The Future Convergence of Actors, Domains and Capabilities

A Jackson Calder Ltd. Report

This is an expansion of a report initially completed for the New Zealand Ministry of Defence by Jackson Calder as an independent contractor. This report provided background research contributing to the development of a Defence Assessment.

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Ministry of Defence - Defence Assessment 2020 Research Report

This report will analyse the future convergence of three core trends; development of, and subsequent reliance upon, autonomous weapon systems; emerging domains of great power competition, focusing on grey-zone and hybrid warfare; and the rise of non-state and private sector actors. Comprehensive research on these topics exists individually, but there is a lack of robust futures mapping that properly analyses their convergence. Identifying and extrapolating trends within a Critical Uncertainties Matrix is an incredibly valuable method of futures mapping that initially emerged in the private sector and assisted multinational corporations in gaining prominence, hence its alternative label as the 'Royal Dutch Shell Method'. This report utilises the timeframe of 2035-2040 to produce four alternative future scenarios, each with a detailed narrative to provide a contextual glimpse at what they may look like in actuality.

Key overview:

- Rapidly expanding research and development in autonomous weapon systems by advanced militaries and increasing accessibility to cost-effective drone technology on open international markets is highly likely to lead to innovation that outpaces policy and operational adaptability. The autonomous arms race is forecast to push human presence and meaningful influence out of operational decision making, while enabling expansionism and enduring conflict that is decoupled from human emotion and is detrimental to civil-military relations.

- Future competition will continue to occur in grey-zones; revisionist powers will employ multi-domain, multi-faceted techniques to challenge established power structures that fall under the established threshold of conventional response. Tactics such as cyber-attacks, informational warfare, irregular forces, and fait accompli strategies will continue to increase in efficacy and complexity, driven by developments in drone swarm technology, and potentially empowering and equipping none-state groups.

- Non-state actors are highly likely to become increasingly influential players in future conflicts, enabled by an amalgamation of improved technological skillsets, more stressed societies, resources, and infrastructure, and greater necessity for asymmetric capabilities vis-à-vis great powers that are intervening in their region. Scenario four, 'Far-flung Bloodbath', represents the potential inadvertent consequences of a global ban on autonomous weapon systems in an international system that is poised for conflict, resulting in steep casualty rates and the displacement of tens of millions of people.

- This carries implications for multiple avenues of New Zealand defence policy. Capability procurement strategies and international defence relationships should be regularly iterated to facilitate future autonomous weapons interoperability with allies and partners. These strategies should consider hardware and software procurement as equally important moving forward. New Zealand should also work with its partners to establish coherent and consistent response thresholds to increasingly common grey-zone and hybrid warfare operations conducted by revisionist states, particularly in regard to cyber-attacks, economic coercion and manipulation, and informational warfare. Attributability is a key concern here, as the increasing potency of algorithms and A.I. may lead adversaries, and allies, to shirk responsibility by blaming system producers.

Great and revisionist power strategic competition:

Senior Fellow for the American Foreign Policy Council, Lamont Colucci, states that the contemporary geopolitical situation 'bears a disquieting resemblance to that world of a hundred years ago that came apart with sudden and appalling violence', citing climate change, migration and resource insecurity as causes of some of the current conflict in regions such as the 'Euro-Russian frontier, the Baltics, the South China Sea, and the Middle East'.[i]

This is evident through the **'revaluating, amplifying, or changing' of major powers' grand strategies in the last two decades**, such as China's Belt and Road Initiative and the quest for Asian primacy, Russia's 'Putin Doctrine' and the fight to establish a buffer zone against territorial threats, and the US' grand pivot to Asia.[ii]

Driving this competition, in regards to China and the US, is a widening ideological divide, not dissimilar to that of the US and the Soviet Union during the Cold War. An example of this was seen in Xi Xingping's 2013 memo sent to all Communist Party leaders throughout China that warned of 'Western infiltration', primarily 'Western constitutional democracy' and 'pro-market neo-liberalism', **representing a soft-power battlespace alongside both conventional and emerging military technology**.[iii]

Grey-zone/hybrid warfare:

It is important here to understand that numerous revolutions in military affairs since the late 20th century have fundamentally changed the way large-scale conflicts and wars unfold, with traditional mass-deployment theatre war last truly being seen in the Vietnam War over fifty years ago.

