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Introduction

The first official public expression that there was a nuclear dimension to the Russo-Ukraine Crisis occurred when Vladimir Putin alluded to nuclear weapons in his statement of 21 February 2022 claiming that Ukraine intended to produce a nuclear capability and that Ukraine already possessed nuclear delivery systems: "We cannot leave this danger without reaction." In his speech announcing the next phase of the Ukrainian invasion on 24 February, Putin asserted that "Whoever tries to hinder us, and even more so, to create threats to our country, to our people, should know that Russia's response will be immediate. And it will lead you to such consequences that you have never encountered in your history." The next day, Putin announced in a televised statement that Russian nuclear forces were put on a "special regime of combat duty" and that "there should be no doubt for anyone that any potential aggressor will face defeat and ominous consequences should he directly attack our country." Two days later, on 27 February, Putin, with Minister of Defence Sergy Shoigu and Chief of the General Staff Valery Gerasimov present, repeated these statements. To underscore these remarks, Dmitry Kiselyov (known as "Putin's mouthpiece"), asserted on Rossiya 1 TV that "Our submarines alone can launch more than 500 nuclear warheads which guarantees the destruction of the US and NATO…why do we need the world if Russian won't be in it?" Finally, on 28 February, Minister of Defence Shoigu publicly reported to Putin that the Strategic Missile Forces; Northern Fleet; Pacific Fleet, and Long Range Aviation forces "have taken up duty with reinforced personnel."

These unprecedented statements, however, only confirmed what had been occurring since at least March 2021: that Russia had been exercising her nuclear forces to signal potential opponents while preparations were made to invade Ukraine. Indeed, this followed a historical pattern established during the 1956 and 1968 crises when the Soviet Union exercised strategic nuclear forces prior to intervening in Hungary and Czechoslovakia. This signalling was done with the intent of forestalling outside interference in support of the target nations. New methods of information collection and analysis today, however, give breadth and depth to the astonishing extent that signalling using strategic nuclear forces was in play by Russia, the United States, the United Kingdom, and France prior to and after the Earth-shaking events of 24 February 2022. Indeed, it is possible that strategic nuclear signalling reached new breadths and depths during this crisis because of the explosion of new social media technologies and other methods not available in the past. This study will examine how these new technologies have merged with traditional strategic nuclear forces crisis signalling to present an augmented form of information operations that transcends anything we have seen in this field previously, specifically because of the importance of potential nuclear weapons use. It must be emphasized, however, that this is a preliminary study based on currently available information and thus some assertions are tentative and subject to the emergence of new information and interpretations.

Theory and Methodology

Signalling theory involving strategic nuclear forces has a long pedigree rooted in 1950s and 1960s-era game theory. By the 1990s, the derivative dominant signalling model was the applied sunk cost model which leaned on the concept of audience costs, or as James Fearon described it, "Tying Hands" versus "Sinking Costs."[1] Though influential at the time, there were significant limitations. Fearon's modeling appears to have been based on situations involving two primary antagonists with attendant proxies, whereas the situation we are dealing with today over Ukraine is more complex than this. Ukraine is not an American proxy, despite the howls of the Russian information operations apparatus: it is a recipient of military aid and intelligence support and thus its behaviour does not conform to this model or operate well within it.

Additionally, actions by other players who are not directly involved in the contest, like North Korea, have the ability to insert random events into the signalling "system" and disturb it, something not accounted for in the sunk cost model. Indeed, the United States engaged in "touts azimuth" signalling and deterrence, as demonstrated in this study. Similarly, it is impossible to quantify Ukrainian national survival and prevention of genocide in such a model in abstract terms like "values" and "prizes." The applied sunk cost signalling model does not take into account the vagaries of human behaviour and the differences in cultural background that influence signalling. In that vein, the model assumes most actions are undertaken as deliberate bluffs. This perspective does not take into

account the complexities of *Gibridnye Metody* and similar Russian concepts. Actions may appear to be a bluff at the poker table, but they are in fact a chess move on a more complex board.[2]

In 2018, a new body of scholarship took on the dominant 1990s approach. Broadly, this was a critical assault on applied sunk cost theory embodied by Fearon. This new body of work correctly determined that leaders do not behave or even think in terms of applied sunk cost theory. Indeed, they lean towards the credibility of signals as a dominant lens through which to assess them, that is, "dispositional orientations" play a significant role. Neither the 1990s nor the 2010s schools assess the quality of the signal nor do they address the specific methodology by which the signal is conducted, however.[3]

Boiled down, it appears as though some theorists keep trying to empirically prove to themselves that troop mobilizations, public threats, and nuclear weapon flourishes don't "work," thus hoping deterrence cannot be proven to "work," and therefore arguments can be made in favour of ridding the world of nuclear weapons rather than stockpiling them. Though perhaps laudable from an activist standpoint, this does not assist us in understanding how other less ethical leaders operate and how to counteract their activities. Fuhrmann and Sechser's work published in 2013 is a notable exception to this perspective in their examination of extended deterrence using the sunk cost model, but the approach retains the limitations of the theoretical arc established by Fearon.[4]

That said, some activities are, perhaps, beyond scientific empirical proof produced by modeling. Jill Lapore's work on the Simulmatics Corporation and its application of modelling to the Vietnam War and political behaviour strongly suggests this is the case.[5] Whether artificial intelligence, machine learning or Oxford Analytica-like capabilities will more closely approach absolute predictability remains to be seen. The reality is, statesmen and leaders of regimes around the world engaging in signalling behaviour conduct it out of historical tradition. There are no indications that they are seriously informed by American signalling theory generated by academics. This is just the way things are done, as they have been done since the advent of modern international diplomacy. The manoeuvring

of military forces to reinforce a diplomatic or other political position in the international arena has its pedigree in the gunboat diplomacy of the 19th and 20th Centuries, and then in the nuclear crises and other military operations of the Cold War: There is a substantial body of work that supports this argument.[6] Signalling activities are a language within a specific type of environment. And signalling language has now evolved to include social media as well as gunboats.

We have learned repeatedly that templating Western values, beliefs, and operating methods on adversaries in order to understand them is extremely problematic. How does one in the West empirically assess the current Russian ideology that there is a Nazi-Zionist-LGBTQ conspiracy to destroy Russia using Ukraine as a proxy and how this plays a role in motivating signalling behaviour? Western scholars may not take Russian geopolitical theorist Alexander Dugin seriously, but derivative works based on his theories are required reading in higher-level military academies in Russia.[7] Men like Vladimir Putin do not decide or behave according to Western modeling and perhaps are more likely to behave according to their complex cultural, psychological and experiential make-up. And putative allies like Volodomyr Zelensky do not behave according to models, as we have recently seen, either. What we can measure is what is observable, and we can caveat this by understanding that we do not see everything. We can, rightly so, debate if we have enough information or we can debate its quality in order to draw conclusions or not. The amount of information available and its quality as demonstrated in this study suggests we do have enough for tentative analysis. Historical precedence and context is, perhaps, a better method to view and assess strategic nuclear force signalling at this juncture in this particular crisis rather than other methodologies. Establishing an agreed-to narrative is a sine qua non before one can theorize in any case. A new approach that builds on this new data cannot and should, clearly, not be categorically ruled out.

In the 2000 Cuban Missile Crisis film *Thirteen Days*, there is a scene where Secretary of Defense Robert McNamara lectures CNO George Anderson in the Pentagon's naval plot room during a critical phase of that

crisis. Anderson views the naval blockade (or quarantine) in traditional terms, but McNamara sees it as language, a means by which Kennedy and Khrushchev communicate. Cold War-era signalling methodology relied on traditional diplomatic communications, on surveillance and intelligence collection methods, and on flourishing nuclear forces at particular times and in particular configurations. An example of this was the elevation of Strategic Air Command's Defence Condition to DEFCON 2 during the Cuban Missile Crisis and the consequent increased number of nuclear-armed B-52 bombers that were made deliberately visible to Soviet signals intelligence and surveillance systems.[8] The manoeuvre of nuclear forces during crises in some ways was a definitive part of the Cold War and became ensconced in popular culture which resonates today and frames the public as well as governmental understanding of what to expect in a crisis involving nuclear forces.

That language today has several dialects, some which were not foreseen back 1962. In the era of social media, Facebook, Twitter, Telegram and other platforms have emerged as signalling tools. The ability to proliferate a message in minutes if not seconds has been a part of daily life for over a decade and it was only a matter of time before that capability was harnessed for other purposes, both diplomatic and military. Former US ambassador to the Russia Michael McFaul was confronted with an extremely sophisticated anti-US information operations campaign on arrival in Moscow in 2012 and fought to use the social media platforms to full effect to signal American intent, albeit in a non-war situation. A variety of social media platforms were rapidly integrated into their information strategies by both sides during and after Russia's 2014 invasion of Ukraine.[9] All ministries of defence, including Russia, maintain Facebook pages, Twitter pages, and news websites. The Russian ones are known particularly for their high production value when it comes to photos and video footage.

Another product of the new information age is the public's ability to access global air traffic control plots (ATC) and observe aircraft movements in real time. All commercial aircraft and some military aircraft operating under certain conditions and in certain geographical locations

must carry transponders which produce a signal so that air traffic can be deconflicted. It is possible to observe the behaviour of even highly specialized intelligence collection, nuclear command and control aircraft and nuclear-capable aircraft if the owner chooses to "squawk" or allow its transponder to be employed. Consequently, if an aircraft can be seen in these systems, the probability approaches 100% that its owner wants the aircraft to be seen. If it does not, the option to squawk off exists. For example, during the Kazakhstan crisis in January 2022, Russian transport aircraft carrying the intervention force were visible while they were conducting operations. When open-source intelligence outlet Bellingcat publicly announced that they were tracking these aircraft, the Russian air force switched their transponders off before entering Kazakh airspace and would turn them back on some time after they re-entered Russian airspace.[10]

Experience with these systems in order to interpret the data is crucial. In some cases Russian airport ground support vehicles have transponders that squawk as though they are aircraft.[11] Real time ATC data can be spoofed, even though there are numerous mitigation strategies.[12] And if a nation intends to send a message using aircraft tracks while having one aircraft portray another, the message is still delivered in any case despite the deceptive methodology. Indeed, the ATC tracking data can be correlated with military radar tracks and even open-source satellite imagery to confirm movements.[13]

Of course, one must have a high level of awareness when examining and interpreting signals, especially so in the heavy social media information environment. Indeed, the intertwining of signalling, deception, disinformation and active measures demands substantial skill and background if one is to filter out the chaff. This is further complicated by the deliberate use of information to generate reactions or initiate processes in an adversary long before military force is employed. Although there are numerous definitions and approaches as well as a hearty debate over them, signalling is integral to what some call hybrid warfare, grey zone warfare, net centric warfare, or information warfare. For our purposes here, the Russian term *gibrinaya metody* is the best descriptor of actual

as opposed to theoretical Russian activity: hybrid methods, which are described by one of its main proponents "as a complex employment of political, economic, information and other non-military means, which are supported by military power." Indeed, "a combination of traditional and hybrid methods is already an important characteristic of any armed conflict. However, if the latter can be used without an open employment of military force, the former- traditional military actions-cannot without hybrid [methods]."[14] In effect, signalling is one means to influence an opponent as part of an integrated effort to achieve national objectives. As we will see, the observed frequency and quality of the Russian signal increased significantly from April 2021 to April 2022. Russian presidential spokesman Dmitry Peskov, referring obliquely to the movements of strategic nuclear forces, stated on 18 February 2022, or six days before the assault on Ukraine, that "The fact is that a number of exercises are underway now, and these are actions that are absolutely transparent and understandable for specialists from other countries."[15] Peskov neatly confirmed for the cognoscenti that Russia had been signalling and would continue to signal during this crisis.

Endnotes

1. James D. Fearon, "Signalling Foreign Policy Interests: Tying Hands versus Sinking Costs," *The Journal of Conflict Resolution* vol. 41 no. 1, February 1997, pp. 68-90.
2. As examined in Ofer Fridman, *Russian Hybrid Warfare: Resurgence and Politicization* (London: Hurst and Co, 2018) and in Peter Pomerantsev, This is Not Propaganda: Adventures in the War Against Reality (New York: Public Affairs, 2019)
3. Keren Yarhi-Milo, Joshua D. Kertzer, and Jonathan Renshon, "Tying Hands, Sinking Costs, and Leadership Attributes," *Journal of Conflict Resolution* Vol. 62 No. 10, 2018 pp. 2150-2179. Both Fearon and Yarhi-Milo et al provide summaries of previous theories and their specific geolocation within them.
4. Matthew Fuhrmann and Todd S. Sechser, "Signalling Alliance Commitments: Hand-tying and Sunk Costs in Extended Nuclear Deterrence," *American Journal of Political Science* 19 September 2013 at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2327559
5. Jill Lepore, *If/Then: How the Simulmatics Corporation Invented the Future* (New York: Liveright Publishing Corporation, 2020).
6. Examples include James Cable's work *Gunboat Diplomacy: Political Applications of Limited Naval Force* in its various editions from 1971 to 1991; Barry M. Bleckmann and Stephen S. Kaplan's *Force Without War: U.S. Armed Forces as a Political Instrument* (Washington DC: Brookings Institution, 1978) and Stephen S. Kaplan, *Diplomacy of Power: Soviet Armed Forces as a Political Instrument* (Washington DC: Brookings Institution, 1981).
7. For detailed unpacking of Dugin, if you dare, see Charles Upton, *Dugin Against Dugin: A Traditionalist Critique of the Fourth Political Theory* (Reviviscimus Press, 2018). Col Gen Leonid Ivashov, commander of Russian forces during the Kosovo War in 1999, assisted Dugin with his seminal work *Foundations of Geopolitics* (1997) which is required reading at the highest levels of the Russian military.
8. As discussed in Sean M Maloney, *Deconstructing Dr. Strangelove: The Secret History of Nuclear War Films* (Lincoln: Potomac Books, 2020) ch. 5.
9. Michael McFaul, *From Cold War to Hot Peace: An American Ambassador in Putin's Russia* (New York: Houghton, Mifflin, and Harcourt, 2018) ch. 18; David Patrikarakos, *War in 140 Characters: How Social Media is Reshaping Conflcit in the Twenty-First Century* (New York: Basic Books, 2017) ch's 4, 7, 8 and 9.

10. The author observed this behaviour in January 2022. See Aiganysh Aiderbekova, "Launching an Open Source Flight Database for Kazakhstan in Wake of Protests," 8 Jan 22, at https://www.bellingcat.com/resources/2022/01/08/launching-an-open-source-flight-database-for-kazakhstan-in-wake-of-protests/
11. The author observed what looked like a formation of four aircraft land in sequence at St Petersburg. After checking the meteorological conditions, this event turned out to be four snow plows clearing snow on the runway.
12. CRFS Blog, "ADS-B Spoofing Detection with 3D TDOA," at https://www.crfs.com/blog/ads-b-spoofing-detection-with-3d-tdoa/; Xuhang Ying et al, "Detecting ADS-B Spoofing Attacks using Deep Neural Networks," https://arxiv.org/pdf/1904.09969.pdf ; Kellyn Wagner Ramsdell, "Few Answers for ADS-B Security Concerns," AINonline, 14 Feb 18, https://www.ainonline.com/aviation-news/business-aviation/2018-02-14/few-answers-ads-b-security-concerns
13. An example of this is the Sentinel-2 satellite imaging system, frequently used by open source intelligence aficionados. https://sentinel.esa.int/web/sentinel/missions/sentinel-2
14. Ofer Fridman, *Russian Hybrid Warfare" Resurgence and Politicisation* (London: Hurst and Co, 2018) p. 143. The author of this statement is General Valery Gerasimov, the Russian chief of the general staff at the start of the Russo-Ukrainian War.
15. TASS, "Planned exercises of strategic deterrence forces led by Putin will be held in Russia," 18 Feb 22, https://tass.ru/armiya-i-opk/13762491

The Russo-Ukrainian Crisis and Signalling in 2021

There were several stages to the Russian plan to attack and seize Ukraine. The earliest were mounted in 2014 against Crimea and the Donbas, which eventually stabilized into a low-level "frozen" conflict with varying levels of death and provocation producing around 14 000 dead prior to 2021. In April 2021, however, a variety of sources reported large-scale movements of Russian military formations, around 120 000 troops, to positions opposite Ukraine, as well as the activation of airborne and naval units, key elite formations necessary for any further invasion of Ukrainian territory. Performative actions involving the withdrawal of 12 000 troops were conducted once the implications of the build-up were assessed by Western powers and media scrutiny and diplomacy applied.[1] The next phase was a renewed Russian build up in the November 2021, which in turn led to another round of diplomacy and significantly increased concerns that Russia would invade Ukraine. During the fall of 2021, Russian strategic nuclear forces shifted from their baseline posture and by December there were American shifts to match.

We cannot see all of the chess pieces that were moved as part of signalling activity. For example, U.S. Air Force B-2 bombers at Whiteman Air Force Base in Missouri each have their own hanger and it is possible to generate this force by moving nuclear weapons from their bunkers at night or when there is no satellite coverage to those shelters while

maintaining operational security. And we must distinguish between what is done routinely, what is part of a scheduled exercise, and what is done deliberately to make a point on a discrete matter. There are ongoing generalized deterrence activities and then there are more specific activities that relate to a given crisis. What we can see are the visible movements of aircraft associated with nuclear command and control as well as tanker or other support aircraft. Sometimes the movements of bombers are visible or detectable. And when Russian ballistic missile formations are exercised, many of these are publicly announced. Tracking ballistic missile submarine movements is problematic using open-source information unless these are advertised by their owners. To see what moves are unusual, one must establish a baseline and the moves surrounding the March-April 2021 deployments and after provide us with that.

When Russia mounted its initial troop build-up opposite Ukraine in March-April 2021, there were significant deviations of the activities of its strategic nuclear forces. The first visible departures consisted of flights conducted by Il-96-300PU aircraft. These are presidential command post aircraft that carry communications means that cover the low frequency to ultra-high frequency communications bands. Some carrying a battle staff. In February and March, this aircraft type was employed in what will hereafter be called the "Kozelsk Loop" and by the end of March, they were deployed on what will be called the "Novosibirsk run." There is no available data that clearly demonstrates that these activities were conducted in the past at the levels they reached in 2021 and 2022.

The Kozelsk Loop is significant. The aircraft departs its base from a special holding compound at Vnukovo airport, flies down to the Kozelsk area southwest of Moscow, loops around a specific geographical point, and returns to Vnukovo. The flight takes about an hour. Kozelsk is the location of an ICBM field that dates back to the Cold War. It was later upgraded to house the 28th Guards Missile Division consisting of 14 TOPOL-MR missiles in silos.[2] The bulk of the Russian strategic rocket forces consists of TOPOL-M mobile ICBMs situated in bases across the country all the way out to Irkutsk. Kozelsk is the westernmost anchor of these missile forces. The 28th Guards Missile Division is believed to have

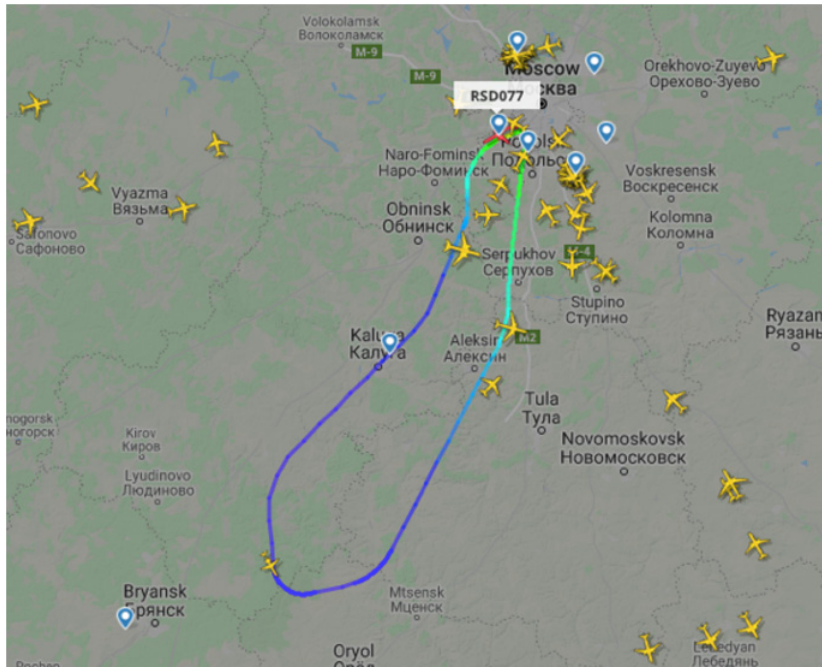

Image 3.1: An example of the Kozelsk Loop flight path flown by Russian nuclear command and control aircraft. (Flight Radar24 screenshot by the author)

a capability similar to the US Cold War-era emergency Communications Rocket System (ERCS), whereby a number of ICBMs were equipped with UHF transmitters designed to give "go code" orders to the entire missile force as the missile travelled over them.[3] The flight of the command and control aircraft on the Kozelsk Loop appears to be some form of communications check. They are likely equipped with a Russian counterpart of the American Airborne Launch Control System, which permits the battle staff to communicate directly with the silos and order a launch if necessary. Importantly, such a communications system could theoretically have a range of 200 miles or more and thus the aircraft does not have to be this close to the missile field to communicate with it. This suggests that the flight had a concurrent crisis signalling function.

The Novosibirsk run has the command post aircraft depart its compound at Vnukovo and fly a mission out to Novosibirsk, where it orbits and then returns to the Moscow area. Such a flight can take ten or more hours. Given the distances involved it is crucial for Russian strategic forces to be able to communicate with far eastern forces and thus an aircraft is required to relay communications because of the curvature of the Earth. Note that such an arrangement presumes that Russian communications satellite constellations would be disrupted or destroyed in the early stages of war and thus are demonstrating that they are not as dependent on them as say, American military forces.

