# UT Octos vs Northland LB

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### 1

#### Counterplan:

#### The Republic of Kenya should

#### recognize an unconditional right of workers to strike with the exception of dock workers

#### make striking by all dock workers a federal crime and implement penalties modelled after New York City Taylor Law including two-for-one fines, lifetime bans from federal jobs, and jail time.

#### The CP shuts down Port Strikes.

Bauernschuster et Al 17, Stefan, Timo Hener, and Helmut Rainer. "When labor disputes bring cities to a standstill: The impact of public transit strikes on traffic, accidents, air pollution, and health." American Economic Journal: Economic Policy 9.1 (2017): 1-37. (Faculty of Business Administration and Economics, University of Passau, Innstra)//Elmer

New York City's **Taylor Law,** which was put into effect **in response to a transit strike** in 1966, represents an example of a particularly draconian measure. Under Section 210, the law **prohibits** any **strike or** other concerted **stoppage** 01 worn or slowdown by public employees (Division of Local Government Services 2009). Instead, it prescribes binding arbitration by a state agency to resolve bargaining deadlocks between unions and employers. **Violations** against the prohibition on strikes are **punishable with hefty penalties**. The fine for an individual worker is **twice** the striking employee's **salary** **for each** **day** the strike lasts. In addition, union leaders face **imprisonment**. Since its inception in 1967, the Taylor Law has generated a lot of controversy. To proponents, it was **successful in averting several potential transit strikes** that would have imposed significant costs on the city and its inhabitants (OECD 2007). Indeed, New York City has only seen two transit strikes over the past four decades—in 1980 and in 2005. In both cases, harsh monetary penalties were imposed on workers and unions. The 2005 transit strike additionally led to the imprisonment of a union leader, and saw the Transport Workers Union (TWU) filing a formal complaint with the ILO. Since then, the ILO has urged the United States government to restore the right of transit workers to strike, arguing that they do not provide essential services justifying a strike ban (Committee on Freedom of Association 2011, 775). So far, the Taylor Law has not been amended in this direction.

#### Kenyan dock worker strikes coming now.

Atieno 11/10 “Kenya: Port Workers to Down Tools in Pay Row” Winnie Atieno 10 NOVEMBER 2021 <https://allafrica.com/stories/202111110052.html> SM

Kenya: Port Workers to Down Tools in Pay Row

More than 5,000 workers at East Africa's biggest port are set to down their tools over a pay rise dispute with the Salaries and Remuneration Commission (SRC).

The Dock Workers Union (DWU) has issued a seven-day strike notice barely a month after the Labour and Social Welfare Committee of the National Assembly ordered the SRC to implement the 2020/2021 Collective Bargaining Agreement.

The union was supposed to register the two-year CBA at the Employment and Industrial relations Court that would see the Kenya Ports Authority (KPA) give the workers a 10 per cent salary raise. But DWU said it had reached a "dead end" with SRC.

"We have issued a seven-day strike notice because of the hard stance taken by management on the issue of overdue promotions. This is a protected strike notice after we reached a dead end on this matter," DWU Secretary General Simon Sang said in a statement. The DWU boss said the workers were yet to receive a commitment letter from SRC to the KPA management on the 2020/2021 agreement.

The union said KPA had confirmed that they had no objection to overtime above 30 per cent as provided for in the human resource manual, on condition that approval is granted by the managing director.

"The sectional shop stewards are now required to take full responsibility in ensuring that requests for such overtime are made and fully processed two days before the date scheduled to undertake the overtime," said the unionist, adding, workers "do not want to earn according to the national wages guidelines".

"Instead, we want to rely on global port salary guidelines because we are the interface between Kenya and the world".

In a recent interview, the unionist said his recent appointment to the Maritime Wages Council will boost port workers' agitation for better salaries.

#### Dock worker strikes disrupt regional trade.

Burite 15 “Strike at East Africa’s Biggest Harbor Disrupts Regional Trade” Joseph Burite July 3, 2015 <https://www.bloomberg.com/news/articles/2015-07-03/strike-at-east-africa-s-biggest-harbor-disrupts-regional-trade> SM

Strike at East Africa’s Biggest Harbor Disrupts Regional Trade

A strike by Kenyan dock workers at the port of Mombasa disrupted trade for five neighboring countries that rely on East Africa’s biggest harbor for their shipments of goods, the Kenya Ports Authority said.

Members of the Dock Workers Union stopped working on Wednesday because of a dispute over salary deductions to pay for a national-health insurance program, Gichiri Ndua, the managing director of the Mombasa-based authority, said in an e-mailed statement. The stoppage is unwarranted, he said.

“There is no trade dispute registered between the Dock Workers Union and Kenya Ports Authority,” Ndua said. “The strike is therefore uncalled for and has caused undue disruption to port operations. It has adversely affected business in Kenya and the entire region.”

Kenya is the world’s biggest exporter of black tea and Mombasa hosts one of the world’s largest auctions of the leaves. The harbor serves landlocked countries including Uganda, Africa’s top shipper of coffee, Rwanda, Burundi, South Sudan and eastern Democratic Republic of Congo.

A separate strike by dock workers over a new biometric time-management system ended on Monday. The stoppage barred hundreds of trucks from entering or leaving the port.

#### Regional Economic Integration solves Terrorism.

**Demeke 14**, Memar Ayalew, and Solomon Gebreyohans Gebru. "The Role of Regional Economic Communities in Fighting Terrorism in Africa: The Case of Inter-Governmental Authority on Development (IGAD)." *European Scientific Journal* (2014). (Addis Ababa Science and Technology University, Governance and Regional Integration at the Pan-African University, Institute of Governance, Humanities and Social Sciences, Cameroun)//Elmer

**In Africa, Regional Economic Communities** (RECs) were initially established to tackle the economic challenges of the continent. However, overtime, they **expanded** their **mandate to deal with the security threats of the continent such as terrorism.** In fact, the fight against terrorism has been internationalized following the September 9/11 terrorist attack in the U.S.A. Since then, **RECs have been giving considerable attention to preventing and combating terrorism in their respective regions**. Similarly, IGAD has been involved in preventing and combating terrorism. So far, however, little has been done with regard to what IGAD has performed in fighting terrorism. Therefore, this study was intended to describe and analyze the legal and practical activities carried out by IGAD in its fight against terrorism in the region general and in Somalia in particular. Both descriptive and analytical methods were employed and data were analyzed through qualitative approach. Finally, based on the findings, the study argues that, instead of overreliance on hard power as a means of fighting terrorism, IGAD should invest more on the political and socio-economic problems of its member states so as to address the root causes. Keywords: Regional Economic Communities, IGAD, Terrorism, Treaties The Genesis of Regional Economic Communities in Africa The idea and practice of regional integration in Africa is not a new phenomenon. Africa has a long track record of economic cooperation and regional integration since independence in the 1960s (Bourenance, 2002). The changing nature of the international **trade** due to the globalization of the world economy has **increased** the urgency of **economic cooperation and integration among African countries** to gain a large share and benefits from the international trade.

The urgency for regional economic communities in Africa has been reinforced by both external and internal factors (Memar, 2012). Externally, the end of the Cold War and the acceleration of the globalization process, along with Africa‘s risk of further marginalization from the global market, presented the **establishment of regional economic communities (RECs) as an imperative**. According to Okoth (2004), the emergence of a strong desire to have regional economic communities was a clear response to the events of the end of the Cold war. In fact, in Africa, there had been regional economic communities such as the Economic Community of Western African States (ECOWAS), Southern Africa Development Community (SADC), East African Community (EAC) and Inter-Governmental

Authority on Drought and Desertification (IGADD) prior to the culmination of the Cold War, Internally, the **proliferation of intra-state conflicts in Africa** following the withdrawal of the then Super powers (the U.S.A and U.S.S.R), **necessitated the establishment of RECs as the only mechanism to handle the security matters of the continent**. The prevalence of bad governance, human rights violation, poverty, humanitarian catastrophe and environmental degradation presented the argument that RECs are the essential vehicle to address these key challenges by promoting maximum mobilization of regional resources while minimizing external dependence. There was also a recognition that regionalism could create a springboard for economic liberalization and fee movement of labour which would enable neighbouring countries to deepen commercial ties and to solidify their economies through

harmonization of polices for mutual benefits and joint regional development. The imperatives of RECs has also to do with the dynamism and the complexity of the global economy, as an instrument to increase flow of investment and to promote economic growth through better leverage in international trading (Ndomo, 2009). It also offers the opportunity to broaden national markets and production scales; and to advance trade in services and inter-regional investments. According to the first report of the United Nations Economic Commission for Africa (ECA), regional integration provides a number of opportunities which includes but not limited to sustainability; increased foreign and domestic investment; increased global competitiveness; promotion of regional public goods; prevent

conflict; consolidation of economic and political reforms (ECA, 2004).

The genesis of a concerted effort to integrate the African continent economically can

be traced directly to the Lagos Plan of Action and to the OAU Charter. This effort resulted in the adoption of the Treaty Establishing the African Economic Community (The Abuja Treaty) in June 1991. The Abuja Treaty recognizes RECs as the only viable means to overcome underdevelopment and the security challenges of the continent (The Abuja Treaty, 1991). It emphasis, in one way or another, the need for regional integration given ―the nature of Africa‘s economies, which, being small and fragmented, stand to enjoy a variety of economic benefits that would come from integration, in addition to becoming a stronger voice in international economic decision-making‖ (Janneh, 2012).

The African Economic Community (AEC) was established as an integral part of the OAU with the primary objective of promoting the integration of African economies. In this regard, Chapter XIX of the treaty emphasizes the importance of establishing the AEC ―through the coordination, harmonization, and progressive integration of the activities of regional economic communities‖ (Abuja Treaty, 1991). It further underscores that member states have the responsibility ―to promote the coordination and harmonization of the integration activities of regional economic communities of which they are members with the activities of the community‖ (Ibid, 1991). In addition, Article 3 of the Constitutive Act of the African Union also recognizes the need ―to coordinate and harmonize the policies between the existing and the future RECs for the gradual attainment of the objectives of the Union‖ (AU Constitutive Act, 2002). However, multiplicity of membership, lack of political commitment coupled with ineffective organizational structure and regulatory policies have impeded their success and the delivery of expected outcomes. In this regard, Naceur Bourenane has summarized constraints which have been hindering the process of regional integration in Africa into six categories. These are: i) infrastructural constraints; ii) institutional constraints, which refers to organizational matters and choice of economic policy; iii) constraints related to country‘s economic structure; iv) those concerning the international environment and its changes; v) constraints linked to the players involved and their strategies; and vi) conflicts. Among other things, lack of well established infrastructures continue to be the biggest challenge of the RECs which has been obstructing the expansion of cross-border regional trade and the deepening of economic integration by combating security threats such as terrorism and piracy. Although the challenges differ from region to region, terrorism, for instance, have been the most challenging security threats of IGAD.

**Regional Economic Integration solves Terrorism.**

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The urgency for regional economic communities in Africa has been reinforced by both external and internal factors (Memar, 2012). Externally, the end of the Cold War and the acceleration of the globalization process, along with Africa‘s risk of further marginalization from the global market, presented the **establishment of regional economic communities (RECs) as an imperative**. According to Okoth (2004), the emergence of a strong desire to have regional economic communities was a clear response to the events of the end of the Cold war. In fact, in Africa, there had been regional economic communities such as the Economic Community of Western African States (ECOWAS), Southern Africa Development Community (SADC), East African Community (EAC) and Inter-Governmental

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The African Economic Community (AEC) was established as an integral part of the OAU with the primary objective of promoting the integration of African economies. In this regard, Chapter XIX of the treaty emphasizes the importance of establishing the AEC ―through the coordination, harmonization, and progressive integration of the activities of regional economic communities‖ (Abuja Treaty, 1991). It further underscores that member states have the responsibility ―to promote the coordination and harmonization of the integration activities of regional economic communities of which they are members with the activities of the community‖ (Ibid, 1991). In addition, Article 3 of the Constitutive Act of the African Union also recognizes the need ―to coordinate and harmonize the policies between the existing and the future RECs for the gradual attainment of the objectives of the Union‖ (AU Constitutive Act, 2002). However, multiplicity of membership, lack of political commitment coupled with ineffective organizational structure and regulatory policies have impeded their success and the delivery of expected outcomes. In this regard, Naceur Bourenane has summarized constraints which have been hindering the process of regional integration in Africa into six categories. These are: i) infrastructural constraints; ii) institutional constraints, which refers to organizational matters and choice of economic policy; iii) constraints related to country‘s economic structure; iv) those concerning the international environment and its changes; v) constraints linked to the players involved and their strategies; and vi) conflicts. Among other things, lack of well established infrastructures continue to be the biggest challenge of the RECs which has been obstructing the expansion of cross-border regional trade and the deepening of economic integration by combating security threats such as terrorism and piracy. Although the challenges differ from region to region, terrorism, for instance, have been the most challenging security threats of IGAD.

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#### Cross apply 1AC impacts

### 2

#### Counterplan:

#### The Republic of Kenya should recognize a conditional right of essential service workers to strike dependent on the creation of a minimum service agreement

#### The Republic of Kenya should recognize an unconditional right of non-essential service workers to strike

#### None of their evidence advocates for the plan – control F unconditional in their cards. Their solvency evidence explitily concludes that minimum standards for strikes that ensure SOME essential service workers provide services not only solve the aff but are necessary for public health, which straight turns advantage 2

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This has led to the conclusion of "minimum service agreements".[47](http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S1727-37812020000100006" \l "back_fn47) Such agreements intend to allow certain employees in an industry designated as an essential service to strike, while at the same time maintaining services and personal safety. As alluded to above, the ILO supervisory bodies have considered minimum service agreements to be appropriate instruments for use in this context. However, two requirements have to be met. Firstly, the service required must genuinely and exclusively be a minimum service and must be limited to operations that are strictly necessary in order to meet the basic needs of the population or the minimum requirements of such services. Secondly, workers' organisations should be able to participate in defining such services, along with employers and the public authorities.[48](http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S1727-37812020000100006" \l "back_fn48) Where strikes have been prohibited, as in the case of essential services in Kenya, adequate protection should be given to the employees. As experienced in Kenya from 2017-2018 in public hospitals, the "blanket" prohibition of strikes in essential services has far-reaching implications. Upon that understanding, therefore, a solution should not be to impose a total prohibition of strikes in essential services. Instead, adequate legislative measures and inclusive processes for resolving labour disputes are necessary. For that reason, this article recommends that Kenya should take urgent legislative measures to introduce provisions that would require parties in an essential services dispute to conclude a minimum service agreement before embarking on a strike. As the ILO recommends, a minimum service is required rather than a total provision of services, the requirement of which would lead to a prohibition of strikes.[49](http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S1727-37812020000100006" \l "back_fn49) Furthermore, a minimum service could be appropriate in situations where a limitation of the right to strike or a total prohibition of strike action would not appear to be justified. In allowing the right to strike to be exercised by a majority of employees, attention should be given to ensure that basic needs are met and that facilities operate safely or without interruption

#### Also solves court legitimacy – their ev

**AC Gathongo**, Johana, **and** Leah **Ndimurwimo 20**. (Dr Johana Kambo Gathongo is currently a Law Lecturer and Ag. Dean at the University of Embu, School of Law. He teaches Tort Law and Legal Research and Writing. Dr Gathongo received his Legum Baccalaureus (LLB) degree, Master of Laws (LLM) degree and Doctor of Laws (LLD) degree from the Nelson Mandela University (NMU). He also holds a Post Graduate Diploma in Labour Law Practice directed by the Commission for Conciliation Mediation and Arbitration (CCMA – South Africa). While at NMU, Dr Gathongo served as a Teaching Assistant, a Supplemental Instruction (SI) Leader and Supplemental Instruction Coordinator. He is also a research associate at Nelson Mandela University, Faculty of Law in South Africa. He has supervised and still supervises Masters (LLM – research) and examines students’ in the field of Labour law at Nelson Mandela University, Faculty of Law. Dr. Gathongo also writes frequently for publications. He is the author or co-author of many papers in international refereed journals and has contributed in conferences. He serves as a peer reviewer for the Journal of Law and Ethics – Kabarak University. Besides working at NMU, Dr Gathongo has also worked at Rhodes University in South Africa as an acting Employee Relations (ER) Manager. While there, he represented the University at the CCMA proceedings, initiated staff disciplinary hearing, advised Heads of Department (HoDs) on various institutional matters, assisted in drafting, reviewing and amending internal Policies, provided advice on various amendments to labour legislation, monitored compliance with internal University Policies, labour and other relevant legislation. He subsequently held the position of Senior Administrator: Legal, Support, Projects and Services at Rhodes University until 30 June 2019. Research Interests - His research is situated in the field of Law, with a special focus on Labour Law.) (Dr Ndimurwimo is an academic in South African and international law. She hold an LLD in Public International Law from the [North-West University](http://www.nwu.ac.za/) (South Africa), LLM in Labour Law from the then Nelson Mandela Metropolitan University, now [Nelson Mandela University](https://www.mandela.ac.za/) (South Africa), and LLB from Tanzania.  She currently lectures undergraduate students in Higher Certificate in Criminal Justice, Diploma in Law Enforcement, and LLB programs. Along with that, supervise both undergraduate and postgraduate law students in labour law, public law, and multidisciplinary studies. She is an author and co-author of peer-reviewed publications on violations of human rights in Africa. She reviews manuscripts for accredited journals and examines postgraduate studies (Masters and Doctorate) from other universities.  She presented a number of conference papers at national and international levels.  She has been working at [Nelson Mandela University](https://www.mandela.ac.za/), as a lecturer/ senior lecturer from 2006- to date. her passion lies in, international human rights; humanitarian law; constitutional law, refugee law; transitional justice and labour law in Africa; research and most importantly, teaching and motivating students to reach their greatest potential.) "Strikes in Essential Services in Kenya: The Doctors, Nurses and Clinical Officers' Strikes Revisited and Lessons from South Africa." The Scientific Electronic Library Online, Nelson Mandela University, Feb. 2020, www.scielo.org.za/scielo.php?script=sci\_arttext&pid=S1727-37812020000100006.//JQ

This article submits that section 81(1)(3) of the 2007 LRA, which declares in peremptory terms that "there shall be no strike in an essential service", fails to meet the standards of fair labour practice and the protection of employees' right to strike as entrenched in the Kenyan Constitution. It is equally important to point out that the 2007 LRA must be aligned with the objectives of the Constitution.  Article 2(4) of the Kenyan Constitution emphasises that "any law that is inconsistent with it is void". In the light of the above, this article recommends that the provisions of section 81(1)(3) of the 2007 LRA, which read with section 78(1 )(f) the 2007 LRA place a blanket prohibition on the right to strike in sectors designated as essential services, should be revisited and amended accordingly.