This idea is summarised well by British Army General Rupert Smith when he posits that 'war as cognitively known to most non-combatants, as battle in a field between men and machinery, as a massive deciding event; such war no longer exists', with contemporary warfare being characterised instead by grey-zone conflict, proxy wars, and constant multi-domain competition.[iv] **This 'political warfare' is a combination of military, economic, and diplomatic capabilities that aim to achieve state objectives but fall under the threshold of war, such as covert operations, funding insurgencies, cyber-attacks, economic coercion and fait accompli strategies.**[v]

The 2018 US National Defense Strategy document outlines 'revisionist powers' utilising 'corruption, predatory economic practices, propaganda, political subversion, proxies, and the threat or use of military force' as the largest threat to the stability of the international system, **exemplifying well how grey-zone competition has become the established norm.**[vi] This is further legitimised as the character of future war through the **US Congress' approved authority of 'Section 1202' of the 2018 National Defense Authorization Act**; instilling the Pentagon with a greater capacity to fund 'foreign forces, irregular forces' and any group or individual 'who are supporting or facilitating Special Operations Command irregular warfare operations'.[vii]

Ultimately, it is evident that an amalgamation of enduring and emerging challenges, including a 'competitive and conflict-prone zero-sum mentality' may serve to fragment the international order further and drive great powers into increasingly fierce competition and conflict.[viii]

Autonomous weapon systems/drones:

The revolution in autonomous weapon systems has already begun, and is forecast by many experts and scholars to continue to develop exponentially. United States Department of Defense **spending on drones**, operating across all three physical domains, **'skyrocketed after 9/11, increasing sixfold'** from late 1990's figures of around $300 million to over $2 billion annually by 2005.[ix] Projected spending on military robots with some degree of autonomy is forecast to exceed $7.5 billion by 2018, with the United States representing the bulk of this, alongside other highly-developed militaries such as major European states, Russia, China, and Japan.[x] The Department of Defense Directive Number 3000.09 defines an autonomous weapon as a system that 'once activated, can select and engage targets without further intervention by a human operator', however develops this to acknowledge International Human Rights Law and ethical concerns by emphasising that 'appropriate levels of human judgement over the use of force' are to be maintained.[xi]

On the ground since as early as 2009 there are been Samsung SGR-A1 fully autonomous sentry turrets on the South Korean side of the DMZ, that have the capability to 'stand guard continuously' and are programmed to assume that anyone entering the DMZ is hostile, at which point the system itself can decide whether to 'sound an alarm, fire rubber bullets, or make use of its Daewoo K3 machine gun'.[xii]

Swarm technology:

Drone swarm technology is a salient emerging sub-trend within this field and focuses on large amounts of cheaper, mass-produced, networked drones with semi-autonomous capabilities working together as a singular decision-making entity. These swarms can be launched from the air, sea, or land and **once given a command they can operate 'off-leash' to achieve their objective**, with their software independently deciding which drones should focus on which target and ensuring they do not collide with one another.[xiii] Described as a 'whirling gyre' of 'pure chaos' by the Director of the Technology and National Security Program, Paul Scharre, these swarms are being implemented as a legitimate military tactic throughout developed militaries, with the **US demonstrating a successful 103 aerial drone swarm in 2016 that was trumped mere months later by a Chinese swarm of 119 drones.[xiv]**

Withdrawn human presence/influence in decision making:

US Air Force and US Navy Long-Range Anti-Ship Missiles (LRASMs), like their drone counterparts, operate within the **'OODA Loop' of observe, orient, decide, act**; equipping the missile with a 500 nautical-mile range and 'advanced survivability features' that enable it to independently detect and avoid threats on its flight path, and autonomously identify its target upon arriving at destination amidst an 'area of uncertainty'.[xv]