In terms of frequency, the Kozelsk Loop appears to start at the end of February 2021, though it may have existed before this, and was supplemented by the Novosibirsk run in the last half of February. In general

Image 3.2: The shrouded-in-mystery IL-96-300PU presidential command post aircraft is equipped with full-spectrum communications systems. This particular aircraft has been involved in all manner of strategic nuclear force communications checks and exercises. A sister aircraft flew to within 25 km of the Ukrainian border on 16 December 2021 (screenshot from Pravda Report, YouTube documentary)

Image 3.3: This is the rarely-seen TU-214SUS airborne communication station aircraft. This particular TU-214SUS deploys to wherever President Putin is when he travels around Russia to ensure continuity of communications in the vast stretches of Russian territory. The primary recognition feature for this aircraft type is the ventral antenna. (enlarged screenshot from Russian news broadcast, 12 Apr 22)

terms, these flights were done once every two weeks with the Kozelsk and Novosibirsk runs doubling up one week. At the height of the April war scare, however, the Kozelsk Loop was done every week and supplemented by a run to Omsk in place of the Novosibirsk run. Additionally, on 21 April, a major communications exercise was conducted near Saratov. This involved an Il-96-300PU presidential command post and two TU-214PU command post aircraft.[4]

As for corresponding Long Range Aviation activity, there was a sortie of a pair of TU-160 BLACKJACK strategic bombers on 9 February (prior to the crisis) but then two TU-160s and two TU-96MS BEAR H missile carriers flew from the Kola Peninsula, down through the Norwegian Sea and then over the North Sea.[5] The next day, a pair of TU-160 flew to a position over the Norwegian Sea while two TU-142 long range maritime patrol aircraft conducted a similar flight. And from 13 to 15 April amateur radio and open-source intelligence aficionados detected the commu-

nications of other Long Range Aviation flights.[6] For comparative purposes, the last publicly acknowledged Russian Long Range Aviation flights in the European area occurred once in March and once in October 2020.[7] The use of the TU-160 BLACKJACK and TU-95MS BEAR H aircraft for this activity is significant. Today's bomber aircraft are essentially cruise missile Pez dispensers as opposed to dropping nuclear gravity bombs. They can carry between 12 and 16 cruise missiles.[8] The presence of two such aircraft over, say, the North Sea becomes somewhat significant to NATO if the aircraft were loaded with nuclear weapons given the time of flight to targets, which would be measured in minutes.

Finally, in the third week of March 2021, Russia mounted exercise UMKA-21. This involved the simultaneous surfacing of three nuclear ballistic missile submarines in the Arctic from under the ice, two DELTA IV and a Borei-B, carrying an estimated 480 re-entry vehicles in their submarine launched ballistic missiles (SLBM). The Russian ministry of defence released high resolution footage of the exercise and ensured it was distributed on all forms of social media.[9] This deployment clearly was signalling North American countries, not just Western Europe.

Consequently, the combination of command post aircraft activity, bomber activity, and submarine activity was significant during the spring 2021 war scare. After this phase of the crisis wound down, there were no visible flights on the Kozelsk Loop or Novosibirsk run until a Kozelsk Loop was conducted on one occasion in July, and there were no command and control aircraft aloft during a bold flight over the Baltic by a pair of TU-160 bombers escorted by four Su-27 fighters on 15 June, which suggests a one-off event that did not require coordination with other forces.[10] It is evident that Russian strategic nuclear forces were exercised in April 2021 and those movements deviated from the norm. It is equally clear that Russian authorities wanted these movements to be seen as they were visible on air traffic control systems, as well as reported in social media, and any cursory analysis of previous behaviour easily demonstrates this deviation.

The Russian military build-up opposite Ukraine suddenly picked up again in the fall of 2021. This time, however, it was accompanied by some

Image 3.4: Russian exercise UMKA-21 involved the very public simultaneous surfacing of three ballistic missile submarines in the Arctic during the initial troop build-up opposite Ukraine in March-April 2021. (Russian Ministry of Defence)

form of hybrid methodology designed to simultaneously villainize and destabilize Poland and distract attention away from the build-up itself. Though there had been a refugee issue between Belarus and Poland dating back to 2020, this crisis was deliberately enhanced just prior to the Russian build up and reached a crescendo in November 2021.[11] It was at that point open-source intelligence aficionados reported on social media that citizens in Russia were posting footage of trains loaded with military vehicles as well as their locations and the direction of travel, which was west. The frequency and volume of this footage picked up throughout November and eventually led to diplomatic entreaties by the end of the month.[12]

The Russian strategic nuclear force posture shifted significantly in September and picked up in October-November. From May to August, there was only one visible flight of a Russian nuclear command and control aircraft. In September, there were two Kozelsk Loops back to back, as well as the rarely-seen deployment of a TU-214SR, an airborne commu-

nications relay station, which took off from Vnukovo and orbited for several hours near Pskov on the Latvian border.[13] This was likely a flight test because on 13 September a TU-214 SR departed Vnukovo, flew west, and orbited for protracted periods in three locations that were in line of sight with the headquarters of the 27th Guards Missile Army HQ at Vladimir and its subordinate 54th Guards Missile Division at Teykovo and the 14th Missile Division at Yoshkar-Ola (total: 62 mobile ICBMs).[14]

Two days after that a TU-214PU-SBUS, a special command post aircraft assigned to the Minister of Defence, deployed to Nizhny Novgorod and on the return leg to Moscow conducted a manoeuvre that was likely a test of its low frequency communications system while it was south of Moscow. A similar flight was repeated on 17 September except the destination was Kazan.[15] The significance of this move is that the bunker and communications complexes for the Minister of Defence is located at Sharapovo, while the bunker for the Strategic Rocket Forces is nearby at Chekhov.[16] There were no publicly reported Long Range Aviation activities in September, so these activities were more likely a shake out of the communications system as opposed to crisis signalling.

October activity consisted of a Kozelsk Loop, a Novosibirsk run and a Ufa run, all conducted within a week. On 27 October, however, Long Range Aviation mounted an elaborate operation prompting interception and tracking by the Royal Norwegian Air Force. Two TU-160 BLACKJACKS, a number of SU-24 FENCER strike aircraft, all escorted by MiG-31 FOXHOUNDS and supported by a A-50 MAINSTAY AWACS aircraft, conducted this operation. These aircraft did not file flight plans, they ignored civilian air traffic control, and did not squawk with their transponders.[17] This operation could be characterized as a challenge to NATO during the build-up opposite Ukraine; a signal regarding the ongoing Polish-Belarus crisis; or possibly a geographically based distraction to re-orient attention away from both regions.

There was a significant shift to in Russian signalling activity in November 2021. Though there was a Kozelsk Loop and three Novosibirsk runs conducted within one week and similar in timing and extent as those conducted in October, LRA activity scaled up. Most importantly, at the

height of the Belarus-Polish refugee affair, Russia deployed a pair of TU-22M3 BACKFIRE strategic bombers over Belarus. The TU-22M3 is usually equipped with standoff weapons, including hypersonic missiles. Russia was likely demonstrating that the TU-22M3 could strike targets inside Poland from Belarusian airspace, potentially the ballistic missile defence complex at Redzikowo, Poland so that Russian Iskander ballistic missiles stationed in Kaliningrad could exploit such a gap in the event of conflict.

The BACKFIRE flight was accompanied by a direct threat from Russian foreign affairs minister Sergy Lavrov to the European Union (and by inference, NATO) to "not let themselves be drawn into a spiral that is fairly dangerous."[18] This was immediately followed up with a flight by a pair of TU-160 BLACKJACKs proceeding from the Barents Sea, to the Norwegian Sea, and then to the North Sea, where they were intercepted by the British RAF, Royal Norwegian Air Force, and Belgian Air Force fighters. Again, the Russian aircraft did not communicate at all.[19] A third event in which Portuguese fighters intercepted and tracked two TU-95MS bombers over the Baltic took place soon afterwards.[20]

The events of November 2021 were clearly signalling but it important to notice the lack of any extensive nuclear command and control manoeuvring to accompany the LRA moves. These appear to have been a trio of sharply pointed fingers to back up Russian objectives which were to disrupt a coherent NATO response to the Polish-Belarus crisis, which in turn supported the other larger Russian strategic objectives. This was, in effect, hybrid methodology in practise with nuclear forces signalling backstopping the whole effort. For comparative purposes, this was a significant deviation from baseline activity prior to February 2021 and from the spring and summer of 2021.

As the crisis moved into early December, the ongoing build-up of Russian ground and air forces opposite Ukraine became daily news and with that there was significantly increased awareness of the threat in the public domain and corresponding sharply increased diplomatic efforts. There were now more visible movements involving US strategic nuclear forces. The US Navy operates the E-6 Mercury command and control aircraft, equipped to communicate with its ballistic missile submarine force and

the aircraft are also equipped with the Air Launch Control System to communicate with the ICBM force. These aircraft, rarely seen on publicly available air traffic control plots, were observed manoeuvring around Naval Air Station Patuxent River and over the Atlantic Ocean on 11 December. Another rare bird, the E-4B Nightwatch, known colloquially as "The Doomsday Plane," was also unmasked the following day visiting Patrick Space Force Base in Florida. The E-4B carries a battle staff and the ability to use all forms of communication with American strategic nuclear forces.[21]

At the same time, Russian flights consisting of three Il-96-300PU command post aircraft Novosibirsk runs were conducted over a seven-day period.[22] These flights bracketed a highly unusual Russian move. On 16 December, an Il-96-300PU presidential command post aircraft departed Vnukovo and flew within 25 kilometers of the Ukrainian border near Kharkiv, well within the Ukrainian air defence envelope.[23] This completely unique event, not seen before or ever again, was clearly the Putin regime asserting its seriousness over the Ukraine situation to a variety of parties: Ukraine, NATO, and the United States. Again, it was done with the aircraft transponder squawking in the clear. There is no other conceivable purpose for this flight.

Almost in response, two E-6B Mercury aircraft squawked in the clear during their flights over the United States on 19 December. Having a pair of E-6 periodically visible became the baseline for US nuclear command post aircraft signalling for this phase of the crisis.[24] The message was enhanced on 21 December with the deployment of an E-4B Nightwatch from a deployment base to a racetrack flight pattern over Lake Superior. The E-4B is equipped with a trailing wire antenna for low frequency communication with submarines which extends nearly a mile behind the aircraft. In peacetime, this system is only deployed over large bodies of water when tested in case the antenna must be jettisoned in an emergency. An E-6B was also aloft that day.[25] The E-4B communications test would be repeated only twice during the crisis, an indication of how rare this event is.

Russian movements for the rest of December consisted of three Ko-

zelsk Loops, one every two days for the week 24-31 December, and the deployment of a TU-214PU command post from Vnukovo out to Saratov on 22 December, where it orbited for some time before returning to base. A new player, the one-of-a-kind TU-214VPU special command post aircraft, appeared on 21 December: it conducted extensive loops southwest of Moscow for several hours, flying over the Chekov and Sharapovo bunker complexes.[26] Taken together, the deployment of these resources far exceeded any previous activity during the entire 2021 year and is thus significant from a signalling perspective. At year end, the US launched an E-4B Nightwatch while President Biden conferred with Putin on 30 December, and a pair of E-6 Mercuries were also visible daily.[27]

The context for these flights was a period of intense diplomacy and extreme concern that Russia would launch an attack during the Christmas period (western and orthodox).[28] It is unclear what American nuclear forces were doing at this time, as they were not visible. However, on New Years Day 2022 the United Kingdom deployed a *Vanguard*-class ballistic missile submarine. These SSBNs each carry 16 Trident ll D5 missiles, each of those carrying up to eight re-entry vehicles. The name of the submarine was not given but the boat departed its base in daylight with the clear intent that it be seen to be doing so. Pictures of the departure proliferated on social media.[29]

Confusing the Issue: Kazakhstan, Ukraine and North Korea in January 2022

Both the Americans and the Russians reinforced the existing pattern of signalling activity during the first week of January 2022. The Kozelsk Loop, however, was now flown by a TU-214PU command post aircraft while the Il-96-300PUs were held at Vnukovo.[30] The American forces maintained two visible nuclear command and control aircraft daily as their baseline, either two E-6, two E-4B or one of each.[31]

At this point the visible USAF tanker aircraft baseline requires some explanation. The fluctuation of the number of aerial tankers became increasingly significant from here on and through the crisis. Generally, at

any given hour, there were 10-20 tankers visible supporting US operations and training over the continental United States.[32] In an emergency situation, like a change in the defence condition, the number of tankers aloft will increase to support the bomber force which is being generated and requires tanker support to reach their targets in Russia or elsewhere.[33] The rapid, sudden appearance of large number of visible tankers could reflect an alteration in the strategic situation; it could reflect the need to conduct an emergency airlift; or it could be an exercise of the bomber force.

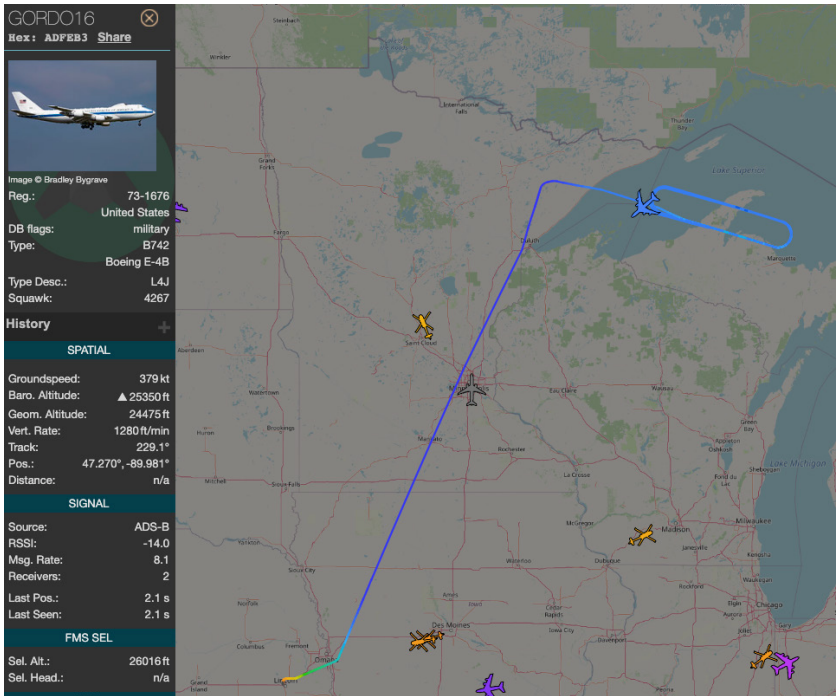

Image 3.5: An E-4B Nightwatch engaged in a communications test over Lake Superior. (ADS-B Exchange Screenshot by author)

The onset of widespread unrest in Kazakhstan on 5 January in the midst of the Russian build-up opposite Ukraine was unanticipated by all parties. Stemming from domestic energy issues, the rioting threatened to unseat the pro-Russian government with strategic implications for the Putin regime. Kazakhstan hosts the Baikonur Cosmodrome, the Semipalatinsk nuclear test site, and Sary Shagan anti-ballistic missile test site, all legacy Soviet-era facilities on Kazakh soil. More importantly, the rioting in Kazakhstan was likely interpreted by the Putin regime as yet another "colour revolution" intended to reduce Russian influence in Eurasia. The pathological fear of "colour revolutions" amongst Putin's *siloviki* while they were engaged in the Ukraine endeavour produced reactions in the conventional as well as nuclear spheres: Russian VDV (airborne) forces were moved to air bases and readied to fly into Kazakhstan. That said, the Russian nuclear dimension to this crisis in the context of the Ukrainian situation remains shrouded.

What we can see was the American response to whatever Russian moves there were. On the morning of 5 January, there were no visible American nuclear command and control aircraft, but there were fifteen visible tankers. In less than an hour, the American strategic posture shifted to thirty visible tankers, two visible E-6 Mercurys, the deployment of an RC-135 COBRA BALL (which we will elaborate on later), and the movement of some tankers over Canada. After two hours, the visible tankers dropped to five, while an E-4B Nightwatch replaced one of the E-6 Mercurys.[34] On 6 January, the American visible posture was one E-4B, one E-6, and fifteen tankers, with some of these over Canada. Two E-4B's rotated in on 7 January. COBRA BALL also conducted orbits on these days.[35]

One event of particular interest was the severing of the Svalbard subsea communications cable that connects the extensive Svalbard Satellite Station with its customers which include NOAA, NASA, the ESA and numerous meteorological agencies. Information collected by the station is also used for tracking ships in the Arctic. The outage apparently occurred early on the morning of 7 January and thus far the conclusions have been that the disruption was generated by human action. Given Soviet and

later Russian interference with submarine communications cables dating back to 1961, the probability is high that this event was generated by the Putin regime.[36]

The communications interreference was likely designed to simultaneously signal, disrupt, and distract while Russia conducted a massive airlift of conventional forces into Kazakhstan on 8 and 9 January. The American posture was slightly heightened by maintaining three command and control aircraft visible, one E-4B and two E-6.[37] But then everything changed dramatically between 10 and 13 January and it is not clear why.

Over the course of the next four days, the United States deployed significant nuclear command and control resources. On 10 January, three E-6s were visible, while an E-4B uncharacteristically orbited NORAD headquarters in Colorado. Tankers were observed over Manitoba and Ontario.[38] The next day four command aircraft were visible: all three E-4B Nightwatches, and an E-6 Mercury. They were joined by 46 visible tankers and a U.S. Navy P-8 long range maritime patrol aircraft that squawked on just off the Russian naval bases on the Kola Peninsula. Global Strike Command conducted an Agile Combat Employment exercise with B-52s.[39] On 12 January, two E-6s were visible, while an E-4B conducted a trailing wire antenna test over Lake Superior. B-52s that launched from northern tier bases were seen to squawk off just before they reached Canadian airspace.[40] Finally, on 13 January, two E-4Bs, an E-6, Air Force 1 and Air Force 2 were up, as well as KC-135 tankers over New Brunswick and Manitoba.[41]

The Agile Combat Employment exercise is significant. During the Cold War, Strategic Air Command B-52 bombers regularly deployed during crises from their main bases to satellite bases to ensure dispersion and survival. Several days after 11 January, the U.S. Air Force publicized the deployment of several B-52s and a ground support element from Barksdale Air Force Base to an abandoned Cold War SAC air base at Blytheville, Arkansas. This site is the location of the National Cold War Center, a museum devoted to the history of the SAC Alert Force, thus reinforcing what the Russian intelligence apparatus likely already ascertained by observing the exercise with their methodology. The U.S.

Air Force stated openly this was the first such Agile Combat Employment exercise done in the post-Cold War environment, which underlines the fact this was a signal.[42]

What is mysterious is the lack of significant visible Russian activity during this period: two Kozelsk Loops were flown on the same day, 12 January, which was an anomaly during the crisis thus far: one by an IL-96-300PU presidential command post and the other by a TU-214SUS airborne communications station.[43] Another anomaly involved the activities of a Tupolev 204 transport belonging to the head of the Ministry of Internal Affairs, Vladimir Kolokoltsev. Flying across Russia from Moscow headed east, the aircraft abruptly turned around over Omsk and headed back to Moscow.[44] This suggests some form of emergency meeting called back in Moscow that required his presence.

In yet another anomaly, on 13 January a Il-96-300PU command post aircraft squawked on but with no callsign while landing at Dododemovo airport southeast of Moscow. It taxied to a remote facility at the southeast end of the eastern runway and continued squawking while on the ground for some time before the transponder was turned off. No other air traffic took off or landed on this runway, though the western runway remained open.[45] The significance of this location is that Domodedovo is within driving range (20 miles) to the Chekhov and Sharapovo command bunkers south of Moscow. In addition, an abandoned Cold War-era SA-1 GUILD surface to air missile site sits slightly southeast of where the aircraft was situated. On this site a modern surface-to-air missile unit can be clearly seen on Google Earth. It appears as though part of the Russian nuclear command and control apparatus was dispersed during this period from Vnukovo airport to protected locations. It is not possible to ascertain from open-source information the activities of other Russian strategic nuclear forces during this period at this time.

There is, perhaps, another reason for the extraordinary activity and it highlights the complexity of signalling in a world where nations other than the United States and Russia possess nuclear capabilities. North Korea launched what it claimed was a hypersonic missile system on 10 January. The Federal Aviation Administration grounded aircraft on the

US west coast for about fifteen minutes and there were subsequent publicly expressed concerns on the nature of the so-called "ground-stop."[46] Historically, NORAD tracks ballistic missile tests whenever they occur and plot the likely trajectory of the tested system to ensure they are not threats to North America. This is done to ensure that a test cannot be used as cover for the opening shot of a nuclear attack. Indeed, the possible use of a small number of weapons to generate electro-magnetic pulse (EMP) damage against North America before a larger strike is a planned-for scenario that dates back to the 1960s.[47] The most likely situation on 11 January was that the observed trajectory of the North Korean hypersonic missile had characteristics that potentially placed the system over the US west coast and, knowing a singular weapon could cause immense EMP damage, part of the North American defense system initiated a partial hold until the exact trajectory could be determined. When it was clear that the trajectory was not a threat, the ground-stop was released.

This may explain the behaviour of the RC-135S COBRA BALL aircraft during this period. COBRA BALL is a surveillance aircraft equipped to conduct optical tracking and collect visual and telemetric data on re-entry vehicles during ICBM and SLBM tests. Normally, COBRA BALL is deployed to Shemya Island in the Aleutians to observe dummy Russian re-entry vehicles hit their targets on the Kamchatka Peninsula.[48] From 10 to 14 January, COBRA BALL conducted three visible missions to exactly the same location.[49] The aircraft departed its base at Lincoln, Nebraska and proceeded to Nekoma, North Dakota where it orbited for several hours before returning to base. The COBRA BALL conducted its orbits very deliberately over center of the North American continent at the abandoned Missile Site Radar (MSR) from the defunct 1970s-era Safeguard anti-ballistic missile system. The MSR was one of two radar sites associated with Safeguard.[50] The other is the Perimeter Acquisition Radar Cueing System (PARCS) located east of the MSR at Concrete, North Dakota. Unlike the MSR, the PARCS is still operational and is part of the NORAD space surveillance and warning network manned by bother American and Canadian personnel. The PARCS radar, however, is directional and looks north, backing up the Ballistic Missile Early

Warning System (BMEWS). The COBRA BALL operations suggest that the aircraft may have been acting as a stopgap early warning capability as well as for information collection. They definitely suggest that there were concerns that the North Korean test could have been something incredibly problematic, perhaps something like a hypersonic vehicle with an EMP generator payload. Though the location of the COBRA BALL orbits may appear coincidental, this was the third time American aircraft visibly orbited a site associated with Cold War deterrence during the crisis. And there would be more occasions as the crises continued to unfold.

