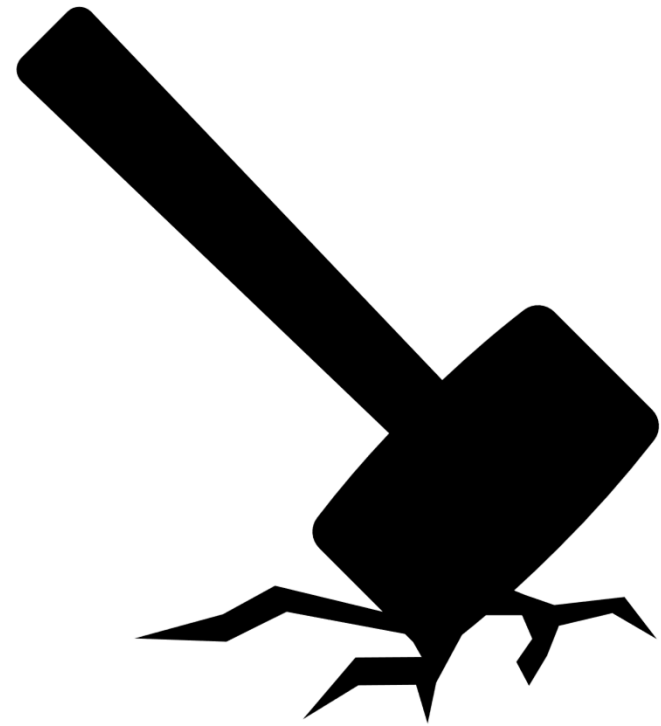
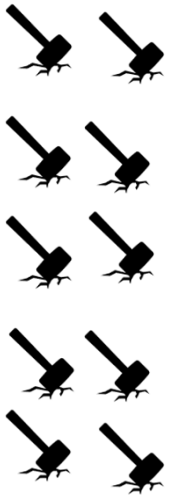
...But PLAN Adding Tonnage Several Times Faster Than U.S.



Source: U.S. Navy, Chinese Media, China Military Power Report

Note that U.S. Forces Spread Between Multiple Global Theatres

U.S., Taiwan, and Regional Allies Should Prepare for Massive Fires Intensity if China Chooses War



China's Potential Next Set of Revisionist Actions

Action	Warning Timetable
Maritime Militia actions against Taiwan's outlying islands such as Pratas	Days
PLA blockade of Taiwan's outlying islands	Days
Invasion of Kinmen or other outlying Taiwanese islands	Weeks
Customs quarantine possibly escalating to maritime blockade of Taiwan	Days/Weeks
Missile/Air "exercises" to disrupt air and maritime traffic into Taiwan	Hours/Days
Full invasion of Taiwan	Weeks/Months

Sources: David Lague and Maryanne Murray, "War Games—T-Day: The Battle for Taiwan," Reuters, November 5, 2021, <https://www.reuters.com/investigates/special-report/taiwan-china-wargames/>; authors' analysis

The Risk is Here...Must Rush Preparations to Completion

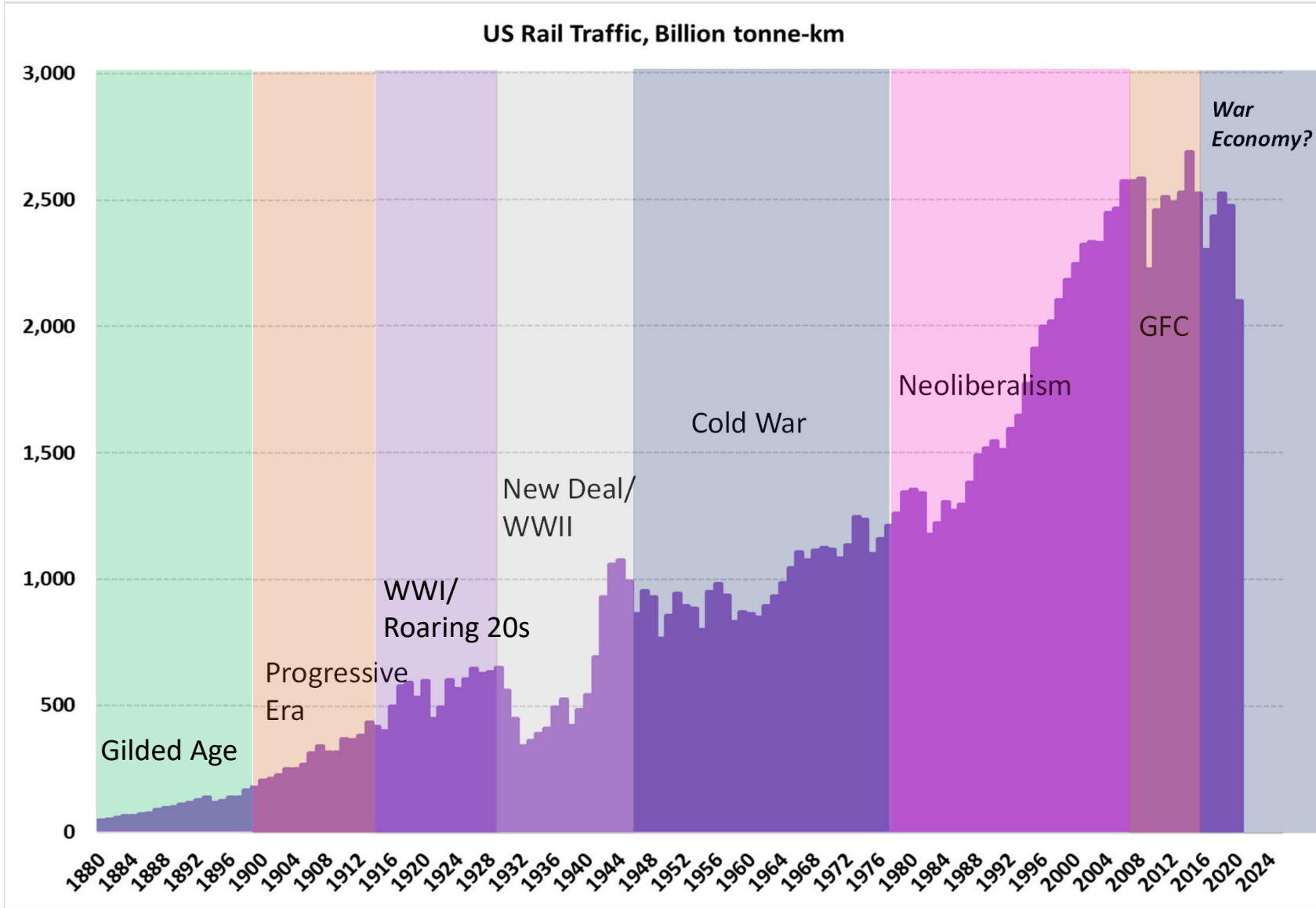


- U.S. and allies cannot “wait China out.”
- Losing Taiwan would severely erode regional alliance structure and hand Beijing the keys to regional hegemony
- Holding the Line will require proactive action to defend rules-based order
- The winning U.S. strategy will likely hinge on denial rather than dominance.

Lesson #2 For U.S.