The British Ministry of Defence has forecasted that systems operating within the OODA Loop are **'likely to become commonplace'**, including automated submarines, surface patrol vessels, and land vehicles that can be utilised to 'deliver supplies, conduct reconnaissance, and clear obstacles', **with these systems also likely to be 'employed further away from human supervision' as confidence in them, and efficacy of them, increases.[xvi]** It is important to note here that the proliferation of autonomous weapon systems thus far has **'outpaced everything from planning for future acquisitions, to doctrine, to personnel'**, and advanced militaries

are increasingly likely to find themselves having to pit their drones against each other before adequate operationalisation processes can be formulated.[xvii]

Impact of accessibility and affordability:

The lynchpin of swarming technology is cost-efficiency, with basic networkable computers purchasable online for as low as US$5 and a basic swarm-capable drone, one that possesses enough power and manoeuvrability, can be purchased or built for around US$200, **creating the possibility of militaries employing a million-drone swarm for the price of a single advanced frontline aircraft, such as an F-35.[xviii]**

The necessary components are readily available on open international markets, enabling both rogue regimes and non-state actors to potentially utilise drone swarms which could easily pass over borders and through air defences to deliver lethal payloads or conduct spying and sabotage, all under the veil of anonymity if required.[xix]

Rise of none-state groups:

Dr Robert Johnson of the University of Oxford states, in a 2015 report for NATO, that **'10-20 years from now, the capabilities and organisation of some insurgent groups will be like those of state armies'**, with their tools and skillsets converging with state actors and a 'significant probability there will be twice the number of insurgencies that exist at the present' by 2035.[xx] These actors, likely the inadvertent victims of great power struggle in and around their region, may materialise as **'conflict entrepreneurs' who are highly adaptable and proficient in highly asymmetrical tactics who have 'resorted to the use of force to partake in the spoils of society'**.[xxi]

Facilitated by grey-zone strategies:

Numerous key trends will contribute to the rise of both insurgent groups and private militaries such as **'systemic warfare'**; encompassing the targeting of financial systems, 'anti-state, anti-government activity', information manipulation, 'disruptive electronic warfare', and strategic ground-level disruptions to food, water, and energy supplies.[xxii]

Through this, **there is likely to be a rise in 'nodal degradation' as a focus of irregular conflict**; non-state groups targeting hubs, or nodes, of the enemy's 'capacity to resist, command, or communicate', including telecommunications centres, energy infrastructure, and even informational, psychological, and biological manipulation of vulnerable proxy groups to instil panic and decrease morale.[xxiii] Furthermore, **rapid urbanisation and littoralisation is forecast to result in much greater infrastructural stress and overloading of 'economic, social, and governance systems'** and, consequently, significantly larger amounts of people competing for diminishing resources in 'crowded, underserviced, and under-governed urban areas'.[xxiv]

Convergence with autonomous weapons/burgeoning open drone markets:

Even when lacking significant ordinance, non-state drone capabilities could have a significant impact on the electromagnetic battlespace by deploying cost-effective communications jamming, better recognised as **'weapons of mass disruption'**.[xxv] Interestingly, as the great powers increasingly rely upon autonomous weapon systems **their counter-insurgency**

capacities are likely to be diminished. Here, Riza notes that 'it must be the primary focus of any counter-insurgency to replace that support or tolerance' that the insurgent actors have accrued within a region, to 'win the hearts and minds' of those effected, but the growing great power focus on autonomy is set to be counterproductive in this respect, as **'how does a robot have tea with a village elder?'**[xxvi]

Expanding upon this, it is likely that increased autonomous weapon use by great powers in their quest for riskless warfare **will only coerce non-state actors further towards implementing the same tactics, however in much more 'unpredictable, asymmetrical, and disproportionate' ways,** particularly against civilian populations and infrastructure. Therefore, the rising utilisation of autonomous systems by great powers, and especially for counter-insurgency purposes, can be seen as an emerging paradox when forecasting the future of war. **In his NATO report, Johnson specifically forecasts 'localised swarm attacks, particularly in urban centres' by non-state actors**, alongside possible acquisition of last-generation autonomous missiles and ground systems as the great power autonomous arms race is likely **push new technology into obsolescence reasonably rapidly, resulting in theoretically easier access to the slightly older systems for insurgencies and private security companies**.[xxvii]