So was the North Korean test designed to serve purely North Korean purposes? Or did it also serve the purposes of the Putin regime? The disruptive and possibly destabilizing effects of the test are clear in the context of the ongoing Kazakh and Ukraine crises. Possible complicity between the Putin and Kim regimes regarding the hypersonic test on 10 January was hinted at on 12 January 22 when Secretary of State Anthony Blinken announced that specific North Korean nationals based in Russia as well as specific Russian nationals and their parent entities would be sanctioned. Closer examination of the list reveals that these people were involved in proliferating technology that could be used in hypersonic weapons.[51]

The situation in January was serious enough for another unprecedented move. As noted earlier, the locations of ballistic missile launching submarines are extremely sensitive and not revealed for obvious reasons. Stealth and secrecy are their first lines of defence. It was surprising, then, that the Chief of Naval Operations and the commander of Pacific Submarines used Twitter to announce, with pictures, that the ballistic missile submarine USS *Nevada*, was visiting the island of Guam with the added note that "The *Ohio*-class ballistic missile #submarine's visit demonstrates our nuclear triad's capability and flexibility reinforcing #America's commitment to regional security and stability."[52] The US Strategic Command followed up with tweets associated with USS *Nevada* from 15 to 18 January in case the target audience was not getting the point.[53]

The USS *Nevada* is perfect for signalling. She carries 20 x Trident II D-5 missiles each with up to 14 re-entry vehicles, that is, the ship can

strike 280 desired ground zeros. If fired from the Guam area, the Trident II D-5 missiles can saturate the Russian ICBM forces right across continental Russia. Nevada, incidentally, is home to the former Nevada Test Site (now the Nevada National Security Site), the main Cold War-era nuclear test site in the continental United States. The probability that the unmasking of the USS *Nevada* had multiple audiences, Russia, Communist China, and North Korea, is high given the potential trajectories from the Guam area. To further underscore the point social media tweeted that an E-6 Mercury aircraft arrived in Guam at the same time, demonstrating there was positive control over the submarine and command connectivity to responsible authorities in the United States.[54] It is crucial to re-emphasize how unprecedented the unmasking of the USS *Nevada* is. Like the Royal Navy *Vanguard*-class deployment on 1 January, it is unheard of to openly discuss, let alone officially post on social media, the location of an SSBN.

The next break point in the crisis was when Putin asserted that Russian-NATO relations have approached or reached a red line due to NATO members military support for Ukraine on 16 January. Putin used the words "strong response" without elaborating.[55] To underscore this threat, Russian social and other media noted that the 25th Missile Division at Barnaul and the 14th Missile Division at Yoshkar-Ola were conducting exercises.[56]

Both of these units employ the TOPOL-M mobile inter-continental ballistic missile system. Each missile is mounted on a Transport Erector Launcher (TEL) and these vehicles are located in central bases. While conducting exercises or on alert, the TEL's deploy from their bases with their security forces into the forests nearby in order to disperse them and make them harder to target. The TOPOL-M missile carries 3 or 4 300-500 kt yield re-entry vehicles or 4 to 6 with 150 kt yield re-entry vehicles. The number of systems available includes 36 at Bernaul and 27 at Yoshkar-Ola, for a possible 252 to 378 re-entry vehicles. The TOPOL-M can reach, from these locations, any target in Western Europe.[57]

We have learned recently that Putin approved the Ukraine invasion plans on 18 January 22.[58] There were two significant events on 18 Janu-

ary. The first was the abnormal flight of an E-4B Nightwatch aircraft that departed its base at Lincoln, Nebraska, flew over Omaha, and returned to Lincoln. The flight path was in the form of an infinity sign and the cross point for that sign was directly over the Strategic Air Command Museum at Ashland, Nebraska. This is the fourth time that US forces associated with strategic nuclear weapons overflew a site specifically associated with Cold War deterrence.[59]

The second abnormal event was the visible departure of USAF F-16C/D aircraft from Aviano, Italy where they promptly conducted flight profiles over the Adriatic Sea that were more closely associated with nuclear weapons delivery than air combat manoeuvring.[60] They were accompanied by a KC-135 tanker aircraft. Aviano Air Base is the home of a detachment of the 704th Munitions Support Squadron who maintain around 70 B-61-3 and B-61-4 gravity bombs. Estimated yields of these weapons can range from .3 kt to 170 kt.[61] Given the quality of intelligence released in the public domain regarding Russian activities related to Ukraine, it is likely that American authorities were aware of the Russian plan finalization and that these up to now abnormal activities could have been an American signal in response to them.[62]

The next two weeks marked a period of the protracted movements of Russian strategic nuclear forces, with several events per day in some cases. Nuclear command and control aircraft were manipulated visibly ten of the fourteen days: three Kozelsk Loops by TU-214PU and IL-96-300 command posts; six Novosibirsk runs by presidential command post Il-96-300PUs; an Omsk run by a TU-214PU; and a Vnukovo loop by a Il-96-300PU that was done simultaneously with a Kozelsk Loop on 25 January by the specialized command post TU-214VPU.[63] For comparative purposes, this was the largest amount and widest variety of Russian aerial command post activity thus seen during the crisis.

This may have partly been in response to the unmasking of the cruise missile submarine, USS *Georgia*, whose presence visiting Limassol, Crete was tweeted by US Naval Forces, Europe-Africa on 19 January.[64] As before the announced presence of US Navy submarines, and especially in social media, is highly unusual. This particular capability played right to

Image 3.6 and 3.7: An example of the TOPOL-M mobile ICBM and a satellite image of a pre-deployment base. Note the transporter erector launchers which appear to be involved in camouflage training. (Russian Ministry of Defence, and screenshot of GoogleEarth image by author)

the paranoia in the Russian military establishment that exists over cruise missiles launched from ships and submarines, something that goes back to the 1980s.[65] The USS *Georgia* was a former SSBN modified to carry 154 BGM-109 Tomahawk cruise missiles. If the submarine moved into the Aegean Sea, the coverage could include any target in Belarus, Ukraine, or southwestern Russia. If operating from the eastern Mediterranean, targets from Crimea to Volgograd were in range, including Vladimir Putin's castle at Gelendzhik on the Black Sea and his dacha(s) in Sochi. One must emphasize that nuclear-capable Tomahawks (TLAM-N) were removed from the U.S. Navy shipboard inventory back in 2013, but the extreme accuracy and the ability to saturate targets from a single submarine still makes this a potent system in its conventional form. Whether or not the Russian intelligence apparatus believes that there are no TLAM-N left in service is another matter: the W80-0 warheads were supposedly dismantled in 2013.[66] This was the first of two occasions that the USS *Georgia* was unmasked on social media in response to Russian moves.

The Russian Long Range Aviation forces launched a significant and complex air operation on 20 January. Four TU-22M3 BACKFIRE bombers from Sescha air base and supported by Il-78 tanker aircraft launched from one of the air bases in the Moscow area, conducted what was portrayed in a Russian social media source as a "raid" on the Franz Joseph Land islands in the Arctic.[67] Also according to Russian state-controlled media and disseminated on social media, two or four TU-160 BLACKJACK bombers "performed a planned flight in the airspace over neutral waters of the Arctic Ocean, the Barents, and White Seas."[68] There was no mention of the TU-22M3 operation in the official Russian Ministry of Defence posts, nor in the state-controlled media derived from them.

The most likely sequence of events for the exercise would have had the TU-22M3's lift off, and then refuel using the IL-78 tankers. The TU-22M3 carries long-range stand-off missiles, with either conventional or nuclear warheads as required. The TU-22M3 carry out the initial strike against the NORAD air defence system, thus permitting the TU-160 bombers to penetrate through the gaps and then release their cruise missiles against targets further south in North America. Franz Joseph Land facilities were

probably stand-ins for the initial air defence systems suppression targets.

In terms of command and control, a TU-214PU command post aircraft flew an Omsk run while the operation was ongoing, while another TU-214PU, this one specially equipped for Arctic operations, was spotted staging back through from the north through St Petersburg to Vnukovo when the operation was completed.[69] This strongly suggests that there was higher level command, control and coordination exercised during the operation, which differentiates it from previous exercises in 2019, 2020, and 2021. Of interest, ten Soviet TU-95 BEAR bombers conducted a similar operation in exactly the same area during the 1956 Suez Crisis and a geographical point north of Franz Josef Land was also the turn around point for SAC B-52's on Airborne Alert during the Cuban Missile Crisis in 1962.[70]

The Russian operation produced an immediate effect in Canada and in the United States. NORAD tweeted that it conducted "synchronized multi-region aircraft operations from four locations in Canada and the US today demonstrating counter-cruise missile capabilities and ensuring readiness to respond to potential threats to our nations 24/7/365."[71] Note the use of the word "operation" instead of "exercise." Of note USAF tankers were operating in Canadian airspace at this time. Military executive transport aircraft were routed around an airspace "bubble" in southern Alberta, Saskatchewan, and Manitoba presumably to avoid them. How close the TU-160s came to North American Air Defence Identification Zone (ADIZ) is not available in the public domain, but the COBRA BALL aircraft was up over North Dakota, and the number of visible E-6 Mercury aircraft was increased from two to three.[72]

Russian Long-Range Aviation was back at it on 23-24 January. Russian Ministry of Defence media released high-resolution footage of TU-95 BEAR aircraft operating from Engels air base near Saratov, with the implication that they were headed for the Arctic. The descriptor specifically pointed out they were the MS version, that is, the aircraft type carries cruise missiles. The footage specifically and deliberately lingered on one of the cruise missile pylons so that we were meant to know it is not the maritime patrol version, or the gravity bomber. The pylons are

all empty in the footage, with the obvious message that they could have been loaded if that choice were made. Tail numbers conformed to known TU-95MS carriers. The footage did not show an operation, but it did pan over runways full of TU-95MS and multiple aircraft taking off.[73]

In what became a steady daily beat of strategic nuclear force exercises, the 54th Guards Missile Division located around Teykovo northeast of Moscow with its 36 mobile ICBMs dispersed on its "combat patrol routes" on 25 January. This information was "leaked" by Russian Ministry of Defence sources into the social media universe, and then repeated the fact on its own media using those social media sources later on 25 January. An Il-96-300 presidential command post aircraft conducted a Kozelsk Loop and the TU-214VPU special command post aircraft was also in the air for several hours doing loops that took the aircraft near the Sharapovo and Chekhov command complexes while the exercise was on.[74]

This signalling repeated itself the next day when the 29th Guards Missile Division at Irkutsk exercised its 27 mobile ICBMs. The fact of the exercise, its extent, and particularly that the TELs were dispersed from their main bases made its way into the public consciousness via Russian Ministry of Defence-friendly Russian media outlets.[75] The missile forces were not alone, however. Long Range Aviation mounted an exercise, this time in the Far East. Two TU-142 BEAR long range maritime patrol aircraft made an appearance over the Sea of Okhotsk but also all over social media with the by-now expected high resolution footage. At the same time, two TU-95MS missiles carriers conducted exercises in the Far East at an unrevealed location. The footage of these aircraft showed them in a "clean" configuration with no missile pylons attached. Il-96 tanker aircraft accompanied both pairs on their movements and this was given substantial coverage to ensure the audience knew that intercontinental ranges were possible.[76] A special command post aircraft, a TU-214SUS, conducted the Kozelsk Loop rather than an Il-96-300 while this exercise was ongoing, suggesting that the need for improved communications to handle both a missile and a bomber exercise.[77]

The importance of the Irkutsk-area missile division cannot be under-

estimated. Previously, Russian mobile missile divisions that had been visibly exercised were in western Russia, close to Europe. Irkutsk is the eastern anchor of the Russian ICBM force chain. It is also geographically closest, over the North Pole, to the American ICBM and bomber bases in Montana, Wyoming, and North and South Dakota. Or, in another scenario the ICBMs could be used against the air defence forces to permit exploitation by their bomber forces. By conducting and publicizing the exercising of the 29th Guards Missile Division, the Putin regime was once again signalling that North America was not disconnected from events in Europe.

While the Irkutsk ICBM deployment was in progress, Russian Long-Range Aviation conducted several activities in the Far East. The Russian Ministry of Defence released more artistic BEAR footage noting that the TU-95MS's were from the Far Eastern Aviation Regiment. The footage depicted a BEAR taking off, conducting in-flight refueling, and landing back at base, presumably north of Vladivostok. Closer examination of the footage shows a TU-95MS. This particular TU-95MS was intercepted over the Sea of Japan in 2020 by the Japanese delf-defence forces extremely close to Japanese territory. In 2019, this BEAR was also part of a four-ship element operating from Anadyr (Ugolnyy) forward operating base that was intercepted and observed by US forces off Alaska. In the footage the BEAR manoeuvred with an IL-98 tanker and refuelled. The intercontinental range of the BEAR means that it does not require refuelling to complete its primary mission of delivering its weapons against North America. Refuelling would be used to extend the endurance of the aircraft if it were conducting some form of airborne alert off North America as they did in the 1980s or some other long duration mission.[78] The Putin regime was clearly reminding its audience that it had a nuclear cruise missile capability in the Far East and that they can reach any target they choose. The targets from forces like this in the Far East include North America and bases in the Pacific. As with the Irkutsk mobile ICBM exercises, these were likely more reminders of Russian strategic nuclear capabilities that could be directed at North America during a time of extreme crisis over Ukraine.

The second was a possible exercise by the 200th heavy bomber regiment at Belaya, north of Irkutsk. Some aircraft from this base accidentally left their transponders on as they departed Belaya but shut them off over Lake Baikal. Belaya is the home of 30 TU-22M BACKFIRE bombers. Historically, the Soviets and Russians maintain bombers centrally but then deploy them to "bounce" airfields closer to their targets. The possibility exists that this unit was conducting such an exercise to the Far East.[79] A TU-214 PU aircraft flew out to Omsk, landed, took off and headed back to the Moscow area. It could have been acting as a communications relay or in a command role for the Far East activities.[80]

In the midst of this Russian activity, USAF F-16s out of Aviano conducted another visible series of exercises over the Adriatic, while, separately, Germany conducted a unilateral exercise using its Tornado strike aircraft on 26 January. In this exercise, five Luftwaffe Tornados engaged in a penetration exercise against twelve Eurofighters over German airspace. The Tornados are based at Buchel Air Base which hosts the USAF's 702nd MUNSS maintaining 20 to 40 B-61 nuclear gravity bombs assigned to NATO but under American control. This particular exercise should perhaps be seen in the context of extensive criticism of Germany's announced policy of not arming Ukraine. It is likely Germany wished to highlight the fact it was still committed to NATO security.[81]

It is not clear what occurred between 28 January and 31 January that drove an increase in signalling. There was substantial Russian media activity related to Venezuela that implied that the Putin regime might repeat its 10 December 2018 deployment of two TU-160 BLACKJACKs to Caracas. Consequently, there was a flurry of Russian media comparing this to the Cuban Missile Crisis, but this appears to have been primarily a Russian discussion for Russian readers as opposed to calculated information operations.[82] The United States deployed an RC-135 RIVET JOINT intelligence collection aircraft off Venezuela on 28 January, a highly unusual move in that it was visible on air traffic control the entire time it was on station.[83] The next day the U.S. Navy tweeted that the ballistic missile submarine USS *Wyoming* conducted a crew change while deployed at sea. Once again, the highly unusual and deliberate ex-

posure of SSBN activity in social media strongly suggests signalling.[84] One reason to conduct a crew change is to avoid the time it would take to return to base in Bangor, Washington and thus maintain on-station target coverage.

It was on 30-31 January, however, that strategic nuclear force activity and remained at a high level well into February. On the Russian side, key events included social media coverage of an exercise of the 54th Guards Missile Division near Teykovo involving 36 mobile ICBMs; exercises involving another unnamed mobile ICBM formation; ballistic missile submarine readiness; the deployment of two TU-142 BEAR maritime patrol aircraft into the Arctic basin accompanied by Il-76 tankers; and a burst of articles fired into all types of traditional Russian print media: tabloids, military specialty magazines, and regular media channels. The information operations offensive focused on common themes: strategic nuclear forces and Russia's ability to deter under present conditions.[85]

Of particular interest was an announcement by the Russian Ministry of Defence that the Strategic Missile Forces were to receive "unique simulators for training communications specialists" to learn to establish communications with various levels of the chain of command." This new system has been installed at a regional training centre in Yaroslavl region. One possible theory is that the Russian Ministry of Defence wanted their adversaries to know they are about to upgrade their strategic nuclear command and control apparatus. Another is that this announcement was intended to reassure that they have improved their nuclear command and control during the crisis to ensure stability.[86] On a parallel track, Russian Ministry of Defence social media emphasized that all Far East-based Long Range Aviation units were subjected to an hour-long briefing on the legality or illegality of "Colour revolutions." This was clearly political indoctrination to assure LRA personnel that whatever it is they were going to do, it is legal and moral in defence of Russia.[87] Of note, the Russian envoy to the United Nations walked out of a UN Security Council meeting dealing with the Ukraine crisis, so Russian messaging likely underpinned diplomatic activity to some degree.

The Run-Up to the Invasion: February 2022

There was a significant response to the Russian moves. On the American side, visible activity on 30-31 January was limited to a COBRA BALL flight to North Dakota and the flight of an E-4B Nightwatch and an E-6 Mercury flying in tandem over the American southwest.[88] That changed on 1-2 February. A by now familiar Kozelsk Loop was conducted with a TU-214PU, but this time another TU-214 PU was recalled from Sochi to the Moscow area where it orbited as well.[89]

Initially, the 42nd Missile Division at Nizhniy Tagil with 27 mobile ICBM conducted a combat deployment exercise.[90] Then there were three concurrent events involving Long-Range Aviation units. The first was Russian Ministry of Defence announcements that TU-95MS cruise missile carriers were conducting operations with tanker aircraft in the Amur region, that is, the Far East.[91] The second involved TU-160 BLACKJACK bombers. Russian media confirmed that there was, in fact, a TU-160 BLACKJACK exercise in the Arctic involving three TU-160, three Il-67 tanker aircraft and an A-50U MAINSTAY AWACS aircraft. The location is not specified but presumed to be the Arctic basin where they were observed by the North American air defence system. The presence of the A-50U suggested the need to maintain aerial surveillance of the exercise and to record NATO attempts to observe or interfere with the exercise.[92] The third involved two TU-95MS BEAR H and two TU-143 BEAR F aircraft. These aircraft launched and proceeded north of Norway, where they were intercepted and observed by Royal Norwegian Air Force F-35s. British Royal Air Force Typhoons supported with tankers and E-3D Sentry AWACS aircraft then intercepted and observed the flights as they moved closer to the United Kingdom which prompted a Quick Reaction Alert (QRA) scramble out of RAF Lossiemouth.[93]

The TU-142s may have been cooperating with the TU-95MSs. The sensitivity of the Soviets and then the Russians to aircraft carriers in general, and aircraft carriers in the Norwegian Sea in particular is long standing. NATO plans in the Cold War were for carrier task groups protected in Norwegian fiords to conduct air strikes against targets on the Kola Peninsula, ie: Polyarni submarine base and its outstations; Murmansk; and

the strategic airfields and nuclear storage sites in the area. Combinations of these two aircraft types in the past were established to hunt down aircraft carriers with the TU-142 acting as spotter for the TU-95MS. The Russian aircraft appear to have flown as far south as the southwest tip of the United Kingdom.[94]

A U.S. Air Force E-4B Nightwatch was placed in a ground alert posture at Warner-Robbins AFB in Georgia, as was a COBRA BALL aircraft at Lincoln, Nebraska. The visible tanker count jumped to 30 at 1130 hrs EST and climbed to 40 within an hour.[95] Three E-6 Mercury aircraft were visible while the Russian aircraft were aloft. In a highly unusual move, a U-2S reconnaissance aircraft callsign X-RAY11 was unmasked while it was over the southwest United States. It is extremely rare to observe U-2s on public air traffic control sites. In this case, the U-2S proceeded from Palmdale or Edwards AFB to the White Sands Missile Range where it proceeded to fly several "infinity loops" with the crossover point right over the 1945 Trinity Site.96 The possibility the aircraft was involved in testing sensor systems exists, but the timing and the fact that the aircraft was squawking on ATC suggests there were multiple purposes to this flight and it was signalling in response to the Russian Arctic operations. Additionally, a pair of B-1B bombers were dispatched to the United Kingdom for an "anniversary flyover" ostensibly related to the Second World War.[97]

All of the Russian activity was supported with a steady drumbeat of messaging pumped out through official and quasi-official Russian media outlets underscoring deterrence themes. And, finally, in another abnormal move, the Russians unmasked a TU-214SR communications relay aircraft. Departing Ulyanovsk, this aircraft was, unlike its other TU-214SR siblings, squawking in the clear on its journey to Moscow. Instead of a linear route to Vnukovo, however, the aircraft significantly deviated from its flight path before returning to its original course. This deliberate dip took place near Arzamas. Arzamas-16, also known as Sarov, has been and remains the Russian functional equivalent of Los Alamos National Laboratory.[98] No other Russian aircraft had behaved like this throughout the crisis up to this point and did not in the following months. The

fact that this happened the same day a U-2S orbited over the Trinity Site cannot be coincidental.