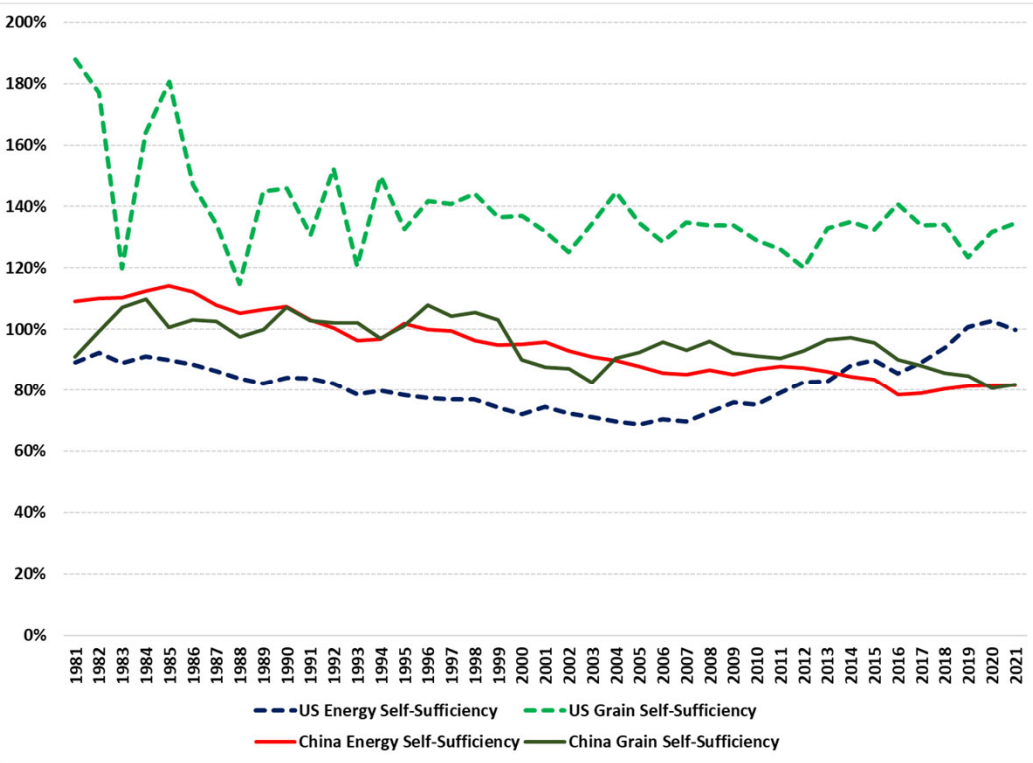
**Existential Competition Is Forcing U.S. Into a New
Political-Economy Paradigm: The War Economy**

**Macro,
Philosophical
Level: Russia's
Invasion
Likely
Accelerates
an Ongoing
Paradigm
Shift to "War
Economy"**

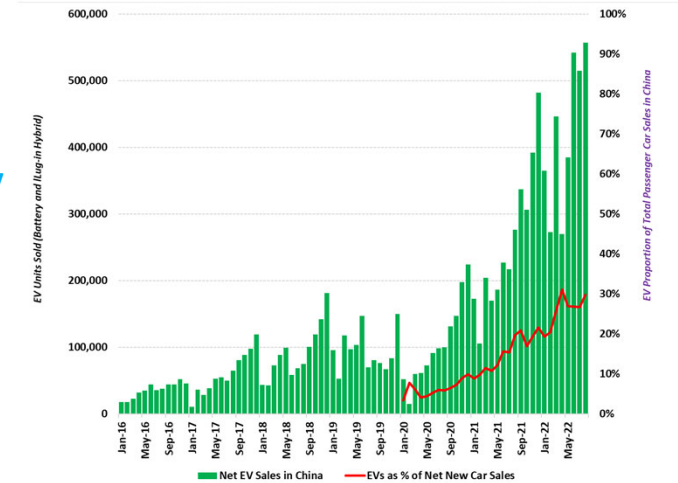


The Tera-States Seek to Insulate Themselves

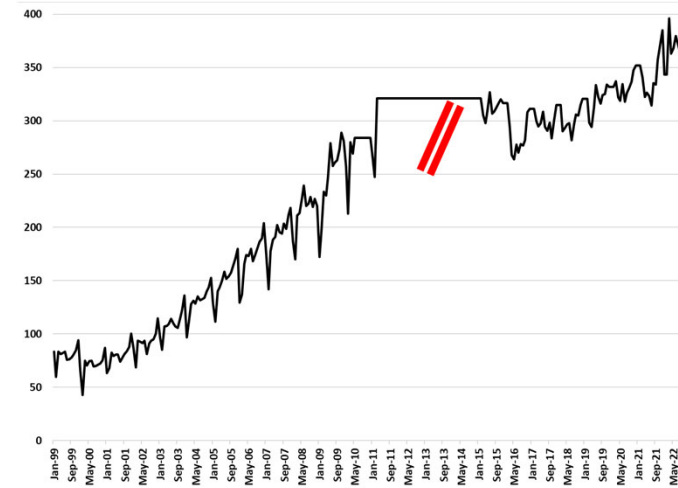
U.S. and China Energy & Food Self-Sufficiency, Production ÷ Consumption



China Battery EV & Plug-In Hybrid Vehicle Sales (Units)

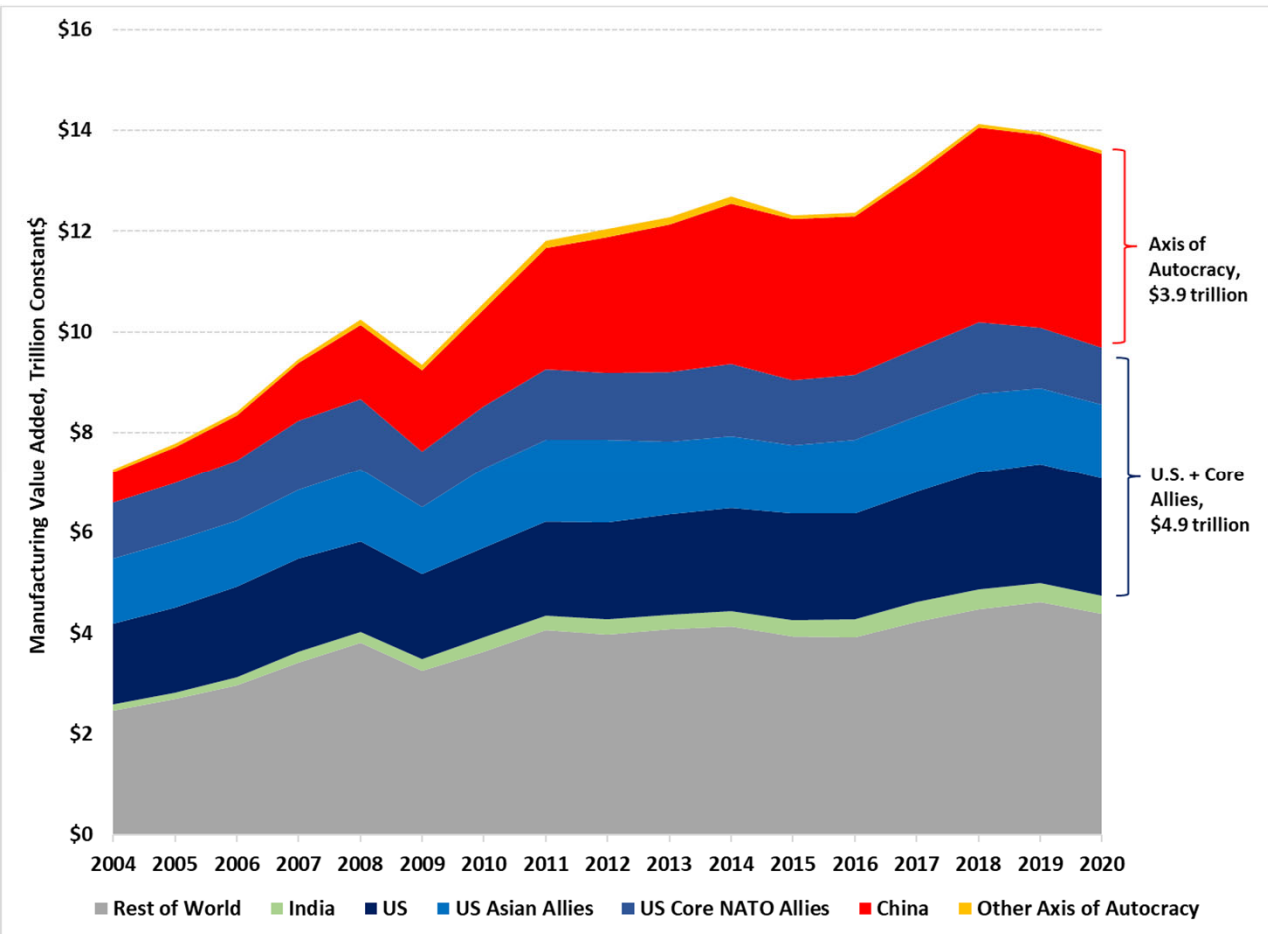


China Domestic Coal Production (Million MT/Month)