Furthermore, although the 2007 LRA provides for a mechanism in terms of which sectors can be classified as essential service, it fails to provide the mechanism for concluding minimum service agreements through collective bargaining processes. This article emphasises that addressing the deficiencies under the 2007 LRA in dealing with strikes in essential services would entail introducing the requirement of concluding minimum services agreements in order to ensure the continuity of certain critical services during strikes. Evidently, there is a lack of balance between the right to strike in essential services and the realisation of the constitutional right to access to health care. Consequently, this right continues to be violated. As evident from the above, finding a balance between the right to strike and the right to access to health care services is vital. All deliberations about essential services should be in line with the public interest and constitutional compliance. The Hippocratic Oath taken by health care practitioners' demands that they should do no harm to the patients under their care. The oath places special obligations on public health practitioners towards their patients, including that they take necessary measures to benefit them.

### 3

#### 1AR theory is skewed towards the aff – a) the 2NR must cover substance and over-cover theory, since they get the collapse and persuasive spin advantage of the 3min 2AR, b) their responses to my counter interp will be new, which means 1AR theory necessitates intervention, c) they have a 7-6 advantage on all 1AR offs. Implications – a) drop the arg to minimize the chance the round is decided unfairly, b) use reasonability with a bar of defense or the aff always wins since the 2AR can line by line the whole 2NR without winning real abuse, c) condo and PICs – they set the terms of debate and know the plan better than us, so multiple options ensures the neg doesn’t auto lose after the 1AR, d) multiple shells bad – they can collapse to one and generate a 3:1 skew in ballot access, e) reject 1AR theory if the neg doesn't read theory - definitionally 1:1 ballot access cuz its most reciprocal

## Case

#### Toplevel –

#### 1] Ctrl F “unconditional” – it doesn’t appear anywhere outside the plan text and their definition, is not in either advantage or an actual solvency card – this means you should be heavily skeptical of 1AR spin on solvency deficits and aff solvency

#### 2] Can’t solve – their ev calls for a mediation between worker rights and healthcare access – the squo is all access and no rights, but the plan flips to the other extreme which decks access and can’t solve any offense

#### 3] Right to Strike increases Strikes – best empirical evidence

Pope 10, James. (Professor Pope received an A.B. and J.D. from Harvard, and a Ph.D. in politics from Princeton. From 1974 to 1980, he worked in the metal trades and was an active member of the International Association of Machinists and the Industrial Union of Marine and Shipbuilding Workers. After law school, he clerked for Chief Justice Rose Elizabeth Bird of the California Supreme Court. Prior to joining the Rutgers faculty in 1986, he was associated with the Boston law firm of Segal, Roitman & Coleman, where he represented labor unions and workers. Professor Pope is a member of the National Lawyers Guild and serves on the Executive Council of the Rutgers AAUP/AFT (AFL-CIO). His articles about workers’ rights, constitutional law, and labor history have appeared in a wide variety of publications including the Columbia Law Review, Law & History Review, the Michigan Law Review, the University of Pennsylvania Law Review, the Texas Law Review, the Yale Law Journal, Labor History, New Labor Forum (with Peter Kellman & Ed Bruno), and Working USA (also with Kellman & Bruno).) "The Right to Strike under the United States Constitution: Theory, Practice, and Possible Implications for Canada." Rutgers University Libraries, 2010, scholarship.libraries.rutgers.edu/discovery/fulldisplay/alma991031549922004646/01RUT\_INST:ResearchRepository. //Re-cut by Elmer

In practice, however (with the sole exception of the Wolff Packing case, discussed below), the Supreme Court has upheld **restrictions on the right to strike** without considering their effect on the ability of workers to influence their conditions of employment. As a result, U.S. law is extraordinarily unprotective of the right to strike. The Court has, for example, **approved** the **privilege** **of employers to permanently replace economic strikers**, upheld a flat prohibition on secondary strikes, and sustained flat bans on public employee rights.6 The ILO’s Committee on Freedom of Association has concluded that each of these outcomes violates international standards.7 **Scholars** have **suggested** that the **permanent replacement rule**, in particular, **has contributed to a drastic decline in strike activity in the U.S.**8 Once labor’s great equalizer, the threat of a strike has been appropriated by management both in negotiations, where employers are more likely to threaten permanent replacement than unions are to threaten a strike, and in organizing drives, where the threat of permanent replacement is “Exhibit Number One” against unionizing.9

#### Courts advantage:

#### 1] Rehighlighting on the CP destroys this advantage and proves our solvency

#### 2] GAN doesn’t have an internal link to their impact – it gets to “hindering Kenya’s long-term economic growth” at best and some “increased business costs for foreign investors” but doesn’t quantify any of that or indicate a broader downturn or spillover

#### 3] Decline doesn’t cause war

Clary 15 – Christopher Clary, former International Affairs Fellow in India at the Council on Foreign Relations, Postdoctoral Fellow at the Watson Institute at Brown University, Adjunct Staff Member @ RAND Corporation, Security Studies Program @ MIT, country director for South Asian affairs in the Office of the Secretary of Defense, former Research Fellow @ the Harvard Kennedy School's Belfer Center for Science and International Affairs, former research associate in the Department of National Security Affairs at the Naval Postgraduate School, BA from Wichita State University and an MA from the U.S. Naval Postgraduate School, 2015 (“Economic Stress and International Cooperation: Evidence from International Rivalries,” Massachusetts Institute of Technology Political Science Department Research Paper No. 2015-­‐8, “Economic Stress and International Cooperation: Evidence from International Rivalries,” <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2597712>)

Do economic downturns generate pressure for diversionary conflict? Or might downturns encourage austerity and economizing behavior in foreign policy? This paper provides new evidence that economic stress is associated with conciliatory policies between strategic rivals. For states that view each other as military threats, the biggest step possible toward bilateral cooperation is to terminate the rivalry by taking political steps to manage the competition. Drawing on data from 109 distinct rival dyads since 1950, 67 of which terminated, the evidence suggests rivalries were approximately twice as likely to terminate during economic downturns than they were during periods of economic normalcy. This is true controlling for all of the main alternative explanations for peaceful relations between foes (democratic status, nuclear weapons possession, capability imbalance, common enemies, and international systemic changes), as well as many other possible confounding variables. This research questions existing theories claiming that economic downturns are associated with diversionary war, and instead argues that in certain circumstances peace may result from economic troubles. Defining and Measuring Rivalry and Rivalry Termination I define a rivalry as the perception by national elites of two states that the other state possesses conflicting interests and presents a military threat of sufficient severity that future military conflict is likely. Rivalry termination is the transition from a state of rivalry to one where conflicts of interest are not viewed as being so severe as to provoke interstate conflict and/or where a mutual recognition of the imbalance in military capabilities makes conflict-causing bargaining failures unlikely. In other words, rivalries terminate when the elites assess that the risks of military conflict between rivals has been reduced dramatically. This definition draws on a growing quantitative literature most closely associated with the research programs of William Thompson, J. Joseph Hewitt, and James P. Klein, Gary Goertz, and Paul F. Diehl.1 My definition conforms to that of William Thompson. In work with Karen Rasler, they define rivalries as situations in which “[b]oth actors view each other as a significant politicalmilitary threat and, therefore, an enemy.”2 In other work, Thompson writing with Michael Colaresi, explains further: The presumption is that decisionmakers explicitly identify who they think are their foreign enemies. They orient their military preparations and foreign policies toward meeting their threats. They assure their constituents that they will not let their adversaries take advantage. Usually, these activities are done in public. Hence, we should be able to follow the explicit cues in decisionmaker utterances and writings, as well as in the descriptive political histories written about the foreign policies of specific countries.3 Drawing from available records and histories, Thompson and David Dreyer have generated a universe of strategic rivalries from 1494 to 2010 that serves as the basis for this project’s empirical analysis.4 This project measures rivalry termination as occurring on the last year that Thompson and Dreyer record the existence of a rivalry.5 Why Might Economic Crisis Cause Rivalry Termination? Economic crises lead to conciliatory behavior through five primary channels. (1) Economic crises lead to austerity pressures, which in turn incent leaders to search for ways to cut defense expenditures. (2) Economic crises also encourage strategic reassessment, so that leaders can argue to their peers and their publics that defense spending can be arrested without endangering the state. This can lead to threat deflation, where elites attempt to downplay the seriousness of the threat posed by a former rival. (3) If a state faces multiple threats, economic crises provoke elites to consider threat prioritization, a process that is postponed during periods of economic normalcy. (4) Economic crises increase the political and economic benefit from international economic cooperation. Leaders seek foreign aid, enhanced trade, and increased investment from abroad during periods of economic trouble. This search is made easier if tensions are reduced with historic rivals. (5) Finally, during crises, elites are more prone to select leaders who are perceived as capable of resolving economic difficulties, permitting the emergence of leaders who hold heterodox foreign policy views. Collectively, these mechanisms make it much more likely that a leader will prefer conciliatory policies compared to during periods of economic normalcy. This section reviews this causal logic in greater detail, while also providing historical examples that these mechanisms recur in practice.

#### Public health advantage:

#### 1] This aff has ZERO Kenya key warrant – their COVID impact multiplier doesn’t say Kenya outside of calling it repressive and their pandemic escalation card has NO WARRANT for why KENYA is going to stop GLOBAL disease spread or escalation scenarios – they don’t even have nukes for deterrence – ctrl F Kenya in it

#### 2] Kenya thumps – healthcare bad anyway – this card is cracked

Mohiddin and Temmerman 20. “COVID-19 exposes weaknesses in Kenya’s healthcare system. And what can be done” Conversation. July 27, 2020, <https://theconversation.com/covid-19-exposes-weaknesses-in-kenyas-healthcare-system-and-what-can-be-done-143356> TG

[About](http://www.healthpolicyplus.com/ns/pubs/11323-11587_KenyaHealthFinancingSystemAssessment.pdf) 20% of Kenyans have some form of health insurance coverage, including national health insurance, but this varies by region. [For instance](http://www.healthpolicyplus.com/ns/pubs/11323-11587_KenyaHealthFinancingSystemAssessment.pdf), 41% of residents in Nairobi have cover, while under 3% will have cover in marginalised rural areas such as Wajir and West Pokot.

In the public sector, the 47 [county governments](https://www.nation.co.ke/kenya/news/covid-19-what-uhuru-told-governors-at-coronavirus-summit-1906894) deal with service provision at the local level, while the national level is concerned with policy and the referral hospitals.

Taking all the healthcare systems in Kenya together, the fundamental shortcoming is the mismatch between needs and the available care, in particular specialist care and the workforce – from doctors to technicians – needed to run it.

For instance, a [nationwide study](https://pubmed.ncbi.nlm.nih.gov/29191247/) found major shortages in chest specialists, hospital physicians and emergency care nurses. An assessment of health facilities in 2018 also [reported that](https://www.health.go.ke/wp-content/uploads/2020/01/KHFA-2018-19-Popular-version-report-Final-.pdf) just 12% had the standard items needed to prevent infections, such as gloves, infectious waste storage and disinfectant. Of the hospitals that offer emergency breathing intervention services, 78% offered administration of oxygen and 23% had invasive mechanical ventilation.

The mismatch between available care and needs manifests in two main ways: geographically and economically.

Geographically, there’s a huge divide between what’s available in rural areas and urban areas. Most Kenyans, [about 70%](https://kenyanwallstreet.com/census-2019-datashows-kenya-has-a-youthful-rural-population/) of the population, live in rural areas. They mostly rely on community health volunteers and health facilities that are staffed by nurses who provide primary health care services like immunisation. Sub-county hospitals provide more services and a few medical doctors are available.

Economically, those who are poorer or uninsured are less able to access what is available. If they can access healthcare, [they risk](https://gh.bmj.com/content/4/6/e001809) huge bills which can push them into poverty.

Another challenge is corruption. This manifests dangerously in various ways throughout the system. For instance, a major concern is the cartels within the Ministry of Health which [are accused](https://www.nation.co.ke/kenya/news/politics/kagwe-transfers-30-officers-in-battle-against-cartels-288426) of colluding to steal public funds. Such theft weakens health institutions and diverts valuable time and attention to its mitigation.

In addition, some officials from the main supplier of medical goods – Kenya Medical Supplies Agency – [are under](https://www.standardmedia.co.ke/article/2001375820/anti-graft-agency-probes-illegal-dealings-at-kemsa) investigation for awarding protective equipment tenders irregularly.

#### 3] No mass COVID extinction

#### A] empirics – the vast majority of people survive COVID and the mutations aren’t causing extinction

#### B] low mortality and burnout

Steven Salzberg 20, PhD from Harvard, worked at The Institute for Genomic Research, where he sequenced the genomes of many bacteria, including those used in the 2001 anthrax attacks, also worked on the Human Genome Project, now the Distinguished Professor of Biomedical Engineering, Computer Science, and Biostatistics at Johns Hopkins University, “Coronavirus: There Are Better Things To Do Than Panic”, https://www.forbes.com/sites/stevensalzberg/2020/02/29/coronavirus-time-to-panic-yet/#7de449ad7fa6

1.The mortality rate is probably much, much less than 2%. The rapid spread of COVID-19 suggests that many more people are infected than those who have confirmed cases. The number of people who have no symptoms or very mild symptoms is likely to be ten times as high as the number of reported cases. (This is only a guess.) That would mean the mortality rate might be only 0.2%, or even lower. We still don't know. (The cruise ship that was quarantined in the Japan [had just over 700 cases, and 6 people have died](https://www.bbc.com/news/uk-51677846), suggesting a mortality rate of 1%.)

2.The reported mortality rate is dramatically lower in young people. If you are under 30, you can probably relax a bit. However, if you are over 70, the mortality rate is [frighteningly high, 8-15%](https://www.bbc.com/news/health-51674743).

3.2,933 deaths is a tragedy, but it's a tiny number compared to the annual deaths from the influenza virus, which we have learned to live with. In the U.S. alone, [the CDC estimates that 12,000–61,000 people die each year from the flu](https://www.cdc.gov/flu/about/burden/index.html) (the number varies a lot because the virus itself changes from year to year), and 9-45 million people get sick. The worldwide totals are far higher. So in terms of numbers, the world is definitely over-reacting to the new coronavirus.

4.Infectious viruses tended to become milder over time. At least 4 other coronaviruses already circulate among humans, causing little more than mild cold symptoms. It is quite possible that the virus causing COVID-19, nCoV-19, may mutate to become a milder disease as well. RNA viruses mutate extremely rapidly, and from an evolutionary perspective, viruses adapt to their hosts by becoming milder. (My perspective is based in part on my [past research on the influenza virus](https://www.nature.com/articles/nature04239).) From the virus's point of view, it can't spread itself around if the host is too sick.