Russian strategic nuclear forces signalling was conducted daily from 5 February to 10 February, with one event per day. This included exercising mobile ICBMs of the 54th Missile Division near Teykovo and then the 39th Missile Division near Novosibirsk, and as before, multimedia high resolution footage and graphics accompanied these announcements.[99]

In a repeat of the actions of November 2021, pairs of TU-22M3 BACKFIRES were observed over Belarus making runs for the Polish border on 5 and 8 February escorted by Russian and Belarusian fighter aircraft. Social media circulated material from RIA Novosti, a (the?) Russian government mouthpiece that has posted footage of the bombers with the caption that they are "patrolling" Belarusian skies. There was no footage depicting their armament. The footage depicted a pair of TU-22M3 taking off, in flight, and landing, but with few details.[100] TU-22M3 loadouts become important in this case as the aircraft is a platform for standoff weapons and the aircraft can strike targets in adjacent countries from Belarusian airspace: the Baltics; Poland, Ukraine. The TU-33M3 can carry a variety of air to surface missiles with a variety of range: Kh-15: 300 km, Kh-32: 600-1000 km, Kh-47: 2000+ km.

Regarding the 8 February flight, there was a Russian social media remark that TU-22M3's had flown twice before this flight but there was no corroborating video. The TASS report asserted that the 8 February flight was the second such flight. It is possible an earlier flight was scrubbed or only partially completed. Two videos were released into the social media ecosystem detailing the flight over Belarus but were different from footage released on the weekend. Belarusian Su-30SM and Russian Su-35S FLANKER fighters can be seen escorting the two BACKFIRES. The photographers in both videos took great pains to deliberately highlight what some have identified as a Kh-32 stand-off missile, through the outer presentation of the Kh-32 is identical to the Kh-22 from which it is derived.[101]

The Kh-22 and Kh-32 are dual capable conventional or nuclear. The airframe is easily capable of carrying a nuclear charge yielding 250 kt to

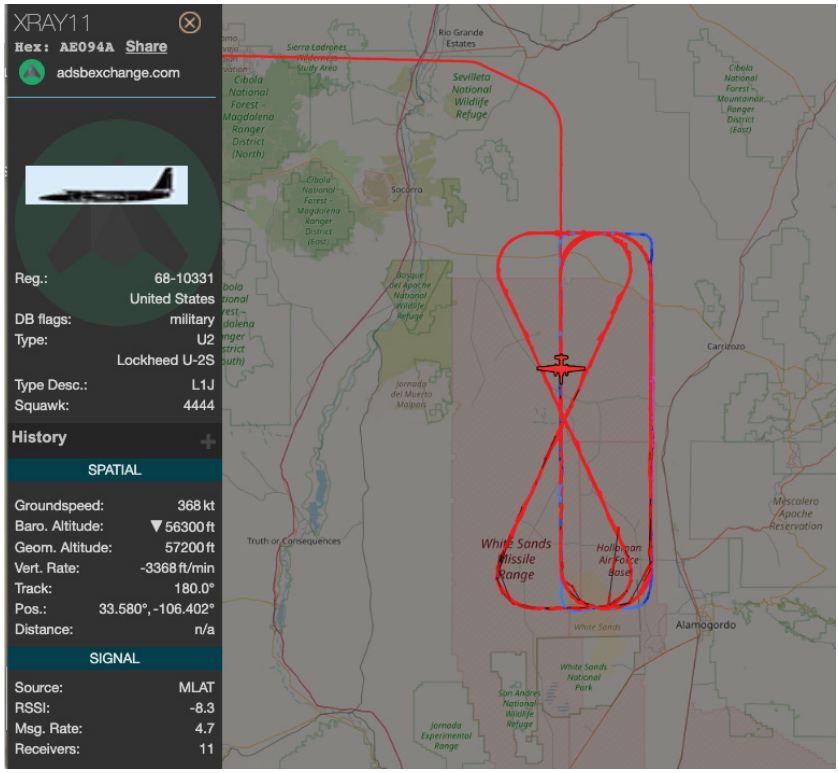

Image 3.8: A U-2S orbiting over the Trinity Site in New Mexico (ADS-B Exchange screenshot by the author)

1 MT.[102] In the past, TU-22M2's have been photographed with three such weapons. In these videos only one weapon was visible on one TU-22M3, and it was carried asymmetrically. That there is deliberate attention paid to it suggests there was something unique about this particular missile, that it was in Belarusian airspace, and Russia wanted NATO and Ukraine to see it. There is a high probability that this was a nuclear version of the weapon.[103]

Concurrent with the BACKFIRE flights, Russia also unmasked for western consumption a deployment of the Kh-42M2 Kinzhal missile to the Russian legacy enclave of Kaliningrad between Poland and Lithuania

on 7 February. The Kh-47M2 is nuclear-capable, with a purported yield of 5 to 50kt. It can be fired from TU-22M3 BACKFIRE and MiG-31K FOXHOUND aircraft, with a Mach-10 speed out to 2000 km, possibly further, and the weapon can manoeuvre in flight. Testing conducted on the Kola peninsula in 2019 demonstrated that this system works, and it was successfully employed against a ground target in Syria in June 2021.[104]

Some explanation is required. The Kh-47M2's characteristics have been flaunted in Russian media for some time, playing on concerns over new developments in hypersonic missiles that cannot be intercepted. The reality is the Kinzhal is a hypersonic missile…but technically ALL ballistic missiles are hypersonic at terminal velocity. In fact, the Kinzhal is a sawed-off Iskander ballistic missile launched from a modified MiG-31K interceptor.

As an information operation, however, the Kaliningrad Kinzhal deployment was an interesting example. Purportedly "amateur" footage of the aircraft arriving in Kaliningrad was released on a Russian Telegram account and then it migrated to Western social media and circulated among plane spotters. Then Forbes magazine ran an article on the Kh-47M2 playing up the dangers of the system…which "mainstream" Russian media echoed back to its readership on how the West was scared of the Kh-47M2. When a skeptical commentator asserted that the blurry image could be a "dummy store," the Russian Ministry of Defence released a sharper picture of two MiG-21K's loaded with Kh-47M2's just to clarify the point. Communist China then circulated the deployment in its media, calling it a "slap in the face" to NATO.[105] Of note, and clearly for signalling purposes, the MiG-31K's carried Long Range Aviation insignia, that is, this former interceptor aircraft is now stabled with strategic bombers.[106]

In the NATO context, probable target coverage for both the TU-22M3s and the MiG-31/Kh-47 systems includes the Aegis Ashore ABM system in Poland and Romania as a precursor for ballistic missile attacks using Iskander ballistic missiles from Kaliningrad and Belarus. In the Ukraine context targets presumably included command and control and air de-

fence complexes, particularly those surrounding Kyiv. There was obvious signalling involved with this deployment, in part to Russian allies who would view this as deterrent top cover directed at NATO, and in part to aggravate NATO and complicate defence arrangements and plans.

And finally, on 10 February there was another significant Long Range Aviation movement. Multiple Russian Ministry of Defence social media sources reported a significant air operation involving bomber forces in the Amur region. The exercise involved ten TU-22M3 BACKFIRE which deployed from Belaya air base (near Novosibirsk) to Ukrainka air base in the far east, a distance of 1700 km. Once again, as with other Russian information operations products, the high-definition footage focused specifically on the weapons carried by these TU-22M3: Kh-32s or Kh-22's asymmetrically carried on the port wing pylon. The movement of this many Long Range Aviation aircraft from a base deep in the interior to one that is dramatically closer to the Russian Empire's perimeter was significant.[107]

These moves were accompanied daily by the manipulation of nuclear command and control aircraft. This included two Kozelsk Loops, with TU-214SUS special communications aircraft; the deployment of a TU-214VPU special communications aircraft orbiting the Moscow area; a TU-214PU out to Tyumen and Ulyanovsk; and a Il-96-300PU presidential command post aircraft out to Novosibirsk and back. In terms of frequency, Russia maintained the roughly the same level of nuclear command and control coverage as it had starting in the last half of January.[108]

Matching American moves from 2 to 10 February consisted of maintaining three E-6 Mercurys visible at all times until 9 Feb 22. On that day, no nuclear command and control aircraft were visible, but the visible tanker count jumped to 40, and this action was repeated the next day. These moves coincided with the low-profile but visible deployment of four B-52H's from Minot Air Force Base in North Dakota to the United Kingdom. This move had multiple signalling purposes, as we will see when they arrived in Europe. However, one B-52H took an unusual route and unmasked itself while overflying Ottawa, Ontario on the night of 10 February on its way to the United Kingdom.[109]

The B-52H's proceeded to Europe where they landed at RAF Fairford, a former Strategic Air Command base in the United Kingdom which, not coincidentally, hosted B-47's back in the 1950s that were at that time targeted against Moscow.[110] After arrival, the B-52H's commenced a signalling programme. On 15 and 16 February, B-52H's flew from RAF Fairford, over Norway, then out over the Norwegian Sea where they flew holding patterns.[111] The significance is that this geographically permits potential target coverage of the entirety northwest Russia with AGB-86B cruise missiles. A single aircraft can carry 20 such missiles.[112] From a Russian perspective, it would have been difficult to determine whether or not the B-52H's were so-equipped, so even if they were not, the deployment still constituted signalling. The following day, B-52H's conducted similar flights over Sweden, ostensibly for Joint Terminal Air Controller (JTAC) exercises with Swedish forces. Moving the aircraft from the Norwegian Sea to the eastern Swedish coast significantly extends potential target coverage and reduces Russian reaction time if that potential were employed. Indeed, the flight time from this location to Russian Iskander ballistic missiles and storage sites stationed in Kaliningrad drops to 15 minutes.[113] In addition to the Scandinavian orbit areas, B-52H's flew to the western Mediterranean, refuelled off Palomares, Spain (the site of the Palomares nuclear accident in 1966 when a B-52 loaded with four nuclear weapons collided with a tanker and crashed) and then flew to the eastern Mediterranean on 14 February. This gave the aircraft potential target coverage of Ukraine and southwest Russia.[114]

A possible Russian response to this was to send via information operations conduits that a test of a RS-28 Sarmat ICBM was imminent. The Sarmat ICBM, as announced previously by Russian outlets in 2018, reputedly can carry 10 heavy or 15 light re-entry vehicles, or a hypersonic boost glide vehicle. Russian outlets in the past took pains to note that the RS-28 possesses a Fractional Orbital Bombardment (FOBS) capability, that it, the missile can be launched so that it takes a southern polar route before dispensing its re-entry vehicles over North America, thus avoiding the ballistic missile early warning systems and complicating any intercept attempts.[115] The RS-28 test did not take place at this time and was

believed by some to be delayed for the upcoming GROM-2022 nuclear command exercise (see below).[116]

In terms of Russian nuclear command and control aircraft movements, these resources were in heavy play from 14 to 18 February. There were two and sometimes three flights per day in various combinations. Three Kozelsk Loops, three Novosibirsk runs, and three Vnukovo Loops were conducted, involving all types of command control aircraft.[117] The Russian SSBN force situation was, however, murky in the public domain. It appeared to some analysts that four of the six ready SSBN's based out of Gadzhiyevo submarine base near Polayarnii on the Kola peninsula were not present.[118] That said, another pair of TU-22M3 BACKFIREs conducted a patrol over Belarus as they had previously.[119]

An indicator that the US shifted its posture to match the Russian posture was the continuous visible presence of four E-6 Mercury command planes over North America, instead of two. NORAD also posted details of a 2020 exercise in the Arctic involving CF-18s supported by USAF KC-135 tankers, with the implication that something like it was ongoing.[120] This was probably in anticipation of Russian nuclear command and control exercise, GROM 2022.

The GROM ("Thunder") series of exercises are the annual coordinated manipulations of the Russian strategic nuclear forces and generally end in the live launching of one system from each leg of the triad, albeit without the detonation of the nuclear package. Previous GROM exercises were notable for their signalling in the larger context of the renewed nuclear arms competition and re-acquisition of capabilities lost in the 1990s. GROM 2014 held in May 2014, was widely assessed as an overt message to NATO as Russian forces intervened in Ukraine. GROM 2018 (11 October 2018 was a comparatively limited effort that resulted in a salvoed SLBM launch, and cruise missile shots from a TU-95MS. No ICBMs were launched.[121] GROM 2019 (15-17 October 2019) was the largest manipulation of Russian strategic nuclear forces in an exercise since the end of the Cold War. Key features of GROM 2019, according to an assessment by the Marshall Center,[122] were:

- Russian leadership not only accepts the possibility of but also

seeks to prevail in a large-scale nuclear war involving multiple exchanges of various strikes.

- The modernization of Russia's nuclear arsenal is not yet complete and—because new weapon systems are mixed with old ones—the compatibility of various capabilities is uncertain.
- Russian command tends to perceive its readiness to manage the high risks of accidents and brinksmanship as an important strategic advantage over the risk-averse United States and North Atlantic Treaty Organization (NATO).
- The heaviest concentration of nuclear assets and the highest intensity of nuclear-related activities will continue to be found in the Arctic theater.

GROM 2020 (9 December 2020) had a greater degree of secrecy that the previous GROMs, and involved a salvoed SLBM launch from several submarines, TU-160 and TU-95MS aircraft launching cruise missiles, and an ICBM launch from Pletsetsk. As with previous GROMs, these were held in the Arctic basin. The larger purpose of GROM 2020, according to some analysts, was to undermine the existing arms control regime two months before the START talks and establish a new bargaining position.[123] The calendar analogue to GROM in 2021 was UMKA-21 (March 2021): this was the deployment of three SSBN and their surfacing from under the Arctic ice. It coincided with the initial conventional military build-up opposite Ukraine in March-April 2021, as discussed earlier, but no other forces were exercised in coordination with the submarine operation.

GROM 2021 was apparently scheduled for October, then December 2021, and was put off to 2022. There is some debate as to why. There were two camps. The first believed that the COVID pandemic played a role in the delay. The other was that the dynamics of the Ukraine situation meant that the exercise was held in reserve for messaging related to the crisis. TASS, the official Russian government media outlet, stated on 2 January 22 that GROM would be held in early 2022 but without explanation. This decision was apparently taken on 21 December 2021, which was also reported by TASS at the time. TASS foreshadowed the exercise by noting it would likely consist of an SLBM launch, and ICBM launch,

and cruise missile launches from bombers.[124]

The exercise was finally conducted on 19 February. Released Russian Ministry of Defence footage for GROM 2022 included TU-95MS footage of a single aircraft, with no external pylons attached. There was a mobile ICBM launch, fired from a TEL at a launch pad at Plesetsk. Launch crews were seen giving orders from command vehicle. A Kh-47 Kinzhal hypersonic missile was launched from a MiG-31K. Two MiG-31Ks with the weapons were shown taking off, with one launching against a structural target with a high-explosive warhead. Iskander-K SSMs were fired their TELs from Kapustin Yar. The DELTA IV SSBN *Karelia* fired a single Sineva SLBM. Footage showed the sub departing on the surface but it is unclear whether the launch took place from the surface or underwater as the footage of the Sineva was indistinct. Naturally, TASS confirmed that "All missiles in Putin-led strategic exercise hit targets."[125]

Russian media also claimed that the exercise was inaugurated by Putin at the Kremlin Situation Centre and Lukashenko was with him implying that Belarus was under the Russian nuclear umbrella again, so no more attempts at colour revolutions should be made.[126] There was no significant movement of the Russian aerial NC3I architecture during the exercise. When all was said and done, GROM 2022 was a pedestrian affair in keeping with previous exercises in the series. In some ways it appears to have been toned down, that is, a single SLBM with no apparent MIRV deployment and a single TU-95MS with no footage of the missiles actually being released from the aircraft. The footage distributed through official social media was lackluster.

GROM-2022 seems to have been timed to inaugurate the invasion of Ukraine, which was originally supposed to be launched on 20 February.[127] The exact reasons for the delay remain obscure and perhaps will be for some time. None of the Russian command and control aircraft were visibly in the air on 20 and 21 February. In what looks like a very clear signal, on 21 February Russian Ministry of Defence released footage of two BEAR operations conducted in 12 hours. The footage commentary noted that the aircraft were TU-95MSs belonging to the Amur long range aviation unit, that is, the units based at Ukrainka air base in the Far East.

One clip showed a TU-95MS with a cruise missile externally carried on one of its pylons, likely a Kh-101. This was in contrast to footage taken earlier in February and January showing empty pylons. LRA forces in the Far East have North American taskings not European ones and thus this constituted part of the ongoing threat to North America.[128] The Russian messaging was reinforced on 22 February in which a TU-214SUS airborne communications station and a Il-96-300PU both conducted a Kozelsk Loop in one day, an event not seen previously.[129]

The Americans must have sensed something was afoot on 23 February. Observation of the visible nuclear command and control aircraft and their behaviour suggested an elevated level of alert:[130]

- E-4B CLUB22: orbiting northeast of Raleigh, North Carolina, after a transit up the Atlantic coast.
- E-6 IOTO14: conducted a scramble take off from Albuquerque, New Mexico and then an evasive manoeuvre northwest of the city.
- E-6 BANIG34: conducted a scramble take off from Travis AFB, California, and conducted a loop over the Pacific and then orbited north of Travis AFB.
- E-6 SARGE15: conducted a scramble take off from St Louis, Missouri and was on a direct course to the northern tier bases.
- E-6 GEODE12: on strip alert at Lincoln, Nebraska.

The first reports in the open-source media that Russian forces were attacking Ukraine came in late on 23 February. A Russian Il-22PP electronic warfare aircraft was seen orbiting the so-called Donetsk and Luhansk "Democratic Republics" and there was a barrage of social media reports of cyberwarfare activity directed against Ukrainian, Latvian, and Lithuanian targets.[131] Amateur radio enthusiasts picked up communications on the Russian strategic bomber force radio frequencies, though it was difficult to make out what was being said.[132] Plane spotters saw and no doubt heard TU-95MS BEAR bombers departing Engels Air Base and posted this on social media.[133] The first cruise missile launched from these aircraft reportedly struck sometime around 0600 h Kyiv time on 24 February.[134] But was the time for signalling over?

The Days After: February–March 2022

The day of the Russian air and ground assault, the United States maintained four E-6 Mercurys, a KC-135 COBRA BALL, and a E-4B Nightwatch in the air.[135] The Nightwatch callsign was significant: it was dubbed "Order66" in reference to a *Star Wars* film in which this was a covert signal to decapitate the oppositional leadership prior to a coup d'etat.[136] The Order66 reference underscored the heightened readiness that the aerial NC3I force had entered into the day before. Accompanying signals on 24 February included the deployment of a B-52H near Kaliningrad and another to Sweden.

Russian activities from 25 - 27 February appear to have been designed to underpin the various public statements made by Putin regarding nuclear weapons and their relationship to the crisis, but the public face of these activities seems strange and haphazard. To recapitulate, Putin issued a warning during his 24 February public speech announcing the so-called "special military operation" against Ukraine: "Whoever tries to hinder us, and even more so, to create threats to our country, to our people, should know that Russia's response will be immediate. And it will lead you to such consequences that you have never encountered in your history."[137] Interestingly, it was the French foreign minister who responded to the threat by reminding the Putin regime: "Yes, I think that Vladimir Putin must also understand that the Atlantic alliance is a nuclear alliance. That is all I will say about this."[138] Putin responded to that statement the next day:

> As for military affairs, even after the dissolution of the USSR and losing a considerable part of its capabilities, today's Russia remains one of the most powerful nuclear states. Moreover, it has a certain advantage in several cutting-edge weapons. In this context, there should be no doubt for anyone that any potential aggressor will face defeat and ominous consequences should he directly attack our country.[139]

At the same time, Russian Ministry of Defence media and social media outlets released footage of a strange ceremony involving a Russian Orthodox priest and a parade of four TOPOL-M mobile missile TELs departing a base, probably Teykovo, headed for Moscow. Social media

Image 3.9: Signal shift: the first screenshot comes from a Russian Ministry of Defence film released on social media on 2 Feb 22. The TU-95MS BEAR is clearly shown with no cruise missiles mounted on the wing pylons. On the 21 Feb 22 footage released by the Russian Ministry of Defence, the aircraft are clearly shown with the pylons loaded. (Author)

in Russia tracked the convoy as it headed to Moscow where it promptly disappeared from view.[140] One possibility was that they were headed for Belarus. The Lukashenko regime repudiated its anti-nuclear-ness on 28 February and had maintained infrastructure at several Cold War-era mobile missile bases since 1996 for this contingency.[141] Restoring strategic nuclear capability to Belarussian soil to deter NATO intervention in what was now a huge Russian forward operating base for its invasion of Ukraine was one possibility.