Manufacturing Superiority = Endurance = Victory

Manufacturing Value Added, Trillion Constant \$



Source: World Bank, Author's Analysis

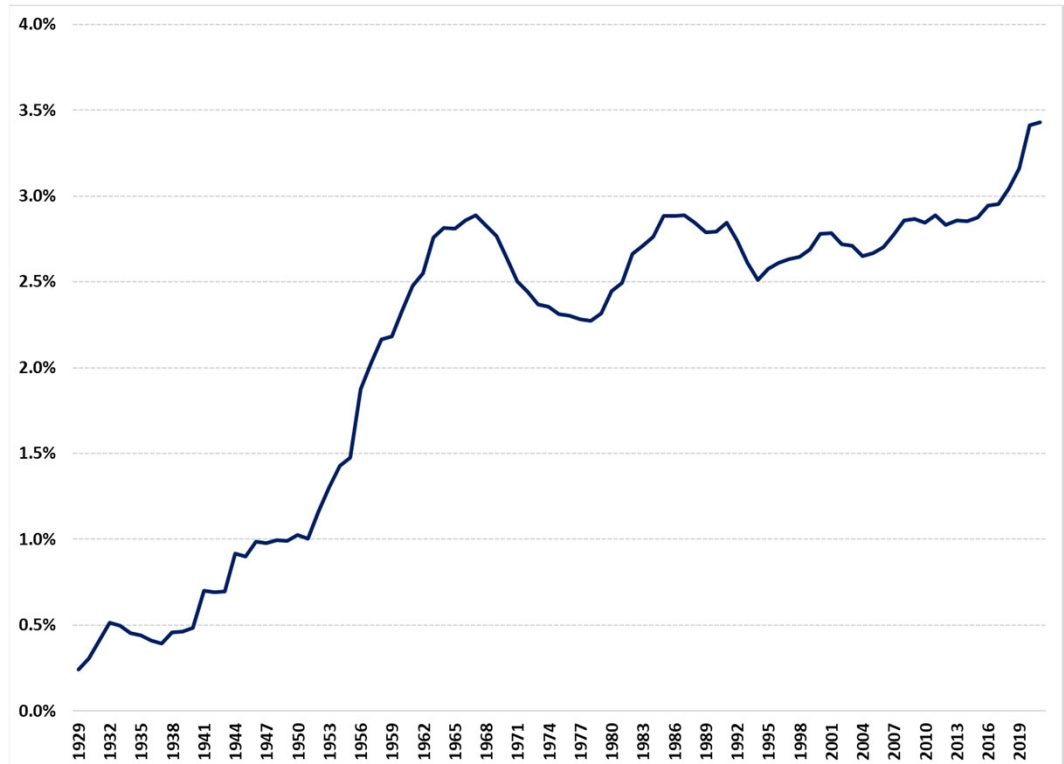
Replenishment Wins Wars

*"I cannot understand these Americans. Each night we know that we have cut them to pieces, inflicted heavy casualties, mowed down their transport. We know, in some cases, we have almost decimated entire battalions. But—in the morning, we are suddenly faced with fresh battalions, with complete replacements of men, machines, food, tools, and weapons. This happens day after day."—German Officer, Normandy, 1944**

U.S. Industrial Policy: Need “Seed Corn, Not Hog Troughs”

- CHIPS and Science Act of 2022—August 2022 (\$52.7 billion)
- The Inflation Reduction Act—August 2022 (\$369 billion)
- **Must avoid a special interest grab bag that emulates distortions, inefficiencies, and long-term erosion of competitiveness caused by overzealous state involvement in places like China, France, and others.**
- Focus on 3-5 critical areas
- Munitions, defense repair, life-critical goods
- Facilitate energy abundance agenda in a way befitting the “Blood, Iron, and Silicon” Great Power competition we’re now in—**carbon fee & dividend likely to play in here**

Research and Development as % of US GDP



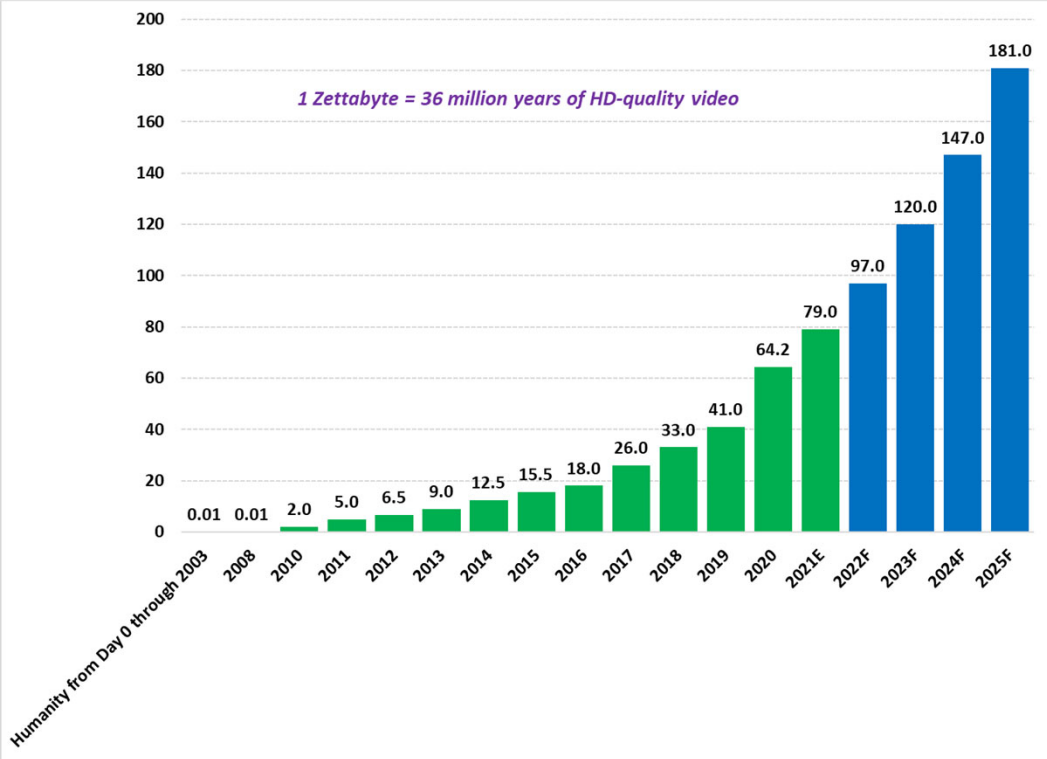
U.S. Bureau of Economic Analysis, Gross Domestic Product: Research and Development [Y694RC1Q027SBEA], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/Y694RC1Q027SBEA>, September 26, 2022.

Lesson #2A For U.S.

**“War Economy” DOES NOT Mean Isolationism or
Curtailment of Private Sector**

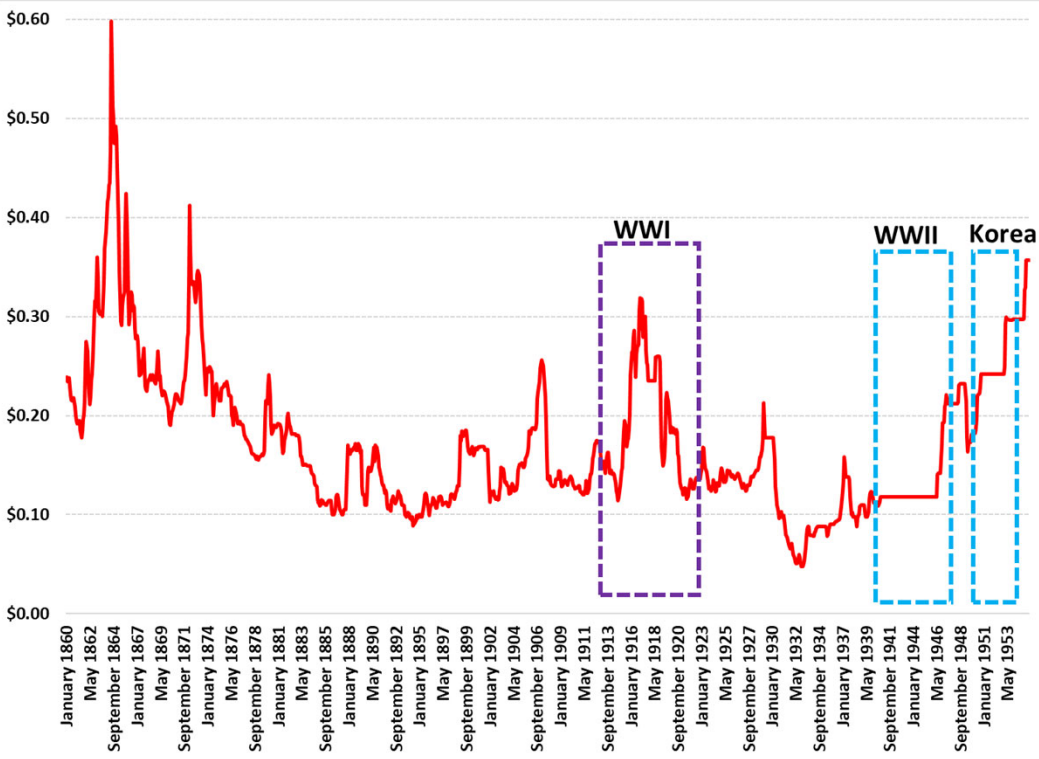
Borders Are Osmotically Penetrable in a World Where Connectivity Defies Politics