#### 4] No disease impact - Disease can’t cause extinction

Dr. Toby Ord 20, Senior Research Fellow in Philosophy at Oxford University, DPhil in Philosophy from the University of Oxford, The Precipice: Existential Risk and the Future of Humanity, Hachette Books, Kindle Edition, p. 124-126

Are we safe now from events like this? Or are we more vulnerable? Could a pandemic threaten humanity’s future?10

The Black Death was not the only biological disaster to scar human history. It was not even the only great bubonic plague. In 541 CE the Plague of Justinian struck the Byzantine Empire. Over three years it took the lives of roughly 3 percent of the world’s people.11

When Europeans reached the Americas in 1492, the two populations exposed each other to completely novel diseases. Over thousands of years each population had built up resistance to their own set of diseases, but were extremely susceptible to the others. The American peoples got by far the worse end of exchange, through diseases such as measles, influenza and especially smallpox.

During the next hundred years a combination of invasion and disease took an immense toll—one whose scale may never be known, due to great uncertainty about the size of the pre-existing population. We can’t rule out the loss of more than 90 percent of the population of the Americas during that century, though the number could also be much lower.12 And it is very difficult to tease out how much of this should be attributed to war and occupation, rather than disease. As a rough upper bound, the Columbian exchange may have killed as many as 10 percent of the world’s people.13

Centuries later, the world had become so interconnected that a truly global pandemic was possible. Near the end of the First World War, a devastating strain of influenza (known as the 1918 flu or Spanish Flu) spread to six continents, and even remote Pacific islands. At least a third of the world’s population were infected and 3 to 6 percent were killed.14 This death toll outstripped that of the First World War, and possibly both World Wars combined.

Yet even events like these fall short of being a threat to humanity’s longterm potential.15

[FOONOTE]

In addition to this historical evidence, there are some deeper biological observations and theories suggesting that pathogens are unlikely to lead to the extinction of their hosts. These include the empirical anti-correlation between infectiousness and lethality, the extreme rarity of diseases that kill more than 75% of those infected, the observed tendency of pandemics to become less virulent as they progress and the theory of optimal virulence. However, there is no watertight case against pathogens leading to the extinction of their hosts.

[END FOOTNOTE]

In the great bubonic plagues we saw civilization in the affected areas falter, but recover. The regional 25 to 50 percent death rate was not enough to precipitate a continent-wide collapse of civilization. It changed the relative fortunes of empires, and may have altered the course of history substantially, but if anything, it gives us reason to believe that human civilization is likely to make it through future events with similar death rates, even if they were global in scale.

The 1918 flu pandemic was remarkable in having very little apparent effect on the world’s development despite its global reach. It looks like it was lost in the wake of the First World War, which despite a smaller death toll, seems to have had a much larger effect on the course of history.16

It is less clear what lesson to draw from the Columbian exchange due to our lack of good records and its mix of causes. Pandemics were clearly a part of what led to a regional collapse of civilization, but we don’t know whether this would have occurred had it not been for the accompanying violence and imperial rule. The strongest case against existential risk from natural pandemics is the fossil record argument from Chapter 3. Extinction risk from natural causes above 0.1 percent per century is incompatible with the evidence of how long humanity and similar species have lasted. But this argument only works where the risk to humanity now is similar or lower than the longterm levels. For most risks this is clearly true, but not for pandemics. We have done many things to exacerbate the risk: some that could make pandemics more likely to occur, and some that could increase their damage. Thus even “natural” pandemics should be seen as a partly anthropogenic risk.

#### Scenario 1 is warming:

#### 1] Disease outbreaks will be defeated with quarantines

**Szalai 7/26** [(Jennifer Szalai - author for the NYT) “The Extradordinary History (and likely busy future) of quarantine” The New York Times. 7-26-2021]

**Quarantine can be lifesaving**; it can also be dangerous, an exercise of extraordinary power in the name of disease control, a presumption of guilt instead of innocence.

In “Until Proven Safe,” a new book about quarantine’s past and future, Geoff Manaugh and Nicola Twilley do an impressively judicious job of explaining exactly why fears of quarantine are understandable and historically justified, while also showing how in coming years “we will almost certainly find ourselves more dependent on quarantine, not less.” Quarantine has to do with risk and uncertainty, and its logic is simple: “There might be something dangerous inside you — something contagious — on the verge of breaking free.”

**While medical advances have made some diseases more diagnosable** and less deadly, newfound knowledge can also accentuate the depths of our ignorance. The more we know, the more we know how much we don’t know — not to mention that **modern life, with escalating numbers of people and goods churning** their way **around the world**, has **increased the opportunities for contagion.**

Quarantine is distinct from isolation, even if the terms are often used interchangeably. Someone is isolated when they are known to be sick; **someone is quarantined when they might be but we cannot be sure**. Manaugh, an architecture and technology blogger, and Twilley, the co-host of a podcast about the science and history of food, bring an impressively wide range of interests to bear on a subject that involves not only infectious disease but also — in their ambitious yet seamless narration — politics, agriculture, surveillance and even outer space.

#### 2] Quarantines solve climate change – COVID was responsible for the largest drop in emissions ever

**Alexander 20** [(Kurtis, a general assignment reporter for The San Francisco Chronicle, frequently writing about water, wildfire, climate and the American West. His recent work has focused on the impacts of drought, the widening rural-urban divide and state and federal environmental policy. Before joining the Chronicle, Alexander worked as a freelance writer and as a staff reporter for several media organizations, including The Fresno Bee and Bay Area News Group, writing about government, politics and the environment.) "Coronavirus has altered the global warming trajectory. But for how long?" San Francisco Chronicle, 5/20/20, https://www.sfchronicle.com/health/article/Greenhouse-gas-emissions-on-track-for-record-drop-15279312.php] TDI

The disruption caused by the coronavirus has been so profound that it’s altered the trajectory of global warming.

Not since World War II — and perhaps never before — have the emissions of heat-trapping gases dropped as much around the planet as they have during the COVID-19 outbreak.

The latest and most detailed study yet on the pandemic’s impact on climate pollution, published Tuesday and authored by the research group Global Carbon Project chaired by Stanford University’s Rob Jackson, finds that the Earth will see up to a 7% decrease in carbon dioxide this year. The dip is five times the decline in emissions in 2009, when the recession choked the world’s economy, and double what it was in 1992, after the fall of the Soviet Union.

The paper’s findings mirror other reports that have similarly found sharp drops in greenhouse gases recently. The emerging research also is in agreement that the lull will likely be short-lived and, at best, buy time before the most devastating effects of climate change take hold. The lockdown that has halted factories, energy plants and automobiles during the pandemic is already lifting, and without deliberate action, carbon-intense activities are bound to resume.

“That’s the danger here,” said Jackson, a professor of earth system science and senior fellow at Stanford Woods Institute for the Environment. “We’ve decreased emissions for the wrong reasons. Will they jump back up starting this fall, or could the virus allow us to rethink transportation and other parts of the economy?”

The answer to the question, say Jackson and others, may not be so straightforward. Greenhouse gases could rebound in some areas, and there could be lasting decreases in others.

Measuring heat-trapping gas emissions, for which carbon dioxide is a proxy, is not easy to do, especially in real time. The researchers at the Global Carbon Project analyzed daily economic activity in 69 countries from January through April and modeled the carbon pollution that likely resulted, then compared it to last year. The countries included have historically produced almost all of the world’s carbon dioxide.

The researchers found that China, the largest polluter, reduced emissions by nearly 24% on some days in mid-February. The United States, the second-largest polluter, cut emissions by nearly 32% for almost two weeks in mid-April. The European Union, including Great Britain, trimmed emissions by about 27% during the first week of April.

The dates of peak reductions varied in different parts of the globe because each locked down at a different time. The biggest cumulative drop in carbon dioxide was on April 7 and measured about 17%, according to the study.

While a variety of activity explains the declines, fewer people driving was the largest contributor worldwide. Less industrial pollution was also a big contributor.

Based on the observed drops in emissions, the researchers estimate that going forward, carbon dioxide will fall between 4% and 7% for the year worldwide, depending on how quickly countries end their lockdowns.

Jackson said the amount of the decline can be viewed as both considerable, given that it’s the largest ever seen, and humbling because it’s the minimum needed annually to put the planet on track to meet the Paris climate agreement — enough of a drop to prevent the global temperature from rising 2 degrees Celsius above preindustrial levels.

“We would need to do this every year,” he said.

The International Energy Agency recently projected an 8% dip in greenhouse gases for the year while the International Monetary Fund came up with an estimate closer to 6%. Both organizations said carbon pollution would likely rise again in 2021.

After the decline in emissions in 2009 of about 1.4%, the following year saw an increase of 5.1%.

The Global Carbon Project says there’s reason to think that at least some parts of the globe will try to prevent heat-trapping gases from bouncing back. Stimulus programs aimed at developing clean energy and new carbon-friendly ways of living adopted during the pandemic, such as working from home, could help limit emissions.

“Cities from Seattle to Milan are keeping roads closed to cars and letting them stay open to bikes and pedestrians even after the shelter-in-place,” Jackson said. “And maybe COVID-19 and stimulus funding will jump-start electric cars.”

#### 3] Shutdowns solve climate change – substantially reduce emissions, air and water pollution, directs attention to climate

**Chow 20** [(Denise, a reporter for NBC News Science focused on general science and climate change) "Coronavirus shutdowns have unintended climate benefits: cleaner air, clearer water," NBC News, 3/18/20, https://www.nbcnews.com/science/environment/coronavirus-shutdowns-have-unintended-climate-benefits-n1161921] DRD

Concentrations of nitrogen dioxide in the atmosphere over Italy also fell precipitously, as they did in China. An analysis by The Washington Post found that the most dramatic drop was observed over northern Italy.

Nitrogen dioxide can irritate the lungs, and inhaling the pollutant can increase the risk of asthma and inflammation of the lungs. Although the noxious gas isn't thought to be a major contributor to climate change, studying its concentration in the atmosphere can help scientists understand other heat-trapping greenhouse gases that do drive global warming.

Jacqueline Klopp, co-director of the Center for Sustainable Urban Development at Columbia University in New York City, said she expects to see greenhouse gas emissions plummet across the board because of the quarantine measures.

"People were in their homes and really stopped a lot of the activities that lead to greenhouse gas emissions and other pollution," she said.

Early observations have shown that extreme social-distancing measures are likely also having an effect on air pollution at the city level in the U.S.

Jordan Wildish, a project director at Earth Economics, an environmental non-profit organization based in Tacoma, Washington, developed an online dashboard to track air quality in San Francisco, New York City and the Seattle area, comparing the measurements with figures from the same time last year.

In San Francisco, which is under shelter-in-place orders to control the spread of the coronavirus, the average concentration of fine particulate matter — tiny particles in the air that are dangerous because they can be breathed deeply into the lungs — over the past five days was almost 40 percent lower than the previous year.

In New York City, there was a 28 percent drop over the same period of time, and the Seattle-Tacoma-Bellevue saw a 32 percent decrease.

But experts warned that observed reductions are temporary and that as cities, countries and economies bounce back, so, too, will emissions — unless major infrastructure or societal changes are adopted.

Klopp said the pandemic could make companies and governments realize that other threats to humanity, including climate change, could be just as devastating and that it's imperative to develop protective measures.

#### Short-term action to mitigate climate change solves extinction and nuclear war

**Pester 8/30/21** (Patrick, staff writer for Live Science. His background is in wildlife conservation and he has worked with endangered species around the world. Patrick holds a master's degree in international journalism from Cardiff University in the U.K. and is currently finishing a second master's degree in biodiversity, evolution and conservation in action at Middlesex University London. Citing **Luke Kemp, a research associate at the Centre for the Study of Existential Risk at the University of Cambridg**e in the United Kingdom AND **Michael Mann, PhD, distinguished professor of atmospheric science at Penn State**. “Could climate change make humans go extinct?” [https://www.livescience.com/climate-change-humans-extinct.html August 30](https://www.livescience.com/climate-change-humans-extinct.html%20August%2030), 2021)DR 21

According to Mann, a global temperature increase of 5.4 degrees Fahrenheit (3 degrees Celsius) or more could lead to a collapse of our societal infrastructure and massive unrest and conflict, which, in turn, could lead to a future that resembles some Hollywood dystopian films.

One way climate change could trigger a societal collapse is by creating food insecurity. Warming the planet has a range of negative impacts on food production, including increasing the water deficit and thereby reducing food harvests, [Live Science previously reported](https://www.livescience.com/58891-why-2-degrees-celsius-increase-matters.html). Food production losses can increase human deaths and drive economic loss and socio-political instability, among other factors, that may trigger a breakdown of our institutions and increase the risk of a societal collapse, according to a study published Feb. 21 in the journal [Climatic Change](https://go.redirectingat.com/?id=92X1590019&xcust=livescience_us_1191050396230939400&xs=1&url=https%3A%2F%2Flink.springer.com%2Farticle%2F10.1007%2Fs10584-021-02957-w&sref=https%3A%2F%2Fwww.livescience.com%2Fclimate-change-humans-extinct.html).

Related: [Has the Earth ever been this hot before?](https://www.livescience.com/65927-has-earth-been-this-hot-before.html)

Past extinctions and collapses

Kemp studies previous civilization collapses and the risk of climate change. Extinctions and catastrophes almost always involve multiple factors, he said, but he thinks if humans were to go extinct, climate change would likely be the main culprit.

"If I'm to say, what do I think is the biggest contributor to the potential for human extinction going towards the future? Then climate change, no doubt," Kemp told Live Science.

All of the major [mass-extinction events](https://www.livescience.com/mass-extinction-events-that-shaped-Earth.html) in Earth's history have involved some kind of climatic change, according to Kemp. These events include cooling during the Ordovician-[Silurian](https://www.livescience.com/43514-silurian-period.html) extinction about 440 million years ago that wiped out 85% of species, and warming during the [Triassic](https://www.livescience.com/43295-triassic-period.html)-[Jurassic](https://www.livescience.com/28739-jurassic-period.html) extinction about 200 million years ago that killed 80% of species, Live Science previously reported. And more recently, climate change affected the fate of early human relatives.

While [Homo sapiens](https://www.livescience.com/homo-sapiens.html) are obviously not extinct, "we do have a track record of other hominid species going extinct, such as [Neanderthals](https://www.livescience.com/28036-neanderthals-facts-about-our-extinct-human-relatives.html)," Kemp said. "And in each of these cases, it appears that again, climatic change plays some kind of role."

Scientists don't know why Neanderthals went extinct about 40,000 years ago, but climatic fluctuations seem to have broken their population up into smaller, fragmented groups, and severe changes in temperature affected the plants and animals they relied on for food, according to the [Natural History Museum](https://www.nhm.ac.uk/discover/who-were-the-neanderthals.html) in London. Food loss, driven by climate change, may have also led to a tiny drop in Neanderthal fertility rates, contributing to their extinction, [Live Science previously reported](https://www.livescience.com/65594-neanderthal-fertility-led-to-extinction.html).

Climate change has also played a role in the collapse of past human civilizations. A [300-year-long drought](https://www.livescience.com/38893-drought-caused-ancient-mediterranean-collapse.html), for example, contributed to the downfall of ancient Greece about 3,200 years ago. But Neanderthals disappearing and civilizations collapsing do not equal human extinction. After all, humans have survived climate fluctuations in the past and currently live all over the world despite the rise and fall of numerous civilizations.

Homo sapiens have proven themselves to be highly adaptable and able to cope with many different climates, be they hot, cold, dry or wet. We can use resources from many different plants and animals and share those resources, along with information, to help us survive in a changing world, according to the [Smithsonian’s National Museum of Natural History](https://humanorigins.si.edu/research/climate-and-human-evolution/climate-effects-human-evolution).

Related: [How would just 2 degrees of warming change the planet?](https://www.livescience.com/58891-why-2-degrees-celsius-increase-matters.html)

Today, we live in a global, interconnected civilization, but there's reason to believe our species could survive its collapse. A study published on July 21 in the journal [Sustainability](https://www.mdpi.com/2071-1050/13/15/8161/htm) identified countries most likely to survive a global societal collapse and maintain their complex way of life. Five island countries, including New Zealand and Ireland, were chosen as they could remain habitable through agriculture, thanks to their relatively cool temperatures, low weather variability and other factors that make them more resilient to climate change.

New Zealand would be expected to hold up the best with other favorable conditions, including a low population, large amounts of good quality agricultural land and reliable, domestic energy. So, even if climate change triggers a global civilization collapse, humans will likely be able to keep going, at least in some areas.