3D-printed drones arise here as another complex challenge for counter-insurgency operations, as **non-state actors can rely on cost effective, 'crowdsourced' assets that represent a distributed threat with no central node of command**; tactics likely to be increasingly utilised by cyberspace actors such as Anonymous in the future, too, as cheap drones 'would be a natural extension of their operations'.[xxviii]

<u>Implications for New Zealand defence policy:</u>

New Zealand should ensure its **capability procurement strategy and international defence relationships are flexible and regularly revisited to facilitate future autonomous systems interoperability with its partners.** The Loyal Wingman program introduced by the Australian Department of Defence in May 2020 represents a relevant technological and operational development that may change New Zealand's strategic calculus in this respect.

A flexible procurement strategy should also take into account the source of autonomous weapons software, which should be considered equally as important as the system hardware itself. This is particularly important for New Zealand and other small-to-medium states as it is highly likely that they will be importers of such systems in the future, not producers.
Given New Zealand's extensive EEZ and extended maritime jurisdictions in the South Pacific, it is **positioned to benefit significantly from operationalising surface ship and aerial drone fleets**, particularly to monitor IUU fishing, contribute to disaster relief, and search and rescue operations.

With the proliferation of grey-zone and hybrid warfare strategies throughout the strategic environment, **it will be valuable for New Zealand to regularly iterate its thresholds of response to such challenges**. Cyber-attacks, economic coercion and manipulation, and informational warfare are primary concerns to New Zealand security, as our relative geographic isolation negates the threat of irregular forces and critical infrastructure sabotage that are evident in numerous other regions. **Working with international partners and likeminded states will be crucial in developing coherent and consistent grey-zone response thresholds.**