Data Created, Consumed, Stored Globally, Zettabytes



Source: Statista

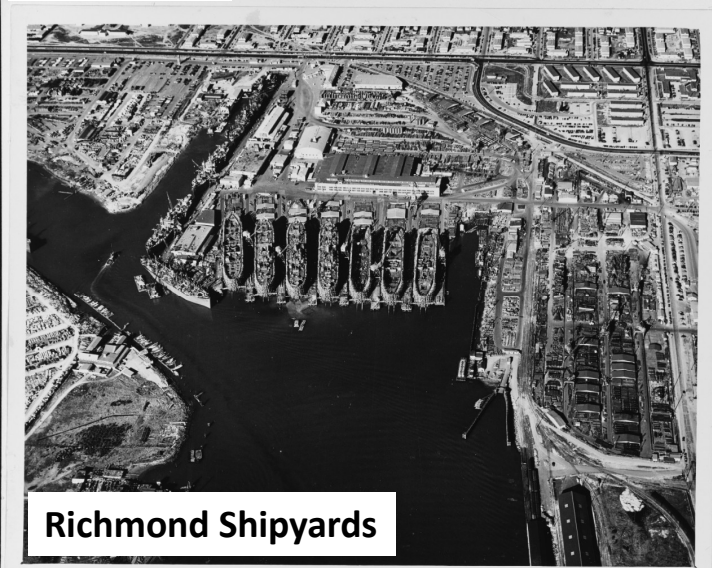
New York Copper Prices, \$/lb (1860-1955)



National Bureau of Economic Research, Wholesale Price of Copper, Electrolyte for New York [M0415BUS000NYM267NNBR], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/M0415BUS000NYM267NNBR>, <https://fred.stlouisfed.org/series/M0415AUS35620M267NNBR> September 18, 2022.

Embracing The Titans? Corporate Scale & Innovation

WWII



2022



LOCKHEED MARTIN



And many others...plus emerging players if we can reform our defense ecosystem

China's Parastatals

INVESTIGATION

TECH GIANTS ARE GIVING CHINA A VITAL EDGE IN ESPIONAGE

U.S. officials say private Chinese firms have been enlisted to process stolen data for their country's spy agencies.

BY ZACH DORFMAN
DECEMBER 23, 2020, 6:00 AM

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Specific Critical Areas For Industrial Policy Focus and Investment

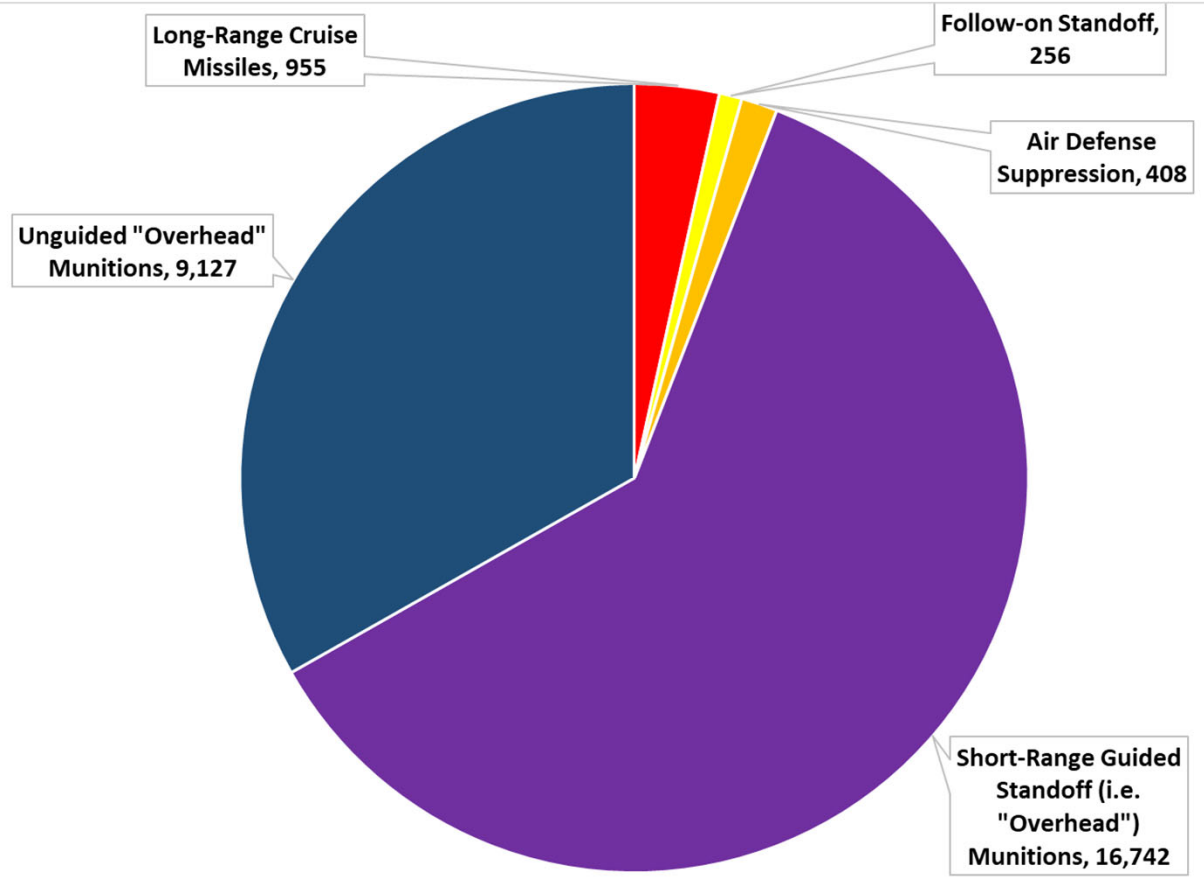
*Hint: Bombs, Repair Facilities, Meds, CHIPS, and SHIPS***

Phrased this way because maritime capacity deserves the legislative attention chips received earlier this year

<https://www.wicker.senate.gov/2017/6/wicker-launches-ships-act>

Item #1: Munitions

U.S. Aerial Munitions Expenditure During Operation Iraqi Freedom Through 30 April 2003



• China is about 22 times physically larger than Iraq and has exponentially more military and strategic industrial and infrastructure points that might be targeted under various scenarios.