In terms of aerial NC3I activity, there was only a single unusual TU-214SUS special communications aircraft flight initially. Deployed to a location in Kazakhstan without being "seen" by ATC tracking at some point, this aircraft returned to Moscow and became visible as it landed on 24 February. The next day, the pattern of visible Russian NC3I aircraft movement completely changed. The Kozelsk Loop was never flown again and henceforth was replaced with a flight path out to Tver and back to Vnukovo, the "Tver Loop." A presidential Il-96-300PU conducted this new flight path in what looked like a scramble from its base. It is probable that the southernmost tip of the Kozelsk Loop was too close to air defence systems associated with the Ukrainian assault. That day, the TU-214SUS took off from the Moscow area, entered Kazakh airspace, and turned off its transponder. In retrospect it looks like this aircraft was a communications relay between the Moscow command apparatus and strategic missile and aviation formations in east-central Russia. Having such an aircraft situated in Kazakhstan, technically a foreign country, could permit part of the Russian command and control apparatus to survive if the situation escalated to a nuclear exchange. It is likely that a Il-96-300PU command post aircraft that dispersed to Astrakhan performed a similar function.[142]

The French response clearly agitated Putin, who convened a televised announcement that included Minister of Defence Sergy Shoigu and Chief of the General Staff, Valery Gerasimov on 27 February:

> Putin said on February 27 that leading NATO powers had made "aggressive statements" along with Western countries imposing crippling financial sanctions against Russia, including the president himself. Putin ordered Russia's defense minister and the chief of the military's General Staff to put the nuclear deterrent forces in a "special regime of combat duty."[143]

What was meant by "special regime of combat duty"? Western media outlets assumed this was a heightened level of alert on the part of Russian strategic nuclear forces and behaved accordingly. "Putin's mouthpiece," Dmitry Kiselyov, provided supporting gas on the fire on Rossiya 1 TV by asserting that "Our submarines alone can launch more than 500 nuclear warheads which guarantees the destruction of the US and NATO…why do we need the world if Russian won't be in it?"[144] The next day, 28 February, Shoigu publicly announced to Putin that the strategic missile forces, the northern fleet, the pacific fleet, and Long Range Aviation had taken up duty with reinforced personnel.[145]

The visible American posture was stable at four E-6 Mercurys and a E-4B Nightwatch: this was in accordance with White House statements that implied readiness without escalation.[146] The four E-6 Mercury posture was maintained the next day as well, while an RC-135S COBRA BALL flew over Hiroshima, Japan. Whether the COBRA BALL flight over Hiroshima was a coincidence or not is difficult to determine.[147] In what came across as a delayed reaction, Russian sluggishly deployed two SSBNs from the Polyarki base area near Murmansk but then rapidly deployed the 29th Guards Missile Division with its TOPOL-M's to forested areas around Irkutsk, again with the implication they were focused on North American targets as opposed to European. In a clear departure from the baseline activities established back to 2021, a TU-214SUS special communications aircraft conducted the new Tver Loop, while the specialized TU-214VPU command plane flew in a meandering flight path all over the Moscow area, including over the command bunkers at Sharapovo and Chekov.[148]

Of note were some unusual Russian movements that were related to Finland and Sweden. The increased dialogue in both countries over joining NATO, especially after 23-24 February, and the spinoff international effects of those discussions, clearly were of concern to the Putin regime. A Russian Il-114LL aircraft, which is generally referred to in open-source material as a "flying laboratory," conducted surveillance of Finland and Finnish territorial waters. This aircraft is designed for "performance of complex radar, photography and thermal vision mapping of ground and

sea surfaces. The aircraft is fitted with side-looking radar, a combined television and thermal vision gyro-stabilized system for space surveillance and documenting work of radiolocation devices." The aircraft carried no callsign and was briefly observed on ATC data.[149] This sort of mission is usually conducted to collect and update targeting data, or to provide the appearance of this for an audience.

The second event was the probing of Swedish airspace by four Russian aircraft, two Su-27 FLANKER fighters and two Su-24 FENCER bombers, on 2 March. These aircraft proceeded to a point east of Gotland before returning to base.[150] Nearly a month later, however, Swedish media asserted that the Su-24 FENCERS were carrying nuclear weapons and provided blurry shots of the aircraft which appear to have been carrying external stores. This triggered a public debate as to whether there were or not equipped with nuclear weapons.[151] The Swedish Air Force would not elaborate on the armament but Air Force Commander Carl-Johan Edstrom "said that the air force assessed the incident and found it to have been done deliberately. 'We assess it as a conscious action. Which is very serious especially as you are a warring country." The commander ruled out the possibility that the violation took place due to "incorrect navigation.'"[152]

The third event is murkier and open to some interpretation. Russian social media carried a post of cell phone camera footage of a nuclear weapons movement convoy that was moving south of St Petersburg, possibly from the Tver-9 nuclear storage site north of Moscow. This particular convoy was configured to support Iskandar ballistic missile units. If an Iskander unit was deployed south of St Petersburg opposite Estonia, it could easily threaten Finland as well. The question is whether or not the social media footage was intended to be seen in the West or was it accidental footage captured by a local enthusiast of military vehicles.[153] Taken together, these events clearly highlight that the Putin regime was engaged in signalling directed at Sweden and Finland at this time.

Norway expressed concern with both regional and strategic developments. Defence Minister Odd Roger Enoksen noted that "In the north we see Putin has increased the protective measures around their nuclear

weapons. These are Russian defensive measures. We do not see an explicit military threat to NATO or Norway, but the situation in Europe is unpredictable."[154]

And that unpredictability increased on 3 March when the Anonymous hacker collective announced that they had penetrated Roscosmos and shut down Russian satellite control systems. This was denied by Roscosmos who issued a statement that "Offlining the satellites of any country is actually a casus belli, a cause for war."[155] It is unclear in the public domain what effects the hack or hacks actually had on Russian satellite capabilities, but the larger problem of strategic stability was addressed by the United States with the very public rescheduling of GLORY TRIP by the Secretary of Defence, Lloyd Austin.[156] GLORY TRIP is the codename of a regularly-scheduled training and validation event whereby a launch control crew deploys with a Minuteman III ICBM to Vandenberg Air Force Base in California and the missile is launched towards Kwajalein Atoll without its nuclear payload. Having the SECDEF reschedule GLORY TRIP was a very clear signal to the Putin regime, especially when it was combined with an increase in the number of visible nuclear command and control aircraft to four and the number of visible tankers to 40 at the same time.[157] For comparative purposes, the launch of an ICBM in a test configuration during the Cuban Missile Crisis in October 1962 was perceived by some to have been a destabilizing event.[158] That said, B-52H's visibly operated over the Czech Republic and Romania, while the USS *Truman* carrier battle group moved into the northern Aegean Sea. The American posture could best be described as ready but not provocative.[159]

The Putin regime, however, behaved as if nothing had changed and actually elevated their posture. A pair of ballistic missile submarines are believed to have departed their base near Polyarnyi. The 39th Missile Division at Novosibirsk and the 29th Missile Division at Irkutsk, both focused on North American targets, once again deployed their TOPOL-M mobile ICBMs into local forests.[160] And there were accompanying significant movements of Russian command and control aircraft: two Il-96-300PUs conducted the new Tver Loop; another Il-96-300PU flew out to

Ufa, orbited, and then flew back to Moscow. The TU-214VPU special command post flew a pattern around the Moscow area, dipping towards Kozelsk. Another TU-214PU command post aircraft also dispersed to Magnitogorsk.[161] This posture was maintained until the end of 5 March.

It was at this point the sub-strategic nuclear capabilities of the TOPOL-M ICBM became the subject of discussion on social media on 6 March but it is unclear if this was some form of implicit signalling or not. That said, a Russian specialist in Cold War nuclear weapons, who usually focuses on Cold War topics, all of a sudden produced substantial information on the TOPOL-M's sub-strategic re-entry vehicles, including links to when they may have been tested in 2007-08, as well as possible application which he defined as "preventive tactical strikes." The preference for such a system instead of using strike aircraft was that the TOPOL-M system could be employed immediately and would not be detectable by intelligence methods in the way aircraft loading might be. The discussion was picked up by Western-based observers on Twitter.[162] Was this coincidental to the uncharacteristic and very public TOPOL-M departure from Vladimir towards Moscow and possibly Belarus on 25 February? Publicly available information from Russian sources credits the TOPOL-M with a "warhead with a capability of 550 kilotons [in] a monoblock warhead" and that that warhead "can be replaced in the shortest possible time with a warhead with several warheads with individual guidance. The capacity of each [warhead] is 150 tons (TNT equivalent)."[163]

This discussion was immediately followed by the posting of a detailed document explaining the Russian's so-called "nuclear de-escalation" option via the Riddle Russia website and social media. Quoting an official Russian document from July 2017, the author highlighted that "In the context of an escalating military conflict, a demonstration of readiness and determination to use force using non-strategic nuclear weapons is an effective deterrent."[164] Of interest, this Russian declaratory policy copies NATO nuclear planning under the context of the Flexible Response strategy inaugurated in the MC-14/3 strategic concept of 16 January 1968 which has "demonstrative use of nuclear weapons" as an option in the face of Soviet aggression.[165] The author underscored the relationship be-

tween sub-strategic nuclear weapons use and Ukraine:

> Ultimately, the "special regime" of containment, despite its rhetorical nature, means that the Kremlin, against the backdrop of a difficult situation on the battlefield, does not abandon attempts to bargain from a position of strength and continues to raise rates: today this is already a threat to turn the war against Ukraine into a major regional conflict with the use of nuclear weapons.[166]

It must be noted that the author viewed that the threat as "at least some kind of foreign policy card."[167] Whether or not it was deliberate, the overall discussion of the subject in Western social media likely served the Putin regime's signalling purposes, given the context of the situation: they had the ability to employ sub-strategic nuclear weapons in Ukraine, and they had the doctrinal context in which to do it. To what extent could the United States, France, and the United Kingdom deter that move if it were undertaken?

A possible American response was a Tweet by US STRATCOM. In a highly unusual message, STRATCOM tweeted that two submarine tenders attached to the Pacific Fleet were "providing vital maintenance and logistical support" to nuclear submarines in the region. It identified and pictured one, the USS *Emory S. Land*, moored at Saipan, but did not identify or locate the other.[168] The importance of this post could not be underestimated by the Russian intelligence apparatus, or Communist China's, for that matter. These ships have the ability to support American nuclear submarines.[169] During the Cold War, plans included reloading American submarines at remote atolls in the Pacific so that another wave of nuclear strikes could occur after the initial SIOP was launched. The implications were clear: the United States retained the capability to re-arm or re-configure its submarines in addition to missiles already aboard the estimated two to four ballastic missile submarines that were at sea in the Pacific Ocean. That emphasized deterrence if the Putin regime moved at the strategic level, but did that deterrence extend to Ukraine? And to what extent did it extend to neighbouring countries?

That deterrent sector was apparently covered by other means. The U.S. Navy guided missile destroyers USS *Forrest Sherman* and USS *Donald Cook* entered the Baltic Sea on 7 March. Between them they pos-

sessed 186 vertical launch missile cells: a significant proportion of those cells were loaded with Tomahawk cruise missiles. The flight time of the Tomahawk to Moscow from the Baltic Sea is one hour and considerably less, minutes, to Kaliningrad. In effect, both ships could strike whatever Russian targets they were ordered to west of the Urals. Although only the conventional version of the missile is loaded, these weapons are extremely accurate. And, as we have seen, the psychological effect of mobile cruise missile launching platforms on the Russian military psyche was and remains powerful.[170]

As the fighting raged on across Ukraine and the Russian Army was fought to a standstill, the aerial component of the Russian strategic nuclear forces remained at an elevated level of activity from 7-12 March. This generally took the form of a Tver Loop by a TU-214PU and a long flight to Kazan by an Il-96-300PU or Ulyanovsk by a TU-214PU.[171] In some cases the specialized communications plane, the TU-214SUS, flew to a dispersal base in Kazakhstan after filing a false flight plan and then dropping off ATC coverage.[172]

As we have seen before in January, there is a period of murkiness that lasts from 14 to 23 March where there are a series of events in the public domain that appear to connect with other events that are not in the public domain, yet the picture cannot fully be discerned. There were three major exercises conducted by the Western allies starting 14 March; there is what appears to have been Russian pre-emption of a putsch or coup d'etat; and then a series of inchoate threats made by Russian officials to neighboring countries implying nuclear weapons use, culminating in a French strategic nuclear flourish on 23 March.

This phase of the crisis was initiated by an attack against the Yavoriv Training Center in Ukraine just kilometres from the Polish-Ukrainian border by Russian by TU-95MS's based at Engles Air Base firing an estimated 30 cruise missiles.[173] The use of a dual-capable strategic asset like the TU-96MS and the proximity of the target to Poland was clearly language directed at Poland and other NATO members to back off in supporting Ukraine. Yavoriv was used as the primary base for NATO-member training teams working with Ukrainian forces since 2015. Iskander

ballistic missiles from Belarus could just as easily have been used against Yavoriv, so the combination of all of these factors suggests this attack constituted signalling on the Putin regime's part.

The next component of the crisis was the conduct of three separate major exercises simultaneously. It is important to note that these were all scheduled and planned at least a year in advance, so they were not specifically intended for crisis signalling. That said, they were not cancelled like, say, GLORY TRIP, and continued on schedule. Some were in fact augmented. Russian analysis would, however, have likely taken a different, more paranoid view and would have assessed the three exercises as a synergistic effort to coerce Russia when combined with other signalling efforts like the submarines and B-52 operations. Indeed, the opportunistic use of the exercises to message the Putin regime cannot be ruled out, as similar activities had occurred during the Cold War.

The first of these was Exercise COLD RESPONSE 2022. This massive exercise was a direct echo of its Cold War predecessors, the EXPRESS and NORTHERN WEDDING series conducted from 1968 to 1990. In a general sense, aircraft carrier and amphibious task forces from NATO nations converge on northern Norway and the Norwegian Sea to work with Norwegian forces in exercising the defence of the NATO Area. During the Cold War, exercises in Norway were specially established to counter intense Soviet diplomatic pressure to force Norway to become a neutral state like Sweden and Finland. Later on in the 1980s, north Norway exercises were specifically designed to exert pressure on the large base areas on the Kola peninsula, but implying NATO could raid these important submarine, missile, and air bases in the event of hostilities. This forced the Soviets to expend scarce resources in these remote areas.[174]

COLD RESPONSE's size was impressive especially by post-Cold War standards. There were two aircraft carrier task groups, one British and one American. A US Marine Expeditionary Brigade and Marine Air Group, as well as a British Royal Marines battalion participated, among 30 000 personnel deployed from 27 nations including Sweden.[175]

The second significant exercise was ICEX 2022. This was a US Navy exercise with Canadian, British and Danish participation and involved

the attack submarines USS *Illinois* and USS *Pasedena* operating under the Arctic ice and with a deployed ice station, code-named Queenfish. There were likely undeclared forces involved in under-ice operations but the public face of the exercise had one submarine blowing a hole in the ice with a torpedo so it could surface through it.[176] If Russia had deployed SSBN's under the Arctic ice pack as they had during UMKA 21, ICEX 2022 demonstrated that the US Navy had the ability to track and destroy them if necessary.

Finally, there was Exercise NOBLE DEFENDER. This NORAD exercise included three regions: Alaskan, Canadian, and Continental with the first two focused on the Arctic and the last in the eastern flank of the United States. Canadian and American interceptors conducted operations scrambled from four different bases against "intruder" B-52s from US STRATCOM north of CFS Alert, with Canadian CF-18s refuelling from USAF KC-10 tankers.[177]

Russian analysis of the three exercises would have concluded that Canada and the United States could defend against bombers and cruise missile and the U.S. Navy had the demonstrated ability to conduct under ice operations against ballistic missile submarines, and thus had the ability to deter Russian movements in those areas. COLD RESPONSE demonstrated that NATO's Northern Flank was under protection but also that NATO members had the potential to project ground and especially air power to the Kola Peninsula with its plethora of naval and submarine bases if necessary. Indeed, the 61st Naval Infantry Brigade assigned to the Russian northern fleet was at this time being ground up in Ukraine, leaving the area with a significantly reduced ground force presence. If the Putin regime escalated the war outside of Ukraine, the Kola Peninsula was vulnerable to conventional attack.

With the exercises as the background, there were a series of activities that suggest the Putin regime may have pre-empted a putsch between 11 and 17 March. The most visible clue was that Sergy Lavrov's aircraft did a U-turn over Siberia and returned to Moscow, indicating that there was something serious in play. A raid at FSB headquarters the previous week led to the arrests of two generals and later, 150 personnel associ-

ated with them. Alexander Bortnikov, the director the FSB, was last seen on 11 March. Viktor Zolotov, commander of Rosgvardia, disappeared on 13 March after meeting with a senior religious figure with whom he apparently questioned the morality of the war. Subsequently, his deputy, General Roman Gavrilov, was arrested on corruption charges. Of interest here was that Gavrilov apparently served in the FSO, the organization that handles Presidential security. General Valery Gerasimov, the chief of the general staff, who had been absent since 28 February, remained so but his deputy General Igor Kostyukov was rumoured to have "heart problems" and disappeared from view. Minister of Defence Sergy Shoigu also remained absent.[178]

An indicator that the strategic nuclear command and control system on both sides was elevated was the disposition of the American command and control aircraft. On 14 March, there were four E-6 Mercurys up over the continental United States, as well as a COBRA BALL aircraft orbiting over Japan, with an E-4B on ground alert at Lincoln, Nebraska: this elevated level could have been attributed to a planned North Korean missile test.[179] However, on 16 March a record nine E-6 Mercury's were up plus one hundred visible tanker aircraft.[180] This appears to have been timed with Ukrainian President Volodomyr Zelensky's address to the American Congress and therefore should been seen as a sign of American support for Ukraine in the face of the Russian invasion as well as a readiness move in case there was, in fact, a putsch in progress in Moscow.

On the Russian side, a TU-214PU command post aircraft departed Vnukovo and landed at Novosibirsk. He then took off again headed northwest. The previous day, this aircraft from Moscow to Tyumen to Ulyanovsk and back to Moscow. Then a TU-214SR communication relay aircraft flew from Vnukovo to Omsk. The last time this plane visibly moved was 2 February. During its flight the TU-214SR conducted an unusual manoeuvre north of Kurgan.[181] This manoeuvre is associated with calibration of a low frequency communications system. Similar aircraft had been seen to conduct this manoeuvre in the presence of other command aircraft in late 2021. The most likely scenario was that the TU-214PU command plane used the TU-214SR as a relay back to facilities in

Moscow (Sharapovo and Chekov bunker complexes) while testing links to the 29th Guards Missile Division at Irkutsk and the 39th Guards Missile Division at Novosibirsk, the 62nd Missile Division at Uzhur, and the 35th Missile Division at Barnual. This was probably a communications test of the 33rd Guards Missile Army, headquartered in Omsk.

The most mysterious Russian command post aircraft flight also took place on 17 March. A presidential IL-96-300 departed Vnukovo airport and flew a highly unusual flight path that did not correspond to any previous behaviour. No other command and control aircraft had conducted this or similar flights during the past year. The aircraft did not put down at any point in the flight and returned to Moscow (Vnukovo). This Il-96-300 was in the air for over ten hours. It remained over nearly uninhabited Russian territory and did not approach any facility of strategic value. It did not appear to have interacted with any other aircraft (tankers, for example). Previous behaviour of this aircraft had it conducting the Moscow-Ufa-Moscow communications check loop. It was also involved in Putin's Beijing trip to the Olympics, probably as the stand-by aircraft in Vladivostok. At two points in the flight the aircraft could not provide ATC data because of its remote location. This may have been some form of demonstration of capability or validation of a capability. If senior Kremlin leaders wanted to ride out a nuclear exchange and not be fixed to a ground facility, this flight demonstrated that they could do so in an uninhabited, uncontrolled space and not be targeted or suffer the effects a strike which would be directed at strategic nuclear facilities first.[182]

The same day a US Navy E-6 command post aircraft callsign MASS97 conducted a series of orbits west of Harrisburg, PA. There was only one E-6 up that morning after a record nine the day before.[183] MASS97 is Berkelium on the Periodic Table of Elements, an element discovered by Glenn Seaborg and is named after Berkeley, California, the home of the Lawrence Livermore National Laboratory. The element has no apparent practical application and can only be made at the Oak Ridge National Laboratory. Both facilities are associated with nuclear weapons production. Up to this point in the crisis, E-6's did not operate in this area at all. The significance of this location relates to its proximity to Ravenrock

(Site R) the JCS relocation bunker complex; the Camp David presidential retreat; and multiple communications downlink facilities in the area.

The Russians maintained their effort on 18 March. A TU-214PU command post aircraft flew outbound towards Omsk for a communications check with the 33rd Guards Missile Army (with a phoney flight plan for Novosibirsk). An IL-96-300PU presidential command post aircraft conducted a Tver Loop, while the TU-214SR communications relay aircraft returned to Vnukovo from Omsk, after working with the TU-214PU. Two other Il-96-300PU's dispersed to Sochi and Nur Sultan, Kazakhstan respectively.[184] The next day activity dropped to a Tver Loop with an Il-96-300PU and a Moscow-area flight of the TU-214VPU special communications aircraft.[185]

There is no hard explanation for the manipulation of the Russian nuclear command and control aircraft flotilla at this time. There is no publicly available information on the movements of the Russian bomber force at this time, though commercial satellites detected the return of three Russian ballistic missile submarines to Gadzhiyevo base near Polyarnii, Murmansk earlier in the month but at least two of the other three were being loaded.[186]

That said, public statements coming from senior Russian leaders suggest a dangerously confused situation. Statements coming from Mikhail Alexandrov at the Moscow State Institute for International relations (MIGMO) asserting that Russia has the right to launch missile attacks on Georgia if it did not comply with Russian inspections to ensure the lack of presence of biological weapons laboratories was not contradicted nor denied by the Putin regime.[187] So was Russia going back into Georgia to finish the job it started in 2008? Was this more hybrid methodology? In coming days, "Russia's online propaganda outlets started floating the idea of using 'tactical' nukes against Azerbaijan since Russia can't fight two wars at the same time."[188]

Sergei Lavrov phrased the overall conflict as a reflection on "the battle over what the world order will look like."[189] The confusion was compounded on 21 March when Dmitry Medvedev, now the Deputy Chairman of the Security Council of Russia, posted a rambling but disturbing

Telegram post in which he implied that for there to be good relations between Poland and Russia, the existing political elite in Poland had to be removed or else Poland will suffer the same fate as Ukraine.[190] There were unconfirmed reports in Polish media that Russian TU-22M3 BACKFIRE aircraft were making runs at the Polish border and turning away at the last minute.[191] Russian media open discussed the use of nuclear weapons against Europe as part of an invasion of Poland and Lithuania to "relieve" the "pressure" on Kaliningrad.[192] Smoke was seen to emanate from the Russian embassy in Warsaw and it appeared as though they were destroying their documents.[193]

At the same time, media and social media speculation had been building based on the theory that the Putin regime would employ battlefield nuclear weapons or chemical weapons to extricate itself in the now bogged down war in Ukraine. Russian influencers as well as state-controlled media stoked such thinking at every turn. The combination of pressure on Poland and potential weapons of mass destruction use in Ukraine was too much, even for the Macron administration in France.