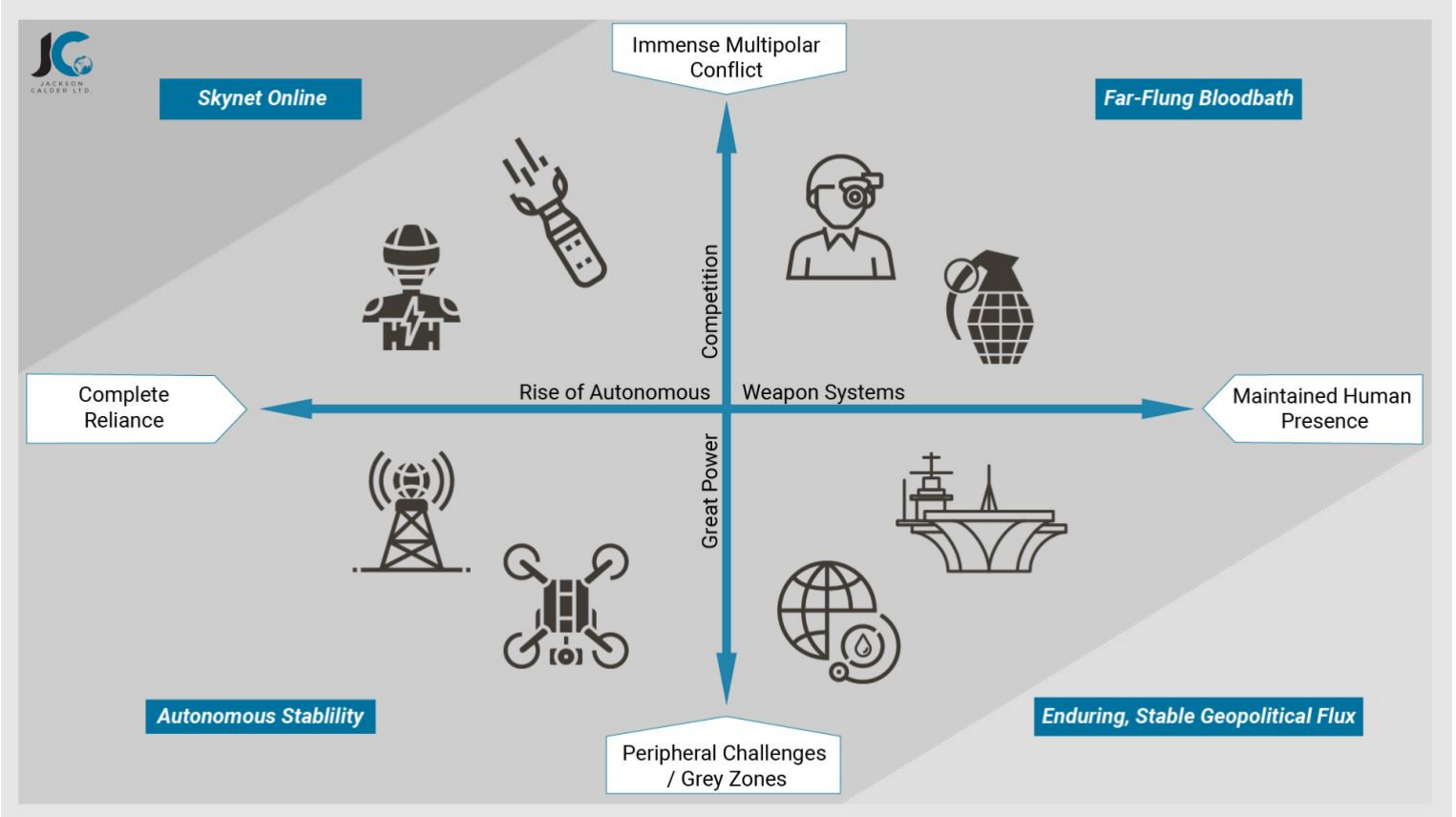
A core challenge in this vein will be achieving attributability, both for foreign cyber operations and future drone operations. Foreign actors will blur the lines of accountability, potentially blaming their software for their system's actions, especially if they procured it from another state. In this regard, New Zealand's policies should be constantly re-evaluated to position it as a bulwark against grey-zone and hybrid warfare strategies in the wider South Pacific.

It is forecast that the convergence of autonomous weapon systems and increasing strategic competition may facilitate expansionism by established great powers and rising revisionist states, driven by riskless robotic warfare. **New Zealand should prepare for its allies and partners, particularly the U.S. and China, to manipulate or coerce it into system basing, network sharing and interoperability arrangements** which will position it as merely a pawn in their inter-regional expansionist chess game. Granted, it may be beneficial to New Zealand's national security to enter such an agreement in the future, but defence policy should pre-empt this development and **the government should have established processes in place that allow it to negotiate, not have said arrangements forced upon it.**

Futures Modelling:

This report utilises the **Royal Dutch Shell/GBN Critical Uncertainties Matrix Model** to produce four alternative future scenarios based on the extrapolation of the analysed trends. This report's length restrictions do not allow for the inclusion of an **Impact/Uncertainties Matrix** that would demonstrate more of the futures modelling process, but this will be shown in future reports. The trend of increased use of autonomous weapon systems can be extrapolated in two directions of varying intensity, and is placed on an axis that ranges from **'maintained human presence in war, autonomous systems only complimentary'** to **'complete reliance on robotic/autonomous warfare'**. The trend of increasing great power competition can be extrapolated in two directions of varying intensity, and is placed on an axis that ranges from **'peripheral challenges to a maintained US-led international order'** to **'immense multipolar grey-zone conflicts'**. The futures model used centres on the two key trends discussed above consisting of the axes, thus the third trend of the rise of non-state actors is not extrapolated into two alternative futures or placed on an axis, instead influencing each alternative future scenario in ways consistent with the previously analysed research.