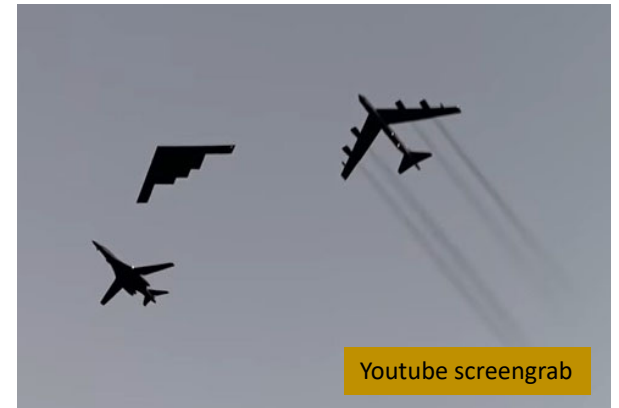
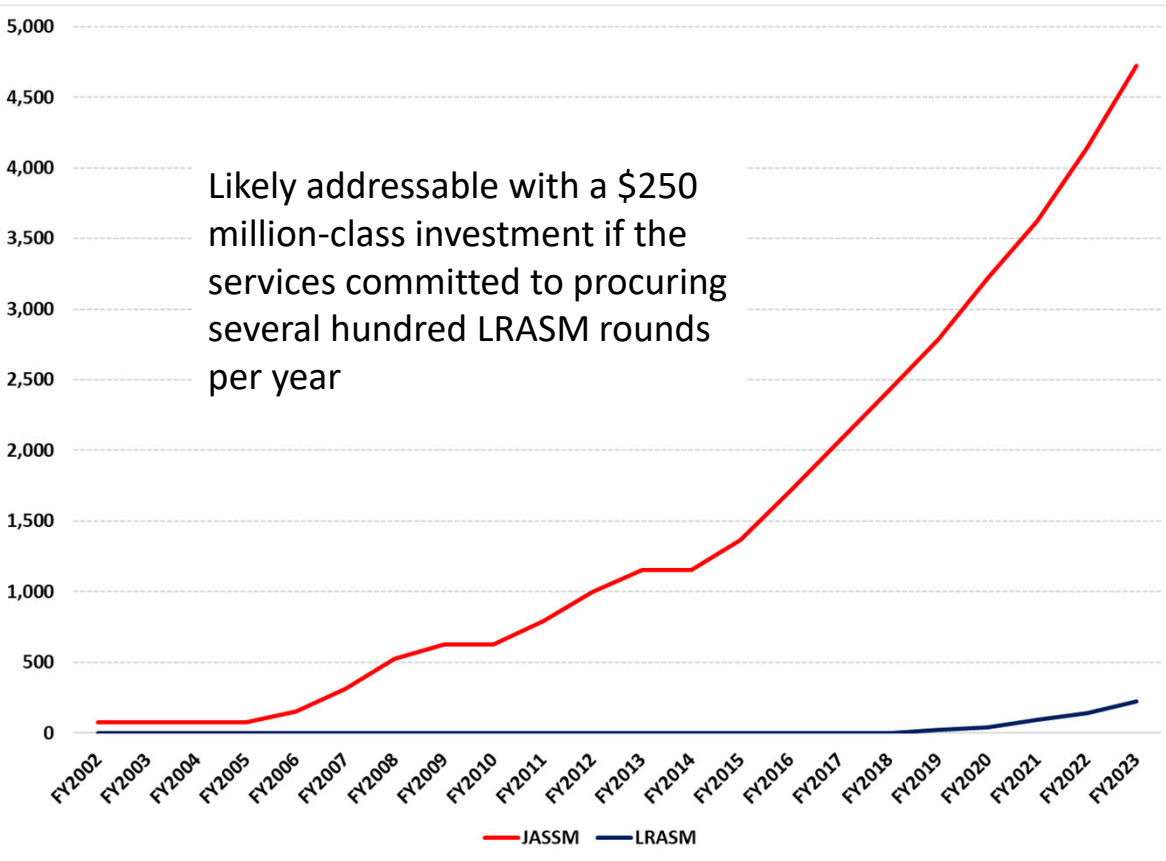


Combat in maritime East Asia would amplify demands, esp. for AAMs, ASCMs & torpedoes.

Source: US CENTAF

Addressable Distortion Example: Maritime Denial Munitions

JASSM and LRASM Historical and FY2023 Est. Procurement



Youtube screengrab



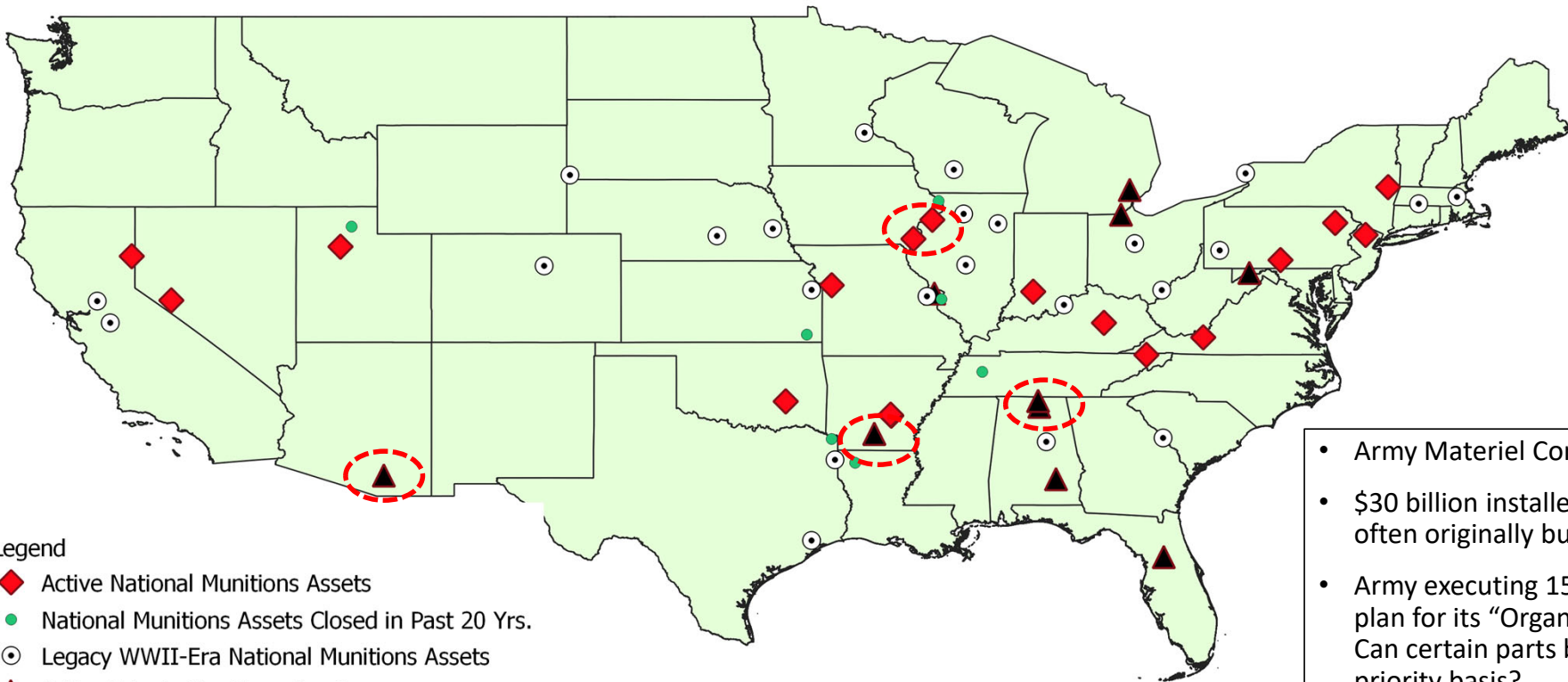
Lockheed Martin

Major asymmetric US advantage for targeting China's navy

<https://warontherocks.com/2022/09/defeat-chinas-navy-defeat-chinas-war-plan/>

Source: DoD, Author's Analysis

U.S. Munitions Manufacturing Base: Past and Present



Legend

- ◆ Active National Munitions Assets
- National Munitions Assets Closed in Past 20 Yrs.
- Legacy WWII-Era National Munitions Assets
- ▲ Active Private Munitions Assets

- Army Materiel Command key
- \$30 billion installed base, facilities often originally built during WWII
- Army executing 15-year modernization plan for its “Organic Industrial Base” — Can certain parts be accelerated on a priority basis?
- Facilities’ geographic footprint should help encourage bipartisan embrace of the opportunity to enhance local economic opportunities that bolster national security over the long-term