As a result, the French conducted their own nuclear signalling at this time. Numerous press reports appeared in English and French on 21-23 March that there were now three French ballistic missile submarines at sea instead of the normal two, and this had not been done since the Cold War. This was accompanied by refusals to confirm or deny the deployments by French authorities.[194] Right on the heels of this came an announcement from the French Ministry of Defence that a successful test of the Air-Sol Moyenne Portee Ameliore (ASMPA) nuclear air-to-surface missile was conducted on 24 March.[195] The significance of the ASMPA test lies its relationship to French nuclear doctrine. This missile carried a 300 kt yield warhead and is launched from Mirage 2000NK3 aircraft or Rafale Marine aircraft from the French aircraft carrier force. French nuclear doctrine has a "nuclear warning" component whereby nuclear weapons like the ASMPA are employed before the decision to fire the ballistic missile force is made in order to get the aggressor to back off. In this case, the French submarine forces carries 64 sea-launched ballistic missiles and each missile carries six TN-75 re-entry vehicles of 100 kt

yield each for a total of 384 DGZs for the SSBN force.[196]

A French nuclear flourish was certainly an interesting development. Operating outside of NATO, France possesses the doctrinal and policy ability to extend deterrence over whoever it choses using the "touts azimuth" doctrine established during the Cold War and more finely tuned into the 21st Century. The force de dissuasion has the ability to saturate Russian ABM defences and fulfil a range of target options which contributes greatly to overall deterrence. As a NATO member, France can also activate Article 5 if attacked by Russia. Knowing that France has this capability, a disproportionate percentage of the Russian strategic forces must be kept available to cover off targets in France, thus placing some stress on the Russian capacities if they are not to reduce target coverage of the United Kingdom and the United States.

The following day, while visiting American troops in Poland, President Biden stated that In the event that Russia employed weapons of mass destruction in Ukraine, "We would respond if he uses it. The nature of the response would depend on the nature of the use." Stoltenberg stated that NATO members would "reinforce its chemical, biological, and nuclear defense systems" if Russia employed such weapons.[197]

Concurrent with the French moves, there were American moves. The B-52H force in the United Kingdom conducted a series of "JTAC training exercises" over German, Romanian, and Black Sea airspace. US STRATCOM tweeted about a B-2 exercise conducted with Australia but underlined the fact that the B-2 could operate at extreme ranges, implying they could be used against Russian targets.[198] B-52H's later conducted missions over Denmark.[199]

Finally, an RC-135U COMBAT SENT reconnaissance aircraft continuously squawked while it conducted its collection pattern off Murmansk.[200] The COMBAT SENT is a US Joint Chiefs of Staff or Secretary of Defense-tasked asset designed to collect in fine detail the attributes of the Russian air defence system's radars and communications network, unlike the RC-135S RIVET JOINT which has a broader collection capability against SIGNINT and COMINT. In theory, COMBAT SENT is deployed immediately before air operations so the latest information is available

for strike packages.[201] The fact this aircraft was mounting this operation at the same time as Exercise COLD RESPONSE would in theory generate uncertainty in the Russian establishment vis-à-vis the defence of the Kola Peninsula and its extensive cluster of naval bases if Russia chose to mount expanded military operations outside of Ukraine. As such, the COMBAT SENT's presence is considered to be part of the overall American deterrent apparatus.[202]

The End of the Beginning: Russia's Second Phase, March-April-May 2022

In an unexpected multimedia briefing, the Russian Ministry of Defence announced on 25 March that the "special military operation" in Ukraine was entering its "second phase." The reality of the situation was that Russian forces had been mauled on practically every front they were operating on, and the Russian leadership effected a retreat from northern Ukraine and redeployed what forces remained to the eastern and southern fronts. This announcement was not accompanied by any unusual visible movement of Russian strategic nuclear forces during this period. There were two TU-214PU flights: one to Ulyanovsk and back to Moscow, and the dispersal of another one to Sochi. And there was a long duration IL-98-300 flight from St Petersburg to Kazan, where it orbited for some time, and returned to Moscow.[203] Visible American nuclear command and control aircraft flights returned to a baseline of two aircraft.[204]

And the war ground on in Ukraine, the Putin regime felt to need to flourish its newer nuclear capabilities by mounting an unannounced exercise involving the 31st Missile Army at Orenberg and the 13th Missile Division situated in silos around Dombarovsky.[205] This formation is notable in that it is equipped with not only the traditional SS-18 SATAN ICBM but also SS-19 mod 4 ICBMs capable of carrying Avangard hypersonic glide vehicles.[206] The importance of this system is that hypersonic vehicles, once fired, reach speeds that make them impossible to intercept with existing air and missile defence systems. The possibility that a small number of HSGVs carrying electro-magnetic pulse generators could penetrate

over North America, for example, is of course extremely problematic and could erode or undermine a deterrent posture. Recall, of course, that we are talking about combat potential as a part of signalling: "We could do this" and "We have the capability to do this."

Throughout early April, Russian NC3I aircraft continued to do a mix of the Tver Loop and a new route that took the command planes north of Kazan where they orbited for some time and returned to Moscow. This was most likely a communications check with the Yoshkar Ola missile division.[207] The pullback of the TU-214PU's from the Kozelsk Loop was validated on 4 April when Ukrainian air defence forces shot down an Il-22, which was either an airborne command post or an electronic warfare aircraft, over Taganrog inside Russia.[208]

US STRATCOM mounted Ex AGILE TIGER on 5 April and ensured there was social media coverage of the 4-day "interoperability exercise" involving all three US bomber types (B-1, B-2, and B-52). The exercise "allow[ed] America to maintain credible strategic deterrence." The size and geographical scope of the exercise was left vague in the public domain initially and implied to have been limited to Whiteman AFB in Missouri, but other sources depict a much larger exercise spread out across the Midwest with over 15 Guard and Reserve units participating alongside the regular U.S. Air Force units and formations.[209] US NC3I aircraft that were in the air at this time included four E-6 Mercurys, plus an E-4B Nightwatch in some form of ground alert posture, which suggests that AGILE TIGER was more than just a small interoperability exercise.[210]

On the Russian side, there were again three near-simultaneous activities that appear to be interlocked with each other and revolved around a Putin-Lukashenko meeting. Contextually, Russia forces were defeated north of Kyiv and the remnants withdrew into Belarus, which continued to act as a launch pad for missile strikes against Ukraine. Putin's decision to hold a meeting with Lukashenko at the new cosmodrome near Blagoveshchensk in the Far East was surprising in that both men would be remote from their capitals with the potential of domestic unrest looming in the background for both of them. It is not surprising then that a large number of Russian nuclear command and control aircraft were dispersed

or redeployed as a dry run in support the future meeting: an Il-96-300PU to Ufa; a TU-214PU to Nizhny Novgorod; another TU-214PU to Blagoveshchensk, for example.[211] Tver Loops continued, with two occurring on 8 April.

While Putin was meeting with Lukashenko, however, another purge was conducted in Moscow. Vladislav Surkov, the functional equivalent of party ideologist in the Putin regime and author of the dubious concept of "managed democracy," was arrested. At the same time 150 FSB agents and personnel were rounded up and jailed.[212] At this point, the Russian NC3I aircraft plot had a TU-214PU at Blagoveshchensk; the TU-214PU-SBUS Ministry of Defence command plane moving around the Moscow area but only squawking intermittently; a TU-214SR communications relay plane that flew into the Siberian wilderness outside of air traffic control systems range; a TU-214PU that did the same; and the executive TU-214 that brought Putin and Lukashenko to Blagoveshchensk.[213] Was all of this signalling or did it constitute continuity of government preparations given the breadth of Russian territory? The corresponding American aircraft movements were relatively minimal: three NC3I aircraft up and a visible tanker count of 32.[214]

During this time the United States did signal with its submarine force. The cruise missile submarine USS *Georgia* was seen (and tweeted by the U.S. Department of Defense) surfaced near Souda, Greece on 11 April, whereas we will recall optimum firing positions against targets in Ukraine or southwestern Russia are located.[215] Nearly a week later, British tabloids printed "leaked" photos of submarine activity in Gibraltar. The nuclear hunter killer submarine HMS *Audacious* was shown tied up near the USS *Georgia* SSGN, loading Tomahawk cruise missiles, type undermined. British media outlets specifically used the phrase "show of force" in the articles discussing HMS *Audacious*. This class of submarine can carry 38 weapons (torpedoes and cruise missiles in combination). Of note, British Royal Navy submarines operating in concert with US Navy submarines, fired the opening salvoes of Operation ALLIED FORCE in 1999; during the initial operations against Al Qaeda in October 2001; and the 2003 Iraq invasion with HMS *Turbulent* launching

30 Tomahawk.[216] At the same time, pictures of an *Astute*-class submarine departing its base in Scotland made the rounds after pictures of a similar submarine were published in Norwegian media operating in northern Norway.[217] The most likely explanation for the flourish of these systems was the rampant media speculation, spurred on by Russian state-controlled media, on whether or not Russia would employ chemical weapons to break the deadlock over the Azovstal siege in Mariupol, or to open up the stalled out offensives in eastern Ukraine.[218]

Russian threats ramped up again on 14 April after the cruiser *Moskva* was sunk by Ukrainian forces and the purges in Moscow continued. Dmitry Medvedev warned that nuclear hypersonic weapons would be deployed if Sweden and Finland joined NATO. Yet Russian NC3I aircraft movements returned to baseline: a Tver Loop with a TU-214PU-SUS and a TU-214PU run out to Tyumen.[219] American NC3I moves were limited to a visible E-4B and an E-6.[220] That said, pressure continued on the Northern Flank when the aircraft carrier USS *Kearsarge* and its associated task group and Marine Expeditionary Unit suddenly appeared at Tromso in northern Norway for "winter training with Norwegian troops."[221] Moscow countered with public announcements of refurbishing ground forces infrastructure in the Murmansk area.[222]

What appears to have been the fruits of the Putin-Lukashenko meeting emerged on 18 April. A significant Belarusian army airborne exercise was conducted near Brest on the Polish border, while Lukashenko issued statements provoking and condemning Poland. At the same time, Medvedev repeated his threats regarding nuclear deployments in the Baltic region. This prompted alarming social media posts that the Polish government was taking continuity of government measures in the event of a nuclear attack. Lukashenko then made statements on 19 April threatening the destruction of Lithuania, Poland, and Latvia. By having Lukashenko threaten NATO members and directly threatening Sweden and Finland, it is possible Putin was looking for some means to distract the Western military support effort for Ukraine.[223]

This sudden verbal tidal wave may also have been coordinated with an ICBM test on 20-21 April. The RS-28 Sarmat is a replacement for the

heavy ICBM R-36M (SS-18 SATAN) that has been under development since 2009 but was last tested in 2017 with a trio of cold launch tests. Strategically, the RS-28 is problematic in that it can carry boost glide hypersonic nuclear weapons, has a range of defensive systems, and is also a possible FOBS carrier.[224] That said, there has been some debate over this test and its relationship to the crisis. One observer noted that this test had been, in fact, delayed for three years and that western media misread the test as a signal in the context of the Ukrainian war.[225]

As with any Russian missile test, however, the possibility that it might be a precursor shot to generate EMP disruption ahead of a more general nuclear strike can never be ruled out. Consequently, RC-135 COBRA BALL missile training aircraft were deployed to the Far East to observe this test, but at the same time an E-4B Nightwatch deployed over Lake Superior, four E-6 Mercurys were aloft and the visible tanker count was 50. This decreased by two-thirds a matter of hours after the RS-28 test.[226]

Russian posturing on the weapons of mass destruction issue spiked again on 22 and 23 April. This time, western media reported that ROSCOSMOS chief Dmitry Rogozin claimed that British Prime Minister Boris Johnson asserted that "the U.K. reserves the right to carry out a retaliatory nuclear strike against Russia without first consulting with other members of NATO." Rogozin was then quoted as saying "Boris, if Sarmat is used, none of you will 'consult with each other.'"[227] It remains unclear as to where the alleged Johnson quote came from but it was then spread all over the Twitterverse and even by a Ukrainian government spokesman.[228] Newsweek attempted to ascertain where the quote came from and it was denied by No. 10 Downing Street. British government "sources said Rogozin may be deliberately using disinformation" but for what purpose remained unclear.[229]

This bizarre row was quickly followed by another. The state-run RIA Novosti propaganda outlet quoted a retired colonel from the Russian Ministry of Defence who asserted that Ukrainian biological weapons laboratories were working secretly with Polish biological weapons laboratories, neither of course which existed in 2022.[230] A screenshot of a Russian Ministry of Defence media briefing that spread around Twitter

claimed that Azerbaijan, Moldova, and Georgia were partners in the Polish-Ukrainian scheme to destroy Russia.[231] Then General Igor Kirilov, the commander of Russian Chemical and Biological Protection Forces was interviewed by TASS and claimed The United States was working all of the previous entities to generate "provocations" in order to accuse Russia of chemical, biological, of nuclear weapons use.[232]

In response, Pentagon Press Secretary John Kirby told the media that the United States "has seen NO changes in Russia's nuclear posture that would merit change to Pentagon alert status but is watching 'very closely'."[233] Certainly the Russian nuclear command post aircraft plot was behaving normally from 23 to 29 April with Tver Loops, and runs to Voronezh and Omsk.[234]

That said, something changed on 29 and 30 April. The United States had four E-6 Mercurys and a E-4B Nightwatch aloft as well as a record 100 plus visible tankers. The following day it was five E-6 Mercurys, and E-4B and more than 90 visible tankers.[235] This was accompanied by a Pentagon press secretary statement on 30 April that Russian nuclear threats were bluster and there was "no reason to change" the force posture at this time.[236]

The Pentagon statements and the force movements are incongruous and when set against Russian statements, it is clear that more was going on. Note that John Kirby stated there were no changes to Russia's nuclear posture. He did not state that there was no change to Russia's chemical or biological weapons posture. And, in the context of Russia's information operation seeking to simultaneously justify WMD use as a "response" to Johnson's non-statement and to justify action based on the supposed Polish-Ukrainian-Azerbaijani-Georgian-Moldova chemical and/or biological "provocation," the need to nudge up the readiness level of the American NC3I aircraft, tanker force and other unseen assets itself became justified. Ramped up Russian information operations focusing on nuclear weapons, both fantastic and real, in state-controlled media took place throughout early 5 May but it produced no significant response from official Western spokespeople other than hilarity at Dmitry Kiselyov's graphic of a nuclear torpedo-generated tidal wave inundating the British Isles on Rossiya 1.[237]

Social media posts showed an unnamed British ballistic missile submarine returning home to Faslane from patrol and the families of the crew of the ballistic missile submarine USS *Rhode Island* greeting the returning submarine to its base at King's Bay, Georgia. The caption helpfully reminded anyone who cared to read it that "*Rhode Island* is one of six ballistic-missile submarines stationed at the base providing the most survivable leg of the strategic deterrence triad for the United States."[238]

Endnotes

1. CSIS,"The Russian and Ukrainian Spring 2021 War Scare," https://www.csis.org/analysis/russian-and-ukrainian-spring-2021-war-scare
2. The author recognizes that there is significant debate over the various TOPOL variants in relationship to Russia's attempts to circumvent New START. For our purposes I will refer to the current standard Russian mobile ICBM as TOPOL M and the silo-based version as TOPOL-MR. For order of battle information, see Pavel Podvig, "Russian Strategic Nuclear Forces: Strategic rocket forces," https://russianforces.org/missiles/
3. "Perimeter System," Military Review, 27 Jun 13, at https://topwar.ru/29887-sistema-perimetr.html Note that commentary on the article relating to Kozelsk has been subsequently removed since the article was first accessed in 2017. The author retains screenshots of the original material.
4. "The third plane from the special flight squad "Russia" is approaching the Saratov region - this time the "presidential" Il-96," NVersia News, 12 Apr 21 at https://nversia.ru/news/k-saratovskoy-oblasti-priblizhaetsya-uzhe-tretiy-za-den-samolet-iz-specialnogo-letnogo-otryada-rossiya-na-etot-raz-prezidentskiy-il-96/
5. "NATO Intercepts Russian planes 'ten times in a day," BBC News, 30 Mar 21, https://www.bbc.com/news/world-europe-56577865
6. Status-6 Twitter, post 15 Apr 21.
7. "Third Interception of Russian aircraft in a Week," BBC News, 12 Mar 20 https://www.bbc.com/news/uk-scotland-highlands-islands-51851846 ; OSINT Technical post on Twitter, 14 Oct 20.
8. Yefrim Gordon and Dmitry Komissarov, *Tupolev TU-160* (Atglen: Schiffer Publishing, 2016), ch. 6; Yefrim Gordon and Dmitry Komissarov, *Tupolev TU-95 and TU-142* (Manchester: Hikoki Publications, 2017), ch. 5.
9. "Arctic Exercise UMKA-21 Shows Russian SSBN can Deliver Massive Strike," *Naval News* 10 Apr 21, https://www.navalnews.com/naval-news/2021/04/arctic-exercise-umka-2021-shows-russian-ssbn-can-deliver-massive-strike/
10. "Two Russian Tu-160s and Four Flankers Intercepted By Italian F-35s, Danish F-16s and Swedish Gripens Over The Baltic", *The Aviationist*, 15 Jun 21, https://theaviationist.com/2021/06/15/tu-160-italian-f-35/
11. Michal Fiszer, et al "Manufactured Migrant crisis on Polish Border is a Form of Hybrid Warfare," *Discourse* 18 Nov 21, https://www.discoursemagazine.com/politics/2021/11/18/manufactured-migrant-crisis-on-polish-border-is-a-form-of-hybrid-warfare/ ; Sascha-Domink Bachmann, "Is the Belarus migrant crisis a new type of war?" *The Conversation* https://theconversation.com/is-the-belarus-migrant-crisis-a-new-type-of-war-a-conflict-expert-explains-171739

12. Ostap Yarysh and Myroslava Gongadze, "US, Ukraine Scrutinize Russian Troop Build up As Moscow Dismisses Invasion Fears," *VOA News*, https://www.voanews.com/a/us-ukraine-scrutinize-russian-troop-buildup-as-moscow-dismisses-invasion-fears/6323280.html
13. Flight Radar 24 [hereafter FR24], screen shot of RA-64528 on 11 Sep 21.
14. FR24, screen shot RA-64527 on 13 Sep 21; Pavel Podvig, "Russian Strategic Nuclear Forces: Strategic rocket forces," https://russianforces.org/missiles/
15. FR24, screen shot of RA-64530 13 Sep 21, FR24, screen shot of RA-64530 17 Sep 21
16. CIA CREST NPIC PIR, "Hardened Central-Command Associated Facilities Near Moscow," April 1971.
17. Bart Noeth, "Royal Norwegian Air Force intercepts Russian bombers and fighters," *Aviation24.be* 28 Oct 21, https://www.aviation24.be/organisations/nato/royal-norwegian-air-force-intercepts-russian-bombers-and-fighters/
18. "Russia Flies nuclear-capable bombers over Belarus as migrant crisis escalates," *Jerusalem Post* 10 Nov 21, https://www.jpost.com/breaking-news/russian-bombers-sent-to-patrol-belarus-airspace-684576
19. NATO press release, "NATO Jets Intercept Russian Nuclear-Capable Bombers over the Norwegian and North Seas," 12 Nov 21, https://ac.nato.int/archive/2021/nato-jets-intercept-russian-nuclearcapable-bombers-over-the-norwegian-and-north-seas
20. Dylan Malyasov, "Portuguese F-16s intercept Russian bombers near NATO airspace," *Defence Blog* 23 Nov 21, https://defence-blog.com/portuguese-f-16s-intercept-russian-bombers-near-nato-airspace/
21. ADS-B Exchange screenshots for 11 December and 13 December 21.
22. FR24 screenshots for RA-96019 11 Dec, 13 Dec, and 17 Dec 21.
23. FR24 screenshot RA-96021, 16 Dec 21.
24. ADS-B Exchange screenshot, 19 Dec 21.
25. ADS-B Exchange screenshot, 21 Dec 21.
26. FR24 screenshots, 21, 22, 24, 27, and 29 Dec 21.
27. ADS-B Exchange screenshots, 30 and 31 Dec 21.
28. "NATO Warns Russia over Ukraine military build-up," Al Jazeera, 15 Nov 21, https://www.aljazeera.com/news/2021/11/15/nato-warns-russia-over-ukraine-military-build-up ; Shane Harris and Paul Sonne, "Russia Planning massive military offensive against Ukraine involving 175, 000 troops, U.S. intelligence warns," *The Washington Post* 3 Dec 21 https://www.washingtonpost.com/national-security/russia-ukraine-invasion/2021/12/03/98a3760e-546b-11ec-8769-2f4ecdf7a2ad_story.html ; Amanda Macias, "Biden to Speak to Putin on Thursday," CNBC, 29 Dec 21, https://www.cnbc.com/2021/12/29/

biden-and-putin-to-call-amid-russian-military-presence-near-ukraine.html

29. Iain Cameron Twitter post, 1 Jan 22. For comparative purposes, Peter Hennessy and James Jinks explain the great pains the Royal Navy took during the Cold War to prevent Soviet acquisition of Royal Navy ballistic missile submarines as they departed their base. See *The Silent Deep: The Royal Navy Submarine Service since 1945* (London: Alan Lane, 2015) 283, 330, 342-346.
30. FR24 screenshot RA-64520 2 Jan 22.
31. ADS-B exchange screenshots, 1-4 Jan 22.
32. Author's observations November-December 2021, January 2022.
33. As discussed in Sean M. Maloney, *Emergency War Plan: The American Doomsday Machine, 1945-1960* as well as in *Deconstructing Dr. Strangelove: The Secret History of Nuclear War Films*.
34. ADS-B Exchange screenshots, 5 Jan 22.
35. ADS-B Exchange screenshots, 6 and 7 Jan 22.
36. "Human Activity behind Svalbard cable disruption," *The Barents Observer* 11 Feb 22, https://thebarentsobserver.com/en/security/2022/02/unknown-human-activity-behind-svalbard-cable-disruption; "Damage to SvalSat cable proves Russia further upping stakes," The Robert Lansing Institute, 13 Jan 22 https://lansinginstitute.org/2022/01/13/damage-to-svalsat-cable-proves-russia-further-upping-stakes/ ;
37. ADS-B Exchange screenshots, 7 and 8 Jan 22.
38. ADS-B Exchange screenshots, 10 Jan 22.
39. ADS-B Exchange screenshots, 11 Jan 22.
40. ADS-B Exchange screenshots, 12 Jan 22.
41. .ADS-B Exchange screenshots, 13 Jan 22.
42. William Pugh, "Executing mission, fostering innovation, making history: Barksdale's first ACE," 24 Jan 22, https://www.barksdale.af.mil/News/Article/2910004/executing-mission-fostering-innovation-making-history-barksdales-first-ace-exer/ ; "From Barksdale to Blythville: Exercise Proves B-52s Can Provide Global Deterrence Anytime, Anywhere," Bossier Now 12 Feb 22.
43. FR24 screenshots RA-64522 and RA-96020, 12 Jan 22.
44. FR24 screenshot, 13 Jan 22.
45. FR24 screenshot, 13 Jan 22.
46. David Sharpton, "FAA briefly halted some U.S. West Coast flights around time of North Korean missile launch," https://www.reuters.com/world/us/us-faa-briefly-halted-some-west-coast-flight-departures-monday-2022-01-11/ Reuters, 11 Jan 22,