Turning on ourselves

The last scenario to consider is climate-driven conflict. Kemp explained that in the future, a scarcity of resources that diminish because of **climate change could** potentially create conditions for wars that threaten humanity. "There's reasons to be concerned that as water resources dry up and scarcity becomes worse, and the general conditions of living today become much, much worse, then suddenly, the threat of potential nuclear war becomes much higher," Kemp said.

Put another way, climate change impacts might not directly cause humans to go extinct, but it could lead to events that seriously endanger hundreds of millions, if not billions, of lives. A 2019 study published in the journal [Science Advances](https://advances.sciencemag.org/content/5/10/eaay5478) found that a nuclear conflict between just India and Pakistan, with a small fraction of the world's nuclear weapons, could kill 50 million to 125 million people in those two countries alone. Nuclear war would also change the climate, such as through temperature drops as burning cities fill the atmosphere with smoke, threatening food production worldwide and potentially causing mass starvation.

What's next?

While avoiding complete extinction doesn't sound like much of a climate change silver lining, there is reason for hope. Experts say it isn't too late to avoid the worst-case scenarios with significant cuts to greenhouse gas emissions.

"It is up to us," Mann said. "If we fail to reduce carbon emissions substantially in the decade ahead, we are likely committed to a worsening of already dangerous extreme weather events, inundation of coastlines around the world due to melting ice and rising sea level, more pressure on limited resources as a growing global population competes for less food, water and space due to climate change impacts. If we act boldly now, we can avoid the worst impacts."

#### War with China is their only scenario for great power war in the lake evidence:

#### US-China war is structurally inevitable --- China delays it to buy time to modernize

Kazianis 18

Harry J. Kazianis. Harry J. Kazianis is director of defense studies at the [Center for the National Interest](https://cftni.org/), founded by former President Richard M. Nixon, “A US-China trade war is coming, but here's how to stop it.” Fox News. April 6, 2018. http://www.foxnews.com/opinion/2018/04/06/us-china-trade-war-is-coming-but-heres-how-to-stop-it.html

But even if a deal is struck to prevent most of the new tariffs from taking effect, we have crossed an important milestone in the U.S.-China relationship. Both sides now realize the nature of their ongoing geopolitical struggle. It is not out of the question to wonder whether ties between these countries with the two largest economies in the world are entering a heated, almost Cold War atmosphere.

[As I noted](http://www.foxnews.com/opinion/2018/04/04/china-is-no-friend-to-us-trump-is-right-to-take-them-on.html) in an op-ed for Fox News this week, clearly China is no friend of America. Our two nations have very different trade as well as diplomatic, economic and geopolitical goals that will naturally create tensions for perhaps decades to come. And as President Trump pointed out Thursday, each nation is understandably seeking to come out on top in any deal the two work out.

What’s needed now are tough and serious negotiations between China and the U.S. to reach a reasonable and fair compromise that gives each nation some of what it wants. But this is now a matter for diplomacy – not tweets or off-the-cuff comments. It would be a strategic mistake for the U.S. and China to engage in a tit-for-tat war of words in the media, simply adding gasoline to the fire of their trade dispute.

This is especially true because there are some indications that Beijing may be ready to blink – for strategic reasons.

Thursday night I spoke with several top-tier Chinese academics, scholars, and economists – all close to the government, all with good insights into Beijing’s thinking on escalating trade tensions with Washington. They all echoed a very similar opinion: there is a possibility of a deal with America, [even despite Beijing’s comments that no negotiations are likely](https://www.reuters.com/article/us-usa-trade-china/trump-threatens-tariffs-on-100-billion-more-china-goods-beijing-ready-to-strike-back-idUSKCN1HD0NW), for very clear reasons.

The experts I spoke with talked to me on the condition that I not identify them by name, so they could speak candidly.

“China was not ready for the sheer magnitude of President Trump coming after us on the so-called trade imbalance,” a senior Chinese economist with close ties to the government told me. “However, there is a deal that could be struck, as both sides have a lot to lose, especially China, as we are not ready for economic warfare with such a big power as America.”

The economist continued: “What scares me, and many government officials, is the rhetoric is heating up very quickly, leaving both sides very little room to work out a deal. Both sides are making a big mistake, as trying to score quick points for their own domestic political audiences is a big error. Now is the time to get both sides in a room, lock the doors, and work towards a deal that is fair to everyone.”

A Chinese scholar, also with close ties to the Beijing government, agreed with that sentiment, but with a twist.

“Chinese officials will likely offer some strong concessions to make sure we avoid a trade battle with Washington,” the scholar told me. “At the moment, we aren’t fully ready to take America on, and must continue to grow our economic and military power. This confrontation is not in our interest, and must be, at least for the moment delayed, until we are in a more powerful position.”

This scholar explained that it might even be in China’s interest to “fold” on this issue, because Beijing has much bigger issues that it must confront in the coming years.

“China must think correctly on all of this trade discussion,” the scholar said. “Our goal is to ensure our rise is not halted. We have greater strategic goals in mind. Winning a trade skirmish with America could come at the highest of prices – and turning America into an enemy that we can’t hope to defeat, at least not yet. We must delay that day for as long as we can.”

A White House official, who spoke to me Friday on condition that I not name him, also expressed hope that a deal could be worked.

“President Trump has always said he was willing to negotiate with Beijing, that is nothing new,” the U.S. official said. “But we are done being suckers to China. We want fair, reciprocal trade. I think we can get there.” However, the official expressed some caution, stating quite clearly that “the ball is now in China’s court.”

What happens now is really anyone’s guess. I would argue that a deal is most likely possible, with both sides making some concessions, especially China on intellectual property and access for U.S. products to its massive domestic markets in the years ahead.

But, at the same time, we should be cautious. The Trump administration has invested precious political capital in making sure China not only understands our intent but understands that we will defend our interests – even if that requires America to take an economic hit.

The U.S. must make sure that any agreement protects American workers, our technological base and other vital national priorities. Such a negotiation could take some time and cause us some economic pain, but would protect our long-term economic interests.

There is, however, a much bigger challenge looming just over the horizon: China’s changing strategic outlook.

Beijing is adjusting its gaze across the globe, seeing America as a very real strategic threat – and posing an increasing threat to America. Just this week, Chinese defense officials offered words of support to Russia[, forging ties that are looking more and more like a straight-up alliance](http://www.foxnews.com/world/2018/04/05/russia-china-hail-burgeoning-ties.html).

Washington must be prepared for the long haul and be ready to confront Chinese power in the months and years to come.

A Chinese economist, based out of Hong Kong, who I have known for a long time now, put it bluntly: “Washington and Beijing are set to clash. It’s just a matter of when and how.”

#### US wins now, but by 2025 A2/AD makes it game over --- strikes stay conventional and neutralize military targets

Majumdar 16

Dave Majumdar, Defense Editor of the National Interest, “New Report Details Why a War between China and America Would be Catastrophic.” The National Interest. August 1, 2016. <https://nationalinterest.org/blog/the-buzz/new-report-details-why-war-between-china-america-would-be-17210?page=0%2C1>

A war between the United States and China would cause severe losses on both sides, but—today at least—Beijing would bear the brunt of the casualties. However, as China’s anti-access/area denial (A2/AD) capabilities continue to improve—the balance of losses would shift more towards Beijing’s favor by 2025. Nonetheless, China would still suffer more losses than Washington even at that stage—according to a new report from [the RAND Corporation](http://www.rand.org/pubs/research_reports/RR1140.html#relatedProducts). Victory for either side might prove to be elusive as the conflict could degenerate into inconclusive bloodletting.

“As its military advantage declines, the United States will be less confident that a war with China will conform to its plans,” reads the new report by [David C. Gompert](http://www.rand.org/about/people/g/gompert_david_c.html), [Astrid Cevallos](http://www.rand.org/pubs/authors/c/cevallos_astrid.html)and [Cristina L. Garafola](http://www.rand.org/about/people/g/garafola_cristina_l.html). “China’s improved military capabilities, particularly for anti-access and area denial (A2AD), mean that the United States cannot count on gaining operational control, destroying China’s defenses, and achieving decisive victory if a war occurred.”

A war with China—now and in the future—would likely be fought at sea and in the air, but cyber and space capabilities would play a significant role, according to the report. But the RAND researchers expect that should a war breakout, it would remain a conventional fight. “Each side’s increasingly far-flung disposition of forces and growing ability to track and attack opposing forces could turn much of the Western Pacific into a ‘war zone,’ with grave economic consequences,” reads the report. “It is unlikely that nuclear weapons would be used: Even in an intensely violent conventional conflict, neither side would regard its losses as so serious, its prospects so dire, or the stakes so vital that it would run the risk of devastating nuclear retaliation by using nuclear weapons first.”

Moreover, while the RAND study postulates that the United States would strike heavily at the Chinese mainland, the researchers don’t believe that Beijing would strike at the U.S. homeland except via cyber attacks. “We also assume that China would not attack the U.S. homeland, except via cyberspace, given its minimal capability to do so with conventional weapons,” the report states. “In contrast, U.S. nonnuclear attacks against military targets in China could be extensive.”

A Sino-American war could develop in a number of ways—including short bloody war or a long and devastating war. Moreover, modern technologies incentivize either side to launch a preemptive attack first. “Sensors, weapon guidance, digital networking, and other information technologies used to target opposing forces have advanced to the point where both U.S. and Chinese military forces seriously threaten each other,” the report reads. “This creates the means as well as the incentive to strike enemy forces before they strike one’s own. In turn, this creates a bias toward sharp, reciprocal strikes from the outset of a war, yet with neither side able to gain control and both having ample capacity to keep fighting, even as military losses and economic costs mount.”

In the case of a brief war fought today, American losses would be significant, but Chinese losses might be catastrophic. “If either U.S. or Chinese political leaders authorize their military commanders to carry out plans for sharp strikes on enemy forces, a severely violent war would erupt,” the report reads. “As of 2015, U.S. losses of surface naval and air forces, including disabled aircraft carriers and regional air bases, could be significant, but Chinese losses, including to homeland-based A2AD systems, would be much greater. Within days, it would be apparent to both sides that the early gap in losses favoring the United States would widen if fighting continued.”

By 2025, however, China’s military capabilities are likely to have expanded to a point where it will not sustain as many losses. “By 2025, though, U.S. losses would increase because of enhanced Chinese A2AD. This, in turn, could limit Chinese losses, though these would still be greater than U.S. ones,” the report reads. “It could be unclear then whether continued fighting would result in victory for either side.”

A longer war would be far more devastating—and could leave both military forces in shambles. “As of 2015, the longer a severe war dragged on, the worse the results and prospects would be for China,” the report states. “By 2025, however, inconclusive results in early fighting could motivate both sides to fight on despite heavy losses incurred and still expected. Although prospects for U.S. military victory then would be worse than they are today, this would not necessarily imply Chinese victory.”

#### No escalation --- we’d use counterforce strikes

Lieber and Press 16

Keir A. Lieber and Daryl G. Press. Keir A. Lieber is Director of the Security Studies Program and Associate Professor in the Edmund A. Walsh School of Foreign Service at Georgetown University. Daryl G. Press is Associate Professor in the Department of Government at Dartmouth College. “The New Era of Nuclear Weapons, Deterrence, and Conflict.” Strategic Studies Quarterly. Vol. 10, No. 5. 2016.

https://www.jstor.org/stable/pdf/26271621.pdf?refreqid=excelsior%3A928c663c72c835e2ad1bf2512a0f4eb3

“The United States is not seeking to neutralize adversary deterrent forces.”

Some critics argue that the United States is not seeking strategic primacy. They reject any intent behind the emergence of US nuclear primacy and downplay the effort to neutralize adversary deterrent forces in US military strategy. Instead of the United States bolstering its counterforce capabilities, critics emphasize how it is minimizing the role of nuclear weapons in national security strategy—as only this is consistent with international arms control and nonproliferation efforts aimed at convincing other states to forego strategic weapons, reduce existing arsenals, or cancel modernization programs. The implication is that we have mistakenly imputed sinister motives to US defense programs and planning.

Disavowal of the US pursuit of strategic primacy comes most frequently from those who work inside or outside the government on arms control and nonproliferation policy. Yet, those who work on US regional war plans and counterproliferation policy typically see nothing controversial in our claim that the United States seeks the ability to neutralize adversary strategic weapons. In fact, this effort appears to be official US policy. As a simple Internet search shows, the US government does not hide the wide range of research and planning efforts underway that fall under the rubric of “defeat WMD” or “combatting WMD.” And the underlying logic behind those efforts is simple: deterrence may fail, especially during conventional wars, and therefore the United States needs the ability to defend US forces, allies, and the US homeland from enemy WMD using, depending on the circumstances, conventional strikes, missile defenses, special operations, offensive cyber attacks, and in extreme cases nuclear strikes. In short, “defeating WMD” and “seeking strategic primacy” are essentially synonymous: protecting oneself from others’ strategic weapons (which sounds reasonable) and neutralizing others’ strategic deterrent forces (which sounds more malicious) are simply two phrases describing the same behavior.

**That kills 700 max**

**Lieber 17**

Keir A. Lieber, Associate Professor in the Edmund A. Walsh School of Foreign Service and the Department of Government at Georgetown University, and Daryl G. Press, Associate Professor in the Department of Government at Dartmouth College, The New Era of Counterforce: Technological Change and the Future of Nuclear Deterrence, Volume 41, Number 4, Spring 2017