Item #2: Repair Capabilities

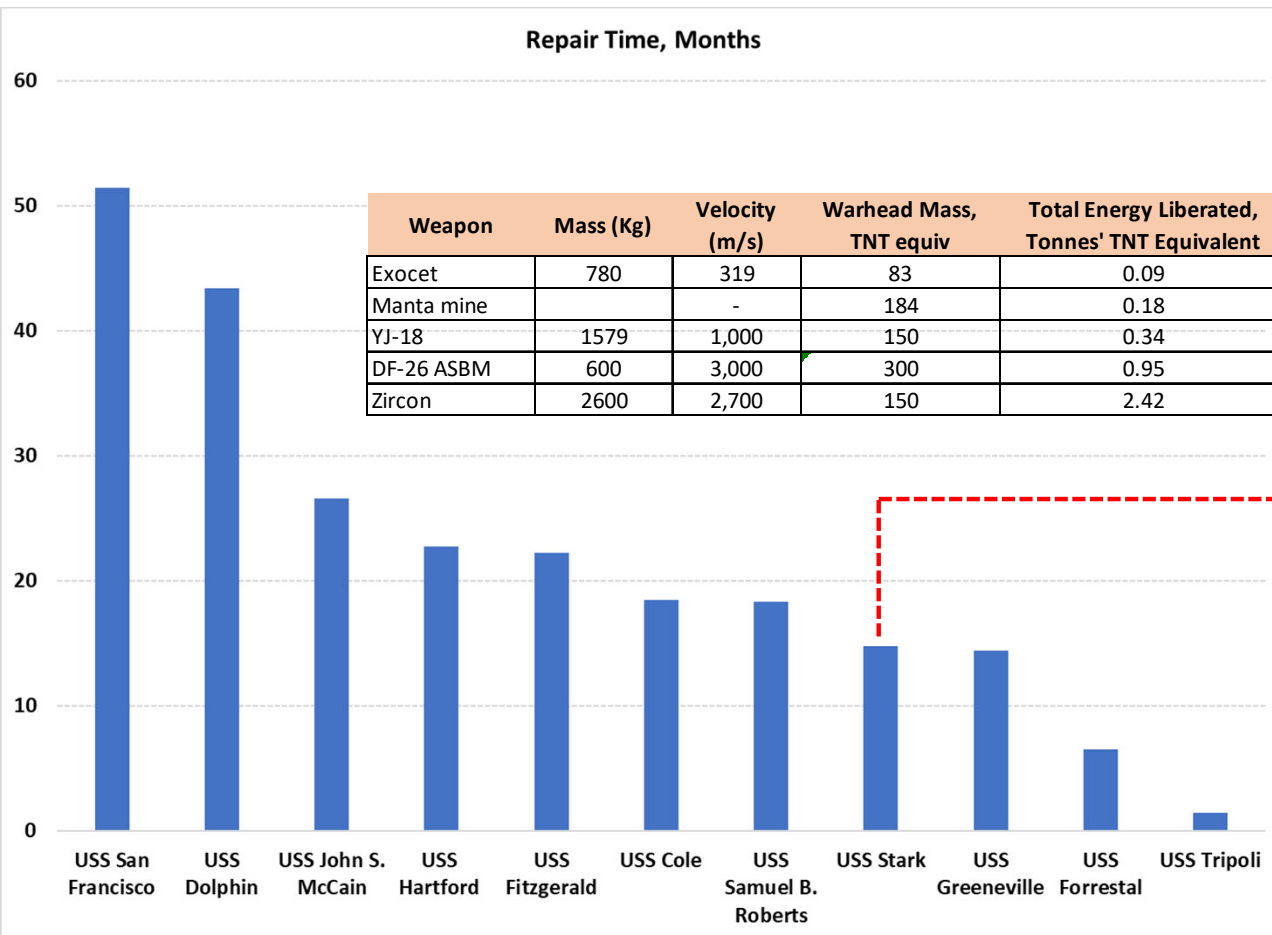
- *“The most dramatic demonstration of the importance of the mobile drydocks was given during the long drawn-out naval support of the invasion of Okinawa, when the fleet was subjected for weeks to continual and desperate “Kamikaze” attacks by Japanese suicide-bombers.”*
- *“The fleet suffered great damage, but the ready availability of the mobile drydocks at nearby advance bases, and the yeoman service rendered by their own crews and the ship repair components at these bases, save many ships and minimized the time ships were out of action for repairs, to such an extent that these docks may well have represented the margin between success and failure.”--Building the Navy's Bases in World War II, Volume I (Part II), Naval History and Heritage Command*

Apra Harbor, Guam (1945): USS ABSD-3 Large Auxiliary Floating Dry Dock repairing USS Pennsylvania after kamikaze attack.