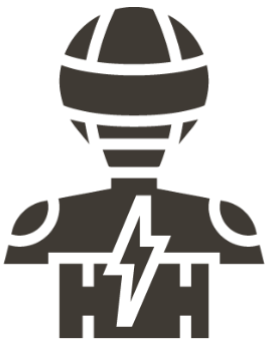
Critical Uncertainties Matrix:



Alternative future scenario one: Skynet Online

- **'Complete reliance on robotic/autonomous warfare' meets 'immense multipolar grey-zone conflicts':**

Numerous flash points of great power geopolitical competition have erupted into conflict, such as the South China Sea, Syria, and the Korean Peninsula, however human battlefield casualties of the great powers are extremely low. Complete reliance on autonomous weapon systems resulted in the US, China, Russia, India, and Japan increasingly asserting their presence in foreign conflicts and sensitive geopolitical regions, facilitated and enabled by riskless robotic warfare. Aerial, naval, and land-based drone swarms are now capable of operating completely independently for months on end, transmitting enormous caches of data back to their central command, but adjusting their tactics and targets too rapidly for any significant human influence. Entirely autonomous Lockheed Martin LRASMs, and their Chinese and Russian counterparts, possess ranges of over 1000 nautical miles and can remain in flight for days searching for an adversary's large assets and infrastructure, in addition to being able to release its own miniature drone swarm that is commanded by the central on-board computer, outside of human control. Cyber-attacks and psychological warfare is commonplace, and the electromagnetic spectrum has become a primary battlespace, with swarms of drones across all domains constantly seeking to disrupt enemy communications and spread disinformation. Non-state actors have enormous influence over warfare in their regions, such as ISIS dominating most of Syria's airspace through thousands of independent drone swarms operated from underground bunkers. The oceans of the Indo-Pacific region are dominated by swarms of surface ship and submarine drones, and international shipping lanes are regularly disrupted, resulting in a significant stagnation of the global economy. Small powers in geostrategic points are coerced into drone supply and maintenance agreements by the power-projecting states, such as the U.S. using New Zealand as its de facto South Pacific base. With conflict losses being measured in dollars instead of human lives, major powers are incentivised to maintain the heavy deployment of autonomous systems to proxy regions around the world, including the South China Sea, Africa, Eastern Europe, Central Asia, and Central America, with no cessation of conflict in sight.



Alternative future scenario two: Autonomous Stability

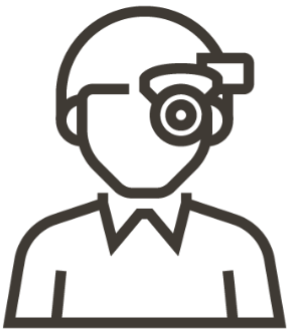
- **'Complete reliance on robotic/autonomous warfare' meets 'peripheral challenges to a maintained US-led international order':**

The revolution in autonomous weapon systems emerged alongside a defensively-oriented multipolar international system in which the rules-based order has endured, and authoritarian revisionist states are refraining from direct challenges to US-Japan-India trilateral hegemonic order. Great power territorial defence has been sub-contracted to efficient and reliable drones of many kinds, including sentry turrets and roaming sea mines, and enormous swarms of drones endlessly patrol state borders, making territorial expansion impossible. China and Russia continue to wage cyber-warfare against the US and its allies, resulting in sustained economic, political, and ideological competition with occasional mass disruption to energy infrastructure and the telecommunications sector. Non-state actors are engaged in immense localised struggles for ideological domination and access to natural resources, such as the Houthi rebels implementing highly asymmetrical drone swarm bombings in Saudi Arabian population centres and oil processing infrastructure, resulting in the state employing private military firms with the latest autonomous weapon capabilities for protection. On the horn of Africa, Somali pirates utilise swarms of autonomous submarines to identify and target international shipments of valuable resources, and are often met by a defensive coalition of Indian Ocean naval powers such as India, Japan, and the US who command counter-insurgency operations from mainland nodes, to varying degrees of success. The global economy, however, remains competitive and continues to grow, with great powers and their allies experiencing the lion's share of growth, while smaller states are increasingly vulnerable to peripheral challenges to their sovereignty, such as economic coercion, cyber-attacks, and home-grown terrorism.