47. Maloney, *Deconstructing Dr. Strangelove*, 135, 295-298.
48. Robert S. Hopkins III, *The Boeing KC-135 Stratotanker: More Than Just a Tanker* (Manchester: Crecy Publishing, 2017), 267-269.
49. ADS-B Exchange screen shots, 10, 12 and 14 Jan 22.
50. The author surveyed this site in 2017.
51. State Department Press Statement, 12 Jan 22, https://www.state.gov/united-states-designates-entities-and-individuals-linked-to-the-democratic-peoples-republic-of-koreas-dprk-weapons-programs/
52. USNavyCNO Twitter post, 15 Jan 22.
53. US Strategic Command Twitter post, 18 Jan 22.
54. Aircraft Spots Twitter post, 15 Jan 22
55. "Russia will act of NATO countries cross 'red Line'," *The Guardian* 16 Jan 22, https://www.theguardian.com/world/2021/nov/30/russia-will-act-if-nato-countries-cross-ukraine-red-lines-putin-says
56. "There is to Take Up Combat Duty!" Red Star, 16 Jan 22, http://redstar.ru/est-zastupit-na-boevoe-dezhurstvo/
57. Podvig, "Strategic Rocket Forces," https://russianforces.org/missiles/
58. Material confirming this was captured by Ukrainian forces and released to the public on 1 March 22. Petri Makela Twitter post, 1 Mar 22. Screen shots of the captured documents accompanied this post.
59. ADS-B exchange screenshot, 18 Jan 22.
60. ADS-B Exchange, screenshots, 18 Jan 22.
61. Kyle Mizokani, "Whoops, US Airmen Accidentally Leaked Top-Secret Nuke Locations," *Popular Mechanics* 2 Jun 21, https://www.popularmechanics.com/military/weapons/a36598369/air-force-personnel-exposed-nuclear-weapons-secrets-online/ ; Commander Aviano (USAFE) "Air Base Instruction 21-204, "Maintenance: Weapons Storage and Security System procedures," 24 Oct 06 at: https://www.bits.de/NRANEU/others/END-Archive/avianoabi21-204%282006%29.pdf ; Hans Kristensen and Matt Korda, "Nuclear Notebook: United States Nuclear weapons, January 12, 2021 at https://thebulletin.org/premium/2021-01/nuclear-notebook-united-states-nuclear-weapons-2021/
62. Zachary B. Wolf, "How US Intelligence got it right on Ukraine," CNN 26 Feb 22 at https://www.cnn.com/2022/02/26/politics/us-intelligence-ukraine-russia/index.html
63. FR24 screenshots 18-29 Jan 22.
64. U.S. Naval Forces Europe-Africa Twitter post, 19 Jan 22.
65. John Lehman, *Oceans Ventured: Winning the Cold War at Sea* (New York: W.W. Norton Co., 2018), 145.

66. U.S. Department of State, "Strengthening Deterrence and Reducing Nuclear Risks, Part II: The Sea-Launched Cruise Missile-Nuclear (SLCM-N)" *Arms Control and International Security Papers* Vol. 1 No. 11 23 Jul 2020, p. 2. https://www.state.gov/wp-content/uploads/2020/07/T-Paper_SCLM-N-CLEARED_T-Final.pdf
67. Заметки охотника ("Hunter's Notes") Twitter post screenshot, 20 Jan 22. Note: Заметки охотника was subsequently taken down after sanctions were imposed on Russia after 24 Feb 22.
68. Ministry of National Defence of the Russian Federation Twitter post, Facebook post, and website post, 21 Jan 22. Tatyana Pashkova, "Russian TU-160 missile carriers made a training flight over the Arctic Ocean," *Politexpert*, 21 Jan 22. Link now unavailable due to sanctions blocking.
69. FR24 screenshots 20 Jan 22, 24 Jan 22
70. *Атомная эра российской авиации* [The Atomic Era of Russian Aviation] (Moscow: Capitol Encyclopaedia Publishing House, 2019), 41; Maloney, *Deconstructing Dr Strangelove* see Figure 29.
71. NORAD Twitter post, 20 Jan 22.
72. ADS-B Exchange screenshot, 20 Jan 22.
73. Минобороны России [Russian Ministry of Defence]Twitter post, 23 Jan 22.
74. Russian Defence Policy Twitter post, 25 Jan 22; "Strategic Missile System YARS entered the routes of combat patrol in the Ivanovo region," *Military News* 25 Jan 22 at: militarynews.ru/story.asp?rid=1&nid=565184&lang=-RU ; FR25 screenshot or RA-96016, 25 Jan 22.
75. "Mighty YARS Conquers Siberia," *VPK News* 26 Jan 22 at vpk-news.ru/news/65532
76. Минобороны России [Russian Ministry of Defence]Twitter post, 27 Jan 22.
77. FR24 screenshot of RA-64522, 26-27 Jan 22
78. Минобороны России [Russian Ministry of Defence]Twitter post, 27 Jan 22; Rob Lee Twitter post, 24 Mar 20; Steffen Watkins, Twitter post, 23 May 19.
79. This activity was observed in real time on Flight Radar 24 by the author on 27 Jan 22.
80. FR24 screenshot of RA-64532,, 28 Jan 22.
81. ADS_B Exchange screenshot, 24 Jan 22; Evergreen Intel Twitter post, 26 Jan 22; See also Hans M. Kristensen, *U.S. Non-Strategic Nuclear Weapons* (Federation of American Scientists, 2012).
82. Vladmimir Isachenkov, "Russia sends 2 nuclear-capable bombers to Venezuela," *The Associated Press*, 10 Dec 18, https://www.militarytimes.com/flashpoints/2018/12/10/russia-sends-2-nuclear-capable-bombers-to-venezuela/ ; "Russian military base in Venezuela: pros and cons," *Политический*

калейдоскоп [Political Kaleidoscope] 27 Jan 22, http://k-politika.ru/rossijska-ya-voennaya-baza-v-venesuele-za-i-protiv/?utm_source=warfiles.ru ;

83. ADS-B exchange screenshot, 28 Jan 22.
84. U.S. Fleet Forces Twitter post, 29 Jan 22.
85. Press release, "Pilots of the Northern Fleet worked out refueling in the air," Ministry of Defence of the Russian Federation, 30 Jan 22, https://function.mil.ru/news_page/country/more.htm?id=12406035@egNews [link severed due to the crisis: author has screenshot]; Press release, "During the large-scale exercises of the Strategic Missile Forces in the Ivanovo region, conditional sabotage and reconnaissance groups were timely detected and destroyed," Ministry of Defence of the Russian Federation, 31 Jan 22, https://function.mil.ru/news_page/country/more.htm?id=12406319@egNews [link severed due to the crisis: author has screenshot]
86. Press release, "The Strategic Missile Forces Receive Unique Simulators for training communications specialists," Ministry of Defence of the Russian Federation, 30 Jan 22, https://function.mil.ru/news_page/country/more.htm?id=12406059@egNews [link severed due to the crisis: author has screenshot];;
87. Press release, "A unified legal hour dedicated to the "Color Revolutions" was held in the Amur Long-Range Aviation Unit," Ministry of Defence of the Russian Federation, 30 Jan 22, https://function.mil.ru/news_page/country/more.htm?id=12405943@egNews [link severed due to the crisis: author has screenshot]
88. ADS-B Exchange screenshot, 31 Jan 22.
89. FR24 screenshot RA-64520 and RA-54532, 2 Feb 22.
90. Минобороны России [Russian Ministry of Defence] Twitter post, 2 Feb 22.
91. Минобороны России [Russian Ministry of Defence] Twitter post, 2 Feb 22.
92. nde Twitter post, 2 Feb 22; London Wanderer Twitter post, 2 Feb 22. These are amateur radio (ham) people who intercept Russian LRA communications who intercepted communications between BALANS (LRA control station) and "white swans" (belyye lebedi, the Russian nickname for the TU-160). See also Заметки охотника ("Hunter's Notes") Twitter post screenshot, 2 Feb 22; Forsvaret Twitter post, screenshot, 2 Feb 22.
93. "Norway Scrambles jets as group of Russian aircraft flies from the north," *The Barents Observer* 2 Feb 22, https://thebarentsobserver.com/en/2022/02/norway-scrambles-jets-russian-bombers-flies-towards-western-europe https://thebarentsobserver.com/en/2022/02/norwayscramblesjetsrussian-bombersfliestowardswesterneurope; Минобороны России [Russian Ministry of Defence]Twitter post, 2 Feb 22;
94. For insight into how NATO carried out exercises in the 1980s in this vein,

see Eric Grove with Graham Thompson, *Battle for the Fiords: NATO's Forward Maritime Strategy in Action*, (Annapolis: Naval Institute Press, 1991).

95. ADS-B Exchange screenshot, 1 Feb 22.
96. ADS-B Exchange screenshot, 1 Feb 22.
97. Military Monitoring World Twitter post 30 Jan 22.
98. FR24 screenshot of RA-64516, 2 Feb 22.
99. News release, Russian Ministry of Defence, "Autonomous launchers of the YARS mobile missile system changed positions during an exercise in the Ivanovo region," 6 Feb 22 at https://function.mil.ru/news_page/country/more.htm?id=12407499@egNews [page blocked, screenshot by author]; TASS post on Telegram, 8 Feb 22; LivemapUA post on Twitter, 8 Feb 22.
100. "Two TU-22M3 bombers of the Russian Aerospace Forces conducted patrols in the sky over Belarus," Inforeactor, 5 Feb 22 at https://inforeactor.ru/407902-dva-bombardirovshchika-tu-22m3-vks-rf-proveli-patruliro-vanie-v-nebe-nad-belorussiei
101. "Two Russian TU-22M3 bombers conduct second air patrol over Belarus," TASS, 8 Feb 22 at https://tass.com/defense/1399907?fbclid=IwAR3hIAG-algpIKaNwxOOKdSdSgdg99QkNg5mhhrWDkcWSvVGUO-KawnvVa-E ; Yan Brastsky and Nokolay Baranov, "TU-22M3 bombers of the Russian Aerospace Forces completed the second patrol in the sky over Belarus," TV Zvezda, 8 Feb 22, https://tvzvezda.ru/news/2022281931-awPZj.html
102. "Long Range supersonic bomber-missile carrier Tu-22M3," https://zakaztu-ra.su/aeroporty/tu-22.html
103. The Russian Ministry of Defence footage of the TU-22-M3 flights rapidly spread throughout the Twitter accounts observing Russian military aircraft. See for example Rob Lee's post of 8 Feb 22. Footage of the flights was also embedded in the Bratsky/Baranov article.
104. "High precision air-launched ballistic missile Dagger (XM-47M2 Kinzhal)," *VPK News*, https://vpk.name/library/f/kinzhal-br.html ; "Russia first used the Kinzhal hypersonic missile system in Ukraine," *Naked Science* 19 Mar 22, https://naked-science.ru/article/tech/kinzhal-na-ukraine
105. Hunter's Notes Twitter post, 7 Feb 22; Hunter's Notes Telegram post, 7 Feb 22 ; Status-6 Twitter post, 7 Feb 22 ; Alexander Sitnikov, "MiG-31 with "Daggers" in Kaliningrad took aim at NATO headquarters," *Free Press* at https://svpressa.ru/war21/article/324661/?utm_source=warf-iles.ru ; "Chinese media called the use of the Kh-47 Kinzhal complex a slap in the face of NATO," *Red Spring*, https://rossaprimavera.ru/news/ce5c2e08 ; Sebastian Roblin, "Russia deploys hypersonic missile to Baltic in Range of NATO capitals, *Forbes* 8 Feb 22, https://www.forbes.com/sites/sebastienroblin/2022/02/08/russia-deploys-hypersonic-missile-to-baltic-in-range-of-nato-capitols/?sh=2ac801b8217e

106. Piotr Butowski Twitter post screenshot of MiG-31K insignia, 4 May 22.
107. Минобороны России [Russian Ministry of Defence]Twitter post, 10 Feb 22. See embedded video.
108. FR screenshot for RA-64524, 7 Feb 2FR screenshot for RA-64523, 8 Feb 2FR screenshot for RA-64531, 9 Feb 22; FR screenshot for RA-96020, 11 Feb 22 ; FR screenshot for RA-96019, 11 Feb 22
109. ADS-B Exchange screenshot, 10 Feb 22.
110. Maloney, *Emergency War Plan*, 292.
111. FR24 screenshot, 15 Feb 22; 16 Feb 22.
112. "AGM-86B/C/D Missiles, Air Force Link, Nov 2007, https://web.archive.org/web/20080710131923/http://www.af.mil/factsheets/factsheet.asp?fsID=74. These weapons were life extended to 2030. See "USAF Outlines Nuke Weapons Inventory Modernization, *Defense News*, 24 May 12, https://archive.ph/20120724135939/http://www.defensenews.com/article/20120524/DEFREG02/305240005/USAF-Outlines-Nuke-Weapon-Inventory-Modernization.
113. ADS-B Exchange screenshot, 18 Feb 22.
114. FR24 screenshot, 14 Feb 22.
115. Pavel Podvig Twitter post, 12 Feb 22; "Sarmation ICBM and FOBS Reintroduction," Globalsecurity.org, https://www.globalsecurity.org/wmd/world/russia/ss-30-fobs.htm
116. Dmitry Stefanovic Twitter post, 13 Feb 22.
117. RF24 screens shots, 14 to 18 Feb 22.
118. The Lookout Twitter post, 13 Feb 22.
119. Минобороны России [Russian Ministry of Defence] Twitter post, 18 Feb 22.
120. ADS-B Exchange screenshot 18 Feb 22; NORAD Twitter post, 18 Feb 22.
121. Maxim Starchak, "Key Features of Russia's GROM 2019 Nuclear Exercise," *Eurasia Daily Monitor* Vol. 16 Issue 150, 29 Oct 19, https://jamestown.org/program/key-features-of-russias-grom-2019-nuclear-exercise/ ; Pavel Podvig, "Annual exercise of the strategic forces, this time without ICBMs," www.russianforces.org/blog/2018/10/annual_exercise_of_the_strateg.shtml
122. Pavel K. Baev, "The GROM-2019 Exercise Illuminated the Risks of Nuclear Renaissance in Russian Strategic Culture," George C. Marshall Center for Security Studies, https://www.marshallcenter.org/en/publications/security-insights/grom-2019 ;
123. Thomas Nilsen, "Russia exercised nuclear triad in the Barents region," *The Barents Observer* 9 Dec 20, https://thebarentsobserver.com/en/security/2020/12/russia-plays-cross-arctic-nuclear-missiles-exercise ; Daivis Petaitis, et al "Russia's Strategic Exercises: Messages and Implications," NATO

Strategic Communications Centre of Excellence, Riga, 20 Jul 20, https://stratcomcoe.org/publications/russias-strategic-exercises-messages-and-implications/30

124. "Russia to hold Vostok and Grom strategic command-and-staff exercises in 2022," TASS, 21 Dec 21; "Drills of Russia's strategic nuclear forces to be held in early 2022, source says," TASS, 2 Jan 22; Rob Lee Twitter post, 5 Feb 22; Jennifer Griffin Twitter post, 4 Feb 22.
125. "All missiles in Putin-led strategic exercises hit targets," TASS, 19 Feb 22.
126. "Putin from the situational center in the Kremlin launched the exercises of the Strategic Missile Forces," *VPK News*, 19 Feb 22, https://vpk-news.ru/news/65854
127. Material confirming this was captured by Ukrainian forces and released to the public on 1 March 22. Petri Makela Twitter post, 1 Mar 22. Screen shots of the captured documents accompanied this post.
128. Минобороны России [Russian Ministry of Defence] Twitter post, 21 Feb 22
129. FR24 screenshots, 22 Feb 22.
130. All of these aircraft were observed on ADS-B Exchange in real time by the author on 23 Feb 22 and screenshots were taken.
131. Oliver Alexander Twitter post on the Il-22PP aircraft, 23 Feb 22; NetBlocks Twitter post, 23 Feb 22; Dustin Volz Twitter post, 23 Feb 22; BellingCat Twitter post, 23 Feb 22.
132. TJ Twitter post on bomber communications, 23 Feb 22; Aircraft Spots Twitter post, 23 Feb 22; Thenewarea51 Twitter post, 23 Feb 22.
133. Aircraft Spots Twitter post, 23 Feb 22; World Events Live Twitter post, 23 Feb 22.
134. ELINT News Twitter post, 23 Feb 22.
135. ADS-B Exchange, screenshots 24 Feb 22.
136. On Order66: https://starwars.fandom.com/wiki/Order_66
137 Reuters, 24 Feb 22, https://www.reuters.com/world/europe/france-says-putin-needs-understand-nato-has-nuclear-weapons-2022-02-24/
138. Reuters, 24 Feb 22, . https://www.reuters.com/world/europe/france-says-putin-needs-understand-nato-has-nuclear-weapons-2022-02-24/
139. Republic World, 25 Feb 22, https://www.republicworld.com/world-news/russia-ukraine-crisis/putin-threatens-to-use-nuclear-weapons-if-west-tries-to-stop-russias-invasion-of-ukraine-articleshow.html
140. Минобороны России [Russian Ministry of Defence] Twitter post, 25 Feb 22.
141. "Belarus Approves hosting Russian nuclear forces permanently, France 24, 28 Feb 22, https://www.france24.com/en/europe/20220228-belarus-approves-hosting-nuclear-weapons-russian-forces-permanently ; "Belarus

Overview," The Nuclear Threat Initiative, https://www.nti.org/analysis/articles/belarus-overview/

142. FR24, screenshot, 25 Feb 22.
143. "Putin Puts Russia's Nuclear Deterrent Forces On High Alert, Raising Tensions Further," Radio Free Europe/Radio Liberty, 27 Feb 22, https://www.rferl.org/a/putin-russia-nuclear-deterrant-forces-alert/31726441.html
144. Здесь Шепелин [Ilya Shelapin] Twitter repost of Rossiya 1 TV Twitter post, screenshot, 28 Feb 22.
145. PlusTV Twitter Screenshot, 28 Feb 22.
146. ADS-B Exchange screenshots, 28 Feb 22; ABC News, 27 Feb 22, https://abcnews.go.com/Politics/week-transcript-27-22-white-house-press-secretary/story?id=83130361
147. ADS-B Exchange screenshots, 1 Mar 22.
148. FR24 screenshot, 1 Mar 22; "Russia carries out nuclear submarine drills in Barents Sea," *Jerusalem Post* 1 Mar 22, https://www.timesofisrael.com/liveblog_entry/russia-carries-out-nuclear-submarine-drills-in-barents-sea/ ;
149. The information in this aircraft was drawn from the Ilyushin website which has now been scrubbed: https://www.ilyushin.org/en/aircrafts/special_ The author retains a download of this page. See also FR24 screenshot of the flight, 1 Mar 22.
150. "Ryska stridsflygplan kränkte svenskt luftrum," 2 Mar 22. https://www.forsvarsmakten.se/sv/aktuellt/2022/03/ryska-stridsflygplan-krankte-svenskt-luftrum
151. "Kärnvapenbestyckade ryska plan kränkte svenskt luftrum" 31 Mar 22, https://www.tv4.se/artikel/6cNV5sPAaxdIgAsnItdVsK/kaernvapenbestyckade-ryska-plan-kraenkte-svenskt-luftrum
152. Indir Singh Bisht, "Nuclear-Armed Russian Fighters Breached Swedish Airspace: Report," 1 Apr 22, https://www.thedefensepost.com/2022/04/01/nuclear-armed-russian-fighters-breached-swedish-airspace/
153. TiK Tok account @svetylia97, 4 Mar 22, author has screen shots of the convoy.
154. Statement by the Norwegian Defence Minister, 3 Mar 22 https://www.thelocal.no/20220312/nato-launches-defence-exercise-in-norway/
155. Joseph Cox, "Hackers Breach Russian Space Research Institute Website," Vice 3 Mar 22, https://www.vice.com/en/article/z3n8ea/hackers-breach-russian-space-research-institute-website ; Ed Browne, "Roscosmos head rejects Anonymous claim that Russian Satellites were Hacked," *Newsweek* 3 Feb 22, https://www.vice.com/en/article/z3n8ea/hackers-breach-rus-

sian-space-research-institute-website

156. Ellen Mitchell, "Pentagon postpones missile test launch to deescalate Russia tensions," *The Hill* 3 Mar 22, https://thehill.com/policy/defense/596603-pentagon-postpones-missile-test-launch-to-deescalate-russia-tensions/
157. ADS-B Exchange screenshots, 3 Mar 22.
158. Scott Sagan, *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons* (Princeton: Princeton University Press, 29950 ch.3.
159. Status-6 Twitter Post, 4 Mar 22; ADS-B Exchange screenshots, 4 Mar 22.
160. Russia's Nuclear Activity Twitter posts, 4 Mar 22;
161. FR24 screenshots, 4 Mar 22.
162. Владислав Демченко [Vladislav Demchenko] Twitter posts, 6 Mar 22; Pavel Podvig, Twitter post, 6 Mar 22.
163. "Intercontinental Missile System RT-2PM2 TOPOL-M," *Army Today*, https://army-today.ru/tehnika/topol-m
164. Pavel Luzin, "Nuclear De-escalation Option," https://ridl.io/optsiya-yadernoj-deeskalatsii/
165. NATO Military Committee, "Final Decision on MC-14/3," https://www.nato.int/docu/stratdoc/eng/a680116a.pdf
166. Luzin, "Nuclear De-escalation Option."
167. Luzin, "Nuclear De-escalation Option."
168. US STRATCOM Twitter post, 6 Mar 22.
169. USS Emory S. Land, http://www.uscarriers.net/as39history.htm
170. Alexandria Vishnevskaya, "The Baltic Fleet began tracking two US missile destroyers in the Baltic Sea," *Вестник РУ* 7 Mar 22, https://www.gazeta.ru/army/news/2022/03/07/17394295.shtml
171. FR24 screenshots, 5-14 Mar 22.
172. FR24 screenshot, 11 Mar 22.
173. Hugo Bachega, "Ukraine war: sky turned red as missiles hit Lviv military base," BBC, 13 Mar 22, https://www.bbc.com/news/world-europe-60728208
174. Sean M. Maloney, "Fire Brigade or Tocsin? NATO's ACE Mobile Force, Flexible Response, and the Cold War," J*ournal of Strategic Studies*, Vol. 27 No. 4 2004; Lehman, O*ceans Ventured* ch. 6.
175. Thomas Nilsen, "Two NATO carrier groups will sail north for exercise Cold Response," *The Barents Observer* 13 Jan 22, https://thebarentsobserver.com/en/security/2022/01/two-nato-carrier-groups-will-sail-north-exercise-cold-response ; Robbin Laird, "The North Carolina-Based Marines Participate in Cold Response 2022," Second Line of Defense, 18 Feb 22,

https://sldinfo.com/2022/02/the-north-carolina-based-marines-participate-in-cold-response-2022/ ; "UK Armed Forces Join Cold Response 2022," *Joint Forces News* 15 Mar 22, https://www.joint-forces.com/exercise-news/51920-uk-armed-forces-join-cold-response-2022