Third, the emergence of a new era of counterforce raises the question of whether it is wise, for the United States in particular, to continue improving nuclear and nonnuclear counterforce capabilities. On the one hand, improved **counterforce capabilities** could be invaluable in a range of plausible scenarios.11 Improved offensive capabilities could help the United States **deter** weak countries from **initiating conventional conflicts** or from **escalating** in the midst of war. Enhanced counterforce capabilities could also help **protect U.S. forces, allies, and the U.S. homeland from nuclear attack if a conventional war did escalate**. On the other hand, better counterforce could be a source of danger: not only might improved disarming strike capabilities—in any country's hands—increase the temptation to attack, but also potential victims of disarming strikes will seek to escape their vulnerability, thereby possibly triggering arms racing and incentives to strike preemptively.12 Both views may be correct. The net benefit of decisions to enhance counter-force capabilities will therefore depend on the particular case. For countries that perceive a highly malign threat environment, face aggressive nuclear [End Page 12] armed adversaries, or have ambitious foreign policy goals, the benefits of developing advanced counterforce capabilities may outweigh the costs. For those countries that face a benign environment and have more modest goals, however, the secondary costs of enhancing counterforce may be too great. In any case, these contentious issues have not received sufficient attention; analysts and policymakers have largely overlooked the ways that rapidly changing technologies are eroding the foundation of deterrence. The remainder of this article is organized as follows. We first discuss the key role that arsenal survivability plays in nuclear deterrence theory. Second, we describe the main strategies that planners employ to ensure arsenal survivability in practice. Next, we explore one of the major technological trends eroding survivability, the **great leap in weapons accuracy**, and illustrate how improved accuracy creates new possibilities for counterforce strikes. We then focus on the second major trend, **dramatic improvements in remote sensing**, and how the resulting increase in transparency threatens **concealed and mobile nuclear forces**. We conclude with a summary of our findings and their implications for international politics and U.S. national security. Nuclear Survivability in Theory At its core, nuclear deterrence theory rests on two simple propositions. First, countries will not attack their adversaries if they expect the costs to exceed the benefits. Second, nuclear weapons allow countries, even relatively weak ones, to inflict unprecedented levels of damage on those who attack them. Taken together, these propositions suggest that nuclear weapons are the ultimate instruments of deterrence: no conceivable benefit of attacking a nuclear-armed state could be worth the cost of getting hit with nuclear weapons in retaliation. As long as nuclear arsenals are survivable, that is, able to withstand an enemy's first strike and retaliate, nuclear weapons are a tremendous force for peace. The theory of the nuclear revolution builds on the logic of deterrence theory and extends its implications. Because nuclear weapons make countries fundamentally secure, countries can escape the most pernicious consequences of anarchy. According to the theory of the nuclear revolution, once countries deploy survivable arsenals they no longer need to fear conquest.13 As a result, they [End Page 13] can stop worrying about the relative balance of power;14 engaging in arms races;15 or competing for alliance partners and strategic territory.16 Proponents of the theory of the nuclear revolution have always recognized the discrepancy between their theory's predictions and the actual behavior of countries in the nuclear era. The Cold War competition between the United States and the Soviet Union, in particular, is filled with empirical anomalies: extensive arms racing, intense concerns about relative power gains and losses, and competition for allies and control of strategic territory—all occurring at a time when the main adversaries appeared to be invulnerable to disarming strikes.17 World War III was averted, as nuclear deterrence theory would predict, [End Page 14] but the transformation of international politics that advocates of the theory of the nuclear revolution anticipated never materialized. Today, nuclear powers still eye each other's economic power and military capabilities warily; strive for superiority over their adversaries in conventional and nuclear armaments; aim to control strategically relevant areas of land, air, sea, and space; seek to build and maintain alliances; and prepare for war. The discrepancy between the theory of the nuclear revolution and the behavior of states stems from the theory's misplaced confidence in the survivability of nuclear arsenals.18 Proponents of the theory believe that nuclear weapons deployed in even moderate numbers are inherently survivable.19 Moreover, according to the argument, survivability is a one-way street: once a country deploys a survivable arsenal, it will remain that way. Yet, what if survivability is reversible? If arsenal survivability depends on the uncertain course of technological change and the efforts of adversaries to develop new technologies, states will feel compelled to arms race to ensure that their deterrent forces remain survivable in the face of adversary advances. They will worry about relative gains, because a rich and powerful adversary will have more resources to invest in technology and military forces. They will value allies, which help contribute resources and valuable territory. Moreover, states may be enticed to develop their own counterforce capabilities in order to disarm their adversaries or limit the damage those adversaries can inflict in case of war. In short, if nuclear stalemate can be broken, one should expect countries to act as they always have when faced with military threats: by trying to exploit new technologies [End Page 15] and strategies for destroying adversary capabilities. If arsenals have been more vulnerable than theorists assume, or if survivability and stalemate are reversible, then the central puzzle of the nuclear era—continued geopolitical competition—is no longer a puzzle. We argue not only that stalemate is reversible in principal, but also that changes in technology occurring today are making all countries' arsenals less survivable than they were in the past. The fear of suffering devastating retaliation will still do much to deter counterforce attacks, but countries will increasingly worry that their adversaries are trying to escape stalemate, and they will feel pressure to do the same. Deterrence will weaken as arsenals become more vulnerable. In extreme circumstances—for example, if an adversary threatens escalation (or begins to escalate) during a conventional war—the temptation to launch a disarming strike may be powerful.20 In short, in stark contrast to the expectations of the theory of the nuclear revolution, security competition has not only endured, but also will intensify as enhanced counterforce capabilities proliferate. Nuclear Survivability in Practice The survivability of retaliatory arsenals has long been a crucial objective of real-world military planning, not just a fertile topic of theoretical analysis. Military planners have employed three basic approaches to protect their countries' nuclear forces from attack: hardening, concealment, and redundancy. In terms of hardening, planners deploy missiles in reinforced silos designed to resist blast, heat, ground shock, and the other effects of nuclear detonations; place aircraft in hardened shelters; create protective sites for patrolling mobile missile launchers; and bury command and control sites, as well as the secure means used to communicate launch orders. Nuclear planners also rely heavily on concealment. Concealment is the foundation of survivability for mobile delivery systems, such as ballistic missile submarines (SSBNs) or mobile missile launchers (known as "transporter erector launchers," or TELs), both of which hide in vast deployment areas. Aircraft are harder to hide because they require airfields for takeoff and landing, but they too can employ concealment by dispersing to alternate airfields or remaining [End Page 16] airborne during alerts. Even the most difficult facilities to hide, hardened missile silos or command bunkers, can be concealed using camouflage and decoys. Finally, redundancy is used to bolster every aspect of the nuclear mission, especially force survivability. Most nuclear-armed states use multiple types of delivery systems and warheads to complicate enemy strike plans and protect against warhead design flaws. They spread their forces and warheads across multiple bases. Moreover, the most powerful nuclear-weapon states employ redundant communication networks, command and control arrangements, and early warning systems. No single strategy of survivability is ideal, because each entails important trade-offs. Hardening is attractive, but it comes at the price of concealment: for example, it is difficult to hide the major construction entailed in building a nuclear silo. Also, hardened sites are not mobile; once discovered, they remain so.21 Similarly, concealment comes at the price of hardening. If mobile forces are discovered, they tend to be easy to destroy. Concealment has another significant drawback: it is a "fail deadly" strategy, meaning that if an adversary develops a way to locate one's forces, one's arsenal might go from highly survivable to completely vulnerable almost overnight. Even worse, one might not know that the nuclear balance has shifted in such a calamitous manner.22 Some countries have adopted operating doctrines that attempt to capitalize on the advantages of both hardening and concealment: China today, for example, appears to plan to disperse its mobile missiles in a nuclear crisis from its peacetime garrisons to remote protective sites.23 Such approaches capture the [End Page 17] benefits of both strategies, but they also pay the costs. For example, China's strategy **leaves its forces vulnerable if an attacker has identified its dispersal sites** or detects mobile missiles in transit.24 Major technological trends are **directly undermining** these strategies of survivability. Leaps in weapons accuracy threaten nuclear forces that rely on hardening, while an unfolding revolution in remote sensing threatens nuclear forces that depend on concealment. (Another major change since the end of the Cold War, **far smaller nuclear arsenals** among potential adversaries, weakens the third strategy of survivability: redundancy.)25 Developing survivable forces is not impossible, but **a new age of vulnerability has begun**. Counterforce in the Age of Accuracy For most of the nuclear age, neither bombers nor ballistic missiles could deliver weapons accurately enough to reliably destroy hardened targets. Too many variables affected the impact point of a bomb—such as the aircraft's speed and altitude; the air defense environment; and atmospheric conditions including wind, temperature, and humidity—for even highly skilled crews to deliver bombs precisely.26 Long-range ballistic missiles were even less accurate. Although their initial deployment conjured fears of "bolt-from-the-blue" disarming strikes, throughout the 1970s long-range missiles were not accurate enough to destroy fields of hardened silos.27 **Technological improvements chipped away** at the sources of inaccuracy, however. Leaps in navigation and guidance, including advanced inertial sensors [End Page 18] with stellar updates, improved the ability of missiles to precisely determine their position in flight and guide themselves, as needed, back on course. Other breakthroughs allowed mobile delivery systems, such as submarines and mobile land-based launchers, to accurately determine their own position prior to launch, greatly improving their accuracy.28 As a result of these innovations, new missiles emerged in the mid-1980s with far better accuracy than their predecessors, rendering hardened targets vulnerable as never before. For bombers, onboard computers now continuously measure the variables that previously confounded bombardiers. Data on aircraft speed and location are uploaded from the aircraft into the computers of "smart" bombs and cruise missiles, which in turn automatically plot a flight path from the release location to the target. The weapons adjust their trajectory as they fly to remain on course.29 **As a result, bombs and missiles can achieve levels of accuracy unimaginable at the start of the nuclear age.** The leap in munitions accuracy has been showcased repeatedly during conventional wars: videos of missiles and bombs guiding themselves directly to designated targets now appear mundane. Although the effects of the accuracy revolution on nuclear delivery systems are equally dramatic, they have received far less attention, despite huge implications for the survivability of hardened targets. IMPROVED MISSILE ACCURACY Figure 1 illustrates one consequence of the accuracy revolution, as applied to nuclear forces, by comparing the effectiveness of U.S. ballistic missiles in 1985 to those in the current U.S. arsenal.30 We use formulas, employed by nuclear analysts for decades, to estimate the effectiveness of missile strikes against a [End Page 19] Figure 1. The Growing Vulnerability of Hard Targets, 1985–2017 NOTE: The calculations underlying this figure assume targets hardened to withstand 3,000 pounds per square inch (psi). Data for 1985 are based on the most capable U.S. land-based intercontinental ballistic missile (ICBM) and submarine-launched ballistic missile (SLBM) at the time: the Minuteman III ICBM armed with a W78 warhead and the Trident I C-4 SLBM armed with a W76 warhead. The 2017 ICBM data are based on the same Minuteman III / W78, with an improved guidance system. The 2017 SLBM data show both contemporary configurations of the Trident II D-5 missile: one version armed with the W76 and the other with higher-yield W88 warheads. The data and sources for U.S. weapon systems are in the online appendix, , table A1. Click for larger view View full resolution Figure 1. The Growing Vulnerability of Hard Targets, 1985–2017 NOTE: The calculations underlying this figure assume targets hardened to withstand 3,000 pounds per square inch (psi). Data for 1985 are based on the most capable U.S. land-based intercontinental ballistic missile (ICBM) and submarine-launched ballistic missile (SLBM) at the time: the Minuteman III ICBM armed with a W78 warhead and the Trident I C-4 SLBM armed with a W76 warhead. The 2017 ICBM data are based on the same Minuteman III / W78, with an improved guidance system. The 2017 SLBM data show both contemporary configurations of the Trident II D-5 missile: one version armed with the W76 and the other with higher-yield W88 warheads. The data and sources for U.S. weapon systems are in the online appendix, http://dx.doi:10.7910/DVN/NKZJVT, table A1. typical hardened silo.31 The figure distinguishes three potential outcomes of a missile strike: hit, miss, and fail. "Hit" means that the warhead detonates within the lethal radius (LR) of the aimpoint, thus destroying the target. "Miss" means that the warhead detonates outside the LR, leaving the target undamaged. "Fail" means that some element of the attacking missile system malfunctioned, leaving the target undamaged. [End Page 20] Figure 1 shows that the accuracy improvements of the past three decades have led to substantial leaps in counterforce capabilities. In 1985 a U.S. intercontinental ballistic missile (ICBM) had only about a 54 percent chance of destroying a missile silo hardened to withstand 3,000 pounds per square inch (psi) overpressure. In 2017 that figure exceeds 74 percent. The improvement in submarine-launched weapons is starker: from 9 percent to 80 percent (using the larger-yield W88 warhead). Figure 1 also suggests, however, that despite vast improvements in missile accuracy, the weapons still are not effective enough to be employed individually against hardened targets. Even modern ballistic missiles are expected to miss or fail 20–30 percent of the time. The simple solution to that problem, striking each target multiple times, has never been a feasible option because of the problem of fratricide: the danger that incoming weapons might destroy or deflect each other.32 The accuracy revolution, however, also offers a solution to the **fratricide**