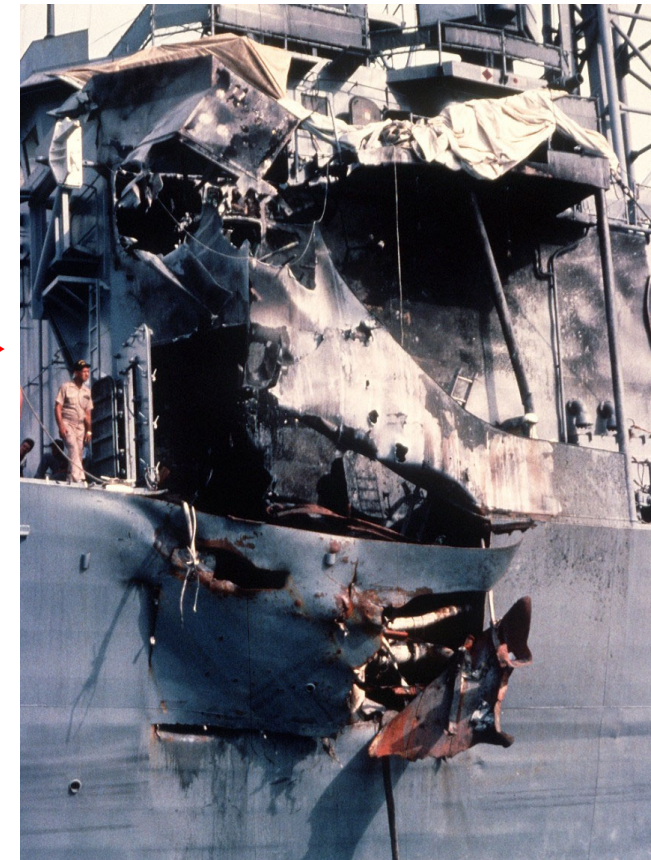


Source: <http://www.navsource.org/archives/09/67/6703.htm>

We Will Need to Regenerate Military Power While Fighting

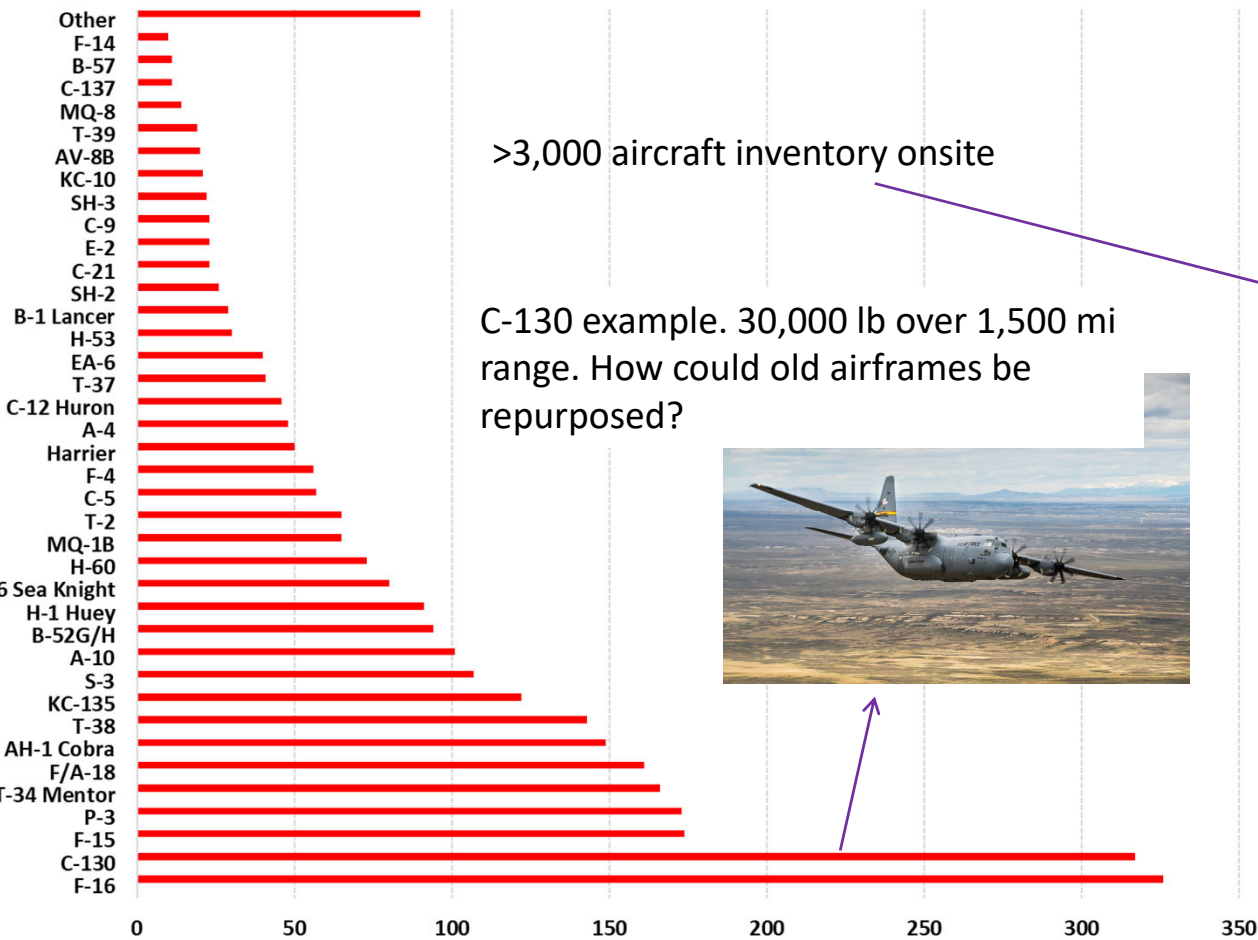


Contemporary anti-ship missiles can have 4-25X the energy of what struck USS Stark in 1987



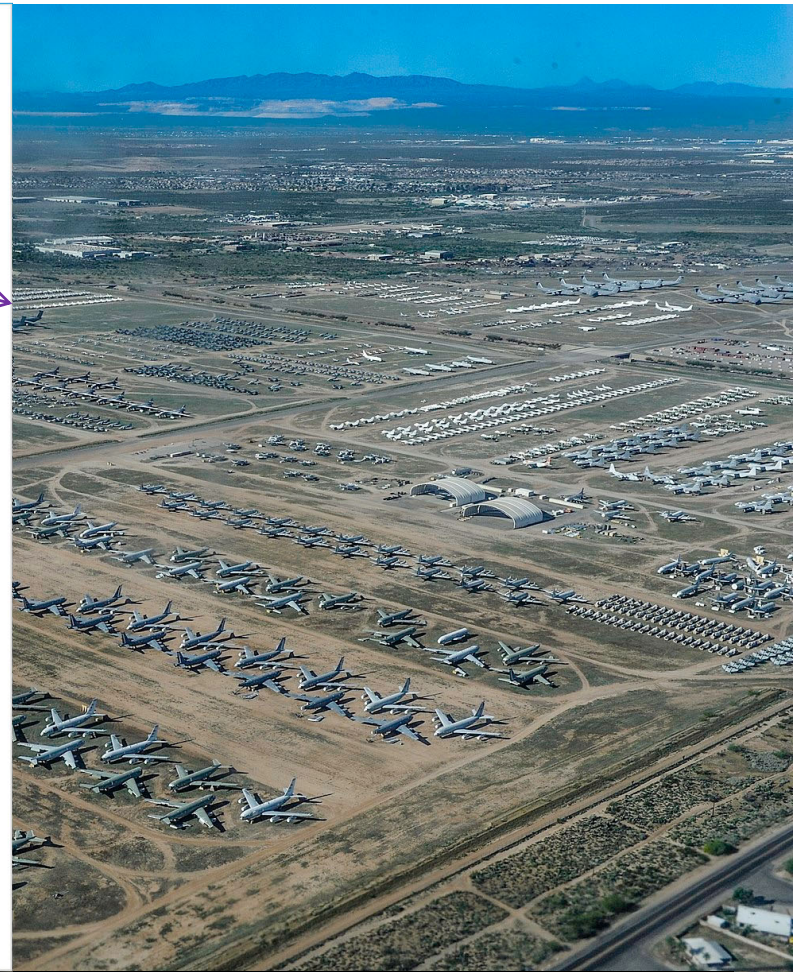
Source: US Navy, Local Media

Tap the Boneyards and Expand Shipyards



>3,000 aircraft inventory onsite

C-130 example. 30,000 lb over 1,500 mi range. How could old airframes be repurposed?



Item #3: Pharmaceutical/Life Critical Goods Supply Chains

Positive Early Action Example: Re-Shoring Amoxicillin Production, East Tennessee, Initial Investment of \$16 million

- India is world's largest producer of generic medications and, according to an August 2020 WSJ report, obtains 80% of the active pharmaceutical ingredients in those medicines from PRC-based producers.
- U.S. consumers have already fallen victim to contaminated PRC-origin medications (NDMA contamination of blood pressure meds)
- Distinct risk that medication supplies could be weaponized during a conflict.
- **“We are at the mercy of others when it comes to computer chips, but we are the world's largest exporter of raw materials for vitamins and antibiotics...Should we reduce the exports, the medical systems of some western countries will not run well.”**—Li Daokui, Tsinghua University, member of the Monetary Policy Committee of the People's Bank of China, delegate to the Beijing People's Congress CPPCC member.

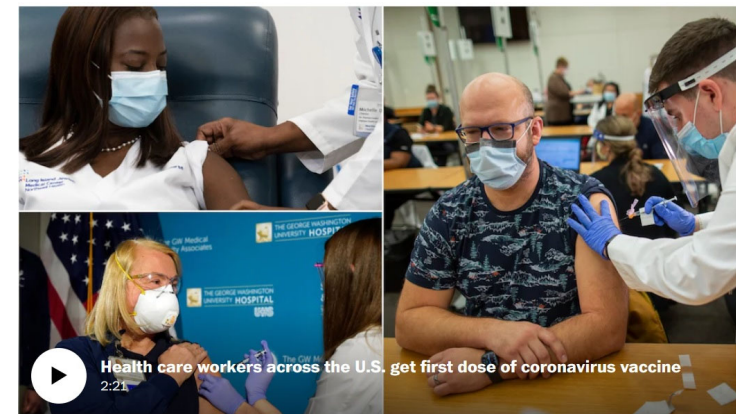


Covid-19 Vaccines Offer Contemporary Example of Successful Public Private Partnership to Address National Security Threat



May 2020

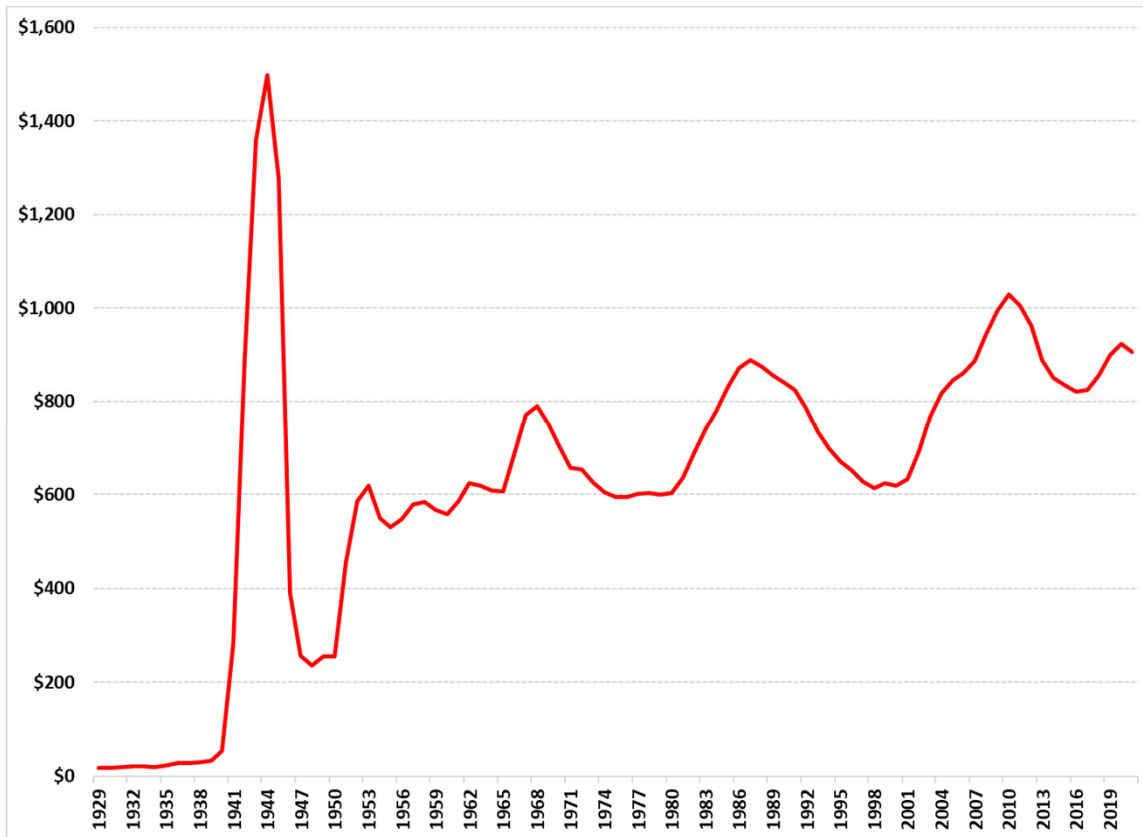
- Private firms had developed the underlying mRNA vaccine technology
- What would normally take 10 years took about 10 months
- Private investment led the way—government’s job was to condition the risk environment and help facilitate production scale-up