176. "Navy launches training exercise in Arctic Circle as global tensions rise, " ABC News, 15 Mar 22, https://abcnews.go.com/US/navy-launches-training-exercise-arctic-circle-global-tensions/story?id=83439828; Seth Koenig, "U.S. Navy Concludes ICEX 2022," US Navy Press Office, 17 Mar 22, https://www.navy.mil/Press-Office/News-Stories/Article/2970072/us-navy-concludes-icex-2022/ ; "US Navy kicks off ICEX 2022 in the Arctic Ocean," *Naval News*, 7 Mar 22, www.navalnews.com
177. NORAD Twitter posts, 16-17 Mar 22; 1St Air force/America's AOC Twitter post 17 Mar 22; RCAF Operations Twitter post, 16 Mar 22.
178. Andrei Soldatov Twitter post, 18 Mar 22; "Not only Shoigu disappeared from the public space, but also other key security officals-Zolotob, Bortnikov, and Lostyukov," *Moscow Times* 26 Mar 22, https://www.moscowtimes.ru/2022/03/25/iz-publichnogo-prostranstva-rossii-propali-pochti-vse-osnovnie-siloviki-a18986 ; Marinia Fedorovskikh, "Zolotov lost his deputy," *URA News*, 17 Mar 22, ura.news/news/1052539299 ; Christo Grozev Twitter post, 17 Mar 22; "Lavrov flew to Beijing but Suddenly diverted back to Moscow," *Charter 97* 17 Mar 22, https://charter97.org/en/news/2022/3/17/459433/ Note there was rampant speculation at the time over why exactly Lavrov's plane turned around, everything from the PRC told him no entry as a snub to the belief that nuclear war was imminent.
179. ADS-B Exchange screenshots, 14 Mar 22.
180. ADS-B Exchange screenshots, 16 Mar 22.
181. FR24, screenshots 17 Mar 22.
182. FR24 screenshot, 17 Mar 22.
183. ADS-B Exchange, 17 Mar 22.
184. FR24 screenshots, 18 Mar 22.
185. FR24 screenshots, 19 Mar 22.
186. The Lookout Twitter post, 6 Mar 22, 18 Mar 22.
187. "Expert: Russia has the right to destroy US biological laboratories in Georgia," *Regnum* 15 Mar 22, https://regnum.ru/amp/3533153
188. Ayaz Rzayev Twitter post, 27 Mar 22.
189. Visegrad 24 Twitter post, 20 Mar 22.
190. Dmitry Medvedev Telegram post, 21 Mar 22.
191. Marek Kozubal, "MON: nie potwierdzamy naruszenia przestrzeni powietrznej Polski ," *Wydarzenia*, 21 Mar 22, https://www.rp.pl/wo-

jsko/art35905901-mon-nie-potwierdzamy-naruszenia-przestrzeni-powietrznej-polski

192. Maria Andreeva Twitter post, 22 Mar 22.
193. "Russian Diplomats Burning Files, Preparing to Leave: Reports," PolskieRadio, 22 Mar 22, https://www.polskieradio.pl/395/7785/Artykul/2925661,Russian-diplomats-burning-files-in-Warsaw-preparing-to-leave-report. In reality, the embassy burned its documents in response to the PNG'ing of 40 diplomats and intelligence personnel after a Russia mole was uncovered in the Polish Vice President's office.
194. Pierre Tan, "France and Ukraine 2022 Crisis: France Sends 2nd SSBN to Sea," *Second Line of Defense*, 11 Mar 22, https://sldinfo.com/2022/03/france-and-the-ukraine-2022-crisis-france-sends-2nd-ssbn-to-sea/ ; "France ups defence and deploys three of its four nuclear submarines," *Connexion France*, 25 Mar 22, https://www.connexionfrance.com/article/French-news/France-ups-defence-and-deploys-three-of-its-four-nuclear-submarines ; "France increases its nuclear response presence in response to Russian threats," *The Times*, 23 Mar 22, https://www.thetimes.co.uk/article/france-increases-nuclear-submarine-presence-in-response-to-russian-threats-7l2355kj2 ; "Why did France sail three nuclear submarines from Ile-Longue?" *Le Telegramme*, 21 Mar 22, https://www.letelegramme.fr/france/pourquoi-la-france-a-t-elle-fait-appareiller-trois-sous-marins-nucleaires-au-depart-de-l-ile-longue-21-03-2022-12954544.php
195. "France Claims Successful testing of advanced ASMPA nuke missile," Anadolu Agency, 24 Mar 22, https://www.aa.com.tr/en/europe/france-claims-successful-testing-of-advanced-asmpa-nuke-missile/2545156 ; Richard Scott, "Successful flight test of upgraded ASMPA missile paves way for refurbishment," *Janes* 30 Mar 22, https://www.janes.com/defence-news/news-detail/successful-flight-test-of-upgraded-asmpa-missile-paves-way-for-refurbishment
196. For details see Bruno Tertrais, *French Nuclear Deterrence Policy, Forces and Future: A Handbook* (Paris: Fondation pour la Recherche Strategique, 2020) https://www.frstrategie.org/sites/default/files/documents/publications/recherches-et-documents/2020/202004.pdf
197. "Biden: 'We would respond' if Putin used chemical weapons," CNN, 24 Mar 22, https://www.cnn.com/europe/live-news/ukraine-russia-putin-news-03-24-22/h_b4daacf79dfcfb1146be1ecb3a1f8bfd
198. US STRATCOM Twitter post, 23 Mar 22; US STRATCOM Tweet, 24 Mar 22.
199. ADS-B Exchange screenshot, 25 Mar 22.
200. FR24 screenshot, 24 Mar 22; ADS-B Exchange screenshot, 24 Mar 22.
201. USAF fact sheet "RC-135U COMBAT SENT," https://www.af.mil/About-

Us/Fact-Sheets/Display/Article/104495/rc-135u-combat-sent/ ; Military.com "RC-135U COMBAT SENT," https://www.military.com/equipment/rc-135u-combat-sent ; AirForce Magazine fact sheet, "RC-135U COMBAT SENT," https://www.airforcemag.com/weapons-platforms/rc-135u/ ; "RC-135 History: The Hidden Hero of the Skies," *Owlcation*, 24 Mat 20, https://owlcation.com/humanities/RC-135-History-The-Hidden-Hero-of-the-Skies

202. Thomas Withington, "Keeping Your Ears Open," *Armada International* 16 Oct 17, https://www.armadainternational.com/2017/10/keeping-your-ears-open-elint/
203. FR24 screenshots, 25 and 26 Mar 22.
204. ADS-B Exchange screenshots, 25-29 Mar 22.
205. "Russian strategics went on exercise," *VPK News*, 31 Mar 22, vpk-news.ru/news/66403; "Strategic Missile Forces of the Russian Federation conduct an exercise involving 3,000 military personnel," *Military News* 31 Mar 22, militarynews.ru/story.asp?rid=1&nid=571668&lang=RU
206. Hans M. Kristensen, "Russian Nuclear Weapons, 2021," *Bulletin of the Atomic Scientists*_u Vol. 77 No. 2 2021 pp. 90-108.
207. FR24 screenshots 1-4 Apr 22.
208. EMPR.Media Twitter post, 4 Apr 22.
209. US Strategic Command Tweet, 5 Apr 22; "Exercise AGILE TIGER: Integrated Defense in the Heartland of America," *Mirage News*, 14 Apr 22, https://www.miragenews.com/exercise-agile-tiger-integrated-deterrence-in-764364/
210. ADS-B Exchange screenshots, 5 Apr 22.
211. FR24 screenshots, 6 Apr 22.
212. Carl Bildt, Twitter post, 11 Apr 22; Anders Aslund Twitter post, 11 Apr 22; Moscow Times Twitter post, 11 Apr 22.
213. FR24 screenshots, 11 Apr 22.
214. ADS-B exchange, screenshot, 11 Apr 22.
215. U.S. Department of Defense Tweet 11 Apr 22.
216. Oliver Trapnell, "Britain's most powerful nuclear submarine arrives in Gibraltar hours after Putin's threat," *The Express* 17 Apr 22, https://www.express.co.uk/news/world/1596978/ukraine-news-britain-hms-audacious-nuclear-submarine-gibraltar-putin Note: of course, the British SSBNs are more powerful than the SSNs.The Express then ran a series of detailed photos showing the Tomahawk load out in progress with captions like "UK's show of force for Putin." See also Sea Forces Online, " UGM/BGM/RGM-109 Tomahawk," https://www.seaforces.org/wpnsys/SURFACE/BGM-109-Tomahawk.htm

217. Iain Cameron, Twitter post, 10 Apr 22; "Flexing a nuclear-powered submarine in Lyngen, UK sharpens Arctic military presence," *The Barents Observer*, 30 Mar 22, https://thebarentsobserver.com/en/security/2022/03/flexing-nuclear-powered-submarine-lyngen-uk-sharpens-arctic-military-presence
218. Olena Roshchina, "Russia threatens chemical attacks in Mariupol," *Pravda (UA)* 11 Apr 22, https://www.pravda.com.ua/eng/news/2022/04/11/7338843
219. Andrei Soldatov Twitter post, 14 Apr 22; Leonid Nevzlin Twitter post, 14 Apr 22; Guy Faulconbridge, "Russia warns of nuclear, hypersonic deployment of Sweden and Finland join NATO," Reuters, 14 Apr 22, https://www.reuters.com/world/europe/russia-warns-baltic-nuclear-deployment-if-nato-admits-sweden-finland-2022-04-14/?fbclid=IwAR0stunxxcCOm50cexnyIzzN ; FR24 screenshots 14 Apr 22.
220. ADS-B Exchange screenshots 14 Apr 22.
221. The Barents Observer Twitter post, 14 Apr 22.
222. The Barents Observer Twitter post, 21 Apr 22.
223. "Russia warns of nuclear deployment if Sweden, Finland join NATO," Al-Jazeera 18 Apr 22, https://www.aljazeera.com/news/2022/4/14/russia-warns-of-nuclear-deployment-if-sweden-finland-join-nato?fbclid=IwAR1fFTezpe-0u1PEka-H_H7n0AhIqUc6h_4A ; Visegrad 24 Twitter post, 16 Apr 22; OsintTv Twitter post, 16 Apr 22; Samuel Ramani Twitter post, 17 Apr 22; OSINTdefender Twitter post, 18 Apr 22; Visegrad 24 Twitter post, 19 Apr 22
224. Anthony Ruggiero et al "Russia's Sarmat test underscores need to modernize US nuclear triad," *Defense News*, 28 Apr 22, https://www.defensenews.com/opinion/commentary/2022/04/28/russias-sarmat-test-underscores-need-to-modernize-us-nuclear-triad/
225. William Alberque, Twitter post, 21 Apr 22.
226. ADS-B Exchange screenshots, 20-21 Apr 22.
227. Ed Browne, "Russia's Dmitry Rogozin Delivers Nuclear Threat About Boris Johnson's Hair," *Newsweek*, 21 Apr 22, https://www.newsweek.com/russia-dmitry-rogozin-boris-johnson-hair-comment-sarmat-nuclear-missile-1699812
228. Dmitri Tweet screenshot of Arestovych conversation with media, 24 Apr 22; Народ України [People of Ukraine] Twitter post, 24 Apr 22.
229. Browne, "Russia's Dmitry Rogozin Delivers Nuclear Threat About Boris Johnson's Hair."
230. RIA Novosti Twitter screenshot, 23 Apr 22.
231. JR2 Twitter post, 23 Apr 22.
232. Russia's Nuclear Activity Twitter post, 23 Apr 22.

233. Jack Detsch Twitter post, 22 Apr 22.
234. FR24 screenshots 22-27 Apr 22.
235. ADS-B Exchange screenshots 29 and 30 Apr 22.
236. Mike Eckel Twitter post, 1 May 22.
237. "Cornered: Baranets explained the impotence of the United States in front of the Russian Missile Sarmat," InfoReactor, 5 May 22, https://inforeactor.ru/23166278-_zagnani_v_ugol_baranets_ob_yasnil_bessilie_ssha_pered_rossiiskoi_raketoi_sarmat ; "The Russian Defence Ministry published footage of the use of Iskanders during a special operation," InfoReactor 2 May 22, https://inforeactor.ru/23160775-minoboroni_rossii_opublikovalo_kadri_primeneniya_iskanderov_v_hode_spetsoperatsii ; Chris Pleasance and Will Stewart, "Russia's chief propagandist threatens to 'plunge Britain into the depths of the sea' with underwater Poseidon nuke that would trigger a 1,600ft radioactive tidal wave and wipe the UK off the map," *The Daily Mail*, 2 May 22, https://www.dailymail.co.uk/news/article-10774235/Ukraine-war-Russian-state-media-threatens-UK-underwater-nuke.html
238. Dougie Coult Photography Twitter post, 2 May 22; US Strategic Command Twitter post, 5 May 22; Defense Visual Information Distribution Service, "USS Rhode Island (SSBN 740) Returns to King's Bay," https://www.dvidshub.net/image/7161793/uss-rhode-island-ssbn-740-returns-kings-bay

Conclusions

The most important take away from this study is the sheer amount of signalling using strategic nuclear forces that took place during this crisis as well as the fact it went back many months before the 24 February phase of the fourteen-year Russian invasion of Ukraine. That said, this study reveals that there were several different types of signalling that took place. The first could be characterized as General Deterrence Signalling. This essentially is the baseline, non-crisis deterrent activity that goes on day-to-day, while respecting the idea that Russia is perpetually at war with "the West" in the context of its present ideology. The period that best exemplifies this general deterrence signalling was from April to November 2021. Another type of signalling that emerged during the crisis could be called a Geographical Statement. This messaging involves the deployment of strategic nuclear assets over a particular geographical area to signal that it is under the nuclear umbrella of the antagonist making the statement. The Russian BACKFIRE operations over Belarus in November 2021 and the U.S. Air Force B-52 flight over Ottawa in February 2022 are examples of this.

How do we know that there has been a shift from baseline deterrent activity to activity associated with a crisis? This depends on how we define "crisis." Some could argue that these defining a crisis as a rigid period from a specific date to a specific date is an artificial but humanly necessary means of categorization. For example, the initial depiction of the Cuban Missile Crisis of 1962 was that of a thirteen-day affair in October

of that year. The reality was that the crisis continued well into November, despite the fact it was publicly declared to be over. And did it start with the American discovery of missiles in Cuba from analysis of photography from a U-2 flight, or did it start with the Soviet decision to mount the deployment in the first place earlier in 1962? Or when the Soviet missiles actually arrived on the island? Or when the "technicians" arrived to construct the sites? In a sense, the Soviet moves only became a crisis when American leaders realized the dire implications of this deployment and responded to it with signalling.

The Russo-Ukrainian crisis and its signalling doesn't follow this schema and more closely approximates the 1956 and 1968 crises. The 1956 crisis was really three crises that synergistically became a single one: Poland, Hungary, and Suez all occurred roughly at the same time. The first two were crises for the Soviet Union in that revolutions threatened to break up the Warsaw Pact, while the Suez situation was used opportunistically by Khrushchev to draw attention and resources away from his plight in eastern Europe. During this situation, strategic nuclear forces were flourished to signal NATO not to exploit Soviet weakness and the accessibility of the West Berlin access routes were used by the Soviets in conjunction with those moves. In 1968, the Brezhnev regime flourished some of its strategic nuclear forces prior to its intervention in Czechoslovakia, although distressingly the Johnson administration did not notice as it was preoccupied with the war in Vietnam. The 1973 alerting of Soviet and American nuclear forces over Israeli military success against Egypt more closely followed the Cuban situation rather than the 1956 crisis both in duration and intent.

The Russo-Ukrainian crisis of 2021-22 was far more protracted and consisted of several wheels within wheels. It had an initial Russian conventional build-up opposite Ukraine in spring 2021 backed up with a limited nuclear flourish. Then there was a period of normality until the Belarus-Polish refugee crisis in the fall of 2021. This was followed by the massive conventional buildup that was initially countered with Western diplomacy as both the Russian leadership on one side and the Americans and British on the other conducted limited signalling in response. While

the Russian build-up extended into Belarus, the Kazakh crisis erupted which led to Russian signalling in the same vein as Hungary in 1956 and Czechoslovakia in 1968. The extensive signalling with Russian strategic nuclear forces and the American response that took place in February 2021 again has no real historical parallel. Indeed, is this when the crisis starts? Or is it after 23-24 February when the latest Russian assault on Ukraine goes in?

We can detect a number of signalling variants, like an Alert Level Shift. Although all the evidence is not in, it appears as though there were significant alert level shifts during the crisis. The methodology is not in the public domain but they likely correspond roughly to what the public understands as the "DEFCON" system in the American context as reflected in popular culture. The manipulation of strategic nuclear forces within the context of an alert level shift constitutes signalling and is more in line with the events of the Cuban Missile Crisis of 1962 than, say in 1956 when the DEFCON system did not exist. In the Russo-Ukrainian crisis, such a shift was made publicly in late February by Putin, Shoigu, and Gerasimov after the ground and air assault started. Interestingly, the moves of the strategic nuclear forces took place before the announcement.

There were also occasions where nuclear forces were manoeuvred to apply punctuation for public statements or otherwise emphasize policy shifts either before the crisis or during it. The mass deployment of E-6 Mercurys while Zelensky's speech to Congress was in progress is an example. Acknowledging a signal was another, though murky, use of strategic nuclear forces and can only really be discerned by contextualizing the event very carefully. The "Arzamas Dip" and U-2 flight over the Trinity Site appear to be examples of very deep signalling, as is assigning the callsign ORDER66 to an E-4B Nightwatch.

What is evident in this crisis is that strategic nuclear forces signalling was used to backstop Russian grey zone activities, that is, hybrid methods. The Russian BACKFIRE flights over Belarus while Belarus was engaged in a complex operation to undermine Polish legitimacy on the international stage in the fall of 2021 is a prime example of this. Simi-

larly the manoeuvring of nuclear capable SU-24s on the edge of Swedish airspace while there were reports of suspicious UAV activity at Swedish nuclear power plants with a backdrop of Russian state-controlled media indignation at the possibility of Sweden joining NATO is another.

There is, however, no better signal than the public statement of a statesman, particularly when it is backed with credible nuclear forces and seen to be so. The French reminding Russia that France was a nuclear power accompanied by its nuclear flourish in response to threats against Poland, and President Biden's explicit statement that the use of chemical or battlefield nuclear weapons by Russia in Ukraine would produce a guaranteed response while submarines were publicly seen to be loading Tomahawk cruise missiles are two examples.

As this study has been written while the crisis is in progress, it remains a living document until such point the crisis ends or the situation goes back into so-called frozen conflict status circa 2015-2021. That said, the crisis has produced a new dynamic when it comes to the study of strategic nuclear force signalling and future crises will likely follow the trajectory established here and now.

A Note on Sources

The ephemeral nature of Twitter and air traffic control tracking databases demands that these data be recovered and stored by non-traditional means. All air traffic control data activity acquired for this paper was screenshot while it was ongoing or while using open as well as proprietary databases. Similarly, all Twitter posts used for this paper were recorded using screenshots with appropriate date time groups. Some Russian media is not accessible at this point due to wartime internet restrictions, but the data used in the paper was downloaded prior to these restrictions going into place.

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Signalling using strategic nuclear forces was thought to be an artifact of the Cold War. This Martello paper demonstrates that this is not so. Indeed, new forms of of information, especially social media, has altered and now merged with nuclear force signalling.

Weeks before the latest iteration of the Russian invasion of Ukraine in February 2022, American, British, and French strategic nuclear forces were employed to backstop and underpin diplomatic and other efforts in an attempt to forestall escalation. Russian attempts to use strategic nuclear forces to generate docile compliance by the West failed in the face of these efforts. This preliminary analysis looks at this activity in the first half of 2022 during the initial stages of this phase of the Russo-Ukrainian war.

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