**problem**, opening the door to assigning **multiple warheads against a single target**, and thus paving the way to **disarming counterforce strikes**. THE FADING PROBLEM OF FRATRICIDE One type of fratricide occurs when the prompt effects of nuclear detonations—radiation, heat, and overpressure—destroy or deflect nearby warheads. To protect those warheads, targeters must separate the incoming weapons by at least 3–5 seconds.33 A second source of fratricide is harder to overcome. Destroying hard targets typically requires low-altitude detonations (so-called ground bursts), which vaporize material on the ground. When the debris begins to cool, 6–8 seconds after the detonation, it solidifies and forms a dust cloud that envelops the target. Even small dust particles can be lethal to incoming warheads speeding through the cloud to the target. Particles in the debris cloud take approximately 20 minutes to settle back to ground.34 For decades, these two sources of fratricide, acting together, posed a major [End Page 21] problem for nuclear planners.35 Multiple warheads could be aimed at a single target if they were separated by at least 3–5 seconds (to avoid interfering with each other); yet, all inbound warheads had to arrive within 6–8 seconds of the first (before the dust cloud formed). As a result, assigning more than two weapons to each target would produce only marginal gains: if the first one resulted in a miss, the target would likely be shielded when the third or fourth warhead arrived.36 Improvements in accuracy, however, have greatly mitigated the problem of fratricide. As figure 1 shows, the proportion of misses—the main culprit of fratricide—compared to hits is fading. To be clear, some weapons will still fail; that is, they will be prevented from destroying their targets because of malfunctioning missile boosters, faulty guidance systems, or defective warheads. Those kinds of failures, however, do not generally cause fratricide, because the warheads do not detonate near the target. Only those that miss—that is, those that travel to the target area and detonate outside the LR—will create a dust cloud that shields the target from other incoming weapons. In short, leaps in accuracy are essentially reducing the set of three outcomes (hit, fail, or miss) to just two: hit or fail. The "miss" category, the key cause of fratricide, has **virtually disappeared**.37 THE CUMULATIVE CONSEQUENCES FOR COUNTERFORCE The end of fratricide is just one development that has helped negate hardening and increased the vulnerability of nuclear arsenals. The computer revolution has led to other improvements that, taken together, **significantly increase counterforce capabilities**. First, improved accuracy has transformed the role of ballistic missile submarines, turning these instruments of retaliation against population centers into potent counterforce weapons. Recall (from figure 1 above) that a 1985 submarine-launched ballistic missile (SLBM) had only a 9 percent chance of destroying a hardened target. This meant that although ballistic missile submarines could destroy "soft" targets (e.g., cities), they could not destroy the hardened sites that would be a key focus of a disarming attack. Increased [End Page 22] SLBM accuracy has added hundreds of SLBM warheads to the counterforce arsenal; it has also unlocked other advantages that submarines possess over land-based missiles. For example, submarines have flexibility in firing location, allowing them to strike targets that are out of range of ICBMs or that are deployed in locations that ICBMs cannot hit.38 Submarines also permit strikes from close range, reducing an adversary's response time. And because submarines can fire from unpredictable locations, SLBM launches are more difficult to detect than ICBM attacks, further reducing adversary response time before impact. Second, upgraded fuses are making ballistic missiles even more capable than figure 1 reports. In a compelling new analysis, Theodore Postol explores the implications of new "compensating" fuses that exist on most U.S. SLBMs and that will soon be deployed on the entire force.39 Reentry vehicles equipped with this fusing system use an altimeter to measure the difference between the actual and expected trajectory of the reentry vehicle, and then compensate for inaccuracies by adjusting the warhead's height of burst.40 Specifically, if the altimeter reveals that the warhead is off track and will detonate "short" of the target, the fusing system lowers the height of burst, allowing the weapon to travel farther (hence, closer to the aimpoint) before detonation. Alternatively, if the reentry vehicle is going to detonate beyond the target, the height of burst is adjusted upward to allow the weapon to detonate before it travels too far.41 Without this technology, as figure 1 shows, the lower-yield W76 warheads are much less effective against hardened targets than their higher-yield cousins, the W88s. The improved fuse cuts the effectiveness gap roughly in half, making the hundreds of W76s in the U.S. arsenal potent counterforce weapons for the first time.42 **The consequences** of the new fuse [End Page 23] **are**, therefore, **profound**, essentially **tripling the size of the U.S. submarine-based arsenal against hard targets**.43 More broadly, the technology at the core of compensating fuses is available to any state capable of building modern multistage ballistic missiles.44 A third key improvement, rapid missile retargeting, increases the effectiveness of ballistic missiles by reducing the consequence of malfunctions. As figure 1 illustrates, when accuracy increases, missile reliability becomes the main hurdle to attacks on hardened targets. For decades analysts have recognized a solution to this problem: if missile failures can be detected, the targets assigned to the malfunctioning missiles can be rapidly reassigned to other missiles held in reserve.45 The capability to retarget missiles in a matter of minutes was installed at U.S. ICBM launch control centers in the 1990s and on U.S. submarines in the early 2000s, and both systems have since been upgraded.46 We do not know if the United States has adopted war plans that fully exploit rapid reprogramming to minimize the effects of missile failures.47 Nevertheless, such a targeting approach is within the technical capabilities of the United States and other major nuclear powers and may already be incorporated into war plans.48 [End Page 24] Table 1 illustrates the consequences of these improvements against two hypothetical target sets: 100 moderately hard mobile missile shelters and 200 hardened missile silos.49 Row 1 shows the approximate counterforce capabilities of a 1985-era U.S. Minuteman III ICBM strike; a 2-on-1 attack would have been expected to leave 8 mobile missile shelters intact. A strike against 200 hardened silos would fare worse, with 42 targets expected to survive. The remaining rows in table 1 highlight the implications of the changes that have occurred from 1985 to 2017. Row 2 illustrates the impact of improved Minuteman III guidance, which reportedly reduced circular error probable (CEP) from 183 to 120 meters. Row 3 employs the most capable missile and warhead combination in the current U.S. arsenal: the Trident II armed with a high-yield W88 warhead. As the results in both rows show, upgraded missiles perform better than their predecessor, but not well enough to conduct effective disarming strikes against large target sets. Rows 4–7 demonstrate how the various improvements in missile technology have combined to create transformative counterforce capabilities. In row 4, we use a more realistic figure for missile system reliability. Although 80 percent missile reliability is traditionally used as a baseline, **much evidence suggests that the actual reliability of modern missiles exceeds 90 percent**.50 Row 4 shows attack outcomes for a Trident II/W88 with 90 percent reliability. Row 5 shows the consequences if the United States can reprogram its missiles [End Page 25] Table 1. The Demise of Hard Target Survivability NOTE: Results are displayed for 100 mobile missile shelters hardened to withstand up to 1,000 pounds per square inch (psi) or 200 missile silos hardened to 3,000 psi. Yield is in kilotons and circular error probable (CEP) is in meters. The column "Attack Plan" indicates the number of warheads assigned to each target; "R" (for reprogramming) means that the attacker uses reserve missiles to replace boost phase malfunctions. The columns titled "p(K)" list the probability that each individual target is destroyed, and "Survives" is the expected number of targets surviving the attack. The designation of "0.99+" under p(K) indicates 99.9 percent or greater chance of destroying each individual target. Light shaded cells indicate successful disarming attacks; darker cells indicate very successful strikes. Note that a single surviving mobile missile shelter does not necessarily imply that a mobile missile survived, whereas a surviving silo suggests a surviving missile. Click for larger view View full resolution Table 1. The Demise of Hard Target Survivability NOTE: Results are displayed for 100 mobile missile shelters hardened to withstand up to 1,000 pounds per square inch (psi) or 200 missile silos hardened to 3,000 psi. Yield is in kilotons and circular error probable (CEP) is in meters. The column "Attack Plan" indicates the number of warheads assigned to each target; "R" (for reprogramming) means that the attacker uses reserve missiles to replace boost phase malfunctions. 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This row, unlike the others, employs the lower-yield warhead on the Trident II missiles (the W76). With the compensating fuse, a 2-on-1 attack using W76s would be expected to destroy all the mobile missile shelters and all but one of the hardened silos. (An attack that mixed W88s and W76s could destroy the entire hardened silo force.) The results in table 1 are simply the output of a model. In the real world, the effectiveness of any strike would depend on many factors not modeled here, including the skill of the attacking forces, the accuracy of target intelligence, the ability of the targeted country to detect an inbound strike and "launch on warning," and other factors that depend on the political and strategic context. As a result, these calculations tell us less about the precise vulnerability of a given arsenal at a given time—though one can reach arresting conclusions based on the evidence—and more about trends in how technology is undermining survivability.51 One crucial consequence of the accuracy revolution is not captured in the above results. Yet, its impact on the vulnerability of nuclear arsenals may be just as profound. The accuracy revolution has rendered **low-casualty counter-force attacks** plausible for the **first time**. THE DAWN OF LOW-CASUALTY COUNTERFORCE In nuclear deterrence theory, the primary factor preventing nuclear attack is the attacker's fear of retaliation. In reality, however, additional sources of inhibition exist, including the terrible civilian consequences of an attempted counterforce strike. If a leader contemplating a disarming strike knows that such an attack will inflict massive casualties on the enemy, that leader will also understand that the failure to disarm the enemy will provoke a massive punitive response, foreclosing the possibility of a limited nuclear exchange. Furthermore, if a disarming strike would cause enormous civilian casualties in the target country, but also possibly in allied and neutral neighboring countries, leaders who value human life or the fate of allies would contemplate such an [End Page 27] attack in only the direst circumstances. The link between civilian casualties and nuclear inhibition explains why many arms control advocates oppose the development of less destructive nuclear weapons; they worry that such weapons are more "usable."52 Counterforce was tantamount to mass casualties throughout the nuclear age, **but the accuracy revolution is severing that link**. In the past, the main impediment to low-casualty nuclear counterforce strikes has been **radioactive fallout**. Targeters would have had to rely on ground bursts to maximize destructive effects against hardened facilities such as silos and storage sites. Detonations close to the ground have a major drawback, however: debris is sucked up into the fireball, where it mixes with radioactive material, spreading radiation wherever it settles. Although the other effects of nuclear detonations (e.g., blast and fire) can have large-scale consequences for civilians, in many circumstances those effects can be minimized.53 If a strike produces fallout, however, the consequences are potentially vast and difficult to predict.54 In theory, it has always been possible to employ nuclear weapons without creating much fallout. If weapons are detonated at high altitude (above the "fallout threshold"), very little debris from the ground will be drawn up into the fireball, greatly reducing fallout.55 In practice, however, this targeting strategy has never been feasible against hardened sites. The problem is that any high-yield weapon that detonates low enough to destroy a hardened target will also be low enough to create fallout. Low-yield weapons could do the job and remain above the fallout threshold, but that has always been impractical because low-yield weapons would need to be delivered with great precision to destroy hardened sites, which was previously impossible.56 [End Page 28] Figure 2. The Potential for Low-Fallout Nuclear Counterforce NOTE: "Target hardness" (the horizontal axis) is measured in pounds per square inch (psi), with a typical range of psi for hardened mobile missile shelters and missile silos noted. "Yield" (the vertical axis) is measured in kilotons and plotted on a logarithmic scale. The curve depicts the maximum weapon yield that can destroy a given target from above the fallout threshold. Any weapon yield/target hardness combination above the line that is effective enough to destroy the target will necessarily result in fallout. Points below the line indicate that weapons can be detonated at an altitude that will destroy the target yet produce little or no fallout. See the online appendix for calculations. Click for larger view View full resolution Figure 2. The Potential for Low-Fallout Nuclear Counterforce NOTE: "Target hardness" (the horizontal axis) is measured in pounds per square inch (psi), with a typical range of psi for hardened mobile missile shelters and missile silos noted. "Yield" (the vertical axis) is measured in kilotons and plotted on a logarithmic scale. The curve depicts the maximum weapon yield that can destroy a given target from above the fallout threshold. Any weapon yield/target hardness combination above the line that is effective enough to destroy the target will necessarily result in fallout. Points below the line indicate that weapons can be detonated at an altitude that will destroy the target yet produce little or no fallout. See the online appendix for calculations. Figure 2 illustrates why high-yield strikes against hard targets inevitably create fallout, and it highlights the potential low-yield solution to the fallout problem. The vertical axis reflects weapon yield, and the horizontal axis depicts the hardness of potential targets—with the approximate values for mobile missile shelters and missile silos indicated. The solid black line shows the maximum yield of a weapon that can generate enough overpressure to destroy a target from above the fallout threshold. For example, figure 2 shows that for a 3,000 psi target, the highest-yield weapon that can destroy it while remaining above the fallout threshold is 0.35 kilotons. A larger-yield weapon will necessarily cause fallout if it destroys the target. A low-fallout strike against a 1,000 psi mobile missile shelter would require a weapon with 50 kilo [End Page 29] tons yield, or less. In short, low-fatality nuclear counterforce is possible, but it requires low-yield weapons, and hence very accurate delivery. The accuracy of nuclear delivery systems is now to the point that low-casualty disarming strikes are possible. For example, a 0.3 kiloton bomb would require a CEP of 10–15 meters to be highly effective against hard targets;57 that level of accuracy is likely within the reach of the new guided B61-12, which is slated to replace all nuclear gravity bombs in the U.S. arsenal.58 Similarly, a 5-kiloton missile warhead, which may approximate the yield of the fission primary on many existing ballistic missiles, could destroy a hardened target if its CEP was approximately 50 meters.59 That level of accuracy was implausible for most of the Cold War, yet it is within reach of many countries today.60 By detonating weapons above the fallout threshold, targeters can greatly reduce fallout relative to ground bursts. But how significant are these reductions? How many fewer deaths would be caused in comparison with ground burst strikes? To compare the fallout and potential fatalities from high-yield and low-yield counterforce operations, we used unclassified U.S. Defense Department software, called Hazard Prediction and Assessment Capability (HPAC).61 We modeled two different counterforce strikes, one using a "traditional" high-yield approach and one employing low-yield airbursts, against five hardened targets in North Korea (e.g., nuclear storage sites or hardened mobile missile shelters). Because there is no available unclassified information about the location of North Korea's nuclear storage sites, we modeled strikes against notional locations around the DPRK's periphery. [End Page 30] Figure 3. Low-Fallout Counterforce Option against North Korea NOTE: The figure illustrates the potential fallout consequences of two alternative counter-force strikes against five notional North Korean hardened nuclear sites. In both strike options, each target is destroyed with **greater than 95 percent probability**. The high-yield attack employs ten W88 warheads (455-kiloton yield), with two warheads against each target. Because high-yield weapons cannot destroy hardened sites from above the fallout threshold, the W88s are ground bursts. The low-yield attack uses twenty B61 bombs (0.3-kiloton yield), set to detonate at an altitude that maximizes effectiveness while minimizing fallout. The fallout patterns and casualty figures were generated using unclassified U.S. Defense Department software, called Hazard Prediction and Assessment Capability. Click for larger view View full resolution Figure 3. Low-Fallout Counterforce Option against North Korea NOTE: The figure illustrates the potential fallout consequences of two alternative counter-force strikes against five notional North Korean hardened nuclear sites. In both strike options, each target is destroyed with greater than 95 percent probability. 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As long as the targets were located outside North Korean cities, the number of Korean fatalities from a low-yield strike would be comparable to the human losses from conventional operations. In fact, the fallout contours that are visible in figure 3 for the low-yield scenario correspond to annual radiation levels deemed acceptable by the U.S. Occupational Safety and Health Administration. The precise results of the HPAC simulation should be treated with skepticism: wind speed and direction change constantly, altering fallout patterns. The amount of fallout generated in the low-yield scenario is so low, however, that the results of figure 3 are robust regardless of which way the wind blows: [End Page 31] few people located away from the actual targets would be killed. The point of figure 3 is not to predict the outcome of a counterforce strike on North Korea, but to reveal the relationship between accuracy and fallout. When accuracy was poor, the only approach to nuclear counterforce was high-yield strikes, which would create catastrophic results such as the one depicted above. The accuracy revolution has **changed the calculus**, however; **low-fatality nuclear strikes are now possible**.62 The accuracy revolution is ongoing. As accuracy continues to improve, the effectiveness of conventional attacks on hard targets will continue to increase. Today, low-yield nuclear weapons can destroy targets that once required very large yield detonations. In the future, many of those targets will be vulnerable to conventional attacks. In sum, from the start of the nuclear age to the present, force planners have relied on hardening as a key strategy for ensuring the survivability of their arsenals. That strategy made sense, and until recently ensured that disarming strikes would not only fail, but also kill millions of civilians in the process. Technology never stands still, however, and the technical foundations of deterrence, particularly for the strategy of hardening, have been greatly undermined by leaps in accuracy. Counterforce in the Age of Transparency While advances in accuracy are negating hardening as a strategy for protecting nuclear forces, leaps in remote sensing are undermining the other main approach: concealment. Finding concealed forces, particularly mobile ones, remains a major challenge. Trends in technology, however, are eroding the security that mobility once provided. In the ongoing competition between "hiders" and "seekers," waged by ballistic missile submarines, mobile land-based missiles, and the forces that seek to track them, the hider's job is growing more difficult than ever before. Five trends are ushering in an age of unprecedented transparency.63 First, [End Page 32] sensor platforms have become more diverse. The mainstays of Cold War technical intelligence—satellites, submarines, and piloted aircraft—continue to play a vital role, and they are being supplemented by new platforms. For example, remotely piloted aircraft and underwater drones now gather intelligence during peacetime and war. Autonomous sensors, hidden on the ground or tethered to the seabed, monitor adversary facilities, forces, and operations. Additionally, the past two decades have witnessed the development of a new "virtual" sensing platform: cyberspying.64 Second, sensors are collecting a widening array of signals for analysis using a growing list of techniques. Early Cold War strategic intelligence relied heavily on photoreconnaissance, underwater acoustics, and the collection of adversary communications—all of which remain important. Now, modern sensors gather data from across the entire electromagnetic spectrum; they employ seismic and acoustic sensors in tandem; and they emit radar at various frequencies depending on their purpose, for example, to maximize resolution or to penetrate foliage. Modern remote sensing exploits an increasing number of analytic techniques, including spectroscopy to identify the vapors leaking from faraway facilities, interferometry to discover underground structures, and signals processing techniques (such as those underpinning synthetic aperture radars) that allow radars to perform better than their antenna size would seem to permit.65 Third, remote sensing platforms increasingly provide persistent observation. At the beginning of the Cold War, strategic intelligence was hobbled by sensors that collected snapshots rather than streams of data. Spy planes sprinted past targets, and satellites passed overhead and then disappeared over the horizon. Over time those sensors were supplemented with platforms that remained in place and soaked up data, such as signals intelligence antennas, undersea hydrophones, and geostationary satellites. The trend toward persistence is continuing. Today, remotely piloted vehicles can loiter near enemy targets, and autonomous sensors can monitor critical road junctures for months or years. Persistent observation is essential if the goal is not merely to count enemy weapons, but also to track their movement. [End Page 33] The fourth factor in the ongoing remote sensing revolution is the steady improvement in sensor resolution. In every field that employs remote sensing technology, including medicine, geology, and astronomy, improved sensors and advanced data processing are permitting more accurate measures and fainter signals to be discerned from background noise. The leap in satellite image resolution is but one example: the first U.S. reconnaissance satellite (Corona) could detect objects as small as 25 feet across. Today, even commercial satellites (e.g., DigitalGlobe's WorldView-3 and WorldView-4) can collect images with 1-foot resolution, and U.S. spy satellites are reportedly capable of resolutions less than 4 inches.66 Advances in resolution are not merely transforming optical remote sensing systems; they are extending what can be seen by infrared sensors, advanced radars, interferometers and spectrographs, and many other sensors. The fifth key trend is the huge increase in data transmission speed. During the first decades of the Cold War, it took days or longer to transmit information from sensors to analysts. At least a full day passed before the photographs snapped by U-2 aircraft were developed and analyzed. Early satellites were slower: the satellite had to finish its roll of film, and then eject the canister, which would be caught midair and flown to a facility for development and analysis. All told, images collected at the beginning of a satellite mission might take weeks before they arrived at an analyst's desk. Today, by contrast, intelligence gathered by aircraft, satellites, and drones can be transmitted in nearly real time. The data can be transmitted to intelligence analysts, political leaders, and in some cases directly to military commanders conducting operations. None of these technological trends alone is transformative. Taken together, however, they are creating a degree of transparency that was unimaginable even two decades ago. These new remote sensing technologies are not proliferating around the world evenly; the United States, for example, seems to have exploited new sensing technologies more intensively than other countries. Many countries are developing expertise in advanced sensing, however. The sensing revolution is a global phenomenon, with implications for the survivability of all countries' nuclear arsenals. Remote sensing technologies have improved greatly, but the crucial question is whether these advances have meaningfully increased the vulnerability of the two most elusive types of nuclear delivery systems: SSBNs and mobile land-based missiles. If the ability to track submarines at sea or mobile missiles [End Page 34] on patrol remains out of reach, then the counterforce improvements we identify are less significant, at least for now. In fact, SSBNs have never been as invulnerable as analysts typically assume, and advances in remote sensing appear to be reducing the survivability of both submarines and mobile missiles. REMOTE SENSING AND TRACKING SUBMARINES During the Cold War, the competition between submariners and antisubmarine warfare operators was shrouded in secrecy, but that history is finally being revealed. We now know that the United States was able to locate, and even track, Soviet SSBNs during extended periods of the Cold War.67 The core of U.S. ASW efforts against the Soviet Union lay in a series of breakthroughs in passive sonar and signals processing, as well as doctrine and tactics to exploit those advances. Starting in the 1950s, the United States deployed an expanding network of underwater hydrophones designed to identify and locate adversary submarines. Data from the hydrophones were transmitted across undersea cables to onshore computing facilities, where powerful computers discerned the faint sounds of submarines from ocean noise. Potential targets were then passed along to aircraft and attack submarines (SSNs) for further location and tracking. U.S. capabilities to track Soviet submarines leapt forward in the late 1960s and 1970s, as the United States deployed new attack submarines, which were equipped with powerful sonars in their bows, towed sonar arrays, and improved on-ship computing power, giving U.S. SSNs an unprecedented combination of acoustic gathering and data processing capabilities.68 The competition between Soviet SSBNs and the pack of U.S. submarines, aircraft, and surface ships hunting them varied throughout the Cold War. There were periods in which U.S. forces were winning, trailing every Soviet SSBN on patrol, from port to sea and back. In later periods, after discovering their vulnerability, the Russians pulled their forces into protected "bastions" near Soviet territory to counter the U.S. ASW strategy. The United States did not give up, and worked until the end of the Cold War (and beyond) to regain undersea superiority. [End Page 35] The duration of U.S. Cold War ASW superiority cannot be accurately assessed today because of enduring classification constraints. But for periods of the superpower competition, U.S. naval leaders believed they had the ASW problem well in hand. As the former commander of the U.S. Pacific Fleet in the mid-1980s remarked, the United States was able to "identify by hull number the identity of Soviet subs…and know exactly where they were. In port or at sea. If they were at sea, N3 [director for operations] had an SSN [on them]."69 There are three key lessons to draw from the Cold War ASW competition. First, previous advances in remote sensing greatly increased the vulnerability of deployed submarines.70 Second, escaping vulnerability was no easy task. In the late 1960s, the Soviet Union learned that its submarines were vulnerable. But despite Moscow's significant economic and technological resources, it took the Soviet navy more than a decade to develop good countermeasures against the evolving U.S. ASW capabilities.71 Third, and most broadly, the Cold War ASW competition demonstrates that the deployment of ballistic missile submarines neither ended the Cold War nuclear competition nor negated hopes on either side of attaining military superiority. The United States led the undersea competition for a time because of its superior technology and tactics; the Soviet Union developed countermeasures because it discovered its vulnerabilities and innovated. This back-and-forth struggle between hiders and seekers looks more like a traditional struggle for naval superiority than the common depiction of invulnerable submarines. Today's technological advances in remote sensing, data processing, and communication are occurring at a rapid pace, and their ultimate impact on the submarine competition is too uncertain to predict with confidence (especially given the tight controls over information on contemporary ASW capabilities). Yet, there are good reasons to suspect that the dramatic leaps in remote sensing are increasing the transparency of the seas and undermining the ability of submarines to remain concealed.72 Some of the promising new anti-submarine [End Page 36] technologies include improved acoustic sensors (including low-frequency active sonars and new networks of seabed passive sonars); non-acoustic techniques (such as laser detection); sophisticated "big data" analysis (which exploits leaps in processor speed to sift vast quantities of sensor data); and a variety of unmanned and autonomous undersea vehicles (including those designed to find and shadow adversary submarines for weeks or months).73 The point is not that submarines are now easy to locate or that the challenges of ASW have been solved. Locating technologically sophisticated, well-operated submarines in vast ocean sanctuaries remains a substantial challenge. Rather, the key point is that even the nuclear delivery system sometimes touted as the most survivable has been vulnerable in the past and appears to be increasingly vulnerable today, as ASW efforts and capabilities rapidly improve. What about mobile land-based missiles? Are breakthroughs in sensing technology increasing their vulnerability as well? REMOTE SENSING AND HUNTING MOBILE MISSILES We illustrate the impact of two advanced surveillance systems, radar satellites and remotely piloted aircraft, on the survivability of mobile land-based nuclear missiles. The effectiveness of sensing systems depends on the characteristics of the target country—for example, its size, location, topography, and defenses. As such, their impact is difficult to quantify in the abstract. Instead, we explore the potential contributions of two advanced sensor systems in a hypothetical case: a U.S.