Alternative future scenario three: Far-flung Bloodbath

- **'Maintained human presence in war, autonomous systems only complimentary' meets 'immense multipolar grey-zone conflicts':**

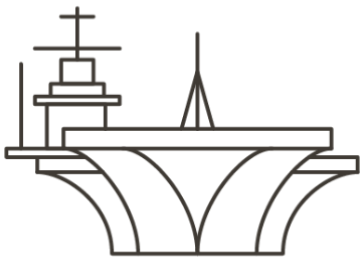
The US-led international rules-based order has been fragmented by increasingly assertive revisionist states and a degradation of institutional integrity and alliance structures. Proxy war in Eastern Europe, Central Asia, and the Middle East is commonplace, with many sub-regions experiencing intense conventional warfare and high casualty rates. Autonomous weapon systems did not develop rapidly enough to become more cost-efficient than conventional frontline assets before a global recession that was due to currency manipulation, trade wars, debt trap diplomacy, and economic protectionism. Additionally, International Human Rights Law and the Pentagon's own inhibitions served to stymie rapid development of the systems. Semi-autonomous systems such as the M9 Reaper drone have been modernised and remain a central operational tactic, alongside expanded special operations and irregular warfare units on the ground. Informational warfare exists at all levels, and the great powers constantly struggle to break through each other's cyber defences while their militaries provide endless streams of strategic support to a plethora of insurgencies and other non-state actors in proxy regions around the globe to fight alongside their forward military deployments. However, non-state actors that are not assimilated into great power logistics and support networks struggle to gain a foothold, and are constantly caught in the crossfire, along with the civilians that fail to flee proxy regions. The worst refugee crisis in recorded history ensues, with tens of millions of people immigrating to Western Europe, India, Northern Africa, and elsewhere. Critical infrastructure in these areas becomes heavily overloaded and competition for resources intensifies, cultivating discontent towards the warring powers alongside deep societal, ethnic, and religious discrimination. As the great powers continue to sustain heavy human and technological losses, nuclear weapons come further towards the forefront of each state's strategies.



Alternative future scenario four: Enduring but Stable Geopolitical Flux

- **'Maintained human presence in war, autonomous systems only complimentary' meets 'peripheral challenges to a maintained US-led international order':**

The US continues to strengthen its interoperability with Japan, whilst developing its strategic relationships with India and Australia, ensuring the success of the Free and Open Indo-Pacific connectivity initiative. Chinese GDP growth stagnates at 2% per year, but the Belt and Road Initiative has made immense progress throughout the Afroeurasian supercontinent, resulting in a significantly increased Chinese presence in Central Asia and Africa. Autonomous weapon systems are being developed slowly on the periphery of conventional US and Chinese power-projection capabilities, namely aircraft carriers, which maintain a constant presence in geostrategically important locations such as the Bay of Bengal and the South China Sea. Russia continues to utilise hybrid strategies, particularly throughout the cyber and proxy domains, below the threshold of war, but has developed advanced hyper-sonic missiles that are constantly mentioned in Russian state media. The US and its allies have continued to implement increasingly harsh sanctions on North Korea, which has demonstrated to the world its nuclear-triad; the capacity to launch weapons of mass destruction reliably from the air, sea, and land. Violent insurgencies are commonplace in Syria, Lebanon, and Iraq with local groups finding themselves increasingly subject to great power intervention and proxy war. While many states have transitioned almost entirely to renewable energy generation there is severe food and water insecurity occurring in the world's megacities, which have more than doubled in number to over one hundred. Although multilateral institutional integrity within the rules-based order has endured, Chinese economic and political influence commands central Asia, Indochina, and most of Africa, foreshadowing an impending conflict between the competing orders that could be triggered by any multitude of existing flashpoints.



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[xxiv] da Cruz, Out of the Mountains, p.152.
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