December 2020

Core Challenge: Cyclical Defense Expenditures

U.S. Federal Gross Investment in National Defense, Billion 2021\$



- In what areas should DoD consider funding “hot” spare production capacity?
- Can “block buying” of key munitions and platforms help?

U.S. Bureau of Economic Analysis, Government consumption expenditures and gross investment: Federal: National defense [A824RC1A027NBEA], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/A824RC1A027NBEA>, September 9, 2022.

Lesson #3 For U.S.

We Need Allies, Adherence to Principles Bigger Than Our Own Narrow National Interests, And Embrace of An Abundance Agenda to Win in This Latest Competition of Systems

We Will Win Based on Fighting “For Something” More Than We Do “Against Something”

YouTube ^{CA}

Search



Ukrainian leadership gets this.

*For us, the most terrible iron is not missiles,
aircraft and tanks, but shackles*

7:47 / 9:43



Zelensky's gives emotional speech to mark Ukraine's independence day - in full

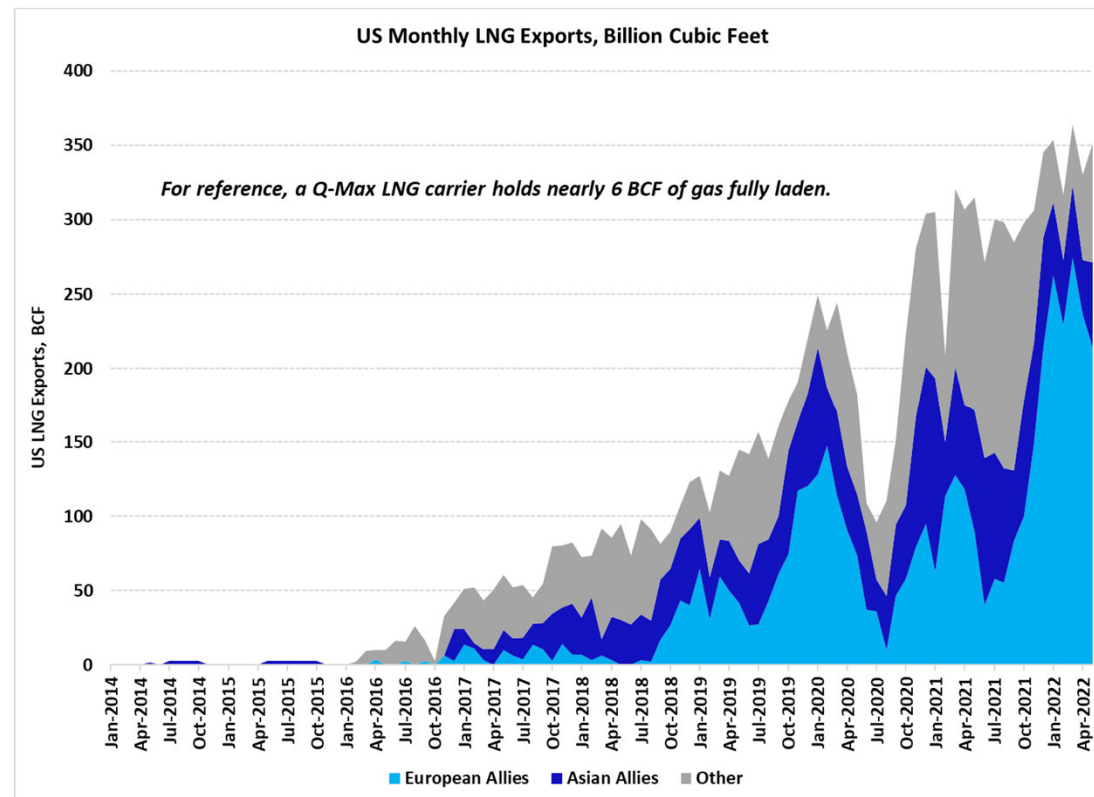
Confront Revisionist Aggression With Abundance, Not Deprivation

First It Was Food...

- **“Contrary to the general impression, our main exports to Europe have not been the weapons of war...The explanation for our great increase in exports is found rather in the group we call *food*, especially in breadstuffs.”**—Edwin Clapp, 1915*
- **“..agriculture is one segment of our economy already geared to meet any emergency challenge, already offering us fully productive resources to meet any threat of Soviet economic warfare throughout the world.”**—United States Senate, Committee on Agriculture and Forestry, 1958**

*ECONOMIC ASPECTS OF THE WAR: NEUTRAL RIGHTS, BELLIGERENT CLAIMS AND AMERICAN COMMERCE IN THE YEARS 1914-1915, <https://net.lib.byu.edu/estu/wwi/comment/Clapp/ClappTC.htm#TC>; **"Food and fiber as a force for freedom: report by Senator Hubert H. Humphrey to the Committee on Agriculture and Forestry, United States Senate on policies and operations under the agricultural trade development and assistance act (Public Law 480, 83d Cong.) and its relationship to foreign policy", Senate Committee on Agriculture and Forestry," 21 April 1958, <https://books.google.com/books?id=ll1-xQEACAAJ&printsec=frontcover#v=onepage&q=economic%20warfare&f=false>

...Now It's Also About Energy



Source: EIA, Authors' Analysis

And Do So Knowing the Fight is Likely to Be Long, But Certainly Worthwhile

- Even if demographic & economic factors short circuit China's quest for superpowerdom, in most scenarios short of collapse, it will pose a multi-decade competitive challenge.
- Russia is a “persistent power” but we don't really have a contemporary model for what a post-Decade of Danger China might look like.
- Adroit U.S. domestic policy and its management of key relationships abroad will be essential to prevailing in the incipient Cold War 2.0
- Past performance does not guarantee future returns but it provides some guidance templates.

Prevailing in one strategic contest...



Thank You!

Questions, Comments, Hate Mail? Please send to gbc3@rice.edu

Additional Reading

- Gabriel Collins and Gopal Reddy, “**China’s Growing Water Crisis**,” Foreign Affairs (Snapshot), 23 August 2022, <https://www.foreignaffairs.com/china/chinas-growing-water-crisis>
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- Gabriel B. Collins and Andrew S. Erickson, “**China Is Laying Climate Traps for the United States**,” Foreign Policy, 2 September 2021. <https://foreignpolicy.com/2021/09/02/china-climate-traps-carbon-dioxide-emissions/>
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- Gabriel Collins and Andrew S. Erickson, “**Economic Statecraft: Options for Reducing U.S. Overdependence on Chinese-supplied Materials and Medications**,” Baker Institute Report, 23 April 2020, Rice University’s Baker Institute for Public Policy, Houston, Texas, <https://www.bakerinstitute.org/media/files/files/000f91f7/bi-report-042320-ces-statecraft.pdf>