-led operation to destroy a small arsenal of North Korean nuclear-tipped mobile missiles.74 We assume that North Korea's TELs are postured like most other countries' mobile missiles; they remain in hardened shelters during peacetime, with plans to disperse a portion of the force during a conflict.75 U.S. and allied strategic intelligence would have at least three critical roles in [End Page 37] support of a military operation against North Korean TELs. The first, a peacetime mission called "intelligence preparation of the battlefield" (IPB), involves locating North Korea's nuclear and missile facilities, identifying the patrol routes utilized by its missile forces, learning its organizational routines, and mapping its command and communication network. The other two roles are principally wartime missions. "Detection" refers to sensing possible targets; it typically involves sensors that can monitor large areas, but that have inadequate resolution for positive identification or targeting. "Identification" is the next step; once a possible target is detected, other platforms (often with higher-resolution sensors) are cued to identify and precisely locate the target.76 SATELLITES/SAR SENSORS A core element of U.S. surveillance capabilities lies in a constellation of satellites that use synthetic aperture radar to image targets on the ground. Satellites provide a unique capability to peer deep into adversary territory, and they are especially useful for missions that require frequent observations of critical facilities. Whereas manned aircraft and unmanned aerial vehicles (UAVs) are often restricted from adversary airspace, satellites routinely overfly adversary territory. Moreover, unlike satellites with optical or infrared sensors, radar satellites can image targets at night and through cloudy weather. Until recently, the type of radar employed on most satellites—synthetic aperture radar (SAR)—could not image moving targets, limiting the effectiveness of space-based sensors for hunting mobile missiles.77 But over the past two decades, engineers have developed data-processing techniques that enable SAR systems to detect moving targets and determine their speed and direction of travel.78 Although the precise capabilities of intelligence satellites are classified, [End Page 38] civilian radar satellites can scan approximately 150-kilometer-wide swaths along the ground as they pass overhead with sufficient resolution to detect truck-sized moving vehicles.79 New techniques are being developed that may soon double or triple the width of the swath that can be scanned on each pass.80 SAR-equipped satellites, now able to find mobile targets, have the potential to transform counter-TEL operations. If U.S. intelligence satellites can detect moving vehicles within a 150-kilometer-wide swath along the ground, a conservative assumption given that a civilian satellite launched nearly a decade ago can do so, then centering the radar on a mobile missile garrison would put all the roads within two hours' drive-time of that facility within the radar's swath width.81 A single satellite can generate up to twelve 150 kilometer x 150 kilometer swaths in a single pass over North Korea, enough to image all the country's roads more than once—and key sections multiple times—before passing over the horizon.82 Although SAR satellites have become powerful tools for hunting TELs, they have important limitations. Surveillance satellites provide only intermittent coverage of key areas, passing overhead and then descending over the horizon. Thus, even if a constellation of satellites could image the entire road network in North Korea every hour, North Korean TELs might be able to disperse without being observed, by seeking shelter whenever a satellite approaches. Furthermore, if many of North Korea's critical facilities are located in its mountainous regions, topography may block the satellite's line-of-sight, which would allow targets within the swath to be hidden from the radar. The potential effectiveness of radar satellites for hunting mobile missiles, therefore, depends [End Page 39] on two key factors: the time interval between satellite passes and the percentage of road network that is observable in a given pass.83 To assess the effectiveness of SAR satellites for hunting North Korean mobile missiles, we conducted an analysis with three key steps. First, we created a digital map of North Korea's roads. Second, we used geospatial analysis software to determine the visible portion of those roads as a function of a satellite's position. Third, we calculated the frequency with which satellites pass within an orbital band that provides high levels of visibility of the road network.84 Our analysis of satellite orbits and North Korean topography reveals that satellites passing through an orbital band that stretches as far as 1,500-kilometer lateral distance from the Korean Peninsula can view, on average, 90 percent of North Korean roads. A typical radar satellite (which operates in low earth orbit) will pass through such a band, what we call a "usable pass," roughly 2.5 times per day. The total number of usable passes per day thus depends on the number of SAR satellites in orbit that are available for hunting mobile missiles. The number of available satellites, in turn, depends on the willingness of the United States and its close allies to share sensitive satellite imagery, the technical preparations that have been undertaken to facilitate that sharing, and the precise technical capabilities of the satellites. Table 2 shows the implications of different assumptions about those uncertainties. If the United States and key allies create the political and technical arrangements to share satellite data during wartime, North Korean TEL commanders would have little time between passes—specifically, as few as 24 minutes.85 Twenty-four minutes between satellite passes could provide enough time for TELs or other vehicles to move quickly from shelter to shelter, but that strategy requires precise information on satellite orbits, and the short time interval between passes leaves little margin for error for vehicles racing for cover. Moreover, the challenge for TEL operators is more serious than the data suggest. The analysis here focuses on the twenty military and intelligence SAR [End Page 40] satellites, not the half dozen or more U.S. and allied civilian platforms that might be pressed into service in wartime.86 Nor does the analysis count the optical and infrared satellites that supplement SAR coverage. Finally, the number and capability of radar satellites available to the United States is growing.87 As that number increases, the window for mobile missiles to scoot away without being observed will narrow further. Table 2. Synthetic Aperture Radar (SAR) Satellites and Frequency of Usable Passes NOTE: The category "Number of SAR Satellites" counts major military and intelligence SAR satellites operated by the United States and key allies. The other columns are cumulative and show how satellite coverage grows when one adds the assets of various U.S. partners. "Usable Passes per Day" indicates the daily satellite overflights that pass through an orbital band that offers, on average, 90 percent coverage of North Korean roads. Click for larger view View full resolution Table 2. Synthetic Aperture Radar (SAR) Satellites and Frequency of Usable Passes NOTE: The category "Number of SAR Satellites" counts major military and intelligence SAR satellites operated by the United States and key allies. The other columns are cumulative and show how satellite coverage grows when one adds the assets of various U.S. partners. "Usable Passes per Day" indicates the daily satellite overflights that pass through an orbital band that offers, on average, 90 percent coverage of North Korean roads. SAR satellites do not solve the problem of locating mobile targets. For one thing, Russia and China are improving their ASAT capabilities, partly in response to U.S. capabilities.88 Furthermore, adversaries will seek to place missile garrisons and conduct deterrent patrols in locations that are difficult to observe.89 Those choices, however, force adversaries into ever-narrower zones, which then become the focus of other surveillance tools—for example, stealthy penetrating UAVs and unattended ground sensors. [End Page 41] In terms of the three key sensing missions (IPB, detection, and identification), SAR-equipped satellites offer a high level of capability for the IPB mission, because they can repeatedly image stationary or moving targets in peacetime. They also contribute a high level of capability to detection, by offering frequent wide-area coverage of North Korean roads. Finally, SAR satellites offer fairly good capability for the identification mission: they can produce high-resolution images of stationary TELs and enough resolution of moving vehicles to determine that a target is "truck-sized."90 UAVS/SAR SENSORS A second set of sensing capabilities lies in a fleet of aircraft, including manned and remotely piloted vehicles, that use powerful radars to scan adversary territory. These aircraft carry SARs, and many are equipped with Ground Moving Target Indicator (GMTI) radars, allowing them to create high-resolution images of stationary targets or track a large number of moving vehicles. Most surveillance aircraft must operate from "standoff" distances to reduce their vulnerability to air defenses. Some drones, however, are stealthy and can penetrate adversary airspace. Below we illustrate the capabilities of standoff SAR/GMTI platforms and penetrating UAVs in the context of a U.S. and allied operation against North Korean mobile missiles. The United States uses several types of aircraft for standoff radar-reconnaissance missions; we base our model on one of them: the remotely piloted RQ-4 Global Hawk. We explore the potential effectiveness of radar surveillance from four continuous orbits 80 kilometers outside North Korean territory.91 ArcGIS software allows us to identify orbital locations that maximize coverage of North Korean roads, as well as calculate the visible percentage of the road network from those locations.92 Figure 4 shows the results. Figure 4 reveals that even against a small country such as North Korea, standoff airborne radars cannot, by themselves, provide complete coverage of key roads and regions. Four orbits can observe 54 percent of North Korea's roads; the remainder is out of sensor range or shielded by mountainous terrain. These results also suggest, however, that standoff UAVs could play a crucial role in a sensing operation; that is, the ability to continuously monitor [End Page 42] roughly half of North Korea's road network during a conflict would compel North Korea to constrain its mobile missile operations to the north-central region of the peninsula. Figure 4. Coverage of North Korea with Standoff Unmanned Aerial Vehicles (UAVs) NOTE: The white circles depict potential orbital locations for four UAVs; the locations were selected to maximize surveillance of North Korea's road network. The orbits are located 80 kilometers from North Korea's territory at an altitude of 60,000 feet, which reflect plausible operations for RQ-4 Global Hawks. White road segments are observable from at least one of the locations. For additional discussion of the underlying analysis, see the online appendix at . The image was created using ArcGIS and road data from OpenStreetMap and DIVA-GIS. Click for larger view View full resolution Figure 4. Coverage of North Korea with Standoff Unmanned Aerial Vehicles (UAVs) NOTE: The white circles depict potential orbital locations for four UAVs; the locations were selected to maximize surveillance of North Korea's road network. The orbits are located 80 kilometers from North Korea's territory at an altitude of 60,000 feet, which reflect plausible operations for RQ-4 Global Hawks. White road segments are observable from at least one of the locations. For additional discussion of the underlying analysis, see the online appendix at http://dx.doi:10.7910/DVN/NKZJVT. The image was created using ArcGIS and road data from OpenStreetMap and DIVA-GIS. In addition to standoff UAVs, the United States has developed drones for so-called penetrating operations.93 These UAVs reduce their visibility to enemy radar [End Page 43] by utilizing stealth technologies and a combination of passive sensors and "low-probability of intercept" (LPI) radars to observe targets on the ground.94 Even sophisticated, stealthy UAVs are vulnerable to air defenses. To some extent their vulnerability depends on technical questions, for example, the state of competition between radar engineers and designers of stealth technology. The vulnerability of penetrating drones, however, depends greatly on their mission. Of the two critical wartime missions, "detection" is likely more dangerous than "identification." The detection mission—continuously monitoring a large area to detect possible targets—would require a drone to remain within the line-of-sight of a large portion of adversary territory. The mission would, therefore, require the drone to fly at high altitude (to maximize line-of-sight) and possibly use active sensors (to maximize the drone's sensor range). The identification mission, on the other hand, would allow penetrating drones to protect themselves better: to operate at lower altitude so that terrain would shield them from enemy sensors, and fly (when cued by detection systems) to investigate a possible TEL. Only then would the penetrating UAV employ LPI or passive sensors to examine the potential target. We used ArcGIS to explore the potential capability of penetrating drones in the identification mission by determining the percentage of the North Korean road network that would be visible using four UAV orbits. Because the penetrating UAVs would need to rapidly identify the vehicles detected by other sensors, we restricted the UAVs to 5 minutes of flight time to maneuver into position to observe the suspected TEL.95 Furthermore, because LPI radars and passive sensors have shorter range than the powerful radars on standoff platforms, we limit the sensor range to 50 kilometers.96 Our analysis reveals that four penetrating drones, operating as we describe above, can identify targets along 84 percent of North Korea's roads.97 As figure 5 [End Page 44] shows, penetrating and standoff systems would be particularly effective in combination, increasing the road network coverage to 97 percent. Assuming that penetrating UAVs can be cued by other reconnaissance systems, such as satellites, unattended ground sensors, or (near the coast) standoff drones, North Korean TEL operators would have great difficulty moving safely along the country's road network without being detected. If U.S. and South Korean intelligence had identified mobile missile garrisons and operating areas before the conflict, the regions surrounding those zones might be fully covered by only one or two drone orbits.98 Figure 5. Coverage of N. Korea with Standoff and Penetrating Unmanned Aerial Vehicles NOTE: The white circles depict potential orbital locations for four UAVs operating 80 kilometers outside North Korea's territory. The black circles depict the area over North Korea that four penetrating UAVs can overfly within five minutes of flight time starting from the center of each circle. Road segments are coded as visible (white) if they are observable from either a standoff or penetrating UAV. For discussion of the underlying analysis, see the online appendix at . The image was created using ArcGIS and road data from OpenStreetMap and DIVA-GIS. Click for larger view View full resolution Figure 5. Coverage of N. Korea with Standoff and Penetrating Unmanned Aerial Vehicles NOTE: The white circles depict potential orbital locations for four UAVs operating 80 kilometers outside North Korea's territory. The black circles depict the area over North Korea that four penetrating UAVs can overfly within five minutes of flight time starting from the center of each circle. Road segments are coded as visible (white) if they are observable from either a standoff or penetrating UAV. For discussion of the underlying analysis, see the online appendix at http://dx.doi:10.7910/DVN/NKZJVT. The image was created using ArcGIS and road data from OpenStreetMap and DIVA-GIS. [End Page 45] Each of the sensing systems explored here has important limitations. For example, radar satellites provide wide-area coverage, but do so intermittently and at only moderate resolution. Standoff drones provide persistent coverage, but only near the coast. Penetrating drones can provide persistent coverage inland (at the cost of increased risk to the aircraft) or intermittent inland coverage at lower risk. In many cases, however, the capabilities of one system can offset the limits of another. Moreover, this analysis merely scratches the surface in terms of new sensing platforms (e.g., unattended ground and seabed systems), signals (e.g., high-resolution spectroscopy), and approaches (e.g., cyber intrusions), many of which would be employed together for the same mission. Old assumptions about the survivability of mobile forces need to be revised in light of new sensing technologies and capabilities. Concealment is not impossible, of course. An adversary's mobile delivery systems can remain secure if its air defenses can keep UAVs at bay, its navy can keep enemy ASW forces from its coastal waters, and anti-satellite technology can blind satellites. But in this new era of transparency, whether concealed forces are survivable or not depends on the state of competition between opposing intelligence and military organizations. Survivability through concealment can no longer be assumed. What About Countermeasures? Countries will surely address the growing vulnerability of their nuclear arsenals by trying to develop countermeasures to thwart advanced sensor and strike systems. They will seek to deploy radar jammers, anti-satellite weapons, and decoys. They will try to adapt mobile missile doctrines to reduce vulnerability, for example, by timing movements to elude satellites and minimizing communications to thwart signals intelligence efforts. The new era of counter-force will not be static; it will be characterized by vigorous efforts to develop countermeasures, as well as equally vigorous efforts to overcome them. Yet, there are good reasons to expect that the net result of these efforts will leave nuclear delivery systems more vulnerable than they have been in the recent past. First, hunters are poised to do well in the back-and-forth battle of countermeasures. Counterforce is the domain of the powerful; those that are seeking to track enemy nuclear forces typically have greater resources than their rivals.99 Additionally, the countries that are leaders in sensing technology [End Page 46] have an advantage in the race to build (and thwart) countermeasures. As Brendan Green and Austin Long observe about the Cold War ASW competition, U.S. superiority in passive acoustics helped the United States quiet its own SSBNs, which in turn allowed it to practice and hone its tracking capabilities.100 Expertise in sensors and countermeasures go hand in hand. Perhaps most importantly, many countermeasures reduce one vulnerability at the cost of exacerbating others. For example, limiting communications between mobile missiles or submarines and their command authorities reduces vulnerability to signals intercepts, but it increases vulnerability to attacks designed to sever (or simulate) their command and control.101 Avoiding coastal roads neutralizes offshore sensors, but it channels forces into a smaller zone, easing the search problem. Even the simplest countermeasures, such as increasing security near sensitive facilities to prevent the emplacement of unattended ground sensors or improving air defenses around key sites to thwart UAVs, may cue hunters to the presence of high-value sites. Second, the potential targets of disarming strikes cannot merely respond to a single counterforce technology; they must respond to a daunting list of them. The revolutions in accuracy and sensing have had multiple, synergistic effects in bolstering counterforce. The task for hiders is not simply to thwart a single platform, such as SAR satellites, but rather to develop countermeasures to the entire array of (known) capabilities deployed by the hunters. For example, North Korea may find ways to interfere with U.S. radar satellites, but that still leaves its missiles vulnerable to detection by optical satellites; UAVs; unattended ground sensors; and a variety of tagging, tracking, and locating capabilities. Third, some vulnerabilities are difficult to fix. In the late 1960s, the Soviet Union learned that its SSBNs were being tracked by the United States, but it took more than a decade to counter this U.S. capability. Consider the challenge faced by China today in building a survivable ballistic missile submarine force; China deployed its first submarines in the 1960s, but more than half a century later Chinese submarines are still so noisy that experts predict it will be decades before Beijing can field survivable submarines.102 [End Page 47] The battle between countermeasures and corresponding attempts to defeat them is under way, and its outcome will likely depend on the strategic context. Rich countries with advanced research and development infrastructure are developing technology and doctrine to protect their nuclear forces in the face of improvements in weapons accuracy and remote sensing. Weaker countries with modest resources, however, will be hard pressed to develop effective countermeasures to the full spectrum of emerging means of counterforce. Conclusion For most of the nuclear age, there were many impediments to effective counterforce. Weapons were too inaccurate to reliably destroy hardened targets; fratricide prevented many-on-one targeting; the number of targets to strike was huge; target intelligence was poor; conventional weapons were of limited use; and any attempt at disarming an adversary would be expected to kill vast numbers of people. Today, in stark contrast, highly accurate weapons aim at shrinking enemy target sets. The fratricide problem has been swept away. Conventional weapons can destroy most types of counterforce targets, and low-fatality nuclear strikes can be employed against others. Target intelligence, especially against mobile targets, remains the biggest obstacle to effective counterforce, but the technological changes under way in that domain are revolutionary. Of the two key strategies that countries have employed since the start of the nuclear age to keep their arsenals safe, hardening has been negated, and concealment is under great duress. The new era of counterforce helps solve one of the enduring theoretical puzzles of the nuclear age. For decades, scholars of the theory of the nuclear revolution wondered why leaders seemed to be ignoring the profound implications of nuclear weapons for international politics. In theory, nuclear weapons make states that possess them so secure that they need not engage in traditional forms of competition with adversaries, such as arms racing, alliance building, relative gains competition, and rivalry over strategic territory. In practice, all those behaviors have endured. Scholars blame the persistent discrepancy between theory and practice on misperception, illogic, or other decisionmaking pathologies. The new era of counterforce suggests, however, that leaders have been correct to perceive that stalemate can be broken, and that the nuclear balance can vary dramatically across cases. If today's secure arsenal can become tomorrow's first-strike target, then there is little reason to expect [End Page 48] the geopolitical competition between countries to end with the deployment of seemingly secure nuclear weapons. **The policy implications of the new era of counterforce are** also **important**. First, if nuclear forces are becoming increasingly vulnerable to counterforce, then states need to improve their retaliatory arsenals just to maintain the same level of deterrence. Given that nuclear delivery systems are expensive and must last for decades, the challenge for force planners is extraordinary: deploy weapon systems that will remain survivable for multiple generations, even as technology improves at an ever-increasing pace. Second, the growing threat to nuclear arsenals (from nuclear strikes, conventional attacks, missile defenses, ASW, and cyber operations) raises major questions about the wisdom of cutting the size of nuclear arsenals. In the past, many arms control advocates believed that arms cuts reduced the incentives for disarming strikes; whether right or wrong in the past, that assumption is **increasingly dubious** as a recipe for **deterrence stability** today. Finally, leaps in accuracy and remote sensing should **reopen** debates in the United States about **the wisdom of** pursuing effective **counterforce** systems. Fielding those capabilities—nuclear, conventional, and other—may prove invaluable: enhancing deterrence during conventional wars and, if deterrence fails, allowing the United States to defend itself and its allies. Enhancing counterforce capabilities, however, may trigger arms races and other dynamics that exacerbate political and military conditions. In the past, technological conditions bolstered those who favored restraint: disarming strikes seemed impossible, so enhancing counterforce would likely trigger arms racing without much strategic benefit. Today, technological trends appear to **validate the advocates of counterforce**: remote sensing, conventional strike capabilities, ASW, and cyberattack techniques will continue to improve and increasingly threaten strategic forces **whether or not** the United States seeks to maximize its counter-force capabilities. In this new era of counterforce, technological **arms racing seems inevitable**, so exercising restraint may **limit options** **without yielding much benefit**. Nuclear deterrence can be robust, but **nothing about it is automatic** or everlasting. Nuclear stalemate might endure among some pairs of states, and technology could someday reestablish the ease of deploying survivable arsenals. Today, however, **survivability is eroding**, and **it will continue to do so** in the foreseeable future. Weapons will grow even more accurate. Sensors will improve. The new era of counterforce will likely yield benefits to those countries that best adapt to the new landscape, and costs to those that fall behind. The first step in understanding these dynamics is to recognize the new strategic reality confronting nuclear powers today.

#### Limited nuclear war doesn’t cause extinction – BUT – stigmatizes future use.

Deudney 18 [Daniel H. Deudney, Associate Professor of Political Science at Johns Hopkins University, March 15, 2018, “The Great Debate,” The Oxford Handbook of International Security, www.oxfordhandbooks.com, doi:10.1093/oxfordhb/9780198777854.013.22]

Although nuclear war is the oldest of these technogenic threats to civilization and human survival, and although important steps to restraint, particularly at the end of the Cold War, have been achieved, the nuclear world is increasingly changing in major ways, and in almost entirely dangerous directions. The third “bombs away” phase of the great debate on the nuclear-political question is more consequentially divided than in the first two phases. Even more ominously, most of the momentum lies with the forces that are pulling states toward nuclear-use, and with the radical actors bent on inflicting catastrophic damage on the leading states in the international system, particularly the United States. In contrast, the arms control project, although intellectually vibrant, is largely in retreat on the world political stage. The arms control settlement of the Cold War is unraveling, and the world public is more divided and distracted than ever. With the recent election of President Donald Trump, the United States, which has played such a dominant role in nuclear politics since its scientists invented these fiendish engines, now has an impulsive and uninformed leader, boding ill for nuclear restraint and effective crisis management. Given current trends, it is prudent to assume that sooner or later, and probably sooner, nuclear weapons will again be the used in war. But this bad news may contain a “silver lining” of good news. Unlike a general nuclear war that might have occurred during the Cold War, such a nuclear event now would probably not mark the end of civilization (or of humanity), due to the great reductions in nuclear forces achieved at the end of the Cold War. Furthermore, politics on “the day after” could have immense potential for positive change. The survivors would not be likely to envy the dead, but would surely have a greatly renewed resolution for “never again.” Such an event, completely unpredictable in its particulars, would unambiguously put the nuclear-political question back at the top of the world political agenda. It would unmistakably remind leading states of their vulnerability It might also trigger more robust efforts to achieve the global regulation of nuclear capability. Like the bombings of Hiroshima and Nagasaki that did so much to catalyze the elevated concern for nuclear security in the early Cold War, and like the experience “at the brink” in the Cuban Missile Crisis of 1962, the now bubbling nuclear caldron holds the possibility of inaugurating a major period of institutional innovation and adjustment toward a fully “bombs away” future.

#### Continued modernization causes China to MIRV ICBMs

Killalea 17

Debra Killalea, Writer for AU News, “China: New missile, DF-41, expected to be deployed next year.” AU News. December 1, 2017. <https://www.news.com.au/world/asia/china-new-missile-df41-expected-to-be-deployed-next-year/news-story/5f0989eb732ab8f4c6b6a00db3eecae5>

CHINA has unveiled its most powerful weapon yet and its new intercontinental ballistic missile is a force to be reckoned with.

The DF-41 ICBM can carry up to 10 manoeuverable warheads ranging from 100 to 200 kilotonnes to megaton size and has a range of between 12,000kms and 15,000kms.

In comparison, North Korea’s Hwasong-15, which was launched yesterday, has an estimated range of 13,000km.

China’s[People Daily](http://en.people.cn/n3/2017/1128/c90000-9297997.html?mkt_tok=eyJpIjoiTnpkaFpUSTBOR00wWTJNNSIsInQiOiJuWmYrSTNYR0RzRlNnU2k2a3dQZTk5WUxYUlowSGQyZnBcL0xpbFV1ck9ISDNIVzFzN1dGb1BZQ3FDbUJ1NGpqcExMTHZcL0ZsWWhrczU0d0c1YXh6TUF4T0l4R1FOTTVCR1JUYWNaQUtSbW83TXl4cmJLandrMHhrcDkrZ1kyUkFtIn0%3D)newspaper revealed the DF-41 could enter service as early as the first half of next year.

Military expert Yang Chengjun told a TV program broadcasted on China Central Television (CCTV) earlier this week the DF-41 is China’s latest strategic missile and was quick, mobile and precise.

“The missile can hit every corner of the earth, allowing China to counter a nuclear strike on the country,” Mr Yang said.

According to the newspaper, the test launches have had a 100 per cent success rate.

Dr Malcolm Davis, a senior analyst in defence strategy and capability at the Australian Strategic Policy Institute, said this was China’s most advanced ICBM.

“It’s a road-mobile, solid fuelled ICBM with the range to cover all targets in the continental United States,” Dr Davis said.

“Its MIRVed — MIRV standing for multiple independently targeted re-entry vehicles.

“This means the missile can carry multiple nuclear warheads — up to 10 warheads each with yields of around 150 kilotons (150,000 tons TNT equivalent) — or a single warhead with a yield up to 3 megatons (millions of tons of TNT).”

Dr Davis said 24 of these missiles could deliver between 240 warheads against the US.

“The North Korean Hwasong-15 would by contrast carry a single warhead,” he said.

“It would also carry penetration aids (‘penaids’) designed to confuse US missiles defences.”

Dr Davis said China is also developing ‘MARVs’ — manoeuvring re-entry vehicles — that would give them the ability to further defeat US missile defence, and potentially, attack mobile targets.

“They are also developing hypersonic glide vehicles which would carry individual warheads and glide at up to Mach 20 at very high altitude on a highly evasive trajectory, with the hypersonic glide vehicle (called a ‘DZ-ZF’) being launched atop the DF-41 in place of the regular payload of warheads,” he said.

Beijing’s overall objective is to ensure Chinese ICBMs like the DF-41 can defeat US missile defence systems, Dr Davis said.

ULTIMATE WEAPON

Nuclear disarmament campaigner John Hallam said the DF-41 was simply the most powerful nuclear missile in the world and was the “ultimate doomsday weapon”.

“It’s a whopper, comparable to the biggest Russian missiles, which it resembles, including the recently tested Sarma,” Mr Hallam said.

He said there have been rumours and claimed sightings of this missile for some time and that it has been tested before.

“The backbone of China’s strategic force has always been the somewhat ancient DF-5 missile, each with a single 5 megaton warhead (by far) the biggest warhead in actual military use,” Mr Hallam said.

“For a long time there were just 20 of these things, but a few years back the Chinese started to upgrade, update, and add to the DF5’s, so there might be 30 now, and they started to deploy something called the DF-41 — the same designation as this one.”

The missile also could have a deadly impact if used in conflict.

“Just one of these missiles, with 10 warheads each of 100kt plus range, could essentially destroy either the major cities or the significant military capacity of the United States, especially if command and control nodes are prioritised,” Mr Hallam said.

“The DF-41 with multiple big warheads and probably a middling accuracy is ideally suited for incinerating cities, and its being mounted on a TEL (Transporter-Erector-Launcher), is consistent with that — it moves around so it can’t easily be targeted like a silo.

#### US missile defense ensures deployment – competition draws in India and escalates

Kristensen, director of the Nuclear Information Project at the Federation of American Scientists, ‘15

(Hans M., “Pentagon Report: China Deploys MIRV Missile,” May 11, https://fas.org/blogs/security/2015/05/china-mirv/)

**Why Chinese MIRV?**

The big question is why the Chinese leadership has decided to deploy MIRV on the silo-based, liquid-fuel DF-5A.

Chinese officials have for many years warned, **and US officials have predicted**, that advanced US non-nuclear capabilities such as missile defense systems could cause China to deploy MIRV **on some of its missiles.** The Pentagon report **repeats this analysis** by stating that China’s “new generation of mobile missiles, with warheads consisting of MIRVs and penetration aids, are intended to ensure the viability of China’s strategic deterrent in the face of continued advances in U.S. and, to a lesser extent, Russian strategic ISR, precision strike, and **missile defense capabilities**.”

Conclusions

**Chinese MIRV on the DF-5 ICBM is a** bad day for nuclear constraint.

Seen in the context of China’s other ongoing nuclear modernization programs – deployment of several types of mobile ICBMs and a new class of sea-launched ballistic missile submarines – the deployment of a MIRVed version of the DF-5 ICBM reported by the Pentagon’s annual report **strains the credibility of China’s official assurance** that it only wants a minimum nuclear deterrent and is not part of a nuclear arms race.

MIRV on Chinese ICBMs changes the calculus that other nuclear-armed states will make about China’s nuclear intensions and capacity. Essentially, **MIRV allows a much more rapid increase of a nuclear arsenal than single-warhead missile.** If China also develops MIRV for a mobile ICBM, then it would further deepen that problem.

To its credit, the Chinese nuclear arsenal is still much smaller than that of Russia and the United States. So this is not about a massive Chinese nuclear buildup. Yet the development underscores that a technological nuclear competition among the nuclear-armed states is in full swing – one that China also contributes to.

Although it is still unclear what has officially motivated China to deploy a MIRVed version of the DF-5 ICBM now, previous Chinese statements and US intelligence assessments **indicate that it may be a** reaction to the US development and deployment of missile defense systems **that can threaten China’s ability to retaliate with nuclear weapons.**

If so, **how ironic that the US missile defense system** – intended to reduce the threat to the United States – instead **would seem to have increased the threat by triggering development of MIRV** on Chinese ballistic missiles that could destroy more US cities in a potential war.

The deployment of a MIRVed DF-5 also raises serious questions about China’s strategic relationship with India. The Pentagon report states that in addition to US missile defense capabilities, “India’s nuclear force is an additional driver behind China’s nuclear force modernization.” **There is little doubt that Chinese MIRV has the potential to** nudge India into the MIRV club as well.

Indian weapons designers have already hinted that India may be working on its own MIRV system and the US Defense Intelligence Agency recently stated that “India will continue developing an ICBM, the Agni-VI, which will reportedly carry multiple warheads.”

**If** Chinese MIRV triggers Indian MIRV **it would** deepen nuclear competition **between the two Asian nuclear powers and reduce security for both**. This calls for both countries to show constraint but it also requires the other MIRVed nuclear-armed states (Britain, France, Russia and the United States) to limit their MIRV and offensive nuclear warfighting strategies/